PROVINCE OF BRITISH COLUMBIA

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# Provincial Department of Fisheries

## REPORT

WITH APPENDICES

For the Year Ended December 31st

1952

VICTORIA, B.C.
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1953

*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, 1952.

WILLIAM RALPH TALBOT CHETWYND,
*Minister of Fisheries.*

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

*The Honourable William Ralph Talbot Chetwynd,*
*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, 1952.

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 1952

## VALUE OF BRITISH COLUMBIA'S FISHERIES IN 1952 SHOWS A DECREASE

The total marketed value of the fisheries products of British Columbia for 1952 amounted to $56,635,000. This was a decrease from the year previous of $27,177,704, or approximately 32 per cent less than the marketed value of fisheries products in 1951.

The principal species, as marketed in 1952, were salmon, with a value of $40,500,000; herring, with a value of $4,235,000; and halibut, with a marketed value of $5,672,000. The value of the salmon production in 1952 was $20,249,658 less than in 1951. The value of herring production in 1952 also showed a decrease from the year previous of $6,404,653. It should be noted that these figures are for the calendar year and, consequently, somewhat distort the picture in respect to herring, as this fishery extends from November to March. The herring values quoted are for those fish landed in the months of January and February and properly belong to the 1951–52 herring-fishing season. The value of the 1952 halibut-catch was decreased by $90,000.

In 1952 the marketed value of shell-fish amounted to $1,390,000. The value of the clam production was $477,000; oyster production, $438,000; and crab production, $475,000.

The total value of boats engaged in commercial fishing in 1952 was $42,161,000, and the total value of gear used in British Columbia's fisheries during 1952 was $6,570,000.

The above figures are taken from the "Preliminary Fisheries Statistics of British Columbia," published by the Federal Department of Fisheries.

## REVIEW OF BRITISH COLUMBIA'S SALMON-CANNING INDUSTRY, 1952

In 1952 the Department of Fisheries licensed nineteen salmon-canneries to operate in the Province of British Columbia. This was four less than were licensed in 1951. The operating canneries in 1952 were located as follows: Skeena River, 5; Central Area, 2; Rivers Inlet, 1; and Fraser River and Lower Mainland, 11.

The distribution of the operating canneries is somewhat different from that of 1951. In 1952 one less cannery operated on the Skeena River and one less in the Central Area than in the year previous. The same cannery operated in Rivers Inlet in 1952 as in 1951, while in 1952 no canneries were operated on Vancouver Island. The Fraser River and Lower Mainland had eleven operating canneries in 1952, compared with twelve in the year previous. There were no canneries operated on the Nass River and in the Queen Charlotte Islands in 1952. Smith Inlet, also, did not have an operating cannery in 1952. All three of these areas formerly supported operating canneries. The salmon-catch from these canneries is now transported to other areas for canning. This tendency to pack fish from one area to another for canning has been mentioned in previous issues of this Department's Report, and apparently the policy of concentrating the packing of salmon in fewer canneries is continuing. The liberal use of ice, together with modern, fast packers, has made it possible for the operators to transport fresh salmon over increasingly greater distances. It is anticipated that this practice will continue, but, if the quality

of the canned-salmon products is to remain high, the distance that fish may be transported before canning is limited. As pointed out in this Department's Report last year, this practice may serve as some measure of economy in production costs, but the major portion of the cost of a case of canned salmon is the price of the raw fish, and until such time as the prices of raw fish are reduced, the cost of producing a case of canned salmon will remain high, regardless of the concentration of the operation of canneries.

Probably the most outstanding feature of the fishing season under review was the many interruptions in fishing caused by labour disputes between the fishermen's union and the operators. These interruptions are particularly noticeable in the pack figures for the different districts. The first strike took place in the whaling industry on April 1st and lasted until May 1st. The crews finally decided to go to work at the price offered, with the result that a month was lost, and it is estimated that the crews lost from $300 to $600 per man, while the plant workers lost an average of $300 each. Commencing on April 18th and continuing until July 1st, part of the beam-trawl fishery went on strike. It is estimated that 100 or more fishermen were involved in this strike and that their probable earnings would have been upwards of $900 to $1,100 each. On July 20th the sockeye-salmon fishermen went on strike, or, more properly, it may be said that they did not commence fishing at the beginning of the season. The strike resulted in the increase of a half a cent per pound on pink salmon. Again, on September 1st, the entire salmon-fishing industry closed down until October 18th, and during this strike no material gain was made by the fishermen. It is estimated that from $1,000 to $1,500 per man was lost by the fishermen and that the plant workers lost probably $400 per man and the tendermen approximately $500 each. The herring-fishery, which normally commences about the first of November, lost the entire season, as the operators and fishermen were unable to come to terms. In a normal herring-fishing season approximately 1,000 herring-fishermen and tendermen are employed, and it is estimated that these men lost between $2,500 to $3,000 apiece, while the workers in reduction plants lost between $600 and $800 apiece on account of the shut-down.

It is not the purpose of these remarks to level praise or blame for these strikes on any particular segment of the fishing industry. It should be remarked, however, that a strike in the fishing industry cannot gain anything for anyone. The fishing industry differs from other industries—the logging industry for instance. If that industry is tied up for a period of time, the trees that would have been cut down remain and can still be cut after the strike is finished, but in the fishing industry the fish must be caught while that particular species is available, otherwise they are lost to the fishermen and the industry for all time. A good example is the herring-fishery of British Columbia. Normally this industry is worth approximately $8,000,000 a year. In 1952 there was no herring-fishery, consequently the economy of British Columbia is poorer by that amount. Not only have the fishermen and operators directly concerned lost a season, but the whole economy of the Province has been reduced by that amount.

Since 1947 the export of fresh salmon has been permitted after September 1st in each year, which has resulted in a large movement of chum salmon to the United States for processing in Puget Sound canneries. In so far as the Canadian canned-salmon pack is concerned, Canadian canneries practically close up after September 1st, as nearly all of the chum salmon caught for canning purposes after that date find a market in the United States and are canned there. This export of raw fish, which would ordinarily be canned in British Columbia, has had the effect of reducing the canned-salmon pack of the Province considerably and, of course, has had the effect of reducing the number of employees and employees' earnings in British Columbia canneries. It is doubtful whether the small increase earned by the fishermen from the slightly higher price received for their fish from United States' buyers compensates for the loss to the industry and the shore workers by the closure of British Columbia canneries. What has happened in the

last few years in connection with the export of raw fish to the United States for canning should be a good object lesson as to the value of the embargo and a demonstration of what would happen if the embargo on the export of canning-fish were permanently removed. It goes without saying that the salmon-canneries in British Columbia would practically go out of business. This will be true until such time as the United States market for canned salmon is available to Canadian canners without the impost of a high duty.

In considering the current pack figures for the canneries of the Lower Mainland, it should be kept in mind that the export of raw fish reduced the pack by the equivalent of the amount exported. Due allowance should therefore be made for this when comparing the canned-salmon pack figures with the years previous to 1947.

## THE CANNED-SALMON PACK FOR BRITISH COLUMBIA, 1952

The total canned-salmon pack for British Columbia in 1952 amounted to 1,305,160 cases, according to the annual returns submitted to the Provincial Department of Fisheries by those salmon-canners licensed to operate. The 1952 salmon-pack was 652,360 cases below that for the previous year and was also slightly lower than the average annual pack for the previous five-year period.

In comparing the 1952 salmon-pack with the year previous, it must be remembered that the pack in 1952 was the largest since 1941 and, excluding the pack of 1941, was the largest in any year since 1928. The canned-salmon pack in 1952 does not necessarily represent the size of the runs of fish to the various watersheds in British Columbia, because several strikes interfered with salmon-fishing during the season.

The 1952 salmon-pack was composed of 449,494 cases of sockeyes, 9,279 cases of springs, 3,762 cases of steelheads, 67,438 cases of cohoes, 679,182 cases of pinks, and 96,005 cases of chums.

The total sockeye-pack in 1952, amounting to 449,494 cases, exceeded the pack of 1951 by 21,195 cases and was 88,120 cases greater than were packed in the previous five-year period.

In 1952 the spring-salmon pack amounted to 9,279 cases. The size of the spring-salmon pack is never indicative of the size of the run, but, for comparative purposes, the 1952 pack is compared with the previous five years, in which the following quantities were canned: 1952, 13,698 cases; 1950, 9,233 cases; 1949, 21,184 cases; and 1948, 16,445 cases.

Steelheads are not salmon, but a few are canned each year, principally those which are caught incidentally while fishing for other species. In 1952 the steelhead-pack amounted to 3,762 cases. This is compared with 3,655 cases in 1951, 3,227 cases in 1950, and 2,373 cases in 1949.

The cohoe-pack in 1952 was 67,438 cases. This was the smallest pack of cohoe salmon reported in a great many years and was, no doubt, due to the fact that the catch was reduced considerably by strikes and that large quantities of fall cohoe were exported to the United States. For purposes of comparison, it might be noted that the five-year average for the cohoe-pack in the years 1947 to 1951 amounted to 204,269 cases. The 1952 cohoe-pack, therefore, was 136,831 cases lower than the average for the period under review.

In 1952 the pink-salmon pack amounted to 679,182 cases, which was 56,911 cases below the pack of this species for 1951 and 100,494 cases above the average annual pack for the previous five-year period.

The pack of chum salmon in 1952 amounted to 96,005 cases. This was 366,096 cases less than in 1951 and 265,530 cases below the average annual pack for the previous five-year period. This reduction in the chum-salmon pack was partly due to interruptions

in fishing by strike action and more particularly due to the large quantities of chum salmon which were exported to the United States for canning there.

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

In the Appendix to this Report will be found " Salmon-spawning Report, British Columbia, 1952," which report was supplied by the Chief Supervisor for Federal Department of Fisheries and is hereby gratefully acknowledged.

## BRITISH COLUMBIA'S CANNED-SALMON PACK BY DISTRICTS

### Fraser River

The total canned-salmon pack for the Fraser River in 1952 amounted to 151,147 cases, compared with 268,233 cases in 1951. Pink salmon run to the Fraser River in the odd-numbered years, and as there was no pink-salmon run to the Fraser in 1952, comparison with the total pack for the year previous is somewhat misleading. In 1950, also a year in which pink salmon did not enter the Fraser River fishery, the total salmon-pack amounted to 139,721 cases.

The total pack on the Fraser River in 1952 was composed of 134,625 cases of sockeyes, 2,279 cases of springs, 202 cases of steelheads, 5,500 cases of cohoes, 60 cases of pinks, and 8,480 cases of chums, half-cases having been dropped in each instance.

*Sockeye Salmon.*—In 1952 the Fraser River produced 134,625 cases of sockeye salmon. This was 10,606 cases greater than the number produced in the year previous and 24,813 cases greater than the average annual pack for the previous five-year period, 1948 to 1952. The sockeye runs to the Fraser River are composed principally of 4- and 5-year-old fish and properly should be compared with the cycle-years. In 1948 the sockeye-pack on the Fraser River was 64,823 cases, while in 1947, the five-year cycle, the pack amounted to 33,952 cases. Again, in 1952, reports from the sockeye-salmon spawning-beds of the Fraser River indicated that all were well seeded. Much of the improvement in the Fraser River sockeye picture can be attributed to the success of the programme of the International Pacific Salmon Fisheries Commission and the conservation methods adopted by the Federal Department of Fisheries.

The Fraser River sockeye-salmon fishery is regulated by an International Commission under treaty between Canada and the United States. This fishery is an international one in that the sockeye salmon comprising the fishery pass through both Canadian and United States territorial waters before reaching the Fraser River, hence the nationals of both countries share in the catch. The Commission is composed of six members, three of whom are appointed by the United States Government and three by the Canadian Government.

According to figures published by the International Pacific Salmon Fisheries Commission in its annual report for 1952, the total sockeye-salmon pack for the Fraser River amounted to 230,452 cases. Of this total, Canadian gear is credited with 115,814 cases and United States gear with 114,638 cases. The percentages are, Canadian, 50.26 per cent and, United States, 49.74 per cent.

The discrepancy apparent in the figures reported by the International Pacific Salmon Fisheries Commission for Fraser River caught fish and those presented in this Report is, no doubt, due to the fact that Johnstone Strait sockeye are credited to the Fraser River in the figures contained in this Department's Report.

For convenience a table is included in this section showing the American and Canadian catches by percentages from 1935 to 1952, inclusive:—

| | American (Per Cent) | Canadian (Per Cent) |
|---|---|---|
| 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 |
| 1950 | 57.70 | 42.30 |
| 1951 | 46.78 | 53.22 |
| 1952 | 49.74 | 50.26 |

The percentages for 1952 are based on figures supplied by the International Pacific Salmon Fisheries Commission.

There is again included in the Appendix to this Report a table showing the total sockeye-salmon packs for the Fraser River arranged in accordance with the four-year cycle from 1895 to 1952, inclusive, showing the catches made by British Columbia and Washington fishermen in the respective years.

*Spring Salmon.*—In 1952 there were 2,279 cases of spring salmon canned from fish caught on the Fraser River. This is compared with 5,719 cases of springs in 1951, 1,818 cases in 1950, and 9,889 cases in 1949. The pack in 1948 was 2,955 cases. The canned-salmon pack of spring salmon from the Fraser River is in nowise indicative of the size of the catch of this species, as spring salmon find a large outlet in other than the canned state. The fresh- and frozen-fish trade takes large quantities of spring salmon.

*Cohoe Salmon.*—The Fraser River produced a total pack of 5,500 cases of cohoe salmon in 1952. This is compared with the pack in the year previous, which amounted to 14,848 cases. It must be remembered that the 1951 pack was the largest pack of cohoe on the Fraser River since 1948. The cohoe-pack from Fraser River caught fish in 1950 was 6,025 cases, and in 1949, 10,286 cases were canned.

The reader is reminded that the pack figures quoted for the Fraser River in this Report are for Canadian catches only, unless otherwise stated. The United States catches of each species proceeding to the Fraser River are not included in these figures. In the case of cohoes it should be remembered that large quantities are frozen for the winter trade, and these, of course, are in addition to the catch, as indicated by the canned-salmon pack.

*Pink Salmon.*—The pink-salmon run to the Fraser River occurs in the odd-numbered years only, and, accordingly, there was no pink-salmon run to the Fraser in 1952. A total of 60 cases was reported to have been canned from pink salmon caught incidentally while fishing for other species in the Fraser River in 1952.

*Chum Salmon.*—In 1952 there were 8,480 cases canned from Fraser River caught chums. This was 27,050 cases less than were canned in the year previous.

In recent past years the chum-salmon pack on the Fraser River has been showing a constant decline. This is not caused by any reduction in the amount of fish available, but is due entirely to the quantity of chum salmon exported to the United States for canning. It will be recalled that the Canadian Government maintains an embargo on the

export of fresh salmon to the United States for canning up until September 1st. In recent past years this embargo has been lifted after September 1st, and most of the chum salmon caught after that date have been finding a market on the other side of the border. What is happening with chum salmon on the Fraser River is indicative of what could happen to British Columbia's salmon-canning industry if, for any reason, the Canadian embargo on the export of fresh salmon were lifted. There is no doubt that United States canners, with their very much larger home market, would be able to outbid Canadian canners for Canadian fish, with the result that Canadian fish would be canned in the United States or else the Canadian consumer would have to pay a higher price for salmon caught and canned in Canada. The extra dollars earned by the slightly higher price obtained by the fishermen for fish on the other side of the line would not compensate for the loss incurred by a large number of people who find employment in British Columbia canneries, together with the higher cost to the Canadian consumer.

Any consideration of the canned-salmon pack as a measure of the total run of any species must take into account the escapement to the spawning-beds. The escapement to the various spawning-beds of the Province is reported each year by the Chief Supervisor of Fisheries for the Federal Government. This report is contained in the Appendix, and the reader is referred to it when appraising the salmon runs to the different river systems.

## Skeena River

The Skeena River in 1952 produced a total salmon-pack of 221,306 cases. This was the largest pack for the Skeena since 1945, when 221,471 cases were canned. The Skeena River pack in 1952 was composed of 114,775 cases of sockeyes, 2,082 cases of springs, 2,139 cases of steelheads, 8,358 cases of cohoes, 89,314 cases of pinks, and 4,638 cases of chums. A feature of the large pack in 1952 was the fact that a large pack of sockeye salmon coincided with a fairly large pack of pink salmon.

*Sockeye Salmon.*—The pack of sockeye salmon on the Skeena River in 1952, amounting to 114,775 cases, was the largest pack of sockeye since 1940, in which year 116,507 cases were canned. The Skeena River sockeye-pack in 1952 was 36,545 cases greater than the average annual pack for the previous five-year period and was 13,508 cases higher than the cycle-year 1948, assuming that the bulk of the Skeena River sockeye are four-year fish.

In the pages of this Report for 1951 we drew attention to the probable effects of a bad rock-slide which occurred on the Babine River, a tributary of the Skeena, up which a large percentage of the Skeena River sockeye salmon proceed to spawn. It was feared that this slide would have a serious detrimental effect on the sockeye runs proceeding to Babine Lake and those tributaries. It is too early to report on the effect on the 1951 run of sockeye to this river system. However, through the efforts of the Federal Department of Fisheries and its engineering branch, this obstruction has now been cleared. The effect of the slide on the 1952 sockeye run to the Babine was not as serious as it was at first feared. It is reported that the 1952 run was materially assisted by the work of the engineering and biological staffs of the Federal Department of Fisheries and that most of the run proceeded from the slide onwards in a normal manner.

*Spring Salmon.*—Spring salmon on the Skeena River, as on other river systems in the Province of British Columbia, find an outlet in other markets than canning, and the spring salmon canned are usually those caught incidental to fishing for other species. Therefore, the size of the spring-salmon pack is not indicative of the size of the run of this species to any river system. In 1952 there were 2,082 cases of spring salmon canned from Skeena River caught fish. This is compared with 2,055 cases in 1951, 1,758 cases in 1950, and 2,507 cases in 1949.

*Cohoe Salmon.*—Cohoes are never a large factor in the Skeena River total pack of canned salmon, and the cohoe-pack for this river system in 1952 was no exception. There were 8,358 cases of cohoes canned from Skeena River caught fish in 1952, while

in the year previous the pack was 19,977 cases. In 1950 the pack amounted to 9,781 cases, and in 1949 there were 21,333 cases of cohoes canned. The 1952 cohoe-pack on the Skeena was 7,949 cases below the average annual pack for this species for the previous five-year period.

*Pink Salmon.*—Pink salmon canned on the Skeena River in 1952 amounted to 89,314 cases. Pink salmon are considered to be two-year fish; that is to say, the runs occur in two-year cycles. In 1952 the catch was the progeny of the spawners of 1950, in which year the Skeena River produced a pack of 26,256 cases. In the cycle previous to that, 1948, the pack amounted to 50,656 cases. In view of the immediately preceding cycle-years, the pink-salmon pack on the Skeena in 1952 must be considered as satisfactory. The 1952 pack was the largest pack of pink salmon for the Skeena River since 1945, in which year the pack amounted to 69,783 cases. The 1952 pink-salmon pack for the Skeena River was 43,584 cases above the average annual pack for the previous five-year period.

*Chum Salmon.*—Chum salmon are never canned in large quantities on the Skeena River, and 1952 was no exception, the pack in that year amounting to 4,638 cases. This was considerably smaller than the pack in the previous year, when 14,778 cases were canned. The 1952 chum-salmon pack on the Skeena was 4,791 cases less than the average annual pack for this species for the previous five-year period.

In considering the salmon-packs to the various river systems by species, one must remember that there were several stoppages of fishing owing to strike action by the fishermen's union in 1952. These strikes all had a material effect on reducing the numbers of fish caught in this year. The reader is referred to another section of this Report for comments on the fishing strikes in 1952.

## Nass River

The total canned-salmon pack on the Nass River in 1952 amounted to 57,775 cases, composed of 29,429 cases of sockeyes, 641 cases of springs, 290 cases of steelheads, 1,223 cases of cohoes, 13,016 cases of pinks, and 13,112 cases of chums.

The salmon runs to the Nass River are very erratic, and on this account it is difficult to compare one year's pack with another. In 1951 the total pack on the Nass River amounted to 152,742 cases, while in 1950 the pack was 57,961 cases. In 1949 the total pack of Nass River salmon amounted to 58,336 cases, while in 1948 only 38,538 cases were canned. It should be pointed out here that the 1951 salmon-pack on the Nass River was considered something of a record for this river system.

*Sockeye Salmon.*—The 1952 sockeye run to the Nass River produced a pack of 29,492 cases. This was one of the largest sockeye-salmon packs for the Nass River for many years. The pack in 1936 approached this figure, when 28,562 cases were canned, and again in 1950, when the pack was 27,286 cases. The 1952 pack was 8,766 cases above the average annual pack for this river system for the previous five-year period.

*Spring Salmon.*—Spring salmon are caught and canned on the Nass River incidental to fishing for other species and, consequently, the size of the canned-salmon pack is not indicative of the size of the run. In 1952 there were 641 cases of spring salmon canned from Nass River fish, while the pack in 1951 amounted to 596 cases. In 1950 there were 798 cases of spring salmon canned and 174 cases in 1949.

*Cohoe Salmon.*—The cohoe-pack on the Nass River in recent past years has fluctuated widely. In 1952 there were 1,223 cases of cohoes canned from Nass River catches, while in the year previous the pack was 18,711 cases. The Nass River has produced some fairly large cohoe-packs, but the pack of this species in 1952 was the smallest since 1930.

For purposes of comparison, the pack in 1950 amounted to 2,737 cases, in 1949 it was 6,665 cases, while in 1948 there were 8,954 cases of cohoes canned on the Nass River.

*Pink Salmon.*—The pink-salmon pack on the Nass River in 1952 amounted to 13,016 cases, compared with 12,582 cases in 1950, the cycle-year, and 8,565 cases in 1948. The 1948–52 cycle is apparently the small cycle for pink salmon on the Nass River, as the packs in the previous year's cycle amounted to 70,880 cases in 1951 and 34,324 cases in 1949, while in 1947 only 5,047 cases were canned. However, in 1945 the pack amounted to 35,918 cases. While the pink-salmon pack on the Nass River in 1952 was 14,857 cases below the average annual pack for the previous five years, it was, however, slightly greater than the quantity packed in the cycle-year 1950.

*Chum Salmon.*—Chum salmon are never a large factor in the Nass River canned-salmon production. The pack in 1952, amounting to 13,112 cases, may be considered an average pack, although it was less than the 1951 pack by 14,630 cases. The 1952 chum-salmon pack on the Nass River was 2,948 cases below the average annual pack for this species in the preceding five-year period.

Commenting on the spawning conditions on the Nass River area in 1952, the Chief Supervisor of Fisheries says: " There was a better than medium escapement of sockeye to the Meziadin Lake area. . . . A light to moderate escapement of spring salmon occurred, the exception being in the Meziadin Lake area, where supplies were light. Generally, the escapement of pink salmon was light, including streams in Wark Canal, Khutzemateen, and lower tributaries of the Nass River, as well as Quinimass River. The over-all seeding of chums was better than medium, showing some improvement over the brood-year. The chum run was only lightly fished."

## Rivers Inlet

Rivers Inlet produced a total pack of canned salmon in 1952 amounting to 105,040 cases, composed of 84,297 cases of sockeyes, 865 cases of springs, 280 cases of steelheads, 3,415 cases of cohoes, 12,469 cases of pinks, and 3,711 cases of chums. The total pack for this inlet in 1952 was 43,956 cases less than in the year previous and 67,967 cases less than in 1950.

*Sockeye Salmon.*—The total sockeye-salmon pack for Rivers Inlet in 1952, amounting to 84,297 cases, was 18,268 cases less than were packed in the year previous, but the 1952 pack was 10,484 cases above the average annual pack for this inlet for the previous five-year period. Rivers Inlet sockeye are 4- and 5-year-old fish. The 1952 pack was, therefore, the progeny of the runs of 1948 and 1947. In 1948 the Rivers Inlet sockeye run produced a pack of 37,665 cases, while in 1947 the pack was 140,087 cases.

*Spring Salmon.*—Rivers Inlet, like many other fishing areas in British Columbia, supports a spring-salmon run, but in most of these areas the canned-salmon pack is not indicative of the total run, as usually this species is not canned but finds a market in the fresh- and frozen-fish trade. Therefore, any canning of spring salmon on Rivers Inlet is done from fish caught incidental to fishing for other species.

In 1952 the canned-salmon pack of springs for Rivers Inlet amounted to 865 cases, compared with 937 cases in 1951, 619 cases in 1950, and 743 cases in 1949. In 1948 there were 899 cases of spring salmon canned on Rivers Inlet.

*Cohoe Salmon.*—Rivers Inlet is never a large producer of cohoe salmon, although the amount canned varies from year to year. The 3,415 cases of cohoes canned from Rivers Inlet caught fish in 1952 are compared with 12,146 cases canned in 1951, 5,736 cases in 1950, 5,978 cases in 1949, and 8,143 cases in 1948.

*Pink Salmon.*—The 12,469 cases of pink salmon canned from Rivers Inlet caught fish in 1952 was considered a normal pack of this species for this inlet, although, compared with the year previous, the pack figures are considerably less. The pack in 1951 was 20,960 cases. It will be recalled, however, that the 1951 pack was considerably above

the usual pack of pinks for this area. The pink-salmon pack on Rivers Inlet in recent past years has been as follows: 1950, 12,864 cases; 1949, 11,937 cases; and 1948, 13,491 cases.

*Chum Salmon.*—Rivers Inlet was not considered a producer of chum salmon for canning until 1935, and in that year a small fall fishery was introduced for the first time. Since then there has been a pack of canned chums put up each year, the pack varying from year to year, more in relation to the fluctuation in demand for chum salmon than to the size of the runs. In 1952 the chum-salmon pack for this inlet amounted to 3,711 cases. This is compared with 11,842 cases in 1951, 10,014 cases in 1950, 11,819 cases in 1949, and 11,486 cases in 1948. The 1952 pack of chums on Rivers Inlet was the lowest since 1944, when 2,705 cases were canned.

## Smith Inlet

Smith Inlet, like Rivers Inlet close by, is very largely a sockeye-producing area. Other species caught there are usually caught incidentally while fishing for sockeye. The total canned-salmon pack for Smith Inlet in 1952 was 43,562 cases, and of this amount, 34,834 cases were sockeye. The balance of the pack was composed of 367 cases of springs, 84 cases of steelheads, 1,466 cases of cohoes, 6,496 cases of pinks, and 315 cases of chums.

*Sockeye Salmon.*—The 34,834 cases of sockeyes canned from Smith Inlet caught fish in 1952 were slightly below the 49,473 cases caught there in 1951, but were 4,757 cases higher than the average annual pack for this area for the previous five-year period. It was also 24,378 cases higher than the pack of the cycle-year, 1948, although in 1947, which would be the cycle-year for the 5-year-old portion of the run, the pack was 36,800 cases.

*Spring Salmon.*—In 1952 the spring-salmon pack was 367 cases in Smith Inlet, compared with 174 cases in 1951, 71 cases in 1950, and 159 cases in 1949.

*Cohoe Salmon.*—The cohoe-pack in Smith Inlet in 1952, like the spring-salmon pack, is never large. The pack of 1,466 cases in 1952 is compared with 3,259 cases in 1951, 397 cases in 1950, and 785 cases in 1949.

*Pink Salmon.*—Smith Inlet does not support a large pink-salmon run. Pink salmon caught in this area are caught incidentally while fishing for sockeye salmon. The pack in 1952, amounting to 6,496 cases, is contrasted with 2,482 cases in 1951, 5,308 cases in 1950, and 2,533 cases in 1949.

*Chum Salmon.*—There were 315 cases of chum salmon caught and canned from Smith Inlet fish in 1952. The pack in 1951 was 2,530 cases, and in 1950, 4,499 cases. This inlet produced 2,361 cases in 1949 and 1,521 cases in 1948. The size of the chum-salmon pack in Smith Inlet is in nowise indicative of the size of the run of this species to this area.

## Queen Charlotte Islands

Pinks and chums are the two species of salmon fished in the Queen Charlotte Islands District exclusively for canning purposes. Chum salmon are taken every year in this district, but pink salmon are caught only every alternate year, the runs coinciding with the even-numbered years. The year 1952 was a pink year in the Queen Charlotte Islands.

In addition to the salmon which are fished for in the Queen Charlotte Islands area exclusively for canning, there is a large spring- and cohoe-salmon fishery for the fresh- and frozen-fish trade. The product of the troll fishery is not considered in these reports of the canned-salmon packs. A few cohoes are caught incidentally while fishing for chum salmon, and these find an outlet in the canneries and are recorded. The canned-salmon pack, however, is in no way indicative of the quantity of cohoes caught in the Queen Charlotte Islands area.

In 1952 the total salmon-pack for the Queen Charlotte Islands was 185,590 cases, composed of 635 cases of sockeyes, 96 cases of springs, 19 cases of steelheads, 4,168 cases of cohoes, 178,959 cases of pinks, and 1,712 cases of chums. The sockeye, spring, and steelhead packs were from fish caught incidentally while fishing for pink salmon.

*Cohoe Salmon.*—The small pack of cohoes in the Queen Charlotte Islands in 1952, amounting to 4,168 cases, is not to be compared with the packs of this species in the previous years, due to the fact that fishing for chums and cohoes was very much curtailed due to strike action of the fishermen in the fall of the year when these species are most plentiful.

*Pink Salmon.*—The pink-salmon pack in 1952 in the Queen Charlotte Islands, amounting to 178,959 cases, is compared with 92,986 cases of pinks packed in 1950, the cycle-year, and 51,722 cases in 1948.

From the size of the pink-salmon pack in 1952 in the Queen Charlotte Islands, it seems evident that the conservation measures being practised in recent past years by the Federal Department of Fisheries are having the expected beneficial effect on the runs of pink salmon to this area, as the pink-salmon runs previous to 1948 were materially reduced for a number of years, possibly due to overfishing and damage to some of the streams by logging.

*Chum Salmon.*—There was practically no chum-salmon fishing in the Queen Charlotte Islands in 1952 because of a fishermen's strike during the time that chum salmon would have been fished. The 1,712 cases of chums packed from fish caught in this area in 1952 must not be considered as any indication of the runs to the streams in the Queen Charlotte Islands, nor can the pack be compared with the packs of other years, owing to the circumstances prevailing in the fishery at that time.

## Central Area

For the purpose of this Report, 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. This inlet is treated separately.

Salmon-fishing in the Central 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, but rather reflects the size of the runs generally within the geographical limits of the area.

In 1952 the total canned salmon produced from fish caught in the Central Area amounted to 289,476 cases. This pack was composed of 26,583 cases of sockeyes, 1,261 cases of springs, 682 cases of steelheads, 17,289 cases of cohoes, 207,055 cases of pinks, and 36,605 cases of chums.

*Sockeye Salmon.*—The 26,583 cases of sockeyes canned from Central Area fish in 1952 was the largest pack of this species since 1944, when 32,715 cases were canned. The 1952 pack was 4,271 cases higher than in the year previous and 3,727 cases better than the average five-year pack of sockeyes in this area.

Sockeye salmon caught in the Central Area are not the product of one individual river system, but rather of a number of streams, and while the pack figures do not necessarily reflect the condition of any individual stream, the maintenance of the pack would seem to indicate that the district in general is maintaining its average production.

*Spring Salmon.*—Spring salmon are caught and canned in this district, but again only incidentally while fishing for other species. The bulk of the spring salmon being taken in this area finds an outlet in the fresh- and frozen-fish trade. In 1952 the spring-salmon pack amounted to 1,261 cases, while 1,082 cases were canned in 1951. This species accounted for 776 cases in 1950 and 1,007 cases in 1949.

*Cohoe Salmon.*—The Central Area produced cohoe salmon in 1952 to the extent of 17,289 cases. This was considerably below the cohoe-pack in 1951, when 61,423

cases were canned, but was almost identical with the cohoe-pack of 1950, when 17,061 cases were canned. The cohoe-pack in the Central Area in 1949 amounted to 44,169 cases, while 36,816 cases were canned in that district in 1948.

*Pink Salmon.*—The Central Area has always been considered a high producer of pink salmon, and, as pointed out in previous issues of this Report, the area has produced as high as 370,000 cases of pink salmon in a single season. For a number of years the Central Area has been going through a cycle of low pink-salmon production, and it is encouraging to note that in latter years the runs seem to be improving, as measured by the pink-salmon pack.

In 1952 the Central Area produced a pack of 207,055 cases. This was only slightly lower than the 237,559 cases canned in 1951 and was 43,754 cases better than 1950, the cycle-year for this run.

*Chum Salmon.*—The small chum-salmon pack in the Central Area in 1952, amounting to 36,605 cases, was due almost entirely to strike action by the fishermen. This area has produced over 100,000 cases of chum salmon annually in the past three years, and previous to that the chum-salmon pack has reached as high as 300,000 cases in the Central Area. The pack in 1951 was 190,843 cases and 164,884 cases in 1950. In 1949 there were 116,292 cases of chum salmon packed and 225,686 cases in 1948.

The reader is referred to another section of this Report for remarks in connection with the strike which occurred in the fishing industry during the 1952 fishing season. The results of these strikes and consequent shut-downs in the industry are reflected in the reduced packs in several of the areas.

## Vancouver Island

Vancouver Island, like the Central Area, supports numerous races of salmon running to different streams. No attempt is made to deal with the various races separately. It should be pointed out, however, that the sockeye salmon caught in the Sooke traps are not credited to Vancouver Island, but 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 not to Vancouver Island. These sockeye are known to be migrating to the Fraser River.

In 1952 Vancouver Island and the adjacent Mainland waters produced a total pack of canned salmon amounting to 245,437 cases, composed of 24,252 cases of sockeyes, 1,687 cases of springs, 63 cases of steelheads, 23,583 cases of cohoes, 171,812 cases of pinks, and 24,039 cases of chums. As pointed out in the preceding paragraph, the 24,252 cases of sockeyes were caught in areas other than Johnstone Strait and the vicinity of Sooke.

*Sockeye Salmon.*—The sockeye-salmon pack in 1952 credited to Vancouver Island, amounting to 24,252 cases, was slightly above the pack for 1951, when 22,107 cases were canned. The 1952 pack, however, was 8,657 cases above the average annual pack credited to this area for the previous five-year period. The 1952 pack was the largest pack since 1946, when 35,381 cases were canned.

*Spring Salmon.*—Spring salmon are caught in large quantities each year by trolling 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, and mild-cured. Because of these outlets, the canned-salmon pack figures for spring salmon in the Vancouver Island district are not indicative of the size of the catch of this species.

In 1952 there were 1,687 cases canned from Vancouver Island caught spring salmon, compared with 3,133 cases in 1951 and 3,343 cases in 1950. The pack of spring salmon for Vancouver Island in 1949 was 6,361 cases, and 6,622 cases in 1948.

*Cohoe Salmon.*—Cohoe salmon are also caught in large numbers by troll off the west coast of Vancouver Island, and these, like spring salmon, find a ready market other than in cans. For this reason, the canned-salmon pack is not necessarily indicative of the size of the catch or of the run.

In the Vancouver Island district in 1952 the canned cohoe-pack amounted to 23,583 cases. This is contrasted with 151,325 cases in 1951, 72,871 cases in 1950, 98,958 cases in 1949, and 109,939 cases in 1948. The drastic reduction in the quantity of cohoe salmon canned from Vancouver Island caught fish in 1952 must be considered as the result of strike action during the fishing season and to the large quantities of cohoe which are exported to the United States later on in the season.

*Pink Salmon.*—Vancouver Island produced a pack of pink salmon in 1952 amounting to 171,812 cases. In 1950, the cycle-year for this run, there were canned 132,016 cases, while in 1948 only 43,574 cases were canned.

*Chum Salmon.*—Chum salmon, like cohoe from Vancouver Island caught fish, were notably less than in the years previous. In 1952 the chum-salmon pack amounted to 24,039 cases, contrasted with 105,458 cases in 1951, 125,833 cases in 1950, 51,629 cases in 1949, and 147,227 cases in 1948. Large quantities of chum salmon find a market in the fresh- and frozen-fish trade, and in 1952 a considerable amount was also shipped to the United States for canning there.

In comparing the canned-salmon pack figures with previous years, it must be remembered that in recent past years large quantities of chum salmon are shipped to the United States in the fall of the year for canning. Therefore, it must be assumed that the large drop indicated in the canned-salmon pack figures for Vancouver Island for 1952, compared with previous years, was due almost exclusively to time lost by the fishermen on account of strikes.

## OTHER CANNERIES

*Pilchard-canneries.*—There has been no run of pilchards off the west coast of Vancouver Island since 1949, and, as a consequence, again in 1952 no pilchard-cannery licences were issued.

*Herring-canneries.*—In 1951 there were three herring-canneries licensed, and all of these operated, producing a pack of 103,928 cases of canned herring. In 1952 a strike tied up the herring-fishery, and, as a consequence, there was no operation. One herring-cannery licence was issued to a cannery which put up a small pack of young herring caught before the regular herring-fishing season commenced.

*Tuna-fish Canneries.*—The first commercial tuna-fish canning operation in British Columbia was licensed in 1948. Tuna were caught off the British Columbia coast previous to that date, but the catch was largely frozen and shipped to United States canneries for processing there. The run of tuna to the coast of British Columbia has been spasmodic. In some years the fish appear in fairly large numbers, while in other years they fail to put in an appearance. Since the end of the war there has been some importation of Japanese-caught tuna, frozen in Japan and exported to British Columbia.

In 1952 the three tuna-fish canneries licensed to operate produced a total pack of 65,373 cases of ½'s and 13,201 cases of ¼'s. In 1951 five plants were licensed to can tuna, and all operated. These five plants produced a total pack amounting to 102,132 cases of 7-ounce cans and 2,289 cases of ¼'s.

The tuna-fishery off the west coast of British Columbia is still in what might be considered an experimental condition. In some years the fish appear and in others the fishermen are unable to locate them; consequently, it is reasonable that the packs will fluctuate widely from year to year until the fishery becomes more stable.

*Shell-fish Canneries.*—Under this heading, those plants which are concerned with the canning of various species of shell-fish are reviewed. In 1952 eleven shell-fish

canneries were licensed to operate, compared with nine operating plants in 1951. These eleven plants produced the following packs:—

Crabs: 908 cases of 48/½'s and 90 cases of 24/1's.

Clams: 12,762 cases of 48/½'s, 41,832 cases of 24/1's, and 4,796 cases of 6/10's (gallons).

Oysters: 14 cases of 48/½'s, 271 cases of 24/10-ounce, and 9,946 cases of 48/¼'s.

Abalone: 116 cases of 48/1's.

Shrimps: 149 cases of 48/4½-ounce.

These figures are compared with the pack of 1951, which was as follows:—

Clams: 4,917 cases of 48/½'s, 14,568 cases of 24/1's, and 1,696 cases of 6/10's (gallons).

Crabs: 8,709 cases of 48/½'s.

Oysters: 486 cases of 48/10-ounce and 11 cases of 96/¼'s.

Abalone: 130 cases.

## MILD-CURED SALMON

In 1952 two plants were licensed to mild-cure salmon, compared with three plants licensed in the year previous. The 1952 pack of mild-cured salmon amounted to 614 tierces or 5,220 hundredweight, compared with 821 tierces in 1951.

## DRY-SALT SALMON

Previous to the outbreak of the war in 1939, large quantities of chum salmon were dry-salted in British Columbia each season for shipment to the Orient. In some years the production of dry-salt salmon reached quite large proportions, and it was a very definite factor in the market for fall fish. 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. This was done as a war measure. Since the end of the war the business of dry-salting salmon has not been revived. In 1947 two licences were issued, but no operation took place and no licences have been issued for salmon dry-salteries since that time.

Most of the dry-salt salmon produced previous to the outbreak of the war found a market in Japan. It is hoped that there is a possibility of this market reviving now that the Japanese people have obtained their sovereignty. In 1952 a permit was issued to one operator to salt a limited quantity of salmon as a sample. There were 64,650 pounds of chum salmon salted under permit. It is hoped that this may be the forerunner of a revival of this business.

## DRY-SALT HERRING

In British Columbia, previous to World War II, the dry-salting of herring was an important factor in the winter fishery, the dry-salted product being shipped to China. Since the outbreak of the war the bulk of British Columbia's herring-catch has been either canned or reduced to meal and oil, most of the catch going to the reduction plants. Since the war some activity has taken place each season in the dry-salting of herring, although the business has not yet attained anything like the proportions of pre-war years.

In 1952 three herring dry-salteries were licensed to operate. These three plants had a production of 5,871 green tons, which produced 26,070 boxes of approximately 400 pounds net, or 5,214 cured tons. This is compared with the production of the year previous, when five licensed plants produced 4,331 cured tons.

No doubt other operators would have been interested except for the strike of the herring-fishermen.

## PICKLED HERRING

There has been no pickled herring produced in British Columbia since 1947.

## HALIBUT-FISHERY

The halibut-fishery on the Pacific Coast of North America is regulated by the International Fisheries Commission, which Commission is set up under a treaty between Canada and the United States for the protection and rehabilitation of the halibut-fishery. This is a deep-sea fishery and is shared in by the nationals of the two countries. The Commission regulates the fishery on a quota basis and, on that account, there is little fluctuation in the total amount of halibut landed from year to year, except where the quotas are changed by the Commission for any reason.

For the purpose of regulation, the coast was originally divided into a number of areas, the principal ones, from the standpoint of production, being Areas 2 and 3. The Commission has found it necessary to subdivide these areas into a number of sub-areas in order to facilitate its work and to make better use of the stocks of halibut on the different banks. For a more detailed breakdown of the areas and the geographical limits of each, the reader is referred to the Pacific Halibut Regulations for 1952.

In 1952 the catch-limits set by the Commission for the different areas were as follows: Area 2A, 25,500,000 pounds; Area 3A, 28,000,000 pounds; Areas 2B and 2C, no limit to the catch, but a ten-day fishing period only; Areas 3B and 4, no limit, but a seventeen-day fishing period only; Areas 1A and 1B, no catch-limit; Area 1A closing with Area 3A, and Area 1B, closing with Area 2A.

In 1952 the total landings by all vessels in all ports by areas amounted to 61,852,000 pounds, compared with 56,906,000 pounds in 1951. A breakdown of the halibut production in 1952 by areas is as follows: Area 1A, 110,000 pounds; Area 1B, 118,000 pounds; Area 2A, 26,869,000 pounds; Area 2B, 2,091,000 pounds; Area 2C, 1,294,000 pounds; Area 3A, 30,358,000 pounds; Area 3B, 879,000 pounds; and Area 4, 133,000 pounds.

In 1952 the total landings of halibut by all vessels in Canadian ports by areas was as follows: Area 2A, 15,578,000 pounds; Area 2B, 1,457,000 pounds; Area 2C, 305,000 pounds; Area 3A, 8,954,000 pounds; and Area 3B, 69,000 pounds, for a grand total of 26,363,000 pounds. This figure is compared with 25,275,000 pounds landed by all vessels in Canadian ports in 1951.

The total landings by Canadian vessels in Canadian ports in 1952 was 23,326,000 pounds, compared with 20,884,000 pounds in 1951. These were taken in the following areas: Area 2A, 15,156,000 pounds; Area 2B, 1,457,000 pounds; Area 2C, 248,000 pounds; Area 3A, 6,396,000 pounds; and Area 3B, 69,000 pounds. In addition to the above, Canadian vessels landed in American ports a total of 1,028,000 pounds taken in Area 3A.

American vessels in 1952 landed a total of 3,037,000 pounds in Canadian ports from Areas 2A, 2C, and 3A.

The average price paid for Canadian halibut in Prince Rupert in 1952 was 17.9 cents per pound, and the average price for all Canadian landings in Canadian ports in 1952 was 17.2 cents per pound. The value of the halibut-livers to United States and Canadian fishermen in 1952 was $380,000.

The above figures relating to the halibut-catch are to the nearest thousand pounds.

This statistical information for the halibut-fishery was supplied by the International Fisheries Commission and is hereby gratefully acknowledged.

## FISH OIL AND MEAL

The production fish-oil and edible fish-meal has been an important branch of British Columbia's fisheries for a number of years. Previous to World War II, pilchards and

herring were the principal species used for the production of meal and oil. The products of the reduction plants found a ready market, the meal being used as a supplementary food for animal-feeding and the oil being used in manufacturing processes of many kinds.

The demand for natural sources of vitamins stimulated the production of vitamin oils from fish products, and at the outbreak of World War II, the demand for natural sources of vitamins greatly increased the production of fish-oils of high vitamin content in British Columbia. This increased demand for high vitamin oils brought into use other fish besides herring and pilchards during the war years and immediately after the war. Dogfish and shark livers were in high demand in those years. Recently, however, the increased production of synthetic Vitamin A has lessened the demand for fish-liver oil as a natural source of this vitamin, and if the price of synthetic Vitamin A falls much lower, the market for livers containing this vitamin may very soon disappear. Fish-livers, cannery-waste, and viscera are all utilized for the production of fish-oil in British Columbia.

In addition to the production of oils from British Columbia's various fish and fish-livers, in recent years considerable activity has been developed in the use of cannery-waste and viscera for the production of various pharmaceutical products. Besides the high vitamin-content oils used in the medicinal field, British Columbia's fish-oils of lower vitamin potency find an outlet in many manufacturing processes, and large quantities are used for the feeding of poultry and live stock.

*Fish-liver Oil.*—In 1952 four plants were operated and produced vitamin oils from fish-livers. These four plants processed 1,208,886 pounds of liver and produced 4,870,557 million U.S.P. units of Vitamin A. Whale solubles, another source of Vitamin A, increased this production to 5,409,264 million U.S.P. units of Vitamin A. The production in 1951 from four plants amounted to 5,250,441 million U.S.P. units of Vitamin A.

*Pilchard-reduction.*—The year 1952, like the immediately preceding seven consecutive years, did not produce a pilchard run. This was the eighth year in succession in which the pilchard run to British Columbia waters has been a complete failure. Biologists charged with the investigation of this fishery are still not optimistic that this condition will materially improve in the near future. Pilchards are not native to British Columbia waters but migrate off our coast from California, where they are spawned in the ocean. There is a large pilchard-fishery in California conducted on the same body of fish that formerly migrated to British Columbia. This fishery is heavily fished in California, and, as many of the young fish are caught as well as the maturer ones, there can be little doubt that the heavy fishing in California has had a detrimental effect on the runs which formerly appeared off the British Columbia coast.

*Herring-reduction.*—The winter herring-fishery in British Columbia has developed into a very important branch of the fishing industry and ranks second in point of dollar value in British Columbia's fisheries. The season generally runs from late in September or early in October through until the following March, with a short break at the Christmas period. Many of the boats used in catching herring are also used in salmon-fishing, and, generally speaking, the herring-fishery does not get into full swing until the boats have been released from fishing for salmon.

In the 1952 herring-fishing season the fishermen and operators were unable to come to terms on the price to be paid for raw fish. As no agreement had been reached by January 1st, the operators decided that an economical operation for the balance of the season was impossible; consequently, the whole fishing season was lost. The only herring-reduction which took place in 1952 was a small amount of anchovies reduced under herring licence and a small amount of scrap herring reduced at another plant. These two plants produced 218 tons of meal and 7,203 gallons of oil. In 1951 there were fifteen plants licensed, all of which operated. These fifteen operating plants

produced 32,777 tons of meal and 3,832,301 imperial gallons of oil, with a value of $8,233,965. There is no reason to doubt that the catch in 1952 would have reached similar proportions to that of 1951 had an operation materialized.

*Whale-reduction.*—In 1948 the hunting of whales off the British Columbia coast for reduction purposes was again resumed after a short period of inactivity. Whale-reduction continued in 1952, and in this year 465 whales were captured, compared with 437 in 1951. This fishery also suffered a month-long strike at the beginning of the season. There can be little doubt that, except for the strike, this figure would have been increased.

*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 the carcasses of dogfish, and produce meal and oil for various purposes. The oil produced from the carcasses of dogfish should not 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 1952 there were ten plants licensed to reduce under the miscellaneous reduction licences. These plants produced a total of 2,011 tons of meal and 192,315 imperial gallons of oil, compared with fourteen plants licensed in 1951 which produced 3,217 tons of meal and 227,517 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 in question.

As indicated in the table, from returns made to this Department by licensees, the kokanee-catch in Okanagan Lake in 1952 was almost a complete failure.

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. The fur-farm licences are issued to licensed fur-farmers, and the coarse fish taken under these licences are used as food for fur-bearing animals held in captivity. Ordinary fishing licences are issued for the capture of fish other than trout, salmon, or sturgeon, while licences issued for sturgeon-fishing are exclusively for that fishery.

A detailed account of the fish taken by the licensed nets in the different waters of the Province is again carried in the table appearing in the Appendix to this Report.

## VALUE OF CANADIAN FISHERIES AND THE STANDING OF THE PROVINCES, 1951

The value of the fisheries products of Canada for the year 1951 totalled $174,309,613. During that year British Columbia produced fisheries products to the value of $83,812,704, or 48 per cent of Canada's total. British Columbia in 1951 led all of the Provinces of Canada in respect to the production of fisheries wealth. Her output exceeded that of Nova Scotia, second in rank, by $43,516,337.

The market value of the fisheries products of British Columbia in 1951 was $15,890,246 more than in the year previous. There was an increase in the value of salmon amounting to $12,048,000.

The following statement gives the value of fisheries products of the Provinces of Canada for the years 1947 to 1951, inclusive:—

| Province | 1947 | 1948 | 1949 | 1950 | 1951 |
|---|---|---|---|---|---|
| British Columbia | $58,764,950 | $58,703,803 | $56,120,154 | $68,821,358 | $83,812,704 |
| Nova Scotia | 26,658,915 | 36,090,820 | 35,039,804 | 38,164,967 | 40,296,367 |
| New Brunswick | 17,131,690 | 20,122,378 | 17,428,127 | 18,053,168 | 21,154,877 |
| Quebec | 5,316,999 | 6,393,635 | 5,111,878 | 5,496,282 | 5,511,379 |
| Ontario | 5,403,662 | 5,942,723 | 5,728,389 | 7,033,552 | 7,924,530 |
| Manitoba | 5,329,448 | 5,414,583 | 4,800,387 | 6,791,290 | 7,524,392 |
| Prince Edward Island | 2,897,284 | 3,634,376 | 2,704,444 | 3,320,513 | 3,212,629 |
| Alberta | 856,609 | 1,527,834 | 652,545 | 767,887 | 862,327 |
| Saskatchewan | 1,170,930 | 1,282,437 | 1,025,896 | 1,360,114 | 1,748,444 |
| Northwest Territories | 530,948 | 636,352 | 2,334,009 | 2,297,466 | 2,261,964 |
| Yukon | 7,474 | (1) | (1) | (1) | (1) |
| Newfoundland (estimated) | | | | 30,000,000 | 29,000,000 |
| Totals | $124,068,909 | $139,748,941 | $130,945,633 | $182,106,597 | $174,309,613 |

[1] 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 1948 to 1952, inclusive, is given in the following table:—

| Species | 1948 | 1949 | 1950 | 1951 | 1952 |
|---|---|---|---|---|---|
| Salmon | $36,671,140 | $35,897,732 | $48,701,583 | $60,749,658 | $40,495,000 |
| Halibut-livers and viscera oil | 527,868 | 333,200 | 121,165 | 158,250 | 141,000 |
| Herring | 10,485,090 | 9,412,786 | 9,313,447 | 10,639,653 | 4,235,000 |
| Pilchard | | | | | |
| Grey cod | 134,494 | 204,855 | 444,317 | 453,796 | 521,000 |
| Ling cod | 878,972 | 870,513 | 523,435 | 826,315 | 590,000 |
| Clams | 107,546 | 209,379 | 262,983 | 382,746 | 477,000 |
| Black cod | 564,888 | 631,850 | 263,892 | 501,110 | 310,000 |
| Crabs | 326,263 | 443,339 | 399,396 | 403,538 | 475,000 |
| Soles | 1,170,890 | 580,328 | 913,689 | 1,187,934 | 1,533,000 |
| Shrimps | 84,910 | 89,447 | 122,345 | 148,933[1] | 227,000[1] |
| Oysters | 214,495 | 282,616 | 353,429 | 289,624 | 438,000 |
| Abalones | 4,838 | 2,811 | 1,732 | 2,229 | 3,000 |
| Flounders | 15,661 | 17,112 | 43,500 | 47,499[3] | 20,000 |
| Red cod | 131,910 | 140,830 | 54,632 | 109,047 | 75,000 |
| Perch | 5,731 | 4,636 | 7,681 | (2) | |
| Smelts | 10,053 | 18,421 | 20,785 | 30,697 | 15,000 |
| Sturgeon | 5,502 | 13,418 | 11,909 | (2) | (2) |
| Octopus | 2,199 | 6,172 | 2,722 | (2) | |
| Skate | 5,208 | 4,683 | 7,284 | (3) | 5,000 |
| Eulachons | 30,224 | 29,609 | 25,861 | 80,210 | 115,000 |
| Sardines | | | 30,324 | 8,386 | |
| Grayfish, etc.— | | | | | |
| Livers | 11,057 | 6,659 | | | |
| Liver-oil | 1,634,388 | 1,539,951 | 169,724 | 328,220 | 208,000 |
| Meal | | 2,822 | | | |
| Whales | | 450,405 | 639,643 | 1,282,600 | (2) |
| Fur-seals | 296 | 720 | 2,336 | 5,430 | (2) |
| Anchovies | 88,305 | 37,283 | 688 | | 26,000 |
| Tuna | 990,424 | 708,004 | 767,767 | 73,211 | 54,000 |
| Shark-livers | 2,822 | 195 | | | |
| Shark-liver oil | 23,435 | 8,464 | | | |
| Ratfish-livers | 242 | 678 | | | |
| Miscellaneous | 454,949 | 148,216 | 184,985 | 499,807 | 1,142,000[2] |
| Totals | $58,703,803 | $56,120,154 | $68,821,358 | $83,812,704 | $56,635,000 |

[1] Shrimps and prawns. [2] Included in miscellaneous. [3] Skate and flounders.

Miscellaneous includes perch, octopus, sturgeon, whales, and fish products, meal and oil which cannot be separated into species, with a value of $500 or less.

The above figures were supplied by the Federal Department of Fisheries, Vancouver, and are hereby gratefully acknowledged.

## CONDITION OF BRITISH COLUMBIA'S SALMON-SPAWNING GROUNDS

We are again 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 and permitting the same to be published in the Appendix to this Report. The Chief Supervisor's courtesy in supplying us with this information is gratefully acknowledged.

## CONTRIBUTIONS TO THE LIFE-HISTORY OF THE SOCKEYE SALMON (PAPER No. 38)

(Digest)

Paper No. 38 in this series is again contributed by D. R. Foskett, B.A., M.A., of the staff of the Pacific Biological Station at Nanaimo. This series was commenced some thirty-eight years ago by this Department and has been continued ever since without interruption. The value of such an unbroken record of the salmon runs to the principal spawning-streams of the Province is increasing as the years go by. In recent years the extended salmon work being done by the Fisheries Research Board of Canada in British Columbia has made it possible to have the material for the catch analyses collected simultaneously while other field work was in progress, and arrangements have now been made to have this investigation continued. In the future, however, the work will be financed and carried forward by the Fisheries Research Board of Canada. The Provincial Department of Fisheries will continue to contribute to this work by publishing the papers relating to this investigation. These papers will appear in the Appendix to the Annual Report of the Provincial Department of Fisheries, as heretofore.

Commenting on the runs to the various river systems, the author points out that on the Nass River in 1952 the sockeye-salmon pack, amounting to 29,492 cases, was much better than in 1951 and decidedly above the average for the past ten years, while the escapement was considered satisfactory.

For the Skeena River the sockeye pack of 114,775 cases was almost double that of 1951. The fish were of approximately the same size as those in the year previous and the various spawning runs were of average size, except in the Babine area, where a rock-slide in the Babine River caused a very large loss of spawners and probably reduced the effectiveness of thousands which did succeed in reaching the lake.

Commenting on the Rivers Inlet sockeye run of 1952, the author points out that the very heavy spawning escapement in the area was in part the result of a fishermen's strike which occurred just after the peak of the run at a time when normally the catch would have been large.

In Rivers Inlet in 1952 the sampling of the sockeye run was extended to the spawning-grounds. The author points out that this comparison indicates some discrepancy in the sex ratio, as indicated by the sampling in the commercial fishery, and from this comparison it is evident that the fishery does not make use of the smaller fish in the run but exploits most heavily the large $4_2$ males and the small $5_2$ males, making relatively little use of the smallest and largest fish. This, of course, is largely due to the selective method of fishing inherent in a gill-net fishery.

The only comment the author has to make on the Smith Inlet sockeye-pack of 1952 was that the 34,834 cases packed were not as high as in the past two years but were approximately the same as the cycle-year. The spawning was evidently excellent.

For a more detailed account of the sockeye-salmon runs to the above-mentioned areas, the reader is referred to Mr. Foskett's paper, which is published in full, with supporting statistics, in the Appendix to this Report.

## HERRING INVESTIGATION

Research on British Columbia herring was continued in 1952–53 by the Fisheries Research Board of Canada at the Pacific Biological Station, Nanaimo, under the supervision of J. C. Stevenson.

The central purpose of the research is to accumulate knowledge on the factors affecting recruitment to the various adult herring stocks upon which the fishery depends. Such knowledge enables prediction of abundance and can permit establishment of the most effective system for sound management of the fishery. To this end, the research is divided into three main divisions: (1) Intensive study, on a comparative basis, of two major herring populations to obtain information on the long-term effect of contrasting methods of management; (2) general study of all other major adult herring stocks in British Columbia to indicate general application of results of specific studies; and (3) study of survival during early life-history stages.

The studies encompassed in the first two divisions of the research (the adult studies) were hampered in 1952–53 by the sharply curtailed fishery, which resulted from failure of fishing companies and the fishermen's union to agree in price negotiations. Only 11,800 tons of herring were taken in British Columbia waters, as compared to 198,000 tons in the previous year. Certain data (for example, sampling data) were collected less readily than in years when an extensive fishery takes place. Other data (for example, data obtained from tag-recovery) could not be gathered at all. On the other hand, the reduced fishing offered an opportunity to procure certain data that could not have been obtained otherwise; for example, there appears to be a good chance that information on the extent of natural mortality may be derived in 1953–54 from a comparison of the concentrations of 1952 and 1953 tags in the catches.

### The Comparative Study of Two Herring Populations

No new information on the comparative merits of non-quota fishing and fishing under application of a fixed catch quota was gathered in 1952–53 as a result of the reduced fishery. The west coast of Vancouver Island population, where unrestricted fishing is permitted, except for a fishing closure date on February 5th prior to spawning, had a negligible fishery of about 20 tons. The lower east coast of Vancouver Island population was subjected to a fishery of 8,085 tons, only one-fifth of the amount allowed under the quota.

Much valuable information was, however, accumulated on the two populations. The age composition of the winter runs was obtained by sampling the small catches and by supplementing these samples with others taken in fishing for research purposes with seine-boats borrowed from the fishing companies. The 1950 year-class (III-year fish) was found to comprise over 60 per cent of each population; the 1949 year-class (IV-year fish) was the next largest contributor, forming almost 30 per cent of the winter runs. The relative abundance of the 1950 year-class on the west coast was greater in 1952–53 than in any season of recent years, except 1949–50, but it was about average on the lower east coast.

Spawn deposition in both populations was considerably greater than in previous years. It rose to 64.3 statutory miles on the west coast as compared to 35.7 miles in 1952, and 82.7 miles on the lower east coast, as compared to 31.5 miles in the previous year. At least part of the increase in spawning was undoubtedly a result of the reduced fishery in the preceding winter. Whether or not an increase in total population abundance also contributed to the large spawnings is not readily determinable. The sparsity of catch statistics data seriously hampered assessment of changes in population abundance. However, by using all data available it was concluded that abundance of each population was as great as, and possibly greater than, in the previous year. There was more evidence of increased abundance on the lower east coast than on the west coast.

Published reports of qualitative changes in abundance of the two populations over the past seven years were analysed in an attempt to set up a quantitative basis for estimation of population fluctuations. Total population abundance in each year was considered to consist of the number of herring that spawned plus the number of herring that were caught. Because there is a difference in time of fishing and spawning, consideration was given to correcting for this by reducing the amount of fish involved in the catch by the natural mortality which would take place between the time of fishing and time of spawning. The greatest problem in applying this method of population estimation was in determining the average number of fish involved in a mile of spawning.

Fluctuations in west coast abundance, determined by this method, showed no significant relationship to fluctuations in lower east coast abundance over the past seven years. In the past two years, lower east coast abundance apparently exceeded abundance of the west coast population for the first time during the period. Exploitation of lower east coast stocks has been consistently greater than that of west coast stocks, despite the fact that the fishery on the former is regulated by quota, whereas the fishery on the latter is not. Various considerations suggest that some type of catch restriction on the fishing of the lower east coast winter runs may always be required to maintain production. Need for catch restriction on west coast runs appears less urgent. There is appreciable evidence that while population abundance is high, quota regulations on west coast catches would serve no useful purpose.

Results of research on the herring populations of the west coast and lower east coast of Vancouver Island in 1952–53 are discussed in some detail in a paper presented in the Appendix to this Report. In addition, the estimation of population abundance using catch and spawning data is developed, and the method is applied to data of these two populations.

## General Studies on the Adult Stocks of All Major Herring Populations

About two-thirds of the curtailed herring-fishery in 1952–53 took place in the lower east coast population, and the northern and central populations accounted for 18 and 9 per cent respectively of the total catch. An appreciable amount of herring (1,200 tons, or about 10 per cent of the catch) was taken by trawl in 1952–53, considerably more than in any previous year. Trawling for herring was carried on during the winter months in the northern sub-district and lower east coast of Vancouver Island sub-district. Most of the herring caught by seine on the lower east coast were salted. About one-third of the total catch in 1952–53 was used for bait. Only a relatively small proportion (about 12 per cent) of the 1952–53 catch was reduced to meal and oil.

Spawn deposition in the spring of 1953, which was determined largely by surveys conducted by fisheries officers of the Federal Department of Fisheries, showed an 86-per-cent increase over that of the previous year. All populations, except that of the middle east coast of Vancouver Island, showed pronounced increases in spawning. Middle east coast spawning remained about the same in the two years. Spawning on the lower east coast showed the largest increase—about 260 per cent of the previous year's spawning. Spawnings of the upper east coast of Vancouver Island and of the east coast of the Queen Charlotte Islands were also unusually large. The 1953 year-class, arising from this large spawning deposition, will be followed with special interest. In past years, large spawnings have given rise to both strong and weak year-classes.

The 1950 year-class (III-year fish) strongly dominated the populations of the west coast, lower east coast, and middle east coast of Vancouver Island. It was also the most abundant year-class in stocks of the central sub-district but its contribution to that population was less important than in the more southerly sub-districts. In the northern sub-district, on the east coast of the Queen Charlotte Islands, and on the upper

east coast of Vancouver Island, the 1950 year-class was of minor importance. In these populations the 1949 and 1948 year-classes (IV- and V-year fish), which were generally weak in the southern stocks, made appreciable contributions. The 1947 year-class, which was exceptionally abundant in all populations in 1949–50 and 1950–51 (as III- and IV-year fish) and which made heavy contributions in 1951–52 as V-year fish, was unusually abundant in 1952–53 (for VI-year fish) in the more northerly populations and in the northern runs of the west coast of Vancouver Island population.

Undoubtedly the increased spawning population in most sub-districts in 1952–53 was at least partly the result of the small fishery. Whether increased total population abundance also accounted for some of the increase cannot be readily determined because of the sparsity of adequate catch statistics data. However, careful consideration of all pertinent information suggests that (1) total abundance of the lower east coast, upper east coast, south central, and Queen Charlotte Islands populations was certainly as great as in the previous year, and, more likely, somewhat greater; (2) population abundance on the west coast of Vancouver Island and in the north central runs was about the same in the two years; and (3) abundance was probably less on the middle east coast of Vancouver Island and in the northern population. Predictions made in the fall of 1952 on population abundance in 1952–53 were in general agreement with the above indications.

In order to take advantage of the reduced fishing in 1952–53 for obtaining estimates of the extent of natural mortality, an intensive coastwise tagging programme was undertaken in the spring of 1953. Since determination of these estimates depended upon making comparable taggings in 1952 and 1953, special attention was given to tagging, whenever possible, in the same localities and on the same dates as in the previous year. In addition, several taggings were made in localities not before included in tagging surveys to gain additional information on movement between and within populations. A total of 81,390 herring was tagged in 1953, the largest herring-tagging ever undertaken. Twenty-seven of the forty individual taggings were comparable to taggings of the previous year.

Considerable progress was made in 1952–53 toward setting up an experiment to determine the feasibility of tagging herring with radioactive cobalt (Co 60). It is hoped that the experiment can be carried out in 1953–54. If radioactive tags can be carried by herring without harmful effects, radioactive tagging may be used instead of tagging with conventional metal tags. There is little doubt that recovery of the former would present fewer problems than recovery of the latter.

An aerial survey of herring-spawning grounds in British Columbia and South-eastern Alaska was undertaken jointly by the Fisheries Research Board of Canada and the United States Fish and Wildlife Service in March and April, 1953. It was found that herring spawnings could be readily detected at heights ranging from 400 to 2,000 feet. The presence of milt in the water was an unmistakable feature of spawning herring. The presence of birds feeding on spawn was used to distinguish spawnings that had taken place prior to the date of observation. A greater amount of herring spawn was found in British Columbia than in South-eastern Alaska. Data obtained in the survey are not yet fully analysed.

### Studies of Survival of Herring Spawn and Juvenile Herring

The study of " natural " mortality of spawn was carried out on a reduced scale in 1953. Major emphasis was placed on determining the differences in survival of spawn located in places with varying degrees of exposure to wave-action. Mortality was greatest (over 90 per cent) under extreme conditions; that is, in spawnings at the head of well-protected inlets where brackish water conditions prevailed and in spawnings directly exposed to the open ocean. Spawnings in localities having intermediate degrees

of protection from wave-action showed low mortality (less than 6 per cent). Since at least three-quarters of the spawnings on the west coast of Vancouver Island are of the latter type, it appears that natural mortality on spawn is not likely an important factor in determining the success of early year-class survival.

The extent of bird predation on herring spawn was studied in 1953 on a spawning at Matilda Creek in Clayoquot Sound. The loss of eggs during the incubation period amounted to 30 per cent, an amount similar to that obtained for other west coast spawnings in 1951 (30 per cent loss) and 1952 (41 per cent loss).

An extensive survey of juvenile herring was again carried out in Barkley Sound in the summer of 1953. Scouting cruises were made in July and August for the purpose of estimating abundance and growth. Large marking and tagging programmes were also undertaken; the former will enable statistical estimation of juvenile abundance, and the latter will provide information on the survival from the juvenile stage until recruitment to the fishery.

Complete analysis of the data has not as yet been carried out. Preliminary indications are that the 1953 year-class (as juveniles) is slightly less abundant than that of 1952 in Barkley Sound. When these year-classes are recruited to the fishery, information will be forthcoming on the usefulness of juvenile abundance in predicting recruitment.

## REPORT OF THE BIOLOGIST, 1952

The Provincial Shell-fish Laboratory at Ladysmith has continued to provide an information service on commercial molluscs and their culture. The biology of the various species is required to be studied as it affects their abundance, reproduction, growth, and culture.

The Pacific or Japanese oyster is the species on which the main emphasis is presently being placed. Productivity in terms of survival in relation to the number of spat planted is being studied. Attempts are being made to correlate fatness with plankton production. Modifications in the present method of oyster-culture are being considered, and experiments are being conducted.

Considerable time and effort is being expended on oyster-seed production in relation to time, place, and method. Associated with this are detailed studies on the habits of the larvæ.

A series of oyster bulletins detailing the results of the above investigations, as they are obtained, are issued to growers and other interested individuals. Reports of work published elsewhere, but of interest and possible use to growers, are also included in these bulletins. During the summer breeding season they are mainly concerned with spawning reports and spatfall forecasts.

In 1952, oyster-seed imported from Japan by British Columbia growers was inspected at the port of landing as a measure of pest-control. No pests were found, and the seed was generally of excellent quality, being small, well hardened, with high counts and low mortality.

One interested grower imported a quantity of very high-count Japanese seed, as well as some caught on cement-dipped Keyes egg-trays. This material was turned over to the laboratory for study. First results on survival will be available in the spring of 1953. The purpose of the experiment is to determine whether the present Japanese oyster-seed import technique might be improved.

Twenty oyster leases applied for to the Provincial Department of Lands and Forests were examined regarding their suitability for oyster-culture. These opinions are transmitted to the applicant by the Department of Lands and Forests.

A further survey of potential oyster-ground has been carried on, with detailed examination of the Clayoquot Sound area on the west coast of Vancouver Island, John-

stone Strait, and a part of Queen Charlotte Sound. Test plantings in the more suitable areas were made.

Because of the emphasis on the oyster investigations, little time is available for work on the other commercial species of molluscs, and what has been done consists mainly of routine observations to maintain continuity of records. Work on the early life-history of the British Columbia shipworm is being continued as time permits.

## Oyster Biological Investigations

### *Pacific-oyster Breeding*

The breeding season of 1952 was characterized by generally fine weather, although the mean monthly sea-water temperature in Ladysmith Harbour was slightly lower than in 1951. In 1952 the temperature reached higher levels for shorter periods than they did in the previous year. The most significant difference between the two years was the steady and quite rapid decline in water temperature in 1952 between August 12th and August 25th. Except for slightly higher level, the temperature picture in Pendrell Sound was nearly identical to that in Ladysmith Harbour. Of significance was the late Pacific-oyster spawning in all areas, for major releases of spawn did not occur until mid-August. This may have been the result of delayed gonad development due to relatively low water temperature in June. As a result of the late spawnings, the larvæ were caught in the temperature decline in the last half of August and by the severe storm over the week-end of August 23rd and 24th. Consequently, commercial sets were obtained only in Pendrell and Hotham Sounds. No breeding of significance occurred in Fanny Bay, Boundary Bay, or Pender Harbour, which were the other areas studied.

*Ladysmith Harbour.*—Small scattered spawnings occurred after a sharp rise in water temperatures to 70° F. on July 10th. Several size-groups of larvæ were present, although in very small numbers, and very few spat resulted from these spawnings. A further light spawn on August 4th also did not produce significant numbers of spat. On August 9th, with the water temperature at 73° F., a spawning occurred which produced 60 straight-hinged larvæ per gallon. By August 20th the numbers had been reduced to 16 umboned larvæ per gallon—ample, however, to provide an excellent commercial set. A spatfall was forecast for the week beginning August 24th, with light setting beginning on August 23rd. However, by August 25th the water temperature had dropped to 61° F. from 68° F. on August 20th, and presumably this had the effect of directly or indirectly decimating nearly the whole larval population. The final average spatfall for the harbour was less than 1 spat per Pacific-oyster shell.

*Hotham Sound.*—In 1951 a commercial set was recorded from this area, but since the previous history indicated light and irregular breeding, it was considered that a larger spawning population was required before consistent successful breedings would occur. However, on July 16th the one and only spawning of the season occurred, and by July 24th 41 umboned larvæ per gallon had survived. A commercial spatfall was forecast for the first week in August. This spatfall produced an average of 294 spat per inner face of a Pacific-oyster shell. Only a small amount of cultch was exposed in Hotham Sound, since all operations were geared for Pendrell Sound. It appears that this area will bear closer scrutiny in the future. It has the advantage that it is closer to the major growing areas than Pendrell Sound by about 50 miles.

*Pendrell Sound.*—On July 16th a small spawning occurred, but the larval survival was good and setting was expected at the beginning of August. Spatting began on August 3rd and reached the peak on August 5th and 6th. Shells exposed between August 3rd and 12th caught an average of 57 spat per inner Pacific-oyster shell-face. No further spawnings occurred until August 9th, when 250 straight-hinged larvæ per gallon were produced. An excellent commercial set was forecast for the last week in August. How-

ever, as in Ladysmith Harbour, the storm and rain on the week-end of August 24th contributed directly or indirectly to the heavy larval mortality, and by August 27th plankton samples averaged less than 4 larvæ per gallon. However, cultch exposed for this set caught an average of 33 spat per shell, with a range of 7 to 65 spat per shell. Commercial shell strings exposed throughout the summer caught an average of 100 spat per shell, both sides.

While no spatfall was particularly heavy, the total for the summer was well above the intensity required for commercial purposes. Cultch equivalent to about 4,000 cases of oyster-seed (Japanese) was exposed during the 1952 breeding season, and most of it caught a set of commercial value.

*Vertical Distribution of Larvæ*

The vertical distribution of oyster larvæ in Pendrell Sound was studied by sampling at various depths at regular intervals of time throughout several days. The concentration of larvæ of all sizes occurred between the surface and a depth of 10 feet, with the greatest numbers at the 3-foot level. This distribution follows closely that of the spatfall on floating cultch. The vertical distribution of larvæ appears to be influenced mainly by temperature and very little by salinity. There was no discernible diurnal vertical movement, and the stage of the tide had no effect.

*Effect of Tidal Phase on Time of Setting.*—This was studied by exposing shell strings during the spatting periods between intervals of slack water. The greatest number of larvæ were found to set during the period of the long run-in from lower low water to higher high water. There appeared to be no real difference in the amount of setting between daylight and darkness. While there appeared to be some preference for the long run-in, setting occurred in appreciable quantity at other stages of the tide. Spatting in Pendrell Sound is found to occur from the highest tide-level down to a little below mean low water, wherever satisfactory cultch is present. However, there is little survival from the level of high water down to the 12-foot mark. As yet there is no explanation why there is no spatting below the level of mean low water along the shore. Maximum setting occurred in the zone between 6 and 11 feet above mean low water. On floating cultch, spatting occurred between the surface down to the 38-foot level, although appreciable setting ceases at the 13-foot mark, which coincides with the average vertical larval distribution shown by plankton sampling. It is indicated that commercial cultch need not be extended lower than 5 feet below the surface in order to receive the maximum spatfall.

*Cultch Development*

Further tests were made of cement-dipped Keyes egg-trays, and, as in previous tests, the trays caught very well, but their performance on the beds left much to be desired, for spat mortality is extremely high unless the trays receive a very heavy cement dip, and this is unsatisfactory from the economic point of view. Wood shavings were experimented with and caught satisfactory sets. There is, however, some difficulty in handling this material on the beds. Light rock, a light-weight cement aggregate, was also experimented with, but the spatfall on this material was very poor. The search for a more satisfactory cultch is being continued.

*Oyster Production*

The production of oysters in British Columbia in 1952 totalled 81,185 shucked gallons (U.S.), which is 22,234 gallons more than in 1951, an increase of 37 per cent. The production by area is shown in the following table, the data for which are supplied by the Federal Department of Fisheries:—

| | Production in Shucked U.S. Gallons | |
|---|---|---|
| | *1951* | *1952* |
| Area 14 (Baynes Sound) | 5,117 | 6,830 |
| Area 16 (Pender Harbour) | 4,182 | 2,347 |
| Area 17 (Stuart Channel) | 12,442 | 13,613 |
| Area 19 (Victoria) | ---------- | 16 |
| Area 20 (Juan de Fuca) | 1,045 | 668 |
| Area 29E (Boundary Bay) | 36,165 | 57,711 |
| Totals | 58,951 | 81,185 |

*Condition in Oysters*

The condition or fatness of oysters is of great importance to the industry, for it not only determines to a large extent the quality of the product, but also the return the oyster-grower obtains from a unit volume or weight of oysters. All of the factors influencing the condition of oysters are not yet known.

In 1952 a study carried out in Ladysmith Harbour to determine the seasonal change in the condition of a group of oysters showed that it remained relatively constant during the period from October to March, when the probable food organisms were at a minimum level of abundance. Soon after the spring flowering of diatoms in mid-March, the condition of the oysters rose rapidly to the high for the year in mid-May. This high level was nearly maintained during the period of spawn development, with the difference that the condition factor was due to the presence of spawn rather than of fat. A dramatic drop in the condition was measured after spawning in early August. Diatom production was relatively high at this time, and within a month the oysters had recovered to a point near the normal winter level.

It appears that there is some connection between the abundance of diatoms and other small possible food organisms and the condition of oysters in Ladysmith Harbour.

## Clam Investigations

*Hard-shell Clams*

The production of butter-clams in 1952 was 5,492,300 pounds, compared with 3,500,500 pounds in 1951. The production of Native little-neck clams was 493,300 pounds in 1952; of Manila clams, 405,900 pounds; and 143,700 pounds of mixed species.

*Abalone*

While no definite steps are being taken to increase the utilization of this species, there are indications that there is an increase in interest in the possibilities of the species. In 1952 there were 11,900 pounds of abalone produced.

*Razor-clams*

According to the statistics supplied by the Federal Department of Fisheries, 125,500 pounds of razor-clams were produced in 1952, a slight drop from the 135,500 pounds produced in 1951. The whole production comes from the area between Rose Spit and Masset, in the Queen Charlotte Islands, where the clam-beds are held under lease.

*Seal Island*

Seal Island, near Comox, has been reserved for a number of years as an experimental clam area, and the history of the clam populations of the area has been followed carefully since 1938.

During 1952 the ground was surveyed to determine whether there had been any significant change in the composition of the clam population there since the time of the last examination in 1950. A comparison of the two years is shown in the following table:—

| | | 1950 | 1952 |
|---|---|---|---|
| Area surveyed | sq. yd. | 74,375 | 74,375 |
| Weight of clams per square yard | lb. | 3.2 | 3.4 |
| Number of clams per square yard | | 8.8 | 9.6 |
| Mean weight per clam of legal size (2½ in.) | lb. | 5.9 | 5.6 |
| Number of clams under legal size per square yard | | 2.0 | 1.9 |
| Percentage population under legal size | | 17.0 | 17.0 |

It may be seen that there has been little change in conditions over the period. Other observations indicate there has been no major breeding—indeed, no major spawning—for a number of years. Only small numbers of newly set clams are found each year. Of the population, 50 per cent is 15 years or more in age and weigh on an average 8.0 ounces. The clams less than 15 years of age are distributed approximately evenly in numbers in the year-classes between 2 and 14.

There are approximately 100 tons of clams on the 15 acres of clam-bearing ground at Seal Island. Although the area has been opened to commercial digging for short periods during recent years, commercial diggers have shown no interest; therefore, it may be assumed this population level is below that at which it is economical to dig.

# APPENDICES

## CONTRIBUTIONS TO THE LIFE-HISTORY OF THE SOCKEYE SALMON (No. 38)

By D. R. Foskett, B.A., M.A., Pacific Biological Station, Nanaimo, B.C.

### INTRODUCTION

The more important sockeye-salmon runs in British Columbia are sampled each year to study the distribution of ages and sexes in the commercial catch. Length and weight characteristics of each sex and age groups contributing to the catches are also recorded. This is the thirty-eighth report since 1914 recording, by major fishing areas, the composition of the landings and commenting on the spawning escapements.

### DESIGNATION OF AGE-GROUPS AND TREATMENT OF DATA

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 fresh water. The age-groups which are met most commonly are:—

$3_1$, $4_1$—the " sea types " or fish which migrate seaward in their first year and mature in their third and fourth year respectively.

$3_2$—" the grilse," usually males, which migrate seaward in their second year and mature in their third year.

$4_2$, $5_2$—fish which migrate seaward in their second year and mature in their fourth and fifth years respectively.

$5_3$, $6_3$—fish which migrate seaward in their third year and mature in their fifth and sixth years respectively.

$6_4$, $7_4$—fish which migrate seaward in their fourth year and mature in their sixth and seventh years respectively.

Fish were measured to the nearest quarter of an inch and averaged to the closest tenth of an inch. Most weights were recorded to tenths of a pound and so tabulated in quarter-pound groupings as to produce an even-pound and half-pound bias. This bias is especially evident for Smith Inlet, where much of the original data was recorded to the nearest half-pound.

### 1. THE NASS RIVER SOCKEYE RUN OF 1952

#### (1) General Characteristics

The pack of sockeye on the Nass River, 29,492 cases (Table I), was much better than in 1951 and decidedly above the average for the past ten years. The escapement was reported as satisfactory.

#### (2) Age-groups

The most prominent age-group in the 1952 Nass sockeye run was that of the $5_3$'s (46 per cent), with the $4_2$ and $5_2$ age-groups forming 28 and 19 per cent respectively (Table I). The $6_3$ age-class formed 4 per cent of the sample. Three per cent of the sample was recorded as sea-run types, but there is some doubt concerning these interpretations.

### (3) Lengths and Weights

The Nass River fish were very large, approaching in size those taken in 1951 (Tables IV and V). The average weight of fish in the samples was 6.4 pounds. This is the same value as that obtained from the statistics of the Federal Department of Fisheries.

### (4) Distribution of Sexes

There was nothing unusual in the distribution of sexes in the Nass River sockeye (Table VI). The $5_2$ and $6_3$ age-groups, with 56 and 59 per cent males respectively, were furthest from the total sex ratio of the sample, which was 50:50.

## 2. THE SKEENA RIVER SOCKEYE RUN OF 1952

### (1) General Characteristics

The 1952 Skeena River sockeye-pack (114,775 cases) was almost double that of 1951, and the fish were of approximately the same size as those of the 1951 run. The spawning runs were of average size, except in the Babine area, where a rock-slide in the Babine River caused a very large loss of spawners and probably reduced the effectiveness of thousands which did succeed in reaching the lake. Conditions for the survival of the eggs deposited appeared to be normal.

### (2) Age-groups

In the Skeena River catch sample, 66 per cent were in the $4_2$ age-group and 26 per cent were $5_2$ age-class fish (Table VII). The only other groups present in important numbers were the $5_3$ and $6_3$ age-classes, forming 3 and 5 per cent of the sample respectively. The minor age-groups present and the numbers of fish in them may be found in Tables VIII and IX.

### (3) Lengths and Weights

The $4_2$, $5_2$, and $6_3$ age-groups were composed of relatively large fish for these groups (Tables X and XI). The $4_2$ males exceeded in length and weight the records for the past ten years, and the $4_2$ females equalled their records (Tables X and XI). The average weight of the fish in the sample was 5.8 pounds. The average weight of the catch, as calculated from the Federal Department of Fisheries statistics, was 6.0 pounds, showing acceptable agreement.

### (4) Distribution of Sexes

As may be seen from Table XII, the sex ratio in the two main age-groups closely follows the pattern of the past ten years, while that of the whole sample is close to the theoretical 50:50 distribution, being 48 per cent males and 52 per cent females.

## 3. THE RIVERS INLET SOCKEYE RUN OF 1952

### (1) General Characteristics

The Rivers Inlet sockeye-pack was 84,297½ cases in 1952 (Table XIII). The very heavy spawning escapement in the area was in part the result of the fishermen's strike which occurred just after the peak of the run, at a time when normally the catch would have been large.

### (2) Age-groups

As usual, the $4_2$ and $5_2$ age-groups predominated in the 1952 Rivers Inlet salmon-catch sample, forming 41 and 58 per cent of the run respectively (Table XIII). A few $5_3$ and $6_3$ age-class fish were present and one fish in each of the $3_2$ and $6_2$ age-groups (Tables XIV and XV).

### (3) Lengths and Weights

Both the $4_2$ and $5_2$ age-class salmon were large, the latter equalling or exceeding the averages recorded during the past ten years (Tables XVI and XVII). The average weight of the sample is 0.3 pound greater than that of the total catch, obtained by using the Federal Department of Fisheries statistics. The discrepancy is not great, but is probably real, and to be explained by the inclusion in the sample of a disproportionate number of fish caught near the head of the inlet. The average size of fish caught in that area is greater than the average size of fish caught near the mouth of the inlet.

### (4) Distribution of Sexes

The distribution of sexes within the age-classes followed closely the pattern of the past ten years (Table XVIII). The general ratio of 44 males to 56 females was the same as in 1951.

### (5) Spawning-ground Samples

In the Rivers Inlet area, sampling was extended to the spawning-grounds. With the assistance of Federal Fisheries Inspectors Houghton and White and the co-operation of their patrolmen, 838 fish were measured on the spawning-grounds. Of these, 539 were males and 299 females, giving a sex ratio of 64:36. Of the males, 108 were jacks (3-year-olds). Excluding them the sex ratio is 59:41. This value is in marked contrast to that obtained from the sample of the commercial catch. Degeneration of the scales takes place among ripening salmon, with the result that scales cannot be used for age determination. However, length-frequency diagrams, such as those shown in Fig. 1, give clear indication of the age distribution in the sample. Because of the development of secondary sexual characters, the distributions do not agree in detail with those obtained for samples from the fishery (Fig. 2), but the various groups are clearly distinguishable.

### (6) Comparison of Samples from the Fishery and the Spawning-grounds

Figs. 3 and 4 compare the size distributions of sockeye in the catches and on the spawning-grounds. Immediately evident is the fact that the fishery makes no use of the jacks. It is also clear that the fishery heavily exploits the large $4_2$ males and the small $5_2$ males, making relatively little use of the smallest and largest fish. The larger $5_2$ females are also used relatively little, although selection effects are less marked than among males.

The difference between fishery and spawning-ground length frequencies results from the greater effectiveness of each size of gill-net on fish of a certain size. This has not been made the subject of a thorough study, but preliminary observations show that the effect can be quite critical. In 1951 the average weight of sockeye caught by eight fishermen fishing in the lower part of the inlet with 5⅜-inch mesh nets was 6.3 pounds. This may be compared with the 6.8-pound average from landings by ten fishermen using 5½-inch mesh over the same period in the same area.

## 4. THE SMITH INLET SOCKEYE RUN OF 1952

### (1) General Characteristics

The Smith Inlet sockeye-pack in 1952, 34,834 cases, was not as good as that of the past two years but was approximately the same as that of the cycle-year. The fish were, however, of good size, and the spawning run was excellent.

### (2) Age-groups

As 91 per cent of the Smith Inlet sockeye sample was composed of $5_2$ age-class fish (Table XIX), the catch was very uniform. The $4_2$ age-class formed only 8 per cent of the sample, and the $5_3$ group, 1 per cent. Two $6_2$ age-class fish were present, and one

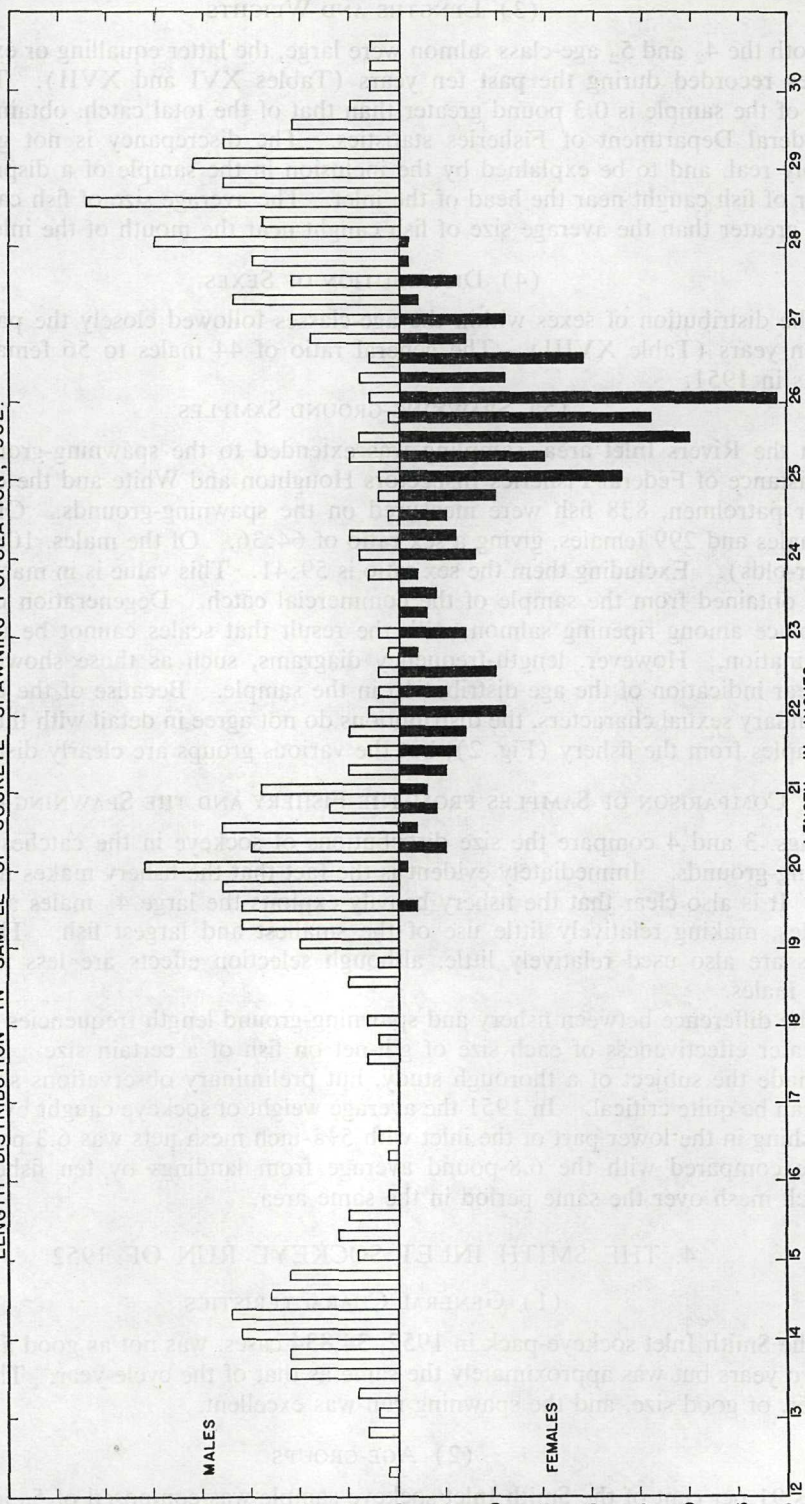
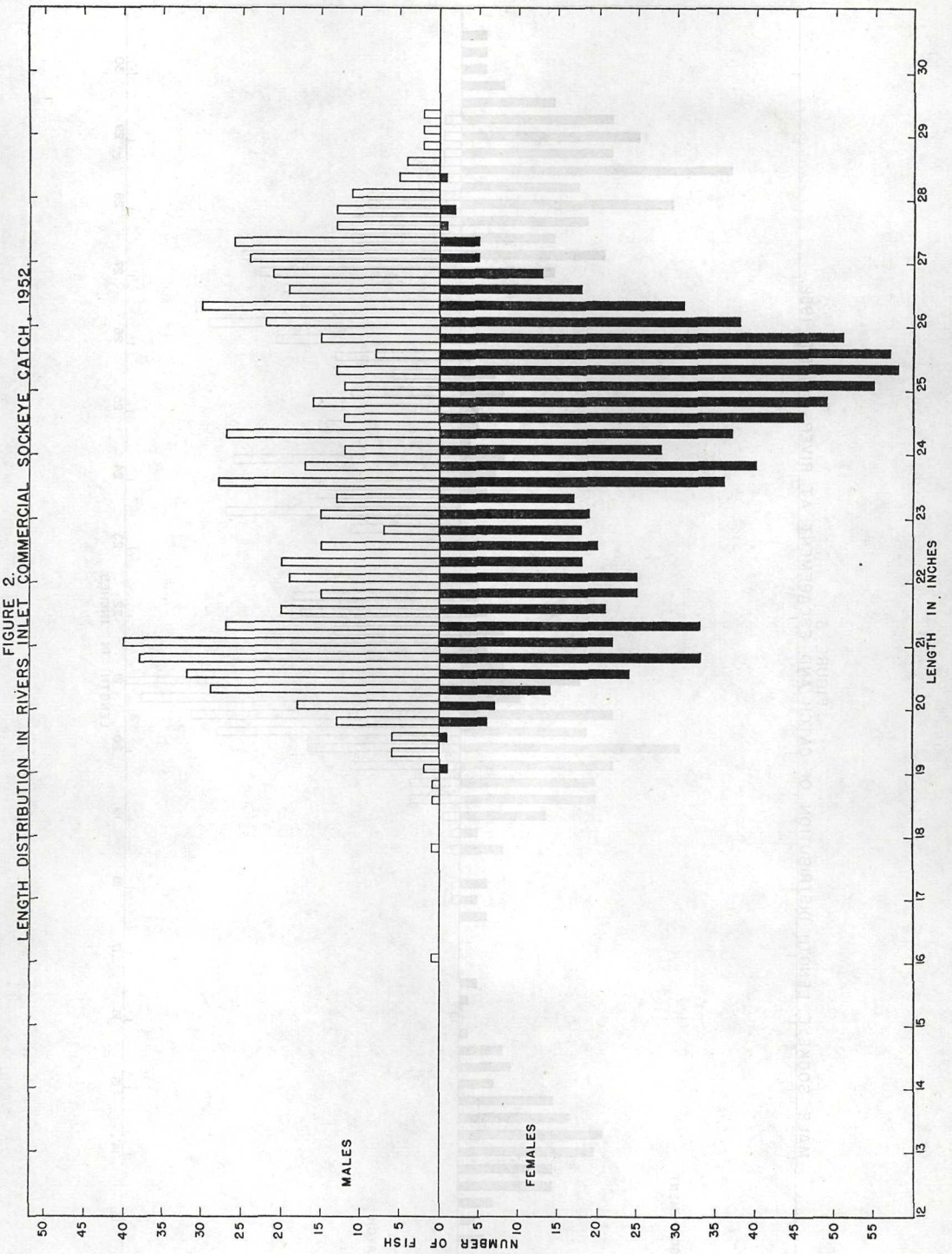



FIGURE I.
LENGTH DISTRIBUTION IN SAMPLE OF SOCKEYE SPAWNING POPULATION, 1952,
RIVERS INLET

FIGURE 2.
LENGTH DISTRIBUTION IN RIVERS INLET COMMERCIAL SOCKEYE CATCH, 1952.



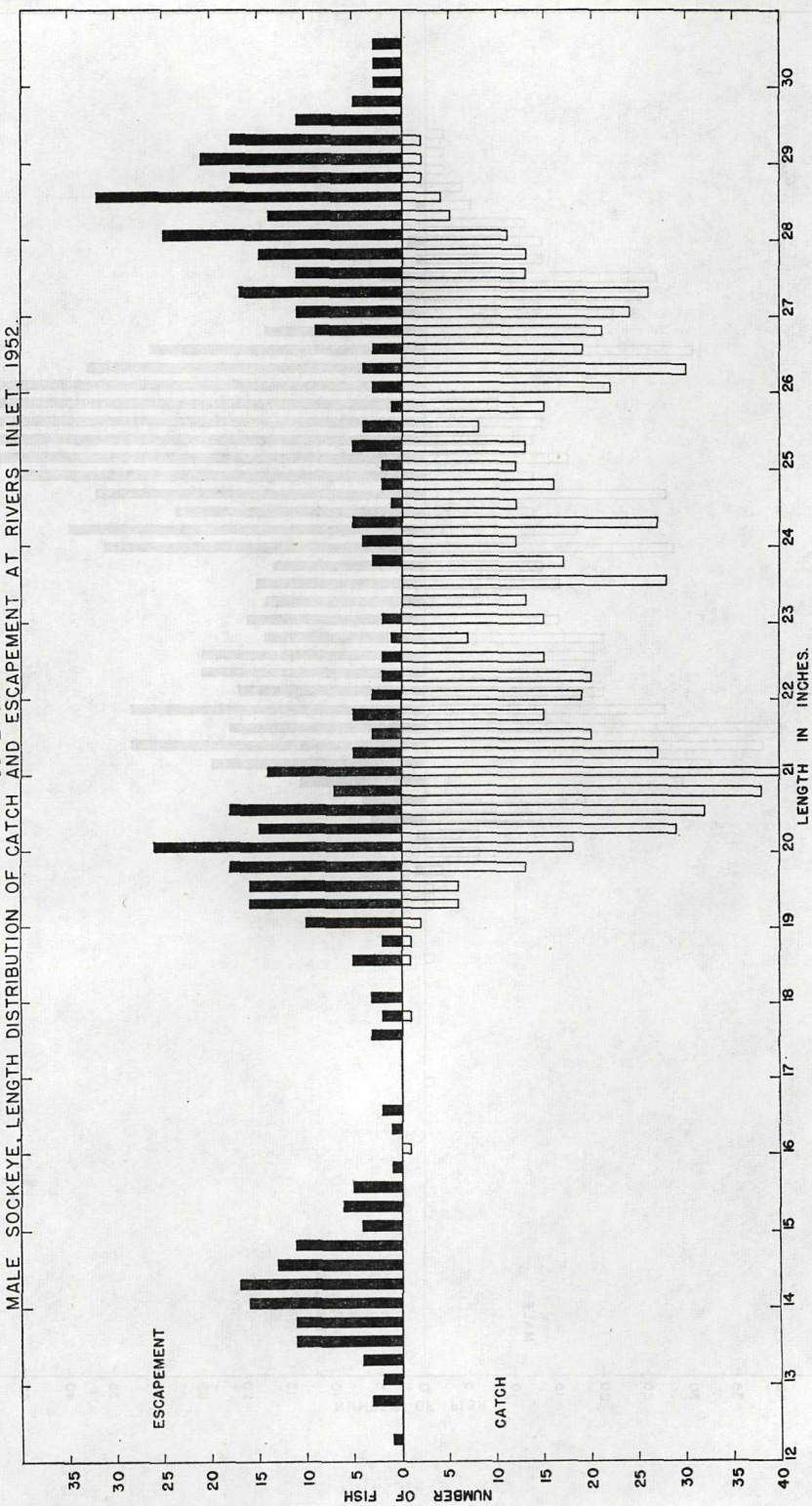



FIGURE 3.
MALE SOCKEYE, LENGTH DISTRIBUTION OF CATCH AND ESCAPEMENT AT RIVERS INLET, 1952.

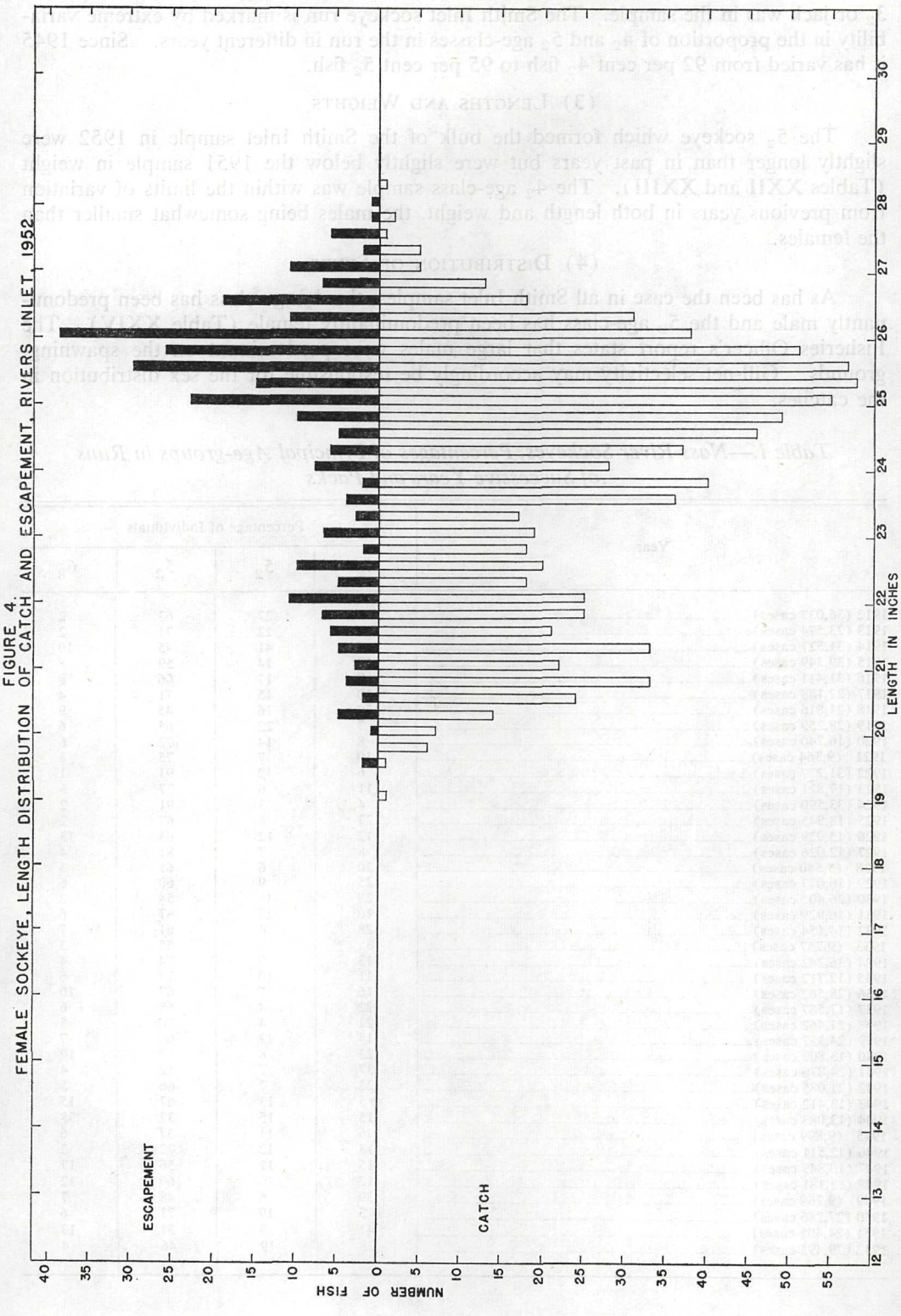



FIGURE 4.
FEMALE SOCKEYE, LENGTH DISTRIBUTION OF CATCH AND ESCAPEMENT, RIVERS INLET, 1952.

$3_2$ or jack was in the sample. The Smith Inlet sockeye run is marked by extreme variability in the proportion of $4_2$ and $5_2$ age-classes in the run in different years. Since 1945 it has varied from 92 per cent $4_2$ fish to 95 per cent $5_2$ fish.

### (3) Lengths and Weights

The $5_2$ sockeye which formed the bulk of the Smith Inlet sample in 1952 were slightly longer than in past years but were slightly below the 1951 sample in weight (Tables XXII and XXIII). The $4_2$ age-class sample was within the limits of variation from previous years in both length and weight, the males being somewhat smaller than the females.

### (4) Distribution of Sexes

As has been the case in all Smith Inlet samples, the $4_2$ age-class has been predominantly male and the $5_2$ age-class has been predominantly female (Table XXIV). The Fisheries Officer's report states that large males were predominant on the spawning-grounds. Gill-net selectivity may accordingly be responsible for the sex distribution in the catches.

*Table I.—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 |
| 1950 (27,286 cases) | 3 | 19 | 71 | 6 |
| 1951 (24,405 cases) | 41 | 9 | 31 | 13 |
| 1952 (29,492 cases) | 28 | 19 | 46 | 4 |

*Table II.—Nass River Sockeyes, 1952, Grouped by Age, Sex, Length, and by Their Early History*

| Length in Inches | Number of Individuals | | | | | | | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | $3_1$ | | $4_1$ | | $4_2$ | | $5_2$ | | $5_3$ | | $6_3$ | | $7_4$ | | |
| | M. | F. | M. | F. | M. | F. | M. | F. | M. | F. | M. | F. | M. | F. | |
| 19½ | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- |
| 19¾ | ---- | ---- | ---- | ---- | 1 | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | 1 |
| 20 | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- |
| 20¼ | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- |
| 20½ | 1 | ---- | ---- | ---- | ---- | 1 | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | 2 |
| 20¾ | 1 | 1 | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | 2 |
| 21 | 2 | ---- | ---- | ---- | ---- | 1 | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | 3 |
| 21¼ | 1 | ---- | ---- | 1 | 1 | 3 | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | 6 |
| 21½ | 1 | ---- | ---- | 1 | 2 | 7 | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | 11 |
| 21¾ | 1 | ---- | ---- | 1 | 5 | 4 | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | 11 |
| 22 | ---- | ---- | ---- | 1 | 4 | 16 | ---- | 1 | 3 | 3 | ---- | ---- | ---- | ---- | 28 |
| 22¼ | 1 | ---- | ---- | 1 | 2 | 19 | 1 | 1 | ---- | 6 | ---- | ---- | ---- | ---- | 31 |
| 22½ | ---- | ---- | ---- | 5 | 5 | 36 | 1 | 2 | 1 | 22 | ---- | ---- | ---- | ---- | 72 |
| 22¾ | ---- | ---- | ---- | 1 | 9 | 23 | ---- | 1 | 3 | 20 | ---- | ---- | ---- | ---- | 57 |
| 23 | 2 | ---- | ---- | 4 | 21 | 31 | ---- | 1 | 8 | 50 | ---- | ---- | ---- | ---- | 117 |
| 23¼ | ---- | ---- | ---- | 4 | 17 | 36 | ---- | ---- | 9 | 33 | ---- | ---- | ---- | ---- | 99 |
| 23½ | 1 | ---- | ---- | 1 | 34 | 34 | ---- | 2 | 19 | 58 | ---- | ---- | ---- | ---- | 149 |
| 23¾ | ---- | ---- | ---- | 4 | 31 | 20 | 2 | 5 | 17 | 45 | ---- | ---- | ---- | ---- | 124 |
| 24 | ---- | ---- | ---- | 5 | 35 | 22 | ---- | 8 | 30 | 51 | ---- | ---- | ---- | ---- | 151 |
| 24¼ | ---- | ---- | 2 | 1 | 21 | 10 | 1 | 7 | 41 | 45 | ---- | ---- | ---- | ---- | 128 |
| 24½ | ---- | ---- | 2 | 3 | 19 | 1 | 4 | 9 | 44 | 29 | ---- | 3 | ---- | ---- | 114 |
| 24¾ | ---- | ---- | ---- | ---- | 15 | 4 | ---- | 10 | 42 | 29 | ---- | 1 | ---- | ---- | 101 |
| 25 | ---- | ---- | 1 | ---- | 21 | ---- | 9 | 13 | 64 | 20 | ---- | 3 | ---- | ---- | 131 |
| 25¼ | ---- | ---- | ---- | ---- | 7 | ---- | 6 | 25 | 34 | 16 | ---- | 4 | ---- | ---- | 92 |
| 25½ | ---- | ---- | 1 | ---- | 9 | 2 | 6 | 16 | 39 | 16 | 2 | 1 | ---- | ---- | 92 |
| 25¾ | ---- | ---- | 1 | ---- | 2 | ---- | 9 | 6 | 22 | 7 | 1 | 1 | ---- | ---- | 49 |
| 26 | ---- | ---- | ---- | 1 | 1 | ---- | 4 | 16 | 29 | 5 | ---- | 1 | ---- | ---- | 57 |
| 26¼ | ---- | ---- | 2 | ---- | 1 | 1 | 14 | 13 | 7 | 2 | 2 | 1 | ---- | ---- | 43 |
| 26½ | ---- | ---- | 1 | ---- | 2 | ---- | 22 | 8 | 15 | ---- | 4 | 2 | ---- | ---- | 54 |
| 26¾ | ---- | ---- | 1 | ---- | ---- | ---- | 16 | 9 | 3 | ---- | 4 | ---- | ---- | ---- | 33 |
| 27 | ---- | ---- | ---- | ---- | ---- | ---- | 23 | 3 | 2 | ---- | 4 | 2 | ---- | ---- | 34 |
| 27¼ | ---- | ---- | ---- | 1 | ---- | ---- | 22 | 2 | 1 | ---- | 2 | 3 | ---- | ---- | 31 |
| 27½ | ---- | ---- | ---- | ---- | ---- | ---- | 25 | 1 | 1 | ---- | 4 | 4 | ---- | 1 | 36 |
| 27¾ | ---- | ---- | ---- | ---- | ---- | ---- | 7 | 1 | ---- | 1 | 5 | 1 | ---- | ---- | 15 |
| 28 | ---- | ---- | ---- | ---- | ---- | ---- | 11 | ---- | 1 | ---- | 3 | 3 | ---- | ---- | 18 |
| 28¼ | ---- | ---- | ---- | ---- | ---- | ---- | 6 | ---- | ---- | 1 | 2 | ---- | ---- | ---- | 9 |
| 28½ | ---- | ---- | ---- | ---- | ---- | ---- | 4 | ---- | ---- | ---- | 4 | ---- | ---- | ---- | 8 |
| 28¾ | ---- | ---- | ---- | ---- | ---- | ---- | 5 | ---- | ---- | ---- | 1 | ---- | ---- | ---- | 6 |
| 29 | ---- | ---- | ---- | ---- | ---- | ---- | 2 | ---- | ---- | ---- | 2 | ---- | ---- | ---- | 4 |
| 29¼ | ---- | ---- | ---- | ---- | ---- | ---- | 2 | ---- | ---- | ---- | 3 | ---- | ---- | ---- | 5 |
| 29½ | ---- | ---- | ---- | ---- | ---- | ---- | 2 | ---- | ---- | ---- | 1 | ---- | ---- | ---- | 3 |
| Totals | 11 | 1 | 11 | 35 | 265 | 271 | 204 | 160 | 435 | 459 | 44 | 30 | ---- | 1 | 1,927 |
| Average lengths | 21.8 | 20.8 | 25.4 | 23.4 | 23.9 | 23.1 | 26.8 | 25.3 | 24.8 | 23.9 | 27.6 | 26.3 | ---- | 27.5 | 24.5 |

*Table III.—Nass River Sockeyes, 1952, Grouped by Age, Sex, Weight, and by Their Early History*

| Weight in Pounds | Number of Individuals | | | | | | | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | $3_1$ | | $4_1$ | | $4_2$ | | $5_2$ | | $5_3$ | | $6_3$ | | $7_4$ | | |
| | M. | F. | M. | F. | M. | F. | M. | F. | M. | F. | M. | F. | M. | F. | |
| 3 | ----- | ----- | ----- | ----- | 1 | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | 1 |
| 3¼ | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 3½ | ----- | ----- | ----- | ----- | ----- | ----- | ----- | 1 | ----- | ----- | ----- | ----- | ----- | ----- | 1 |
| 3¾ | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 4 | 3 | 1 | ----- | ----- | ----- | 8 | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | 12 |
| 4¼ | 1 | ----- | ----- | ----- | 2 | 8 | ----- | ----- | 5 | 2 | ----- | ----- | ----- | ----- | 18 |
| 4½ | 2 | ----- | ----- | 7 | 10 | 28 | ----- | 1 | ----- | 22 | ----- | ----- | ----- | ----- | 70 |
| 4¾ | 2 | ----- | ----- | 4 | 6 | 28 | 1 | 3 | ----- | 30 | ----- | ----- | ----- | ----- | 74 |
| 5 | 1 | ----- | ----- | 6 | 21 | 61 | ----- | ----- | 14 | 68 | ----- | ----- | ----- | ----- | 171 |
| 5¼ | ----- | ----- | ----- | 2 | 17 | 29 | ----- | 5 | 7 | 49 | ----- | ----- | ----- | ----- | 109 |
| 5½ | ----- | ----- | ----- | 6 | 33 | 38 | 3 | 5 | 21 | 69 | ----- | ----- | ----- | ----- | 175 |
| 5¾ | 1 | ----- | 1 | 4 | 24 | 32 | ----- | 5 | 25 | 40 | ----- | 1 | ----- | ----- | 133 |
| 6 | 1 | ----- | ----- | 3 | 34 | 24 | 3 | 16 | 43 | 54 | ----- | 2 | ----- | ----- | 180 |
| 6¼ | ----- | ----- | ----- | ----- | 32 | 6 | 1 | 8 | 43 | 29 | ----- | 1 | ----- | ----- | 120 |
| 6½ | ----- | ----- | 2 | 1 | 22 | 3 | 8 | 18 | 80 | 32 | ----- | 3 | ----- | ----- | 169 |
| 6¾ | ----- | ----- | ----- | 1 | 16 | 3 | 1 | 12 | 29 | 18 | 1 | 5 | ----- | ----- | 86 |
| 7 | ----- | ----- | 3 | ----- | 15 | 2 | 7 | 22 | 51 | 15 | ----- | 1 | ----- | ----- | 116 |
| 7¼ | ----- | ----- | ----- | ----- | 9 | ----- | 5 | 14 | 27 | 11 | 1 | 2 | ----- | ----- | 69 |
| 7½ | ----- | ----- | 1 | ----- | 13 | ----- | 14 | 13 | 36 | 8 | 2 | ----- | ----- | ----- | 87 |
| 7¾ | ----- | ----- | 1 | ----- | 3 | ----- | 11 | 8 | 11 | 3 | 2 | 2 | ----- | ----- | 41 |
| 8 | ----- | ----- | 1 | ----- | 4 | ----- | 28 | 19 | 22 | 9 | 10 | 2 | ----- | ----- | 95 |
| 8¼ | ----- | ----- | 1 | ----- | 1 | ----- | 19 | 2 | 3 | ----- | 4 | 2 | ----- | 1 | 33 |
| 8½ | ----- | ----- | 1 | 1 | ----- | 1 | 19 | 4 | 9 | ----- | 3 | 6 | ----- | ----- | 44 |
| 8¾ | ----- | ----- | ----- | ----- | 2 | ----- | 11 | 1 | ----- | ----- | 5 | 3 | ----- | ----- | 22 |
| 9 | ----- | ----- | ----- | ----- | ----- | ----- | 23 | 2 | 4 | ----- | 3 | ----- | ----- | ----- | 32 |
| 9¼ | ----- | ----- | ----- | ----- | ----- | ----- | 13 | 1 | 1 | ----- | 4 | ----- | ----- | ----- | 19 |
| 9½ | ----- | ----- | ----- | ----- | ----- | ----- | 10 | ----- | 2 | ----- | 1 | ----- | ----- | ----- | 13 |
| 9¾ | ----- | ----- | ----- | ----- | ----- | ----- | 7 | ----- | 1 | ----- | 2 | ----- | ----- | ----- | 10 |
| 10 | ----- | ----- | ----- | ----- | ----- | ----- | 8 | ----- | ----- | ----- | 2 | ----- | ----- | ----- | 10 |
| 10¼ | ----- | ----- | ----- | ----- | ----- | ----- | 2 | ----- | 1 | ----- | ----- | ----- | ----- | ----- | 3 |
| 10½ | ----- | ----- | ----- | ----- | ----- | ----- | 2 | ----- | ----- | ----- | 1 | ----- | ----- | ----- | 3 |
| 10¾ | ----- | ----- | ----- | ----- | ----- | ----- | 2 | ----- | ----- | ----- | 1 | ----- | ----- | ----- | 3 |
| 11 | ----- | ----- | ----- | ----- | ----- | ----- | 2 | ----- | ----- | ----- | ----- | ----- | ----- | ----- | 2 |
| 11¼ | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | 1 | ----- | ----- | ----- | 1 |
| 11½ | ----- | ----- | ----- | ----- | ----- | ----- | 3 | ----- | ----- | ----- | ----- | ----- | ----- | ----- | 3 |
| 11¾ | ----- | ----- | ----- | ----- | ----- | ----- | 1 | ----- | ----- | ----- | ----- | ----- | ----- | ----- | 1 |
| 12 | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 12¼ | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 12½ | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | 1 | ----- | ----- | ----- | 1 |
| Totals | 11 | 1 | 11 | 35 | 265 | 271 | 204 | 160 | 435 | 459 | 44 | 30 | ----- | 1 | 1,927 |
| Average weights | 4.7 | 4.1 | 7.2 | 5.3 | 6.0 | 5.2 | 8.4 | 6.9 | 6.7 | 5.7 | 8.7 | 7.5 | ----- | 8.2 | 6.4 |

*Table IV.—Nass River Sockeyes, Average Lengths in Inches of Principal Age-groups, 1912 to 1952*

| 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 |
| 1950 | 23.6 | 23.1 | 26.0 | 24.7 | 24.5 | 23.7 | 26.7 | 25.6 |
| 1951 | 24.0 | 23.1 | 26.2 | 24.8 | 25.1 | 24.1 | 27.4 | 26.4 |
| 1952 | 23.9 | 23.1 | 26.8 | 25.3 | 24.8 | 23.9 | 27.6 | 26.3 |

*Table V.—Nass River Sockeyes, Average Weights in Pounds of Principal Age-groups, 1914 to 1952*

| 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 |
| 1950 | 5.9 | 5.2 | 7.9 | 6.6 | 6.4 | 5.5 | 8.2 | 7.1 |
| 1951 | 6.0 | 5.2 | 7.9 | 6.6 | 6.7 | 5.7 | 8.8 | 7.6 |
| 1952 | 6.0 | 5.2 | 8.4 | 6.9 | 6.7 | 5.7 | 8.7 | 7.5 |

*Table VI.—Nass River Sockeyes, Percentages of Males and Females, 1915 to 1952*

| 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 |
| 1950 | 41 | 59 | 42 | 58 | 43 | 57 | 58 | 42 | 44 | 56 |
| 1951 | 46 | 54 | 47 | 53 | 46 | 54 | 70 | 30 | 49 | 51 |
| 1952 | 49 | 51 | 56 | 44 | 49 | 51 | 59 | 41 | 50 | 50 |

*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 |
| 1950 (47,479 cases) | 21 | 72 | 4 | 3 |
| 1951 (61,694 cases) | 33 | 61 | 4 | 1 |
| 1952 (114,775 cases) | 66 | 26 | 3 | 5 |

*Table VIII.—Skeena River Sockeyes, 1952, Grouped by Age, Sex, Length, and by Their Early History*

| Length in Inches | Number of Individuals | | | | | | | | | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | $4_1$ | | $4_2$ | | $5_2$ | | $6_2$ | | $4_3$ | | $5_3$ | | $6_3$ | | $7_4$ | | |
| | M. | F. | M. | F. | M. | F. | M. | F. | M. | F. | M. | F. | M. | F. | M. | F. | |
| 17 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 17¼ | ..... | ..... | 1 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 1 |
| 17½ | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 17¾ | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 18 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 18¼ | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 18½ | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 18¾ | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 19 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 19¼ | ..... | ..... | 1 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 1 |
| 19½ | ..... | ..... | 1 | 1 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 2 |
| 19¾ | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 20 | ..... | ..... | 1 | 1 | ..... | ..... | ..... | ..... | 1 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 3 |
| 20¼ | ..... | ..... | 4 | 2 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 6 |
| 20½ | ..... | ..... | 7 | 2 | ..... | ..... | ..... | ..... | ..... | ..... | 1 | ..... | ..... | ..... | ..... | ..... | 10 |
| 20¾ | ..... | ..... | 3 | 3 | ..... | ..... | ..... | ..... | ..... | ..... | 1 | ..... | ..... | ..... | ..... | ..... | 7 |
| 21 | ..... | ..... | 16 | 14 | ..... | 1 | ..... | ..... | ..... | ..... | 2 | ..... | ..... | ..... | ..... | ..... | 33 |
| 21¼ | ..... | ..... | 7 | 28 | ..... | ..... | ..... | ..... | ..... | ..... | 1 | 2 | ..... | ..... | ..... | ..... | 38 |
| 21½ | ..... | ..... | 13 | 35 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 1 | ..... | ..... | ..... | ..... | 49 |
| 21¾ | ..... | ..... | 26 | 35 | ..... | 1 | ..... | ..... | ..... | ..... | ..... | 4 | ..... | ..... | ..... | ..... | 66 |
| 22 | ..... | ..... | 37 | 75 | ..... | 1 | ..... | ..... | ..... | ..... | 2 | 2 | ..... | ..... | ..... | ..... | 117 |
| 22¼ | ..... | ..... | 55 | 92 | ..... | 1 | ..... | ..... | ..... | ..... | ..... | 3 | ..... | ..... | ..... | ..... | 151 |
| 22½ | ..... | ..... | 57 | 104 | ..... | 3 | ..... | ..... | ..... | ..... | 2 | 3 | ..... | ..... | ..... | ..... | 169 |
| 22¾ | ..... | ..... | 54 | 56 | ..... | 4 | ..... | ..... | ..... | ..... | 1 | 2 | ..... | 1 | ..... | ..... | 118 |
| 23 | ..... | ..... | 72 | 97 | 2 | 7 | ..... | ..... | ..... | ..... | 5 | 4 | ..... | 2 | ..... | ..... | 189 |
| 23¼ | ..... | ..... | 72 | 50 | 5 | 14 | ..... | ..... | ..... | ..... | 6 | ..... | 1 | 4 | ..... | ..... | 152 |
| 23½ | ..... | ..... | 80 | 54 | 2 | 14 | ..... | ..... | ..... | ..... | 4 | 4 | ..... | 2 | ..... | ..... | 160 |
| 23¾ | ..... | ..... | 53 | 33 | 5 | 30 | ..... | ..... | ..... | ..... | 1 | 2 | ..... | 2 | ..... | ..... | 126 |
| 24 | ..... | 1 | 54 | 26 | 6 | 28 | ..... | ..... | ..... | ..... | 2 | 2 | ..... | 4 | ..... | ..... | 123 |
| 24¼ | ..... | ..... | 40 | 15 | 3 | 29 | ..... | ..... | ..... | ..... | 2 | ..... | 2 | 7 | ..... | ..... | 98 |
| 24½ | ..... | ..... | 55 | 11 | 8 | 46 | ..... | ..... | ..... | ..... | 2 | 2 | 3 | 3 | ..... | ..... | 130 |
| 24¾ | ..... | 1 | 43 | 6 | 12 | 33 | ..... | ..... | ..... | ..... | 1 | ..... | 2 | 6 | ..... | ..... | 104 |
| 25 | ..... | 1 | 22 | 1 | 17 | 43 | ..... | ..... | ..... | ..... | 1 | ..... | 2 | 9 | ..... | ..... | 96 |
| 25¼ | ..... | ..... | 18 | 1 | 16 | 46 | ..... | ..... | ..... | ..... | 3 | ..... | 3 | 7 | ..... | ..... | 94 |
| 25½ | ..... | ..... | 7 | ..... | 12 | 32 | ..... | ..... | ..... | ..... | ..... | ..... | 5 | 2 | ..... | ..... | 58 |
| 25¾ | ..... | ..... | 7 | ..... | 13 | 24 | ..... | ..... | ..... | ..... | ..... | ..... | 6 | ..... | ..... | ..... | 50 |
| 26 | ..... | ..... | 1 | ..... | 19 | 20 | ..... | ..... | ..... | ..... | ..... | ..... | 9 | 3 | ..... | ..... | 52 |
| 26¼ | ..... | ..... | 1 | ..... | 16 | 15 | ..... | ..... | ..... | ..... | ..... | ..... | 9 | 2 | 1 | ..... | 44 |
| 26½ | ..... | ..... | 1 | ..... | 17 | 7 | ..... | ..... | ..... | ..... | ..... | ..... | 10 | ..... | ..... | ..... | 35 |
| 26¾ | ..... | ..... | ..... | ..... | 12 | 5 | 1 | ..... | ..... | ..... | ..... | ..... | 5 | ..... | ..... | ..... | 23 |
| 27 | ..... | ..... | ..... | ..... | 14 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 2 | ..... | ..... | ..... | 16 |
| 27¼ | ..... | ..... | ..... | ..... | 5 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 4 | ..... | ..... | ..... | 9 |
| 27½ | ..... | ..... | ..... | ..... | 10 | 1 | ..... | ..... | ..... | ..... | ..... | ..... | 4 | ..... | ..... | ..... | 15 |
| 27¾ | ..... | ..... | ..... | ..... | 4 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 3 | ..... | ..... | ..... | 7 |
| 28 | ..... | ..... | ..... | ..... | 6 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 1 | ..... | ..... | ..... | 7 |
| 28¼ | ..... | ..... | ..... | ..... | 2 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 2 |
| 28½ | ..... | ..... | ..... | ..... | 1 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 1 |
| 28¾ | ..... | ..... | ..... | ..... | 1 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 1 |
| Totals | ..... | 3 | 809 | 742 | 208 | 405 | 1 | ..... | 1 | ..... | 37 | 31 | 71 | 54 | 1 | ..... | 2,363 |
| Av. lengths | ..... | 24.6 | 23.3 | 22.6 | 25.8 | 24.7 | 26.8 | ..... | 20.0 | ..... | 23.2 | 22.8 | 26.1 | 24.6 | 26.3 | ..... | 23.7 |

*Table IX.—Skeena River Sockeyes, 1952, Grouped by Age, Sex, Weight, and by Their Early History*

| Weight in Pounds | Number of Individuals | | | | | | | | | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | $4_1$ | | $4_2$ | | $5_2$ | | $6_2$ | | $4_3$ | | $5_3$ | | $6_3$ | | $7_4$ | | |
| | M. | F. | M. | F. | M. | F. | M. | F. | M. | F. | M. | F. | M. | F. | M. | F. | |
| 2 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 2¼ | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 2½ | ..... | ..... | 2 | 1 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 3 |
| 2¾ | ..... | ..... | ..... | 2 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 2 |
| 3 | ..... | ..... | 4 | 2 | ..... | ..... | ..... | ..... | ..... | ..... | 1 | ..... | ..... | ..... | ..... | ..... | 7 |
| 3¼ | ..... | ..... | 1 | 3 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 4 |
| 3½ | ..... | ..... | 10 | 9 | ..... | ..... | ..... | ..... | 1 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 20 |
| 3¾ | ..... | ..... | 8 | 9 | ..... | 1 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 18 |
| 4 | ..... | ..... | 28 | 63 | ..... | 3 | ..... | ..... | ..... | ..... | 1 | 2 | ..... | ..... | ..... | ..... | 97 |
| 4¼ | ..... | ..... | 34 | 62 | 1 | ..... | ..... | ..... | ..... | ..... | 1 | 2 | ..... | 1 | ..... | ..... | 101 |
| 4½ | ..... | ..... | 65 | 133 | ..... | 3 | ..... | ..... | ..... | ..... | 2 | 5 | ..... | 1 | ..... | ..... | 209 |
| 4¾ | ..... | ..... | 56 | 69 | ..... | 9 | ..... | ..... | ..... | ..... | 1 | 4 | ..... | ..... | ..... | ..... | 139 |
| 5 | ..... | ..... | 86 | 105 | 3 | 16 | ..... | ..... | ..... | ..... | 6 | 3 | 1 | 4 | ..... | ..... | 224 |
| 5¼ | ..... | ..... | 72 | 63 | 2 | 15 | ..... | ..... | ..... | ..... | 5 | 8 | ..... | 5 | ..... | ..... | 170 |
| 5½ | ..... | ..... | 90 | 77 | 10 | 46 | ..... | ..... | ..... | ..... | 3 | 3 | 2 | 8 | ..... | ..... | 239 |
| 5¾ | ..... | ..... | 49 | 38 | 3 | 27 | ..... | ..... | ..... | ..... | 3 | 2 | ..... | 4 | ..... | ..... | 126 |
| 6 | ..... | ..... | 78 | 47 | 14 | 52 | ..... | ..... | ..... | ..... | 4 | ..... | 5 | 10 | ..... | ..... | 210 |
| 6¼ | ..... | 1 | 41 | 17 | 9 | 29 | ..... | ..... | ..... | ..... | 3 | 1 | 3 | 4 | ..... | ..... | 108 |
| 6½ | ..... | ..... | 51 | 23 | 13 | 47 | ..... | ..... | ..... | ..... | 1 | 1 | 9 | 6 | ..... | ..... | 151 |
| 6¾ | ..... | 1 | 29 | 7 | 10 | 29 | ..... | ..... | ..... | ..... | 3 | ..... | 4 | 2 | ..... | ..... | 85 |
| 7 | ..... | 1 | 34 | 7 | 25 | 33 | 1 | ..... | ..... | ..... | ..... | ..... | 7 | 2 | ..... | ..... | 110 |
| 7¼ | ..... | ..... | 27 | 2 | 11 | 16 | ..... | ..... | ..... | ..... | 1 | ..... | 2 | 3 | ..... | ..... | 62 |
| 7½ | ..... | ..... | 17 | 2 | 18 | 28 | ..... | ..... | ..... | ..... | 1 | ..... | 8 | 2 | ..... | ..... | 76 |
| 7¾ | ..... | ..... | 8 | 1 | 10 | 14 | ..... | ..... | ..... | ..... | 1 | ..... | 7 | 1 | 1 | ..... | 43 |
| 8 | ..... | ..... | 11 | ..... | 19 | 14 | ..... | ..... | ..... | ..... | ..... | ..... | 6 | 1 | ..... | ..... | 51 |
| 8¼ | ..... | ..... | 4 | ..... | 7 | 7 | ..... | ..... | ..... | ..... | ..... | ..... | 6 | ..... | ..... | ..... | 24 |
| 8½ | ..... | ..... | 2 | ..... | 11 | 10 | ..... | ..... | ..... | ..... | ..... | ..... | 2 | ..... | ..... | ..... | 25 |
| 8¾ | ..... | ..... | 1 | ..... | 9 | 2 | ..... | ..... | ..... | ..... | ..... | ..... | 1 | ..... | ..... | ..... | 13 |
| 9 | ..... | ..... | 1 | ..... | 6 | 2 | ..... | ..... | ..... | ..... | ..... | ..... | 4 | ..... | ..... | ..... | 13 |
| 9¼ | ..... | ..... | ..... | ..... | 6 | 1 | ..... | ..... | ..... | ..... | ..... | ..... | 2 | ..... | ..... | ..... | 9 |
| 9½ | ..... | ..... | ..... | ..... | 7 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 1 | ..... | ..... | ..... | 8 |
| 9¾ | ..... | ..... | ..... | ..... | 2 | 1 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 3 |
| 10 | ..... | ..... | ..... | ..... | 4 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 1 | ..... | ..... | ..... | 5 |
| 10¼ | ..... | ..... | ..... | ..... | 4 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 4 |
| 10½ | ..... | ..... | ..... | ..... | 3 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 3 |
| 10¾ | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 11 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 11¼ | ..... | ..... | ..... | ..... | 1 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 1 |
| 11½ | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 11¾ | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Totals | ..... | 3 | 809 | 742 | 208 | 405 | 1 | ..... | 1 | ..... | 37 | 31 | 71 | 54 | 1 | ..... | 2,363 |
| Av. weights | ..... | 6.7 | 5.6 | 5.0 | 7.5 | 6.4 | 7.1 | ..... | 3.6 | ..... | 5.6 | 5.0 | 7.4 | 6.0 | 7.8 | ..... | 5.8 |

*Table X.—Skeena River Sockeyes, Average Lengths in Inches of Principal Age-groups, 1912 to 1952*

| 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 |
| 1950 | **22.8** | **22.3** | **25.7** | **24.4** | **23.9** | **23.4** | **25.5** | **24.3** |
| 1951 | 22.7 | 22.6 | 25.9 | 24.8 | 23.6 | 22.9 | 26.0 | 24.6 |
| 1952 | 23.3 | 22.6 | 25.8 | 24.7 | 23.2 | 22.8 | 26.1 | 24.6 |

*Table XI.—Skeena River Sockeyes, Average Weights in Pounds of Principal Age-groups, 1914 to 1952*

| 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 |
| 1950 | **4.8** | **4.3** | **7.2** | **5.9** | **5.8** | **5.1** | **6.8** | **5.6** |
| 1951 | 5.1 | 5.0 | 7.6 | 6.5 | 5.6 | 5.0 | 7.6 | 6.4 |
| 1952 | 5.6 | 5.0 | 7.5 | 6.4 | 5.6 | 5.0 | 7.4 | 6.0 |

*Table XII.—Skeena River Sockeyes, Percentages of Males and Females, 1915 to 1952*

| 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 |
| 1950 | **56** | **44** | **40** | **60** | **44** | **56** |
| 1951 | 41 | 59 | 37 | 63 | 39 | 61 |
| 1952 | 52 | 48 | 34 | 66 | 48 | 52 |

*Table XIII.—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 | --- |
| 1950 (142,710 cases) | 13 | 87 | (1) | --- |
| 1951 (102,565 cases) | 38 | 60 | 1 | 1 |
| 1952 (84,298 cases) | 41 | 58 | 1 | (1) |

[1] Age-class represented but less than 0.5 per cent.

*Table XIV.—Rivers Inlet Sockeyes, 1952, Grouped by Age, Sex, Length, and by Their Early History*

| Length in Inches | Number of Individuals | | | | | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | $3_2$ | | $4_2$ | | $5_2$ | | $6_2$ | | $5_3$ | | $6_3$ | | |
| | M. | F. | M. | F. | M. | F. | M. | F. | M. | F. | M. | F. | |
| 16 | 1 | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | 1 |
| 16¼ | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 16½ | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 16¾ | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 17 | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 17¼ | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 17½ | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 17¾ | ----- | ----- | 1 | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | 1 |
| 18 | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 18¼ | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 18½ | ----- | ----- | 1 | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | 1 |
| 18¾ | ----- | ----- | 1 | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | 1 |
| 19 | ----- | ----- | 2 | 1 | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | 3 |
| 19¼ | ----- | ----- | 6 | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | 6 |
| 19½ | ----- | ----- | 6 | 1 | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | 7 |
| 19¾ | ----- | ----- | 13 | 6 | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | 19 |
| 20 | ----- | ----- | 17 | 7 | 1 | ----- | ----- | ----- | ----- | ----- | ----- | ----- | 25 |
| 20¼ | ----- | ----- | 29 | 14 | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | 43 |
| 20½ | ----- | ----- | 32 | 24 | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | 56 |
| 20¾ | ----- | ----- | 36 | 32 | ----- | ----- | ----- | ----- | 2 | 1 | ----- | ----- | 71 |
| 21 | ----- | ----- | 40 | 22 | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | 62 |
| 21¼ | ----- | ----- | 27 | 32 | ----- | 1 | ----- | ----- | ----- | ----- | ----- | ----- | 60 |
| 21½ | ----- | ----- | 20 | 20 | ----- | ----- | ----- | ----- | ----- | 1 | ----- | ----- | 41 |
| 21¾ | ----- | ----- | 14 | 25 | ----- | ----- | ----- | ----- | 1 | ----- | ----- | ----- | 40 |
| 22 | ----- | ----- | 19 | 22 | ----- | 2 | ----- | ----- | ----- | 1 | ----- | ----- | 44 |
| 22¼ | ----- | ----- | 15 | 12 | 4 | 6 | ----- | ----- | 1 | ----- | ----- | ----- | 38 |
| 22½ | ----- | ----- | 13 | 17 | 2 | 2 | ----- | ----- | ----- | 1 | ----- | ----- | 35 |
| 22¾ | ----- | ----- | 6 | 10 | 1 | 8 | ----- | ----- | ----- | ----- | ----- | ----- | 25 |
| 23 | ----- | ----- | 10 | 7 | 5 | 12 | ----- | ----- | ----- | ----- | ----- | ----- | 34 |
| 23¼ | ----- | ----- | 10 | 4 | 3 | 11 | ----- | ----- | ----- | 2 | ----- | ----- | 30 |
| 23½ | ----- | ----- | 13 | 8 | 15 | 26 | ----- | ----- | ----- | 1 | ----- | 1 | 64 |
| 23¾ | ----- | ----- | 11 | 3 | 6 | 36 | ----- | ----- | ----- | 1 | ----- | ----- | 57 |
| 24 | ----- | ----- | 5 | 2 | 6 | 26 | ----- | ----- | 1 | ----- | ----- | ----- | 40 |
| 24¼ | ----- | ----- | 13 | ----- | 14 | 37 | ----- | ----- | ----- | ----- | ----- | ----- | 64 |
| 24½ | ----- | ----- | 2 | ----- | 10 | 46 | ----- | ----- | ----- | ----- | ----- | ----- | 58 |
| 24¾ | ----- | ----- | 5 | ----- | 11 | 49 | ----- | ----- | ----- | ----- | ----- | ----- | 65 |
| 25 | ----- | ----- | 5 | ----- | 7 | 53 | ----- | ----- | ----- | ----- | ----- | 2 | 67 |
| 25¼ | ----- | ----- | 3 | ----- | 9 | 58 | ----- | ----- | 1 | ----- | ----- | ----- | 71 |
| 25½ | ----- | ----- | ----- | ----- | 8 | 57 | ----- | ----- | ----- | ----- | ----- | ----- | 65 |
| 25¾ | ----- | ----- | ----- | ----- | 15 | 51 | ----- | ----- | ----- | ----- | ----- | ----- | 66 |
| 26 | ----- | ----- | ----- | ----- | 22 | 38 | ----- | ----- | ----- | ----- | ----- | ----- | 60 |
| 26¼ | ----- | ----- | ----- | ----- | 30 | 31 | ----- | ----- | ----- | ----- | ----- | ----- | 61 |
| 26½ | ----- | ----- | ----- | ----- | 19 | 18 | ----- | ----- | ----- | ----- | ----- | ----- | 37 |
| 26¾ | ----- | ----- | ----- | ----- | 21 | 13 | ----- | ----- | ----- | ----- | ----- | ----- | 34 |
| 27 | ----- | ----- | ----- | ----- | 24 | 5 | ----- | ----- | ----- | ----- | ----- | ----- | 29 |
| 27¼ | ----- | ----- | ----- | ----- | 26 | 5 | ----- | ----- | ----- | ----- | ----- | ----- | 31 |
| 27½ | ----- | ----- | ----- | ----- | 13 | ----- | ----- | 1 | ----- | ----- | ----- | ----- | 14 |
| 27¾ | ----- | ----- | ----- | ----- | 13 | 2 | ----- | ----- | ----- | ----- | ----- | ----- | 15 |
| 28 | ----- | ----- | ----- | ----- | 11 | ----- | ----- | ----- | ----- | ----- | ----- | ----- | 11 |
| 28¼ | ----- | ----- | ----- | ----- | 5 | 1 | ----- | ----- | ----- | ----- | ----- | ----- | 6 |
| 28½ | ----- | ----- | ----- | ----- | 4 | ----- | ----- | ----- | ----- | ----- | ----- | ----- | 4 |
| 28¾ | ----- | ----- | ----- | ----- | 2 | ----- | ----- | ----- | ----- | ----- | ----- | ----- | 2 |
| 29 | ----- | ----- | ----- | ----- | 2 | ----- | ----- | ----- | ----- | ----- | ----- | ----- | 2 |
| 29¼ | ----- | ----- | ----- | ----- | 2 | ----- | ----- | ----- | ----- | ----- | ----- | ----- | 2 |
| Totals | 1 | ----- | 375 | 269 | 311 | 594 | ----- | 1 | 6 | 8 | ----- | 3 | 1,568 |
| Average lengths | 16.0 | ----- | 21.5 | 21.5 | 26.0 | 25.0 | ----- | 27.5 | 22.5 | 22.6 | ----- | 24.5 | 23.7 |

*Table XV.—Rivers Inlet Sockeyes, 1952, Grouped by Age, Sex, Weight, and by Their Early History*

| Weight in Pounds | Number of Individuals | | | | | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | $3_2$ | | $4_2$ | | $5_2$ | | $6_2$ | | $5_3$ | | $6_3$ | | |
| | M. | F. | M. | F. | M. | F. | M. | F. | M. | F. | M. | F. | |
| 2 | 1 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 1 |
| 2¼ | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 2½ | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 2¾ | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 3 | ..... | ..... | 2 | 1 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 3 |
| 3¼ | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 3½ | ..... | ..... | 11 | 7 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 18 |
| 3¾ | ..... | ..... | 27 | 10 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 37 |
| 4 | ..... | ..... | 49 | 34 | ..... | 1 | ..... | ..... | 1 | 1 | ..... | ..... | 86 |
| 4¼ | ..... | ..... | 41 | 43 | ..... | 1 | ..... | ..... | 1 | ..... | ..... | ..... | 86 |
| 4½ | ..... | ..... | 63 | 54 | 3 | 1 | ..... | ..... | ..... | 2 | ..... | ..... | 123 |
| 4¾ | ..... | ..... | 34 | 26 | ..... | 3 | ..... | ..... | ..... | 1 | ..... | ..... | 64 |
| 5 | ..... | ..... | 29 | 38 | 3 | 8 | ..... | ..... | 1 | 1 | ..... | ..... | 80 |
| 5¼ | ..... | ..... | 15 | 18 | 1 | 9 | ..... | ..... | ..... | ..... | ..... | ..... | 43 |
| 5½ | ..... | ..... | 23 | 10 | 5 | 19 | ..... | ..... | 1 | 1 | ..... | ..... | 59 |
| 5¾ | ..... | ..... | 12 | 6 | 3 | 9 | ..... | ..... | ..... | 2 | ..... | ..... | 32 |
| 6 | ..... | ..... | 12 | 14 | 8 | 28 | ..... | ..... | 1 | ..... | ..... | ..... | 63 |
| 6¼ | ..... | ..... | 9 | 6 | 8 | 22 | ..... | ..... | ..... | ..... | ..... | 1 | 46 |
| 6½ | ..... | ..... | 19 | 1 | 10 | 50 | ..... | ..... | ..... | ..... | ..... | ..... | 80 |
| 6¾ | ..... | ..... | 5 | 1 | 9 | 27 | ..... | ..... | ..... | ..... | ..... | ..... | 42 |
| 7 | ..... | ..... | 6 | ..... | 17 | 51 | ..... | ..... | 1 | ..... | ..... | 1 | 76 |
| 7¼ | ..... | ..... | 4 | ..... | 8 | 48 | ..... | ..... | ..... | ..... | ..... | ..... | 60 |
| 7½ | ..... | ..... | 10 | ..... | 10 | 55 | ..... | ..... | ..... | ..... | ..... | 1 | 76 |
| 7¾ | ..... | ..... | ..... | ..... | 6 | 44 | ..... | ..... | ..... | ..... | ..... | ..... | 50 |
| 8 | ..... | ..... | 3 | ..... | 13 | 54 | ..... | ..... | ..... | ..... | ..... | ..... | 70 |
| 8¼ | ..... | ..... | 1 | ..... | 11 | 30 | ..... | ..... | ..... | ..... | ..... | ..... | 42 |
| 8½ | ..... | ..... | ..... | ..... | 22 | 46 | ..... | ..... | ..... | ..... | ..... | ..... | 68 |
| 8¾ | ..... | ..... | ..... | ..... | 19 | 23 | ..... | ..... | ..... | ..... | ..... | ..... | 42 |
| 9 | ..... | ..... | ..... | ..... | 21 | 31 | ..... | ..... | ..... | ..... | ..... | ..... | 52 |
| 9¼ | ..... | ..... | ..... | ..... | 16 | 12 | ..... | ..... | ..... | ..... | ..... | ..... | 28 |
| 9½ | ..... | ..... | ..... | ..... | 24 | 11 | ..... | ..... | ..... | ..... | ..... | ..... | 35 |
| 9¾ | ..... | ..... | ..... | ..... | 10 | 3 | ..... | ..... | ..... | ..... | ..... | ..... | 13 |
| 10 | ..... | ..... | ..... | ..... | 23 | 6 | ..... | ..... | ..... | ..... | ..... | ..... | 29 |
| 10¼ | ..... | ..... | ..... | ..... | 10 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 10 |
| 10½ | ..... | ..... | ..... | ..... | 10 | 1 | ..... | 1 | ..... | ..... | ..... | ..... | 12 |
| 10¾ | ..... | ..... | ..... | ..... | 7 | 1 | ..... | ..... | ..... | ..... | ..... | ..... | 8 |
| 11 | ..... | ..... | ..... | ..... | 12 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 12 |
| 11¼ | ..... | ..... | ..... | ..... | 5 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 5 |
| 11½ | ..... | ..... | ..... | ..... | 10 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 10 |
| 11¾ | ..... | ..... | ..... | ..... | 2 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 2 |
| 12 | ..... | ..... | ..... | ..... | 3 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 3 |
| 12¼ | ..... | ..... | ..... | ..... | 1 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 1 |
| 12½ | ..... | ..... | ..... | ..... | 1 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 1 |
| Totals | 1 | ..... | 375 | 269 | 311 | 594 | ..... | 1 | 6 | 8 | ..... | 3 | 1,568 |
| Average weights | 2.0 | ..... | 4.9 | 4.7 | 8.8 | 7.4 | ..... | 10.6 | 5.3 | 5.0 | ..... | 7.0 | 6.6 |

*Table XVI.—Rivers Inlet Sockeyes, Average Lengths in Inches of the $4_2$ and $5_2$ Groups, 1912 to 1952*

| 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 |
| 1950 | 21.1 | 20.8 | 25.2 | 24.2 |
| 1951 | 21.9 | 21.9 | 25.8 | 24.8 |
| 1952 | 21.5 | 21.5 | 26.0 | 25.0 |

*Table XVII.—Rivers Inlet Sockeyes, Average Weights in Pounds of the $4_2$ and $5_2$ Groups, 1914 to 1952*

| 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 |
| 1950 | 4.2 | 3.9 | 7.5 | 6.4 |
| 1951 | 5.2 | 5.0 | 8.6 | 7.4 |
| 1952 | 4.9 | 4.7 | 8.7 | 7.4 |

*Table XVIII.—Rivers Inlet Sockeyes, Percentages of Males and Females, 1915 to 1952*

| 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 |
| 1950 | 50 | 50 | 75 | 25 | 36 | 64 | 41 | 59 |
| 1951 | ---- | ---- | 66 | 34 | 30 | 70 | 44 | 56 |
| 1952 | ---- | ---- | 58 | 42 | 34 | 66 | 44 | 56 |

*Table XIX.—Smith Inlet Sockeyes, Percentages of Age-groups in Runs of Successive Years and Packs*

| Year | Percentage of Individuals | | | | |
|---|---|---|---|---|---|
| | $4_1$ | $4_2$ | $5_2$ | $6_2$ | $5_3$ |
| 1925 (33,764 cases) | --- | --- | --- | --- | --- |
| 1926 (17,921 cases) | --- | --- | --- | --- | --- |
| 1927 (22,682 cases) | --- | --- | --- | --- | --- |
| 1928 (33,442 cases) | --- | --- | --- | --- | --- |
| 1929 (9,683 cases) | --- | --- | --- | --- | --- |
| 1930 (32,057 cases) | --- | --- | --- | --- | --- |
| 1931 (12,867 cases) | --- | --- | --- | --- | --- |
| 1932 (25,488 cases) | --- | --- | --- | --- | --- |
| 1933 (37,369 cases) | --- | --- | --- | --- | --- |
| 1934 (14,607 cases) | --- | --- | --- | --- | --- |
| 1935 (31,648 cases) | --- | --- | --- | --- | --- |
| 1936 (12,788 cases) | --- | --- | --- | --- | --- |
| 1937 (25,258 cases) | --- | --- | --- | --- | --- |
| 1938 (33,894 cases) | --- | --- | --- | --- | --- |
| 1939 (17,833 cases) | --- | --- | --- | --- | --- |
| 1940 (25,947 cases) | --- | --- | --- | --- | --- |
| 1941 (21,495 cases) | --- | --- | --- | --- | --- |
| 1942 (15,939 cases) | --- | --- | --- | --- | --- |
| 1943 (15,010 cases) | --- | --- | --- | --- | --- |
| 1944 (3,165 cases) | --- | --- | --- | --- | --- |
| 1945 (15,014 cases) | --- | 50 | 50 | --- | --- |
| 1946 (14,318 cases) | --- | 11 | 89 | --- | --- |
| 1947 (36,800 cases) | --- | 5 | 95 | --- | --- |
| 1948 (10,456 cases) | --- | 7 | 90 | 3 | --- |
| 1949 (13,189 cases) | 2 | 92 | 5 | --- | (1) |
| 1950 (42,435 cases) | --- | 17 | 83 | --- | (1) |
| 1951 (49,473 cases) | --- | 22 | 77 | (1) | (1) |
| 1952 (34,834 cases) | --- | 8 | 91 | (1) | 1 |

[1] This age-class was represented by less than 0.5 per cent of the number of fish in the sample.

*Table XX.—Smith Inlet Sockeyes, 1952, Grouped by Age, Sex, Length, and by Their Early History*

| Length in Inches | Number of Individuals | | | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | $3_2$ | | $4_2$ | | $5_2$ | | $6_2$ | | $5_3$ | | |
| | M. | F. | M. | F. | M. | F. | M. | F. | M. | F. | |
| 16 | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- |
| 16¼ | 1 | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | 1 |
| 16½ | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- |
| 16¾ | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- |
| 17 | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- |
| 17¼ | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- |
| 17½ | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- |
| 17¾ | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- |
| 18 | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- |
| 18¼ | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- |
| 18½ | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- |
| 18¾ | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- |
| 19 | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- |
| 19¼ | ---- | ---- | 1 | ---- | ---- | ---- | ---- | ---- | ---- | ---- | 1 |
| 19½ | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- |
| 19¾ | ---- | ---- | 1 | ---- | ---- | ---- | ---- | ---- | ---- | ---- | 1 |
| 20 | ---- | ---- | 1 | ---- | 1 | ---- | ---- | ---- | ---- | ---- | 2 |
| 20¼ | ---- | ---- | 1 | 1 | ---- | ---- | ---- | ---- | 1 | ---- | 3 |
| 20½ | ---- | ---- | 3 | ---- | ---- | ---- | ---- | ---- | ---- | ---- | 3 |
| 20¾ | ---- | ---- | 4 | 1 | ---- | ---- | ---- | ---- | ---- | ---- | 5 |
| 21 | ---- | ---- | ---- | 1 | ---- | ---- | ---- | ---- | ---- | ---- | 1 |
| 21¼ | ---- | ---- | 6 | 1 | ---- | ---- | ---- | ---- | ---- | ---- | 7 |
| 21½ | ---- | ---- | 1 | 2 | ---- | ---- | ---- | ---- | 1 | ---- | 4 |
| 21¾ | ---- | ---- | 1 | 1 | ---- | ---- | ---- | ---- | ---- | ---- | 2 |
| 22 | ---- | ---- | 5 | 3 | ---- | ---- | ---- | ---- | ---- | ---- | 8 |
| 22¼ | ---- | ---- | 2 | 4 | ---- | ---- | ---- | ---- | ---- | 2 | 8 |
| 22½ | ---- | ---- | 3 | 3 | ---- | 1 | ---- | ---- | ---- | ---- | 7 |
| 22¾ | ---- | ---- | 1 | 19 | ---- | 5 | ---- | ---- | 1 | ---- | 8 |
| 23 | ---- | ---- | 2 | 3 | 1 | 5 | ---- | ---- | ---- | ---- | 11 |
| 23¼ | ---- | ---- | 3 | 4 | ---- | 8 | ---- | ---- | ---- | ---- | 15 |
| 23½ | ---- | ---- | ---- | 1 | 2 | 13 | ---- | ---- | ---- | ---- | 16 |
| 23¾ | ---- | ---- | 1 | 2 | ---- | 16 | ---- | ---- | ---- | ---- | 19 |
| 24 | ---- | ---- | ---- | ---- | 6 | 29 | ---- | ---- | ---- | ---- | 35 |
| 24¼ | ---- | ---- | ---- | 1 | 10 | 47 | ---- | ---- | ---- | ---- | 58 |
| 24½ | ---- | ---- | ---- | ---- | 17 | 55 | ---- | ---- | ---- | ---- | 72 |
| 24¾ | ---- | ---- | ---- | ---- | 19 | 39 | ---- | 1 | 1 | 1 | 61 |
| 25 | ---- | ---- | 1 | ---- | 27 | 72 | ---- | ---- | 1 | ---- | 101 |
| 25¼ | ---- | ---- | ---- | ---- | 25 | 61 | ---- | ---- | ---- | ---- | 86 |
| 25½ | ---- | ---- | ---- | ---- | 28 | 47 | ---- | 1 | ---- | ---- | 76 |
| 25¾ | ---- | ---- | 1 | ---- | 33 | 34 | ---- | ---- | ---- | ---- | 68 |
| 26 | ---- | ---- | ---- | ---- | 31 | 44 | ---- | ---- | ---- | ---- | 75 |
| 26¼ | ---- | ---- | ---- | ---- | 37 | 10 | ---- | ---- | ---- | ---- | 47 |
| 26½ | ---- | ---- | ---- | ---- | 29 | 8 | ---- | ---- | ---- | ---- | 37 |
| 26¾ | ---- | ---- | ---- | ---- | 16 | 3 | ---- | ---- | ---- | ---- | 19 |
| 27 | ---- | ---- | ---- | ---- | 9 | 4 | ---- | ---- | ---- | ---- | 13 |
| 27¼ | ---- | ---- | ---- | ---- | 9 | ---- | ---- | ---- | ---- | ---- | 9 |
| 27½ | ---- | ---- | ---- | ---- | 3 | ---- | ---- | ---- | ---- | ---- | 3 |
| 27¾ | ---- | ---- | ---- | ---- | 2 | ---- | ---- | ---- | ---- | ---- | 2 |
| 28 | ---- | ---- | ---- | ---- | 2 | ---- | ---- | ---- | ---- | ---- | 2 |
| 28¼ | ---- | ---- | ---- | ---- | 1 | ---- | ---- | ---- | ---- | ---- | 1 |
| Totals | 1 | ---- | 38 | 29 | 308 | 501 | ---- | 2 | 5 | 3 | 887 |
| Average lengths | 16.3 | ---- | 21.8 | 22.4 | 25.7 | 24.9 | ---- | 25.1 | 22.9 | 23.1 | 25.0 |

*Table XXI.—Smith Inlet Sockeyes, 1952, Grouped by Age, Sex, Weight, and by Their Early History*

| Weight in Pounds | Number of Individuals | | | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | $3_2$ | | $4_2$ | | $5_2$ | | $6_2$ | | $5_3$ | | |
| | M. | F. | M. | F. | M. | F. | M. | F. | M. | F. | |
| 2 | 1 | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | 1 |
| 2¼ | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- |
| 2½ | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- |
| 2¾ | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- |
| 3 | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- |
| 3¼ | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- |
| 3½ | ---- | ---- | 2 | ---- | ---- | ---- | ---- | ---- | ---- | ---- | 2 |
| 3¾ | ---- | ---- | 1 | ---- | ---- | ---- | ---- | ---- | ---- | ---- | 1 |
| 4 | ---- | ---- | 7 | 1 | 1 | ---- | ---- | ---- | 1 | ---- | 10 |
| 4¼ | ---- | ---- | 1 | 2 | ---- | ---- | ---- | ---- | ---- | ---- | 3 |
| 4½ | ---- | ---- | 7 | 5 | 1 | 3 | ---- | ---- | ---- | 1 | 17 |
| 4¾ | ---- | ---- | 4 | 1 | ---- | ---- | ---- | ---- | 1 | ---- | 6 |
| 5 | ---- | ---- | 7 | 7 | ---- | 10 | ---- | ---- | 1 | 1 | 26 |
| 5¼ | ---- | ---- | 1 | 1 | ---- | 2 | ---- | ---- | ---- | ---- | 4 |
| 5½ | ---- | ---- | 2 | 6 | 2 | 19 | ---- | ---- | ---- | ---- | 29 |
| 5¾ | ---- | ---- | 1 | 2 | ---- | 1 | ---- | ---- | ---- | ---- | 4 |
| 6 | ---- | ---- | 2 | 3 | 10 | 55 | ---- | 1 | ---- | ---- | 71 |
| 6¼ | ---- | ---- | 1 | ---- | ---- | 4 | ---- | ---- | ---- | ---- | 5 |
| 6½ | ---- | ---- | ---- | 1 | 20 | 69 | ---- | ---- | ---- | ---- | 90 |
| 6¾ | ---- | ---- | ---- | ---- | 2 | 6 | ---- | ---- | 1 | 1 | 10 |
| 7 | ---- | ---- | ---- | ---- | 44 | 102 | ---- | ---- | ---- | ---- | 146 |
| 7¼ | ---- | ---- | 1 | ---- | 3 | 19 | ---- | ---- | ---- | ---- | 23 |
| 7½ | ---- | ---- | 1 | ---- | 35 | 75 | ---- | ---- | ---- | ---- | 111 |
| 7¾ | ---- | ---- | ---- | ---- | 6 | 10 | ---- | ---- | ---- | ---- | 16 |
| 8 | ---- | ---- | ---- | ---- | 56 | 67 | ---- | ---- | ---- | ---- | 123 |
| 8¼ | ---- | ---- | ---- | ---- | 7 | 14 | ---- | ---- | 1 | ---- | 22 |
| 8½ | ---- | ---- | ---- | ---- | 48 | 20 | ---- | 1 | ---- | ---- | 69 |
| 8¾ | ---- | ---- | ---- | ---- | 3 | 3 | ---- | ---- | ---- | ---- | 6 |
| 9 | ---- | ---- | ---- | ---- | 34 | 15 | ---- | ---- | ---- | ---- | 49 |
| 9¼ | ---- | ---- | ---- | ---- | 3 | 3 | ---- | ---- | ---- | ---- | 6 |
| 9½ | ---- | ---- | ---- | ---- | 17 | 3 | ---- | ---- | ---- | ---- | 20 |
| 9¾ | ---- | ---- | ---- | ---- | 5 | 1 | ---- | ---- | ---- | ---- | 6 |
| 10 | ---- | ---- | ---- | ---- | 4 | ---- | ---- | ---- | ---- | ---- | 4 |
| 10¼ | ---- | ---- | ---- | ---- | 2 | ---- | ---- | ---- | ---- | ---- | 2 |
| 10½ | ---- | ---- | ---- | ---- | 3 | ---- | ---- | ---- | ---- | ---- | 3 |
| 10¾ | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- |
| 11 | ---- | ---- | ---- | ---- | 1 | ---- | ---- | ---- | ---- | ---- | 1 |
| 11¼ | ---- | ---- | ---- | ---- | 1 | ---- | ---- | ---- | ---- | ---- | 1 |
| Totals | 1 | ---- | 38 | 29 | 308 | 501 | ---- | 2 | 5 | 3 | 887 |
| Average weight | 2.0 | ---- | 4.8 | 5.2 | 8.0 | 7.1 | ---- | 7.3 | 5.7 | 5.4 | 7.2 |

*Table XXII.—Smith Inlet Sockeyes, Average Lengths in Inches of Age-groups, 1945 to 1952*

| Year | $4_1$ | | $4_2$ | | $5_2$ | | $6_2$ | | $5_3$ | |
|---|---|---|---|---|---|---|---|---|---|---|
| | M. | F. | M. | F. | M. | F. | M. | F. | M. | F. |
| 1945 | ---- | ---- | 22.2 | 22.0 | 25.1 | 24.4 | ---- | ---- | ---- | ---- |
| 1946 | ---- | ---- | 21.3 | 22.7 | 24.7 | 24.0 | ---- | ---- | ---- | ---- |
| 1947 | ---- | ---- | 23.2 | 23.4 | 25.2 | 24.3 | ---- | ---- | ---- | ---- |
| 1948 | ---- | ---- | 21.9 | 21.7 | 25.0 | 24.3 | 26.7 | 25.0 | ---- | ---- |
| 1949 | 25.4 | 23.5 | 21.4 | 21.7 | 24.6 | 24.3 | ---- | 25.5 | ---- | ---- |
| 1950 | ---- | ---- | 21.6 | 21.7 | 24.8 | 24.0 | ---- | ---- | 20.5 | ---- |
| 1951 | ---- | ---- | 22.8 | 22.0 | 25.6 | 24.8 | ---- | 25.1 | 23.4 | ---- |
| 1952 | ---- | ---- | 21.8 | 22.4 | 25.7 | 24.9 | ---- | 25.1 | 22.9 | 23.1 |

*Table XXIII.—Smith Inlet Sockeyes, Average Weights in Pounds of Age-groups, 1945 to 1952*

| Year | $4_1$ | | $4_2$ | | $5_2$ | | $6_2$ | | $5_3$ | |
|---|---|---|---|---|---|---|---|---|---|---|
| | M. | F. | M. | F. | M. | F. | M. | F. | M. | F. |
| 1945 | ..... | ..... | 4.9 | 4.7 | 7.1 | 6.5 | ..... | ..... | ..... | ..... |
| 1946 | ..... | ..... | 4.6 | 5.8 | 7.3 | 6.6 | ..... | ..... | ..... | ..... |
| 1947 | ..... | ..... | 5.7 | 5.5 | 6.9 | 6.0 | ..... | ..... | ..... | ..... |
| 1948 | ..... | ..... | 5.1 | 5.4 | 7.6 | 6.9 | 10.3 | 7.5 | ..... | ..... |
| 1949 | 7.9 | 6.1 | 5.0 | 5.1 | 7.2 | 6.7 | ..... | 7.3 | ..... | ..... |
| 1950 | ..... | ..... | 4.9 | 5.0 | 7.4 | 6.6 | ..... | ..... | 4.0 | ..... |
| 1951 | ..... | ..... | 6.0 | 5.2 | 8.2 | 7.3 | ..... | 7.2 | 6.4 | ..... |
| 1952 | ..... | ..... | 4.8 | 5.2 | 8.0 | 7.1 | ..... | 7.3 | 5.7 | 5.4 |

*Table XXIV.—Smith Inlet Sockeyes, Percentages of Males and Females, 1945 to 1952*

| Year | $4_1$ | | $4_2$ | | $5_2$ | | $6_2$ | | $5_3$ | | Per Cent Total Males | Per Cent Total Females |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | M. | F. | M. | F. | M. | F. | M. | F. | M. | F. | | |
| 1945 | ... | ... | 73 | 27 | 49 | 51 | ... | ... | ... | ... | 61 | 39 |
| 1946 | ... | ... | 76 | 24 | 37 | 63 | ... | ... | ... | ... | 41 | 59 |
| 1947 | ... | ... | 38 | 62 | 47 | 53 | ... | ... | ... | ... | 46 | 54 |
| 1948 | ... | ... | 79 | 21 | 42 | 58 | 11 | 89 | ... | ... | 43 | 57 |
| 1949 | 36 | 64 | 80 | 20 | 40 | 60 | ... | 100 | ... | ... | 77 | 23 |
| 1950 | ... | ... | 86 | 14 | 42 | 58 | ... | ... | 100 | ... | 49 | 51 |
| 1951 | ... | ... | 72 | 28 | 41 | 59 | ... | 100 | 100 | ... | 48 | 52 |
| 1952 | ... | ... | 57 | 43 | 38 | 62 | ... | 100 | 63 | 37 | 40 | 60 |

*Table XXV.—Spawning Escapement Length Distribution,[1] Rivers Inlet*

| Length in Inches | Males | Females | Total | Length in Inches | Males | Females | Total |
|---|---|---|---|---|---|---|---|
| 12¼ | 1 | ---- | 1 | 21¾ | 5 | 7 | 12 |
| 12½ | ---- | ---- | ---- | 22 | 3 | 11 | 14 |
| 12¾ | 3 | ---- | 3 | 22¼ | 2 | 5 | 7 |
| 13 | 2 | ---- | 2 | 22½ | 2 | 10 | 12 |
| 13¼ | 4 | ---- | 4 | 22¾ | 1 | 2 | 3 |
| 13½ | 11 | ---- | 11 | 23 | 2 | 7 | 9 |
| 13¾ | 11 | ---- | 11 | 23¼ | ---- | 3 | 3 |
| 14 | 16 | ---- | 16 | 23½ | ---- | 4 | 4 |
| 14¼ | 17 | ---- | 17 | 23¾ | 3 | 2 | 5 |
| 14½ | 13 | ---- | 13 | 24 | 4 | 8 | 12 |
| 14¾ | 11 | ---- | 11 | 24¼ | 5 | 6 | 11 |
| 15 | 4 | ---- | 4 | 24½ | 1 | 5 | 6 |
| 15¼ | 6 | ---- | 6 | 24¾ | 2 | 10 | 12 |
| 15½ | 5 | ---- | 5 | 25 | 2 | 23 | 25 |
| 15¾ | 1 | ---- | 1 | 25¼ | 5 | 15 | 20 |
| 16 | ---- | ---- | ---- | 25½ | 4 | 30 | 34 |
| 16¼ | 1 | ---- | 1 | 25¾ | 1 | 26 | 27 |
| 16½ | 2 | ---- | 2 | 26 | 3 | 39 | 42 |
| 16¾ | ---- | ---- | ---- | 26¼ | 4 | 11 | 15 |
| 17 | ---- | ---- | ---- | 26½ | 3 | 19 | 22 |
| 17¼ | ---- | ---- | ---- | 26¾ | 9 | 7 | 16 |
| 17½ | 3 | ---- | 3 | 27 | 11 | 11 | 22 |
| 17¾ | 2 | ---- | 2 | 27¼ | 17 | 2 | 19 |
| 18 | 3 | ---- | 3 | 27½ | 11 | 6 | 17 |
| 18¼ | ---- | ---- | ---- | 27¾ | 15 | 1 | 16 |
| 18½ | 5 | ---- | 5 | 28 | 25 | 1 | 26 |
| 18¾ | 2 | ---- | 2 | 28¼ | 14 | ---- | 14 |
| 19 | 10 | ---- | 10 | 28½ | 32 | ---- | 32 |
| 19¼ | 16 | ---- | 16 | 28¾ | 18 | ---- | 18 |
| 19½ | 16 | 2 | 18 | 29 | 21 | ---- | 21 |
| 19¾ | 18 | ---- | 18 | 29¼ | 18 | ---- | 18 |
| 20 | 26 | 1 | 27 | 29½ | 11 | ---- | 11 |
| 20¼ | 15 | 5 | 20 | 29¾ | 5 | ---- | 5 |
| 20½ | 18 | 2 | 20 | 30 | 3 | ---- | 3 |
| 20¾ | 7 | 4 | 11 | 30¼ | 3 | ---- | 3 |
| 21 | 14 | 3 | 17 | 30½ | 3 | ---- | 3 |
| 21¼ | 5 | 5 | 10 | | | | |
| 21½ | 3 | 6 | 9 | Totals | 539 | 299 | 838 |

[1] This length is not strictly comparable to that of fish taken in the commercial fishery due to the changes which occur with sexual maturity.

# RESULTS OF INVESTIGATION OF THE HERRING POPULATIONS ON THE WEST COAST AND LOWER EAST COAST OF VANCOUVER ISLAND IN 1952–53, WITH AN ANALYSIS OF FLUCTUATIONS IN POPULATION ABUNDANCE SINCE 1946–47.

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## INTRODUCTION

From 1946–47 to 1951–52 the herring population of the west coast of Vancouver Island was fished without catch quota restrictions, while a fixed quota of 40,000 tons was maintained on the herring population of the lower east coast of Vancouver Island. A fishing-closure date of February 5th was applied to each population. The contrasting catch regulations formed the basis for long-term scientific investigation of the effectiveness of catch quotas in stabilizing herring populations. The investigation is complicated by the existence of natural fluctuations in year-class strength. Effort is concentrated on comparing the extent of these fluctuations and possible changes in abundance caused by virtually unrestricted fishing.

The results of the first six years of investigation have been outlined in an annual series of reports.* Generally high abundance characterized both populations in the first five years. In the sixth year (1951–52), population abundance continued high on the lower east coast, but decreased sharply on the west coast. The reduced west coast abundance was not considered to be caused by the lack of quota restrictions, but rather

* Previous publications in this series are Tester and Stevenson, 1947, 1948; Stevenson, 1950; Stevenson and Lanigan, 1950; Stevenson, Hourston, and Lanigan, 1951; and Stevenson, Hourston, Jackson, and Outram, 1952.

to poor year-class survival and lowered recruitment. Continuation of the investigation appeared necessary to determine whether unrestricted fishing on the west coast would seriously reduce the spawning stock when generally low abundance prevailed.

The opportunity to study the effect of non-quota fishing on the lowered west coast abundance was lost, at least for the present, when the regular reduction fishery did not develop in 1952–53 because of inability of fishing companies and fishermen to agree on prices to be paid for the catch. The curtailed catch also hampered the collection of various data* useful in studying population abundance. Sampling of the west coast winter runs was accomplished through borrowing vessels from the industry; this method of sampling was used to a smaller extent on the lower east coast, since a fishery for salting developed there. Tag-recovery, which depends upon herring being brought into reduction plants, was not possible in the 1952–53 season.

The present, and seventh, report of the series deals with results of investigation of the west coast and lower east coast populations in 1952–53. The data pertaining to changes in population abundance from 1951–52 to 1952–53 are analysed, and a method is developed whereby abundance during each of the seven years of the study is related to catch and spawn deposition.

Research on Pacific herring (*Clupea pallasi*) is carried out at the Pacific Biological Station, Nanaimo, B.C., by the Fisheries Research Board of Canada. In addition to studies on the adult stocks of the two populations discussed in the report, investigation is undertaken on all other major herring populations of British Columbia. Studies are also carried out on survival during early life-history stages; the chief study of the latter investigations concerns the possible relationship between abundance of juvenile (I-year) herring and year-class recruitment.

A map of the Southern British Columbia coast is given in Fig. 1, on which are indicated the statistical areas into which the west coast and lower east coast sub-districts are divided, as well as some of the place-names mentioned in the text and supplementary tables.

## THE 1952–53 FISHERY

Negotiations between fishing companies and the fishermen's union to determine the price to be paid for the 1952–53 catch began on October 21st, and continued until the end of the year, with no settlement being reached. As a result, only a small quantity of herring was caught for reduction purposes in 1952–53, and most of that was taken in a summer seine-fishery on the lower east coast of Vancouver Island. By special arrangements a small fishery developed on the lower east coast during the winter to procure herring for salting and for bait. Only 11,800 tons of herring were taken in British Columbia waters, as compared to 198,000 tons in the previous year. The lower east coast catch totalled 8,085 tons (68 per cent of the British Columbia catch), of which 6,130 tons were processed as salted herring. The west coast fishery amounted to only 20 tons, all of which was caught in Area 24 and used for bait. In the 1951–52 season, 41,000 and 30,000 tons were taken in the lower east coast and west coast sub-districts respectively. Table I shows the amounts of fish caught by different fishing-gear and processed by various methods during the 1952–53 season in each population.

Six seiners and four trawlers took part in the lower east coast fishery. Seining accounted for about 95 per cent of the catch, and the two seiners that fished for the salteries from October 15th to the closure date of February 5th were responsible for over three-quarters of the lower east coast catch. Most of the seining (98 per cent) was carried out in Nanoose Bay and near Dodd Narrows in Area 17A. Fish were sufficiently abundant in these localities to obviate the need of intensive searching elsewhere.

* A detailed analysis of the implications of the absence of a regular herring-fishery in 1952–53 on herring research is given by the senior author in the Pacific Biological Station Circular No. 27. Phases of research in which collection of data was not possible or made more difficult are discussed, as are phases of research in which the reduced fishing will provide new data.

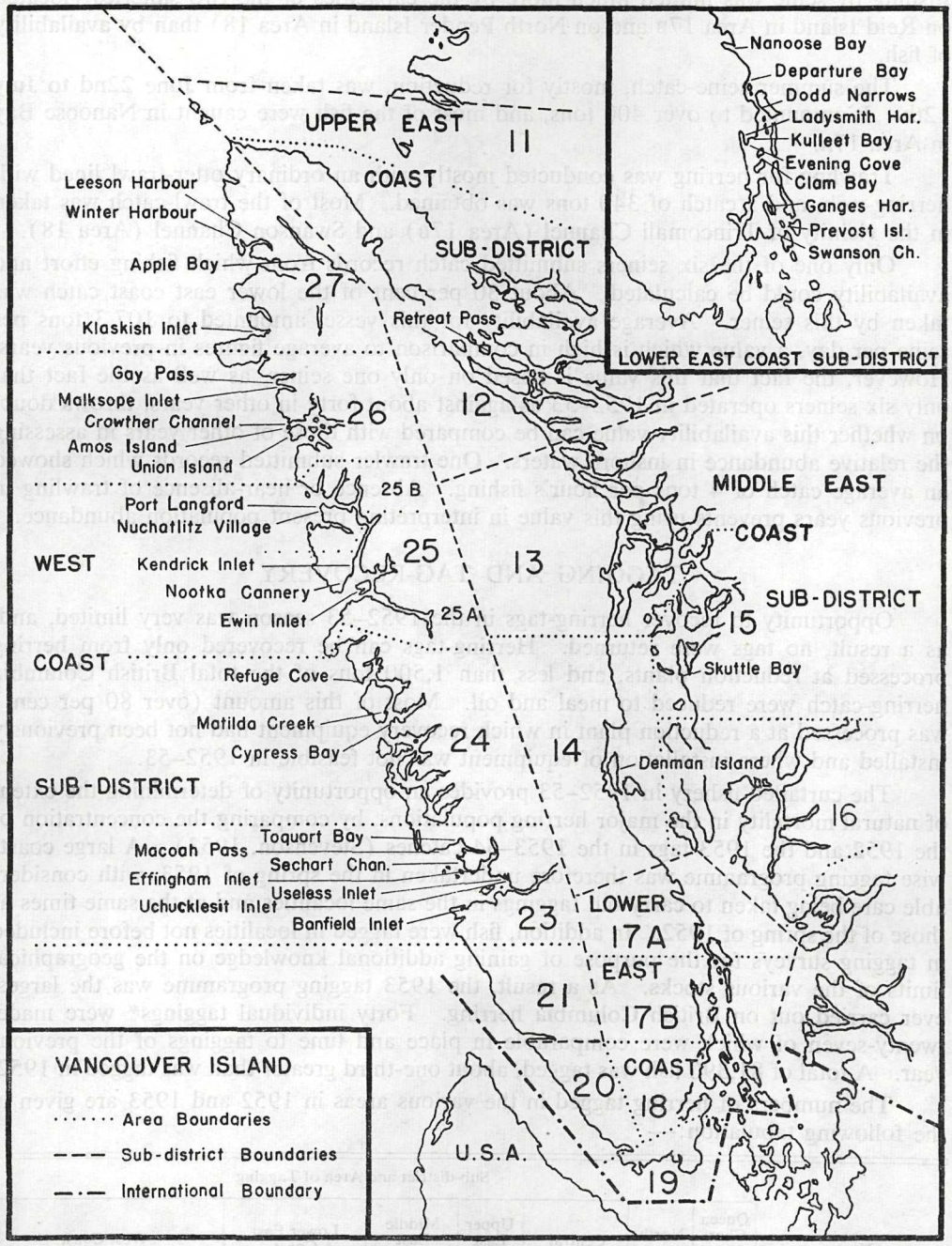


Fig. 1. Map showing the statistical areas into which the sub-districts of the southern British Columbia coast are divided, and including some of the place-names mentioned in the text and supplementary tables.

Fishing by seine was limited much more by the capacities of the two salteries (located on Reid Island in Area 17B and on North Pender Island in Area 18) than by availability of fish.

The summer seine-catch, mostly for reduction, was taken from June 22nd to July 12th. It amounted to over 400 tons, and most of the fish were caught in Nanoose Bay in Area 17A.

Trawling for herring was conducted mostly with an ordinary otter-trawl lined with herring-web, and a catch of 340 tons was obtained. Most of the trawl-catch was taken in the vicinity of Trincomali Channel (Area 17B) and Swanson Channel (Area 18).

Only one of the six seiners submitted catch records from which fishing effort and availability could be calculated. About 30 per cent of the lower east coast catch was taken by this seiner. Average availability for this vessel amounted to 107.3 tons per seine per day, a value which is high in comparison to average figures in previous years. However, the fact that this value is based on only one seiner, as well as the fact that only six seiners operated in 1952–53 as against about forty in other years, throws doubt on whether this availability value can be compared with those of other years in assessing the relative abundance in inshore waters. One trawler submitted records which showed an average catch of 4 tons per hour's fishing. Absence or near-absence of trawling in previous years prevents using this value in interpreting present population abundance.

## TAGGING AND TAG-RECOVERY

Opportunity to recover herring-tags in the 1952–53 season was very limited, and, as a result, no tags were returned. Herring-tags can be recovered only from herring processed at reduction plants, and less than 1,500 tons of the total British Columbia herring-catch were reduced to meal and oil. Most of this amount (over 80 per cent) was processed at a reduction plant in which recovery equipment had not been previously installed and where installation of equipment was not feasible in 1952–53.

The curtailed fishery in 1952–53 provides an opportunity of determining the extent of natural mortality in the major herring populations, by comparing the concentration of the 1952 and the 1953 tags in the 1953–54 catches (Stevenson, 1953). A large coast-wise tagging programme was therefore undertaken in the spring of 1953, with consider-able care being taken to carry out taggings in the same localities and at the same times as those of the spring of 1952. In addition, fish were tagged in localities not before included in tagging surveys for the purpose of gaining additional knowledge on the geographical limits of the various stocks. As a result, the 1953 tagging programme was the largest ever carried out on British Columbia herring. Forty individual taggings* were made, twenty-seven of which were comparable in place and time to taggings of the previous year. A total of 81,390 fish was tagged, about one-third greater than was tagged in 1952.

The numbers of herring tagged in the various areas in 1952 and 1953 are given in the following tabulation:—

| Year | Sub-district and Area of Tagging | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Queen Charlotte Islands | Northern | Central | | Upper East Coast | Middle East Coast | | Lower East Coast | | | West Coast | | | | |
| | 2B(E) | 4 | 6 | 7 | 12 | 14 | 15 | 17A | 17B | 18 | 23 | 24 | 25 | 26 | 27 |
| 1952 | 4,114 | 8,089 | ..... | 8,837 | ..... | 3,013 | ..... | 5,034 | 5,540 | ..... | 10,058 | 5,071 | 8,058 | 3,073 | ..... |
| 1953 | 4,111 | 6,244 | 2,084 | 13,526 | 1,342 | 3,982 | 2,026 | 4,051 | 7,178 | 1,987 | 15,688 | 4,764 | 7,767 | 4,612 | 2,028 |

*A list of all taggings made in 1953, including information on the date and place of each tagging, will be supplied on request (Supplementary Table I).

Three vessels, borrowed from the fishing companies, were used in the tagging surveys. Two vessels commenced operation on the west coast of Vancouver Island in the last week of February, and moved to the central sub-district about the middle of March. One of these vessels later went to the northern sub-district, while the other proceeded to the Queen Charlotte Islands. The third vessel began operations in late February on the lower east coast of Vancouver Island, moving north to the middle and upper east coasts of Vancouver Island and to more southerly parts of the central sub-district. All vessels finished tagging by early April.

## SAMPLING OF WINTER RUNS AND SPAWNING STOCKS

Sampling involves the collection of random samples of herring from the winter and spawning runs, and the determination of age, growth, sex ratio, and sexual development of the fish comprising the samples. A brief outline of the details of the sampling procedure was given in the first report of this series (Tester and Stevenson, 1947).

The collection of herring samples from the west coast of Vancouver Island during the winter of 1952–53 was accomplished through the operation of seine-boats borrowed from the fishing industry. The taking of samples from the commercial catches was not possible on the west coast because of the almost complete absence of a commercial herring-fishery in the 1952–53 season. Although fishing for reduction purposes likewise did not develop along the lower east coast of Vancouver Island, samples of the winter runs were readily provided by the salt-herring fishery which took place in that sub-district. As in previous years, the regular tagging programme in the spring of 1953 permitted sampling of the spawning runs of both populations.

In spite of the sampling difficulties arising from the lack of fishing for reduction purposes, more samples* were taken than in the previous year (184 as compared to 146). Increased sampling of the spawning runs was an important factor in obtaining a greater total number of samples. The distribution of the sampling in the lower east coast and west coast population is indicated in the following tabulation (with comparable data for 1951–52 in parentheses):—

| | Number of Samples | | | |
|---|---|---|---|---|
| | Winter Runs | | Spawning Runs | |
| Lower east coast— | | | | |
| Area 17A | 72 | (37) | 3 | (2) |
| Area 17B | 20 | (0) | 5 | (2) |
| Area 18 | 8 | (42) | 1 | (0) |
| Totals | 100 | (79) | 9 | (4) |
| West coast— | | | | |
| Area 23 | 25 | (16) | 14 | (5) |
| Area 24 | 3 | (1) | 4 | (2) |
| Area 25A | 3 | (0) | 4 | (0) |
| Area 25B | 9 | (37) | 4 | (1) |
| Area 26 | 3 | (0) | 4 | (1) |
| Area 27 | 0 | (0) | 2 | (0) |
| Totals | 43 | (54) | 32 | (9) |
| Grand Total | 143 | (133) | 41 | (13) |

* Lists of all winter and spawning samples taken on the west coast and the lower east coast of Vancouver Island in 1952–53, including places and dates of sampling, numbers of fish of each age and of each sex, and data on maturity, will be supplied on request (Supplementary Tables II and III respectively).

## Age Composition

### *West Coast Population*

The average percentage age composition for the west coast population as derived from samples taken during the winter months is given below for recent seasons. The data were weighted to numbers of fish caught in each statistical area for all seasons except that of 1952–53; for the last season, weighting was according to the number of samples taken in each area.

| Season | In Year of Age | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | I | II | III | IV | V | VI | VII | VIII | IX–XI |
| 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 | 0.0 |
| 1950–51 | + | 9.8 | 35.3 | 44.5 | 8.0 | 1.9 | 0.5 | + | + |
| 1951–52 | + | 2.6 | 36.2 | 23.9 | 31.6 | 4.3 | 1.2 | 0.2 | + |
| 1952–53[1] | 0.1 | 7.3 | 61.7 | 28.5 | 1.8 | 0.5 | 0.1 | 0.0 | 0.0 |

[1] Samples from Area 25A, which were mainly composed of unrecruited II-year fish, were not considered in calculating the average age composition in 1952–53.

In 1952–53 the 1947 year-class failed to comprise a large proportion of the west coast stocks. Its remarkably large contribution to the stocks of the three previous years has marked it as the most abundant year-class of recent years. As III-year fish in 1949–50 it constituted over two-thirds of the catch; as IV-year fish in 1950–51 it formed almost half the catch; and as V-year fish in 1951–52 it made up nearly one-third of the catch. The poor representation of this year-class as VI-year fish in 1952–53 was predicted (Stevenson, Hourston, Jackson, and Outram, 1952), the basis of the prediction being that recruitment to the adult stocks after the fifth year is always relatively small.

The 1948 year-class in 1952–53 provided the smallest percentage of V-year fish ever noted in west coast runs. This fact, together with the poor contribution of the year-class as IV-year fish in the 1951–52 season, points to the relative weakness of the year-class.

The 1949 year-class (IV-year fish in 1952–53), although showing signs of being weak in 1951–52 catches, appears to be of about average abundance on the basis of the current data.

The 1950 year-class (III-year fish) entered west coast catches strongly in 1952–53. The proportion of III-year fish in the runs was greater than in any recent year, except in 1949–50, when the unusually abundant 1947 year-class entered the runs in force. Although the relative abundance of the 1950 year-class is high* in comparison with other year-classes in the 1952–53 runs, and although its relative abundance is also high compared to other year-classes at the same age in previous seasons, information on the absolute population abundance (in terms of numbers of fish) is, of course, essential to determine whether the year-class is large. The lack of fishing in the current season has prohibited the obtaining of the usual catch data, from which an indication of population size could be obtained. However, on the reasonable assumption that west coast abundance was at least as great as in the previous year, it appears that the 1950 year-class is of above average strength.

This indication of the strength of the 1950 year-class differs from that obtained from age-composition data in 1951–52 (Stevenson, Hourston, Jackson, and Outram, 1952). In that season this year-class comprised an unusually small proportion of the fishing stocks (2.6 per cent), a generally reliable indication of low year-class abundance.

* It is possible that the relative abundance of the 1950 year-class in the 1952–53 runs was not determined as accurately by sampling with a single seine-boat, fishing non-commercially, as it would have been if sampling had been carried out on catches from an extensive fishery as in previous years.

A statistically significant correlation has been found (Stevenson, unpublished) between the abundance of II-year fish and the total abundance of the year-class (in all seasons of recruitment) for each west coast year-class from 1939 to 1949 ($r$=0.79; $P$=0.01). (The method of assessing year-class strength is that used by Tester, 1948.)

The relatively large proportion of II's in the 1952–53 winter runs (1951 year-class) appears to indicate that the 1951 year-class will be above average in abundance.

The age composition of the winter runs of herring in the more southerly areas of the west coast (Areas 23 and 24) differed considerably from that of the runs in the more northerly areas (Areas 25B and 26): the 1949 and 1951 year-classes were relatively more prominent in the south than in the north, while the 1950 year-class was more abundant in the north (forming three-quarters of the runs) than in the south (Table II and Fig. 2). The greater strength of the 1949 year-class in the south was indicated in the 1951–52 sampling data (Stevenson, Hourston, Jackson, and Outram, 1952).

The three samples taken in Area 25A (from a single large school) were almost wholly comprised of II-year fish (1951 year-class). The run represented by these samples was presumably composed of herring not yet recruited to the adult stocks.

The age-composition data from the spawning runs (Table II) showed, as did the data from the winter runs, that the 1951 year-class (II-year fish) was more abundant in the southern areas than in the northern areas. The spawning samples also suggested that runs of older fish were not sampled during the winter. The once abundant 1947 year-class comprised a percentage of the winter runs that is usual for VI-year fish, but the proportion of the spawning runs that belong to this year-class (particularly in Area 25) was much higher than has ever been found for VI-year fish. It is presumed that these runs of older fish were missed in the winter sampling either because of the restricted opportunity for sampling in 1952–53 or because the runs did not enter inshore waters until just before spawning.

*Lower East Coast Population*

The average percentage age composition of the lower east coast runs in recent years is presented in the following tabulation. Weighting of the age composition is to numbers of samples taken in the various statistical areas; the numbers of samples from the individual areas are roughly proportional to the commercial catches of the respective areas.

| Season | In Year of Age | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | I | II | III | IV | V | VI | VII | VIII | IX |
| 1949–50 | + | 1.5 | 66.7 | 26.9 | 4.1 | 0.6 | 0.1 | + | 0.0 |
| 1950–51 | + | 4.1 | 63.4 | 25.0 | 6.1 | 1.0 | 0.2 | 0.1 | + |
| 1951–52 | + | 6.6 | 57.5 | 27.1 | 7.0 | 1.3 | 0.3 | 0.1 | + |
| 1952–53 | 0.1 | 2.7 | 60.5 | 32.8 | 3.2 | 0.5 | 0.1 | + | 0.0 |

The relative contribution of each age-group in the catch has been remarkably similar in the past four years. Dominance has been held consistently by III-year fish. The same pattern of age distribution has been noted for each statistical area in which lower east coast herring are fished, and also in spawning samples (Table III). The similarity in age composition of the individual area catches on the lower east coast is in contrast to the considerable difference in age composition found in the more northerly and more southerly areas of the west coast of Vancouver Island stocks (Fig. 2). The reason for the general homogeneity of the various lower east coast fishing schools was discussed in the previous report of this series (Stevenson, Hourston, Jackson, and Outram, 1952, p. 66). It was pointed out that a single migration route was used in the passage of lower east coast herring from offshore summer feeding-grounds to inshore fishing areas, and that all runs tended to pass through each of the fishing areas. The west coast population, on the other

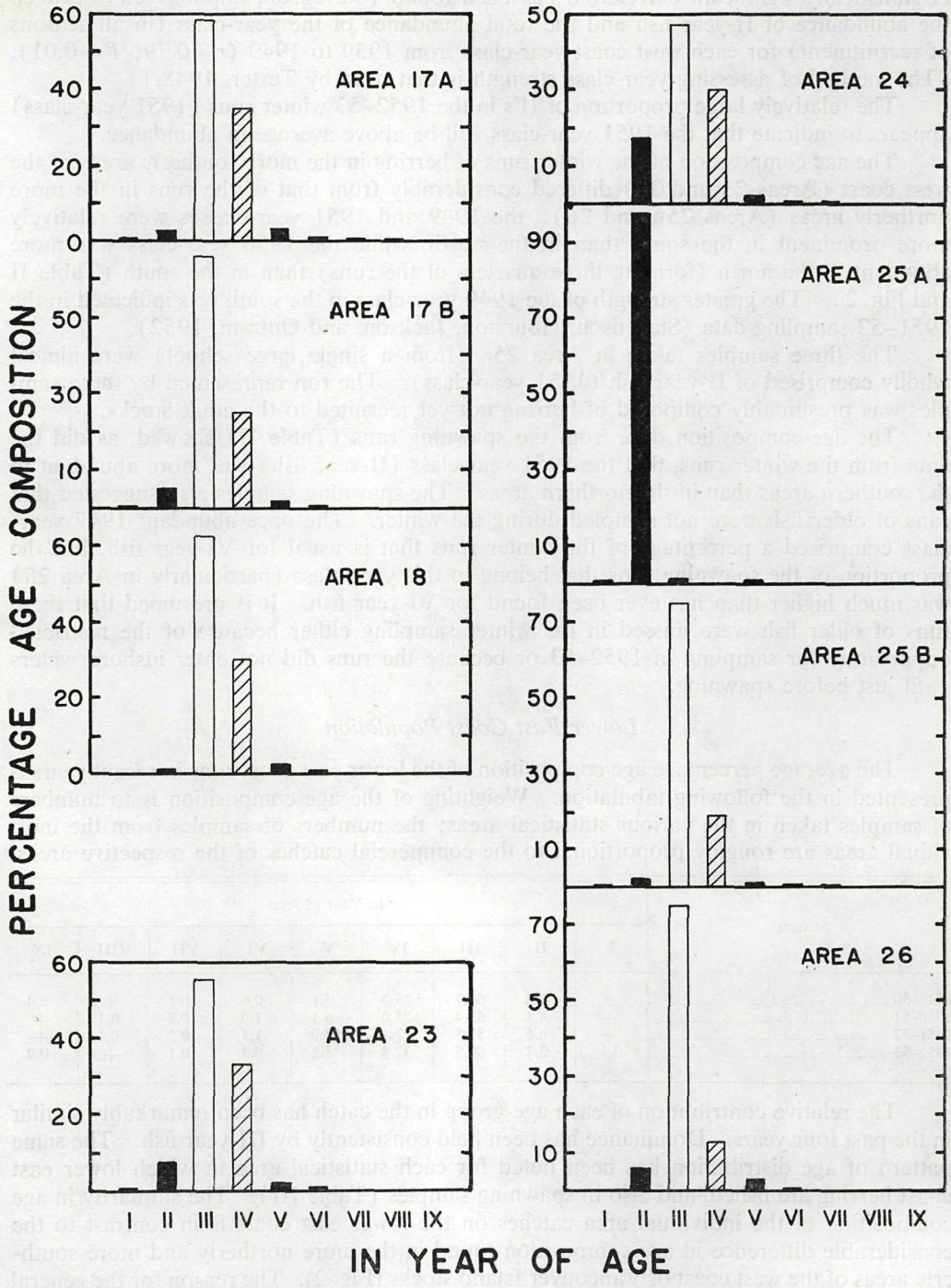


Fig. 2. Diagrams showing the average age composition in 1952-53 of herring in winter runs to the lower east coast of Vancouver Island (Areas 17A, 17B, and 18), and in winter runs to the west coast of Vancouver Island (Areas 23, 24, 25A, 25B, and 26).

hand, enters inshore waters by at least two distinct migration routes, and age-composition differences in these groups of fish presumably reflect a partial segregation of the population on the feeding-grounds.

The uniformity of the age composition of lower east coast stocks in recent years suggests that there is considerably less variation in year-class strength in the lower east coast population than in the west coast population. Information on differences in abundance of lower east coast year-classes can best be derived from catch data and extent of spawning. Catch data are sparse for 1952–53, but spawn deposition in the spring of 1953 shows a pronounced increase over that in 1952 (*see* section of this report on "Extent and Intensity of Spawning"). Although part of the increase in the spawning population was due to the decrease in catch in 1952–53, it appears that population abundance was greater than in the previous year. Hence, the dominant 1950 year-class (III's) is presumably of greater than average abundance.

Fish of Age II were less abundant than in the two preceding seasons. This suggests that the 1951 year-class may not be as strong as the 1950 year-class. However, abundance of II's has not been as reliable an indicator of year-class strength on the lower east coast as on the west coast.

## Sex Ratio and Stage of Development

The sex ratio (number of females divided by number of males) and the sexual development of the herring in samples taken in the 1952–53 winter runs and the 1953 spawning runs are shown by area in Tables IV and V for the west coast and lower east coast populations respectively.

### *West Coast Population*

Generally, males and females have been about equally represented in west coast winter runs, but males have been more numerous than females in spawning runs (Stevenson, Hourston, Jackson, and Outram, 1952). These conditions have been explained mainly by the tendency for females to live longer than males, and on the basis of differences in age composition between winter and spawning runs (the average age of the latter is usually less than that of the former). In 1952–53 the number of females exceeded the number of males in winter samples, largely as a result of the abundance of females in samples from Area 25. Possibly the winter sampling with regard to sex was inadequate in this area. On the other hand, the number of males was more numerous than usual in the spawning samples, especially in Area 25, but also in the more northerly west coast areas generally. This might suggest that males migrated inshore later than the females in the past season. The problem is extremely complex, and the data appear to warrant a detailed analysis in a separate report.

Immature fish were more numerous both in winter and spawning runs than in the previous year. The relatively high proportion of immature fish in the 1952–53 winter runs was largely due to inclusion of the samples from Area 25A, which were taken from unrecruited schools (over 98 per cent of the fish were of Age II). It is not clear why immature fish were so abundant in the spawning runs (2.6 per cent). Previously, immature fish have not accounted for more than 0.8 per cent of the individuals taken in spawning samples.

### *Lower East Coast Population*

The sex ratio of fish in lower east coast winter samples (0.84) was about the same as that in the previous season (0.88). The males in winter samples of this sub-district are generally more abundant than females, while, as mentioned previously, the sexes are usually found in equal numbers in west coast winter runs. The generally younger average age of the lower east coast herring appears to be the reason for the greater representation of males.

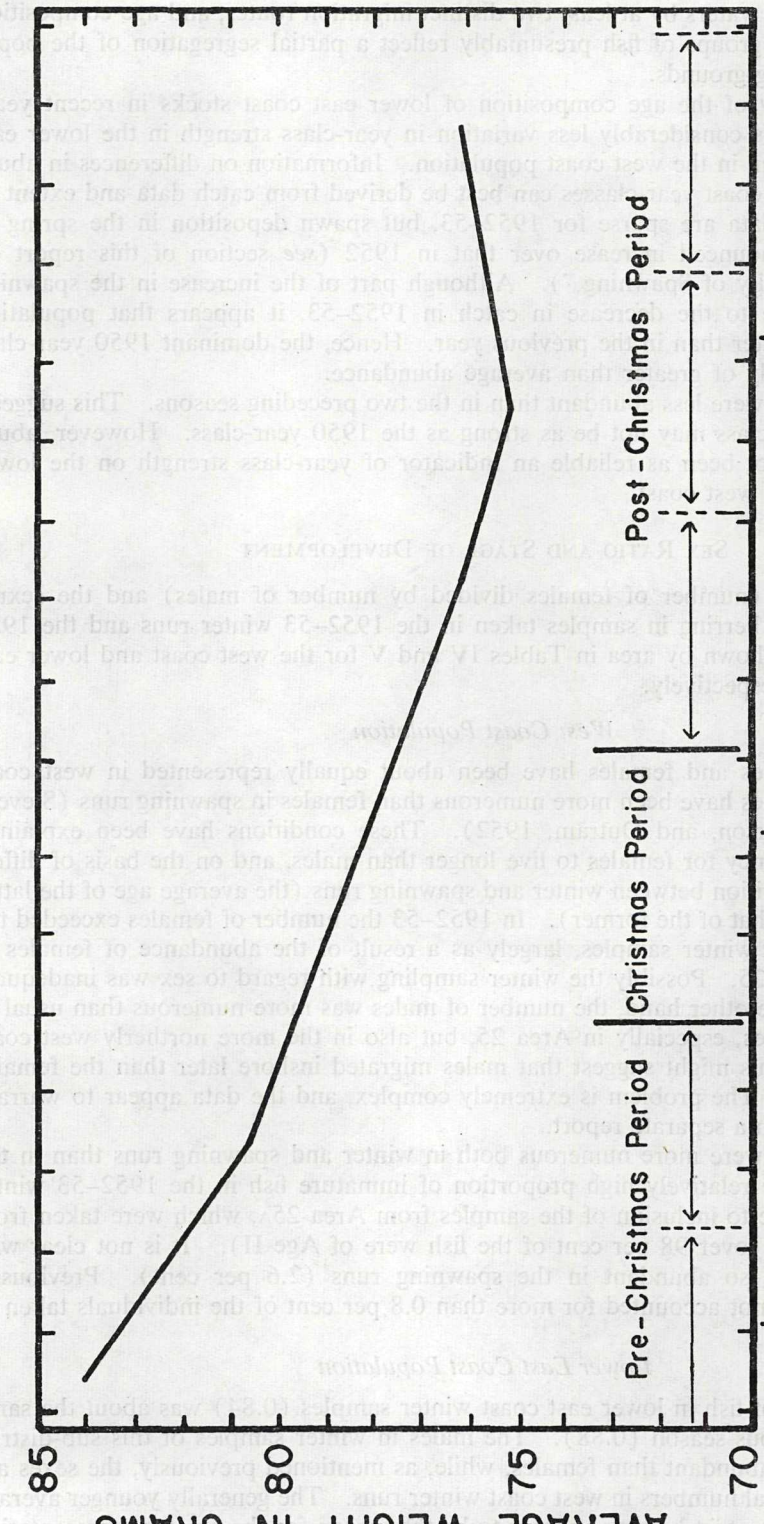


Fig. 3. Average weight of III-year herring in the 1952–53 lower east coast fishery; average weight is calculated for two pre-Christmas and three post-Christmas periods of the fishery.

Immature fish were less abundant on the lower east coast than in the 1951–52 season (Table V). This would be expected in view of the decreased abundance of II-year fish in 1952–53 as compared to the previous year.

The sampling of lower east coast spawning runs in 1952–53 was not sufficiently intensive to permit detailed analysis of sex ratio and development.

## Average Length and Weight

Changes in average length and weight from year to year give information on possible differences which exist in environmental conditions (food-supply, temperature, etc.) which influence growth. The average lengths and weights of west coast herring in the 1952–53 winter runs are shown in Table VI, and average lengths of herring in the 1953 spawning runs are given in Table VII. Comparable data for the lower east coast fish are shown in Tables VIII and IX respectively.

In winter runs the average length of fish, at each age, was similar in each of the lower east coast areas, but the average weight of Area 18 fish was greater than that of either Area 17A or Area 17B fish. Fishing in Area 18 took place earlier in the season than fishing in the other two areas. The former fishery was finished by early December, while the latter fisheries continued into February. The growth data, therefore, show the loss in weight which the herring undergo during the winter, when feeding does not normally take place (Fig. 3).

The average length of spawning fish in Area 17B was appreciably greater at each age above II than that of spawning fish from Area 17A or Area 18, or than that of winter runs of any of the three areas. No explanation for this can be offered.

No significant differences were found in average length or in average weight of each age-group of winter-run fish in Areas 23, 24, 25B, and 26. However, herring taken in winter samples from Area 25A, mostly II-year fish, showed a significantly smaller size. Fish of Age II from Area 25A averaged 144 millimetres in length and 35 grams in weight, while fish of this age from other areas averaged 162 millimetres and 51 grams respectively. It appears that the Area 25A herring schools sampled were composed of fish that had not been recruited to the adult stocks. Presumably recruited II-year fish are exposed to better feeding conditions than unrecruited II's. Although the time when recruitment of II-year fish occurs is not known with certainty, it appears that it takes place sufficiently early in the summer to enable the new recruits to feed for part of the summer with the adults on offshore feeding-grounds. The unrecruited II's presumably feed in inshore localities, which are less productive in herring-food organisms. Another possibility, however, is that only the faster-growing II-year fish become recruited.

No explanation can be given to explain the generally great average size of each age-group in spawning runs of the more northerly west coast areas (Areas 25A, 25B, 26, and 27). The average lengths were similar to those found in the Area 17B spawning runs. The latter run, as mentioned earlier, contained fish that were large in comparison to the spawning runs of other lower east coast areas.

The average lengths and weights of herring in each population are given below for the major age-groups in the winter runs of recent years:—

| Year | Lower East Coast Population | | | | | West Coast Population | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | II | III | IV | V | VI | II | III | IV | V | VI |
| Length in millimetres— | | | | | | | | | | |
| 1949–50 | 153 | 188 | 200 | 211 | 211 | 164 | 190 | 202 | 212 | 220 |
| 1950–51 | 153 | 188 | 200 | 211 | 220 | 158 | 188 | 204 | 215 | 220 |
| 1951–52 | 151 | 185 | 198 | 209 | 217 | 159 | 187 | 205 | 217 | 226 |
| 1952–53[1] | 156 | 184 | 196 | 209 | 214 | 162 | 185 | 198 | 209 | 222 |
| Weight in grams— | | | | | | | | | | |
| 1949–50 | 45 | 91 | 111 | 131 | 148 | 56 | 94 | 117 | 137 | 152 |
| 1950–51 | 42 | 91 | 113 | 137 | 150 | 50 | 88 | 114 | 135 | 149 |
| 1951–52 | 46 | 91 | 114 | 139 | 158 | 53 | 90 | 114 | 139 | 157 |
| 1952–53[1] | 45 | 77 | 94 | 119 | 135 | 51 | 80 | 100 | 119 | 149 |

[1] In compiling the 1952–53 length and weight data for the west coast population, the Area 25A samples, composed almost entirely of slow-growing and apparently unrecruited II-year fish, were not included.

A striking reduction in average weight occurred in the 1952–53 winter runs of herring in both the lower east coast and west coast populations. All age-groups except II-year fish showed weight decreases, which varied from 14 to 18 per cent on the lower east coast and from 5 to 14 per cent on the west coast. Reasons to explain this decrease are obscure. The lack of a regular fishery in the winter of 1952–53 resulted in greatly increased spawning stocks in the spring of 1953, and it may be expected that growth during the summer of 1953 may be reduced because of competition for available food, but this would not account for the decreased growth that obviously occurred in 1952. The most likely possibility appears to be that the amount of suitable food organisms on the feeding-grounds in the summer of 1952 was unusually low. No direct evidence on this point is available.

The fact that the II-year fish (1951 year-class) maintained their usual weight suggests that they were not exposed to the poor feeding conditions. As pointed out previously, precise data on time of recruitment of II-year fish are lacking, but an inference may be made that a period of unfavourable feeding conditions commenced immediately after spawning in early spring and ended before the recruitment of II-year fish began.

No appreciable difference exists in the average lengths of lower east coast fish in 1952–53 and in the previous season. A decrease in average length of west coast fish of Age III and over is apparent, but the decrease is considerably less marked than that shown by average weight data.

## EXTENT AND INTENSITY OF SPAWNING

The amount of herring-spawn deposited in the west coast and lower east coast sub-districts was estimated again in the spring of 1953.* As in the past years, two independent surveys of spawn depositions were carried out on the west coast—one by members of the herring-investigation staff and the other by fisheries officers. A single survey was undertaken in the lower east coast sub-district by fisheries officers. Methods used in the surveys were similar to those of previous years (Tester and Stevenson, 1948).

### West Coast Population

The extent of spawn deposition on the west coast of Vancouver Island in the spring of 1953 was the greatest ever recorded. It was 80 per cent greater than in the previous year. Each statistical area showed increased spawn deposition over the previous year, and Areas 23 and 24 had the greatest spawn depositions of the past seven years. The smallest increase in spawn deposition in relation to the previous year's spawning was in Area 25, the area which showed a phenomenal increase in population abundance in 1950–51 and which since then has maintained high abundance through heavy recruitment and low exploitation (Stevenson, Hourston, Jackson, and Outram, 1952, p. 76).

A summary of the extent of west coast spawn depositions in the past seven years is given by statistical areas in the following tabulation, with intensity of spawn deposition in parentheses. Extent of spawn deposition is in statutory miles, and average intensity of spawn deposition is calculated by weighting the intensities of the individual spawnings—very light, light, medium, heavy, and very heavy—in the ratio of 1, 2, 3, 4, and 5 respectively.

* Lists of the individual spawning localities in the west coast and lower east coast sub-districts, with dates, intensities, and extent of spawn depositions, will be supplied on request (Supplementary Tables IV and V).

| Area | 1947 | 1948 | 1949 | 1950 | 1951 | 1952 | 1953 |
|---|---|---|---|---|---|---|---|
| 23 | 13.2 (3.3) | 10.9 (3.0) | 11.7 (3.1) | 13.4 (2.4) | 8.8 (2.9) | 6.2 (2.6) | 14.5 (2.1) |
| 24 | 6.0 (3.6) | 8.4 (3.3) | 4.3 (3.1) | 4.2 (2.8) | 11.4 (1.3) | 5.6 (2.3) | 8.4 (2.6) |
| 25 | 9.3 (3.8) | 12.8 (3.0) | 16.3 (3.5) | 18.2 (3.2) | 28.3 (3.4) | 21.4 (3.7) | 27.4 (3.8) |
| 26 | 2.5 (2.9) | 2.0 (2.8) | 2.2 (3.4) | 3.2 (3.3) | 1.5 (3.4) | 1.4 (2.8) | 4.4 (3.0) |
| 27 | 1.4 (2.7) | 9.7 (2.2) | 6.6 (2.6) | 4.5 (3.0) | 4.9 (3.1) | 1.1 (3.2) | 9.6 (3.6) |
| All areas | 32.4 (3.1) | 43.8 (2.7) | 41.1 (3.2) | 43.5 (2.9) | 54.9 (2.9) | 35.7 (3.3) | 64.3 (3.2) |

The average intensity of west coast spawning did not differ appreciably from that of the previous year. Intensity of deposition showed the greatest decrease in Area 23 and the greatest increase in Area 27. No change in intensity in any area approached in magnitude the pronounced increase noted in Area 24 from 1951 to 1952.

Considering both the extent and intensity data, the 1953 spawning population was the largest of recent years. The lack of a fishery in 1952–53 permitted an unusually great escapement. The abundance of the 1953 year-class in future years will be followed with especial interest. Valuable information should be forthcoming on possible relationships between amount of spawn and the magnitude of the eventual recruitment to the fishable population.

## Lower East Coast Population

The amount of spawn deposited on the lower east coast also reached a record level. Spawning extent showed a phenomenal increase over that of the previous year (82.7 miles, as compared to 31.5 miles in 1952). Increased spawning occurred only in Areas 17A and 17B; the other lower east coast areas, which habitually account for a minor proportion of the spawning, showed reductions in spawn depositions when compared to spawnings of the previous year.

Average intensity of deposition increased markedly in 1953. In only one other year in the past seven years (1950) was spawning intensity as great as in the 1953 season.

In the following tabulation the extent of spawning on the lower east coast is given in statutory miles for each year since 1947; spawning intensities, determined on the same basis as those presented previously for the west coast of Vancouver Island, are shown in parentheses.

| Area | 1947 | 1948 | 1949 | 1950 | 1951 | 1952 | 1953 |
|---|---|---|---|---|---|---|---|
| 17A | 1.5 (2.0) | 5.7 (1.8) | 3.6 (3.7) | 6.6 (4.4) | 12.7 (2.9) | 8.7 (2.7) | 15.5 (3.4) |
| 17B | 6.1 (4.3) | 7.9 (3.2) | 10.8 (3.9) | 7.0 (3.4) | 6.7 (2.6) | 18.0 (3.4) | 63.4 (3.9) |
| 18 | 2.2 (2.2) | 3.7 (2.5) | 6.4 (3.0) | 1.3 (1.7) | 0.6 (1.3) | 4.6 (1.3) | 3.8 (2.0) |
| 19 | 0.1 (2.0) | 0.1 (1.0) | 0.1 (1.0) | 0.2 (1.0) | 0.2 (1.0) | 0.2 (1.0) | + ( ) |
| All areas | 9.9 (3.4) | 17.4 (2.6) | 20.9 (3.5) | 15.1 (3.7) | 20.2 (2.7) | 31.5 (2.9) | 82.7 (3.7) |

The striking increase in spawn deposition in each population poses the problem of determining the extent to which it was caused by the small 1952–53 catch, and the extent to which it may have resulted from increased population abundance. The percentage increase in lower east coast spawning (in relation to the spawning of the previous year) was about twice that of west coast spawning (163 per cent as compared to 80 per cent). The phenomenal increase in spawn deposition on the lower east coast occurred in spite of the fact that an appreciable catch was made in the immediately preceding fishing season (8,085 tons). On the other hand, a smaller increase took place on the west coast, where a negligible commercial catch occurred (about 20 tons). If it were assumed that population abundance was approximately equal in both populations in 1951–52, population abundance must have been considerably greater on the lower east coast in 1952–53 than on the west coast. It is obvious that the confidence that can be placed in this statement depends upon knowledge of fluctuations in abundance in previous years.

In the following section of the report, data pertaining to population abundance in 1952–53 are discussed, and in the section entitled "Catch, Spawn, and Abundance," the general relationship between catch, spawn deposition, and population abundance is analysed, using data accumulated since the beginning of the present detailed investigation of the two populations.

## POPULATION ABUNDANCE IN 1952–53

The seventh year of the comparative study of the herring populations of the west coast and lower east coast of Vancouver Island provided little data on the main purpose of the investigation; namely, to determine the merits of contrasting systems of fisheries management. Inability of fishing companies and fishermen to come to agreement on fishing prices prevented normal operations of the herring-seining fleet. As a result, two basic requirements for the scientific experiment were not met in 1952–53: (1) West coast fishing was not unrestricted—a negligible amount of herring was taken in west coast waters—and (2) the fixed quota of 40,000 tons was not taken on the lower east coast; although it appeared highly likely that there were sufficient fish to enable this to be done, only about 20 per cent of the quota was caught.

The lack of fishing on the west coast population in 1952–53 prevented assessment of the effects of non-quota fishing on lowered population abundance. In 1951–52 the first major reduction in population abundance occurred on the west coast since the beginning of the present intensive study—a decrease apparently not caused through the effect of fishing, but by the relatively poor recruitment of the 1948 and 1949 year-classes (Stevenson, Hourston, Jackson, and Outram, 1952). Results of investigation up to 1951–52 suggested that during periods of generally high population abundance, removal of quota restriction on catch would not decrease the spawning population to a level at which future recruitment was impaired, as long as a closure date prior to spawning is maintained. An important question which remained to be solved concerned the effect of non-quota fishing during a period of low year-class recruitment and, hence, low abundance. Lack of fishing, however, prevented accumulation of data in 1952–53 pertinent to this problem.

A second consequence of the absence of a fishery was the lack of opportunity to obtain catch statistics data comparable to those of previous years, from which assessment of relative population abundance could be made. Interpretation of information on percentage age composition in terms of population abundance requires both catch and spawn data. Also, the previous use of spawn data in the determination of relative population abundance was based on the existence of approximately equal annual catches.

Certain data are available to assist in determining recent changes in the abundance of the two populations, but the conclusions derived from them are less reliable than those of former years. One of the two seiners that fished for a saltery on the lower east coast submitted catch records that showed an average availability of 107 tons per day's fishing. This availability figure is high in comparison with those of previous fishing seasons, but since it was based on records of only one vessel, and since only six vessels participated in the fishing, compared to many times that number in previous years, only limited confidence can be placed in its indication of the abundance of fish. For the first time, trawlers caught an appreciable amount of herring in the lower east coast in 1952–53. Undoubtedly, improvement in gear and the growing experience of trawl captains in fishing for herring were large factors in enabling the taking of over 300 tons of herring by trawl. In addition, the lack of competition with seines was presumably an advantage to the trawlers. However, it is apparent that successful trawling for herring requires appreciable quantities of herring on the fishing-grounds. Considering these sketchy indications of abundance, along with the phenomenal increase in spawn depositions on the lower east coast in the spring of 1953, it appears that the lower east coast stocks were at least as abundant and probably more abundant than in the previous year.

The almost complete absence of fishing on the west coast precludes a direct comparison of abundance in that population in 1952–53 and in the previous year. Spawn deposition increased greatly over that of the preceding year (from 35.7 to 64.3 miles), but the amount of fish taken decreased from 30,000 tons to a negligible 20 tons. The question is whether 30,000 tons of herring are equivalent to an amount of fish represented by the difference (28.6 miles) in spawn deposition (in which case population abundance would be about equal in the two years), whether it is more than equivalent (in which case abundance decreased), or whether it is less than equivalent (in which case abundance increased). The only evidence that can be applied to the problem is given through analysis of the 1949–50 and 1950–51 data (Stevenson, Hourston, and Lanigan, 1951). In those years, population abundance was considered to be about equal. Catch decreased from 1949–50 to 1950–51 by 12,000 tons, while spawning increased 11 miles. On this basis, a decrease in catch of nearly 30,000 tons, such as occurred in 1951–52 and 1952–53, would be balanced by an increase in spawning of 27 miles if population abundance were about the same in the two years. The fact that spawning in 1953 actually increased by 29 miles suggests that population abundance in 1952–53 was equal or perhaps slightly greater than in the previous year.

## CATCH, SPAWN, AND ABUNDANCE

Changes in population abundance between consecutive years have been analysed qualitatively over the period of the present study, and these changes have been discussed in the present series of reports. The analysis has been based primarily on known changes in catch and spawn deposition. If, for example, catch were greater in one year than in the preceding year, and if the spawn deposition remained about the same, it would be concluded that the abundance in the population under consideration increased. Refinement of this general approach will now be attempted in an effort to obtain quantitative information on abundance of the two Southern British Columbia populations in recent years.

Population abundance, as considered in this discussion, is the abundance of a population that would exist at spawning-time if no catch had been taken. According to this definition, it is therefore equal to total abundance of the adult stocks at the start of the fishing season less the natural mortality occurring beween the commencement of the fishery and the time of spawning, providing that no recruitment takes place during this period.

The total population abundance, as previously defined, can be considered to consist of two components: (1) The amount of fish in the catch that would survive until spawning if no fishery had taken place, and (2) the amount of fish that spawned. This relation can be expressed by the equation $P=Cs+Sx$, where $P$ is total population abundance as previously defined (in numbers of fish), $C$ is catch (in numbers of fish), $s$ is survival rate of the fish in the catch from time of fishing until spawning time, $S$ is amount of spawn deposited on the spawning grounds (in statutory miles), and $x$ is the number of fish which spawn in a statutory mile of spawning beach.

The number of fish in the catch that would survive till spawning-time if no fishing had taken place is represented in the equation by $Cs$. $C$ can be readily calculated by dividing original catch figures (given by weight) by average weight of fish of all ages caught in the fishery. Precise data are lacking to provide information on the value of $s$, but considering the short period of time elapsing from time of fishing until spawning it seems likely that survival is high. For present purposes the value of $s$ will be regarded as 1. Hence $Cs$ is considered equal to $C$.

$Sx$ in the equation represents the number of fish that spawn. $S$ is the number of miles of spawn recorded by fisheries officers and herring investigators in annual surveys of the spawning-grounds. The original records are subjected to two modifications:

(1) Corrections are made for differences in average spawning intensity from year to year by computing the amount of spawn on the basis of a standard spawning intensity of 3,* and (2) corrections are made for incompleteness of coverage of spawning-grounds; using all information available,† it is thought reasonable to assume that west coast spawning-grounds have undergone about 85 per cent coverage in each year of the present study, and that lower east coast spawning-grounds have had about 75 per cent coverage in the years 1947 to 1952 and about 90 per cent coverage in 1953.

Values for $C$ and $S$ are given for the west coast and the lower east coast populations in each of the past seven years in Tables X and XI respectively, and the value of $s$ is taken as unity. Hence, $x$ is the only factor whose value must be determined before $P$ can be calculated in the equation $P=Cs+Sx$.

As an aid to ascertaining the correct value of $x$, various values of $x$ can be substituted into the equation. Since $C$ and $S$ are known for each year in each population (Tables X and XI), and since $s$ is constant, a linear relation is obtained between $P$ and $x$. Thus, on the west coast in 1946–47, $C$ is 5.42, $S$ is 39.4, $s$ is 1, and therefore $P=5.42+39.4x$. This straight line is shown in Fig. 4 (A), together with lines representing the data for other years of the period. In Fig. 4 (B), lines of each year are plotted, using comparable lower east coast data. It will be noted, through reference to the generalized straight-line equation $y=a+bx$, that the catch ($C$ or, more strictly, $Cs$) is represented by the intercept on the $y$-axis, while the spawn deposition ($S$) is represented by the slope of the line.

Qualitative information on changes in total west coast abundance from year to year, which was given in previous reports of this series, can be used in fixing the value of $x$:—

(1) Total abundance in 1947–48 was considered to be less than in 1946–47 (Tester and Stevenson, 1948).
(2) Abundance increased in 1948–49 over that in 1947–48 (Stevenson, 1950).
(3) Abundance in 1949–50 remained generally high (Stevenson and Lanigan, 1950), but decreased catch and slightly reduced spawn deposition indicated a somewhat lessened abundance in relation to the previous year.
(4) Abundance in 1950–51 was considered to be approximately the same as in the previous year (Stevenson, Hourston, and Lanigan, 1951).
(5) Abundance in 1951–52 showed a sharp decrease over that of the previous year (Stevenson, Hourston, Jackson, and Outram, 1952).
(6) It was stated in a previous section of this report that population abundance in 1952–53 was as great as in the previous year and possibly greater, but this was based on less detailed data than in previous years because of the greatly reduced fishery resulting from the fishermen's strike.

These statements permit setting limits on the possible value of $x$. If statement (1) is correct, the value of $x$ cannot be greater than about $0.19\times10^8$, the point at which the 1946–47 and 1947–48 lines cross; that is, the point at which population abundance is equal for each year. Statement (6) indicates that the value of $x$ cannot be less than about $0.07\times10^8$ (the point at which the 1951–52 and 1952–53 lines cross). The value of $x$ must therefore lie between $0.07\times10^8$ and $0.19\times10^8$. Statement (4) suggests that $x$ is about $0.09\times10^8$.

* In spawn surveys the number of eggs on a unit area of substrate is estimated, and the intensity of spawn deposition is categorized as very light, light, moderate, heavy, or very heavy. Several such estimates are made for each individual spawning-ground, and an average intensity is assigned to it. Average intensity for the spawnings in a statistical area or for the spawnings in a sub-district (the whole area of a population) is determined by weighting the extent of each individual spawning by 1, 2, 3, 4, or 5, depending on the category of intensity assigned. Converting from calculated intensity to standard intensity of 3 is accomplished by multiplying the extent of spawn by the ratio of the calculated intensity to 3. Thus, 1 mile of spawn with calculated average intensity of 2.7 is considered equal to 0.9 miles with average intensity of 3.

† Information used to estimate completeness of coverage of surveys include (*a*) fisheries officers' remarks on spawning reports pertaining to this subject, (*b*) knowledge of differences in ease of discovering the spawn depositions in different areas, (*c*) size of areas surveyed by various fisheries officers, (*d*) the fact that the west coast areas are surveyed by herring investigators as well as fisheries officers, and (*e*) the greater opportunity on the lower east coast for fisheries officers to receive information from the public on the occurrence of herring spawnings.

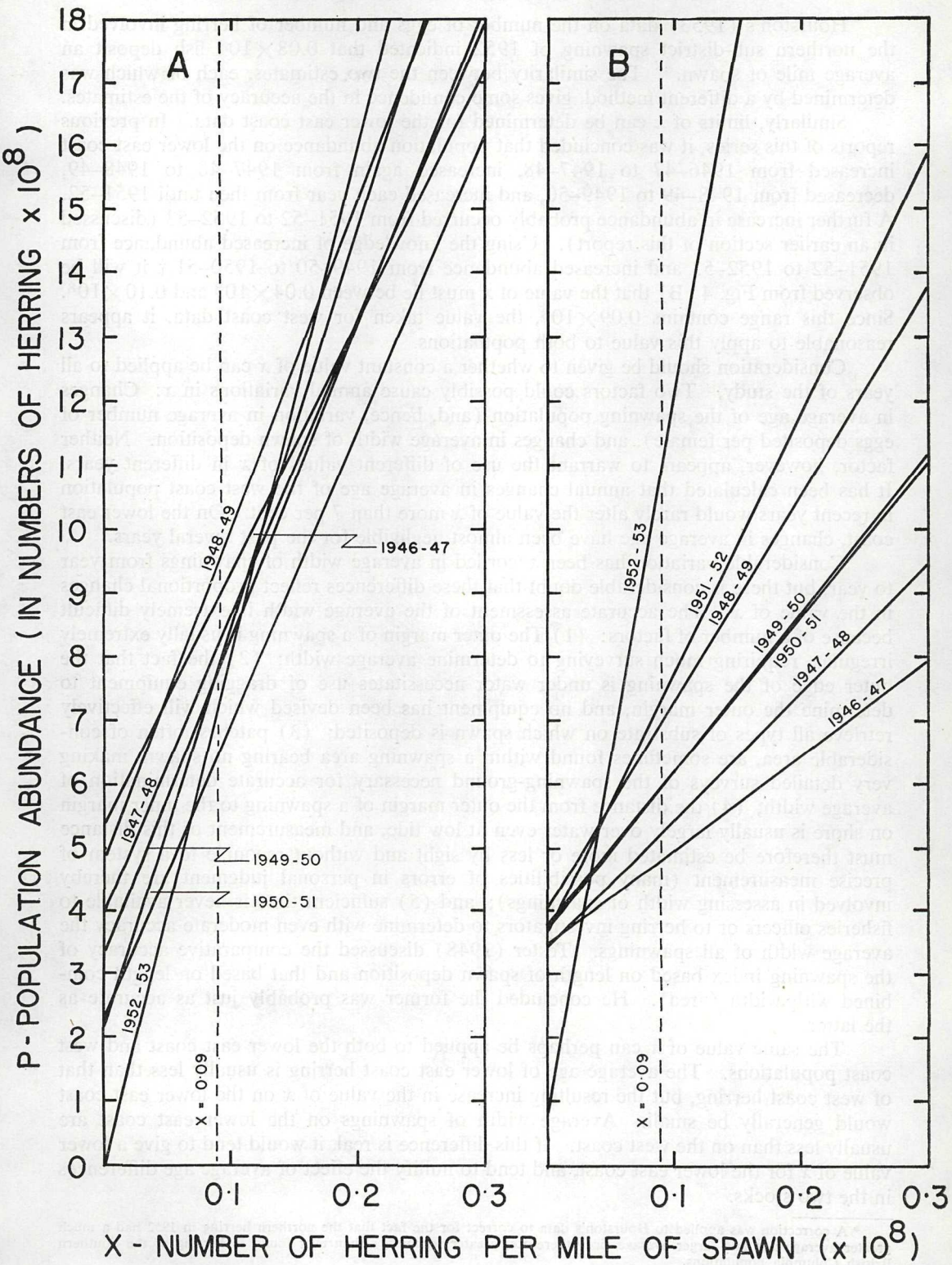


Fig. 4. Total population abundance (in number of fish $\times 10^8$) at spawning-time if no fishery had taken place ($P$) plotted against number of herring ($\times 10^8$) that spawn in a statutory mile of spawning-ground ($x$) on the west coast of Vancouver Island (A) and on the lower east coast of Vancouver Island (B) for each of the past seven years.

Hourston's (1953) data on the number of eggs and number of herring involved in the northern sub-district spawning of 1952 indicated that $0.08 \times 10^8$ fish deposit an average mile of spawn.* The similarity between the two estimates, each of which was determined by a different method, gives some confidence in the accuracy of the estimates.

Similarly, limits of $x$ can be determined for the lower east coast data. In previous reports of this series, it was concluded that population abundance on the lower east coast increased from 1946–47 to 1947–48, increased again from 1947–48 to 1948–49, decreased from 1948–49 to 1949–50, and increased each year from then until 1951–52. A further increase in abundance probably occurred from 1951–52 to 1952–53 (discussed in an earlier section of this report). Using the knowledge of increased abundance from 1951–52 to 1952–53 and increased abundance from 1949–50 to 1950–51,† it will be observed from Fig. 4 (B) that the value of $x$ must lie between $0.04 \times 10^8$ and $0.10 \times 10^8$. Since this range contains $0.09 \times 10^8$, the value taken for west coast data, it appears reasonable to apply this value to both populations.

Consideration should be given to whether a constant value of $x$ can be applied to all years of the study. Two factors could possibly cause annual variations in $x$: Changes in average age of the spawning population (and, hence, variation in average number of eggs deposited per female), and changes in average width of spawn deposition. Neither factor, however, appears to warrant the use of different values of $x$ in different years. It has been calculated that annual changes in average age of the west coast population in recent years would rarely alter the value of $x$ more than 7 per cent. On the lower east coast, changes in average age have been almost negligible for the past several years.

Considerable variation has been recorded in average width of spawnings from year to year, but there is considerable doubt that these differences reflect proportional changes in the value of $x$. The accurate assessment of the average width is extremely difficult because of a number of factors: (1) The outer margin of a spawning is usually extremely irregular, requiring much surveying to determine average width; (2) the fact that the outer edge of the spawning is under water necessitates use of dragging equipment to determine the outer margin, and no equipment has been devised which will effectively retrieve all types of substrate on which spawn is deposited; (3) patches, often of considerable area, are sometimes found within a spawning area bearing no spawn, making very detailed surveys of the spawning-ground necessary for accurate determination of average width; (4) the distance from the outer margin of a spawning to the inner margin on shore is usually largely over water even at low tide, and measurement of this distance must therefore be estimated more or less by sight and without recourse to a system of precise measurement (many possibilities of errors in personal judgment are thereby involved in assessing width of spawnings); and (5) sufficient time is never available to fisheries officers or to herring investigators to determine with even moderate accuracy the average width of all spawnings. Tester (1948) discussed the comparative accuracy of the spawning index based on length of spawn deposition and that based on length combined with width (area). He concluded the former was probably just as accurate as the latter.

The same value of $x$ can perhaps be applied to both the lower east coast and west coast populations. The average age of lower east coast herring is usually less than that of west coast herring, but the resulting increase in the value of $x$ on the lower east coast would generally be small. Average width of spawnings on the lower east coast are usually less than on the west coast. If this difference is real, it would tend to give a lower value of $x$ for the lower east coast, and tend to nullify the effect of average age differences in the two stocks.

* A correction was applied to Hourston's data to correct for the fact that the northern herring in 1952 had a much greater average age and larger average size (therefore, greater fecundity) than ever found in herring of the Southern British Columbia populations.

† Any difference in lower east coast population abundance in 1949–50 and 1950–51 seems overshadowed by similarity in abundance for those years at all values of $x$ (Fig. 4 (B)). Thus, less confidence should probably be put in the accuracy of the upper limit of the range than of the lower limit.

Substituting data given in Tables X and XI into the equation, population estimates (in numbers of fish $\times 10^8$) can be made for the lower east coast and the west coast in each year. These are presented in the following tabulation, with exploitation rates, calculated as the ratio of catch to total population, in parentheses:—

| Year | Lower East Coast | West Coast |
|---|---|---|
| 1946–47 | 4.84 (0.72) | 8.97 (0.60) |
| 1947–48 | 5.25 (0.66) | 8.26 (0.49) |
| 1948–49 | 7.00 (0.58) | 9.50 (0.51) |
| 1949–50 | 5.96 (0.63) | 7.84 (0.43) |
| 1950–51 | 5.97 (0.63) | 7.90 (0.29) |
| 1951–52 | 7.40 (0.51) | 6.51 (0.36) |
| 1952–53 | 11.06 (0.08) | 7.26 ( + ) |

No statistically significant relationship exists between the fluctuations in the abundance of the two stocks over the seven-year period (Fig. 5). Factors that affect year-class strength apparently show no consistency in their action upon the two populations over a number of years. From 1946–47 to 1950–51, population abundance on the west coast exceeded that on the lower east coast, and the difference in abundance was fairly constant during this period. This suggests that at that time year-class recruitment in each stock fluctuated similarly. Since 1950–51, lower east coast abundance was greater than abundance on the west coast, resulting primarily from differential recruitment of the 1949 and 1950 year-classes in the two populations.

The lower east coast catch has comprised a larger proportion of the population than the west coast catch in each year of the investigation. The lower east coast quota has accounted for between one-half and three-quarters of the total population each year, while unrestricted fishing on the west coast (until the official closure date) attained a comparable degree of exploitation in only one season (1946–47). The greater exploitation of the lower east coast stocks suggests that the lower east coast population is more completely available to the fishing fleet than the west coast population is. There seems to be little doubt that the low exploitation on the west coast* in 1949–50, 1950–51, and 1951–52 was largely a result of the natural limitations on catch imposed by late inshore migration of Area 25 runs (Stevenson, Hourston, Jackson, and Outram, 1952, p. 79). Even lower exploitation would have occurred in 1951–52 if the fishing closure date had not been extended in Area 25. The high exploitation on the lower east coast is undoubtedly connected with the simple pattern of inshore migration to the lower east coast fishing localities (Stevenson, Hourston, Jackson, and Outram, 1952, p. 66). Fishing can take place in almost any part of the lower east coast, and the area encompassed by lower east coast waters is small in relation to the area of inshore waters on the west coast.

It seems certain that exploitation rates considerably higher than those shown would be attained on the lower east coast if the catch quota were removed. There is abundant evidence that further catches could have been made each year on the lower east coast after the quota was reached. A distinct possibility exists that removal of the lower east coast quota could result in such high exploitation that the spawning stock would be reduced to a level at which future population abundance could not be maintained. At the present rate of exploitation there is evidence of a tendency for year-class strength to be

* Exploitation rates of the west coast population have been independently calculated from magnet-recovered tag returns for the seasons from 1946–47 to 1950–51: 0.32 (1946–47), 0.76 (1947–48), 0.64 (1948–49), 0.26 (1949–50), and 0.18 (1950–51). Although detailed analysis of sources of error involved in these determinations has not been made, the accuracy of these estimates is probably less than those calculated by the method developed in this report. The most accurate determinations made from tag-recovery are probably those for 1948–49, 1949–50, and 1950–51. During this period the exploitation rates showed a decrease by both methods of estimation. The differences between estimates derived by the two methods may be partly a result of the difference in time at which population abundance was computed. In the method discussed in this paper, exploitation rate is the ratio of the catch to the population abundance which would exist at spawning-time if no fish were caught. In the tag-recovery method, the population abundance is that existing at the beginning of the season before fishing begins. Although natural mortality is probably relatively low in the winter, this difference in time of computing population abundance would doubtless affect the exploitation estimations.

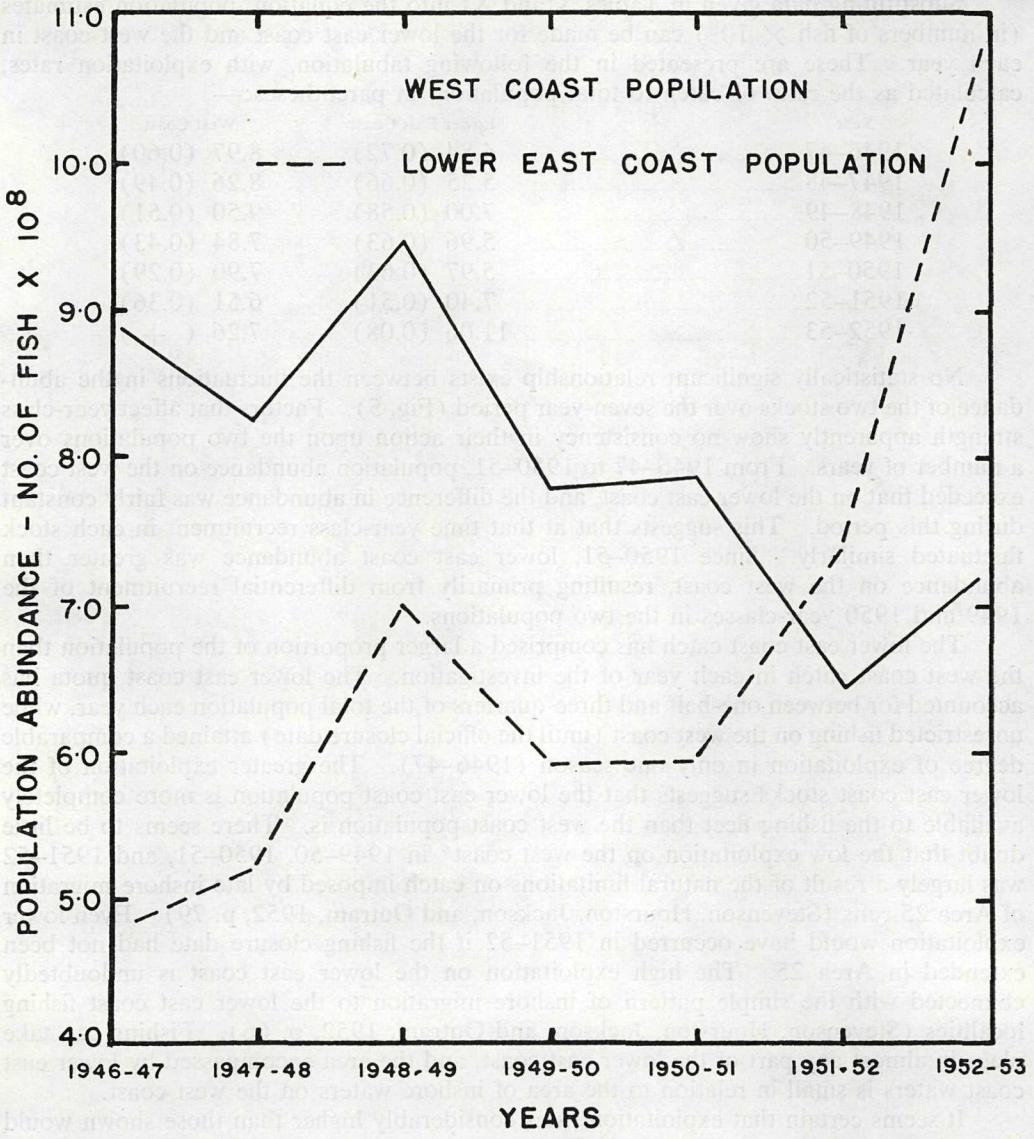


Fig. 5. Fluctuations in herring abundance (in number of fish $\times 10^8$) on the west coast and lower east coast of Vancouver Island in the past seven years.

directly related to the amount of spawn deposited (Stevenson, Hourston, Jackson, and Outram, 1952, p. 78). If this indication should be accurate, greater exploitation may impair future production.

On the other hand, restriction of fishing on the west coast by catch quota appears unnecessary to maintain an adequate spawning stock. In recent years the removal of quota regulations has apparently been accompanied by lower exploitation than that reached on the lower east coast, where a quota is applied. Furthermore, spawn deposition shows no relationship to future recruitment. Whether or not natural restrictions on catch would continue to limit exploitation on the west coast during a period of generally low population abundance is not known. When data can be obtained to answer this question, the main objective of the current investigation on these two herring populations will be attained.

## SUMMARY

Collection of data relative to the comparative study of the west coast and lower east coast herring populations was hampered in 1952–53 by the greatly reduced catch resulting from failure of fishing companies and union to reach a price settlement. Only about one-fifth of the 40,000-ton lower east coast quota was caught (mostly taken for salting by special agreement), and a negligible quantity of herring was taken from the quota-free west coast population. In 1951–52, west coast abundance was sharply reduced from the abundance level of previous years, and the abnormally small catch in 1952–53 prevented studying the effect of non-quota fishing on lowered abundance.

The salt-herring operations on the lower east coast permitted normal sampling of the winter runs of that sub-district, but sampling of west coast winter runs was accomplished through the borrowing of fishing-vessels from the industry. The 1950 year-class (III-year fish) comprised almost two-thirds of the winter runs of each population. On the west coast it was considered that the recruitment from this year-class was average or slightly greater than average in relation to year-class recruitment of recent years. On the lower east coast it appeared that its recruitment was above average. The more northerly west coast runs (in Areas 25B and 26) showed a greater reliance upon this year-class than the runs to the more southerly west coast areas (Areas 23 and 24), whereas a striking uniformity in the proportion of fish belonging to this year-class was apparent in the runs to each of the lower east coast areas (Areas 17A, 17B, and 18). The 1949 year-class (IV-year fish) comprised slightly less than one-third of the winter runs in both populations. Age composition of spawning runs closely resembled that of the winter runs in both stocks, the only major difference being that the 1951 year-class (II-year fish) was generally better represented in lower east coast winter runs than spawning runs, but relatively more abundant in west coast spawning runs than winter runs.

A striking reduction in average weight of herring, at all ages except Age II, occurred in both populations in 1952–53 as compared to the previous year. Apparently feeding conditions in the summer of 1952 were less favourable than in the summer of 1951.

Spawn deposition in the spring of 1953 showed an increase of 163 per cent on the lower east coast over that of the previous year, and an increase of 80 per cent on the west coast. Part of the increase was undoubtedly caused by the absence of a regular winter fishery. Lack of catch statistics data comparable to those of other years made assessment of population abundance in relation to abundance in the previous year difficult. Using all available information pertaining to population abundance, it was concluded that the abundance of each population was at least as great as in the previous year and possibly greater. There was more evidence, however, of an appreciable increase in lower east coast stocks than in west coast stocks.

The qualitative method of estimating population abundance using data on catch and spawn deposition was put on a quantitative basis. The chief difficulty encountered was deciding upon the number of fish involved in a statutory mile of spawning. This value

was fixed by careful analysis of the qualitative information on population abundance that has been obtained since the beginning of the present study. Fluctuations in abundance of the two populations during the seven-year period of the investigation show no statistically significant relationship. Relatively heavier year-class recruitment in the past two years has increased lower east coast abundance above that of the west coast for the first time in the present study.

Exploitation has been consistently heavier on the lower east coast than on the west coast in spite of the catch quota regulations applied to the former sub-district. The low west coast exploitation is partly attributable to natural limitations to catch imposed by late inshore migration of runs to Area 25. Argument is advanced that some type of restriction may always be required on lower east coast catch (in addition to the official closing date prior to spawning) to maintain sustained production, whereas such restriction may not be required on the west coast. A major question which remains to be answered concerns whether or not catch restrictions are required on the west coast during a period of generally low abundance.

## ACKNOWLEDGMENTS

The herring investigation thanks the fishing companies, herring-fishermen, and government fisheries departments for their indispensable support of herring research during 1952–53.

Special thanks are extended to the fishing companies for generously providing vessels on a charter-free basis. British Columbia Packers Limited lent the *Southisle* to enable sampling of the various winter herring runs, and the loan of this vessel was extended for participation in the spring tagging programme. In addition, this company provided the *Dominion No. 1* for a survey of spawning-grounds on the west coast of Vancouver Island. Nelson Brothers Fisheries Limited provided the *Western Ranger* for the sampling of winter herring stocks in December, and the *Western Commander* for sampling during January and early February. They also permitted the latter vessel to be used for tagging from late February to early April. Canadian Fishing Company Limited lent the *Ocean Pride* for use in the tagging programme. The conscientious efforts of the captains and crews of these vessels are also gratefully acknowledged.

The herring investigation is also deeply indebted to the captains and crews of seining and trawling vessels, and to workers in various herring-processing plants, for providing samples from the small 1952–53 catch.

The Federal Department of Fisheries again undertook the surveying of herring-spawning grounds in all coastal areas, through the efforts of its fisheries officers, and provided detailed information on catch. For these services, and for numerous other courtesies shown by the Chief Supervisor, A. J. Whitmore, and by the regional supervisors, H. E. Palmer and G. S. Reade, the investigation is deeply grateful.

The continued interest shown by the Provincial Department of Fisheries and its Deputy Minister, G. J. Alexander, in herring research is much appreciated. The Department has published annual reports of herring research continuously for seventeen years.

Sincere appreciation is extended to the staff members of the herring investigation for their conscientious efforts and for the co-operative spirit they have consistently shown. The junior author of this report, D. N. Outram, assistant scientist, supervised the spawn studies, which included those reported here and others concerned with spawn mortality. A. S. Hourston, assistant scientist, although concerned mainly with investigation of survival of juvenile herring, provided valuable advice on all phases of the research.

G. T. Taylor compiled and analysed data relating to catch, and acted as administrative assistant of the herring investigation. R. S. Isaacson and M. Bakich, laboratory technicians, were responsible for making age determinations of all fish sampled from the fishery and spawning runs. Mr. Isaacson also supervised the compilation of the age and growth data and assisted in many ways in the assembling of this report. Mr. Bakich continued the study of the structure and types of herring-scales.

All staff members assisted at one time or another in the field work of the investigation. A. G. Paul, senior field technician, undertook major responsibilities in the tagging and sampling programmes and in the maintenance of nets and various equipment. Other members of the technical staff, J. A. Bond, J. S. Rees, E. W. Stolzenberg, and B. Wildman, assisted in field programmes and in preliminary analysis of data. Miss Mary Cairns and Miss Diane Blackburn efficiently carried out stenographic and clerical duties.

Various other members of the staff of the Pacific Biological Station rendered valuable assistance to the herring investigation. M. A. Pirart, of the Electronics Laboratory, carried out developmental work on the operation of tag-detectors. R. M. Wilson and W. G. St. Clair, port contact-men in Vancouver and Prince Rupert, respectively, arranged with fishermen and plant personnel for the procurement of samples from herring landings in those ports.

Thanks are due to Dr. K. S. Ketchen and F. H. C. Taylor, associate scientists of the Pacific Biological Station, for constructive criticism of this report.

Lastly, it is a sincere pleasure to acknowledge the valuable advice and sympathetic encouragement offered by Dr. J. L. Hart, Director of the Pacific Biological Station, throughout the past year.

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* Reprints were published in year following the date of publication of report.

# TABLES

*Table I.—Catch (in Tons) Taken on the Lower East Coast and West Coast of Vancouver Island in 1952–53 According to Method of Fishing and Method of Disposal*

| Areas | Total Catch | Catch According to Disposal | | | Catch According to Fishing Method | |
|---|---|---|---|---|---|---|
| | | Salted | Reduced | Bait[1] | Seine | Trawl[2] |
| *Lower East Coast of Vancouver Island* | | | | | | |
| Area 17A | 7,630 | 6,000 | 400 | 1,230 | 7,525 | 105 |
| Area 17B | 390 | 130 | 230 | 30 | 150 | 240 |
| Area 18 | 65 | ..... | 65 | ..... | ..... | 65 |
| Totals | 8,085 | 6,130 | 695 | 1,260 | 7,675 | 410 |
| *West Coast of Vancouver Island* | | | | | | |
| Area 24 | 20 | ..... | ..... | 20 | 20 | ..... |

[1] Including small amounts of herring that were canned, kippered, or sold fresh.
[2] Including small amounts of herring that were taken by gill-net.

*Table II.—Average Percentage Age Composition of Samples from the Winter and Spawning Runs to the West Coast of Vancouver Island during the 1952–53 Season*

WINTER RUN

| Area | No. of Samples | In Year of Age | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | I | II | III | IV | V | VI | VII | VIII | IX |
| 23 | 25 | 0.08 | 7.77 | 56.48 | 33.16 | 1.94 | 0.56 | ..... | ..... | ..... |
| 24 | 3 | ..... | 18.18 | 48.82 | 30.30 | 2.02 | 0.34 | 0.34 | ..... | ..... |
| 25A | 3 | 0.33 | 98.33 | 1.00 | ..... | 0.33 | ..... | ..... | ..... | ..... |
| 25B | 9 | 0.33 | 2.71 | 75.65 | 19.73 | 1.02 | 0.45 | 0.11 | ..... | ..... |
| 26 | 3 | ..... | 6.40 | 75.76 | 13.80 | 3.37 | 0.67 | ..... | ..... | ..... |
| All[1] | 40 | 0.12 | 7.31 | 61.66 | 28.47 | 1.85 | 0.53 | 0.05 | ..... | ..... |
| SPAWNING RUNS | | | | | | | | | | |
| 23 | 14 | 0.14 | 13.13 | 49.68 | 33.23 | 2.79 | 0.74 | 0.22 | 0.07 | ..... |
| 24 | 4 | ..... | 37.16 | 43.12 | 15.93 | 1.77 | 2.02 | ..... | ..... | ..... |
| 25A | 4 | ..... | 7.92 | 43.34 | 31.30 | 8.20 | 7.18 | 1.53 | 0.26 | 0.26 |
| 25B | 4 | ..... | 0.76 | 45.10 | 21.28 | 14.90 | 15.19 | 2.02 | 0.76 | ..... |
| 26 | 4 | ..... | 0.76 | 65.34 | 26.54 | 5.58 | 1.53 | 0.25 | ..... | ..... |
| 27 | 2 | ..... | 1.53 | 58.91 | 22.83 | 10.65 | 4.56 | 1.01 | 0.51 | ..... |
| All | 32 | 0.06 | 11.66 | 50.03 | 27.84 | 5.69 | 3.85 | 0.64 | 0.19 | 0.03 |

[1] Samples from Area 25A not included in these averages.

*Table III.—Average Percentage Age Composition of Samples from the Winter and Spawning Runs to the Lower East Coast of Vancouver Island during the 1952–53 Season.*

WINTER RUN

| Area | Number of Samples | In Year of Age | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | I | II | III | IV | V | VI | VII | VIII |
| 17A | 72 | 0.15 | 2.14 | 58.22 | 35.35 | 3.45 | 0.58 | 0.07 | 0.04 |
| 17B | 20 | 0.05 | 4.95 | 67.70 | 24.60 | 2.35 | 0.35 | ..... | ..... |
| 18 | 8 | ..... | 1.57 | 63.34 | 30.77 | 3.63 | 0.69 | ..... | ..... |
| All | 100 | 0.12 | 2.65 | 60.53 | 32.83 | 3.25 | 0.54 | 0.05 | 0.03 |
| SPAWNING RUN | | | | | | | | | |
| 17A | 3 | ..... | 1.02 | 52.74 | 37.17 | 6.06 | 3.01 | ..... | ..... |
| 17B | 5 | ..... | 1.23 | 63.55 | 28.14 | 6.26 | 0.82 | ..... | ..... |
| 18 | 1 | ..... | 2.00 | 73.00 | 20.00 | 4.00 | 1.00 | ..... | ..... |
| All | 9 | ..... | 1.24 | 61.00 | 30.25 | 5.95 | 1.57 | ..... | ..... |

*Table IV.—Average Sex Ratio (Females/Males) and Stage of Development for Samples from Winter and Spawning Runs to the West Coast of Vancouver Island during the 1952–53 Season.*

WINTER RUNS

| Area | Sex Ratio | Percentage | | |
|---|---|---|---|---|
| | | Immature | Mature Unspent | Mature Spent |
| 23 | 1.07 | 5.08 | 94.92 | ..... |
| 24 | 0.97 | 4.00 | 96.00 | ..... |
| 25 | 1.34 | 26.08 | 73.92 | ..... |
| 26 | 0.99 | 2.33 | 97.67 | ..... |
| All | 1.11 | 10.67 | 89.33 | ..... |
| SPAWNING RUNS | | | | |
| 23 | 1.46 | 3.93 | 78.57 | 17.50 |
| 24 | 0.90 | 3.00 | 87.75 | 9.25 |
| 25 | 0.68 | 0.37 | 89.63 | 10.00 |
| 26 | 0.79 | 2.25 | 79.25 | 18.50 |
| 27 | 0.48 | 2.50 | 97.50 | ..... |
| All | 0.99 | 2.62 | 83.75 | 13.62 |

*Table V.—Average Sex Ratio (Females/Males) and Stage of Development for Samples from Winter and Spawning Runs to the Lower East Coast of Vancouver Island during the 1952–53 Season.*

WINTER RUNS

| Area | Sex Ratio | Percentage | | |
|---|---|---|---|---|
| | | Immature | Mature Unspent | Mature Spent |
| 17A | 0.89 | 2.09 | 97.91 | ..... |
| 17B | 0.74 | 2.81 | 97.19 | ..... |
| 18 | 0.70 | 0.92 | 99.08 | ..... |
| All | 0.84 | 2.14 | 97.86 | ..... |

SPAWNING RUNS

| | | | | |
|---|---|---|---|---|
| 17A | 1.21 | ..... | 92.33 | 7.67 |
| 17B | 0.53 | 0.40 | 46.40 | 53.20 |
| 18 | 0.75 | ..... | 34.00 | 66.00 |
| All | 0.72 | 0.22 | 60.33 | 39.44 |

*Table VI.—Average Length (Millimetres) and Average Weight (Grams) for Each Age in Samples from Winter Runs to the West Coast of Vancouver Island in 1952–53, with Numbers of Fish on Which Averages Are Based in Parentheses.*

AVERAGE LENGTH

| In Year of Age | Area 23 | Area 24 | Area 25A | Area 25B | Area 26 | All Areas[1] |
|---|---|---|---|---|---|---|
| I | (2) 97.0 | ..... | (1) 97.0 | (3) 100.3 | ..... | (5) 99.0 |
| II | (193) 162.6 | (54) 160.3 | (295) 144.0 | (24) 159.8 | (19) 157.6 | (290) 161.6 |
| III | (1,402) 183.8 | (145) 186.1 | (3) 179.7 | (671) 187.7 | (225) 188.2 | (2,443) 185.4 |
| IV | (823) 198.0 | (90) 196.6 | ..... | (175) 199.5 | (41) 198.3 | (1,129) 198.1 |
| V | (48) 209.4 | (6) 209.8 | (1) 205.0 | (9) 209.6 | (10) 205.1 | (73) 208.8 |
| VI | (14) 219.8 | (1) 211.0 | ..... | (4) 227.5 | (2) 230.5 | (21) 221.9 |
| VII | ..... | (1) 212.0 | ..... | (1) 233.0 | ..... | (2) 222.5 |
| VIII | ..... | ..... | ..... | ..... | ..... | ..... |
| ? | (18) 188.2 | (3) 184.7 | ..... | (13) 193.7 | (3) 174.0 | (37) 188.7 |

AVERAGE WEIGHT

| | | | | | | |
|---|---|---|---|---|---|---|
| I | (2) 8.5 | ..... | (1) 9.0 | (3) 10.0 | ..... | (5) 9.4 |
| II | (193) 51.9 | (54) 50.9 | (295) 34.8 | (24) 48.0 | (19) 44.5 | (290) 50.9 |
| III | (1,402) 78.5 | (145) 82.4 | (3) 73.0 | (671) 82.2 | (225) 82.9 | (2,443) 80.1 |
| IV | (823) 100.2 | (90) 98.9 | ..... | (175) 100.7 | (41) 98.3 | (1,129) 100.1 |
| V | (48) 121.5 | (6) 119.0 | (1) 124.0 | (9) 121.8 | (10) 107.4 | (73) 119.4 |
| VI | (14) 145.4 | (1) 149.0 | ..... | (4) 153.5 | (2) 168.5 | (21) 149.3 |
| VII | ..... | (1) 123.0 | ..... | (1) 168.0 | ..... | (2) 145.5 |
| VIII | ..... | ..... | ..... | ..... | ..... | ..... |
| ? | (18) 86.7 | (3) 79.7 | ..... | (13) 90.5 | (3) 69.0 | (37) 86.0 |

[1] Samples from Area 25A not included in these averages.

*Table VII.—Average Length (Millimetres) in Samples from Spawning Runs to the West Coast of Vancouver Island in 1953, with Numbers of Fish on Which Averages Are Based in Parentheses.*

| In Year of Age | Area 23 | Area 24 | Area 25A | Area 25B | Area 26 | Area 27 | All Areas |
|---|---|---|---|---|---|---|---|
| I | (2) 116.0 | ..... | ..... | ..... | ..... | ..... | (2) 116.0 |
| II | (179) 160.8 | (147) 158.9 | (31) 166.4 | (3) 163.0 | (3) 164.3 | (3) 172.0 | (366) 161.4 |
| III | (671) 184.0 | (171) 182.1 | (169) 189.3 | (178) 190.7 | (258) 191.3 | (116) 190.5 | (1,563) 186.8 |
| IV | (447) 198.6 | (63) 199.7 | (122) 204.2 | (84) 204.3 | (105) 202.8 | (45) 205.1 | (866) 200.9 |
| V | (38) 211.7 | (7) 211.3 | (32) 218.8 | (59) 217.3 | (22) 216.4 | (21) 218.0 | (179) 215.9 |
| VI | (10) 223.1 | (8) 219.2 | (28) 227.1 | (60) 226.0 | (6) 225.0 | (9) 224.0 | (121) 225.4 |
| VII | (3) 230.0 | ..... | (6) 238.2 | (8) 234.1 | (1) 242.0 | (2) 220.0 | (20) 233.7 |
| VIII | (1) 239.0 | ..... | (1) 249.0 | (3) 242.3 | ..... | (1) 244.0 | (6) 243.2 |
| IX | ..... | ..... | (1) 238.0 | ..... | ..... | ..... | (1) 238.0 |
| ? | (49) 191.3 | (4) 191.2 | (10) 201.2 | (5) 206.6 | (5) 204.8 | (3) 199.7 | (76) 194.8 |

*Table VIII.—Average Length (Millimetres) and Average Weight (Grams) for Each Age in Samples from Winter Runs to the Lower East Coast of Vancouver Island in 1952–53, with Numbers of Fish on Which Averages Are Based in Parentheses.*

AVERAGE LENGTH

| In Year of Age | Area 17A | Area 17B | Area 18 | All Areas |
|---|---|---|---|---|
| I | (11) 105.4 | (1) 119.0 | ..... | (12) 106.5 |
| II | (162) 156.6 | (97) 154.7 | (12) 157.2 | (271) 155.9 |
| III | (4,100) 184.7 | (1,322) 181.3 | (481) 183.3 | (5,903) 183.8 |
| IV | (2,493) 196.3 | (486) 194.6 | (234) 195.1 | (3,213) 196.0 |
| V | (245) 209.3 | (45) 208.0 | (28) 204.2 | (318) 208.6 |
| VI | (41) 213.9 | (7) 218.0 | (5) 214.0 | (53) 214.4 |
| VII | (5) 222.8 | ..... | ..... | (5) 222.8 |
| VIII | (3) 233.3 | ..... | ..... | (3) 233.3 |
| ? | (36) 193.6 | (2) 188.0 | (3) 196.7 | (41) 193.3 |

AVERAGE WEIGHT

| | | | | |
|---|---|---|---|---|
| I | (11) 12.3 | (1) 19.0 | ..... | (12) 12.8 |
| II | (162) 44.6 | (97) 44.8 | (12) 49.6 | (271) 44.9 |
| III | (4,100) 77.2 | (1,322) 73.5 | (481) 82.0 | (5,903) 76.8 |
| IV | (2,493) 93.4 | (486) 91.6 | (234) 99.4 | (3,213) 93.6 |
| V | (245) 119.2 | (45) 116.7 | (28) 116.9 | (318) 118.7 |
| VI | (41) 135.5 | (7) 137.6 | (5) 130.8 | (53) 135.3 |
| VII | (5) 146.4 | ..... | ..... | (5) 146.4 |
| VIII | (3) 185.0 | ..... | ..... | (3) 185.0 |
| ? | (36) 92.4 | (2) 79.0 | (3) 94.3 | (41) 91.8 |

*Table IX.—Average Length (Millimetres) in Samples from Spawning Runs to the Lower East Coast of Vancouver Island in 1953, with Numbers of Fish on Which Averages Are Based in Parentheses.*

| In Year of Age | Area 17A | Area 17B | Area 18 | All Areas |
|---|---|---|---|---|
| I | ..... | ..... | ..... | ..... |
| II | (3) 161.0 | (6) 151.2 | (2) 152.0 | (11) 154.0 |
| III | (155) 186.2 | (309) 189.6 | (73) 185.4 | (537) 188.1 |
| IV | (110) 199.0 | (137) 206.5 | (20) 198.8 | (267) 202.8 |
| V | (18) 208.9 | (30) 217.9 | (4) 220.0 | (52) 215.0 |
| VI | (9) 220.2 | (4) 231.5 | (1) 230.0 | (14) 224.1 |
| ? | (5) 201.5 | (14) 196.6 | ..... | (19) 197.8 |

*Table X.—West Coast Data on Catch and Spawning Deposition in Each of the Last Seven Years (*See *Text for Explanation of Corrections to Original Data)*

| Year | Catch (Converted to Grams; $\times 10^8$) | Average Weight of Fish in Catch (in Grams) | (*C*) Number of Fish in Catch ($\times 10^8$) | Recorded Extent of Spawnings (in Miles) | Average Intensity of Spawn Deposition | Extent of Spawning Corrected to Standard Intensity (in Miles) | (*S*) Estimated Extent of Spawning if All Spawning-grounds Had Been Surveyed (in Miles) |
|---|---|---|---|---|---|---|---|
| 1946–47 | 535.2 | 98.7 | 5.42 | 32.4 | 3.1 | 33.5 | 39.4 |
| 1947–48 | 410.0 | 100.4 | 4.08 | 43.8 | 2.7 | 39.4 | 46.4 |
| 1948–49 | 499.0 | 102.7 | 4.86 | 41.1 | 3.2 | 43.8 | 51.5 |
| 1949–50 | 338.4 | 99.8 | 3.39 | 43.5 | 2.9 | 42.0 | 49.4 |
| 1950–51 | 228.6 | 100.6 | 2.27 | 54.9 | 2.9 | 53.1 | 62.5 |
| 1951–52 | 272.2 | 115.9 | 2.35 | 35.7 | 3.3 | 39.3 | 46.2 |
| 1952–53 | 0.2 | 84.7 | 0.002 | 64.3 | 3.2 | 68.6 | 80.7 |

*Table XI.—Lower East Coast Data on Catch and Spawning Deposition in Each of the Last Seven Years (*See *Text for Explanation of Corrections to Original Data)*

| Year | Catch (Converted to Grams; $\times 10^8$) | Average Weight of Fish in Catch (in Grams) | (*C*) Number of Fish in Catch ($\times 10^8$) | Recorded Extent of Spawnings (in Miles) | Average Intensity of Spawn Deposition | Extent of Spawning Corrected to Standard Intensity (in Miles) | (*S*) Estimated Extent of Spawning if All Spawning-grounds Had Been Surveyed (in Miles) |
|---|---|---|---|---|---|---|---|
| 1946–47 | 331.1 | 94.6 | 3.50 | 9.9 | 3.4 | 11.2 | 14.9 |
| 1947–48 | 362.0 | 105.1 | 3.44 | 17.4 | 2.6 | 15.1 | 20.1 |
| 1948–49 | 363.8 | 89.1 | 4.08 | 20.9 | 3.5 | 24.4 | 32.5 |
| 1949–50 | 365.6 | 98.0 | 3.73 | 15.1 | 3.7 | 18.6 | 24.8 |
| 1950–51 | 371.9 | 98.5 | 3.78 | 20.2 | 2.7 | 18.2 | 24.3 |
| 1951–52 | 372.4 | 99.1 | 3.76 | 31.5 | 2.9 | 30.4 | 40.5 |
| 1952–53 | 71.1 | 83.1 | 0.86 | 82.7 | 3.7 | 102.0 | 113.3 |

# REPORT OF THE INTERNATIONAL FISHERIES COMMISSION, 1952

The International Fisheries Commission continued the regulation of the Pacific halibut-fishery under the authority of the treaty of January 29th, 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 1952 were as follows: George R. Clark, Ottawa, and George W. Nickerson, Prince Rupert, for Canada; Edward W. Allen, Seattle, Wash., and Milton C. James, Washington, D.C., for the United States. Mr. Nickerson served as chairman and Mr. Allen as secretary. In August, Mr. James resigned after six years of service, and Seton H. Thompson, Chief of the Branch of Alaska Fisheries, U.S. Fish and Wildlife Service, was appointed by the President of the United States to fill the vacancy.

Meetings of the Commission were held at Seattle, Wash., on January 21st, 22nd, and 23rd, to review the current results of regulations and investigations, to adopt necessary regulatory changes, and to approve an investigational programme for the ensuing season. During the meeting the Commission conferred with representatives of all branches of the halibut industry and with representatives of the otter-trawl fishery in Washington and the Bering Sea crab-trawl fishery.

Three particularly significant developments occurred in the fishery in 1952. There was a notable rise in the abundance of stocks that extended the improvement that has been under way since the beginning of regulation. The total yield, which has also been increased steadily since 1930, was over 62,000,000 pounds and was back to the 1915 level. A small quantity of halibut was secured from the Bering Sea for the first time.

The halibut-fishing regulations for 1952 were approved by the President of the United States on April 18th and by the Governor-General of Canada on April 22nd, and then became effective. Though substantially the same as those of 1951, they contained a few major changes.

The convention waters were divided into eight regulatory areas, one more than in 1951, by subdividing former Area 3 into 3A and 3B. The eight areas were: Area 1A, south of Cape Blanco, Ore.; Area 1B, between Cape Blanco and Willapa Bay, Wash.; Area 2A, between Willapa Bay and Cape Spencer, Alaska, exclusive of Areas 2B and 2C; Area 2B, off the east coast of Moresby Island in Lower Hecate Strait; Area 2C, off the west coast of Dall Island in South-eastern Alaska; Area 3A, extending from Cape Spencer to the Sanak Islands; Area 3B, between the Sanak Islands and Cape Sarichef in Unimak Pass; and Area 4, those waters of the Bering Sea lying north of Cape Sarichef.

The regular fishing season opened on May 14th, thirteen days later than in 1951. Other changes included the establishment of a recently underfished far-western section of previous Area 3 as a separate area, Area 3B, and the opening of this in late summer from August 2nd to 18th, inclusive, at the season when it used to yield its greatest catches. This was an extension of the procedure commenced in Area 2 in 1951. Area 4, in Bering Sea, was opened at the same time as Area 3B. The two small areas, Area 2B off British Columbia and Area 2C off South-eastern Alaska, first established in 1951, were again opened as separate areas for ten days commencing July 26th, as in 1951.

Vessels fishing for crabs in Area 4, in Bering Sea, with bottom-nets of 12-inch or larger mesh were permitted to retain halibut caught incidentally to such fishing between August 19th and November 13th, inclusive.

Catch-limits of 25,500,000 pounds and 28,000,000 pounds were provided for Areas 2A and 3A respectively, Area 3A being given the catch-limit of former Area 3. Areas 1A and 1B, where the catch of halibut is comparatively small, were allowed to continue without catch-limits. Areas 2B, 2C, 3B, and 4 also had no catch-limits assigned to them.

The previous catch-limit of 500,000 pounds for Area 4 was removed in view of the specified period of fishing provided in the regulations.

The closure dates of Areas 2A and 3A were again made contingent upon the attainment of their respective catch-limits. The closure date of Area 2A was applied to Area 1B, and that of Area 2A or Area 3A, whichever was later, was applied to Area 1A.

Other regulatory provisions were also continued as follows: A minimum size-limit of 26 inches, heads on, or 5 pounds, heads off, for halibut; the closure of two nursery areas—one off Masset in Northern British Columbia and one off Timbered Islet in South-eastern Alaska; the prohibition of the use of dory gear and nets of any kind in fishing for halibut; the termination after November 15th of permits for the retention of halibut caught incidentally during fishing for other species in Areas 1A, 1B, 2C, 3A, and 3B, and the beginning of the winter closed season after November 30th in any area that might still be open by reason of the non-attainment of the catch-limit which otherwise determined its closure.

Areas 2A and 1B were closed to halibut-fishing at midnight on June 8th, and Areas 3A and 1A were closed at midnight on July 12th. Areas 2B and 2C were closed at midnight on August 4th, and Areas 3B and 4 at midnight on August 18th, as specified in the regulations.

The closure dates of Areas 2A and 3A were announced in advance on May 28th and June 23rd respectively, on the basis of the estimated dates of attainment of their respective catch-limits.

Landings of halibut reported on the Pacific Coast in 1952 amounted to 62,222,000 pounds, about 6,000,000 pounds greater than in 1951 and the greatest since 1915. The landings from the different areas were 238,000 pounds from Areas 1A and 1B combined, 27,273,000 pounds from Area 2A, 2,091,000 pounds from Area 2B, 1,295,000 pounds from Area 2C, 30,193,000 pounds from Area 3A, 879,000 pounds from Area 3B, and 253,000 pounds from Area 4. This was the first year that landings have been officially reported from Area 4. Landings of incidentally caught halibut, amounting to 458,000 pounds from Area 2A and 9,600 pounds from Area 3A, are included above.

Landings of halibut by Canadian vessels in 1952 amounted to 24,414,000 pounds, of which 16,950,000 pounds were from Areas 2A, 2B, and 2C, and 7,464,000 pounds from Areas 3A and 3B. No Canadian vessels fished in Area 4 during the 1952 season. The Canadian landings constituted 55.3 per cent of the landings from Areas 2A, 2B, and 2C, and 23.8 per cent of the landings from Area 3. Landings of the United States vessels in Canadian ports amounted to 3,037,000 pounds.

The scientific investigations which guide regulations were continued. Statistical and biological data, required to ascertain the year-to-year changes in available stocks, were collected. The marking programme, undertaken to ascertain the extent to which the different parts of the stocks were being utilized during the currently short fishing season, was also continued on chartered vessels. Analysis of these data and of the results of marking experiments were carried forward.

Biological statistics, derived from individual fishing records, showed that the catch per unit of effort had increased sharply on the grounds off British Columbia and Alaska, which produce 90 per cent of the catch.

The abundance of halibut in Area 2A has maintained an upward trend for the past twenty-two years. From time to time there have been temporary cessations in the increase, such as in 1951 when the over-all average catch per skate of gear for Area 2A was the same as the previous year. In that year some sections of the area showed an increase and others a small decline. In 1952 a pronounced increase in the catch per unit of effort occurred in all portions of the area.

In Area 3A the abundance of halibut followed a rising trend from 1931 to 1944. During the next five years a recession occurred. In 1950 there was some recovery

which was continued in 1951. During the 1952 season a sharp increase in the preliminary catch per skate was observed over all sections of the area. The abundance was as high as it had been in the previous thirty years, with the exception of 1944.

The later opening of the season in Areas 2A and 3A in 1952 may have played some part in the sharpness of the increases in the catch per unit of effort. However, until it is determined that the increases are maintained in subsequent years, much of the 1952 rise must be tentatively attributed to changes in availability.

Observations of the changes occurring in size and age composition of the stocks were continued. Approximately 47,000 measurements and some 8,600 otoliths were secured for age determination from eighty commercial trips landed at Seattle, Vancouver, and Prince Rupert in 1952.

Analysis of the 1952 size and age composition data from Area 2A showed that the numbers of recruits entering the fishery were below average for the fourth consecutive year, and that the fishery was becoming increasingly dependent upon medium-sized fish. They indicated the need for complete scientific study of the fluctuations in recruitment and their causes.

Analyses of the changes in the size and age composition of the Area 3A stock were continued on a limited scale, using materials collected from 1935 to 1942, and strengthened previous evidence of short-termed natural fluctuations in the production of recruits. At least another year's work will be required to permit reliable estimation of year-to-year changes in the number of specimens and in recruitment during the period.

A few market samples from Area 4 indicated that the Bering Sea stock consists of young fish. Very few individuals reached the upper age of immaturity of females, 16 years, which suggests that the Bering Sea halibut may migrate into Areas 3B and 3A upon becoming mature and may be a part of the large stock in the latter areas.

The tagging programme, begun in 1949 to determine the extent to which the different parts of the stocks were being utilized by the fishery and to ascertain natural and fishing mortality rates, was continued on a chartered vessel in the spring and summer of 1952. Over 3,700 halibut were released in the course of eight trips to different grounds off the coasts of British Columbia and South-eastern Alaska, practically completing the spring and summer phases of the 1949 tagging programme on these sections of the coast.

Approximately 1,150 tags were recovered by the fishery in 1952—more than in any previous year. Analysis of recoveries from summer tagging on the far-western grounds of Area 3A, in the Goose Island section of Area 2A, and in Areas 2B and 2C, all supported previous indications that the stocks on these grounds during the summer months are not available in any appreciable degree to the fishery in Area 3A from May to early July or to the fishery in Area 2A during late May and early June. They made it increasingly evident that fishing must be distributed over a greater part of the year in all areas, to make all parts of the stocks available to the fishery.

Three reports were published during the year—"Regulation and Investigation of the Pacific Halibut Fishery in 1951," "The Production of Halibut Eggs on the Cape St. James Spawning Bank off the Coast of British Columbia, 1935–1946," and "Regulation and Investigation of the Pacific Halibut Fishery in 1952."

# REPORT OF THE ACTIVITIES OF THE INTERNATIONAL PACIFIC SALMON FISHERIES COMMISSION FOR 1952

The fishery for sockeye salmon from the Fraser River watershed of British Columbia is administered by the International Pacific Salmon Fisheries Commission operating under the terms of a convention between Canada and the United States. During 1952, Canadian fishermen took 1,154,383 Fraser sockeye from treaty waters and United States fishermen took 1,113,475. The catch totalled 2,267,858 sockeye, of which 50.90 per cent was taken by Canada and 49.10 per cent by the United States.

The sockeye run in 1952 was the largest of any year of this cycle since 1912. The total pack was equalled during that period in only one cycle-year, 1936, at which time the spawning escapement was negligible. The run in 1952 not only produced 74,361 cases of canned sockeye more than was taken from the preceding cycle run, but it provided satisfactory or increased escapements to all the individual spawning-grounds. The 1952 pack exceeded the 1948 pack in sale value by approximately $2,755,000.

The table which follows shows the sockeye-catch by gear in the United States and Canadian treaty waters for the cycle-years 1940, 1944, 1948, and 1952.

SOCKEYE-CATCH BY GEAR

*United States Treaty Waters*

| | Purse-seines | | Gill-nets | | Reef-nets | | Total |
|---|---|---|---|---|---|---|---|
| | Units | Catch | Units | Catch | Units | Catch | |
| 1940 | 140 | 515,912 | 82 | 57,965 | 69 | 80,219 | 654,096 |
| 1944 | 60 | 335,172 | 55 | 40,625 | 40 | 59,651 | 435,448 |
| 1948 | 195 | 940,409 | 151 | 70,991 | 87 | 77,656 | 1,089,056 |
| 1952 | 210 | 826,304 | 192 | 175,064 | 81 | 112,107 | 1,113,475 |

*Canadian Treaty Waters*

| | Traps | Purse-seines | Gill-nets | Total |
|---|---|---|---|---|
| 1940 | 28,756 | ..... | 1,004,244 | 1,033,000 |
| 1944 | 29,224 | ..... | 974,602 | 1,033,826 |
| 1948 | 74,545 | 14,511 | 663,635 | 752,691 |
| 1952 | 65,417 | 122,114 | 996,852 | 1,154,383 |

In 1952, Indians in various parts of the Fraser River watershed took a total of 84,503 sockeye salmon for their personal use, as reported by the Canadian Department of Fisheries. In 1948, Indian fishermen in the watershed took 86,437 sockeye.

Recommended regulations for 1952, as approved by the Commission on January 30th, were transmitted to the Departments of Fisheries of Canada and of the State of Washington and to the Secretary of the Interior at Washington, D.C. The recommendations were accepted in substance for Canadian waters by Order in Council adopted on June 6th, 1952, and for the United States waters by an Order of the Director of the Washington State Department of Fisheries promulgated May 23rd, 1952.

The 1952 sockeye-fishing season commenced in the territorial waters of Canada at 12.01 a.m. on June 30th. The sockeye season, in so far as regulations recommended by the International Pacific Salmon Fisheries Commission were concerned, ended at various times in the different areas of Canadian treaty waters, as follows: In Areas 21 and 23 of District No. 3, at midnight, August 10th; in Areas 19 and 20 of District No. 3, at 6 p.m., August 24th; in Areas 17 and 18 of District No. 3 and in all of District No. 1,

at 8 a.m., September 29th. The weekly closed seasons were forty-eight hours in Areas 19, 20, 21, and 23. District No. 1 and Areas 17 and 18 of District No. 3 in Canadian waters had weekly closed periods of seventy-two hours, except that on the Fraser River above Pattullo Bridge the weekly closed periods were seventy-six hours. Modifications of the 1952 regulations in Canadian waters during the season were as follows: First, the regular weekly fishing period in District No. 1 (Fraser River) was extended twenty-four hours, to 8 a.m., Saturday, July 26th, instead of closing at 8 a.m. Friday, July 25th. This adjustment to the fishing time in District No. 1 was to allow exploitation of sockeye races which would otherwise have had excessively large escapements from the beginning and end of their migrations, the character of which escapements were not considered desirable for maximum reproduction. The second modification was an extension of the normal week-end closed season in the first week of August by twenty-four hours in all Canadian waters. The purpose of this extension was to obtain the required escapement of sockeye of the Chilko race and to achieve a more nearly equal division of the catch between fishermen of the two countries.

In United States convention waters the sockeye-salmon fishing season opened on June 30th at 12.01 a.m. and closed, in so far as regulations recommended by the Commission were concerned, at 6 p.m., August 24th. There were weekly closed seasons of forty-eight hours. No modifications of the above regulations were required during the sockeye-fishing season.

On the high seas the Commission set a forty-eight-hour weekly closed season in convention waters during each weekly period between June 30th and August 10th, inclusive. Vessels from the United States Fish and Wildlife Service and the Canadian Department of Fisheries enforced the sockeye regulations on the high seas. No violations were reported.

Total escapement of sockeye to the spawning-grounds of the Fraser River tributaries was 852,084 in 1952. The escapement represented 27 per cent of the total run. Spawners were well distributed in the various spawning tributaries, with the principal run of 489,473 spawners going to the Chilko spawning area. In the Horsefly River, the major spawning-ground of the Quesnel districts, 6,829 3-year-old sockeye, including a few females, were counted. The presence of this large number of jack sockeye tends to further support the expectation that the 1953 Horsefly run entering the fishery may possibly total several hundred thousand sockeye. A run of 6,883 sockeye spawned in Gates Creek at the head of Anderson Lake on the Seton-Anderson tributary system. This represents a substantial resurgence of a run that has been of minor size since the Hells Gate disaster in 1913. Taseko River, tributary to the Chilko River, had a total spawning population of 3,647 sockeye in 1952. This remote system has not been recorded as a producer of sockeye until very recent years. The run was distinct in timing of arrival and spawning from the 1952 Chilko run. Spawning populations in the Fraser-Francois and the Stuart Lake systems increased substantially over those of previous cycle-years. Driftwood and Middle Rivers spawning-grounds continued to remain practically barren on this cycle. Sockeye runs to the Raft River and to the Seymour River increased substantially over those occurring in 1948. The year 1952 was an off-year for the Lower Adams River; consequently, the run was of minor size. The escapement to the Birkenhead River spawning area declined significantly for the second year in succession. There is a possibility that channel changes for flood-control purposes may have impaired productivity of the area.

The Commission began experimental operations at its Horsefly Lake hatchery in 1949. In 1952 thirteen 3-year-old mature male sockeye, seven of which were marked, returned to the outlet of the hatchery ponds on Horsefly Lake. These fish represented the first return from 1949 operations. Discussion and interpretation of the biological significance of the return to the hatchery, rather than to the point of planting some miles away in Quesnel Lake, will be undertaken in a Commission publication. It is considered

that the precocious males or jacks mentioned above forecast the arrival of larger numbers of 4-year-old adults at the hatchery pond outlet in 1953.

In 1952 the Commission planted 269,000 sockeye fingerlings of the late Adams River race in Mabel Lake, in the Shuswap River drainage. In addition, 131,000 sockeye fingerlings from the late Adams River race were planted in the Little Horsefly River; 28,000 sockeye fingerlings of the Seymour River stock were planted in Salmon Arm of Shuswap Lake, at the mouth of Salmon River; 23,000 fingerlings raised from eggs taken in the Seymour River were planted at the mouth of Anstey River, in Anstey Arm of Shuswap Lake; 356,000 sockeye-eggs from the Seymour River were taken to the hatchery during 1952 for incubation and rearing at the Horsefly station.

The Commission's activities in the fields of administration of the fishery, research to establish administrative policy, and in maintenance of structures such as fishways continued as usual during 1952. The problem of protection of the vital spawning and rearing areas of the Fraser watershed increased in gravity during the year. Closure of the Kenney Dam on the Nechako River brought into existence problems in maintaining access of certain sockeye races to Nechako spawning tributaries. The Department of Fisheries of Canada and the Commission have collaborated in intensive research and reports on solutions to the fisheries problems caused by this project. Sockeye runs to the area in 1953 will be the first to face the new conditions. Provision has been made for release of stored water from a reservoir below the dam-site to assist the migration of sockeye salmon through shallow areas and to assist the migration and spawning of spring salmon. Expected high temperatures in the residual Nechako River may endanger the survival of certain races of Nechako sockeye. No provision has been made by the company for solution of this phase of the problem.

Rapid economic development of the Province of British Columbia in recent years has caused a growing demand for one of the Province's most valuable assets—water. Proposals for, or actual starts on the construction of, hydro-electric projects, pulp-mills, oil-refineries, irrigation and reclamation projects, and pipe-lines for oil and gas all constitute potential hazards for salmon spawning in the Fraser watershed. In every case analysed to date a solution allowing economic maintenance of both fish and industry has been devised. Adequate laws and an attitude of co-operation and tolerance on the part of all water-users will allow maximum development of new water uses and a maintenance and increase of the sockeye resource. Vigorous research will provide further answers to the problems arising from common occupancy of the watershed.

Members of the Commission during 1952 were as follows: Canadian Commissioners—A. J. Whitmore (secretary), Senator Thomas Reid, Olof Hanson (January to June), and H. R. MacMillan (July to December); United States Commissioners—Robert J. Schoettler (chairman), Albert M. Day, and Elton B. Jones.

# SALMON-SPAWNING REPORT, BRITISH COLUMBIA, 1952

By A. J. Whitmore, Chief Supervisor of Fisheries

## GENERAL

*Foreword.*—Two happenings, each outside the usual pattern of events, and each having entirely different bearing on stocks of salmon for reproduction purposes, occurred during the year, as follows:—

1. Cessation of net-fishing while fishing fleets were tied up on two occasions during the season pending price and other negotiations between the fishermen's union and the operators. The initial tie-up in July, extending over a six-day period at the peak of the sockeye migration along the northern coast, permitted an abnormally large escapement of that species for that part of the season in the Rivers Inlet, Smiths Inlet, Bella Coola, and Skeena areas. The later tie-up in September and October extended over forty-four consecutive days, at the time of migration of cohoe and chum salmon through the fishing areas en route to their various spawning-grounds along the coast. Many thousands of salmon which normally would have been utilized by the industry found a clear passage to their spawning streams and grounds. In the case of chums, to a good many areas along the coast this happening was perhaps fortunate; the chum runs proved out to be below normal strength, and in some cases, despite little toll by fishermen, the supplies reaching the spawning-grounds were not too generous.

2. The other unscheduled event was of converse character. Adverse low water-levels in the streams on Vancouver Island and the Lower Coast of the Mainland, resulting from lightest rainfall during the months of October and November for many years, interfered with and retarded the normal escapement of the latter part of the pink-salmon run and the early portion of the chum and cohoe runs for a prolonged period beyond the usual time these fish enter the streams.

*Sockeyes.*—With one exception, the supplies of sockeye spawners were well maintained in all the principal spawning areas for this species. Escapement to streams of the Rivers Inlet watershed was very heavy, attributable in large measure to the suspension of operations by the gill-net fishing fleet for a six-day period during the peak of the run in July. Similarly, the spawning escapement to Smith Inlet was also heavy. Bella Coola and Nimpkish spawning areas were also heavily seeded. The supplies of spawners in the Nass and Clayoquot areas were satisfactory.

Under the rehabilitation programme for the Fraser River sockeye by the International Pacific Salmon Fisheries Commission, the 1952 escapements to the various spawning areas of this large system appear to be very satisfactory. Generally, the escapement was distributed more favourably than in the 1948 cycle, when the large share was concentrated in the Chilko and Birkenhead systems.

Skeena River spawning stocks again encountered major difficulty. Numerically, the escapement was the largest for many years; this also was due in appreciable measure to the July suspension of fishing operations by the gill-net fishing fleet for a six-day period. The larger portion of the spawning stocks again met with difficulty in the Babine River, where a large rock-slide in the late spring or early summer of 1951 in a remote canyon caused high mortality of the 1951 run. An access road, some 60 miles in length, from Hazelton to the slide area had been completed, and arrangements designed to assist the passage of fish past the slide area were in hand by the time the 1952 run appeared. Under the direction of Departmental engineers and biologists, the passage of substantial numbers of fish was achieved; that is, 376,947—more than double the number which succeeded in passing in 1951. Unfortunately, effective spawning did not materialize from many of the fish passing the obstruction, and it is the view of the local fishery officers that the over-all effectual sockeye spawning may not be much, if any, greater than that

which took place in 1951. It seems inevitable that the return from the 1952 spawning will, like that of 1951, be substantially lower than would normally be expected from normal cycles of the important and prolific Babine area. Based on specialized investigation and study of the unique and rugged conditions prevailing in the slide area, extensive work is now proceeding under major contract to move all material from the slide and to restore conditions at the point of obstruction to the natural state before the 1953 runs arrive.

*Springs.*—The spring-salmon seeding of the Fraser River watershed was again satisfactory, well up to average in the Prince George and Quesnel-Chilko areas and showing some increase in lower sections of the watershed. The escapement to Harrison River was exceptionally large. In District No. 2, the Bella Coola River was heavily supplied; elsewhere the return was light to moderate. Escapement to the Babine area was reduced by the Babine slide. In District No. 3, stocks of this species were fairly satisfactory on most of the spawning areas, including such streams as Cowichan River, Campbell River, and Puntledge River.

*Cohoes.*—Cohoe-supplies in District No. 1 were excellent. Surprisingly large numbers were observed in the Kamloops area, while increasing numbers were noted in the Nicola watershed. Elsewhere very satisfactory seedings occurred. Supplies to the Squamish system were much above average. In District No. 2, the over-all escapement was light to moderate, notwithstanding little commercial fishing was conducted in the district after September 7th. In District No. 3, supplies were generally satisfactory and of fairly good proportions in all areas, with the exception of the Alert Bay, Victoria, and Nootka areas, where light returns only were reported.

*Pinks.*—Being an off-year for pink salmon in the Fraser system, none of this species was expected or observed. In District No. 2 there was a run of pink salmon of unexpected proportions to all Queen Charlotte Islands areas, and seeding of this species was heavy in practically all streams frequented by this variety. Other important pink-salmon areas, such as Grenville-Principe, Butedale, and the Bella Bella areas, were also well stocked. The escapement to Bella Coola River is reported to be adequate, although much smaller than those of 1950 and 1951. The Babine slide reduced the escapement in the Babine River, but elsewhere in the Skeena, seeding of the important grounds was exceptionally heavy. In District No. 3, supplies were very good in practically all streams in the Alert Bay, Quathiaski, Comox, and Quatsino areas; elsewhere pink spawning stocks were light. A note of interest is that pinks reappeared in sizeable numbers in Barkley Sound after an absence of many years; although numbers were not great, improved showings of pinks were in evidence in the Clayoquot, Nootka, and Kyuquot areas.

*Chums.*—The over-all run of chums to the Province was well below average, and although comparatively lightly exploited commercially, spawning stocks, with few exceptions, ranged from light to moderate in all streams. In District No. 1, Fraser River supplies are considered adequate, although generally below brood-year levels. The Squamish and Indian Rivers were heavily seeded. In District No. 2, satisfactory seedings occurred in the Queen Charlotte Islands areas, but elsewhere spawning was disappointing; unquestionably, from a conservation standpoint, it was fortuitous that commercial operations were negligible after September 7th. In District No. 3, the escapement was generally moderate in all areas, with the exception of Alert Bay, Quathiaski, Comox, and Victoria areas in the East Coast Sub-district, and Barkley Sound and Nitinat areas in the West Coast, where seedings were generally light and below average.

## IN DETAIL

### Masset Inlet and North Coast of Graham Island Area

The over-all escapement of cohoes was comparatively light and somewhat less in numbers than for some years. Generally, the seeding of pinks over the area was heavy,

and in the case of some streams very heavy, the exception being Lignite Creek in Naden Harbour, which was only lightly supplied. Yakoun River in Masset Inlet was exceptionally well stocked. Naden River in Naden Harbour was also heavily seeded. Supplies of chums on the spawning-grounds were satisfactory.

### Skidegate Inlet and West Coast of Graham-Moresby Island Area

Generally the seeding of cohoes was very satisfactory in Skidegate Inlet and in Tlell and Copper Rivers, but supplies in the west coast section were light. The run of pinks to this area was much heavier than anticipated, and the escapement was excellent. Particularly heavy supplies were noted in Copper River, Dena River, and Brown's Cabin Creek, and also in Kaisun River and Riley Creek on the west coast of Moresby Island. Better than average seeding of chums occurred in all streams frequented by this species, largest escapements occurring in Long Arm Creek in Skidegate Inlet and Tasu Creek and Flat Creek in Tasu Harbour on the west coast.

### East Coast of Moresby Island and South Queen Charlotte Islands Area

There was a moderate to heavy seeding of cohoes in all streams frequented by this species. Those streams receiving best spawnings were Bag Harbour, Pallant and Salmon Rivers, Big Goose Bay, Mathers and Chadsey Creeks, Lagoon Bay stream, and Tar Island stream. The run of pinks to this area was also much larger than expected. Very heavy supplies were noted in Skeedans Bay Creek, Mathers Creek, Pallant River, Windy Bay and Tar Island streams. A fairly heavy seeding of chums occurred over the entire area, with the majority of streams showing a marked increase over the brood-year. Practically the entire run of this species reached the streams intact due to lack of commercial fishing effort. Very heavy spawnings took place in George Bay and Lagoon Bay, Dana and Sewell Inlets, Pallant and Mathers Creeks, Salmon River, Harriet and Bag Harbours, and Big Goose Bay. Elsewhere supplies ranged from medium to heavy.

### Nass Area

There was a better than medium escapement of sockeyes to Meziadin Lake area, the principal spawning-grounds of this species in the Nass system. A light to moderate escapement of spring salmon occurred, the exception being the Meziadin Lake area, where supplies were light. At the time of inspection, cohoe stocks were generally light, but new-run fish were continuing to arrive on the grounds. Generally, the escapement of pink salmon was light, including streams in Wark Channel, Khutzemateen, and lower tributaries of the Nass River as well as Quinimass River. The over-all seeding of chums was better than medium, showing some improvement over the brood-year. The chum run was only lightly fished.

### Skeena Area

*Babine-Morice Area.*—Work commenced during the fall of 1951 on the access road to the rock-slide in the Babine River, which had prevented at least two-thirds of the 1951 run of Babine sockeyes, or about 50 per cent of the Skeena River supply, from reaching their spawning-grounds, and was completed by early July, and equipment and materials were moved in to provide temporary measures in assisting the 1952 run past the slide area. It was the middle of July before any sockeyes appeared and the end of July before appreciable numbers were in evidence. As the outlet of the lake formed by the slide had dropped about 5 feet during the winter, it seemed likely that salmon might negotiate the obstacle more readily than in 1951, when 150,000 succeeded in making the passage. When reports from the counting-fence maintained at the outlet of Babine Lake by the Fisheries Research Board at the end of the first week in August showed that no appreciable numbers had arrived there, marginal rock work in the river along the foot of the slide was at once commenced and continued throughout the migration period as necessary to meet changing water-levels. Aided by this assistance, substantial portions of the runs of sockeyes, springs, and cohoes were able to pass up-stream. Unrevised figures of

salmon passing through the counting-fence are: Sockeyes, 376,947; springs, 5,915; cohoes, 10,554; pinks, 2,704; and chums, 1.

While a sockeye escapement more than twice as large as the previous year was secured, the resident fishery officers for the Babine area are very definite in their conclusions, as of close continuous observation, that the over-all effectual spawning may not be greater than that of 1951. A number of small tributary streams were dry or lacking adequate water for spawning. They considered many of the fish appeared to be in poor condition, and there was a substantial mortality of unspawned fish. On the other hand, they reported favourable spawning conditions prevailed in larger streams, with prospects of effective spawning.

In addition to the spring salmon passing through the counting-fence, over 2,000 are estimated to have spawned below the fence. General seeding of this species is considered light. The cohoe-run commenced very poorly, but with later improvement an average spawning was reached. Loss in dead, unspawned cohoe was estimated at approximately 30 per cent of the total by the local fishery officers. The escapement of pinks was exceedingly light, and great numbers reaching the slide area failed to negotiate the difficult passage. The Bulkley River system received a medium seeding of sockeyes. Moderate supplies of spring salmon and cohoes were also present, and the local officer estimates that about 2,000 pinks passed through the fishways at Moricetown Canyon. These spawned near the confluence of the Bulkley and Morice Rivers. A few pinks were also observed in the Bulkley a short distance above Houston. Moderate supplies of sockeyes spawned in the Bear Lake and River system. The seeding of spring salmon in Bear River is reported to be moderate, estimated at from 5,000 to 10,000. Pink supplies were moderate there also, estimated at 5,000 to 10,000.

*Lakelse Area.*—A satisfactory seeding of sockeyes occurred throughout the area, including Lakelse Lake and the Kispiox system. Spring salmon stocks appeared to be slightly better than average. Good supplies of cohoes were in evidence, much improved over the cycle-year 1949. Very large pink-salmon supplies occurred throughout the area, Kitwanga, Kispiox, Zymoetz, and Kitsumgallum Rivers being the main spawning-streams. Small quantities of chums spawned in this area.

### Lower Skeena Area

Generally, the escapement of sockeyes to streams of the Lower Skeena was satisfactory, including Johnson Creek, Diana Creek tributary to Kloiya River, and Shawatlan Lake system. The fishway in the dam of the Columbia Cellulose Company in Kloyia River was again in operation, and the several varieties of salmon frequenting the system experienced no difficulty in passing through it. Spring-salmon supplies in Johnson Creek tributary to the Ecstall River were satisfactory. There was heavy escapement of pinks to all pink-salmon spawning-grounds in the area, showing increase over the brood-year 1950. Generally, supplies of cohoes were light in all streams. Chum spawners showed marked increase over the brood-year.

### Grenville-Principe Area

Escapement of sockeyes generally was light to medium, much in line with that of the brood-years 1947 and 1948. Notwithstanding greatly decreased fishing effort as a result of the fishermen's strike, the cohoe spawning in the majority of creeks and rivers was light. Pink-salmon stocks were generally satisfactory and somewhat heavier than those of the brood-year 1950. In the northern portion of the area, heavy seedings occurred in the streams of Kitkatla Inlet, North Arm of Kitkatla Inlet, Ogden Channel, North Grenville Channel, Petrel Channel, as well as Principe Channel, with the exception of Bare Creek, which was moderately stocked. Pink-supplies in the southern portion of the area were medium; that is, in Seven Mile Creek, Turtle Creek, and Turn Creek, chief producers in this locality. Noteworthy feature was the excellent run of pinks to the west

coast of Banks Island, where such streams as Rawlinson Creek, Skull Creek, and Bonilla Arm Creek received moderately good seedings. The over-all chum spawning was very light, notwithstanding little fishing effort for the late run of chums. Supplies in almost every creek in the area were light and disappointing. Exceptions were Turn Creek, Stewart Creek, and Havenor Inlet Creek, where supplies were moderate.

### Butedale Area

Generally, there was a medium escapement of sockeyes, slightly less than that of the brood-year. Both the Kitlope and Kitimat Rivers showed decrease, but there was definite increase in the Aristazabal Island streams. There was a moderate seeding of cohoes with stocks about equal to those of the brood-year. Several of the larger rivers showed some decrease, but streams in the area generally had a fairly good spawning of this species. The pink spawning was highly satisfactory and far surpassed that of the brood-year. Kitimat River, Quaal River in Old Hartley Bay, and Bear River experienced particularly good seedings, as did also streams in Aristazabal Island. The escapement to Laredo Inlet streams did not come up to expectations. Stocks of chums were light, but numbers on the spawning-grounds did slightly exceed those of the brood-year 1948. The seeding in the northern portion of the area was about the same as that of the brood-year, and this also applied to the creeks on Aristazabal Island. Streams in Finlayson Channel, Tolmie Channel, and Sheep Passage showed increased escapements, and a small increase was noted in Laredo Inlet. A particularly good spawning occurred at Price Creek in Higgins Passage. The spring-salmon seeding was about average, with good numbers noted in Kitlope River.

### Bella Bella Area

Sockeye-supplies were below normal in the limited spawning-grounds in this area. The number of spawners in Tinkey River, the main producer, was less than a third of the brood-year. Generally, the seeding of cohoes was moderate and somewhat better than the cycle-year 1949, Kajustis, Noota, and Sally River systems receiving excellent stocks. The escapement of pinks to all but the smaller streams was heavy. Kainet River in Kynoch Inlet was heavily stocked. Supplies in Salmon Bay were good, and in Neekas, Howyit, and Gullchuck Rivers the returns were above brood-year levels. Notwithstanding a lack of any intensive fishing effort, the chum spawning was moderate and only slightly above brood-year levels. While fair numbers reached such important streams as Neekas, Howyit, Salmon, Klatse, and Kainet Rivers, spawning in most of the smaller streams was light.

### Namu-Bella Coola Area

Sockeye stocks in the Bella Coola-Atnarko River systems, the main producer of this species, were heavy, about 35 per cent of the run being jacks. Spawning in the Kimsquit system was moderate, and in other streams light. Escapement of springs to this system was by far one of the best recorded in recent years. Moderate supplies of cohoes were observed in all streams. The pink run to the Bella Coola-Atnarko system was comparatively light compared with that of the brood-year 1950, but is considered an adequate run. Koeye River received a good seeding. Supplies in Kwatna River were moderate, while the smaller streams were lightly to moderately supplied. There was a moderate over-all escapement of chums, showing considerable increase over the brood-year. The seeding in Cascade, Elcho, Kimsquit, and Kwatna Rivers was heavy, and light to medium in the other streams in the area.

### Rivers Inlet Area

Aggregate seeding of sockeyes in the Owekano Lake spawning areas was very heavy—much heavier than expected—due to six-day cessation of gill-net fishing during July. Waukwash, Indian, Genessee, Quap, and Dalleck Rivers were very heavily seeded,

while largest supplies for at least twenty-five years were present on the spawning area at the outlet of the lake. Shumahault Flats were heavily seeded, while supplies in Nookins and Asklum Rivers were moderately heavy. In Cheo and Shumahault Rivers the escapement was medium. Spring-salmon stocks were light in all streams; that is, Waukwash River and the outlet of Owekano Lake, as well as in Chuckwalla River. Cohoe spawning was moderate, on a par with the cycle-year of 1949. There was a heavy escapement of pinks to Hole-in-the-Wall River, otherwise spawning of this species was light. While the chum run was only lightly exploited, the escapement was generally light to medium.

### Smith Inlet Area

Heavy supplies of sockeyes reached the spawning-grounds in this area, although less than the bumper escapements of 1950 and 1951 were considered on a par with the cycle-year 1947, and a definite improvement over the cycle-year 1948. Supplies were heavy on the Delabah and Geluck Rivers, which comprise the principal spawning-grounds of this species. Supplies of spring salmon to the Docee River were moderate, showing improvement over the past four years. The seeding of cohoes was light, similar to the brood-year. There was a heavy escapement of pinks to the Nekite River, the main spawning-grounds of this species. The chum run, although lightly fished, was only moderate.

### Alert Bay Area

The escapement of sockeyes to the various spawning-streams in this area was generally satisfactory. This species was abundant on all spawning-grounds in the Nimpkish River system, the fish being on the average larger in size and more numerous than in 1951. Fish, in large quantity, en route to the upper spawning areas again met with serious obstruction at Karmutsen Falls due to unfavourable seasonal water-levels. The seeding of spring salmon was normal and comparable with last year. The cohoe run to this sub-district was much lighter than the good return last year. Satisfactory seedings occurred in the Nimpkish and Quatse Rivers on Vancouver Island and in the Bond Sound streams and Glendale River on the Mainland. Only light to medium supplies were present in the other streams normally frequented by this variety, notwithstanding lack of net-fishing effort during the period of the fishermen's strike. Once again, as in 1950 and 1951, there was an outstanding abundance of pinks on the spawning-ground throughout the area generally. The run extended over a longer period than usual, and over-all escapement was augmented to some extent by the fishermen's strike. Quatse and Keogh Rivers on Vancouver Island were heavily seeded. Streams on the Mainland side were also extremely well seeded, although it was the off-year for pinks for that part of the sub-district. Notwithstanding lack of fishing operations during the seven-week strike period in September and October, the spawning of chum salmon in the streams throughout the area was generally lighter than in recent years, particularly so in the Mainland streams. Ahnuhatti, Kakweiken, and Glendale Rivers were satisfactorily seeded. Keogh and Nimpkish Rivers on Vancouver Island had good supplies, while the remaining Vancouver Island streams, particularly those flowing into Johnstone Strait, were only lightly seeded. Although chums continued to ascend the Nimpkish River until approximately the end of the first week in December, no new or fresh-run chums were in evidence after November 15th.

### Quathiaski Area

Only moderate stocks of sockeyes occurred in Hayden Bay Creek, while average supplies reached Phillips River. Generally, the escapement of spring salmon compared favourably with last year; better than usual numbers of this species spawned in Salmon River, and a substantial seeding occurred in Campbell River, an increase over the past three seasons. Fair supplies were observed in the Homathko River, but numbers in Southgate and Orford Rivers and Phillips Arm were somewhat below average. Comparatively heavy supplies of cohoes were seen in practically all streams in this area,

showing substantial increase over the brood-year spawning. Particularly good seedings took place at Bear, Campbell, Homathko, Orford, Phillips, and Salmon Rivers, and Granite, Hayden Bay, Know Bay, Menzies Bay, Mohun, Read, Simms, and Village Bay Creeks. Pink-supplies were good, with heavy escapements to Salmon River, Bear River, Menzies Creek, and Campbell River. Good escapements also took place in streams on the Mainland, particularly in Topaze Harbour and Loughborough Inlet. Generally, the escapement of chum salmon showed marked decline from the satisfactory seeding in 1951. On the Vancouver Island side, Bear and Campbell Rivers showed greatest decrease. On Quadra Island, with the exception of Hyacinth Bay Creek, all streams were more lightly seeded than in 1951. On the Mainland, marked decline of supplies was noted in such streams as Apple River, Fraser Creek, Hayden Bay Creek, Phillips River, Quatan River, Southgate River, and Eva Creek.

### Comox Area

This is not a sockeye area. The spawning of spring salmon in the Puntledge River, the principal spawning-stream for this variety, was somewhat below the average of the past four seasons, particularly so in the case of late run of this species. There was an estimated total of 4,000 spawners in this river. Special measures in respect to both sport and commercial fishing were taken in the interests of conservation of this species. Light runs of spring salmon also occurred in Oyster, Big Qualicum, and Little Qualicum Rivers. Generally, the escapement of cohoes was good, above average runs occurring in Oyster, Puntledge, Tsolum, Big Qualicum, and Little Qualicum Rivers. Average seedings occurred in the remainder of the streams in the area, with the exception of Kitty Coleman Creek. Cohoes were unable to enter French Creek before November 5th, or Black and Kitty Coleman Creeks before November 13th, due to low water. Pink-salmon stocks were strong in the principal streams. Puntledge and Tsolum Rivers received heavy seedings, although first arrivals were delayed from ascending Tsolum River due to adverse water-levels. There was also a heavy run of this species to Oyster River. Light supplies were observed in Big and Little Qualicum Rivers, Tsable River, and Cook Creek. Chum-supplies were below average. While Oyster River, Tsable River, and Waterloo Creek received better than normal seedings, the escapement to the more important streams—Puntledge, Big Qualicum, and Little Qualicum Rivers—was only fair and below average.

### Pender Harbour Area

A total of 6,212 sockeyes entered Saginaw Lake, which compares favourably with the escapement of recent years. Supplies of this species in the Tzoonie River at Narrows Arm were light to medium. Spring-salmon supplies were normal. Generally, the escapement of cohoes was light to medium; the early run to Brem, Squawaka, and Tzoonie Rivers was smaller than usual. Initial run to Wilson Creek was in good medium strength, but experienced some delay in reaching the spawning-grounds through adverse water-levels. These low-water levels retarded the ascent of early-run cohoes to the spawning-grounds of practically all small streams throughout the area. The later cohoe run, which appeared in light to medium strength, was able to enter without any delay. In this area 1952 was the off-year for pink salmon. Normal, small off-year pink-salmon spawnings occurred in Wilson Creek, Vancouver Bay River, and Mission Creek. These runs received drastic set-back due to low water resulting from the abnormal drought conditions during the period of the pink-spawning migration. Escapement of chum salmon was light generally. Medium heavy spawnings occurred in Deserted Bay and Theodosia Rivers, but in the majority of the remaining streams, supplies were disappointingly small; two of the larger streams—the Squawaka and Vancouver Bay Rivers—were particularly lightly supplied. The initial movement of chums into the streams throughout the area was also drastically retarded by adverse water-levels.

### Nanaimo-Ladysmith Area

The run of spring salmon to the Nanaimo River was only fair and slightly lower than average. The fish were hampered by low water-levels, and most of the spawning occurred in the lower reaches of the river. The over-all cohoe escapement to the sub-district was satisfactory. Due to adverse low-water conditions—for the second successive year the area experienced a prolonged drought period—the early arrivals were retarded from moving on to the spawning-grounds. Minor supplies of pink salmon were observed in the Nanaimo and Englishman Rivers. Chum-supplies were light to medium and below average in all streams, including the principal producers, the Nanaimo and Chemainus Rivers.

### Cowichan Area

The escapement of spring salmon compares favourably with the escapements of recent years. The cohoe seeding was good. The spring-salmon run and early cohoes were delayed in reaching their spawning-grounds due to low water-levels. There were only fair supplies of chums.

### Victoria Area

Cohoe-supplies were light in all streams other than Goldstream River, where medium seeding occurred. Escapement of chums was also light in all streams, with the exception of Sooke and Goldstream Rivers, these being well seeded.

### Alberni-Nitinat Area

The sockeye escapement to the Somass River system was disappointing. It is estimated that approximately 10,000 to 12,000 sockeye entered Great Central Lake and from 8,000 to 10,000 reached Sproat Lake, or about half the brood-year estimation. The new concrete fishway of vertical-baffle type, completed at the falls in Sproat River in the fall of 1952, eliminated difficulty experienced in past years at that point at certain water-levels. Satisfactory supplies reached Anderson Lake, and the number of spawners in the Hobarton Lake system was well up to average. Spring-salmon supplies were satisfactory and equal to or slightly better than the brood-year in the Somass, Nahmint, Sarita, Toquart, Effingham, Anderson, San Juan, and Gordon Rivers. Numbers of this species in Nitinat River were below average. The cohoe escapement on the whole was very good, notably to the San Juan, Gordon, and Somass Rivers. Two exceptions were the Toquart and Effingham Rivers, where the escapement was somewhat below average of recent years. Pinks reappeared in this sub-district in sizeable numbers after an absence of many years. About 2,000 spawned in Sarita River, 1,500 in Toquart River, and 1,000 in Nahmint River. Generally, the chum-salmon seeding was light in all streams; exceptions were Grappler Creek, Canoe Pass Creek, Salmon Creek, and Toquart River, where fairly good spawnings occurred. Notwithstanding that there was total closure of chum-fishing in the Nitinat area, the seeding of this species can only be considered as fair.

### Clayoquot Area

There was a good escapement of sockeyes to the Kennedy Lake system, with satisfactory seeding on all beds. Escapement of this species to the Megin River was also good. The seeding of spring salmon was average in most streams frequented by this species, with the exception of Cypre River and Tofino Creek, where below normal runs occurred. Generally, cohoe-supplies were satisfactory. The early-run fish were delayed off the streams until October 20th, the end of a prolonged dry spell. About 2,000 pink spawners were observed in Megin River and several hundred in Moyeha River. The seeding of chums was generally fair throughout the area, exceptions being Sidney and Holmes Inlet streams, where supplies were light. Tranquil Creek was again heavily seeded.

### Nootka Area

Spring-salmon supplies on the limited grounds in this area were somewhat below normal. Cohoe stocks, although late in arrival, were fair and showed some improvement over the cycle-year. Although pinks have not always frequented this area, there was fairly good seeding of this species in Gold and Burman Rivers, showing some increase of the 1950 spawning. The chum-salmon spawning was generally only fair, with the exception of Gold and Burman Rivers, where the escapement was good. Due to adverse water-levels, spawning of the earlier portion of the run of this species was retarded.

### Kyuquot Area

Escapement of spring salmon to all streams showed slight increase over 1948. Most noticeable increase was in the Tahsis River, the largest single producer. Although pink salmon do not normally frequent the streams in this area in any large volume, there was a very good seeding of this species in Battle, Tahsis, Clanninick, Narrowgut, Kaooinch, Artlich, and Kaouk Rivers, showing very definite improvement over the brood-year 1950. Generally, cohoe-supplies showed marked increase over the brood-year 1949. Chum-salmon supplies were medium to heavy in all streams, showing substantial improvement over the brood-year 1948. Increases were most noticeable in Tahsis, Narrowgut, Ououkinsh, McKay, Malksope, Kauwinch, Chamiss, Amai, and Battle Rivers. Chum spawning in the remaining streams was moderate.

### Quatsino Area

There was again some increase in the small runs of sockeye to this area. Increasing spring-salmon supplies occurred in Marble Creek and Spruce River. The cohoe seeding was moderately good and, although not as great as last year, was much better than the brood-year. Quite good runs materialized in the inside streams, particularly so in Marble and Spruce Rivers. Seeding of the streams in the Upper West Coast section was satisfactory. There was excellent escapement of pink salmon, outstanding spawnings occurring in Koprino River, East Creek, Browning Creek, Rupert River, Ingersoll River, Fisherman River, and Johnson Creek. The 1948–52 chum-salmon cycle is the poorest of any in this sub-district. Generally, the escapement of this species was moderate, best seeding taking place in the streams in Winter Harbour and in Holberg Inlet with the exception of Hathaway River. Upper West Coast streams received fairly satisfactory supplies, while spawning in the streams of Quatsino Sound was light.

### Fraser River

*Prince George Area.*—The sockeye escapement to this area was almost three times greater than the brood-year 1948. A total of 34,500 sockeyes are estimated to have spawned in the Stuart Lake system, compared with 12,300 in 1948. The early run, estimated at 33,500 sockeye, commenced to arrive at the outlet of Stuart Lake on July 18th and spawned in streams tributary to Takla Lake and Middle River. A small late run spawned chiefly in Middle and Tachie Rivers. Approximately 42,000 sockeyes spawned in the Fraser-Francois watershed, an increase from 14,000 in 1948 and 4,000 in 1944. The late run, estimated at 40,000 fish, spawned in the Stellako River. The Nadina River was stocked with some 1,700 early-run sockeye, compared with 30 in 1948. The local officer reports that spawning conditions generally throughout the whole area were considered to be quite good. Supplies of spring salmon in the Upper Fraser and streams tributary thereto were medium to heavy. Supplies of this species spawning in the Nechako River were estimated at 3,800. Diminished flow of the Nechako River, resulting from closure of Kenney Dam at Nechako Grand Canyon on October 8th last, will have adverse effect on this spawning, as most of the spring salmon redds became exposed, either totally or partially. Spring-salmon stocks in the Stuart River were reported to be medium.

*Quesnel-Chilko Area.*—The run of sockeye to Chilko River was considered to be heavy; a veteran observer for the Department for twenty-nine consecutive seasons estimated numbers of sockeye on the Chilko spawning-grounds to be at least equal to the large return of the brood-year 1948. The run commenced through Farwell Canyon on August 3rd and increased in intensity until the peak was reached, lasting four days from August 14th to 17th. From August 17th to 24th the run, although still heavy, decreased steadily in volume. After August 24th very few fish were passing up-stream through the lower reaches of the river. Supplies were well distributed over the entire Chilko spawning area. Considerable numbers of sockeyes were also noted spawning in the Nemiah area, in the bay and well up in the creek itself. Approximately 185 sockeyes spawned in the Horsefly River, compared with 51 in 1948; and, of important significance, approximately 6,000 jack sockeye were counted on the Upper Horsefly. Sockeye-supplies to the Upper Bowron River showed approximately a 25-per-cent decrease when compared with the brood-year seeding of 25,000 spawners. Numbers of parent spring salmon in the Taseko River and Elkins Creek were average. The Chilcotin River spawning of this species was normal. Some increase in numbers was noted on the Upper Horsefly River. The return of spring salmon to the Likely area of the Quesnel River did not equal the brood-year in numbers and appeared to be late in arriving. Supplies in the Bowron system compared favourably with those of the brood-year.

*Kamloops Area.*—This is considered an off-year for sockeyes in this area. The early run comprised of upwards of 14,000 sockeyes spawned in Raft River in the North Thompson area, and in Seymour and Scotch Creeks in the Shuswap Lake area the return was about on a par with the brood-year. The late run, estimated to be between 12,000 and 13,000 sockeyes, spawned mostly in Adams River system and showed some decrease from the brood-year. A fair increase in spring-salmon supplies throughout the watersheds of both the North Thompson and the Shuswap Lake area was noted, particularly so in the South Thompson, Shuswap, Adams, and Salmon Rivers. Cohoe-supplies were surprisingly large, showing increase over the brood-year, best escapements occurring in Deadman, Adams, Salmon, Eagle, and Raft Rivers.

*Lillooet Area.*—The local fishery officers report the run of sockeye was large (estimated at 125,000) to the Birkenhead River this season, compared with their reports of upwards of 100,000 in the brood-year 1948. About 25 per cent of the run were jacks. Although water-levels were somewhat lower during the spawning season this year, they did not fluctuate to any great extent, with the result that spawning conditions were favourable. The rock groin was repaired near Creekside, at which point important spawning-grounds are located, and the river there was contained in one channel instead of two as in former years. There was also a comparatively large return of sockeye to Gates Creek in the Seton-Anderson system, estimated at about 5,000. The run of spring salmon to the Birkenhead River was somewhat above average, estimated at approximately 900. Small supplies of this species were also present in Seton, Portage, and Gates Creeks. A light run of springs, estimated at 50, was present in the Yalakom, tributary to Bridge River. Cohoe-supplies in the Birkenhead River system were much heavier than in any recent years and were estimated to be approximately 36,000 in numbers. Upwards of 500 cohoes spawned in Gates Creek. Salvage of the spring-salmon run to Bridge River at a point below the diversion dam was continued by the Fish Culture Branch, and a total of 384,900 spring-salmon eggs was secured. One hundred thousand three hundred eggs were planted in Yalakom River and the remainder in Gates Creek.

*Yale-Merritt Area.*—Spring-salmon stocks in the Nicola system were satisfactory, showing some increase over last year and large increase over the brood-year 1948. It is estimated that approximately 8,400 spring salmon spawned in the Nicola River, while 1,860 were present in Spius Creek and 1,720 in the Coldwater River, both tributary to the Nicola River. Heaviest concentrations were in the 2-mile stretch of the Nicola River

in the immediate vicinity of Merritt. Cohoe-supplies are continuing to build up in the Nicola system; approximately 700 of this species spawned in the Nicola River, 1,200 in the Coldwater River, and 1,100 in Spius Creek, showing an increase when compared with the brood-year 1949. A small run of some 400 cohoes was also observed in the Nahatlatch River. This being the off-year, no pink salmon were observed in the area.

*Chilliwack Area.*—There was some increase in the number of sockeyes reaching the Cultus Lake spawning areas, 18,200 being counted through the fence into the lake, compared with a count of 12,000 in 1948. There was also considerable increase in the run of this species to the Chilliwack Lake system, where 1,000 were observed, compared with the average stocks of less than 100. Approximately 500 spring salmon were present in the Chilliwack-Vedder River. There was an excellent cohoe escapement to the Chilliwack-Vedder River. Anglers experienced excellent fishing from this run. Lorenzetti Creek was also well seeded with this species. Other streams in the area received light to medium seedings. As this was an off-year for pink salmon in the Fraser River watershed, none was observed in any of the streams in this area. Generally, chum-salmon supplies were satisfactory, derived mainly from early-run fish. The later run was extremely light compared with late runs of recent years. The Chilliwack-Vedder River and Sweltzer Creek were well seeded. In the smaller streams, those showing increased runs were Succer and Jones Creeks. Others received light to medium spawnings.

*Mission-Harrison Area.*—Notwithstanding supplies of sockeye generally were not up to the strength of the excellent escapement in the brood-year, they are considered adequate. There was some loss of the earlier runs of this species due to lack of water in some streams as a result of the dry spell. The lower portion of Weaver Creek, up which this species ascends to the main spawning-grounds, went completely dry, and there was some considerable loss before remedial measures could be undertaken. It is estimated that between 15,000 and 17,000 sockeyes spawned in Weaver Creek, compared with 20,000 in the brood-year, and an additional 2,000 to 3,000 sockeyes in other waters such as the Lower Chehalis and Harrison Rivers. Supplies in Big Silver River, estimated at 10,000 to 12,000, were slightly below brood-year levels. Elsewhere seedings were light to moderate. The over-all seedings of spring salmon were good. The escapement to Harrison River, estimated at between 40,000 and 60,000, is considered to be one of the best on record. This large escapement in part is due to the strike of commercial fishermen. In addition, there were at least 10,000 jack springs on the grounds. Supplies estimated at 500 to 1,000 were noted in the Upper Chehalis River. Good supplies were present in Spring Creek, while Big Silver River and Maria Slough were moderately seeded. Cohoe stocks were satisfactory, showing considerable increase over those of the brood-year. The main runs occurred to Chehalis River, Weaver Creek, and Harrison River. This is the first year that large numbers of cohoes have been noted spawning in Harrison River. Hicks, Squawkum, and Suicide Creeks were also well seeded; supplies to the Hatzic watershed were light. Generally, the escapement of chums to this area is down from brood-year levels, and low water-levels prevented spawners from entering many of the smaller streams until late in the year. Runs to many larger streams, while light, compared with the brood-year, were nevertheless in sufficient numbers to provide for a reasonable seeding.

*Lower Fraser Area.*—Some 50,000 sockeyes spawned in the Upper Pitt River system. This population is classed as five-year fish, and the run this year compares favourably with the 1947 return. Water conditions were low at the commencement of the run but improved almost immediately. The Widgeon Slough sockeye run was estimated at 1,000; this is almost double the number that spawned there in the brood-year. It is estimated that 1,500 spring salmon spawned in the Upper Pitt River, showing some improvement over the brood-year. Cohoe-supplies are reported to be of unusual abundance, which could be the result of the period of no fishing during the peak of the run.

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Early escapements were observed in Salmon River, Upper Pitt River, Silver Creek, Silverdale Creek, Whonnock Creek, Serpentine River, and the Stave River, while late runs were noted in the Alouette River, Coquitlam River, Nicomekl River, Campbell River, Beaver River, West Creek, and Kanada Creek. The chum spawning was light. Large numbers of early-run chums appeared in the Coquitlam River, Silver Creek, the Alouette Creek, Whonnock Creek, and Silverdale Creek, despite the low water-level stages in the streams, which persisted until late in the season. The usual late run of chums to this area did not materialize in any strength, only minor numbers being noted in all streams.

### North Vancouver Area

The escapement of cohoe salmon to the Capilano, Seymour, and Indian Rivers was satisfactory and heavier than in the brood-year 1949. This increase resulted from cessation of commercial fishing operations during the fishermen's strike in the early fall. Small numbers of off-year pinks were observed in Capilano, Seymour, and Indian Rivers. The off-year cycle of this species does not appear to increase. There was an exceptionally heavy run of chums in Indian River. The escapement of this species to other streams in the area was below normal. It is the opinion of the local officer that large numbers spawned in salt water off the stream-mouths due to the extreme low-water conditions prevailing.

### Squamish Area

The spring-salmon escapement is considered fairly satisfactory, some 16,000 of this species being present in the Squamish River system. There was a heavy escapement of cohoes, attributed to some extent at the start to lack of fishing effort during the period of the fishermen's strike. Notwithstanding an intensive commercial fishery from which a large catch materialized, the stocks of chums to the spawning-grounds of the Squamish system were far above average in the main river as well as in its tributaries. Low-water conditions adversely affected the chum runs to the smaller streams in Howe Sound and the Seechelt Peninsula. Mission Creek had the best run of chums; in others, the numbers of chums and cohoes present were small.

# STATISTICAL TABLES

## LICENCES ISSUED BY THE DEPARTMENT OF FISHERIES FOR THE 1952 SEASON

| Kind of Licence | Number of Licences | Revenue |
|---|---|---|
| Salmon-cannery | 19 | $3,800.00 |
| Herring-cannery | 1 | 100.00 |
| Pilchard-cannery | --- | --- |
| Herring-reduction | 2 | 200.00 |
| Pilchard-reduction | --- | --- |
| Tierced salmon | 2 | 200.00 |
| Fish cold storage | 23 | 2,300.00 |
| Fish-processing | 19 | 19.00 |
| Shell-fish cannery | 11 | 11.00 |
| Tuna-fish cannery | 3 | 3.00 |
| Fish-offal reduction | 10 | 10.00 |
| Fish-liver reduction | 4 | 4.00 |
| Whale-reduction | 1 | 100.00 |
| Pickled herring | --- | --- |
| Herring dry-saltery | 3 | 300.00 |
| Processing aquatic plants | --- | --- |
| Harvesting aquatic plants | 1 | 10.00 |
| Fish-buyers' | 511 | 12,775.00 |
| Non-tidal fishing | 344 | 347.00 |
| Dogfish-reduction | --- | --- |
| General receipts | 4 | 81.25 |
| Total | | $20,260.25 |

## PACK OF BRITISH COLUMBIA SALMON, SEASON 1952

(Showing the Origin of Salmon Caught in Each District (48-pound Cases))

| District | Sockeyes | Springs | Steelheads | Cohoes | Pinks | Chums | Total |
|---|---|---|---|---|---|---|---|
| Fraser River | 134,625 | 2,279 | 202½ | 5,500½ | 60 | 8,480 | 151,147 |
| Queen Charlotte Islands | 635 | 96 | 19½ | 4,168 | 178,959½ | 1,712 | 185,590 |
| Nass River | 29,492 | 641 | 290½ | 1,223 | 13,016 | 13,112½ | 57,775 |
| Skeena River | 114,775 | 2,082 | 2,139½ | 8,358 | 89,314 | 4,638 | 221,306½ |
| Rivers Inlet | 84,297½ | 865½ | 280½ | 3,415½ | 12,469½ | 3,711½ | 105,040 |
| Smith Inlet | 34,834 | 367 | 84 | 1,466 | 6,496 | 315½ | 43,562½ |
| Central Area | 26,583½ | 1,261½ | 682 | 17,289 | 207,055 | 36,605 | 289,476 |
| Vancouver Island and adjacent Mainland | 24,252½ | 1,687 | 63½ | 23,583 | 171,812 | 24,039 | 245,437 |
| Alaska | --- | --- | --- | --- | --- | --- | --- |
| Cold-storage (1951) catch | --- | --- | --- | 2,435 | --- | 3,391½ | 5,826½ |
| Totals | 449,494½ | 9,279 | 3,762 | 67,438 | 679,182 | 96,005 | 1,305,160½ |

NOTE.—5,582½ cases of bluebacks are included with cohoes (Vancouver Island). Cold-storage (1951) catch included 3,391½ cases of chums and 2,435 cases of cohoes, and packed in oil were 727 cases of chums and 50 cases of cohoes, making a total of 6,603½ cases.

## STATEMENT SHOWING THE TOTAL SALMON-PACK BY SPECIES FROM 1944 TO 1952, INCLUSIVE

| | 1952 | 1951 | 1950 | 1949 | 1948 | 1947 | 1946 | 1945 | 1944 |
|---|---|---|---|---|---|---|---|---|---|
| Sockeyes | 449,494½ | 428,299 | 408,026½ | 259,821 | 261,230½ | 286,497 | 543,027 | 329,001½ | 247,714 |
| Springs | 9,279 | 13,698 | 9,233½ | 21,184 | 16,445½ | 10,025 | 8,100½ | 12,801 | 19,362 |
| Chums | 96,005 | 462,101 | 507,611 | 230,556½ | 511,404 | 486,615½ | 576,133½ | 350,188½ | 255,316½ |
| Pinks | 679,182 | 736,093 | 446,456½ | 709,987 | 321,721½ | 600,787½ | 116,607½ | 825,513 | 389,692 |
| Cohoes | 67,438 | 313,674 | 123,629½ | 215,944 | 221,804 | 146,293 | 100,154½ | 218,886½ | 181,546½ |
| Steelheads | 3,762 | 3,655½ | 3,227½ | 2,373 | 5,663½ | 3,260½ | 4,115½ | 2,922 | 3,926½ |
| Totals | 1,305,160½ | 1,957,520½ | 1,498,184½ | 1,439,866 | 1,338,271 | 1,533,478½ | 1,348,138½ | 1,739,312½ | 1,097,557½ |

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

### Total Packed by Districts in 1944 to 1952, Inclusive

| | 1952 | 1951 | 1950 | 1949 | 1948 | 1947 | 1946 | 1945 | 1944 |
|---|---|---|---|---|---|---|---|---|---|
| Fraser River | 151,147 | 268,233 | 139,721½ | 189,938 | 104,485 | 171,302½ | 413,542 | 221,351½ | 130,883½ |
| Skeena River | 221,306½ | 130,681 | 97,889 | 129,027 | 193,435½ | 79,718 | 105,912½ | 221,471½ | 149,948½ |
| Rivers Inlet | 105,040 | 148,996 | 172,107½ | 70,210½ | 72,117 | 168,935½ | 123,304 | 135,412 | 59,391 |
| Smith Inlet | 43,562½ | 58,022 | 52,750 | 19,083 | 14,675 | 46,172 | 23,177 | 21,682 | 6,194½ |
| Nass River | 57,775 | 152,742½ | 57,961 | 58,336½ | 38,538½ | 29,450 | 38,313 | 54,980½ | 61,096 |
| Vancouver Island and adjacent Mainland | 245,437 | 585,240 | 347,996½ | 538,370½ | 317,572 | 552,940½ | 264,922 | 492,281½ | 193,459 |
| Other districts | 475,066 | 612,482 | 623,609 | 431,498½ | 567,314 | 456,639 | 378,968 | 592,133½ | 496,587 |
| Cold storage | 5,826½ | 1,124 | 6,150 | 3,402 | 30,134 | 28,321 | ---------- | ---------- | ---------- |
| Grand totals | 1,305,160½ | 1,957,520½ | 1,498,184½ | 1,439,866 | 1,338,271 | 1,533,478½ | 1,348,138½ | 1,739,312½ | 1,097,557½ |

# TABLE SHOWING THE TOTAL SOCKEYE-PACK OF THE FRASER RIVER, ARRANGED IN ACCORDANCE WITH THE FOUR-YEAR CYCLE, 1895–1952

| | | | | |
|---|---|---|---|---|
| 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 | 1950— 108,223 |
| Washington | 6,760 | 90,441 | 80,547 | 116,458 |
| Total | 40,712 | 155,264½ | 176,706 | 224,681 |
| British Columbia | 1951— 145,321 | 1952— 134,625 | | |
| Washington | 118,151 | 114,638 | | |
| Total | 263,472 | 249,263 | | |

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

## Fraser River, 1944 to 1952, Inclusive

| | 1952 | 1951 | 1950 | 1949 | 1948 | 1947 | 1946 | 1945 | 1944 |
|---|---|---|---|---|---|---|---|---|---|
| Sockeyes | 134,625 | 145,231½ | 108,223 | 96,159½ | 64,823½ | 33,952½ | 341,957 | 79,977 | 88,515 |
| Springs | 2,279 | 5,719 | 1,818½ | 9,889 | 2,955½ | 1,455 | 1,096½ | 6,130½ | 12,577½ |
| Chums | 8,480 | 35,530½ | 23,343½ | 6,763 | 20,209 | 16,475½ | 60,713 | 27,610 | 13,803½ |
| Pinks | 60 | 66,673 | 72 | 66,626 | 31 | 113,136½ | 429 | 95,748½ | 130 |
| Cohoes | 5,500½ | 14,848½ | 6,025½ | 10,286 | 16,102 | 6,105 | 9,168½ | 11,615 | 15,564½ |
| Steelheads | 202½ | 230½ | 240 | 214½ | 364 | 178 | 178 | 270½ | 293 |
| Totals | 151,147 | 268,233 | 139,721½ | 189,938 | 104,485 | 171,302½ | 413,542 | 221,351½ | 130,883½ |

## Skeena River, 1944 to 1952, Inclusive

| | 1952 | 1951 | 1950 | 1949 | 1948 | 1947 | 1946 | 1945 | 1944 |
|---|---|---|---|---|---|---|---|---|---|
| Sockeyes | 114,775 | 61,694½ | 47,479½ | 65,937 | 101,267½ | 32,534 | 52,928 | 104,279½ | 68,197 |
| Springs | 2,082 | 2,055½ | 1,758½ | 2,507½ | 4,018½ | 2,113 | 2,439 | 2,382 | 1,500½ |
| Chums | 4,638 | 14,778 | 10,969 | 4,896 | 11,863 | 8,236 | 11,161 | 9,264 | 8,741½ |
| Pinks | 89,314 | 30,356½ | 26,256 | 33,069½ | 50,656 | 13,190½ | 10,737 | 69,783½ | 48,837 |
| Cohoes | 8,358 | 19,977½ | 9,781 | 21,333½ | 22,086½ | 21,600½ | 26,281½ | 34,201½ | 20,191½ |
| Steelheads | 2,139½ | 1,819 | ..... | 2,507½ | 3,544 | 2,044 | 2,366 | 1,561 | 2,481 |
| Totals | 221,306½ | 130,681 | 97,889 | 129,027 | 193,435½ | 79,718 | 105,912½ | 221,471½ | 149,948½ |

## Rivers Inlet, 1944 to 1952, Inclusive

| | 1952 | 1951 | 1950 | 1949 | 1948 | 1947 | 1946 | 1945 | 1944 |
|---|---|---|---|---|---|---|---|---|---|
| Sockeyes | 84,297½ | 102,565½ | 142,710½ | 39,494½ | 37,665½ | 140,087 | 73,320 | 89,735 | 36,582½ |
| Springs | 865½ | 937½ | 619½ | 743 | 899½ | 475 | 1,108½ | 1,191½ | 805 |
| Chums | 3,711½ | 11,842½ | 10,014½ | 11,819 | 11,486½ | 13,873 | 37,395½ | 16,793 | 2,705 |
| Pinks | 12,469½ | 20,960 | 12,864 | 11,937 | 13,491 | 9,025 | 1,641½ | 9,916 | 5,289½ |
| Cohoes | 3,415½ | 12,146 | 5,736 | 5,978 | 8,143 | 5,182 | 9,524½ | 17,516½ | 13,921 |
| Steelheads | 280½ | 274½ | 163 | 239 | 431½ | 293½ | 314 | 260 | 88 |
| Totals | 105,040 | 148,996 | 172,107½ | 70,210½ | 72,117 | 168,935½ | 123,304 | 135,412 | 59,391 |

## Smith Inlet, 1944 to 1952, Inclusive

| | 1952 | 1951 | 1950 | 1949 | 1948 | 1947 | 1946 | 1945 | 1944 |
|---|---|---|---|---|---|---|---|---|---|
| Sockeyes | 34,834 | 49,473 | 42,435 | 13,189 | 10,456½ | 36,800 | 14,318 | 15,014 | 3,165 |
| Springs | 367 | 174½ | 71½ | 159 | 186½ | 43 | 45 | 26 | 66 |
| Cohoes | 1,466 | 3,259 | 397 | 785 | 929½ | 348 | 177 | 560 | 343 |
| Pinks | 6,496 | 2,482 | 5,308 | 2,533 | 1,481½ | 1,054 | 235 | 2,362 | 498½ |
| Chums | 315½ | 2,530 | 4,499½ | 2,361 | 1,521½ | 7,910 | 8,369 | 3,692 | 2,122 |
| Steelheads | 84 | 103½ | 39 | 56 | 99½ | 21 | 33 | 28 | 666 |
| Totals | 43,562½ | 58,022 | 52,750 | 19,083 | 14,675 | 46,172 | 23,177 | 21,682 | 6,194½ |

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

## NASS RIVER, 1944 TO 1952, INCLUSIVE

| | 1952 | 1951 | 1950 | 1949 | 1948 | 1947 | 1946 | 1945 | 1944 |
|---|---|---|---|---|---|---|---|---|---|
| Sockeyes | 29,429 | 24,405½ | 27,286½ | 9,268 | 13,181½ | 10,849 | 12,511 | 9,899 | 13,083 |
| Springs | 641 | 596½ | 798½ | 174½ | 416 | 398 | 472 | 202 | 681½ |
| Chums | 13,112½ | 37,742 | 14,321 | 7,854 | 7,272½ | 8,925 | 13,810 | 4,981½ | 9,143 |
| Pinks | 13,016 | 70,880 | 12,582 | 34,324 | 8,565 | 5,047 | 7,147 | 35,918½ | 31,854 |
| Cohoes | 1,223 | 18,711 | 2,737 | 6,665 | 8,954½ | 4,075 | 4,239 | 3,895 | 6,102 |
| Steelheads | 290½ | 407½ | 236 | 51 | 149 | 156 | 134 | 84½ | 232½ |
| Totals | 57,775 | 152,742½ | 57,961 | 58,336½ | 38,538½ | 29,450 | 38,313 | 54,980½ | 61,096 |

## VANCOUVER ISLAND DISTRICT AND ADJACENT MAINLAND, 1944 TO 1952, INCLUSIVE

| | *1952* | *1951* | *1950* | *1949* | *1948* | *1947* | *1946* | *1945* | *1944* |
|---|---|---|---|---|---|---|---|---|---|
| Sockeyes | 24,252½ | 22,107 | 13,806 | 19,486½ | 9,981½ | 14,543 | 35,381½ | 5,988 | 5,288½ |
| Springs | 1,687 | 3,133 | 3,343 | 6,361½ | 6,622 | 4,942½ | 2,283½ | 2,323 | 3,068½ |
| Chums | 24,039 | 105,458 | 125,833 | 51,629 | 147,227½ | 99,679½ | 190,313 | 136,724 | 56,029½ |
| Pinks | 171,812 | 303,102½ | 132,016 | 361,783½ | 43,574½ | 355,992 | 6,809½ | 242,590½ | 49,092 |
| Cohoes[1] | 23,583 | 151,325½ | 72,871 | 98,958½ | 109,939½ | 77,684½ | 29,983 | 104,528 | 79,813½ |
| Steelheads | 63½ | 114 | 127½ | 151½ | 227 | 99 | 151½ | 128 | 165 |
| Totals | 245,437 | 585,240 | 347,996½ | 538,370½ | 317,572 | 552,940½ | 264,922 | 492,281½ | 193,459 |

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

## QUEEN CHARLOTTE ISLANDS, 1944 TO 1952, INCLUSIVE

| | 1952 | 1951 | 1950 | 1949 | 1948 | 1947 | 1946 | 1945 | 1944 |
|---|---|---|---|---|---|---|---|---|---|
| Sockeyes | 635 | 510 | 89 | ..... | 20 | ..... | ..... | ..... | 157 |
| Springs | 96 | ..... | 48 | ..... | 145 | ..... | ..... | 4 | 20 |
| Chums | 1,712 | 61,696½ | 148,669 | 24,852½ | 71,287 | 14,096 | 32,414 | 12,132 | 81,916 |
| Pinks | 178,959½ | 3,455 | 92,986 | 1,550 | 51,722 | 1,200 | 8,024 | 4,809 | 90,993 |
| Cohoes | 4,168 | 22,579 | 9,021 | 8,141½ | 4,145 | 392 | 1,192 | 1,108 | 19,615 |
| Steelheads | 19½ | ..... | 15 | ..... | ..... | ..... | 5 | ..... | 1 |
| Totals | 185,590 | 88,240½ | 250,828 | 34,544 | 127,319 | 15,688 | 41,635 | 18,053 | 192,702 |

## CENTRAL AREA, 1944 TO 1952, INCLUSIVE

| | 1952 | 1951 | 1950 | 1949 | 1948 | 1947 | 1946 | 1945 | 1944 |
|---|---|---|---|---|---|---|---|---|---|
| Sockeyes | 26,583½ | 22,312 | 25,997 | 16,140½ | 23,246½ | 17,343½ | 12,611½ | 24,109 | 32,715 |
| Springs | 1,261½ | 1,082 | 776 | 1,007 | 1,195½ | 514½ | 656 | 542 | 643 |
| Chums | 36,605 | 190,843½ | 164,884 | 116,292½ | 225,686 | 292,604½ | 221,958 | 138,992 | 80,793 |
| Pinks | 207,055 | 237,559 | 163,301 | 173,456 | 152,200½ | 101,241½ | 81,584½ | 364,385 | 162,986 |
| Cohoes | 17,289 | 61,423½ | 17,061 | 44,169 | 36,816 | 28,778 | 19,589 | 45,462½ | 25,823 |
| Steelheads | 682 | 706½ | 762 | 355 | 850½ | 469 | 934 | 590 | 666 |
| Totals | 289,476 | 513,926½ | 372,781 | 351,420 | 439,995 | 440,951 | 337,333 | 574,080½ | 303,626 |

## STATEMENT SHOWING THE QUANTITY OF PILCHARD PRODUCTS PRODUCED IN BRITISH COLUMBIA, 1930 TO 1952

| Season | Canned | Meal | Oil |
|---|---|---|---|
| | Cases | Tons | Gal. |
| 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 | ..... | ..... | ..... |
| 1950–51 | ..... | ..... | ..... |
| 1951–52 | ..... | ..... | ..... |
| 1952–53 | ..... | ..... | ..... |

## STATEMENT SHOWING THE QUANTITY OF HERRING PRODUCTS PRODUCED IN BRITISH COLUMBIA, 1935 TO 1952

| Season | Canned | Dry-salted | Pickled | Meal | Oil |
|---|---|---|---|---|---|
| | Cases | Tons | Tons | Tons | Gal. |
| 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] | 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 |
| 1950–51 | 56,798 | 4,418 | ..... | 31,913 | 3,385,685 |
| 1951–52 | 103,928 | 4,331 | ..... | 32,777 | 3,832,301 |
| 1952–53 | 5,132 | 5,871 | ..... | 218 | 7,203 |

[1] 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, 1941 TO 1952.

| Season | From Whales | | | From Fish-livers | From Other Sources | |
|---|---|---|---|---|---|---|
| | Whalebone and Meal | Fertilizer | Oil | Oil | Meal and Fertilizer | Oil |
| | Tons | Tons | Gal. | Gal. | Tons | Gal. |
| 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[1] | 3,929 | 519,802 |
| 1948–49 | 119 | 324 | 186,424 | 10,121,374[1] | 1,172 | 141,098 |
| 1949–50 | 921 | 21 | 312,055 | 12,079,015[1] | 1,635 | 175,202 |
| 1950–51 | 1,098 | ..... | 393,176 | 3,578,905[2] | 1,717 | 166,898 |
| 1951–52 | 1,981 | ..... | 680,129 | 5,250,441[2] | 3,593 | 250,777 |
| 1952–53 | 2,349 | ..... | 668,408 | 5,789,148 | 2,011 | 192,315 |

[1] Fish-liver oil, formerly reported in gallons, is now reported in million U.S.P. units Vitamin A.
[2] Includes Vitamin A production from whales.

# CATCH OF FISH TAKEN FROM NON-TIDAL WATERS, 1952–53 SEASON

| Lakes and Rivers | Kind of Licence | | | Trout | | Kokanee | | Lake-trout | | Whitefish | | Carp | | Ling | | Squawfish | | Suckers | | Other Fish | | Number 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. | | |
| Atlin | .... | 2 | .... | ..... | ..... | ..... | ..... | ..... | ..... | 185 | 220 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 185 | 220 |
| Arrow Lake[1] | .... | 1 | .... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Bednesti Lake | .... | 1 | .... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 325 | 163 | 513 | 1,541 | 263 | 263 | 1,101 | 1,967 |
| Cluculz Lake | .... | 1 | .... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 650 | 325 | 1,025 | 3,075 | 525 | 525 | 2,200 | 3,925 |
| Cobb Lake | .... | 1 | .... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 325 | 162 | 512 | 1,524 | 262 | 262 | 1,099 | 1,948 |
| Cameron Lake | .... | 2 | .... | ..... | ..... | ..... | ..... | ..... | ..... | 130 | 400 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 130 | 400 |
| Christina Lake | .... | 6 | .... | ..... | ..... | 1,998 | 318 | ..... | ..... | ..... | ..... | 16 | 85 | 27 | 108 | ..... | ..... | 12 | 28 | ..... | ..... | 2,053 | 539 |
| Duck Lake[1] | .... | 1 | .... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Eaglet Lake | 1 | .... | .... | ..... | ..... | 194 | 63 | ..... | ..... | ..... | ..... | ..... | ..... | 54 | 84 | 117 | 42 | 112 | 60 | ..... | ..... | 477 | 249 |
| Francois Lake | .... | 4 | .... | ..... | ..... | ..... | ..... | 45 | 280 | 9 | 45 | ..... | ..... | 12 | 25 | ..... | ..... | 2 | 8 | ..... | ..... | 68 | 358 |
| Fish Lake[1] | .... | 1 | .... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Fraser River | .... | .... | 1 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Gladys Lake | .... | 1 | .... | ..... | ..... | ..... | ..... | 20 | 120 | 30 | 45 | ..... | ..... | 9 | 18 | ..... | ..... | ..... | ..... | 21 | 19 | 80 | 202 |
| Hogsback Lake[1] | 1 | .... | .... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Kootenay River | .... | 1 | .... | ..... | ..... | ..... | ..... | ..... | ..... | 3,000 | 6,000 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 162 | 1,000 | 3,162 | 7,000 |
| Klua Lake | .... | 3 | .... | ..... | ..... | ..... | ..... | 120 | 424 | 625 | 585 | ..... | ..... | ..... | ..... | 1 | 7 | 700 | 1,600 | ..... | ..... | 1,446 | 2,616 |
| Moberly Lake[1] | .... | 1 | .... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Naltesby Lake[1] | .... | 1 | .... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Nechako River[2] | .... | .... | 2 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 2 | 300 | 2 | 300 |
| Otter Lake[1] | .... | 1 | .... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Okanagan Lake | .... | 320 | .... | 10 | 20 | 467 | 453 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 477 | 473 |
| Sinkut Lake[1] | 1 | .... | .... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Swan Lake[1] | .... | 1 | .... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Whatshan River[1] | .... | 1 | .... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Totals | .... | .... | .... | 10 | 20 | 2,659 | 834 | 185 | 824 | 3,979 | 7,295 | 16 | 85 | 102 | 235 | 1,418 | 699 | 2,876 | 7,836 | 1,235 | 2,369 | 12,480 | 20,197 |

[1] No returns were submitted by licence-holders covering these lakes. [2] Two sturgeon caught.

NOTE.—The catch of kokanee in Okanagan Lake during the 1952–53 season was very light in comparison with previous years.

*Licences Issued during the 1952–53 Season*

| | |
|---|---|
| Ordinary | 342 |
| Fur-farm | 3 |
| Sturgeon | 2 |
| Total | 347 |

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