

**INTERNATIONAL PACIFIC SALMON  
FISHERIES COMMISSION**

**APPOINTED UNDER A CONVENTION  
BETWEEN CANADA AND THE UNITED STATES FOR THE  
PROTECTION, PRESERVATION AND EXTENSION OF  
THE SOCKEYE SALMON FISHERIES IN  
THE FRASER RIVER SYSTEM**

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**ANNUAL REPORT**  
**1959**

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**COMMISSIONERS**

**SENATOR THOMAS REID**

**ARNIE J. SUOMELA**

**A. J. WHITMORE**

**MILO MOORE**

**F. D. MATHERS**

**DeWITT GILBERT**

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**NEW WESTMINSTER  
CANADA  
1960**

# INTERNATIONAL PACIFIC SALMON FISHERIES COMMISSION

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## MEMBERS AND PERIOD OF SERVICE SINCE THE INCEPTION OF THE COMMISSION IN 1937

### CANADA

William A. Found . . . . .	1937-1939
A. L. Hager . . . . .	1937-1948
Senator Thomas Reid . . . . .	1937-
A. J. Whitmore . . . . .	1939-
Olof Hanson . . . . .	1948-1952
H. R. MacMillan, C.B.E., D.Sc. . . . .	1952-1956
F. D. Mathers . . . . .	1956-

### UNITED STATES

Edward W. Allen . . . . .	1937-1951 1957-1957
B. M. Brennan . . . . .	1937-1942
Charles E. Jackson . . . . .	1937-1946
Fred J. Foster . . . . .	1943-1947
Milo Moore . . . . .	1946-1949 1957-
Albert M. Day . . . . .	1947-1954
Alvin Anderson . . . . .	1949-1950
Robert J. Schoettler . . . . .	1951-1957
Elton B. Jones . . . . .	1951-1957
Arnie J. Suomela . . . . .	1954-
DeWitt Gilbert . . . . .	1957-

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<b>F. D. MATHERS</b>	<b>DeWITT GILBERT</b>

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**DIRECTOR OF INVESTIGATIONS**  
**LOYD A. ROYAL**

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**NEW WESTMINSTER  
CANADA  
1960**

## REPORT OF THE INTERNATIONAL PACIFIC SALMON FISHERIES COMMISSION FOR THE YEAR 1959

The outstanding features of the 1959 run of Fraser River sockeye were the record-breaking small size of the fish and the five to seven day delay in their arrival in the estuarial fishing areas. In addition the 16 per cent survival from smolt to adult of the 1959 Chilko population was one of the highest rates of survival ever recorded.

The Fraser River pink salmon run proved to be the second smallest in the history of the fishery in spite of a well-balanced escapement and what appeared to be excellent spawning and incubation environment in the brood year. However, investigations by the Commission had indicated that high water temperatures in the Strait of Georgia adjacent to the mouth of the Fraser River during the first summer of marine existence of pink salmon were related to poor adult returns. Since the temperatures prevailing in this area during 1958 were extremely high, a decline in the 1959 adult pink salmon population was not unexpected.

The anomalies in the 1959 runs of Fraser River sockeye and pink salmon were not unusual in that other similar anomalies have frequently occurred during the past ten years. In 1951 the sockeye were the largest in size and in 1957 and 1959 the sockeye were the smallest in size in the history of the fishery with the possible exception of the sockeye returning in 1937. The economic impact of size variation should not be overlooked. In 1951, when the fish were of record size, 253,000 full cases of sockeye were packed from a total catch of 2,425,000 fish. In 1959, two cycle years later, 259,000 full cases were produced from 3,393,000 fish. The loss in potential pack due entirely to the difference in fish size is 100,000 full cases valued at \$4,800,000.

Coincident with an intrusion of warm oceanic water into the area adjacent to the west coast of Vancouver Island, beginning in 1957 and retreating in 1959, runs of sockeye have been late in arrival with a higher percentage approaching the Fraser River by a northern coastal route which is not a part of Convention waters. The delay in arrival of the large run of sockeye in 1958 upset the normal relationship of the escapement to its reproductive environment. The total effect of the delay on the success of reproduction of the 1958 escapement is not yet fully assessed but the effects will certainly result in a lower survival. In 1958, when the intrusion was most extensive, 29.0 per cent of the total catch of Fraser sockeye was taken in non-Convention waters as compared with 1.24 per cent in 1954, the previous cycle year. Here again the possible biological and the economic impact of this anomaly in the timing and path of migration cannot be ignored.

A normal Fraser River pink salmon catch for 1959 might have approached 10,000,000 fish. That the 1959 catch was less than half of this figure was not unexpected due to the previously referenced Commission investigations which related adult survival to water temperatures in the Strait of Georgia. Fortunately water temperatures in the Strait of Georgia have been recorded continuously by

the Canadian Government since 1913 and it was the availability and analysis of these marine records which prevented possible disaster in the management of the highly efficient fishery on this species in 1959.

The relationship established between freshwater and estuarial environment and the adult survival of pink salmon, the relationship established by Washington State fisheries biologists between runoff in Western Washington during the freshwater existence of coho salmon and its ultimate adult survival, combined with an increasing accumulation of Commission data relating to the survival of sockeye indicates that the freshwater and estuarial environment may control the ultimate numbers of adult sockeye. In the light of these studies it may be concluded that the influence of the high seas on the survival of adult salmon must be minimized. On the other hand the importance of estuarial environment must be emphasized and detailed records of this environment become essential to the management of the salmon fisheries.

On the basis of existing evidence fish size, distribution, timing and path of adult migration appear related to oceanic environment and further knowledge of the cause of anomalies in these characteristics is essential to scientific management of the salmon resources. Salmon management is not alone in its need for improved and specialized oceanographic data both estuarial and oceanic in character. The persistence of dominant year classes of some marine fishes indicates the great importance of oceanic environment during the early life history of these fishes to the success of their reproduction and ultimate survival.

The required physical data on estuarial and oceanic environment is not now available for the proper management of our fishery resources. There is an immediate need, of considerable economic and biological significance, for a "Weather Bureau of the Sea". Only with a continuing record of the physical features of the environment of the fish throughout its life history, particularly during the early part of its life, can we understand and predict the anomalies which have such a vital effect on the management of our fisheries resources.

International co-ordination is obviously required in the organization of any program for the collection of data on the physical characteristics of both the estuary and the ocean itself.

#### COMMISSION MEETINGS

The International Pacific Salmon Fisheries Commission held ten formal meetings during 1959. The first meeting of the year was held on January 21 with the Advisory Committee composed of the following members:

<i>United States</i>	<i>Canada</i>
John Plancich	Richard Nelson
Salmon Processors	Salmon Processors
N. Mladinich	Charles Clarke
Purse Seine Fishermen	Purse Seine Fishermen
Joe Erisman	Peter Jenewein
Gill Net Fishermen	Gill Net Fishermen
John Brown	Steve Stavenes
Reef Net Fishermen	Purse Seine Crew Members
Bert G. Johnston	Herbert North
Troll Fishermen	Troll Fishermen
Howard Gray	M. W. Black
Sport Fishermen	Sport Fishermen

The tentative recommendations for regulatory control of sockeye and pink salmon fishing in Convention waters, as submitted to the Advisory Committee on December 16, 1958, were discussed and revisions made as a result of the discussions. The regulations recommended for the 1959 sockeye and pink salmon fishery in Convention waters were approved in part, with a decision on the proposed daily opening and closing hours for the Canadian gill net fleet being held in abeyance and subject to further recommendations of the Advisory Committee.

The meeting on March 23 was held for the purpose of discussing technical and administrative questions relating to: (1) the taking of coho (silver) salmon during the sockeye and pink salmon fishery in Convention waters; (2) the segregation of regulatory jurisdiction between national and state agencies and the Commission within Convention waters; (3) the escapement of Fraser River sockeye and pink salmon subject to a fishery outside Convention waters; and (4) the escapement of pink salmon subject to a fishery within Convention waters but destined for areas outside Convention waters. These subjects were raised in part for consideration in a letter from the Washington Director of Fisheries to the Chairman of the Commission under date of January 29, 1959 and by United States members of the Commission's Advisory Committee at the meeting of January 21, 1959.

On April 29 the Commission approved the submission to the Canadian Government of the regulations recommended for the 1959 sockeye and pink salmon fishery in Canadian Convention waters.

The Commission met with its Advisory Committee on July 6 and 7. A comprehensive review of the biological and engineering investigations currently being conducted, in fulfillment of the Commission's terms of reference, was given by the staff for the consideration of both the Commissioners and the members of the Advisory Committee.

A meeting of the Commission was necessary on July 31 to discuss with the Advisory Committee adjustments in the regulations required by the delay in arrival of the runs, the unexpected small size of the United States fishing fleet, the reduction of United States gill net efficiency because of the record small size of sockeye and the strike by Canadian fishermen.

The sixth formal meeting of the Commission was held on August 18 for the purpose of reviewing current regulatory problems. It was decided that the complexity of the regulatory problems required an early meeting with the Advisory Committee.

On August 21 the Commission met with its Advisory Committee to consider regulatory changes for the purpose of providing adequate protection to the Fraser River pink salmon runs.

The eighth meeting of the year was held by the Commission on September 11 to review the fishing regulations in respect to escapement and equal division of the pink salmon catch.

On November 8 and 9 the Commission made a field inspection of the spawning grounds of several pink and sockeye populations of the lower mainland. The Commission authorized a full scale study of the factors controlling the size of the populations of pink and sockeye salmon reproducing in the area below Hell's Gate with a view to inaugurating whatever corrective measures appeared economically and biologically desirable.

The Commission met in a regular business session on December 10 and on December 11 held its annual open meeting with the fishing industry. A review of the 1959 fishing season, a summary of possible factors influencing the 1960 run of sockeye and the tentative regulatory requirements for the proper management of the 1960 fishery were presented for the information of the members of the Advisory Committee and the large number of interested persons who attended the meeting.

### 1959 REGULATIONS

Recommendations for regulations governing the 1959 sockeye and pink salmon fishery in United States Convention waters were adopted at a meeting of the Commission held with its Advisory Committee on January 21, 1959 and submitted to the Government of the United States and the State of Washington on April 8, 1959. Recommendations for regulations governing the 1959 sockeye and pink salmon fishery in Canadian Convention waters were adopted at a meeting of the Commission held on April 29, 1959 and submitted to the Government of Canada on April 30, 1959. The recommendations for the United States waters were accepted by an Order of the Director of the State of Washington Department of Fisheries on May 8, 1959 and for Canadian waters by an Order-in-Council on June 4, 1959.

The recommendations of the Commission were as follows:

#### United States Convention Waters

"The International Pacific Salmon Fisheries Commission appointed pursuant to the Convention between Canada and the United States of America for the protection, preservation and extension of the Sockeye Salmon Fisheries in the Fraser River System, signed at Washington on the 26th day of May, 1930, as amended by the Pink Salmon Protocol signed at Ottawa on the 28th day of December, 1956, hereby recommends to the Director of Fisheries of the State of Washington that regulations to the following effect, in the interests of such fisheries, be adopted by him for the year 1959 by virtue of authority in him vested by Section 6 of Chapter 112 of the Laws of the State of Washington of 1949, namely:

In all of the Convention waters of the United States of America lying easterly of a straight line drawn from the lighthouse on Tatoosh Island in the State of Washington to Bonilla Point in the Province of British Columbia:

- (a) Taking sockeye and/or pink salmon shall be prohibited from four o'clock in the forenoon of Sunday the 21st day of June, 1959 to four o'clock in the forenoon of Monday the 20th day of July, 1959.

(b) Taking sockeye and/or pink salmon by means of purse seine and reef net fishing gear shall be prohibited from eight o'clock in the afternoon of Wednesday of each week to four o'clock in the forenoon of the Monday following and from eight o'clock in the afternoon until four o'clock in the forenoon of the following day during such times as sockeye and/or pink salmon fishing by purse seine and reef net fishing gear is not otherwise prohibited and by means of gill net fishing gear from eight o'clock in the forenoon of Thursday of each week to six o'clock in the afternoon of the Monday following and from eight o'clock in the forenoon until six o'clock in the afternoon of each day during such times as sockeye and/or pink salmon fishing by gill net fishing gear is not otherwise prohibited between the 20th day of July, 1959 and the 15th day of August, 1959, both days inclusive.

(c) Taking sockeye and/or pink salmon by means of purse seine and reef net fishing gear shall be prohibited from eight o'clock in the afternoon of Thursday of each week to four o'clock in the forenoon of the Monday following and from eight o'clock in the afternoon until four o'clock in the forenoon of the following day during such times as sockeye and/or pink salmon fishing by purse seine and reef net fishing gear is not otherwise prohibited and by means of gill net fishing gear from eight o'clock in the forenoon of Thursday of each week to six o'clock in the afternoon of the Sunday following and from eight o'clock in the forenoon until six o'clock in the afternoon of each day during such times as sockeye and/or pink salmon fishing by gill net fishing gear is not otherwise prohibited between the 16th day of August, 1959 and the 27th day of September, 1959, both days inclusive.

In the Convention waters of the United States of America lying westerly of a straight line drawn from the Iwersen dock on Point Roberts in the State of Washington to the flashing white light on Georgina Point at the entrance to Active Pass in the Province of British Columbia:

(a) Taking sockeye and/or pink salmon shall be prohibited between the 6th day of September, 1959 and the 27th day of September, 1959, both days inclusive.

All times hereinbefore mentioned shall be Pacific Standard Time.

In making the above recommendations for regulatory control of sockeye and pink salmon fishing in United States Convention waters for the year 1959 the Commission recognizes the need for the maintenance of certain closed areas by the Director of Fisheries of the State of Washington for the protection and preservation of other species of food fish."

#### Canadian Convention Waters

"The International Pacific Salmon Fisheries Commission appointed pursuant to the Convention between Canada and the United States of America for the protection, preservation and extension of the Sockeye Salmon Fisheries in the Fraser River System, signed at Washington on the 26th day of May, 1930, as amended by the Pink Salmon Protocol signed at Ottawa on the 28th day



of December, 1956, hereby recommends that regulations to the following effect, in the interests of such fisheries, be adopted by Order-in-Council as amendments to the Special Fishery Regulations for British Columbia, for the season of 1959, under the authority of the Fisheries Act, namely:

In the Canadian Convention waters of Juan de Fuca Strait lying westerly of a straight line drawn from Angeles Point in the State of Washington across Race Rocks to William Head in the Province of British Columbia:

(a) Taking sockeye and/or pink salmon shall be prohibited from four o'clock in the forenoon of Sunday the 21st day of June, 1959 to five o'clock in the afternoon of Sunday the 19th day of July, 1959.

(b) Taking sockeye and/or pink salmon by means of purse seine fishing gear shall be prohibited from five o'clock in the afternoon of Wednesday of each week to four o'clock in the forenoon of the Monday following and from five o'clock in the afternoon until four o'clock in the forenoon of the following day during such times as sockeye and/or pink salmon fishing by purse seine fishing gear is not otherwise prohibited and by means of gill net fishing gear from four o'clock in the forenoon of Wednesday of each week to five o'clock in the afternoon of the Sunday following and from four o'clock in the forenoon until five o'clock in the afternoon of each day during such times as sockeye and/or pink salmon fishing by gill net fishing gear is not otherwise prohibited and by trap fishing gear from five o'clock in the forenoon of Thursday of each week to five o'clock in the forenoon of the Monday following, between the 19th day of July, 1959 and the 1st day of August, 1959, both days inclusive.

(c) Taking sockeye and/or pink salmon by means of purse seine fishing gear shall be prohibited from five o'clock in the afternoon of Wednesday of each week to half past four o'clock in the forenoon of the Monday following and from five o'clock in the afternoon until half past four o'clock in the forenoon of the following day during such times as sockeye and/or pink salmon fishing by purse seine fishing gear is not otherwise prohibited and by means of gill net fishing gear from half past four o'clock in the forenoon of Wednesday of each week to five o'clock in the afternoon of the Sunday following and from half past four o'clock in the forenoon until five o'clock in the afternoon of each day during such times as sockeye and/or pink salmon fishing by gill net fishing gear is not otherwise prohibited and by trap fishing gear from five o'clock in the forenoon of Thursday of each week to five o'clock in the forenoon of the Monday following, between the 2nd day of August, 1959 and the 15th day of August, 1959, both days inclusive.

(d) Taking sockeye and/or pink salmon by means of purse seine fishing gear shall be prohibited from five o'clock in the afternoon of Thursday of each week to five o'clock in the forenoon of the Monday following and from five o'clock in the afternoon until five o'clock in the forenoon of the following day during such times as sockeye and/or pink salmon fishing by purse seine fishing gear is not otherwise prohibited and by means of gill net fishing gear from five o'clock in the forenoon of Thursday of each week to five o'clock in the afternoon of the Sunday following and from

five o'clock in the forenoon until five o'clock in the afternoon of each day during such times as sockeye and/or pink salmon fishing by gill net fishing gear is not otherwise prohibited and by trap fishing gear from five o'clock in the forenoon of Friday of each week to five o'clock in the forenoon of the Monday following, between the 16th day of August, 1959 and the 29th day of August, 1959, both days inclusive.

(e) Taking sockeye and/or pink salmon by means of purse seine fishing gear shall be prohibited from five o'clock in the afternoon of Friday of each week to half past five o'clock in the forenoon of the Monday following and from five o'clock in the afternoon until half past five o'clock in the forenoon of the following day during such times as sockeye and/or pink salmon fishing by purse seine fishing gear is not otherwise prohibited and by means of gill net fishing gear from half past five o'clock in the forenoon of Friday of each week to five o'clock in the afternoon of the Sunday following and from half past five o'clock in the forenoon until five o'clock in the afternoon of each day during such times as sockeye and/or pink salmon by gill net fishing gear is not otherwise prohibited and by trap fishing gear from five o'clock in the forenoon of Saturday of each week to five o'clock in the forenoon of the Monday following, between the 30th day of August, 1959 and the 12th day of September, 1959, both days inclusive.

(f) Taking sockeye and/or pink salmon by means of purse seine fishing gear shall be prohibited from five o'clock in the afternoon of Friday of each week to six o'clock in the forenoon of the Monday following and from five o'clock in the afternoon until six o'clock in the forenoon of the following day during such times as sockeye and/or pink salmon fishing by purse seine fishing gear is not otherwise prohibited and by means of gill net fishing gear from six o'clock in the forenoon of Friday of each week to five o'clock in the afternoon of the Sunday following and from six o'clock in the forenoon until five o'clock in the afternoon of each day during such times as sockeye and/or pink salmon fishing by gill net fishing gear is not otherwise prohibited and by trap fishing gear from five o'clock in the forenoon of Saturday of each week to five o'clock in the forenoon of the Monday following, between the 13th day of September, 1959 and the 20th day of September, 1959, both days inclusive.

In the Convention waters of Canada lying easterly of a straight line drawn from Angeles Point in the State of Washington across Race Rocks to William Head in the Province of British Columbia, including all of District I and Areas 17, 18 and that part of Area 19 not otherwise regulated in the foregoing paragraphs:

(a) Taking sockeye and/or pink salmon shall be prohibited from seven o'clock in the forenoon of Sunday the 21st day of June, 1959 to seven o'clock in the forenoon of Monday the 20th day of July, 1959; provided that nothing in this recommendation shall militate against the taking of sockeye and/or pink salmon by gill net fishing gear having mesh of not less than 8 inch extension measure for linen nets or  $8\frac{1}{2}$  inch extension measure for nylon nets, if fishing by such gill net fishing gear is permitted by the Government of Canada.

(b) Taking sockeye and/or pink salmon shall be prohibited from seven o'clock in the forenoon of Thursday of each week to seven o'clock in the forenoon of the Monday following between the 20th day of July, 1959 and the 12th day of September, 1959, both days inclusive.

In the Convention waters of Canada lying easterly of a line drawn from Point Grey to the light on the north westerly end of the North Arm Jetty thence to the Sand Heads light thence to Canoe Pass buoy thence on a line projected toward the West Point Roberts light to the International Boundary line:

(a) Taking sockeye and/or pink salmon shall be prohibited between the 13th day of September, 1959 and the 11th day of October, 1959, both days inclusive, except from seven o'clock in the forenoon of Monday the 21st day of September, 1959 until seven o'clock in the forenoon of Thursday the 24th day of September, 1959; provided that nothing in this recommendation shall militate against the taking of sockeye and/or pink salmon by gill net fishing gear having mesh of not less than 9 inch extension measure for linen nets or 9½ inch extension measure for nylon nets, if fishing by such gill net fishing gear is permitted by the Government of Canada between the 10th day of September, 1959 and the 11th day of October, 1959, both days inclusive.

In the Convention waters of Canada lying easterly of a straight line drawn from Angeles Point in the State of Washington across Race Rocks to William Head in the Province of British Columbia, including all of Areas 17, 18 and that part of Area 19 and District I not otherwise regulated in the foregoing paragraphs:

(a) Taking sockeye and/or pink salmon shall be prohibited between the 13th day of September, 1959 and the 11th day of October, 1959, both days inclusive, except from seven o'clock in the forenoon of Monday the 14th day of September, 1959 until seven o'clock in the forenoon of Friday the 18th day of September, 1959, and except from seven o'clock in the forenoon of Monday the 21st day of September, 1959 until seven o'clock in the forenoon of Friday the 25th day of September, 1959; provided that nothing in this recommendation shall militate against the taking of sockeye and/or pink salmon by gill net fishing gear having mesh of not less than 9 inch extension measure for linen nets or 9½ inch extension measure for nylon nets, if fishing by such gill net fishing gear is permitted by the Government of Canada between the 10th day of September, 1959, and the 11th day of October, 1959, both days inclusive.

All times hereinbefore mentioned shall be Pacific Standard Time."

### Emergency Amendments

The 1959 fishery in Convention waters was most difficult to control effectively because of many unusual intervening factors. An examination of Table VII shows the delayed appearance and the unexpected size of the sockeye run. A stoppage of Canadian fishing from July 26 to August 9 upset the desired catch-escapement ratios as well as the division of the allowable catch. The United

States fleet was below expected size during the period of late July and early August and the record small size of the individual sockeye resulted in a substantial reduction in the effectiveness of the United States gill net fleet.

The pink salmon run appeared in its usual characteristic manner but for an unknown reason the availability of the fish to the fishing gear was much greater than in 1957 resulting in a false impression of the size of the run. Because of the above vagaries in the sockeye and pink salmon migration it was necessary to make a large number of emergency amendments to the regulations established prior to the commencement of the fishing season. A detailed list of the regulatory amendments is as follows:

July 27, 1959 — To offset the effect of reduced fleet size in United States waters the Commission increased the fishing time in United States Convention waters by 24 hours for the week commencing July 26.

July 31, 1959 — To offset the effect of continued reduced fleet size in United States waters the Commission increased the fishing time in United States Convention waters by 24 hours for the week commencing August 2.

August 5, 1959 — Surplus escapements, particularly to Chilko Lake, due to a continued strike of the Canadian fishermen necessitated action to increase fishing time to a full six days in United States waters for the week commencing August 2.

August 11, 1959 — To prevent a further surplus in the escapement of certain races of sockeye, the fishing time in all Convention waters was increased by 24 hours for the week commencing August 9. Fishing time in all Convention waters westerly of the Angeles Point-William Head line was reduced by 48 hours for the week commencing August 16 to provide adequate escapement of the early runs of pink salmon.

August 18, 1959 — Fishing time in United States Convention waters lying easterly of the Angeles Point-William Head line was reduced by 24 hours to three days for the week commencing August 16 thus providing further protection to early migrating pink salmon. To insure against the possibility of large numbers of pink salmon entering Juan de Fuca Strait during the extended weekly closure the fishing time in these waters was advanced 24 hours for the week commencing August 23 to allow a four day fishing period.

August 24, 1959 — Fishing time was reduced by 48 hours for the week commencing August 23 in those United States Convention waters lying southerly of a line drawn from Dungeness light to Smith Island light to Outer Lawson Reef light to Burrows Island light to Fidalgo Head for the protection of those pink salmon destined for southern Puget Sound streams.

- September 1, 1959 — A reduction of 24 hours in the fishing time in all United States Convention waters for the week commencing August 30 was placed in effect as a conservation measure and to allow a reduction of the disparity in the catch of pink salmon in favor of United States fishermen.
- September 4, 1959 — The loss of one day's fishing on September 4 by Canadian fishermen in Juan de Fuca Strait due to gale force winds and the continued large difference in the catch in favor of United States fishermen resulted in the addition of 24 hours fishing time in Canadian Convention waters westerly of the Angeles Point-William Head line effective at 6:00 p.m. September 5.
- September 8, 1959 — To allow Canadian fishermen to reach equality in their catch with a minimum of interference with the escapement of the early Fraser River run of pink salmon the fishing time in the waters of Georgia Strait westerly of the "Blue Line" was increased by 24 hours for the week commencing September 6.
- September 11, 1959 — To provide adequate escapement of pink salmon and to equalize the catch between Canadian and United States fishermen,
1. Fishing time was reduced in all United States Convention waters by 24 hours for the week commencing September 13.
  2. The West Point Roberts closure was extended easterly to a line from Lily Point south to the International Boundary effective September 12.
  3. Fishing time in the waters of District I westerly of the "Blue Line" was reduced 24 hours with fishing scheduled to open at 8:00 a.m. September 15.
- In view of the disappearance of pink salmon in all waters westerly of the Angeles Point-William Head line regulatory control in these waters was relinquished at 6:00 p.m. Thursday, September 17.
- September 17, 1959 — To provide for adequate escapement of Adams River sockeye the scheduled opening of the Fraser River east of the "Blue Line" was delayed 48 hours to 8:00 a.m. September 23 thus reducing the fishing time in this area to 48 hours for the weekly period commencing September 20.
- September 24, 1959 — With regulatory control of all other United States Convention waters being relinquished on September 27 the closure of the enlarged West Point Roberts area was extended until October 4 to protect drifting schools of pink salmon.
- October 2, 1959 — The gradual disappearance of pink salmon in the waters westerly of the "Blue Line" resulted in the Commission relinquishing control in Canadian Convention waters effective at 8:00 a.m. October 7.

## SOCKEYE SALMON REPORT

### The United States Fishery

The effect of the high water obstruction near Yale, British Columbia on the 1955 escapement to the spawning grounds of the Early Stuart run was brought into focus in 1959. With the 1959 fishing season closed in all Convention waters until July 20 the total escapement was only 2,663 fish. It is obvious that during its time of passage in the fishery, a complete closure for the Early Stuart run will be required for one more cycle year before this run can be expected to return to normal size.

Fishing intensity was greatly reduced from that of the brood year between the opening of the season on July 20 and August 8. The average daily number of landings by purse seines and gill nets in 1955 during the above period was 166 and 483 respectively compared with only 120 purse seines and 272 gill nets in 1959. The decline in the intensity of the fishery during a major portion of the Chilko run necessitated a change from a three day fishing week to a four day fishing week. Two extra fishing days were added for the week commencing August 2 to reduce the potential excess in escapement to Chilko resulting from the strike of Canadian fishermen.

The delay in arrival of each of the sockeye runs, presumably due to an intrusion of warm oceanic water along the coast of Vancouver Island, upset considerably the normal schedule of fishing. The consistent time lag in the daily catches from those obtained in 1955 and other previous cycle years is evident from an examination of Table VII.

A high marine survival of sockeye combined with a small run of pink salmon made it possible to obtain a more satisfactory escapement of most late-running sockeye than was recorded in 1955. The increased escapement of late-running sockeye is highly desirable since these fish, particularly those destined for Adams River, comprise an important section of the total sockeye run of this cycle. Since late-running sockeye overlap the pink salmon run, the regulations must of necessity be designed for the management of the pink salmon runs rather than for the protection of the smaller numbers of sockeye migrating at the same time.

The distribution of the United States catch between gear (Table I) varied somewhat from that of the brood year. The gill net catch dropped from 28.11 per cent of the total catch in 1955 to 13.32 per cent in 1959. Part of the decline in the gill net catch can be attributed to the smaller number of gill nets operating during the peak of the run in 1959 than were fishing during the same period in 1955. The share of the total catch taken by gill nets also dropped because of the fixed minimum mesh size which reduced the efficiency in catching the unusually small sized sockeye of the 1959 runs. The season's average for four-year-old sockeye in 1959 was only 5.12 pounds compared with the average for the cycle of 6.00 pounds. The individual size of the 1959 sockeye was the smallest recorded for this cycle since records became available in 1915.

A complete statistical record of the 1959 sockeye catch compared with that for previous cycle years in both United States and Canadian Convention waters may be found in Tables I to IV inclusive.

In summary it may be stated that the 1959 run of sockeye was delayed in its arrival in the fishery by about five days, that it was the most abundant of any cycle run since 1903, that the total United States catch of 1,810,738 was not excessive and parity in the season's catch could have been obtained by Canadian fishermen from the Chilko run without injuring the escapement had it not been for a strike during the Chilko run; also that the run returned to normal in its approach path to the Fraser River with only a small percentage of the fish migrating by way of Johnstone Strait.

### The Canadian Fishery

The Canadian fishery harvested a total of 1,581,883 sockeye or 46.63 per cent of the total catch in Convention waters (Table II). United States fishermen caught 782,189 fish of their total season's catch during the Canadian strike from July 26 to August 9 but much of the potential deficit in the total Canadian catch due to the strike was offset by heavy catches of fish which had accumulated in District I during the strike. The delay in the appearance of the run was fortunate for Canadian fishermen since normally the Chilko run, predominant on this cycle, has, to a major extent, passed through all fishing areas by August 9.

The percentage of the 1959 Canadian catch taken by the gill net fleet increased to 65.80 per cent from 56.42 per cent in the brood year of 1955. The increase in the portion of the catch taken by the gill net fleet was the result of the strike which allowed large numbers of fish to pass through the purse seine fishery in Juan de Fuca Strait to be caught later by gill nets in the Fraser River after fishing commenced on August 10.

### Escapement

The 1959 run of sockeye to the Fraser River system including the commercial catch in Convention waters, Indian catch, and the escapement, totalled 4,405,000 fish representing an increase of 69.75 per cent over the run of the brood year. The escapement of 946,882 sockeye (Table VI) was 21.50 per cent of the total run and a substantial increase over the escapement of 14.61 per cent of the smaller run appearing in 1955. It was very fortunate for the industry that the severe overfishing of the 1955 run, fully recorded in the 1955 Annual Report, was substantially compensated for by an unusually high marine survival. However, the record breaking size of the 1959 sockeye run to the Fraser River does not signify that the brood escapement was adequate; had the escapement been adequate the run would have been proportionately greater. With a well balanced escapement in 1955 the total run in 1959 might have approached 6,000,000 sockeye. The variable marine survival on the Chilko sockeye runs which also appears to reflect the marine survival of all upriver races is easily observed in the following table of preliminary percentage survival data.

<i>Spawning Year</i>	<i>Egg to Fry Survival</i>	<i>Fry to Migrant Survival</i>	<i>Migrant to Adult Survival</i>
1949 .....	6.71	52.00	18.54
1950 .....	6.49	55.00	11.50
1951 .....	11.90	56.65	5.49
1952 .....	6.04	52.02	7.08
1953 .....	4.97	51.92	5.36
1954 .....	9.50	55.33	20.00
1955 .....	9.86	45.40	15.77

In analyzing the escapements to individual spawning grounds in 1959 it may be concluded that:

1. The Early Stuart escapement of only 2,663 fish, in spite of a complete closure of the fishery on this race of sockeye, was disappointing but not unexpected because of the serious delay in the 1955 escapement passing the high water obstruction near Yale, British Columbia. The low productivity of the Early Stuart escapement in 1955 emphasizes the serious adverse effect of any delay in migration which might result from the development of hydroelectric sites on the main Fraser River.
2. The escapements to the Bowron, Nadina, Raft, Chilko, Taseko and other miscellaneous areas, where the spawning migration arrives relatively early, were substantially greater in 1959 than in the brood year due to favorable marine survival and the strike of Canadian fishermen. The Chilko escapement can be considered excessive since an estimated 60,000 or more fish were forced to spawn in the fast current below Canoe Cross where the resulting fry will be swept downstream and lost. In addition, a maximum spawning population estimated at about 350,000 to 400,000 fish is not considered desirable in any cycle year except the 1956-1960 cycle which is at present presumed to have achieved dominance. However, the historical evidence for the existence of true dominance at Chilko is not as conclusive as it is for the Stuart and Shuswap Lake systems.
3. The large escapement to Seymour River is due in part to the strike previously referred to but might be caused also by a shifting of dominant cycles to coincide with the dominant and sub-dominant cycles already established in the lower Adams River population. The productivity of both the Seymour and Adams River populations appears extremely high on this cycle-year, especially so when the small escapements in 1955 are related to the calculated catch of these fish in 1959.
4. A preliminary examination of the 1959 catch indicates that possibly 1,000,000 fish were produced by the 63,500 fish spawning in lower Adams and Little Rivers in 1955. The escapement in that year is considered far below minimum requirements for this cycle and the increase in the 1959 escapement to 135,000 approaches the apparent optimum of 150,000.
5. Escapements to Pitt River, Silver Creek and Weaver Creek were down substantially from those recorded in the brood year, caused apparently by serious flood conditions during the early incubation period in 1955.
6. The escapements to Birkenhead and Stellako Rivers did not increase to the same extent as the escapements from earlier migrating races but a substantial increase was recorded in each case due to the Canadian strike.
7. Lower river runs of sockeye destined for Cultus Lake and Harrison River had substantial escapements since they were unaffected by adverse incubation conditions in the brood year.



In summary it may be stated that the 1959 escapement was suitable in most cases to return a potential run of satisfactory size for this cycle, all other controlling factors approaching normal. It appears that the potential size of the 1963 run might not have been jeopardized even if 200,000 additional fish had been taken by the fishery during the peak of the Chilko migration.

#### Rehabilitation of Barren Areas

The substantial size of the Quesnel run of sockeye prior to the Hell's Gate slide in 1913 is well established in the Annual Reports of the Fisheries Commissioner for British Columbia. Mitchell River, tributary to the north arm of Quesnel Lake and the Horsefly River tributary of the same lake were the principal spawning grounds with Horsefly River being the more important of the two areas.

The timing of the Quesnel run was such that the run usually appeared at Hell's Gate during the period of most adverse water levels. As a result the run was almost exterminated, only 40 fish being recorded in Mitchell River in 1941 and 1,065 fish in the Horsefly River during the same year. The year 1941 was the 7th cycle year after the slide in 1913 and 1 cycle year before the construction of the Hell's Gate fishways in 1945.

The restoration of the Quesnel run has been phenomenal in recent years as revealed by the table below.

Cyclical Spawning Escapements to the Quesnel System

Spawning Area	1941	1945*	1949	1953	1957
Horsefly River .....	1,065	3,000	20,000	105,218	226,378
Mitchell .....	40	No Record	350	2,344	2,677
Total .....	1,105	3,000+	20,350	107,562	229,055

\*Start of fishway operation.

Field observations revealed that an estimated 30,000,000 smolts survived from the spawning of the 1957 escapement and left Quesnel Lake for the sea in the spring of 1959. An average survival for the 1957 migration of smolts would mean the return of 3,000,000 adults of Quesnel Lake origin in the maturing year of 1961.

Horsefly Lake, which drains into the Horsefly River via the Little Horsefly River was never a part of the Quesnel sockeye producing system. The watershed of the lake is very small, being limited to the north and east by the Quesnel Lake drainage and to the south by the Horsefly River drainage. The Little Horsefly River which drains Horsefly Lake is of sufficient size to provide access for adult sockeye but the possible spawning tributaries of the lake either dry up in late summer or are too precipitous or too cold to provide suitable spawning environment. The lake itself is approximately 40 miles long with a surface area of 21 square miles and a mean depth of 217 feet. Both Horsefly and Quesnel Lakes lie at approximately the same elevation and are similar in limnological characteristics.

Theoretically, Horsefly Lake represents a vast potential rearing area for young sockeye if artificially constructed spawning grounds could be provided to produce a supply of sockeye fry. Temporary spawning facilities were built in

1953 at the Field Station on Horsefly Lake and a more extensive experimental area was constructed in 1955. These facilities and their operation have been described in previous annual reports. Fry releases were made in 1954, 1956, 1957, 1958 and 1959 from both the artificial spawning grounds and from the hatchery system. Fyke nets operated at the outlet of the lake revealed that the fry did not leave the lake. Field observations showed that the young fry collected in schools and distributed themselves up lake in a normal feeding migration. Unfortunately very few of the young sockeye left the lake as smolts since trapping operations at the outlet of the lake failed to collect any significant number of fish en route to the sea. The following table summarizes the above operations.

Releases of Sockeye Fry and Production of Smolts in Horsefly Lake

Brood	1953	1955	1956	1957	1958
Number of eggs .....	283,000	522,000	1,445,000	3,824,000	3,873,000
Number of fry .....	131,000	280,000	311,000	3,259,000	3,003,000
Number of smolts .....	247	Unknown	269	21,537	(1960 smolts)

Whatever the controlling factors which prevent seaward migration of yearling sockeye from Horsefly Lake, and there are several possibilities, it does not appear that Horsefly Lake can be utilized as a sockeye rearing area. The failure of any significant number of the yearling sockeye to leave the lake is very disappointing since those which were trapped were of large size and in excellent condition.

In considering the possible reasons for the failure of the stocking experiments the sensitivity of sockeye to their environment and their inability to adjust to new areas is obviously indicated. The factors involved can only be conjectured. The possibility of any adverse effect from competitors is eliminated by the large size of the migrants which were trapped at the outlet of the lake. The decimation of the released fry by predatory action does not seem reasonable since predators do not appear to be more abundant in Horsefly Lake than in any natural sockeye producing lake adjacent to the area. Natural sockeye populations, genetically adapted to their freshwater environment, have been reduced to lower fry producing levels than those represented by the fry releases into Horsefly Lake and these populations have recovered rapidly once the cause for their decline had been eliminated.

That the released fry survived and remained in Horsefly Lake to maturity is suggested by reported increases in the sports catch of kokanee in recent years. Substantiation of these reports is not possible since no catch records were maintained and a native kokanee population has always existed in the lake.

The most logical conjecture as to the failure of the smolt migration can be found in a study of the dynamics of the lake itself. In relation to its size, Horsefly Lake has less outflow than other sockeye producing waters. The attraction of outflow is therefore at a minimum in Horsefly Lake. Wind direction is usually down lake in sockeye producing lakes previously studied and the important effect of wind in creating surface currents is well established. The wind in the outlet section of Horsefly Lake is usually cross-lake or up-lake in direction. In addition, the outlet end of Horsefly Lake is largely isolated from the main lake by a narrow sill area which has a *maximum* depth of only 42 feet. Since many sockeye fry and fingerlings have been observed uplake from the sill,

the combination of wind direction, poor outlet attraction, and the sill itself could interfere with possible influences which may control migration to the outlet of the lake.

The significant increase in the migrants trapped in 1959 could lead to optimism regarding the ultimate success of the experiment. However, even with a 10 per cent adult return only 430 spawners could be expected to escape the fishery to the reproducing area. This number of spawners would produce less than 25 per cent of the eggs required to produce the population originally. Obviously the experiment must still be considered a failure in spite of the increase in the number of the migrants. Even if the young of adults produced by the second or following generations showed a greater adaptation to their lake environment and a more definite tendency to leave the lake as smolts the possibility of producing a genetically adapted population capable of competitive regeneration with other natural populations is extremely poor.

The failure of the experiments to bring Horsefly Lake into production through the use of artificial spawning grounds and artificial propagation does not forestall the possibility of using this method for increasing sockeye populations naturally produced in lake watersheds but controlled in size because of limited spawning areas. It is important that experimentation be started in an area where the lake rearing capacity substantially exceeds any capacity of the natural spawning grounds associated with it. The ability of artificial spawning grounds or controlled spawning channels to produce substantial numbers of sockeye fry is already well established.

In 1958 a total of 807,000 eyed eggs of Stellako River origin were incubated in the experimental artificial spawning grounds of the Quesnel Field Station. Approximately 100,875 eggs were planted in each of eight sections having an area of 600 square feet. The flow percolating to each of four sections (A, B, E, F) was adjusted to 200 U.S. gallons per minute. In each of the remaining four sections (C, D, G, H) the allowable flow was limited to 800 U.S. gallons per minute. The number of fry emerging from each section was fairly uniform with one exception represented by section G. The survival to the fry stage was high with the degree of success higher in the low-flow sections than in the high-flow sections. The results of the experiments in producing emerging fry from eyed eggs by artificial seeding of prepared spawning grounds were as follows:

<i>Section</i>	<i>No. of Emerging Fry</i>	<i>% Survival</i>	<i>Section</i>	<i>No. of Emerging Fry</i>	<i>% Survival</i>
A	68,618	68.0	C	72,034	71.4
B	72,078	71.5	D	62,020	61.5
E	61,644	61.1	G	42,830	42.5
F	76,230	75.6	H	65,918	65.3

A total of 3,003,000 fry of Stellako River origin were released into Horsefly Lake during the spring of 1959; of this total 521,372 originated from the artificial spawning ground and the balance from the hatchery. The incubation temperature in both the hatchery and the artificial spawning ground was controlled artificially to duplicate that of the Stellako River.

A winter examination was made of eyed eggs transferred and planted in

the fall of 1958 to determine the success of survival to the date of the examination. Listed below is the record of each examination.

Location	Date	No. Live Alevins	No. Dead Alevins	No. Dead Eggs	Total	% Alive	Av. Depth of Water	Av. Depth in Gravel	Water Temp.
BARRIERE RIVER (Mile 10) .....	Feb. 25/59	47	0	2	49	96	18"	6"	32.0°F
BARRIERE RIVER (Mile 7) .....	Feb. 25/59	74	1	1	76	97	12"	5"	32.0°F
UPPER ADAMS R. (Mica Lake) .....	Feb. 26/59	104	1	13	118	88	3"	4"	32.5°F
SALMON RIVER (2½ mi. below Falkland) .....	Feb. 27/59								
Sample 1 .....		67	8	6	81	79	8"	5"	—
Sample 2 .....		78	8	1	87	90	8"	5"	—
EAGLE RIVER (½ mi. below N. Fork) .....	Feb. 27/59								
Sample 1 .....		67	3	5	75	90	12"	4"	34.5°F
Sample 2 .....		72	3	1	76	95	10"	4"	

Except for a known loss of eggs due to the construction of a highway bridge in the lower Barriere River and the possible exposure of one unlocated seeded plot in Upper Adams River all samples indicated a satisfactory survival of eggs to the alevin stage of development.

The high flow of Upper Adams River during the fall months when egg transfers must take place as related to the low winter flows during incubation makes it difficult to plant eyed eggs in sufficient depths of water to avoid later exposure. The failure of the transfer of 780,000 eyed eggs in 1955 to return any observable adults to Upper Adams River in 1959 may be associated with reduced winter flows. A check was not made of the transferred eggs in the winter of 1956 so that the cause of the failure of the transfer to produce returning adults cannot be finally determined.

In addition to the release of fry from the Quesnel Field Station into Horsefly Lake and the winter checks of eyed egg transplants detailed previously the following eyed egg transfers were accomplished in 1959.

1. A transfer of 490,000 eyed eggs of Raft River origin during October 10 to 12 to Fennell Creek. Fennell Creek is the principal source of water for North Barriere Lake and is reported as having once supported a fair run of sockeye.
2. A transfer of 900,000 eyed eggs of Seymour River origin during October 20 to 24 to Upper Adams River.
3. A transfer of 600,000 eyed eggs of Taseko Lake origin during October 16 to 20 to Harbour Creek, a tributary to Upper Adams River located about one mile above Mica Lake on the east side of the river.
4. A transfer of 622,000 eyed eggs of Lower Adams River origin during December 14 to 17 to the Middle Shuswap River, one-half mile above the confluence of Bessette Creek.

Reference was made in the 1958 Annual Report of the Commission (page 16) to the continued decline in the cyclical escapements to Birkenhead and

Pitt Rivers. The escapement to Pitt River in 1959 was below that of the cycle year for the ninth time in the last ten years. This decline in the 1959 escapement to Pitt River occurred in spite of a Canadian strike during a major part of the run and an indicated high sea survival of the smolts. The Birkenhead River escapement, unlike the one to Pitt River, showed a 52 per cent increase over that of the cycle year but the 1959 escapement to this stream was the first increase recorded in the last eleven years.

The continued decline in these two races of sockeye raises a serious problem because of the apparent genetic complexity of each of the two races. If either of the two populations were to approach extermination it is highly doubtful if any other races of Fraser sockeye could adjust to the freshwater environment represented by the Pitt and Birkenhead watersheds.

The adverse effect of flash floods on the success of the incubation of salmon eggs has been well established by fisheries scientists. Of all the sockeye populations of the Fraser River watershed only the runs to Pitt River, Weaver Creek and Silver Creek were seriously affected by the fall floods in late October and early November of 1955. Runs to neighbouring river systems such as Cultus Lake and Harrison River were unaffected by the 1955 flood and in 1959 showed increases of 86 and 411 per cent respectively. Observations of the success of incubation in Weaver Creek over a period of nine years showed that the percentage of fry emerging from the total number of eggs deposited declined to less than five per cent in the case of the 1955 brood. This decline can be associated with the flood conditions prevailing in the stream in the fall of 1955.

While a study has not been made of the variation in the success of natural incubation of sockeye eggs in the Pitt River because of adverse field conditions, frequent observations have firmly established that the spawning grounds in the main stream are extremely unstable. High velocities, due to the steep grade of the stream, force the spawning adults to seek shallow side channels which later go dry during the winter season or are badly eroded by periodic floods. The variation in the depth and location of flow is revealed by a study of Figure I.

Since all races of Fraser River sockeye with the exception of the Early Stuart overlap with each other in the timing of their migration through the fishery it is impossible to adjust the rate of fishing mortality for one race without disturbing the rate of fishing mortality of other races. Since most, if not all the other races of sockeye are apparently capable of withstanding greater exploitation than the Pitt and Birkenhead populations, any adjustment to provide the desirable escapement to the latter streams appears to be economically unsound.

The only alternate action to regulatory adjustment of the fishery as a means of maintaining sockeye populations such as Pitt and Birkenhead appears to be an increase in the fry production by some artificial means to offset the poor production due to unstable spawning grounds. Artificial or controlled spawning channels have proven themselves as a means of increasing fry production but the flow and channel characteristics of Pitt River make it difficult and hazardous to divert the required large flow from the stream for such a purpose. The only other method which may have merit is fully controlled artificial propagation and incubation.



FIGURE 1—A natural section of the Upper Pitt River sockeye spawning ground showing the wide variation in flow and in channel location.

An analysis by Dr. R. E. Foerster (Fisheries Research Board of Canada) of the methods of artificially propagating sockeye in British Columbia resulted in a decision that artificial propagation as it was practiced did not result in any significant advantage. All sockeye salmon hatcheries on the Fraser River watershed were closed in 1937. In view of the research by Foerster and the eventual closing of the sockeye hatcheries it is only by the introduction of new methods of operation on an experimental basis that artificial propagation can again be considered as a possible method of fry production. Experiments at the Quesnel Field Station have led to certain changes in standard incubation methods which improve the physiological condition of the fry produced. The survival rate of the fry produced by the new methods to the smolt stage has not been ascertained due to the failure of fry produced by any method to leave Horsefly Lake as smolts.

An *experimental* operation to isolate possible additional faults in modern hatchery practices and to measure the results of improved methods of artificially produced fry in terms of increased survival appear essential if the artificial propagation of Fraser River sockeye can ever be considered as a method of duplicating unstable spawning grounds or spawning grounds lost due to industrial development. Care must be used in the establishment of such an experimental operation that other factors do not disguise the results.

#### **General Investigations**

The continuing management and research activities of the Commission have been fully detailed in previous Annual Reports. A restatement of these activities is considered repetitious except as discussed elsewhere in this report or in the official publications released during the current year. Progress is rapid in the acquisition and use of knowledge required for effective management of sockeye populations of the Fraser Basin. However, a great void still exists in the information required for the full protection and extension of the species involved. It is very necessary that experimental programs be formulated and placed in operation immediately if the current benefits from scientific management of the Fraser River fishery are to be maintained and expanded in spite of the rapid industrial growth of the area.

### **PINK SALMON REPORT**

#### **The 1959 Pink Salmon Fishery**

The 1959 run of pink salmon as represented by the catch in Convention waters plus the escapement to the Fraser River only, totalled 5,818,000 fish as compared with 7,837,000 fish in the brood year of 1957. That the 1959 run would show a further decline than was established by the poor run in 1957 was indicated to the industry by the Commission in advance of the season. In view of what appeared to be an excellent escapement and very favorable spawning and incubation conditions in the brood year the industry of both countries was reluctant to accept the Commission's pre-season estimate of the size of the 1959 run; especially in view of the fact that the Commission had only investigated the pink salmon of the Fraser River for a period of less than two years. Over-optimism by the industry was also stimulated by record breaking troll catches of pink salmon both prior to and during the net fishing season.

Unfortunately the method evolved by the Commission for establishing the

size of the pink salmon run in advance was not precise hence the actual size of the run could only be measured by a comparison of the catch per unit of gear as the season progressed with the catch per unit of gear for the same period in the brood year. Since no known change had been made in the character of the gear used or its method of operation it had to be assumed that the catch per unit would reflect the size of the run.

For some unknown reason the natural availability of the fish to the gear increased substantially in 1959 over that recorded in 1957. The increase in availability of fish resulted in an increased efficiency on the part of the fishing gear, thus giving both the fishermen and the Commission the impression that the run approached that of 1957. The fishing regulations were so designed on the above basis to allow approximately the same escapement as was obtained in 1957 with an increased percentage of the total originating from early running fish.

The actual recorded increase in gear efficiency due to the increased availability of pink salmon in 1959 is detailed below.

Per Cent Change in Pink Salmon Gear Efficiency 1959 Over 1957			
Gear	Canadian West Coast	San Juan Islands	Point Roberts
Purse Seines .....	+ 27 Per Cent	+ 71 Per Cent	+ 29 Per Cent
Gill Nets .....	+ 71 Per Cent	+ 63 Per Cent	+ 56 Per Cent

The effect of increased gear efficiency due to increased availability was to increase the catch above permissible levels consistent with good management. If the Commission had had accurate data on both the fishing and the escapement for more than one year the possibility of variation in availability might have been recognized especially since a poor gill net catch in the Fraser River provided a danger sign. Lacking historical data on variable availability the cause of the poor gill net catch in the Fraser estuary was assigned with some justification to a record runoff due to heavy rains. In the case of future runs the Commission will have developed additional checks throughout the run to protect against unknown errors in assessing regulatory requirements.

The United States pink salmon catch of 2,427,535 fish was 51.21 per cent of the total while the Canadian catch of 2,312,906 fish was 48.79 per cent of the total catch of 4,740,441 pink salmon taken in Convention waters during 1959 (Tables X and XI). The difference of 114,629 fish in favor of the United States is due principally to the catch of 103,901 pink salmon by United States fishermen during the strike; thus with a total catch of 4,740,441, division was within 10,728 fish of parity.

The phenomenal size of the pink salmon troll catch by both Canadian and United States fishermen operating principally in the High Seas area of Convention waters is recorded in Table X. A preliminary investigation of the troll fishery during the past season indicates that increased prices and new lures are responsible for the increasing catch; also that the troll catch in future years will be of sufficient size to require consideration as a factor in proper management.

The daily catch of pink salmon in Convention waters is presented in Tables XII and XIII.



### Escapement

The serious effect of the increased availability of the 1959 run of pink salmon to the fishing gear and the resultant increase in fishing efficiency is reflected in the escapement. The total of 1,078,000 pink salmon recorded on the Fraser River spawning grounds in 1959 represents a 55.54 per cent decline over the escapement in 1957 (Table XIV). When the effect of the below-minimum escapement in 1959 is considered the 1961 run is expected to fall short of its capabilities regardless of its actual size.

The escapement was similar in timing with that of the brood year and was also divided into two groups, consisting of the early and the late spawning populations. Since the early spawning group includes the rehabilitating populations which spawn in the extensive spawning areas of the Thompson and main Fraser it is essential that the escapement to these areas be substantially increased if full restoration of the pre-Hell's Gate runs is to be obtained. The 1959 regulations were designed to increase the percentage of the early run escapement and this percentage increase was achieved in spite of the overall decline due to overfishing. The escapement of 872,963 of early run fish represents a decline of only 45.84 per cent from the total recorded in 1957 while the late run escapement of 205,037 fish shows a decline of 74.78 per cent. Of the total 1957 pink salmon escapement, 66.47 per cent were early run fish while in 1959 the early run fish comprised 80.98 per cent of the total escapement.

An examination of Table XIV reveals the interesting fact that *increases* in escapements were recorded in most of the small spawning tributaries in spite of the decline in the season's total escapement. Several hundred fish were counted in some streams that had no fish in the brood year. In 1957 the referenced streams were very low and the water warm, whereas in 1959 the flow and water temperature appeared more favorable for spawning. Considering these observations and similar ones made by other investigators, it may be concluded that homing of pink salmon may be modified by environmental conditions.

The possibility that homing of pink salmon may be modified by the availability of suitable spawning areas is further substantiated by the manner in which pink salmon have rapidly re-established populations above Hell's Gate. For many years after the slide in 1913 no pink salmon were observed above Hell's Gate in spite of the fact that the occurrence of any fish would be easily detected in such streams as Seton Creek and the Nicola River. The only apparent explanation for the appearance of pink salmon above Hell's Gate after the construction of the fishways is that the fish passing the fishways were merely an extension of the population which has always reproduced in substantial abundance in the main Fraser River below Hope. Since the populations now spawning above and below Hell's Gate migrate at the same time and are subject to very similar reproductive environments the two populations may be of the same origin.

### General Investigations

The principal feature of the 1959 investigations of the pink salmon populations was the cooperative tagging programs conducted under the auspices of the Pink Salmon Coordinating Committee. The Committee, consisting of representa-

tives of the Canadian and Washington State Departments of Fisheries, the Fisheries Research Board of Canada and the Commission, was created to meet the requirements of Article VI of the Pink Salmon Protocol which requires that, "The parties shall conduct a coordinated investigation of pink salmon stocks which enter Convention waters for the purposes of determining the migratory movements of such stocks."

A total of 54,369 pink salmon were tagged during the current season. Of these 22,743 fish were tagged in Johnstone Strait, 13,818 at Salmon Banks, 4,179 at West Beach, 10,474 at Point Roberts and the balance in Admiralty Inlet. Of the fish tagged in Convention waters a total of 17,980 were recovered in the Convention waters fishery, representing a total commercial recovery of 63.2 per cent. Of the fish tagged in Johnstone Strait, preliminary data show that 11,816 fish or 52.2 per cent were recovered in the fishery but over 75.0 per cent of those recovered were taken in the Johnstone Strait area.

In general it may be stated that the cooperative tagging program was unusually successful and that valuable information required for proper management of the pink salmon fishery will become available after extensive analyses of the recovery data. The complete analysis may not be available for at least a year but some information of considerable interest is already available as follows:

1. Substantial numbers of pink salmon destined for certain State of Washington streams were available to the West Beach fishery but very few of these fish were taken elsewhere in Convention waters except in Juan de Fuca Strait.
2. There can be a substantial drift of pink salmon back and forth across the International Boundary at Point Roberts. A total of 115 fish tagged in Johnstone Strait were recovered on September 10 at Point Roberts in spite of the fact that West Point Roberts was closed to fishing.
3. A significant share of the 1959 escapement to the Fraser River was from fish migrating through Johnstone Strait. About 26 per cent of the total number of tagged fish recovered on the Fraser River spawning grounds originated from fish passing through the northern area.
4. A significant number of pink salmon tagged in Convention waters were recovered from spawning streams tributary to Jervis Inlet, Burrard Inlet and Howe Sound in Canada.

Since spawning enumeration programs conducted under the direction of the Coordinating Committee were equally as successful as the marine tagging program it may be concluded that valuable detailed information will be provided on 1. The destination, migration routes, times of passage, catches, and exploitation rates of pink salmon stocks moving through fishing areas adjacent to Convention waters but migrating to streams located in Convention waters and 2. Destination, migration routes, times of passage, catches, and exploitation rates in Convention waters of pink salmon passing through Convention waters en route to streams in outside areas.

## 1959 PUBLICATIONS

1. Annual Report of the International Pacific Salmon Fisheries Commission for 1958.
2. Progress Report.  
The Energy Expenditures of Fraser River Sockeye Salmon During the Spawning Migration to Chilko and Stuart Lakes, by D. R. Idler and W. A. Clemens.
3. Research Bulletin Number X.  
Character of the Migration of Pink Salmon to Fraser River Spawning Grounds in 1957, by F. J. Ward.

TABLE I  
SOCKEYE CATCH BY GEAR

<i>United States Convention Waters</i>										
<i>Year</i>	<i>Purse Seines</i>			<i>Gill Nets</i>			<i>Reef Nets</i>			<i>Total</i>
	<i>Units</i>	<i>Catch</i>	<i>Percentage</i>	<i>Units</i>	<i>Catch</i>	<i>Percentage</i>	<i>Units</i>	<i>Catch</i>	<i>Percentage</i>	<i>Catch</i>
1959.....	257	1,401,819	77.42	446	241,163	13.32	81	163,093	9.01	1,810,738
1955.....	286	621,527	61.74	584	282,995	28.11	88	102,088	10.15	1,006,610
1951.....	242	875,607	77.02	177	152,376	13.40	105	108,497	9.54	1,136,795
1947.....	174	76,692	86.93	29	1,770	2.01	60	9,758	11.06	88,220
<i>Canadian Convention Waters</i>										
<i>Year</i>	<i>Purse Seines</i>			<i>Gill Nets</i>			<i>Traps</i>			<i>Total</i>
	<i>Units</i>	<i>Catch</i>	<i>Percentage</i>	<i>Units</i>	<i>Catch</i>	<i>Percentage</i>	<i>Units</i>	<i>Catch</i>	<i>Percentage</i>	<i>Catch</i>
1959.....	100	516,585	32.66	1,488	1,040,916	65.80	0	0	0	1,581,883
1955.....	104	462,934	41.78	1,348	625,207	56.42	5	18,548	1.67	1,108,081
1951.....	50	214,187	16.63	1,148	1,031,963	80.11	5	42,012	3.26	1,288,162
1947.....	97	44,011	12.40	1,072	307,407	86.58	5	3,617	1.02	355,035

NOTE: Gear counts represent the maximum number of units delivering sockeye on any single day.  
Unlisted troll catches of sockeye included in figures for total catch.

TABLE II  
CYCLIC LANDINGS AND PACKS OF SOCKEYE  
FROM CONVENTION WATERS

	<i>United States</i>	<i>Canada</i>	<i>Total</i>
1959			
Total Landings (No. Sockeye) .....	1,810,738	1,581,883*	3,392,621
Share in Fish .....	53.37%	46.63%	
Total Pack (48 Lb. Cases) .....	135,489	123,248	258,737
Share in Pack .....	52.37%	47.63%	
1955			
Total Landings (No. Sockeye) .....	1,006,610	1,108,081	2,114,691
Share in Fish .....	47.60%	52.40%	
Total Pack (48 Lb. Cases) .....	85,136	95,377	180,513
Share in Pack .....	47.16%	52.84%	
1946-1959			
Total Landings (No. Sockeye) .....	26,766,072	26,607,720	53,373,792
Share in Fish .....	50.15%	49.85%	
Total Pack (48 Lb. Cases) .....	2,361,560	2,318,490	4,680,050
Share in Pack .....	50.46%	49.54%	
1959 <i>Cycle Catch</i>			
1959 .....	1,810,738	1,581,883	3,392,621
1955 .....	1,006,610	1,108,081	2,114,691
1951 .....	1,136,795	1,288,162	2,424,957
1947 .....	88,220	355,035	443,255
1943 .....	242,077	349,011	591,088
1939 .....	555,233	568,943	1,124,176
1935 .....	615,502	825,508	1,441,010
1931 .....	975,591	458,048	1,433,639
1927 .....	1,069,557	713,930	1,783,487
1923 .....	495,490	361,463	856,953
1919 .....	778,669	470,199	1,248,868
1915 .....	736,939	1,088,524	1,825,463
1911 .....	1,447,919	730,714	2,178,633
1907 .....	1,030,359	691,210	1,721,569
1903 .....	1,911,127	2,341,492	4,252,619

\*782,173 Sockeye taken by United States fishermen during a strike by Canadian fishermen.

TABLE III  
DAILY CATCH OF SOCKEYE, 1947-1951-1955-1959 FROM UNITED STATES CONVENTION WATERS

Date	JULY				AUGUST				SEPTEMBER			
	1947	1951	1955	1959	1947	1951	1955	1959	1947	1951	1955	1959
1 .....						57,324	53,990		2,932		2,556	23,297
2 .....		13,102				42,143	75,245		1,575	910		18,812
3 .....		6,615				27,199	45,368	51,046	1,181	538		
4 .....		9,589	7,228					91,067	1,482	986	2,364	
5 .....		9,057	12,418					89,417	984	493	1,621	
6 .....		9,490	6,713					139,733		325	1,424	
7 .....			3,409			44,899		167,337	714	137	703	5,401
8 .....						27,696	48,429	132,596	622		205	10,197
9 .....						33,673	81,369					7,266
10 .....		23,677				19,943	54,024		246	265		11,143
11 .....		10,244					40,503	93,493	406	1,254		
12 .....		8,156	7,824				25,131	124,278	316	33,599	330	
13 .....		6,570	8,251					80,698	248	6,580	255	
14 .....		5,418	7,563					74,075		290	37	
15 .....			7,265			55,972				138	131	
16 .....						39,260	30,632		805		48	747
17 .....		16,435				40,588	32,409		106			495
18 .....		16,565				39,036	31,554		105	149		218
19 .....		12,476	16,903			22,937	43,279	125,123	443	234		
20 .....		13,501	17,687		4,285		27,280	83,286	125	109	142	
21 .....		14,630	13,795	7,112	8,308	9,835	2,222	64,087	240	109	70	
22 .....			11,878	5,962	7,669	10,513	16,714		69	216	123	154
23 .....				5,008	3,838	7,992	12,623		87		77	99
24 .....		58,796				5,544	17,133	924	272	38		56
25 .....		59,917			8,081	2,162	10,967	125,615	57	9		8
26 .....		54,748	38,584		4,953		8,413	67,372	36	14	36	
27 .....		45,817	13,949		5,794			17,846	42	7	6	
28 .....		42,981	29,915	16,216	6,234	2,467		33,994		1	27	
29 .....			30,647	20,278	5,536	7,489	10,136		13	2	45	1,941
30 .....				28,340	3,097	2,334	5,821		6		12	645
31 .....		64,435		44,671		1,346	5,372		10			553
31 .....		79,869			3,314	853	4,307	29,018				
Totals .....		582,088	234,029	127,587	69,369	501,205	682,921	1,591,005	13,122	46,688	10,288	81,032
Troll and outside seine.....	58	5	10,011	437	5,631	6,756	63,702	4,188	32	53	757	27
Monthly Totals .....	58	582,093	244,040	128,024	75,000	507,961	746,623	1,595,193	13,154	46,741	11,045	81,059
June, Oct. & Nov. Totals									8		4,902	6,462
Season Totals									88,220	1,136,795	1,006,610	1,810,738

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TABLE IV  
DAILY CATCH OF SOCKEYE, 1947-1951-1955-1959 FROM CANADIAN CONVENTION WATERS

Date	JULY				AUGUST				SEPTEMBER			
	1947	1951	1955	1959	1947	1951	1955	1959	1947	1951	1955	1959
1 .....						34,757	12,463		264		6,361	18,874
2 .....		24,501				50,315	53,491		114	52	486	19,749
3 .....		16,133				14,127	44,447	15,439	117	32,198		6,740
4 .....		13,850	8,734				41,692	16,614	222	15,955		1,581
5 .....		14,078	13,388					5,000	138	12,617	22,777	
6 .....		1,500	9,539			63,292		Strike		10,675	17,051	3,831
7 .....			7,305			30,490		July 26		6	14,849	7,269
8 .....						33,448		- Aug. 9	15,158		12,715	14,422
9 .....		20,406				29,668	64,348	Incl.	9,684	20	128	27,728
10 .....		11,909				18,040	61,049	228,536	6,796	15,622		31,362
11 .....		8,186	5,701				66,105	145,352	5,537	7,739		306
12 .....		9,464	5,122				38,165	125,006	52	9,229	146	
13 .....		3,000	5,984			59,457		127,041		12,047	31,216	
14 .....			5,960			27,445				25	16,921	24,349
15 .....						13,579	41,061		25,814		29	22,769
16 .....		15,184				8,442	52,783		29,309	4	3	16,543
17 .....		10,116				2,453	31,403	165,960	44,304	40,944		22,802
18 .....		10,134	9,561				29,679	83,683	39,708	27,599		18
19 .....		13,384	7,827		738		16,703	41,091	0	19,424	9	
20 .....		1,580	10,906	10,360	881	22,812				313	8	
21 .....			20,569	8,871	695	10,325				54	1	19,365
22 .....				12,214	333	14,583	12,249		31,284		10	10,636
23 .....		38,081				16,428	27,296	55,943	33,250		1	19,305
24 .....		30,178				392	24,536	104,920	54,538	24,783		15,459
25 .....		32,319	58,985		1,192		21,638	49,084	22,593	12,057		
26 .....		43,327	45,546		731	305	7,510	32,174	21	5,139		
27 .....		10,313	26,579	4,672	483	46,086						6
28 .....			14,064	2,540	296	23,673						2
29 .....					548	17,925	4,356		5,404			1
30 .....		76,209				20,425	20,417		1,572			
31 .....		39,931				228	10,126	31,096				
Totals		443,783	255,770	38,657	5,897	558,695	681,517	1,226,939	325,879	246,502	122,711	283,117
Troll and outside seine			534	2,163	590	1,541	39,667	21,458	166			608
8" Gill Nets	3,469			506	10,329				882		693	37
Monthly Totals	3,469	443,783	256,304	41,326	16,816	560,236	721,184	1,248,397	326,927	246,502	123,404	283,762
June, Oct. & Nov. Totals									7,823	37,641	7,189	8,398
Season Totals									355,035	1,288,162	1,108,081	1,581,883

TABLE V  
THE INDIAN CATCHES OF SOCKEYE SALMON BY DISTRICTS AND  
THE VARIOUS AREAS WITHIN THESE DISTRICTS, 1955, 1959

District and Area	1955		1959	
	Catch	No. of Fishermen	Catch	No. of Fishermen
<b>HARRISON-BIRKENHEAD</b>				
Skookumchuk and Douglas .....	445	10	965	
Birkenhead River and Lillooet Lake .....	3,041	27	3,600	
Harrison and Chehalis .....			1,450	
TOTALS .....	3,486	37	6,015	
<b>LOWER FRASER</b>				
Coquitlam to Chilliwack .....			10,365	
Chilliwack to Hope .....	7,595	—	4,975	
Vedder River and vicinity .....			245	
TOTALS .....	7,595	190*	15,585	
<b>CANYON</b>				
Hope to Lower Gorge .....	6,110	—	4,910	
Upper Gorge to North Bend .....	859	—	1,685	
TOTALS .....	6,969		6,595	
<b>LYTTON-LILLOOET</b>				
North Bend to Lillooet .....	11,124	—	5,100	
TOTALS .....	11,124	—	5,100	
<b>BRIDGE RIVER RAPIDS</b>				
Rapids to Pavilion .....	12,947	—	6,200	
TOTALS .....	12,947	126*	6,200	
<b>CHILCOTIN</b>				
Farwell Canyon .....	522		1,805	
Hances Canyon .....	687		2,282	
Alexis Creek .....	1,091		4,103	
Siwash Bridge .....	4,006		4,017	
Keighley Holes .....	533		570	
TOTALS .....	6,839	68*	12,777	
<b>UPPER FRASER</b>				
Shelley .....	130		108	
Alkali and Canoe Creek .....	750		200	
Chimney Creek .....	2,204		219	
Soda Creek .....	345		100	
Alexandria .....	193		30	
Quesnel .....	425		130	
TOTALS .....	4,047	79*	787	
<b>NECHAKO</b>				
Nautley Reserve .....	879	8	958	13
Stella Reserve .....	670	7	3,192	7
TOTALS .....	1,549	15	4,150	20
<b>STUART</b>				
Fort St. James .....	589	25	169	15
Tachie, Pinchi and Trembleur Villages .....	776	16	361	15
TOTALS .....	1,365	41	530	30
<b>THOMPSON</b>				
North Thompson River .....	302		425	
South Thompson River .....	803		4,100	
Thompson River .....	8,604		2,785	
TOTALS .....	9,709	210*	7,310	
GRAND TOTALS .....	65,630		65,049	

\* Number of permits issued to Indians in district.

The Indian catch statistics detailed above are obtained principally from the Protection Officers of the Canadian Department of Fisheries. These officers control the taking of sockeye for food by the Indian population residing throughout the Fraser River watershed.



RIVER SPAWNING AREAS, 1947, 1951, 1955, 1959

District and Streams	1959 Period of Peak Spawning	Estimated Number of Sockeye				Jacks	Sex Ratio	
		1947	1951	1955	1959		Males	Females
							4-5 yr.	4-5 yr.
LOWER FRASER								
Cultus Lake .....	Dec. 1-5	8,898	13,143	26,000	48,461	682	15,753	32,026
Upper Pitt River .....	Sept. 14-22	90,000	37,837	17,552	15,740	9	9,554	6,177
Widgeon Slough .....	Nov. 7-10	750	745	—	637	15	323	299
HARRISON								
Big Silver Creek .....	Sept. 17-24	—	200	191	64	29	13	22
Harrison River .....	Nov. 9-16	16,000	17,145	5,595	28,562	17	8,816	19,729
Weaver Creek .....	Oct. 17-20	6,500	12,979	21,330	8,379	16	3,289	5,074
LILLOOET								
Birkenhead River .....	Sept. 23-28	120,000	55,862	25,355	38,604	12,445	13,476	12,683
SETON-ANDERSON								
Gates Creek .....	Sept. 3-6	—	—	86	867	286	212	369
Portage Creek .....	Oct. 26-28	50	30	43	572	0	286	286
SOUTH THOMPSON								
Seymour River .....	Aug. 29-Sept. 3	10,000	24,344	9,511	52,325	15	26,511	25,799
Upper Adams River .....	—	0	0	0	0	0	0	0
Lower Adams River .....	Oct. 25-27	185,000	135,000	54,405	113,230	192	38,432	74,606
Little River .....	Oct. 28-Nov. 2	15,000	9,690	9,072	21,080	36	7,155	13,889
South Thompson River .....	Oct. 28-Nov. 2	100	500	0	472	1	160	311
Lower Shuswap River .....	—	0	0	23	0	0	0	0
Middle Shuswap River .....	—	0	0	0	0	0	0	0
NORTH THOMPSON								
Raft River .....	Aug. 31-Sept. 4	8,000	8,561	5,364	10,210	0	4,773	5,437
Barriere River .....	Sept. 5-10	—	108	103	203	0	101	102
Fennell Creek .....	Sept. 1-5	—	—	—	27	0	13	14
CHILCOTIN								
Chilko River .....	Sept. 29-Oct. 1	55,000	118,110	128,081	470,621	8,102	189,669	272,850
Taseko Lake .....	Sept. 2-6	—	500	4,400	16,410	90	7,175	9,145
QUESNEL								
Horsefly River .....	—	6	51	62	Present	—	—	—
Little Horsefly River .....	Sept. 25	—	—	—	27	11	11	5
NECHAKO								
Endako River .....	Sept. 3-7	450	742	594	1,463	0	731	732
Nadina River (Early) .....	Aug. 31-Sept. 2	90	326	202	1,364	7	678	679
(Late) .....	Sept. 16-20	—	—	—	—	—	—	—
Nithi River .....	Aug. 23-28	60	90	79	218	10	125	83
Ormonde Creek .....	Sept. 2-4	40	120	27	74	0	37	37
Stellako River .....	Sept. 26-28	55,000	96,200	51,971	79,355	50	36,869	42,436
STUART LAKE								
Early Runs								
Driftwood River .....	Aug. 16-20	0	50	0	3	0	1	2
Forfar Creek .....	Aug. 6-10	1,500	13,600	68	281	0	140	141
Frypan Creek .....	Aug. 8-12	—	50	0	1	0	1	0
Gluske Creek .....	Aug. 9-14	200	3,787	99	97	0	48	49
Kynoch Creek .....	Aug. 9-14	10,000	32,825	1,029	1,123	0	561	562
Narrows Creek .....	Aug. 8-12	0	400	27	167	0	83	84
Rossette Creek .....	Aug. 8-12	2,500	10,000	916	911	0	455	456
Shale Creek .....	Aug. 8-12	0	190	0	2	0	1	1
Misc. Streams .....	—	—	121	31	78	0	38	40
Late Runs								
Kazchek Creek .....	Sept. 18-24	—	200	18	7	0	3	4
Middle River .....	Sept. 18-24	60	2,000	3,596	3,500	0	1,722	1,778
Tachie River .....	Sept. 24-28	—	100	4,000	2,500	0	1,230	1,270
NORTHEAST								
Upper Bowron River .....	—	23,945	21,770	9,355	29,247	0	12,693	16,554
TOTALS .....		609,149	617,376	379,185	946,882	22,013	381,138	543,731

TABLE VII  
DAILY CATCH OF SOCKEYE, 1944-1948-1952-1956 FROM UNITED STATES CONVENTION WATERS

Date	JULY				AUGUST				SEPTEMBER			
	1944	1948	1952	1956	1944	1948	1952	1956	1944	1948	1952	1956
1 .....			5,011		58,863	118,062	40,805	59,168	26	2,707	711	
2 .....			8,640	4,286	46,797	100,423		41,245		391	597	
3 .....	4		7,943	3,885	28,550	97,469			49	1,150	432	1,418
4 .....			4,857	2,365	20,117	67,360	32,815		44		434	606
5 .....				1,038		60,695	25,891		65	1,297	140	500
6 .....	18				9,370	68,962	16,978	141,861	55	3,799		454
7 .....	99		14,008		6,912		18,488	98,859	19	1,692	722	146
8 .....		CLOSED	9,369		9,221	115,925	13,920		6	404	201	
9 .....	127		8,090	2,429	3,859	101,997				333	573	
10 .....	163		6,796	1,803	3,139	38,878			21	134	636	78
11 .....	92		4,187	2,189	5,788	17,288	6,865		39		557	58
12 .....	127			1,423			7,055		6	212	410	33
13 .....	145				1,855		2,697	24,347		205		119
14 .....	240		9,159		2,272		2,712	21,450	20	65	434	100
15 .....			10,812		383		2,831	12,509	2	15	299	
16 .....	1,413		13,794	4,677	1,242			9,102		42	272	
17 .....	1,292		16,876	8,146	935				28	140	193	43
18 .....	2,646	1,900	11,786	12,101	423		4,096		28		202	146
19 .....	3,836	2,469		15,053			3,143		3	233	151	49
20 .....	9,351	6,345			1,395		2,730	13,151	5	88		23
21 .....	9,313	8,602	90,696		1,612		967	8,831	17	20	117	37
22 .....		5,657	32,619		222		612	4,955	4	24	135	
23 .....	11,272	5,142	34,320	78,518	59			2,252		11	85	
24 .....	14,840		110,491	59,695	18				6	16	48	3
25 .....	11,952	17,524	134,294	39,052	76		220		1		47	3
26 .....	17,100	22,251		31,635			720		1	16	34	4
27 .....	25,144	23,441			51		1,167	651	1	22		5
28 .....	19,183	42,887	128,339		150		1,310	727	1	429	20	5
29 .....		69,529	100,767		243		931	389		811	20	
30 .....	46,334	78,843	96,565	113,200	192			524		319	31	
31 .....	56,431		56,664	70,572	17		654					
Totals.....	231,122	284,590	916,083	452,067	203,761	787,059	187,607	440,021	447	14,575	7,501	3,830
Troll and outside seine.....	113	37				9	2	3,816			17	34
Monthly Totals.....	231,235	284,627	916,083	452,067	203,761	787,068	187,609	443,837	447	14,575	7,518	3,864
June, Oct. & Nov. Totals										2,821	2,265	7,104
Season Totals									435,443	1,089,091	1,113,475	906,872

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TABLE VIII  
DAILY CATCH OF SOCKEYE, 1944-1948-1952-1956 FROM CANADIAN CONVENTION WATERS

Date	JULY				AUGUST				SEPTEMBER			
	1944	1948	1952	1956	1944	1948	1952	1956	1944	1948	1952	1956
1 .....			10,225		98,603		11,392	54,068		2,149	13,562	
2 .....			8,532		91,273	62,634		25,441		2,757	5,599	
3 .....	218		12,241	8,554	89,969	54,876				15	3,343	
4 .....	228		1,184	4,731	69,713	58,060			1,813		6,475	4,403
5 .....	328			6,501		74,788	108,955		1,834		10	1,448
6 .....	396					18,427	36,472		2,689	2,830		
7 .....	711		13,476		85,516		23,048		1,714	1,028		
8 .....			10,009		31,746		911	154,050		388	8	
9 .....			8,732		34,491	101,965		78,176		385	7	
10 .....	1,852		9,000	4,773	24,922	62,668				11	7	
11 .....	1,360		1,317	2,782	22,513	39,454	38,878		458		11	584
12 .....	1,572			2,474		35,812	12,321		413		12	260
13 .....	2,286					1,645	11,433		284	1,927		
14 .....	2,868		13,063		12,203		9,381	53,080	576	1,437		
15 .....			8,249		5,933		110	15,765		1,663	28	
16 .....			13,221		8,641	30,941				1,789	28	
17 .....	5,119		22,896	7,570	8,117	24,102				3	27	
18 .....	5,722		11,729	7,067	9,424	13,438	17,786		3,018		17	
19 .....	5,486	1,281		9,459		11,031	9,714		3,175		17	6,916
20 .....	5,058	1,281				97	6,218		1,567	3,117		2,753
21 .....	13,961	1,283	5,299		16,981		5,443	17,444	1,226	931		
22 .....		637	5,299		4,696		67	5,804		703		
23 .....			5,299		3,290	15,618				859		
24 .....	45,821		39,207	57,027	2,535	8,322						1,383
25 .....	22,035		48,841	22,609	80	8,302	21,489		5,574		1	193
26 .....	18,488	2,912		29,237		7,525	9,583		1,232		1	94
27 .....	15,723	2,967				84	6,535		488	5,523		29
28 .....	12,229	16,769	211,103		9,138		5,162	6,907	704	3,130		
29 .....		11,248	109,483		1,632		13	2,863		2,216	2	
30 .....		23,567	79,096		1,275	2,241				1,650	2	
31 .....	170,205		120,159	181,981	936	1,623						
Totals.....	331,666	61,945	767,660	344,765	633,627	633,653	334,911	413,598	26,765	34,511	29,157	18,063
Troll and outside seine				91			811	111,659				57
8" Gill Nets												220
Monthly Totals.....	331,666	61,945	767,660	344,856	633,627	633,653	335,722	525,257	26,765	34,511	29,157	18,340
June, Oct. & Nov. Totals									11,768	22,582	21,844	6,383
Season Totals									1,003,826	752,691	1,154,383	894,836

TABLE IX  
SUMMARY OF THE SOCKEYE ESCAPEMENT TO THE FRASER  
RIVER SPAWNING AREAS, 1944, 1948, 1952, 1956

District and Streams	Period of Peak Spawning	Estimated Number of Sockeye			
		1944	1948	1952	1959
LOWER FRASER					
Cultus Lake .....	Nov. 18-25	14,200	13,086	18,910	14,133
Upper Pitt River .....	Sept. 14-18	Present	53,000	48,887	32,258
Widgeon Slough .....	Oct. 28-Nov. 5	1,050	—	1,648	1,000
HARRISON					
Big Silver Creek .....	Sept. 12-16	5,192	12,000	6,031	6,187
Harrison River .....	Nov. 10-14	—	26,000	25,794	3,184
Weaver Creek .....	Oct. 20-24	16,441	20,000	33,983	8,472
LILLOOET					
Birkenhead River .....	Sept. 18-21, Oct. 2-5	57,707	120,000	79,082	57,899
SETON-ANDERSON					
Gates Creek .....	Aug. 26-31	—	—	6,883	9,059
SOUTH THOMPSON					
Seymour River .....	Aug. 25-27	200	4,000	6,785	2,684
Lower Adams River .....	Oct. 28-30	1,367	12,600	8,692	7,512
Little River .....	Oct. 25-26	200	2,400	1,964	661
Scotch Creek .....	Sept. 7-10	0	50	357	163
South Thompson River .....		0	100	200	0
NORTH THOMPSON					
Raft River .....	Aug. 28-Sept. 1	1,082	10,500	15,819	9,582
CHILCOTIN					
Chilko River .....	Sept. 22-25	328,655	670,000	489,473	647,479
Taseko Lake .....	Aug. 26-29	—	Present	3,647	1,995
QUESNEL					
Horsefly River .....	Aug. 31	3	50	7,013	2,944
Mitchell River .....					14
NECHAKO					
Endako River .....	Sept. 5-7	1	0	146	18
	Aug. 26-28,				
Nadina River .....	Sept. 21-23	—	30	1,677	1,311
Nithi River .....	Aug. 25-27	—	1	45	36
Ormonde Creek .....	Aug. 25-26	15	150	996	331
Stellako River .....	Sept. 24-27	3,294	16,000	40,462	38,459
STUART					
Early Runs					
Driftwood River .....	Aug. 15-18	—	—	38	50
Forfar Creek .....	Aug. 1-4	46	1,500	6,975	5,497
Gluske Creek .....	Aug. 1-4	—	1,500	5,911	4,619
Kynoch Creek .....	Aug. 1-4	350	7,500	13,439	9,535
Narrows Creek .....	Aug. 6-10	0	0	1,453	697
Rossette Creek .....	July 31-Aug. 3	2	1,500	3,575	3,863
Shale Creek .....	Aug. 6-10	—	0	414	185
Misc. Streams .....	Aug. 8-12	—	—	1,775	711
Late Runs					
Kazchek Creek .....	Sept. 11-15	3	80	295	223
Middle River .....	Sept. 12-15	22	200	476	500
Tachie River .....	Sept. 15-18	—	20	364	600
Sakeniche River .....	Sept. 15-18				131
NORTHEAST					
Upper Bowron River .....		1,700	25,218	18,672	6,996
TOTALS .....		431,530+	997,485	851,881	878,988

TABLE X  
PINK CATCH BY GEAR

<i>United States Convention Waters</i>												
<i>Purse Seines</i>			<i>Gill Nets</i>			<i>Reef Nets</i>			<i>Troll</i>		<i>Total</i>	
<i>Year</i>	<i>Units</i>	<i>Catch</i>	<i>Percentage</i>	<i>Units</i>	<i>Catch</i>	<i>Percentage</i>	<i>Units</i>	<i>Catch</i>	<i>Percentage</i>	<i>Catch</i>	<i>Percentage</i>	<i>Catch</i>
1959 .....	317	1,913,555	78.83	446	227,643	9.38	81	110,416	4.55	175,921	7.24	2,427,535
1957 .....	351	2,216,119	79.79	638	246,296	8.87	99	149,094	5.37	165,248	5.95	2,777,366
1955 .....	359	4,037,448	86.15	395	306,744	6.55	95	276,848	5.91	64,932	1.39	4,685,984
1953 .....	313	4,255,663	85.95	179	219,017	4.42	113	409,607	8.27	67,142	1.36	4,951,429
<i>Canadian Convention Waters</i>												
<i>Purse Seines</i>			<i>Gill Nets</i>			<i>Traps</i>			<i>Troll</i>		<i>Total</i>	
<i>Year</i>	<i>Units</i>	<i>Catch</i>	<i>Percentage</i>	<i>Units</i>	<i>Catch</i>	<i>Percentage</i>	<i>Units</i>	<i>Catch</i>	<i>Percentage</i>	<i>Catch</i>	<i>Percentage</i>	<i>Catch</i>
1959 .....	133	1,357,088	58.68	1,291	693,977	30.00	0	0	0	261,841	11.32	2,312,906
1957 .....	105	1,435,924	54.50	1,473	1,126,085	42.74	5	31,309	1.19	41,402	1.57	2,634,720
1955 .....	104	2,931,552	71.00	1,400	1,039,406	25.17	5	126,036	3.05	32,069	0.78	4,129,063
1953 .....	76	2,950,595	71.23	1,216	1,030,194	24.88	4	86,220	2.08	75,108	1.81	4,142,117

NOTE: Gear counts represent the maximum number of units delivering pinks on any single day.

TABLE XI  
LANDINGS AND PACKS OF PINK SALMON  
FROM CONVENTION WATERS

	<i>United States</i>	<i>Canada</i>	<i>Total</i>
1959			
Total Landings (No. of Pinks) .....	2,427,535	2,312,906*	4,740,441
Share in Fish .....	51.21%	48.79%	
Total Pack (48 Lb. Cases) .....	163,430	160,618	324,048
Share in Pack .....	50.43%	49.57%	
1959 Catch .....	2,427,535	2,312,906	4,740,441
1957 .....	2,777,366	2,634,720	5,412,086
1955 .....	4,685,984	4,129,063	8,815,047
1953 .....	4,951,429	4,142,117	9,093,546
1951 .....	5,086,284	2,885,514	7,971,798
1949 .....	6,235,400	3,189,662	9,425,062
1947 .....	8,801,595	3,491,416	12,293,011
1945 .....	5,458,890	1,279,849	6,738,739

\*103,901 pink salmon taken by United States fishermen during a strike by Canadian fishermen.

TABLE XII  
DAILY CATCH OF PINKS, 1953-1955-1957-1959 FROM UNITED STATES CONVENTION WATERS

Date	JULY				AUGUST				SEPTEMBER			
	1953	1955	1957	1959	1953	1955	1957	1959	1953	1955	1957	1959
1 .....	2		1			9,370			210,985	144,389		187,274
2 .....	1					16,341			267,777		308,214	157,077
3 .....	2					10,279		6,110	188,793		344,634	
4 .....		6			10,889			10,378	109,755	154,128	198,795	
5 .....		17			14,070		17,545	13,181		113,207		
6 .....	71	10			12,244		12,487	12,221	212,407	167,703		
7 .....	6	4			14,098	10,114		13,229	209,440	137,636		108,145
8 .....	23					24,948		9,036	205,765	55,612		153,233
9 .....	8		7			19,202			174,981		143,732	133,600
10 .....	35		1		23,873	16,197		10,105	158,067		82,101	132,028
11 .....		36			21,869	10,225		16,642	107,144	141,602	115,338	
12 .....		106			25,948		24,436	17,634		131,375	56,951	
13 .....	26	111			29,059		43,316	19,633	138,288	24,818	786	
14 .....	85	122			24,516	20,165	57,329		106,416	76,532		
15 .....	116		108			23,491			72,293	38,369		41,645
16 .....	454		235			26,193			78,636		40,133	30,919
17 .....	154		164		56,867	47,162		57,658	75,473		50,380	14,021
18 .....		583			56,938	38,138		41,664	16,501	149,735	35,730	
19 .....		736			72,235	2,488	99,644	36,950		104,360	146	
20 .....		658		1,063	40,859		89,534		73,159	81,676	49	
21 .....	1,190	515		1,533	83,825	66,618	80,747		36,796	68,999		
22 .....	611		1,423	1,127		65,570	110,833		16,013	66,773		8,427
23 .....	1,273		1,371			136,472		10,524	9,655		18,459	8,204
24 .....			1,193			122,729		316,210	7,363		12,369	4,195
25 .....		1,737			170,566	91,280		232,534	3,681	102,199	5,890	1,134
26 .....		890			151,858					29,277		
27 .....	4,264	1,785		3,545	169,118		228,828	59,823	1,015	43,543		
28 .....	5,356	1,827		5,506	156,070	228,497	189,603	125,179	532	46,725		
29 .....	3,586		1,837	5,114	164,644	135,610	97,861		732	15,696		3,790
30 .....	5,675		3,386	4,276	196,160	162,752			157			2,106
31 .....			2,848		310,263	161,889		232,046				2,252
Totals .....	22,938	9,143	12,574	22,164	1,805,969	1,445,730	1,185,836	1,240,757	2,481,824	1,894,354	1,413,707	988,050
Troll and outside seine.....	13,764	4,830	42,145	40,259	400,315	778,434	102,386	126,019	225,291	540,117	10,748	6,545
Monthly Totals .....	36,702	13,973	54,719	62,423	2,206,284	2,224,164	1,288,222	1,366,776	2,707,115	2,434,471	1,424,455	994,595
June, Oct. & Nov. Totals									1,328	13,376	9,970	3,741
Season Totals									4,951,429	4,685,984	2,777,366	2,427,535

TABLE XIII  
DAILY CATCH OF PINKS, 1953-1955-1957-1959 FROM CANADIAN CONVENTION WATERS

Date	JULY				AUGUST				SEPTEMBER			
	1953	1955	1957	1959	1953	1955	1957	1959	1953	1955	1957	1959
1 .....	185		2			7,169	343		138,491	137,320		117,313
2 .....	79		1			6,943			203,070	67,163	192,149	89,335
3 .....	9		1		6,509	16,178			202,614		180,181	99,848
4 .....		17	6		15,459	11,082		13	175,817		147,730	19,653
5 .....		5	7		17,664		20,779			299,702	91,813	
6 .....	91	6			15,838		41,304			175,474	58,796	95,733
7 .....	165	13			7,808		43,086		292,202	182,104		52,704
8 .....	78		6				162		159,485	136,765		92,362
9 .....	193		6			32,507			252,505	117,875	20,398	131,918
10 .....	92		6		36,025	45,148			269,828		113,427	88,337
11 .....		51	10		45,962	52,906		25,687	44,210		96,826	9,774
12 .....		115	10		30,426	40,857	88,365			94,543	57,295	
13 .....	224	93			58,612		53,273			228,496	40,518	
14 .....	282	181			87,204		116,580		60,025	191,906		29,041
15 .....	770		22			67,273	79,958		63,476	31,326		57,720
16 .....	1,105		33			72,500			132,282	4,719	44,764	45,086
17 .....	533		55		54,173	76,519		40,111	82,681		70,693	37,960
18 .....		818	101		38,864	63,697		29,604	452		33,112	1,169
19 .....		522	19		68,481	94,825	79,913	1,749		19,245	42,847	
20 .....	1,244	1,020		1,603	131,155		77,578			10,069	66,096	
21 .....	2,004	1,494		1,807	150,158		91,077		339	4,989		20,122
22 .....	9,641		3,091	2,880		154,777	110,547		336	4,543		17,566
23 .....	36,551		7,849			163,202		201,421	330	3,112	1,455	36,721
24 .....			5,078		138,875	212,995		225,659	75		1,628	22,104
25 .....		4,684	206		164,030	211,931		146,148	64		1,498	
26 .....		6,145			137,887	267,348	113,470	98,483		1,046	226	
27 .....	5,941	3,838			216,145		84,368			671	139	
28 .....	9,734	3,097			257,964		114,618		21	1,060		93
29 .....	6,987		2,078			251,150	164,983		21	240		202
30 .....	9,094		8,170			238,032			21	373	10	63
31 .....	4,631		14,928		183,237	170,565		123,443				
Totals .....	89,633	22,099	41,685	6,290	1,862,476	2,257,604	1,280,567	976,224	2,078,345	1,712,741	1,261,601	1,064,824
Troll and outside seine.....	7,273	2,216	3,398	27,542	40,415	46,117	30,460	179,795	26,707	12,052	4,788	44,467
8" Gill Nets									9,875	6,888		482
Monthly												
Totals .....	96,906	24,315	45,083	33,832	1,902,891	2,303,721	1,311,027	1,156,019	2,114,927	1,731,681	1,266,389	1,109,773
June, Oct. & Nov. Totals									27,393	69,346	12,221	13,282
Season Totals									4,142,117	4,129,063	2,634,720	2,312,906

REPORT FOR 1959



TABLE XIV  
SUMMARY OF THE PINK SALMON ESCAPEMENT TO THE  
FRASER RIVER SPAWNING AREAS

<i>District and Streams</i>	<i>Period of Peak Spawning</i>	<i>Estimated Number of Pink Salmon</i>	
		1957*	1959
<b>EARLY RUNS</b>			
LOWER FRASER			
Main Fraser .....	Sept. 25-Oct. 5	1,263,651	733,933
HARRISON			
Chehalis River .....	Oct. 12-18	9,336	6,729
FRASER CANYON			
Coquihalla River .....	Oct. 3-8	4,433	16,088
Jones Creek .....	Oct. 1-5	1,493	2,604
Lorenzetti Creek .....	Oct. 3-8	6	991
Silver Creek .....	Oct. 4-8	549	1,914
Hunter Creek .....	Oct. 4-9	13	234
American Creek .....	Oct. 5-10	4	790
Spuzzum Creek .....	Oct. 1-5	1,076	2,111
Nahatlatch River .....	Oct. 5-10	208	216
Anderson Creek .....	Oct. 6-10	824	567
Stein River .....	Sept. 30-Oct. 4	185	62
Churn Creek .....	—	8	0
Texas Creek .....	Oct. 8-12	0	195
Popkum Creek .....	Oct. 1-5	0	57
Flood Creek .....	Oct. 1-5	0	8
Yale Creek .....	Oct. 1-5	0	510
Emory Creek .....	Oct. 3-8	0	728
Stoyoma Creek .....	Oct. 5-8	0	42
Kawkawa Creek .....	Oct. 10-15	317	1,279
Ruby Creek .....	Sept. 28-Oct. 5	0	528
SETON-ANDERSON			
Seton Creek .....	Oct. 10-18	58,810	14,887
Portage Creek .....	Oct. 15-18	1,867	52
Bridge River .....	Oct. 15-20	0	1,201
Yalakom River .....	Sept. 28-Oct. 3	0	13
THOMPSON			
Thompson River .....	Oct. 10-20	266,329	86,342
Nicola River .....	Oct. 1-5	1,560	806
Bonaparte River .....	Oct. 18-22	653	3
Deadman River .....	—	564	0
Nicoamen River .....	Oct. 2-4	0	73
<b>TOTAL</b> .....		<b>1,611,886</b>	<b>872,963</b>
<b>LATE RUNS</b>			
LOWER FRASER			
Stave River .....	Nov. 1-5	6,500	1,383
Whonnock Creek .....	Oct. 20-25	549	57
Suicide Creek .....	—	2	0
Silverdale Creek .....	Oct. 13-18	52	68
Kanaka Creek .....	Oct. 18-23	153	18
South Alouette River .....	—	8	0
North Alouette River .....	—	8	0
Silver Creek (Pitt Lake) .....	—	239	0
Coquitlam River .....	—	6	0
HARRISON			
Harrison River .....	Oct. 20-27	585,798	110,311
Weaver Creek .....	Oct. 20-27	346	87
CHILLIWACK-VEDDER			
Chilliwack-Vedder River .....	Oct. 20-Nov. 1	212,334	91,517
Sweltzer Creek .....	Oct. 20-Nov. 1	6,874	751
Little Chilliwack Creek .....	—	68	0
Brown Creek .....	—	44	0
Slesse Creek .....	Oct. 20-Nov. 1	—	317
Middle Creek .....	Oct. 15-25	—	528
<b>TOTAL</b> .....		<b>812,981</b>	<b>205,037</b>
<b>GRAND TOTAL</b> .....		<b>2,424,867</b>	<b>1,078,000</b>

\* 1957 Totals corrected according to Bulletin X.