INTERNATIONAL PACIFIC SALMON
FISHERIES COMMISSION

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

ANNUAL REPORT
1972

COMMISSIONERS

THOR C. TOLLEFSON
DeWITT GILBERT
DONALD R. JOHNSON
W. R. HOURSTON
RICHARD NELSON
RODERICK HAIG-BROWN

NEW WESTMINSTER
CANADA
1973

INTERNATIONAL PACIFIC SALMON FISHERIES COMMISSION

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	1937-1967
A. J. Whitmore	1939-1966
	1968-1969
Olof Hanson	1948-1952
H. R. MacMillan, C.B.E., D.Sc.	1952-1956
F. D. Mathers	1956-1960
W. R. Hourston	1960-
Richard Nelson	1966-
Roderick Haig-Brown	1970-

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
	1957-1961
Albert M. Day	1947-1954
Alvin Anderson	1949-1950
Robert J. Schoettler	1951-1957
Elton B. Jones	1951-1957
Arnie J. Suomela	1954-1961
DeWitt Gilbert	1957-
George C. Starlund	1961-1966
Clarence F. Pautzke	1961-1969
Thor C. Tollefson	1966-
Charles H. Meacham	1969-1970
Donald R. Johnson	1971-

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DIRECTOR – A. C. COOPER

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REPORT OF THE INTERNATIONAL PACIFIC SALMON FISHERIES COMMISSION FOR THE YEAR 1972

Early in 1972 the Commission forwarded to the two national governments its recommendations for a $14,000,000 program for restoration and extension of the sockeye and pink salmon stocks of the Fraser River. The program involves the construction of nine spawning channels for sockeye and three channels for pink salmon over a 16-year period. The proposed projects for sockeye salmon, in conjunction with those already operating or under construction, have the capacity to triple current average commercial catches to an average of approximately 40 million fish every four years. This catch would be somewhat larger than the average of 36 million fish every four years that was obtained during the period 1894 to 1913, prior to the Hell's Gate disaster. The proposed projects for pink salmon, in conjunction with existing projects, would approximately double average catches every two years to about 8.9 million fish. It is believed the implementation of these recommendations will make it possible to restore the stocks to historical abundance.

The success of any program for development of the sockeye and pink salmon resources of the Fraser River system will be dependent upon preserving the migration routes free of obstructions, and also upon maintaining suitable environment in the rivers and lakes used by these salmon.

The importance of these factors, particularly with respect to proposed hydroelectric and flood storage reservoirs, has been stressed in many previous annual reports of the Commission, most recently in the 1966 report. The report on the fisheries problems related to a dam at Moran on the main stem of the Fraser, prepared in 1971 by the Canada Fisheries Service and the Commission, stated clearly the serious consequences of such a project to the salmon stocks of the Fraser River system.

During 1972, the British Columbia Energy Board released its report on power supply for the Province to meet projected requirements up to the year 1990. Significantly, the report did not recommend any power sites on the main stem of the Fraser River. The report of the engineering consultant to the Energy Board, Montreal Engineering Company, stated that power could be obtained elsewhere than from the Fraser River, at similar cost.

The Energy Board report did not include the recommendation of the engineering consultant to divert water from Taseko and Chilko Lakes to the Homathko River for development of power. This recommendation was associated with the proposal for a transmission line from Kelly Lake to Vancouver Island following the Homathko River and Bute Inlet, to provide future power requirements on the island. The Board rejected the transmission line on the basis of concern for security of the line in a mountainous area, and recommended nuclear thermal plants for future power supply on Vancouver Island. No decision on this question has been announced by the Provincial Government, but it would appear from public reaction that the question of nuclear power is controversial. The alternative of conventional thermal power plants considered by the engineering consultants is available, however.

The diversion of water from Taseko River and Chilko Lake to Tatlayoko Lake on the Homathko River as suggested by the Energy Board's consultant is similar to plans previously examined by the Commission in 1949, with the exception that no dam is proposed at the outlet of Chilko Lake, and only 450 cfs of Chilko Lake water (29% of the average outflow of 1,550 cfs) would be diverted. As in the earlier plans a dam near the outlet of Taseko Lake would be used to divert a flow of 1,550 cfs from Taseko Lake to Chilko Lake, to be added to the diversion from Chilko Lake to Tatlayoko Lake. The reduced diversion of Chilko Lake water was proposed "because this lake is an important salmon rearing area". The Fisheries Advisory Committee of the Energy Board was not asked to consider the implications of the project to the fisheries resource, and consequently there was no reference to the proposal in the Committee's report to the Energy Board. It must be emphasized however, that the proposal would have a number of serious effects on the sockeye runs to Chilko and Taseko Lakes which would result in the loss of this important segment of the Fraser River salmon fishery. Several major problems, as follows, can be identified at this time, but it is stressed that there could be other problems associated with changes in temperature and water quality which would require detailed study to evaluate.

1. Eggs in the main spawning grounds in Chilko River could be destroyed by exposure after deposition.
2. The diversion of the exceptionally turbid water of Taseko Lake into the clear water of Chilko Lake would severely reduce the plankton production in Chilko Lake. Sockeye fry rear throughout Chilko Lake for a year before moving downstream to the sea as smolts and their growth and survival would be reduced.
3. The sockeye smolts attempting to leave Chilko Lake would be attracted to the outflow tunnel to Tatlayoko Lake, which would be about 10 miles up the lake from the natural outlet. If smolts entered the tunnel they would be killed at the power plants. If the smolts could be prevented from entering the tunnel, and this is not a certainty, they probably would become resident in the lake.
4. The 200-foot-high dam at the outlet of Taseko Lake would obstruct the migration of adult sockeye into Taseko Lake, and would flood the spawning areas along the lakeshore.

Soon after the Energy Board report was released, the Commission expressed its grave concern regarding the serious effects the proposed diversion would have on the Fraser River sockeye fishery. Similar concern was expressed by the Minister of Fisheries and by the fishing industry.

Chilko River and Chilko Lake are the spawning and rearing areas for the second largest sockeye run to the Fraser River system. In the 20 years (five cycles) from 1952 to 1971, catches have averaged 799,000 fish annually, and for the dominant year run they have ranged from 648,000 to 1,967,000 fish. The average catch is 19.6% of the average Fraser River sockeye catches from all runs, but in two out of four years is 39.9% of the total Fraser catch, and in the dominant cycle years

has been as much as 73.2% of the total Fraser sockeye catch. Catches of sockeye from the Taseko Lake run have averaged nearly 21,000 fish annually. The catch of Chilko and Taseko sockeye has an average annual value of $2,165,000 to the fishermen at 1971 prices. In 1971 and 1972 the catch value to fishermen averaged $4,880,000 each year. The runs also provide an average of 35% of all Indian subsistence catches along the Fraser River, and in one out of every four years they provide 60 to 70% of these catches.

The report of the Commission in 1949 concluded that the proposed diversions would destroy the very valuable Chilko River sockeye run, and the smaller run to Taseko Lake. Insofar as can be determined at this time, the same conclusion would be reached concerning the development recommended to the Energy Board. As stated in the Commission's report in 1949 "the continuance of the existing Chilko sockeye fishery requires that there be no interruption, addition, diversion, or obstruction to either the natural inflow or the natural outflow of Chilko Lake or Chilko River".

The Energy Board report did recommend a second stage of development of the Nechako-Kemano project which would divert all flow of the Nechako River above Kenney Dam. The proposed additional diversion would result in greatly reduced flows in Nechako River, the migration route of Nadina and Stellako sockeye to Francois and Fraser Lakes. The resulting reduced flows would correspond to the conditions examined by the Commission and the Canada Department of Fisheries in 1951, 1952 and 1953. The principal concern was the increase in water temperatures in the Nechako River that would occur at the reduced flows during the period of sockeye migration in July and early August. In the years following completion of Kenney Dam and prior to filling of the reservoir early in 1957, flows in the Nechako River consisted only of the residual tributary inflow. In the summers of 1955 and 1956 daily maximum water temperatures as high as 75 to 77°F were recorded in the Nechako River just above its confluence with the Stuart River, confirming predictions that elevated water temperatures would occur. These conditions have not recurred since spilling of surplus water started in 1957, but they could be expected again after full development of the diversion as proposed. Since Francois Lake is one of the major sockeye rearing areas which the Commission has recommended be brought into full production by expanding the early sockeye run to Nadina River, careful consideration will have to be given to requirements for protecting the sockeye runs to the Fraser-Francois Lake system.

The Energy Board report also recommended diversion of the McGregor River, north of Prince George, into the headwaters of the Peace River. This diversion would provide additional power at Peace River projects, and would significantly reduce peak flows in the Fraser River. There are no sockeye runs to the McGregor River, but the diversion could affect many runs that migrate in the Fraser River. With flows in the Fraser River reduced in the summer months the resulting increased water temperatures in the lower river areas could adversely affect survival of adult sockeye. In addition, although relationships between freshwater environment and survival of juvenile salmon are not fully understood, there are indications that the survival of sockeye smolts and pink salmon fry is influenced by river flow during the seaward migration. Careful consideration of the proposed diversion will be required to ensure protection of these salmon stocks.

In contrast to large upstream storage reservoirs, the construction of dykes to contain river flood waters presents no foreseeable problems in protection of the sockeye and pink salmon stocks. However, 24 years have passed since the major flood in 1948 and construction of the dykes in the lower Fraser Valley to the level recommended by the Fraser River Board is still in progress. The runoff of the Fraser River at Hope in May, June and July 1972 was 10% larger than in 1948, and is estimated to have been 5% larger than during the largest flood on record in 1894. The lower peak water levels in 1972 were primarily due to fortuitous weather conditions. In view of the many facets of public and private interest concerned with provision of effective and economical flood protection, it is hoped that implementation of the objectives of the Federal-Provincial Fraser River Flood Control Program agreement of 1968 can be fulfilled as soon as possible.

COMMISSION MEETINGS

The International Pacific Salmon Fisheries Commission held sixteen formal meetings during 1972 with the approved minutes of these meetings being submitted to the Governments of Canada and the United States.

The first meeting of 1972 was held February 2, with Mr. Thor C. Tollefson serving as Chairman and Mr. W. R. Hourston as Vice-Chairman and Secretary. The Commission received the resignation of Mr. H. Gray from the Advisory Committee after almost 20 years service as United States Sport Fishermen representative. The Commission approved the report on the $14,000,000 development program for transmittal to the two national governments. The Commission met with the Advisory Committee regarding the tentative recommendations for regulatory control of the 1972 sockeye salmon fishery in Convention waters, as submitted to the Committee by the Commission on December 10, 1971. After certain revisions the Commission approved the recommended regulations for submission to the two national governments. The Commission approved a staff organization chart and approved the appointment of Mr. E. L. Brannon as Chief, Biology Division and Mr. S. R. Killick as Chief, Operations Division, with Mr. R. Stewart as Senior Supervisor, effective February 1, 1972. Dr. J. A. Servizi would become Chief, Environmental Protection Division, as well as manager of the Sweltzer Creek Salmon Research Laboratory.

The Commission met April 20, 1972 in executive session to consider administrative matters. In addition the Commission reviewed the status of its Advisory Committee members and approved four-year appointments for the following United States members: Purse Seine Fishermen, Mr. N. Mladinich; Salmon Processors, Mr. D. Franett; Reef Net Fishermen, Mr. J. Brown; Sport Fishermen, Mr. E. Engman; and Troll Fishermen, Mr. F. Lowgren. The Commission's Advisory Committee was composed of the following members for 1972:

United States	Canada
N. Mladinich Purse Seine Fishermen	F. Bublé Purse Seine Fishermen
D. Franett Salmon Processors	L. Monk Salmon Processors
R. Christensen Gill Net Fishermen	F. Nishii Gill Net Fishermen
J. Brown Reef Net Fishermen	H. Stavenes Purse Seine Crew Members
F. Lowgren Troll Fishermen	W. Edwards Troll Fishermen
E. Engman Sport Fishermen	R. Wright Sport Fishermen

The third meeting of the year was held June 20, on board the Canada Department of the Environment, Fisheries Service vessel "Tanu" to observe the presence of pink salmon fingerlings in Haro Strait and adjacent waters of the San Juan and Gulf Islands. In addition the Commission considered administrative matters pertaining to construction of the Nadina River spawning channel, and the budget for fiscal year 1973/74.

During the period July 18 to September 22 inclusive the Commission held eleven formal and six telephone meetings for adjustment of fishing regulations to achieve the desired escapement and, as nearly as practicable, equitable division of the allowable catch of Fraser River sockeye salmon. At one of the above referenced meetings, on August 30, the Commission inspected sockeye spawning in the Gates Creek channel and in Chilko River.

The fifteenth formal meeting of the year was held on November 29. The Commission considered the proposed regulations and predictions for the 1973 sockeye and pink salmon runs. In addition the Commission approved, for four-year terms, the appointments of Mr. R. Christensen as United States Advisory Committee member representing Gill Net Fishermen, and the following Canadian Advisory Committee members; Mr. H. English, representing Sport Fishermen; Mr. H. Stavenes representing Purse Seine Crew Members; and Capt. J. Lenic, Jr., representing Purse Seine Fishermen. The Commission also heard reports on the following subjects: 1. The current status of the Nadina River spawning channel, 2. Studies being conducted regarding toxicity of chlorinated sewage to salmon eggs, fry, smolts and adults, 3. Potential pollution problems associated with possible oil refineries, 4. Results of tests with antibiotics at Gates Creek as part of the continuing study of prespawning mortalities, and 5. An egg transplant in Horsefly River using Stellako and Horsefly fish as donor stocks.

The sixteenth and final meeting of 1972 was held December 7 and 8 in Bellingham, Washington with the first day devoted to general business and a special meeting with Ambassador Donald L. McKernan, Coordinator of Ocean Affairs and Special Assistant to the Secretary of State, and Mr. C. R. Levelton, Director General, Operations Directorate (Fisheries) Department of the Environ-

ment regarding the development program recommended by the Commission earlier in the year. The second day of the meeting the Commission met with its Advisory Committee, staff and approximately 370 representatives of industry, government and press. Ambassador Donald L. McKernan and Mr. C. R. Levelton were also in attendance and reported on the status of the development program. The catch and escapement statistics for the 1972 fishing season were presented by the staff. Reports were also presented on the following topics: 1. Catches and relative production rates for the five spawning channels operated by the Commission, 2. Development of a gravel cleaning machine for use in spawning channels, 3. Continuing pollution control research and monitoring programs, 4. Current results of prespawning mortality studies, 5. Lake productivity studies, and 6. The use of echo sounding techniques to improve escapement estimates in the Fraser River. Prospects for the 1973 fishing season were reviewed and tentative proposals for regulating the 1973 fishery were released subject to further consideration by members of the industry and their representatives on the Commission's Advisory Committee.

1972 REGULATIONS

Recommendations for regulations governing the 1972 sockeye salmon fishery in Convention waters were adopted at a meeting of the Commission held on February 2, 1972 and submitted to the two national governments for approval and to the State of Washington for implementation on February 16, 1972. The recommendations for Canadian Convention waters were implemented by the Government of Canada by an Order-in-Council dated June 13, 1972 and for United States Convention waters by an Order of the Director of the Washington State Department of Fisheries on April 5, 1972.

The recommendations of the Commission were as follows:

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 of 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 1972, under authority of the Fisheries Act, namely:

1. (1) No person shall fish for sockeye or pink salmon in the waters of the southerly portion of District No. 3 embraced in that portion of Area 20 lying westerly of a line drawn true south from Sheringham Point Lighthouse to the International Boundary line with nets from the 25th day of June, 1972 to the 22nd day of July, 1972, both dates inclusive.

(2) No person shall fish for sockeye or pink salmon in the waters described in subsection (1) of this section with purse seines from the 23rd day of July, 1972 to the 12th day of August, 1972, both dates

inclusive, except from half past six o'clock in the forenoon to half past six o'clock in the afternoon of Monday and Tuesday of each week.

(3) No person shall fish for sockeye or pink salmon in the waters described in subsection (1) of this section with gill nets from the 23rd day of July, 1972 to the 12th day of August, 1972, both dates inclusive, except from;

(a) half past six o'clock in the afternoon of Sunday to half past six o'clock in the forenoon of Monday; and

(b) half past six o'clock in the afternoon of Monday to half past six o'clock in the forenoon of Tuesday of each week.

(4) No person shall fish for sockeye or pink salmon in the waters described in subsection (1) of this section with hook and line or trolling gear, except for the purpose of personal consumption and not for sale or barter, from the 23rd day of July, 1972 to the 12th day of August, 1972, both dates inclusive, except at the times that net fishing may be permitted within that area.

2. No person shall fish for sockeye or pink salmon in the waters of the southerly portion of District No. 3 embraced in Areas 17 and 18, and in the Convention waters portion of District No. 1 by means of nets:

(a) From the 25th day of June, 1972 to the 15th day of July, 1972, both dates inclusive, except for those sockeye or pink salmon taken in gill nets having mesh of not less than 8½ inches extension measure as authorized for the taking of chinook salmon by the Director of the Pacific Region, Department of the Environment, Fisheries Service and pursuant to the provisions of the British Columbia Fishery Regulations; and

(b) From the 16th day of July, 1972 to the 29th day of July, 1972, both dates inclusive, except from eight o'clock in the forenoon of Monday to eight o'clock in the forenoon of Wednesday of each week; and

(c) From the 30th day of July, 1972 to the 23rd day of September, 1972, both dates inclusive, except from eight o'clock in the forenoon of Monday to eight o'clock in the forenoon of Tuesday of each week.

3. No person shall fish for sockeye or pink salmon with hook and line or trolling gear, except for the purpose of personal consumption and not for sale or barter, in the Convention waters of Canada lying easterly and inside of a straight line projected from Gower Point at the westerly entrance to Howe Sound to Thrasher Rock Light, thence in a straight line to Salamanca Point on the southerly end of Galiano Island, thence in a straight line to East Point on Saturna Island, thence in a straight line towards Point Roberts Light to the intersection with the International Boundary line, thence following the International Boundary line to its intersection with the mainland from the 20th day of August, 1972 to the 23rd day of September, 1972, both dates inclusive, except at the times and locations that net fishing other than with chinook salmon nets may be permitted within that area.

All times hereinbefore mentioned shall be Pacific Daylight Saving Time."

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 of 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 United States Government that regulations to the following effect, in the interests of such fisheries, be adopted for the year 1972 and that an approved copy of said regulations be forwarded to the Director of Fisheries of the State of Washington for implementation by virtue of authority in him vested by Section 6 of Chapter 112 of the Laws of the State of Washington of 1949, namely:

1. No person shall fish for sockeye or pink salmon by means of nets in the Convention waters of the United States of America from the 25th day of June, 1972 to the 15th day of July, 1972, both dates inclusive.

2. (1) No person shall fish for sockeye or pink salmon in the Convention waters of the United States of America 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 with purse seines from the 16th day of July, 1972 to the 12th day of August, 1972, both dates inclusive, except from five o'clock in the forenoon to half past nine o'clock in the afternoon of Monday, Tuesday and Wednesday of each week.

(2) No person shall fish for sockeye or pink salmon in the waters described in subsection (1) of this section with gill nets:

(a) From the 16th day of July, 1972 to the 22nd day of July, 1972, and from the 30th day of July, 1972 to the 5th day of August, 1972, all dates inclusive, except from seven o'clock in the afternoon of Sunday to half past nine o'clock in the forenoon of Monday, from seven o'clock in the afternoon of Monday to half past nine o'clock in the forenoon of Tuesday and from seven o'clock in the afternoon of Tuesday to half past nine o'clock in the forenoon of Wednesday of each week; and

(b) From the 23rd day of July, 1972 to the 29th day of July, 1972, and from the 6th day of August, 1972 to the 12th day of August, 1972, all dates inclusive, except from seven o'clock in the afternoon of Monday to half past nine o'clock in the forenoon of Tuesday, from seven o'clock in the afternoon of Tuesday to half past nine o'clock in the forenoon of Wednesday and from seven o'clock in the afternoon of Wednesday to half past nine o'clock in the forenoon of Thursday of each week.

3. (1) No person shall fish for sockeye or pink salmon in the Convention waters of the United States of America 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 with purse seines:

(a) From the 16th day of July, 1972 to the 12th day of August, 1972, both dates inclusive, except from five o'clock in the forenoon to half past nine o'clock in the afternoon of Monday, Tuesday and Wednesday of each week; and

(b) From the 13th day of August, 1972 to the 2nd day of September, 1972, both dates inclusive, except from five o'clock in the forenoon to nine o'clock in the afternoon of Monday, Tuesday and Wednesday of each week.

(2) No person shall fish for sockeye or pink salmon in the waters described in subsection (1) of this section with reef nets:

(a) From the 16th day of July, 1972 to the 12th day of August, 1972, both dates inclusive, except from twelve o'clock (noon) Sunday to half past nine o'clock in the afternoon of Sunday, from five o'clock in the forenoon to half past nine o'clock in the afternoon of Monday and Tuesday and from five o'clock in the forenoon of Wednesday to twelve o'clock (noon) Wednesday of each week; and

(b) From the 13th day of August, 1972 to the 2nd day of September, 1972, both dates inclusive, except from twelve o'clock (noon) Sunday to nine o'clock in the afternoon of Sunday, from five o'clock in the forenoon to nine o'clock in the afternoon of Monday and Tuesday and from five o'clock in the forenoon of Wednesday to twelve o'clock (noon) Wednesday of each week.

(3) No person shall fish for sockeye or pink salmon in the waters described in subsection (1) of this section with gill nets:

(a) From the 16th day of July, 1972 to the 22nd day of July, 1972, and from the 30th day of July, 1972 to the 5th day of August, 1972, all dates inclusive, except from seven o'clock in the afternoon of Sunday to half past nine o'clock in the forenoon of Monday, from seven o'clock in the afternoon of Monday to half past nine o'clock in the forenoon of Tuesday and from seven o'clock in the afternoon of Tuesday to half past nine o'clock in the forenoon of Wednesday of each week; and

(b) From the 23rd day of July, 1972 to the 29th day of July, 1972, and from the 6th day of August, 1972 to the 12th day of August, 1972, all dates inclusive, except from seven o'clock in the

afternoon of Monday to half past nine o'clock in the forenoon of Tuesday, from seven o'clock in the afternoon of Tuesday to half past nine o'clock in the forenoon of Wednesday and from seven o'clock in the afternoon of Wednesday to half past nine o'clock in the forenoon of Thursday of each week; and

(c) From the 13th day of August, 1972 to the 19th day of August, 1972, and from the 27th day of August, 1972 to the 2nd day of September, 1972, all dates inclusive, except from six o'clock in the afternoon of Sunday to nine o'clock in the forenoon of Monday, from six o'clock in the afternoon of Monday to nine o'clock in the forenoon of Tuesday and from six o'clock in the afternoon of Tuesday to nine o'clock in the forenoon of Wednesday of each week; and

(d) From the 20th day of August, 1972 to the 26th day of August, 1972, both dates inclusive, except from six o'clock in the afternoon of Monday to nine o'clock in the forenoon of Tuesday, from six o'clock in the afternoon of Tuesday to nine o'clock in the forenoon of Wednesday and from six o'clock in the afternoon of Wednesday to nine o'clock in the forenoon of Thursday.

(4) No person shall fish for sockeye or pink salmon in that portion of the waters described in subsection (1) of this section lying northerly and westerly of a straight line drawn from Iwersen's Dock on Point Roberts in the State of Washington to Georgina Point Light at the entrance to Active Pass in the Province of British Columbia with nets from the 3rd day of September, 1972 to the 16th day of September, 1972, both dates inclusive.

4. (1) The foregoing recommended regulations shall not apply to the following United States Convention waters:

(a) State Fishing Area No. 7 including all Convention waters known as Bellingham Bay lying inside of a line extending from Point Frances through the Post Point Bell Buoy to the mainland, and

(b) That portion of State Fishing Area No. 3 lying easterly and inside of a line projected from Carter Point on Lummi Island to the most northerly tip of Vendovi Island, thence to Clark Point on Guemes Island including the waters of Samish Bay, and

(c) State Fishing Area No. 4 commencing the 16th day of July, 1972.

(d) Preserves previously established by the Director of Fisheries of the State of Washington for the protection of other species of food fish.

All times hereinbefore mentioned shall be Pacific Daylight Saving Time."

Emergency Orders

In order to provide for adequate racial escapements of Fraser River sockeye salmon and for an equitable share of the season's catch by the fishermen of the United States and Canada, the approved regulations as detailed above were later adjusted on recommendations of the Commission as follows.

July 25, 1972 – In the interest of division of catch, the Commission recommended an additional 24 hours fishing in all United States Convention waters making a total of four days fishing for the current week.

July 28, 1972 – In order to secure escapement of Chilko River, Gates Creek, and Pitt River sockeye, the Commission recommended the following regulations for the week commencing July 30: 1. Opening time in all Canadian Convention waters be delayed 24 hours, with the waters lying westerly of William Head open to fishing Monday evening, July 31 for gill nets and Tuesday morning, August 1 for purse seines for two days fishing and the waters lying easterly of William Head open Tuesday morning, August 1 for one day fishing; 2. All United States Convention waters open as scheduled but for two days fishing instead of the scheduled three days.

August 1, 1972 – After reviewing the status of the escapements as well as division of catch, the Commission recommended an additional two days fishing in all United States Convention waters making a total of four days for the current week.

August 4, 1972 – In the interest of adequate harvest of the run and adjustment of division of catch, the Commission recommended that the opening to fishing in all United States Convention waters, for the week commencing August 6, be delayed until further notice.

August 7, 1972 – In order to harvest the Chilko sockeye run adequately and in the interest of division of catch, the Commission made the following recommendations: 1. That all United States Convention waters open to fishing for two days starting noon Tuesday, August 8 for reef nets, Wednesday morning, August 9 for purse seines and Wednesday evening, August 9 for gill nets; 2. Fishing in Canadian Convention waters lying westerly of William Head be extended by 24 hours thus giving three days fishing for the current week.

August 10, 1972 – In the interest of obtaining a proper harvest of the runs and division of catch, the Commission recommended the following regulations: 1. That regulatory control of those Convention waters lying westerly of the Angeles Point-William Head line be extended beyond August 13 until further notice; 2. An additional 24 hours fishing be granted in all United States Convention waters for the current week making a total of three days fishing; 3. That fishing in Canadian Convention waters lying westerly of William Head be opened Friday evening, August 11 for gill nets and Saturday morning, August 12 for purse seines for three days fishing.

August 11, 1972 – In order to achieve division of catch and harvest a larger than expected Chilko run, the Commission recommended the following regulatory changes for the week commencing Sunday, August 13: 1. That fishing in Canadian Convention waters lying easterly of William Head be permitted for 24 hours commencing noon Sunday, August 13; 2. That the scheduled opening in United States Convention waters be delayed 24 hours with reef nets commencing noon Monday, August 14, gill nets Monday evening, August 14 and purse seines Tuesday morning, August 15 for two days fishing.

August 14, 1972 – In the interest of division of catch, the Commission recommended that fishing time in all United States Convention waters be reduced by 24 hours to give one day fishing for the current week after which all United States Convention waters be closed until further notice.

August 18, 1972 – The Commission, in the interest of division of catch and because the volume of sockeye entering Juan de Fuca Strait had declined significantly, made the following regulatory recommendations for the week commencing August 20: 1. That regulatory control for all Convention waters lying westerly of the Angeles Point-William Head line be relinquished effective Sunday, August 20; 2. That fishing in United States Convention waters lying easterly of Angeles Point open as originally scheduled but for two days fishing only; 3. That fishing in Canadian Convention waters lying easterly of William Head open as scheduled for two days fishing instead of the originally scheduled one day.

August 23, 1972 – In order to harvest the late portion of the Chilko River sockeye run and in the interest of division of catch, the Commission recommended 12 hours fishing commencing 8:00 a.m. Friday, August 25 in all Canadian Convention waters lying easterly of William Head.

August 24, 1972 – To protect late running sockeye races and to aid in division of catch the Commission recommended that fishing in United States Convention waters lying easterly of Angeles Point be closed for the week commencing August 27.

August 28, 1972 – The Commission recommended a 12 hour fishery commencing 7:00 a.m. Thursday, August 31 in all Canadian Convention waters lying easterly of William Head.

August 31, 1972 – The Commission recommended that the scheduled opening of Canadian Convention waters lying easterly of William Head be delayed 24 hours for the week commencing September 3 with fishing to commence 8:00 a.m. Tuesday, September 5 for 24 hours.

September 15, 1972 – The Commission recommended that regulatory control of that portion of Canadian Convention waters lying easterly of William Head encompassing Areas 17 and 18 be relinquished effective Sunday, September 17.

Regulatory control of the remaining Canadian Convention waters still in the Commission's control was relinquished as scheduled Sunday, September 24 thus completing the Commission's regulatory obligations for Convention waters for the 1972 season.

SOCKEYE SALMON REPORT

The Fishery

The total 1972 Fraser River sockeye run, estimated at 3,715,000 fish, was larger than the predicted run of 3,000,000. The run was the largest for this cycle since 1936, and the second largest since 1912. The number of Fraser sockeye entering Convention waters through Juan de Fuca and Johnstone Straits was 3,180,725 of which 2,202,548 (69.3%) were caught commercially, 134,268 (4.2%) were taken by the Indian fishery, and 843,909 (26.5%) were recorded on the spawning grounds (see Tables I to VI in Appendix). An estimated total of 6,861 non-Fraser sockeye, mainly from the run to Lake Washington in Washington State, were caught in Convention waters. The estimated catches of Fraser River sockeye in non-Convention waters in Johnstone Strait and northern Strait of Georgia, and off the west coast of Vancouver Island were estimated at 519,338 and 15,053, respectively. The non-Convention waters catch of Fraser River sockeye migrating through Johnstone Strait was 19.0% of the total commercial catch of Fraser sockeye in all areas, and 14.0% of the total run. The latter figure may be compared with a catch of 12.6% of the total run in 1968, the preceding cycle year.

The total 1972 Convention waters catch of 2,209,409 sockeye was 403,447 larger than in the brood year 1968 and the total Fraser River sockeye run was 796,177 larger. Canadian fishermen caught 1,081,217 sockeye (48.94%) and United States fishermen caught 1,128,192 (51.06%) (Appendix Tables I and II). A major reason for the increased run in 1972 was the increase in the Chilko population from 1,900,000 in the brood year to approximately 2,400,000 in 1972. For two consecutive years the Chilko population has exceeded 2,000,000 fish and the combined 1971-1972 Chilko runs have totaled an estimated 4,650,000 sockeye.

In Canadian Convention waters, the catch was almost evenly divided between the Juan de Fuca Strait fishery and inside waters. Of the total catch, 555,171 sockeye were taken in the waters westerly of William Head while 526,046 were caught easterly of this area, primarily in the vicinity of the Fraser River.

The percentage catch by purse seines in Canadian Convention waters showed a marked increase compared with cycle years 1964 and 1968, as a result of the early opening in Juan de Fuca Strait. The percentage of total catch by all gear in 1972 was quite similar to 1960, the most recent cycle year with comparable fishing time in the Canadian portion of Juan de Fuca Strait. The purse seine catch (279,962) in 1972 in Juan de Fuca Strait was the second largest ever recorded on the cycle while the gill net catch (263,192) was the largest of any year on the cycle.

In United States Convention waters the catch by gill nets was the highest recorded for the cycle, and this gear's percentage of total catch (44.88%) was the highest of any year. Purse seines took 47.26% of the total catch, the lowest percentage in any year since 1956. Reef nets took 7.83% of total catch, similar to other cycle years.

The average weight of 4-year-old sockeye was 5.85 pounds, slightly below the cycle average of 6.03 pounds.

Escapement

The net escapement of 843,909 sockeye represented 26.5% of the 1972 Fraser run to Convention waters and 22.7% of the calculated total Fraser River run. Most of the individual races had higher escapements than those recorded in the brood year and total escapement on the cycle was the largest since 1956. In only a few instances were less than desirable escapements obtained.

The first run of the season destined for the Stuart Lake system had excellent production from the small brood year escapement of only 1,587 spawners. The escapement of 5,086 Early Stuart sockeye in 1972 was made possible by the restricted fisheries.

The return of 4,138 sockeye to the Bowron River was a slight increase over the brood year escapement and was considered to be at a satisfactory level.

The Nadina River escapement of 3,529 was the largest on the cycle year since 1940 when records were started and probably the largest since 1918. Most of the escapement was from the Late Nadina run which spawns just below the outlet of Nadina Lake.

The escapements to Upper Pitt River, Seymour River and Gates Creek were slightly below those recorded in the brood year. The escapement to Gates Creek of only 8,569 (including 6,807 in the spawning channel) was considerably less than the estimated escapement past the commercial fishery and was particularly disappointing because the total return of approximately 87,000 fish was one of the largest in many years. The reasons for the apparent loss of escapement are under investigation. About 33% of the Gates Creek female spawners died before spawning, similar to the mortality recorded in the brood year.

The Chilko escapement of 564,465 was the largest on the cycle year since 1956. An estimated 100,000 of the total escapement spawned at the north and south ends of Chilko Lake. Surveys of the lake spawners in 1971 and 1972 have identified a lake spawning stock at the south end of the lake which is racially distinct from the Chilko River spawners. The fish are smaller than the Chilko River spawners and attain less growth in the lake before seaward migration. The stock also has a higher percentage of two year lake residents. It is estimated that this stock comprised about 30,000 spawners in 1972.

Escapements of other populations migrating at a similar time with Chilko, such as Raft River, Stellako River and Fennell Creek sockeye, also showed improvement in 1972. The Fennell Creek escapement was the largest on record for this race. Although the Stellako escapement increased 20.9% above the brood year, a larger escapement was desired but could not be obtained without adding additional unnecessary escapement to Chilko.

Escapement to the Birkenhead River was considered satisfactory. Although the total escapement of 113,097 was the largest since 1948, 58,581 were 3-year-old jacks. The adult escapement of 54,516 was down slightly from the adult escapement of 58,104 in the brood year 1968.

Adams River escapement was slightly better than in 1968. Escapements to Cultus Lake and Harrison River were considerably below brood year levels. However, the return to Weaver Creek of 26,548 sockeye (including 11,043 in the spawning channel) was outstanding. This spawning population has increased over

twenty-fold since the cycle year escapement of only 1,196 adult spawners in 1964, whereas escapements of sockeye to nearby Harrison River and Cultus Lake have declined.

Success of spawning was excellent in most areas this year, with Chilko and Stellako populations having 98.7 and 98.4% success of spawning. The exceptions were at Gates Creek and Raft River with 66.6 and 71.7% spawning success respectively.

The total sockeye escapement of 844,000 represents a good potential for the 1976 run. The escapement level was quite similar to the total of 852,000 and 879,000 obtained in cycle years 1952 and 1956.

REHABILITATION

The survival rate from eggs to fry at the sockeye spawning channels at Gates Creek and Weaver Creek and the sockeye incubation channel at Upper Pitt River continued at a high level. At Gates Creek the spawners in 1971 were restricted to the cleaner lower half of the channel, and the survival obtained was excellent. At the two channels for pink salmon at Seton Creek, where density of spawners was limited to between 0.6 and 0.7 females per square yard, the numbers of fry produced were the largest recorded for these channels. The fry production data for all five installations for the 1971 brood year are given in the following table.

FRY PRODUCTION AT SPAWNING AND INCUBATION CHANNELS FROM THE 1971 BROOD YEAR SPAWNING

Channel	*Species*	*Eggs Deposited*	*Fry Produced*	*Per Cent Survival*
Weaver Creek	Sockeye	5,930,000	4,513,000	76.1
Upper Pitt	Sockeye	2,652,000	2,291,000	86.4
Gates Creek	Sockeye	258,000	216,000	83.7
Seton Upper	Pink	6,535,000	5,500,000	84.1
Seton Lower	Pink	22,369,000	12,770,000	57.1

It is estimated that 91.65% of the 1972 Gates Creek run was produced by the fish spawning in the channel in its first year of operation in 1968. The run of over 95,000 fish to Weaver Creek was the second largest since the channel started operating in 1965. It is estimated that 71% of the run was produced from the channel, and the 2.28% adult return from eggs deposited was the highest yet recorded for the channel.

In preparation for the 1972 spawning at the Gates Creek channel, equipment for cleaning the organic muck and silt from the gravel was developed (Figure 1). This equipment uses a mixture of air and water to flush material out of the gravel. The 6,205-foot-long Gates Creek channel was thoroughly cleaned by this equipment in six days in July, at nominal cost.

Construction of the spawning channel on Nadina River near Nadina Lake continued during the summer of 1972 and the channel is ready for operation in

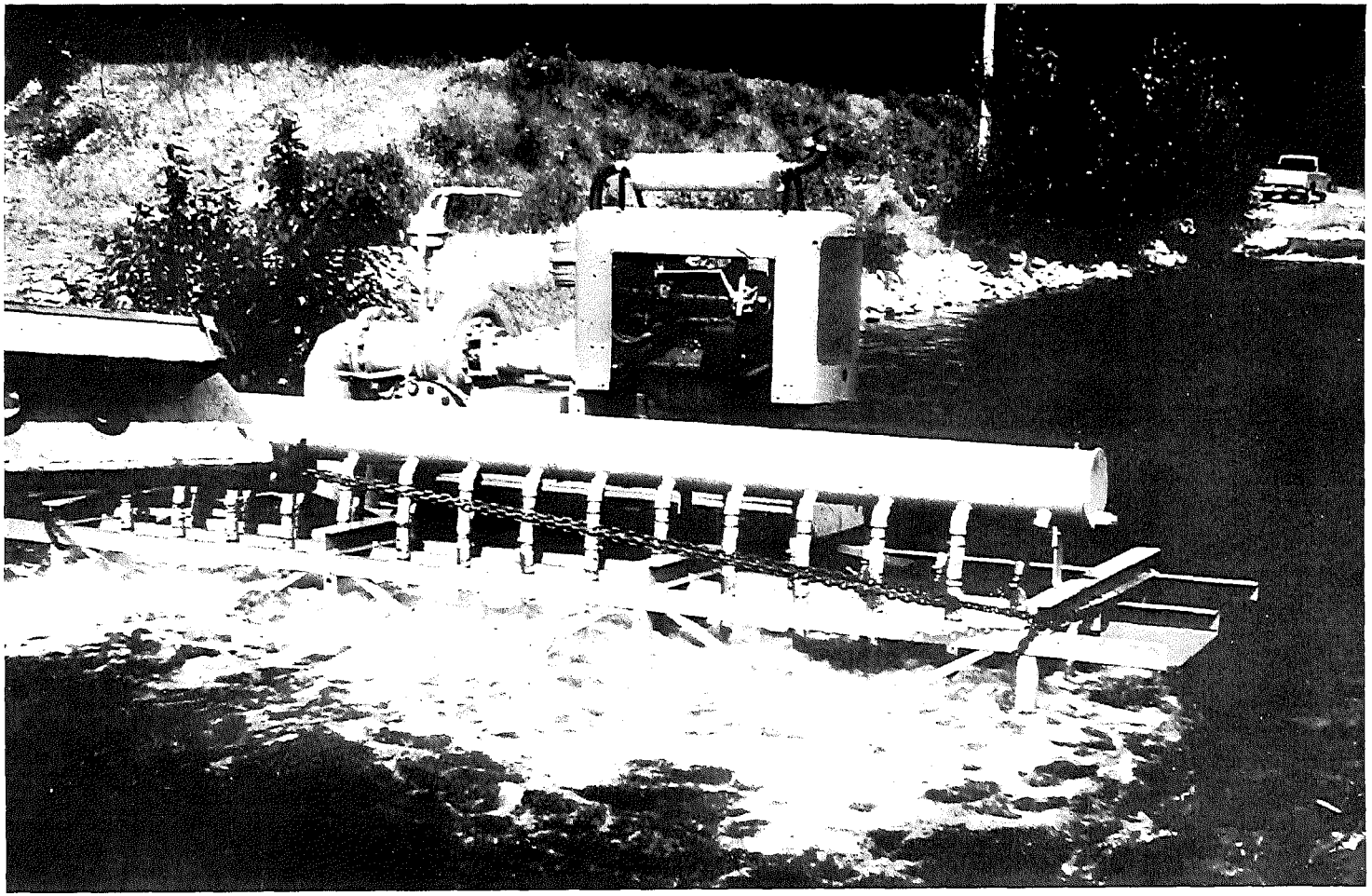

FIGURE 1 – Gravel cleaner in operation in the Gates Creek spawning channel.

1973, the year of the dominant cycle return. The operator's residence, water and light services and a cold water supply from the lake remain to be completed in the summer of 1973.

Cultus Lake sockeye from the 1970 brood were reared at the research laboratory without occurrence of the viral disease, infectious hematopietic necrosis (IHN), which had terminated previous attempts at rearing this stock. Approximately 12,000 sockeye smolts with an average weight of about 14.6 grams were released in the spring of 1972 at the same time as the wild smolt population was emigrating from Cultus Lake. The hatchery fish were more than three times the size of wild Cultus Lake smolts and, based upon experience elsewhere, large size is favorable for survival. The circuli count on scales of the hatchery smolts was greater than that of wild smolts, thus the hatchery fish had a built-in mark and fin-clipping was unnecessary. Intensive scale sampling will be used to determine the returns. Larger numbers of fish are being reared and studies are continuing in order to obtain several years data for comparing smolt-to-adult survival of the artificially reared and wild smolts.

During 1972 a start was made in further rehabilitation of the sockeye run to Horsefly River in the Quesnel system. Historically, the runs to Quesnel Lake were very large, reaching millions of spawners, and the major spawning area, Horsefly River, was well utilized throughout its length up to the first falls. Following removal of the Hell's Gate obstruction, the run to Horsefly River made a remarkable recovery. However, the recovery was only on the dominant cycle, the years between having virtually no production. Moreover, the entire population spawns in the upper part of the river in the vicinity of McKinley Creek, in an area that is estimated to be sufficient for a maximum of 340,000 spawners. The lower river with a much greater potential spawning area remains almost unused. The present stock is frequently subject to large prespawning mortality, usually associated with early timing of the run and most prevalent among the earliest arrivals on the spawning grounds. These fish do not spawn in the lower river area, presumably because of the higher water temperatures there, but also possibly because of homing behavior. It was decided, therefore, to utilize racial hybridization to initiate a stock with later timing which would utilize the spawning grounds in the lower river and which also might be less susceptible to prespawning mortality. Precocious male jacks returning to Horsefly River in 1972 were selected as the male home stream component, and females from the later-timed Stellako River run were selected to provide the timing component. During the last week of September, three to four weeks later than spawning in the upper Horsefly River, 1,020,000 eggs were spawned at Stellako, flown to Horsefly, fertilized and planted in the lower river near the town of Horsefly. Subsequent examination prior to winter showed that survival to that time was over 80%. Since only very minor numbers of sockeye eggs were deposited elsewhere in the Quesnel system in 1972, the development of the planted stock as fry, smolts and adults can be readily followed.

RESEARCH

Research on the lacustrine biology of young sockeye was given major emphasis on the Shuswap Lake system in 1972. Zooplankton abundance, fry emergence timing, and the distribution pattern and growth of young sockeye in the lake were examined. Zooplankton abundance showed an increase over the extremely low levels measured in 1970 and 1971 but was still lower than for other years of this cycle. Zooplankton will be monitored carefully over the next two years to examine the influence of low sockeye abundance on zooplankton standing crop, and to follow trends in zooplankton species composition.

Emergence of Adams River sockeye fry in 1972 coincided closely with the spring zooplankton bloom. The smaller numbers of fry than in 1971 experienced better growing conditions and the fingerlings were much larger just prior to the winter. Differences in the rearing temperatures in the lake system had a marked influence on the size of fingerlings during the summer.

Fry concentrations in the main arm of Shuswap Lake were much lower than last year, but were similar in the rest of the lake. In both years fish have not been uniformly distributed throughout the lake. One factor influencing distribution is flow pattern during spring emergence. During the last two years the spring freshet discharge has been very high and many Adams River fish, displaced from Shuswap Lake, have remained in Little Shuswap Lake until August before they could migrate back up Little River to Shuswap Lake, a delay of two to three months. Any factor which influences distribution will ultimately affect utilization of food resources and must be considered in assessing optimum utilization of the nursery system. The lacustrine environment not only affects sockeye survival in the system, but may help explain differences found in smolt condition and in survival subsequent to emigration.

Studies of the migrating behavior of sockeye fry were concluded and a Bulletin presenting the results was prepared.

A research program applying echo sounding techniques to estimate the upstream migration of adult sockeye was started in 1972. The goal of the program is to improve the daily escapement estimates of each race of sockeye. The echo sounder was mounted on a outboard skiff and transects were run across the Fraser River at a site near Ladner. Echogram targets were counted and provided an index of the daily sockeye escapement. The daily density of targets, primarily adult sockeye, agreed well with test fishing catch data and extrapolated estimates of the daily sockeye passage were generally consistent with the recorded escapements and upstream catches. On the basis of the first year's results, it is anticipated that echo sounding will become an integral part of the management program.

Studies on the cause of prespawning mortality among certain sockeye populations in the Fraser system continued in 1972. Examination of gill tissue from Chilko sockeye in 1971 indicated that tissue degeneration and separation of epithelial layers were apparent as early in the migration as Lummi Island. This year Gates Creek sockeye showed a similar incidence of gill degeneration at Lummi Island which suggests that subsequent mortality in these populations may be related to a physiological state acquired or developed prior to leaving salt water.

Once the fish have entered fresh water, damaged tissue provides sites for invasion by infectious agents. Gill bacteria and columnaris are two such agents that have been isolated from populations experiencing prespawning mortality. The main effect of such gill infections can be respiratory inhibition which, if severe enough, results in death before spawning. Laboratory study was conducted on the effect of artificially reducing the respiratory surface by tying off portions of the gills. Blood oxygen levels were sufficiently reduced by elimination of one fifth to one third of the total gill surface that symptoms similar to those shown by fish dying with gill infection were induced. Activity was markedly reduced with a subsequent delay in maturation rate and reduction in spawning.

Study on the control of prespawning mortality with antibiotics was also continued. While treatment does not eliminate the source of the problem, any reduction of prespawning mortality through such treatment would be beneficial. In 1971, experimental groups of Chilko spawners were injected with antibiotics and placed in pens for comparison with untreated control fish. The results showed that treatment reduced prespawning mortality, although deaths among the controls were believed accentuated by stress from the pen environment. In 1972 studies were conducted at Gates Creek to test the effectiveness of different drugs and methods of treatment on sockeye while under natural spawning conditions. Upon arriving at Gates Creek the spawners were in poor physical condition and prespawning loss was high regardless of treatment. The results indicated, however, that longer acting drugs slightly improved spawning success and significantly reduced the incidence of gill lesions compared to the controls. A high incidence of gill fungus appeared to be associated with use of some of the drugs.

Investigations on pink salmon during 1972 were directed at the freshwater and initial marine residence phases of the life cycle. As a result of low incubation temperatures, the 1972 seaward fry migration of pink salmon was late, and there was no significant early abundance as there has been in the past. The fry production, 255.7 million, and the freshwater survival of the 1971 Fraser brood were both slightly above average. Observations in the Gulf Islands and San Juan Islands indicated a lower abundance of fry and fingerlings than expected from the fry production. The emigration of fingerlings from these areas occurred in late June and early July, as in 1968, and similarly was associated with an incursion of water from the Fraser River into Haro and Rosario Straits. An attempt was made to index the abundance of fingerlings moving from the inland waters to the High Seas via the Strait of Juan de Fuca. Surface trawling, which has proven successful elsewhere, did not intercept significant numbers of pink salmon in Juan de Fuca Strait west of Victoria.

Additional effort was devoted to the analysis of factors affecting the abundance of Fraser River pink salmon stocks. The adult return in 1973 will provide a test of the predictive value of several factors which now are considered to be related significantly to the estuarial and marine survival of pink salmon.

Laboratory investigations were conducted on the influence of temperature on development of pink salmon eggs. Eggs were exposed to a range of constant temperatures and their influence on mortality, size of fry, and the number of temperature units required at yolk absorption was observed. A temperature of 40°F

prior to blastopore closure resulted in 90% mortality of the eggs, and temperatures of 38°F or lower resulted in 100% mortality. These data indicate that streams where the temperature drops to 40°F or lower prior to closure of the blastopore (within about four weeks after spawning) would not be expected to be productive. The data also showed that conversion of yolk sac stores was more efficient at 40°F than at 54°F and that substantially less temperature units were required to yolk sac absorption at the lower temperature.

PROTECTION

Pollution poses a constant threat to the aquatic environment upon which sockeye and pink salmon depend. Protection of these species requires a research program to provide information pertinent to current and anticipated problems. During 1972 studies to measure effects of copper, mercury, zinc and cadmium on sockeye and pink salmon were completed. Measurements indicated that eggs and fry accumulated heavy metal residues in proportion to the level of exposure. Comparison of heavy metal residues in eggs and fry from laboratory experiments and limited samples of specimens from the natural environment indicated the latter were probably not subjected to levels of heavy metal which would cause adverse effects. Sampling of eggs and fry in areas downstream of mining operations and ore bodies should be continued from time to time as a monitoring procedure.

The growth of population and public demand for a cleaner environment are resulting in planning and construction of municipal sewage treatment facilities at many centers. Treated sewage is usually disinfected with chlorine as a public health protection measure. The 1971 Annual Report mentioned that studies to evaluate the effect of chlorinated sewage on Fraser River sockeye and pink salmon were started. Tests performed using alevins, fry, smolts and adults demonstrated that chlorine residual was extremely toxic to salmon. Gills of test fish showed evidence of damage believed caused by chlorine. Amperometric methods of measuring chlorine residual demonstrated that chlorine in treated sewage and the receiving stream was toxic at concentrations much below those detected by the commonly used color comparator method of measurement.

Bioassays demonstrated that dechlorination by lagooning chlorinated treated sewage was an effective method of removing acute toxicity. However, since chlorine was not readily dissipated and stayed at measurable toxic levels for a few days, lagooning may not be a practical dechlorination procedure where sewage flows are large. Removal of residual chlorine by chemical methods may be an alternative in such cases. Arrangements were made at year's end to conduct further studies of the chlorination-disinfection-toxicity problem at the new Lulu Island sewage treatment plant which will be operational early in 1973.

The pulp industry continued development on the Fraser River watershed. The mill at Kamloops completed expansion from 290 to 1,250 tons per day of bleached kraft pulp. The effluent treatment system was expanded at Kamloops to maintain a 4.5-day detention aerated lagoon preceded by two sedimentation basins and a mechanical clarifier. A spill lagoon was added to assist in smoothing shock loads to

the treatment system. In-plant control and recovery of toxic effluents was also improved. Addition of the spill lagoon and in-plant control facilities is in agreement with results of research conducted in a cooperative study at Kamloops in 1971 which indicated that pollution load was lowered and treatment more effective when chemical recovery was increased, contaminated water was recycled and black liquor spills were controlled. A report on this research was published in 1972.

Analyses of selected effluent samples, collected during the 1971 study by the Western Forest Products Laboratory of the Canada Department of the Environment, indicated resin acids were a major factor in toxicity of effluent at the Kamloops pulp mill. One of the resin acids, dehydroabietic, is now being used as a standard reference toxicant in further studies of pulp mill effluent treatment and toxicity.

Since the pulp mill at Kamloops is located 3 miles upstream of Kamloops Lake, a monitoring program including water and plankton sampling in the lake was initiated prior to mill construction and has continued. In order to document fully the conditions before mill expansion, sampling frequency was increased in the summer of 1970. Mill staff measure water quality and forward plankton samples to the Commission for measurement and analysis. These data serve as background information for judging possible effects of the pulp mill's discharge on Kamloops Lake.

Cariboo Pulp and Paper commenced operation of a 750-ton-per-day bleached kraft pulp mill at Quesnel in November 1972. The effluent treatment scheme consists of a two-stage aerated lagoon system in which the first lagoon treats bleach plant effluents for two days before they are joined with general mill effluent for three-day treatment in the second aerated lagoon. A clarifier is used to remove settleable solids from the general mill effluent but bleach plant effluents can also be passed through the clarifier if need arises. Although the mill is located along the Quesnel River, effluent is piped to the Fraser River for diffusion. An emergency spill basin has been provided as a means of smoothing out shock loads to the treatment system. In addition, provision has been made for chemical precipitation of black liquor in the clarifier in the event that spills escape in-plant control facilities. This method of black liquor control is a new approach and its effectiveness will be followed with interest.

Preliminary testing at the three pulp mills at Prince George, starting in November 1971, demonstrated that further study was required to evaluate means of upgrading effluent treatment. As a consequence, a cooperative program including Prince George Pulp and Paper, Canada Department of the Environment Fisheries Service, Environmental Protection Service, Western Forest Products Laboratory and the Commission started in August 1972 using a laboratory scale treatment unit at the mill.

Numerous proprietary "additives" are used in pulp mills to assist production processes. More than 20 of these substances have been bioassayed to determine the likelihood that they contribute to toxicity of effluents. Although the majority appear not to pose a problem, further study is required to determine whether toxic additives enter the effluent and whether they are destroyed during treatment. Answers to these questions are being sought in the cooperative study at Prince George Pulp and Paper Co. Ltd.

Various cargoes are transported adjacent to waterways of the Fraser River watershed and danger exists that materials potentially hazardous to fish may enter the water accidentally. One such accident occurred along the Birkenhead River where five railroad cars carrying pulp chips were derailed and the chips deposited on the bank and in the river. Sockeye were not present when the chips were spilled. Samples of wood chips retrieved from the river bank were mixed with water in aquaria and were found to be toxic to juvenile sockeye. Successive washing of the chips removed the toxic material which was tentatively identified at the Western Forest Products Laboratory as a fungal degradation product of pentachlorophenol, a wood preservative of high toxicity to fish. No mortalities occurred during bioassay of wood chips collected from within the Birkenhead River, indicating the toxicant had been washed away as in the laboratory tests.

The biological monitoring program started in the Fraser River in April 1971 at Mission and Steveston has continued, except for June through October 1972, and was extended to a station on the North Arm in October 1972. In addition to biological monitoring, measurements of dissolved oxygen and biochemical oxygen demand are being continued at Mission, Cottonwood Reach, Steveston and the North Arm in order to document pollution load. Exposure of juvenile salmon for a week at a time and continuous exposure of groups of salmon eggs at Mission and Steveston have not revealed any acutely harmful condition for survival of eggs, fry or smolts.

Through a continuing cooperative arrangement with the Fisheries Service and Environmental Protection Service, Canada Department of the Environment, numerous applications for effluent discharge permits, placer mining leases, water licences, dredging, gravel removal, and construction on waterways were reviewed and recommendations for protection of sockeye and pink salmon were made.

At Adams River, one of the channels opened up to supply water to the main right bank river channel, which had become blocked during 1971, was reopened in February 1972. Measurements in April 1972 showed the right channel was receiving 47% of the river flow. However, the large freshet during the summer of 1972 blocked this channel again. In addition, the size of a channel leading to the left channel was increased, with the result that the flow in the right channel was reduced to 34% of the total flow. Further remedial measures are under consideration for completion prior to the dominant cycle run in 1974.

The river level at Hell's Gate reached a peak of 96.5 feet on June 16, 1972, the second highest recorded since 1912. Levels dropped rapidly after the peak, but were still above gauge 70 during the passage of part of the Early Stuart sockeye run. The fishways at Yale Rapids and the upper level fishway at Hell's Gate prevented a block of this run and loss of spawners such as happened in 1955, before these structures were built.

TABLE I

SOCKEYE CATCH BY GEAR

Gear		*1960*	*1964*	*1968*	*1972*
United States Convention Waters					
Purse Seines	*Units*	199	96	88	117
	Catch	843,850	284,209	464,544	533,179
	Per Cent	70.38	55.94	52.43	47.26
Gill Nets	*Units*	422	337	396	565
	Catch	253,211	177,767	354,760	506,406
	Per Cent	21.12	34.99	40.05	44.88
Reef Nets	*Units*	63	48	34	46
	Catch	100,915	45,827	66,404	88,304
	Per Cent	8.42	9.02	7.50	7.83
Troll	*Catch*	993	284	162	303
	Per Cent	0.08	0.05	0.02	0.03
TOTAL CATCH		1,198,969	508,087	885,870	1,128,192
Canadian Convention Waters					
Purse Seines	*Units*	77	27	46	47
	Catch	353,482	7,409	13,805	281,532
	Per Cent	28.16	1.44	1.50	26.04
Gill Nets	*Units*	1,466	1,038	1,403	1,004
	Catch	898,826	503,690	869,162	784,405
	Per Cent	71.61	97.89	94.46	72.55
Troll	*Catch*	2,887	3,449	37,125	15,280
	Per Cent	0.23	0.67	4.03	1.41
TOTAL CATCH		1,255,195	514,548	920,092	1,081,217

NOTE: Gear counts represent the maximum number of units delivering sockeye on a single day near the peak of the run.

TABLE II

CYCLIC LANDINGS AND PACKS OF SOCKEYE FROM CONVENTION WATERS

	United States	*Canada*	*Total*
1972			
Total Landings (No. Sockeye)	1,128,192	1,081,217	2,209,409
Share in Fish	51.06%	48.94%	
Total Pack (48-lb Cases)	96,696	93,703	190,399
Share in Pack	50.79%	49.21%	
1946-1972			
Total Landings (No. Sockeye)	44,141,945	43,855,387	87,997,332
Share in Fish	50.16%	49.84%	
Total Pack (48-lb Cases)	3,877,695	3,823,745	7,701,440
Share In Pack	50.35%	49.65%	
1972 *Cycle Catch*			
1972	1,128,192	1,081,217	2,209,409
1968	885,870	920,092	1,805,962
1964	508,087	514,548	1,022,635
1960	1,198,969	1,255,195	2,454,164
1956	906,872	894,836	1,801,708
1952	1,113,475	1,154,383	2,267,858
1948	1,089,091	752,691	1,841,782
1944	435,443	1,003,826	1,439,269
1940	654,091	1,033,000	1,687,091
1936	453,025	2,126,074	2,579,099
1932	853,406	733,735	1,587,141
1928	630,457	311,226	941,683
1924	772,056	442,250	1,214,306
1920	677,690	532,039	1,209,729
1916	909,425	376,891	1,286,316
1912	2,005,869	1,357,425	3,363,294
1908	1,879,268	870,612	2,749,880
1904	1,506,137	892,934	2,399,071

NOTE: Pack figures include all sockeye landed even though some were sold fresh and frozen.

TABLE III

DAILY CATCH OF SOCKEYE, 1960-1964-1968-1972 FROM UNITED STATES CONVENTION WATERS

	JULY				AUGUST				SEPTEMBER			
Date	1960	1964	1968	1972	1960	1964	1968	1972	1960	1964	1968	1972
1					117,041		95,135	104,974	3,777	378		
2			749		54,285			78,450		377	3,109	
3			223		45,840	79,585		57,077			2,239	
4		CLOSED	24		45,845	73,612		229			1,796	106
5						59,668	3,291		1,784		1,076	213
6							69,286		1,524			190
7					194,605		68,089	96	1,295			52
8	CLOSED		CLOSED		181,344		50,987	26,887	614	163		
9					126,087		57,251	264,096		152	772	
10					96,389			100,648		83	702	
11					65,882			67,670			146	
12					42,416		82,039				143	
13		3,118				25,336	24,597		CLOSED			53
14		1,463	28				3,519	3,632		314		6
15			2,662				357	28,126		48		5
16			4,530	1						104	46	
17			5,079	2,861		15,456				143	88	
18	6,574			2,990		12,122					83	35
19	6,329			4,696	CLOSED	5,160	12,075		50		59	24
20	6,823	6,956					9,103	2,809	130			
21	7,550	8,672	2,170				3,314	23,404	56	50		
22		16,773	44,615				35	17,222	38	49		
23			40,911	6,394				252		61	108	
24			39,630	58,086		5,773				13	24	
25	78,450		44,582	44,344		1,845					14	31
26	38,405			53,366		1,205	3,182		CLOSED		10	89
27	33,335	79,632		50,708			4,458					879
28	32,087	54,204					2,172	137		22		211
29		53,412	15,711		3,587		33	65		6		
30			96,552	7,840	2,064			55		4	20	
31			86,860	116,110	3,024	681						
Totals	209,553	224,230	384,326	347,396	978,409	280,443	488,923	775,829	9,268	1,967	10,435	1,894
Troll	142	165	90	111	851	113	66	182				
Monthly Totals	209,695	224,395	384,416	347,507	979,260	280,556	488,989	776,011	9,268	1,967	10,435	1,894
June, Oct. and Nov. Totals									746	1,169	2,030	2,780
Season Totals									1,198,969	508,087	885,870	1,128,192

TABLE IV

DAILY CATCH OF SOCKEYE, 1960-1964-1968-1972 FROM CANADIAN CONVENTION WATERS

	JULY				AUGUST				SEPTEMBER			
Date	1960	1964	1968	1972	1960	1964	1968	1972	1960	1964	1968	1972
1			875					108,624	760	1,684		
2			1,761		47,301			66,001		103	1,823	
3			2,481		194,327	114,881					5,017	
4	7,347					42,299					655	185
5	6,170	CLOSED				22,772	233,366		491		584	5,783
6	4,544						57,248		222			35
7								217,308	71	2,491		
8			CLOSED		108,471			76,235		664		
9					208,985			84,294		23	748	
10					87,843						3,800	
11	8,358				34,455						206	2,184
12	4,686					102,832	88,114	38,626	1,402			
13	4,341	2,441				28,793	25,694	153,479	464			
14							2,774	15,165	32	9		
15			3,565				83,013			9		
16			2,078		96,388						39	
17				4,546	45,676	35,135					2,360	
18	11,420			4,142	56,111	15,025					13	8,694
19	14,424					5,341	49,457		CLOSED			
20	24,164	6,922					4,318					
21		8,331					3,426	49,742		1,393		
22			29,390		53,752			15,006				
23			24,249		17,274			3,317		1	1,614	
24				76,873		20,527				1	610	
25	84,939			71,895		7,093		13,362		3		
26	51,124					953	698					
27	60,451	49,543					518					
28		13,561					10,970	22,240	614			
29		12,826	160,129		2,292			1,531	185			
30			44,117		806			617			2,269	
31			28,164		885	4,927		5,376				
Totals	281,968	93,624	296,809	157,456	954,566	400,578	559,596	870,923	4,241	6,381	19,738	16,881
Troll	670	1,775	25,627	7,005	2,092	1,637	10,841	7,540	109	15	107	627
Spring Salmon Gill Nets		675	268	768	253				268	565		1,999
Monthly Totals	282,638	96,074	322,704	165,229	956,911	402,215	570,437	878,463	4,618	6,961	19,845	19,507
June, Oct. and Nov. Totals									11,028	9,298	7,106	18,018
Season Totals									1,255,195	514,548	920,092	1,081,217

TABLE V

INDIAN CATCH OF SOCKEYE BY DISTRICT AND AREA, 1968 AND 1972

	1968		1972	
District and Area	*Catch*	*No. of Fishermen*	*Catch*	*No. of Fishermen*
HARRISON-BIRKENHEAD				
Skookumchuck and Douglas	500	10	450	10
Birkenhead River and Lillooet Lake	5,763	25	3,835	35
Harrison and Chehalis	400	12		
TOTALS	6,663	47	4,285	45
LOWER FRASER				
Below Chilliwack	8,670	66	11,091	62
Chilliwack to Hope	8,546	59	23,300	81
TOTALS	17,216	125	34,391	143
MIDDLE FRASER				
Hope to Lytton	44,913	312	33,825	
Lytton to Lillooet	8,860	36	4,450	
Bridge River Rapids to Churn Creek	22,970	242	23,975	
TOTALS	76,743	590	62,250	590
CHILCOTIN				
Farwell Canyon	7,445		(	
Hances Canyon	990		(15,400	
Alexis Creek	2,540		(	
Siwash Bridge	3,180		(	
Keighley Holes	2,575		2,000	
TOTALS	16,730	100	17,400	134
UPPER FRASER				
Churn Creek to Chimney Creek	1,800		(	
Soda Creek	525		(3,950	165
Quesnel	300		(	
Shelley	131		250	28
TOTALS	2,756	148	4,200	193
NECHAKO				
Nautley and Stella Reserves	2,720	38	4,142	53
TOTALS	2,720	38	4,142	53
STUART				
Fort St. James	92	37	650	24
Tachie, Pinchi and Trembleur Villages	122	42	525	56
TOTALS	214	79	1,175	80
THOMPSON				
Main Thompson River	700	38	6,200	435
North Thompson River	260	41	225	20
South Thompson River	–	114	–	190
TOTALS	960	193	6,425	645
GRAND TOTALS	124,002	1,320	134,268	1,883

The Indian catch statistics detailed above are obtained from Canada Department of the Environment, Fisheries Service. Their officers control the taking of sockeye for food by the Indian population residing throughout the Fraser River watershed.

TABLE VI

SUMMARY OF THE SOCKEYE ESCAPEMENT TO THE FRASER RIVER SPAWNING AREAS, 1960, 1964, 1968, 1972

District and Streams	1972 Period of Peak Spawning	Estimated Number of Sockeye				Jacks	Sex Ratio	
		1960	1964	1968	1972		Males 4-5 Yr.	Females 4-5 Yr.
LOWER FRASER								
Cultus Lake	Nov. 15-18	17,689	11,143	25,736	10,660	294	4,572	5,794
Upper Pitt River	Sept. 13-15	24,511	13,804	16,988	13,412	0	6,810	6,602
Widgeon Slough	Oct. 25-27	400	667	1,552	302	4	107	191
HARRISON								
Big Silver Creek	Sept. 12-14	4,522	3,926	1,090	2,552	40	1,256	1,256
Harrison River	Nov. 15-18	17,279	2,202	5,391	1,399	53	552	794
Weaver Creek	Oct. 26-28	7,042	1,370	4,516	26,548	810	10,524	15,214
LILLOOET								
Birkenhead River	Sept. 23-26	38,916	69,939	83,907	113,097	58,581	25,009	29,507
SETON-ANDERSON								
Gates Creek	Aug. 25-28	5,449	19,971	10,289	8,569	246	3,626	4,697
Portage Creek	Nov. 8-10	—	9	173	1,460	1,270	92	98
SOUTH THOMPSON								
Seymour River	Sept. 2-4	3,047	2,784	3,870	2,889	87	1,358	1,444
Lower Adams River	Oct. 20-23	2,152	796	3,983	4,325	247	1,978	2,100
Little River	Oct. 28-30	66	0	0	81	6	36	39
Scotch Creek	—	11	0	126	47	47	0	0
Upper Adams River	Sept. 4-8	Present	162	—	31	0	13	18
Momich River	Aug. 22-25	1,000	823	617	1,003	0	427	576
NORTH THOMPSON								
Raft River	Sept. 1-4	5,553	5,500	10,697	11,151	103	4,759	6,289
Barriere River	Sept. 5-8	23	85	275	94	0	41	53
Fennell Creek	Aug. 22-25	0	146	954	1,931	0	832	1,099
North Thompson River	Sept. 8-12	—	38	—	465	0	204	261
CHILCOTIN								
Chilko River	Sept. 24-28	420,746	238,601	414,446	564,465	1,815	225,935	336,715
Taseko Lake	Aug. 30-Sept. 3	2,524	433	—	16,068	160	6,586	9,322
QUESNEL								
Horsefly River	Sept. 5-10	3,087	19,800	5,686	3,385	3,277	39	69
Mitchell River	—	5	169	4	85	82	1	2
Little Horsefly River	—	23	355	73	18	18	0	0
NECHAKO								
Endako River	Sept. 1-3	0	7	18	27	0	11	16
Nadina River (Early)	Aug. 21-24	1,566	1,397	902	827	13	359	455
(Late)	Sept. 10-13	157	232	1,496	2,702	148	1,125	1,429
Nithi River	Aug. 21-24	31	13	20	58	4	22	32
Ormonde Creek	Aug. 28-31	158	180	81	54	0	22	32
Stellako River	Sept. 26-29	38,884	31,047	30,420	36,771	71	15,983	20,717
STUART								
Early Runs								
Driftwood River	—	34	2	—	50	11	18	21
Forfar Creek	Aug. 6-8	1,755	27	149	835	126	330	379
Gluske Creek	Aug. 6-8	2,138	218	18	591	11	270	310
Kynoch Creek	Aug. 6-8	4,154	1,147	833	2,534	95	1,137	1,302
Narrows Creek	Aug. 5-7	598	22	41	104	23	38	43
Rossette Creek	Aug. 5-7	4,558	952	518	834	74	354	406
Shale Creek	Aug. 10-12	139	27	0	26	22	2	2
Misc. Streams	Aug. 12-14	1,196	26	28	112	67	21	24
Late Runs								
Kazchek Creek	Sept. 20-25	5	0	33	65	9	30	26
Middle River	Sept. 18-22	1,056	743	288	972	224	411	337
Tachie River	Sept. 20-25	1,687	1,157	149	7,527	1,109	3,426	2,992
NORTHEAST								
Upper Bowron River	Aug. 24-26	7,620	1,500	3,634	4,138	0	1,908	2,230
TOTALS*		619,970	431,452	629,337	843,909	69,645	320,768	453,496

*Totals include small numbers of fish in small tributaries not listed in the table.

TABLE VII

DAILY CATCH OF SOCKEYE, 1957-1961-1965-1969 FROM UNITED STATES CONVENTION WATERS

	JULY				AUGUST				SEPTEMBER			
Date	1957	1961	1965	1969	1957	1961	1965	1969	1957	1961	1965	1969
1	10,165			6,906		128,699						
2	11,833			4,731		75,733	3,137		7,288			4,142
3	13,977	47,926					1,445	122,566	25,515			3,683
4		43,037					52,146	77,758	19,653			
5		28,585	26,335		247,511		65,290	63,332				
6			21,773		135,265							
7				1,824							932	
8	42,804			1,931							358	18
9	57,639			2,324			55,149		1,852		181	78
10	23,464	143,287				82,844	30,297		3,333			981
11		89,786					14,893	42,399	4,583			266
12			20,836		169,312			18,044	1,451			
13			15,456		121,946			15,558	5		62	
14				16,173	71,364			12,433			16	
15	39,662			9,948		18,748					0	191
16	37,687					5,241	13,584		109		0	30
17	33,138	49,754					8,584		610			2
18		43,233						17,370	170	22		
19		34,815	43,747		49,619			23,237		10		
20			74,983		45,223					6	20	
21			84,674	221,188	28,689	11,491					23	
22	95,124			156,203	27,606	6,038					57	98
23	78,735			182,627					24		40	699
24	52,762	199,232							29			91
25		117,345					7,728	19,605	8	11		41
26		73,843			22,237		3,863	17,334		33		
27					16,538					10	43	
28			262,812	230,072	12,724						9	
29	63,287		172,566	201,102	7,420						10	1,004
30	61,061			92,332							0	294
31	46,297	161,484										
Totals	667,635	1,032,327	723,182	1,127,361	955,454	328,794	256,116	429,636	64,630	92	1,751	11,618
Troll and Outside Seine		750	104	131		380	46	210			1	1
Monthly Totals	667,635	1,033,077	723,286	1,127,492	955,454	329,174	256,162	429,846	64,630	92	1,752	11,619
June and October Totals									1,546	16,049	44,918	17,219
Season Totals									1,689,265	1,378,392	1,026,118	1,586,176

CLOSED

CLOSED

TABLE VIII

DAILY CATCH OF SOCKEYE, 1957-1961-1965-1969 FROM CANADIAN CONVENTION WATERS

	JULY				AUGUST				SEPTEMBER			
Date	1957	1961	1965	1969	1957	1961	1965	1969	1957	1961	1965	1969
1	19			10,842	36,393	109,677						1,272
2	274			10,654			206,017		9,419			709
3	1,658	36,879					79,921		4,956			
4	1,157	7,930					29,092	178,581	3,328			
5			35,176		83,204			81,629	1,920	53		
6			8,184		138,428			51,902	1,619	18		
7					52,297						133	286
8	68										106	163
9				5,363		28,636	20,830		67		59	177
10	4,529	109,597				23,368	63,820		11,153			287
11	67	27,730					24,820	34,096	6,060			
12		34,089	19,440		37,115			62,362	3,340	7		
13		46,966	5,750		104,138	52,261		15,882	1,833	4	27	
14				22,096	81,215	18,609					10	
15					85,221	21,972					9	
16	31,184					7,407	9,770		2,753		11	
17	17,143	86,946					26,163		4,224			45
18	17,281	44,527					4,618	8,471	2,102			16
19			73,372		24,722			4,830	763	2		
20			22,946		62,386			13,310	924	3	4,335	
21			13,577	96,953	40,463	17,815				2	8	
22	72,300			30,593	31,909	5,898					3	
23	82,253											15
24	53,025	217,241							1			35
25	20,679	153,593					6,790					
26		98,121			25,088		1,481	5,907		11		
27			179,102	368,974	12,623						18	
28			69,415	229,115	9,799	5,630				1	3	
29	13,254		76,955	160,326	1,836	1,831					3,182	
30	83,664		10,080	91,292			4,562	1,159				18
31	75,599	179,254		79,400				1,160				
Totals	474,154	1,042,873	513,997	1,105,608	826,837	293,104	477,884	459,289	54,462	101	7,904	3,023
Troll and Outside Seine	662	4,976	6,687	43,240	1,001	2,363	2,183	18,802	37	4,236	50	4,419
Spring Salmon Gill Nets				3,079						625	569	8,288
Monthly Totals	474,816	1,047,849	520,684	1,151,927	827,838	295,467	480,067	478,091	54,499	4,962	8,523	15,730
June, Oct. and Nov. Totals									3,607	8,821	29,921	29,788
Season Totals									1,360,760	1,357,099	1,039,195	1,675,536

STRIKE RELIEF FISHING

TABLE IX

SUMMARY OF THE SOCKEYE ESCAPEMENT TO THE FRASER RIVER SPAWNING AREAS, 1957, 1961, 1965, 1969

District and Streams	1969 Period of Peak Spawning	Estimated Number of Sockeye			
		1957	1961	1965	1969
LOWER FRASER					
Cultus Lake	Nov. 17-24	20,647	15,428	2,532	6,739
Upper Pitt River	Sept. 9-10	12,338	11,162	6,981	24,905
Widgeon Slough	—	1,200	1,293	275	715
HARRISON					
Big Silver Creek	Sept. 12-14	389	398	596	85
Harrison River	Nov. 13-16	3,812	42,778	15,034	15,209
Weaver Creek	Oct. 27-30	20,887	4,383	11,162	58,922
Misc. Streams	Sept. 15-18	—	11	50	54
LILLOOET					
Birkenhead River	Sept. 23-26	24,168	49,627	30,008	63,343
SETON-ANDERSON					
Gates Creek	Aug. 22-24	1,112	252	1,679	881
Portage Creek	Oct. 28-31	470	527	2,108	1,040
SOUTH THOMPSON					
Seymour River	Aug. 20-28	14,095	5,822	6,954	7,327
Scotch Creek	Aug. 22-29	2,354	598	1,910	3,395
Lower Adams River	Oct. 14-18	257,614	57,796	55,041	45,908
Little River	Oct. 17-20	34,964	8,253	3,236	6,775
South Thompson River	Oct. 17-20	14,645	254	192	630
Misc. Streams	Oct. 14-18	—	—	1,022	1,917
NORTH THOMPSON					
Raft River	Aug. 25-29	7,264	7,301	6,624	5,594
Barriere River	Aug. 28-Sept. 3	38	335	104	40
North Thompson River	—	—	225	Present	—
CHILCOTIN					
Chilko River	Sept. 19-22	140,765	40,315	39,902	76,518
Taseko Lake	—	3,667	80	Present	Present
QUESNEL					
Horsefly River	Aug. 27-Sept. 1	226,378	295,705	359,232	270,023
Mitchell River	Sept. 7-10	2,677	6,601	5,335	8,939
NECHAKO					
Endako River	—	110	0	2	0
Nadina River (Early)	Aug. 25-29	30,000	18,885	3,884	8,541
(Late)	Sept. 17-19	29,146	17,544	11,293	27,898
Nithi River	Aug. 20-24	1,186	146	34	140
Ormonde Creek	—	450	0	0	0
Stellako River	Sept. 25-28	38,922	47,241	39,418	49,341
STUART					
Early Runs					
Ankwil Creek	July 29-Aug. 3	8,285	18,468	2,806	15,795
Bivouac Creek	July 30-Aug. 2	9,464	997	401	952
Driftwood River	Aug. 2-5	45,567	81,617	4,221	52,873
Dust Creek	July 29-Aug. 3	14,827	10,870	1,584	3,595
Felix Creek	July 28-Aug. 2	7,081	3,082	1,404	5,879
15 Mile Creek	July 29-Aug. 2	511	922	74	209
5 Mile Creek	July 29-Aug. 3	3,821	731	40	902
Forfar Creek	July 28-31	17,975	13,599	2,221	9,922
Forsythe Creek	Aug. 3-5	6,385	5,836	553	2,248
Frypan Creek	July 29-Aug. 3	3,890	10,595	275	3,145
Gluske Creek	July 30-Aug. 2	21,899	5,652	2,200	4,660
Kynoch Creek	July 31-Aug. 4	13,473	16,170	2,885	12,380
Leo Creek	July 29-Aug. 3	10,620	1,624	121	571
Narrows Creek	July 29-Aug. 3	16,184	7,897	1,377	5,746
Paula Creek	July 28-Aug. 2	7,918	1,400	79	794
Rossette Creek	July 30-Aug. 2	7,087	4,993	1,165	1,566
Sakeniche River	July 29-Aug. 3	6,340	5,278	4	691
Sandpoint Creek	July 29-Aug. 3	20,914	3,523	706	693
Shale Creek	July 29-Aug. 3	1,606	2,392	79	706
25 Mile Creek	—	724	1,663	229	0
Misc. Streams	July 29-Aug. 2	10,462	3,911	621	2,335
Late Runs					
Kazchek Creek	Sept. 10-13	19,582	15,676	3,292	178
Kuzkwa Creek	Sept. 15-20	50,006	39,245	10,000	8,370
Middle River	Sept. 15-18	332,098	177,516	139,186	111,322
Pinchi Creek	Sept. 18-22	6,390	527	Present	756
Sakeniche River	—	592	1,094	11	0
Tachie River	Sept. 17-20	118,252	177,047	62,469	84,343
NORTHEAST					
Upper Bowron River	Aug. 25-29	12,069	7,460	2,660	3,872
TOTALS*		1,663,320	1,253,012	845,418	1,019,544

*Totals include small numbers of fish in small tributaries not listed in the table.

TABLE X

DAILY CATCH OF PINK SALMON, 1965-1967-1969-1971 FROM UNITED STATES CONVENTION WATERS

	JULY				AUGUST				SEPTEMBER			
Date	1965	1967	1969	1971	1965	1967	1969	1971	1965	1967	1969	1971
1			13	1		7,164		240		145,934		78,550
2			36		2,533	8,084		4,882			124,314	90,063
3					1,312		2,689	3,215			161,294	201,457
4					6,736		1,941	1,946				189,407
5	84			9	15,117		2,099			362,417		4,666
6	124			9		199				261,626		328,841
7			23	20		6,635			108,690	144,223		390,632
8			25	4		10,666		55	68,470		2,418	262,261
9		2	33		14,502			7,185	27,983		8,677	
10		29			11,818			7,161			127,783	
11		39		1	11,865		3,627	5,042		157,616	57,856	
12	674			43			1,783	4,649		149,560		
13	483			62		24,236	2,521		13,716	124,201		
14			443	111		41,126	2,081	344	4,316	89,874		6,114
15			362	67		45,622		7,238	109		42,946	144,795
16		10			29,700	53,414		7,552	46		19,249	121,411
17		322			26,038			6,577			1,072	91,232
18		209		34			17,014	6,006		96,316		
19	1,729			563			22,877	5,056		48,221		11,796
20	2,504			514				3,154	6,185	39,802		59,887
21	2,272		967	732		133,050		45	2,036	17,651		59,521
22			547			191,662		7,257	2,099		16,381	33,525
23		275	665			140,804		9,171	2,402		19,181	
24		6,873				172,829		12,231			11,860	
25		6,010		112	60,960		98,003	13,107		943	5,347	
26		5,622		2,033	46,508		119,947	11,680		769		1,212
27		5,952		1,438					940	323		19,789
28	3,799		2,080	2,391					530			6,741
29	3,469		2,565	2,837		483,011			335		4,461	7,948
30		3,897	1,259			366,854		5,580	180		2,265	6,865
31		10,619				262,997		92,273				
Totals	15,138	39,859	9,018	10,981	227,089	1,948,353	274,582	221,646	238,037	1,639,476	605.104	2,116,713
Troll	21,986	48,377	5,524	1,999	53,630	132,751	32,702	8,154	1,832	9,297	1,267	1,859
Monthly Totals	37,124	88,236	14,542	12,980	280,719	2,081,104	307,284	229,800	239,869	1,648,773	606,371	2,118,572
June, Oct. and Nov. Totals									668	8,927	17,600	9,799
Season Totals									558,380	3,827,040	945,797	2,371,151

TABLE XI

DAILY CATCH OF PINK SALMON, 1965-1967-1969-1971 FROM CANADIAN CONVENTION WATERS

	JULY				AUGUST				SEPTEMBER			
Date	1965	1967	1969	1971	1965	1967	1969	1971	1965	1967	1969	1971
1			24	Strike		528		6,406			40,906	6,913
2			15	June 26-	10,495	474		5,243			35,463	15,269
3				July 10	12,117			5,988		117,540		27,028
4					10,252		5,777			134,138		13,692
5				1			4,773			128,994		13,768
6	3					10,829	5,684			65,626		33,997
7	2					14,045			17,544	93,898	91,986	
8				1		17,863			10,086	100,559	29,915	141,120
9					23,992	20,326		20,059	5,416		25,639	81,037
10					24,346			17,280			17,039	86,916
11				3	25,866		6,345	15,145		218,008	108,797	58,168
12	10			5			3,674			136,118		46,851
13	10						4,641		6,151	73,745		31,098
14			34			146,394			4,110	31,250		34,631
15				20		108,014			3,383			26,718
16					49,953	105,629		16,750	3,314			
17		8			43,342			9,010			11,653	
18		7			40,776		25,980			29,284	10,891	
19	22	4		31			12,711			16,313		
20	49			51			414		52,695	10,361		14,866
21	182		74			67,700			718			7,649
22			85			150,862		23,135	383	54,442		172,256
23						168,186		25,979			2,206	27,182
24		328						17,141			2,196	
25		266			81,419					10,133		
26		308		192	37,969		1,074	73,040		6,294		47,551
27	353	454	273	57				90,929	317	4,998		8,392
28	147		1,848	217		210,531			163			1,299
29	198		2,315			293,634			32,671			29,454
30	70		2,044		5,307	239,917	36,049	224,988			477	17,488
31		1,037	1,324			221,137	49,946	145,573				
Totals	1,046	2,412	8,036	578	365,834	1,776,069	157,068	696,666	136,951	1,231,701	377,168	943,343
Troll	14,990	99,288	35,622	41,634	51,148	663,415	150,136	245,984	7,378	197,605	26,298	121,281
Spring Salmon Gill Nets Monthly									13,508		55,538	16,822
Totals	16,036	101,700	43,658	42,212	416,982	2,439,484	307,204	942,650	157,837	1,429,306	459,004	1,081,446
June, Oct. and Nov. Totals									1,612	186,432	51,639	71,029
Season Totals									592,467	4,156,922	861,505	2,137,337

TABLE XII

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

District and Streams	1971 *Period of Peak Spawning*	*Estimated Number of Pink Salmon*			
		1965	1967	1969	1971
EARLY RUNS					
LOWER FRASER					
Main Fraser	Oct. 8-16	543,757	785,797	848,532	928,046
HARRISON					
Chehalis River	Oct. 18-22	7,621	5,625	7,147	32,178
FRASER CANYON					
Coquihalla River	Oct. 12-15	3,845	3,045	2,415	16,778
Jones Creek	Oct. 7-13	3,000	3,162	1,779	1,304
Misc. Tributaries	Oct. 8-12	1,057	2,395	450	3,298
SETON-ANDERSON					
Seton Creek	Oct. 15-20	95,046	225,351	198,854	297,968
Portage Creek	Oct. 15-20	5,931	7,822	1,092	1,456
Bridge River	Oct. 15-20	23,657	6,547	13,034	8,817
THOMPSON					
Thompson River and Tributaries	Oct. 13-16	233,100	450,487	247,896	258,203
TOTAL*		917,736	1,490,231	1,321,199	1,553,363
LATE RUNS					
HARRISON					
Harrison River	Oct. 25-30	69,213	64,576	96,390	73,881
Weaver Creek	Oct. 15-20	528	786	725	1,435
CHILLIWACK-VEDDER					
Chilliwack-Vedder River	Oct. 20-29	193,911	252,585	92,222	160,511
Sweltzer Creek	Oct. 17-27	8,908	19,586	18,923	13,122
TOTAL*		273,387	341,141	208,260	250,389
GRAND TOTAL		1,191,123	1,831,372	1,529,459	1,803,752

*Totals include small numbers of fish in small tributaries not listed in the table.

COMMISSION PUBLICATIONS, 1972

1. Annual Report of the International Pacific Salmon Fisheries Commission for 1971.
2. Administrative Report (restricted circulation).
   Proposed Program for Restoration and Extension of the Sockeye and Pink Salmon Stocks of the Fraser River.
3. Progress Report Number 26.
   Detoxification of Kraft Pulp Mill Effluent by an Aerated Lagoon by J. A. Servizi and R. W. Gordon.
4. Research Bulletin Number XXI.
   Mechanisms Controlling Migration of Sockeye Salmon Fry by E. L. Brannon.

NOTE: All previous Commission publications are listed in the 1971 Annual Report.

STAFF

A. C. Cooper, Director

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HELL'S GATE FISHWAYS — F. R. Johnston

UPPER PITT FIELD STATION — W. E. Keillor

WEAVER CREEK CHANNEL — B. A. Van Horlick

GATES CREEK CHANNEL — G. Randall

SETON CREEK CHANNELS — E. Pierce

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