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

1971

COMMISSIONERS

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

NEW WESTMINSTER
CANADA
1972

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
George C. Starlund	1961-1966
Clarence F. Pautzke	1961-1969
DeWitt Gilbert	1957-
Thor C. Tollefson	1966-
Charles H. Meacham	1969-1970
Donald R. Johnson	1971-

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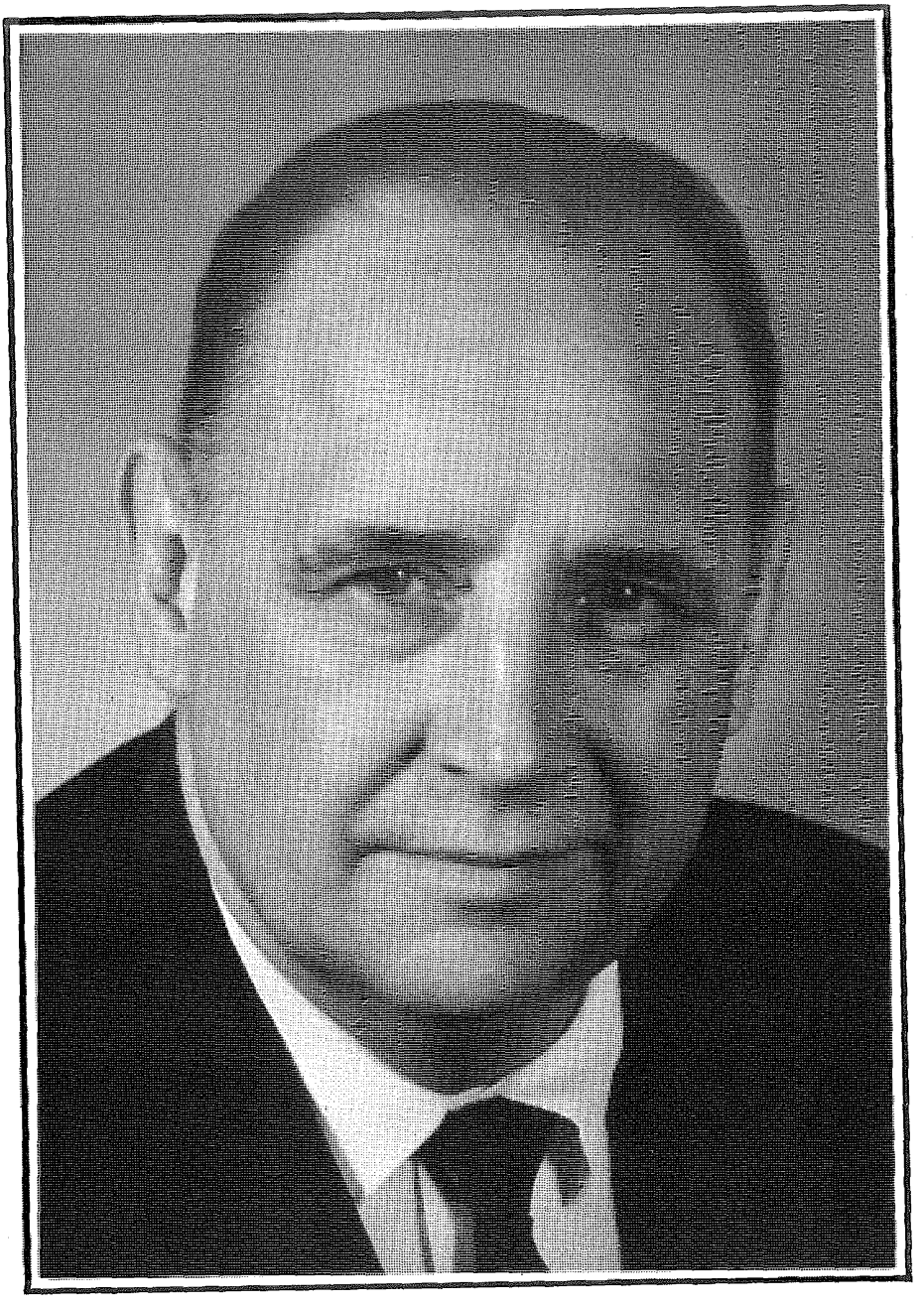
DIRECTOR OF INVESTIGATIONS

A. C. COOPER

NEW WESTMINSTER
CANADA
1972



CLARENCE F. PAUTZKE

Member of the International Pacific Salmon Fisheries Commission from 1961 to 1969, who passed away on August 14, 1971. Mr. Pautzke's tremendous enthusiasm and lifelong interest in fisheries resources provided stimulation and inspiration for his fellow Commissioners and the Commission staff.

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REPORT OF THE
INTERNATIONAL PACIFIC SALMON FISHERIES COMMISSION
FOR THE YEAR 1971

Thirty-four years have passed since the formation of the International Pacific Salmon Fisheries Commission in 1937, under provision of the Sockeye Salmon Fisheries Convention. The signing of the Convention culminated forty-five years of discussions, conferences and negotiations about the sockeye fishery of the Fraser River starting in 1892, and was regarded as "probably the most outstanding happening in the recent history of British Columbia's fisheries."[1] Several generations have passed since the need for rational management of this international fishery was first proposed, and the historical background of the Commission may not be as familiar now as it was to those who were deeply involved with its creation. A brief summary of this background was given in the 1946 Annual Report of the Commission, and for convenience this has been reprinted as an Appendix to the 1971 report. Accounts by the Commissioner of Fisheries of British Columbia in 1937[1] and by Tomasevich[2] give more details of the many discussions held and the people involved.

These early discussions were concerned mostly with means of regulating the fishery, but subjects such as fishing gear, obstructions to migration, water pollution, and fish culture also received attention. The Convention, as finally ratified in 1937 and later amended by the Pink Salmon Protocol of 1957, provides for the protection, preservation, and extension of the sockeye and pink salmon fisheries of the Fraser River, and makes specific reference to fishing regulations, division of catch, fishing gear, obstructions to salmon, fish culture and spawning ground improvements.

The terms of the Convention impart to the Commission certain responsibilities, which for convenience may be summarized as follows:

1. The Commission's primary responsibility is to restore, maintain and extend the fisheries.

2. Associated with the primary responsibility, the Commission shall regulate the fisheries for sockeye and for pink salmon with a view to allowing, as nearly as practicable, an equal portion of such sockeye salmon as may be caught each year and an equal portion of such pink salmon as may be caught each year to be taken by the fishermen of each country.

3. The Commission shall make a thorough investigation into the natural history of the Fraser River sockeye and pink salmon, into hatchery methods, spawning ground conditions and other related matters.

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[1]Province of British Columbia, Report of the Provincial Fisheries Department for 1937.

[2]International agreements on conservation of marine resources with special reference to the North Pacific. J. Tomasevich. Food Research Institute, Stanford University, California. 1943.

4. The Commission shall conduct sockeye and pink salmon fish cultural operations in any of the waters covered by the Convention, and to that end shall have power to improve spawning grounds, construct and maintain hatcheries, rearing ponds and other such facilities as it may determine to be necessary for the propagation of sockeye and pink salmon in these waters, and to stock these waters by such methods as it may determine to be most advisable.

5. The Commission shall have authority to recommend to the two governments the removing or otherwise overcoming obstructions to the ascent of sockeye and pink salmon that may now exist or may from time to time occur in Convention waters, when investigation may show removal or other action to be desirable.

The newly formed Commission acted quickly to ensure that it could fulfill its obligation to maintain the fishery and adopted the following resolution at its meeting on September 22, 1938.

> "Resolved that in view of the provisions of Article III of the Sockeye Salmon Fisheries Convention of May 26th, 1930, the International Pacific Salmon Fisheries Commission respectfully requests the Canadian Government to take such action as will ensure the Commission being notified and consulted before authority is given by the Government concerned for carrying out any project in the Fraser River watershed that will result in modifying any spawning area therein or in the damming, pollution, or diversion, of any waters thereof that are used by migrating fish either in the adult or young stages."

This action resulted in a cooperative arrangement between the Commission and the Canada Department of Fisheries (now Canada Department of the Environment, Fisheries Service) with liaison of technical staffs on questions of common concern.

The accomplishments of the Commission in the intervening years have been recorded in its Annual Reports. In view of the obvious expectations accompanying the ratification of the treaty in 1937, the following condensation of these accomplishments is given to emphasize the success of the Commission in fulfilling its responsibilities and to provide background for consideration of further requirements to achieve full restoration of the fisheries.

Obstructions

Initial investigations by the Commission were concerned with the causes of the decline of the sockeye fishery. The rock slide at Hell's Gate was found to be the principal cause of the decline. A logging splash dam at the outlet of Adams Lake, and a placer mining storage dam at the outlet of Quesnel Lake were found to be contributing factors. The dam at the outlet of Adams Lake was removed in 1945 upon recommendation of the Commission (the dam at Quesnel Lake had been removed in 1921). The Commission constructed large fishways of new design at Hell's Gate in 1944 and 1945 which successfully eliminated the obstruction for the critical range of river levels observed during the period of study. Subsequent

observations of the rebuilding sockeye runs at higher and lower river levels disclosed the need for additional fishways. The completed complex at Hell's Gate now comprises six fishways which provide passage for a range of 82 feet in river level. Continuing investigations disclosed points of difficult passage at Yale Rapids, Bridge River Rapids near Lillooet, and Farwell Canyon on the Chilcotin River. Two of the obstructions at Yale Rapids were removed by blasting, and four fishways were constructed. Two large fishways were built at Bridge River Rapids and five smaller fishways were built at Farwell Canyon. As a result of these works by the Commission, the Fraser River system has been made more accessible to sockeye and pink salmon than at any time in recorded history.

Escapements and Catches

Accompanying the removal of obstructions, management of the sockeye runs has increased the escapement above Hell's Gate from an average of 629,950 in the years 1938 to 1945 to an average of 1,170,849 in the years 1946 to 1971, and the escapement upstream from Lillooet has increased from an average of 170,036 to an average of 544,332 in the same periods. The early summer runs to tributary streams in the Stuart Lake system are probably larger than they have ever been since 1820. The total number of adult sockeye produced from 1950 (the first cycle return after regulations started) to 1971 has averaged 4,773,940 fish annually, which is an increase of 60% over the average of 2,984,886 for the years 1914 to 1949. The average annual catch of sockeye has increased by 861,200 fish or 88,234 cases in the same periods.

Management of the pink salmon runs has increased the escapement above Hell's Gate from none in 1945 to an average of 367,781 in the period 1955 to 1971. This increase in escapement has increased the catches of pink salmon by an estimated average of 1,037,142 fish each 2-year cycle. Pink salmon have extended their range up the river system beyond Bridge River Rapids where they had never been recorded previously.

Division

The Commission rapidly developed management procedures to achieve the required division of catch, while at the same time securing the desired escapement of spawners to perpetuate and increase the fishery. Since 1946, a total Convention waters catch of 85,787,923 sockeye has been divided 50.14% to United States fishermen and 49.86% to Canadian fishermen. Since 1957, a total Convention waters catch of 35,256,318 pinks has been divided 50.61% to United States fishermen and 49.39% to Canadian fishermen.

Protection

The Commission has conducted scientific investigations of the effects of hydroelectric power and storage dams on sockeye. It has worked in close co-operation with the Canada Department of the Environment, Fisheries Service, in assessing proposed projects and in preparing reports pertaining to such proposals,

as well as many other water use projects. Through these combined efforts, the migration paths, lake rearing areas, and spawning grounds have been protected from potentially disastrous effects.

In addition, the Commission has conducted scientific investigations of a number of major potential sources of pollution, which have established a basis for settling treatment criteria. It has collaborated with the Fisheries Service in preparing reports and recommendations regarding numerous sources of industrial pollution. The principle has been established that waste water effluents from industries located in the Fraser River system must be nontoxic to salmon at outfall, and industries have been required to install modern waste treatment facilities, which are monitored regularly. These accomplishments have protected sockeye and pink salmon from potentially adverse changes in the environment of the river system. In connection with this work, the Commission has operated a laboratory at Cultus Lake since 1961 where research is conducted on problems with specific application to the Commission's responsibilities.

Natural History

The Commission has catalogued all the spawning areas utilized by sockeye and pink salmon and has measured spawning areas, gravel composition, intragravel water flow and dissolved oxygen, stream flows and water temperatures for many of these spawning grounds. The factors affecting survival of eggs and fry have been studied experimentally and in the streams and lakes, and data on actual survival rates have been obtained. Data associated with the rearing capacity of all the major sockeye rearing lakes have been collected for a sufficient period to allow preliminary assessment of the rearing capabilities. Survival rates from fry to smolts have been measured for 20 years at Chilko Lake and for many years at Cultus Lake. Practical considerations have precluded similar enumeration of sockeye smolts at other major rearing lakes, but indices of abundance have been obtained by various methods. Estimates of pink salmon fry production are obtained by sampling in the Fraser River at Mission. These data have permitted examination of various environmental factors thought to influence survival to returning adults. They also provide a base reference for forecasts of the numbers of returning adults.

Migration rates and energy expenditure by adult sockeye between the fishing areas and the spawning grounds have been measured and provide a base for assessing the consequences of environmental changes. Histological changes accompanying maturation during the spawning migration have also been measured and will serve a similar purpose. The causes of prespawning mortality and possible remedial measures are being investigated, and substantial expenditures have been made to find means of preventing the serious losses in production from some runs caused by this mortality in recent years. This listing of natural history investigations is by no means all-inclusive, but indicates the major emphasis given to this work.

Fish Culture

The Commission started fish cultural operations in 1949 at a hatchery on Horsefly Lake. Initially, emphasis was given to transplanting fry and fingerlings reared from eggs obtained from various donor stocks. This was followed by transplants of eyed-eggs from various donor stocks in attempts to reestablish depleted runs. Only a few minor return runs were produced. Studies of spawning channels were started at the Horsefly Lake hatchery in 1953, and from 1955 to 1959 an experimental spawning bed was operated. In 1961 an experimental spawning channel for pink salmon was built at Seton Creek, and this was followed by sockeye channels at Weaver Creek and Gates Creek, a sockeye incubation channel at Pitt River and another channel for pink salmon at Seton Creek. These channels were all constructed as remedial measures to offset deterioration or loss of spawning grounds, but they also provided the means of full-scale verification of the feasibility of spawning channels. On the basis of the results reported in 1969, 1970 and in this report, the Commission believes expanded use of spawning and incubation channels is fully justified where appropriate to fulfillment of its terms of reference.

Requirements for Full Restoration of the Runs

The average annual catch of 3,264,429 sockeye in the period 1950 to 1971 is 36% of the average catch of 9,002,796 sockeye in the years 1894 to 1913. These historical catches may underestimate the present catch potential since the early fishery did not harvest the Adams River and other late summer runs. The addition of the Adams River run would increase the potential catch to an average of over 10,000,000 sockeye annually.

Catch records for pink salmon during the early years of the fishery are not indicative of the potential catch because there was no demand for pink salmon at that time and they were either discarded or avoided by the gear. From consideration of the index of abundance at traps[3] before and after 1913, it is conservatively estimated that the river system has the potential to produce catches of 22 million or more pink salmon each cycle. In the years 1959 to 1971 the total catch has averaged 4,475,000 pinks, or about 20% of the indicated potential.

It is evident that substantial increases in production of both sockeye and pink salmon are needed to reach pre-1913 abundance. The necessary rearing capacity for sockeye is available in the many large lakes in the watershed, such as Mabel, Adams, Kamloops, Quesnel, Stuart, Trembleur, Takla, and Francois Lakes, which are only partially utilized by existing stocks. Achievement of the indicated potential appears to depend primarily on the following measures: (1) Establishment of a run to Upper Adams River above Adams Lake to replace an extinct stock, and (2) Provision of facilities to increase production from present stocks which are limited by space or environment on the spawning grounds.

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[3]The salmon and salmon fisheries of Swiftsure Bank, Puget Sound, and the Fraser River. G. A. Rounsefell and G. B. Kelez. U.S. Bur. Fish., Bull. 49(27) 1938: 693-823.

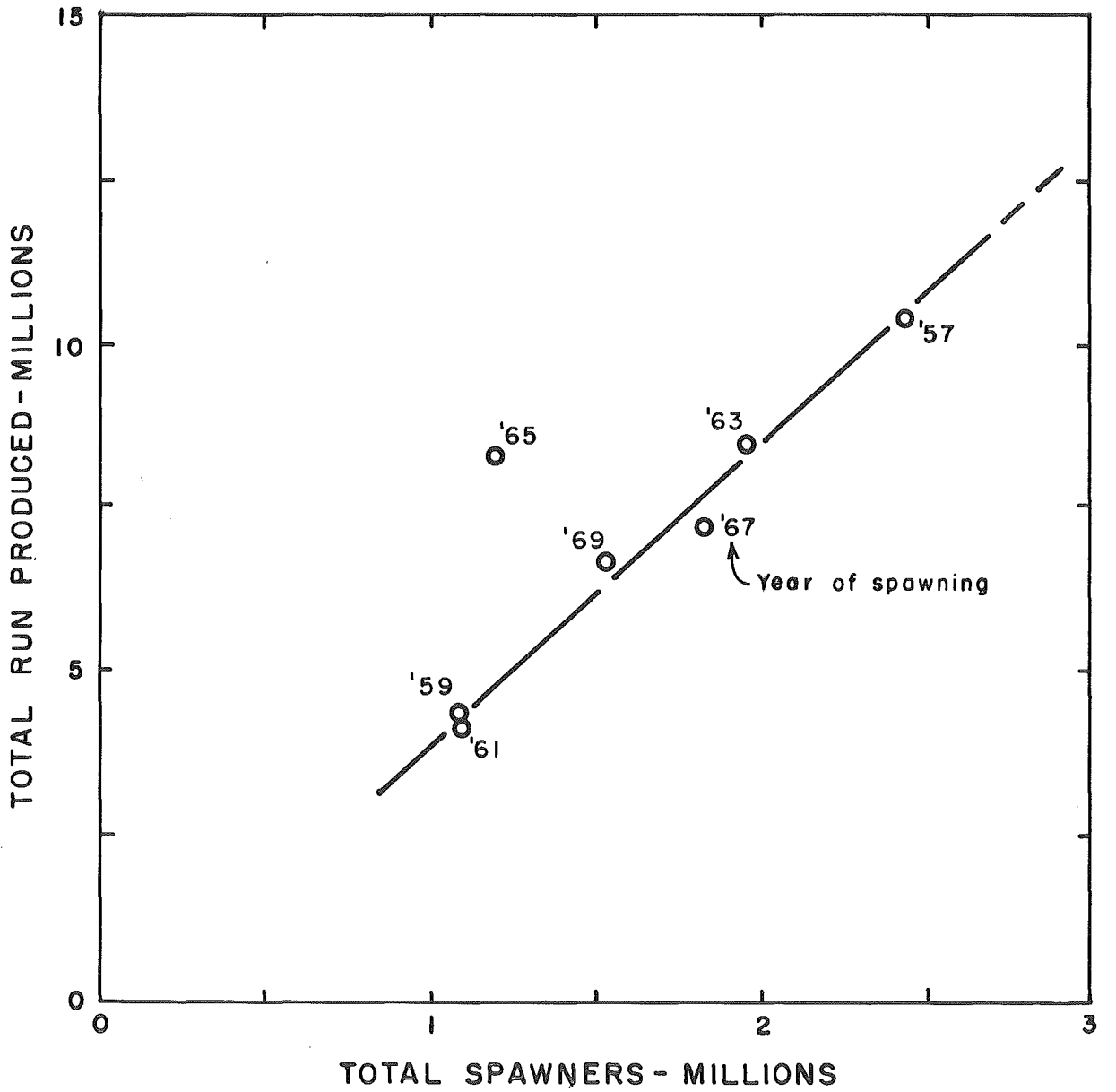

FIGURE 1—Total runs of Fraser River pink salmon produced by brood year spawners calculated on the basis of constant marine survival of 3.0%.

Data on pink salmon production from the Fraser River since 1957, with the total runs produced each year adjusted to the average 3% marine survival, shows that the size of the total run is proportional to the number of spawners (Figure 1). The exceptionally high freshwater survival of 18.4% for the 1965 brood year, compared to the average of 10.7% for the other years, together with high marine survival, caused the exceptional total run on the return cycle.

Extrapolation of the relationship shown in Figure 1 indicates that, for average survival rates, a potential catch of about 22 million pink salmon would require about 6.7 million spawners, or a total run of 28.7 million pinks. There is ample spawning area available to accommodate this number of spawners if escapements are properly distributed. Thus, attainment of the indicated potential appears to depend primarily on a combination of exceptional freshwater and marine survival which will produce a run large enough to provide greatly increased escapement. Artificial aids to increase fry production would increase the chances for reaching management goals and would be justifiable on an economic basis also.

Spawning and incubation channels similar to those already operated by the Commission have the capability of increasing sockeye catches to historic levels and would also assist the expansion of the pink salmon runs. The Commission is recommending to the two national governments a development program which would provide nine channels for sockeye salmon and three for pink salmon, with a total estimated cost of $14,000,000. The average benefit-cost ratio of these projects is calculated to be 9.5 to 1. The proposed projects would produce an average of 5,663,750 sockeye annually and 4,098,000 pink salmon each 2-year cycle. Together with existing sockeye channels, and the natural spawning grounds including Upper Adams River, the sockeye projects would increase the average annual catch of sockeye to over 10,000,000 fish, which corresponds to the potential indicated by historical catches. The pink salmon projects, together with existing channels and natural spawning grounds, would increase the catch of pink salmon to 8,909,000 fish each cycle, or about 40% of the estimated potential. The principal areas for expansion of the pink salmon runs are the large spawning grounds in the Fraser River below Hope, and in the Thompson and Nicola Rivers, where more spawners are required.

The catches of sockeye produced by the projects would have an average value to fishermen of $12,384,000 annually at 1971 prices, with a processed value of $24,206,000 annually, and the catches of pink salmon produced would have an average value to fishermen of $2,288,000 annually, with a processed value of $6,659,000 annually.

COMMISSION MEETINGS

The International Pacific Salmon Fisheries Commission held twenty-three formal meetings during 1971 with the approved minutes of these meetings being submitted to the Governments of the United States and Canada.

The first meeting of the year was held on February 4 and 5, with Mr. W. R. Hourston serving as Chairman and Mr. DeWitt Gilbert as Vice-Chairman and Secretary. On February 5 the Commissioners met with the Advisory Committee composed of the following members for 1971:

Canada	*United States*
F. Bublé Purse Seine Fishermen	J. Brown Reef Net Fishermen
K. F. Fraser Salmon Processors	R. Christensen Gill Net Fishermen
M. Guns Troll Fishermen	C. Mechals Troll Fishermen
F. Nishii Gill Net Fishermen	N. Mladinich Purse Seine Fishermen
H. Stavenes Purse Seine Crew Members	J. Plancich Salmon Processors
R. Wright Sport Fishermen	H. Gray Sport Fishermen

The Commission agreed that a letter be sent to the two governments regarding the growing oil refinery capacity in northern Puget Sound, stating the Commission's concern over the possible disastrous effect of a major oil spill on Convention waters pink salmon. The tentative recommendations for regulatory control of the 1971 sockeye and pink salmon fishery in Convention waters, as submitted to the Advisory Committee by the Commission on December 18, 1970, were reviewed in detail and certain revisions made on the basis of representations of the Committee.

On June 11, 1971 the Commission met in executive session to discuss administrative problems affecting the operation of the Commission. The Chairman noted that this was the first official meeting of the Commission with its new United States Commissioner, Mr. Donald R. Johnson and the Commission's new Director, Mr. A. C. Cooper. The Commission accepted the resignations of two members of its Canadian Advisory Committee, Mr. M. Guns, representing Troll Fishermen and Mr. K. F. Fraser, representing Salmon Processors and announced the appointments of Mr. W. Edwards and Mr. L. Monk as their respective replacements. In addition the Commission approved the appointments of Mr. J. F. Roos as Assistant Director and Mr. F. J. Andrew as Chief Engineer, effective July 1, 1971. In addition to reviewing the possible regulatory problems that would be encountered during the 1971 season if a predicted large subdominant Adams River sockeye run and a poor pink run occurred, the Commission discussed the following subjects: 1. Regulation changes regarding the closure of the portion of State Fishing Area No. 4 lying southerly of a line from Cape George to Diamond Point, 2. A development program for Fraser River sockeye and pink salmon, 3. The current status of the Nadina River spawning channel, and 4. Sockeye fry and smolt production for the spring of 1971 throughout the Fraser River watershed.

Due to an extremely complex year with regard to regulations, the Commission held nineteen other formal meetings and fifteen telephone meetings between June 11 and October 8 to achieve, by adjustment of fishing regulations, the desired escapement and as nearly as practicable, equitable division of the allowable catch of Fraser River sockeye and pink salmon. At one of the above referenced meetings, on June 28, the Commission approved recommended regulations for the release of pink salmon during the period when this might be required. Another meeting, on August 6, was attended by the Commission's Advisory Committee and information was presented indicating that a better than predicted pink salmon run could be expected.

The twenty-second formal meeting of the year was held on October 13, 14 and 15. In addition to inspecting the Hell's Gate Fishways and the spawning channels at Seton and Weaver Creeks the Commission heard the following reports: 1. A review of the season's catch and escapement of sockeye and pink salmon, 2. Progress on the construction of the Nadina River spawning channel, and 3. A review of the proposed developmental program for extending the Fraser River sockeye and pink runs.

The twenty-third and final formal meeting of the year was held on December 9 and 10 in Vancouver, B. C., with the first day devoted to general business. The second day of the meeting the Commission met with its Advisory Committee, staff and approximately 400 representatives of industry, government and press. The characteristics of the 1971 fishing season, related escapements and spawning environments along with the prospects for the 1972 season were reported on by the staff. Reports were also heard on the following topics: 1. A $14,000,000 development program recommended by the Commission to increase production of Fraser River sockeye and pink salmon runs, 2. Results of investigations designed to determine fry rearing potential of sockeye lakes, 3. Review of recent studies related to prespawning mortalities of sockeye salmon, and 4. Summary of the pollution investigation program. The Commission announced that commencing in 1972 the term of appointment of all Advisors would be four years, subject to reappointment by the Commission upon recommendation of the group they represent. Each segment of the industry represented by an Advisor who has already served longer than four years, will be asked to submit two to three nominations for consideration by the Commission. Tentative proposals for regulating the 1972 fishery were released subject to further consideration by members of the industry and their representatives on the Commission's Advisory Committee.

1971 REGULATIONS

Recommendations for regulations governing the 1971 sockeye and pink salmon fishery in Convention waters were adopted at a meeting of the Commission held on February 5, 1971 and submitted to the two national governments for approval and to the State of Washington for implementation on March 8, 1971. The recommendations for Canadian Convention waters were implemented by the Government of Canada by an Order-in-Council dated June 15, 1971 and for United States Convention waters by an Order of the Director of the Washington State Department of Fisheries on June 12, 1971.

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 1971, 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 straight line drawn true south from Sheringham Point Lighthouse to the International Boundary line with purse seines:

(a) From the 20th day of June, 1971 to the 10th day of July, 1971, both dates inclusive, except from six o'clock in the forenoon to six o'clock in the afternoon of Monday, Tuesday, Wednesday and Thursday of each week; and

(b) From the 11th day of July, 1971 to the 31st day of July, 1971, both dates inclusive; and

(c) From the 1st day of August, 1971 to the 7th day of August, 1971, both dates inclusive, except from six o'clock in the forenoon to six o'clock in the afternoon of Monday, Tuesday and Wednesday; and

(d) From the 8th day of August, 1971 to the 4th day of September, 1971, both dates inclusive, except from half past six o'clock in the forenoon to half past six o'clock in the afternoon of Monday, Tuesday, Wednesday and Thursday of each week; and

(e) From the 5th day of September, 1971 to the 11th day of September, 1971, both dates inclusive, except from seven o'clock in the forenoon to seven o'clock in the afternoon of Monday, Tuesday, Wednesday and Thursday.

(2) No person who fishes in the waters described in subsection (1) of this section with purse seines shall retain pink salmon caught between the 8th day of August, 1971 and the 11th day of September, 1971, both dates inclusive.

(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 20th day of June, 1971 to the 10th day of July, 1971, both dates inclusive, except from

(i) six o'clock in the afternoon of Monday to six o'clock in the forenoon of Tuesday; and

(ii) six o'clock in the afternoon of Tuesday to six o'clock in the forenoon of Wednesday; and

(iii) six o'clock in the afternoon of Wednesday to six o'clock in the forenoon of Thursday; and

(iv) six o'clock in the afternoon of Thursday to six o'clock in the forenoon of Friday of each week; and

(b) From the 11th day of July, 1971 to the 31st day of July, 1971, both dates inclusive; and

(c) From the 1st day of August, 1971 to the 7th day of August, 1971, both dates inclusive, except from

(i) six o'clock in the afternoon of Monday to six o'clock in the forenoon of Tuesday; and

(ii) six o'clock in the afternoon of Tuesday to six o'clock in the forenoon of Wednesday; and

(iii) six o'clock in the afternoon of Wednesday to six o'clock in the forenoon of Thursday; and

(d) From the 8th day of August, 1971 to the 4th day of September, 1971, both dates inclusive, except from

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

(ii) half past six o'clock in the afternoon of Tuesday to half past six o'clock in the forenoon of Wednesday; and

(iii) half past six o'clock in the afternoon of Wednesday to half past six o'clock in the forenoon of Thursday of each week; and

(e) From the 5th day of September, 1971 to the 11th day of September, 1971, both dates inclusive, except from

(i) seven o'clock in the afternoon of Monday to seven o'clock in the forenoon of Tuesday; and

(ii) seven o'clock in the afternoon of Tuesday to seven o'clock in the forenoon of Wednesday; and

(iii) seven o'clock in the afternoon of Wednesday to seven o'clock in the forenoon of Thursday.

(4) No person shall fish in the waters described in subsection (1) of this section with gill nets from the 8th day of August, 1971 to the 11th day of September, 1971, both dates inclusive, except with nets having mesh of not more than 6 inches extension measure.

(5) 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 20th day of June, 1971 to the 11th day of September, 1971, 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 27th day of June, 1971 to the 10th day of July, 1971, 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 Fisheries for the Pacific Region and pursuant to the provisions of the British Columbia Fishery Regulations; and

(b) From the 11th day of July, 1971 to the 17th day of July, 1971, both dates inclusive, except from eight o'clock in the forenoon of Monday to eight o'clock in the forenoon of Tuesday; and

(c) From the 18th day of July, 1971 to the 14th day of August, 1971, 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

(d) From the 15th day of August, 1971 to the 28th day of August, 1971, 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; and

(e) From the 29th day of August, 1971 to the 11th day of September, 1971, 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 in the following described waters of the Fraser River upstream to the Canadian Pacific Railway Bridge at Mission City:

(i) In the Main Arm upstream from a straight line projected north and south magnetic through the Woodwards Training Wall West Light near Steveston; and

(ii) In Canoe Pass upstream from a line projected north and south magnetic through Brunswick Cannery; and

(iii) In the Middle and North Arms upstream from Oak Street Bridge; and

(f) From the 12th day of September, 1971 to the 25th day of September, 1971, both dates inclusive; and

(g) From the 26th day of September, 1971 to the 6th day of October, 1971, 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 Fisheries for the Pacific Region and pursuant to the provisions of the British Columbia Fishery Regulations; and

(h) From the 7th day of October, 1971 to the 12th day of October, 1971, both dates inclusive, except from eight o'clock in the forenoon of Thursday to eight o'clock in the afternoon of Thursday in those waters described previously in subsection (e) of this section.

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 15th day of August, 1971 to the 30th day of September, 1971, 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 1971, 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. (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:

(a) From the 20th day of June, 1971 to the 10th day of July, 1971, both dates inclusive, except from five o'clock in the forenoon to half past nine o'clock in the afternoon of Monday, Tuesday, Wednesday and Thursday of each week; and

(b) From the 11th day of July, 1971 to the 17th day of July, 1971, both dates inclusive, except from five o'clock in the forenoon to half past nine o'clock in the afternoon of Monday and Tuesday; and

(c) From the 18th day of July, 1971 to the 7th day of August, 1971, 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

(d) From the 8th day of August, 1971 to the 14th day of August, 1971, both dates inclusive, except from five o'clock in the forenoon to half past nine o'clock in the afternoon of Monday, Tuesday, Wednesday and Thursday; and

(e) From the 15th day of August, 1971 to the 11th day of September, 1971, both dates inclusive, except from five o'clock in the forenoon to nine o'clock in the afternoon of Monday, Tuesday, Wednesday and Thursday of each week.

(2) No person who fishes in the waters described in subsection (1) of this section with purse seines shall retain pink salmon caught between the 8th day of August, 1971 and the 11th day of September, 1971, both dates inclusive.

(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 20th day of June, 1971 to the 26th day of June, 1971, and from the 4th day of July, 1971 to the 10th day of July, 1971, 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, 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

(b) From the 27th day of June, 1971 to the 3rd day of July, 1971, both 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, from seven o'clock in the afternoon of Wednesday to half past nine o'clock in the forenoon of Thursday and from seven o'clock in the afternoon of Thursday to half past nine o'clock in the forenoon of Friday; and

(c) From the 11th day of July, 1971 to the 17th day of July, 1971, both dates inclusive, except 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; and

(d) From the 18th day of July, 1971 to the 24th day of July, 1971 and from the 1st day of August, 1971 to the 7th day of August, 1971, 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

(e) From the 25th day of July, 1971 to the 31st day of July, 1971 and from the 8th day of August, 1971 to the 14th day of August, 1971, 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

(f) From the 15th day of August, 1971 to the 21st day of August, 1971 and from the 29th day of August, 1971 to the 4th day of September, 1971, 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

(g) From the 22nd day of August, 1971 to the 28th day of August, 1971 and from the 5th day of September, 1971 to the 11th day of September, 1971, all 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 of each week.

(4) No person shall fish in the waters described in subsection (1) of this section with gill nets from the 8th day of August, 1971 to the 11th day of September, 1971, both dates inclusive, except with nets having mesh of not more than 5¾ inches extension measure.

(5) No person shall fish for sockeye or pink salmon in the waters described in subsection (1) of this section with commercial trolling gear from the 8th day of August, 1971 to the 11th day of September, 1971, both dates inclusive, except from twelve o'clock (midnight) Sunday to twelve o'clock (midnight) Friday of each week.

2. (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 nets:

(a) From the 24th day of June, 1971 to the 10th day of July, 1971, both dates inclusive, except as described in section 3, subsection (2).

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

(a) From the 11th day of July, 1971 to the 17th day of July, 1971, both dates inclusive, except from five o'clock in the forenoon to half past nine o'clock in the afternoon of Monday and Tuesday; and

(b) From the 18th day of July, 1971 to the 7th day of August, 1971, 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

(c) From the 8th day of August, 1971 to the 14th day of August, 1971, both dates inclusive, except from five o'clock in the forenoon to half past nine o'clock in the afternoon of Monday, Tuesday, Wednesday and Thursday; and

(d) From the 15th day of August, 1971 to the 25th day of September, 1971, both dates inclusive, except from five o'clock in the forenoon to nine o'clock in the afternoon of Monday, Tuesday, Wednesday and Thursday of each week.

(3) 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 11th day of July, 1971 to the 17th day of July, 1971, 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 from five o'clock in the forenoon of Tuesday to twelve o'clock (noon) Tuesday; and

(b) From the 18th day of July, 1971 to the 7th day of August, 1971, 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

(c) From the 8th day of August, 1971 to the 14th day of August, 1971, 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, Tuesday and Wednesday, and from five o'clock in the forenoon of Thursday to twelve o'clock (noon) Thursday; and

(d) From the 15th day of August, 1971 to the 25th day of September, 1971, 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, Tuesday and Wednesday, and from five o'clock in the forenoon of Thursday to twelve o'clock (noon) Thursday of each week.

(4) No person who fishes in the waters described in subsection (1) of this section with purse seines or reef nets shall retain pink salmon caught between the 8th day of August, 1971 and the 25th day of September, 1971, both dates inclusive.

(5) 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 11th day of July, 1971 to the 17th day of July, 1971, both dates inclusive, except 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; and

(b) From the 18th day of July, 1971 to the 24th day of July, 1971 and from the 1st day of August, 1971 to the 7th day of August, 1971, 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

(c) From the 25th day of July, 1971 to the 31st day of July, 1971 and from the 8th day of August, 1971 to the 14th day of August, 1971, 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

(d) From the 15th day of August, 1971 to the 21st day of August, 1971, from the 29th day of August, 1971 to the 4th day of September, 1971 and from the 12th day of September, 1971 to the 18th day of September, 1971, 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

(e) From the 22nd day of August, 1971 to the 28th day of August, 1971, from the 5th day of September, 1971 to the 11th day of September, 1971 and from the 19th day of September, 1971 to the 25th day of September, 1971, all 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 of each week.

(6) No person shall fish in the waters described in subsection (1) of this section with gill nets from the 8th day of August, 1971 to the 25th day of September, 1971, both dates inclusive, except with nets having mesh of not more than 5¾ inches extension measure.

3. (1) Certain portions of 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 shall be subject to further recommended regulations, namely:

(2) No person shall fish for sockeye or pink salmon in that portion of the waters described in subsection (1) of this section designated as State Fishing Area No. 4 (Discovery Bay) with gill nets:

(a) From the 20th day of June, 1971 to the 26th day of June, 1971 and from the 4th day of July, 1971 to the 10th day of July, 1971, 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, 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

(b) From the 27th day of June, 1971 to the 3rd day of July, 1971, both 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, from seven o'clock in the afternoon of Wednesday to half past nine o'clock in the forenoon of Thursday and from seven o'clock in the afternoon of Thursday to half past nine o'clock in the forenoon of Friday.

(3) No person shall fish for sockeye or pink salmon in that portion of the waters described in subsection (1) of this section lying easterly and inside of a fifteen fathom depth line, as measured at mean lower low water, projected from Point Partridge on Whidbey Island to the northwest corner of Deception Island to the Initiative 77 Marker on Fidalgo Island with nets from the 11th day of July, 1971 to the 24th day of July, 1971, both dates inclusive.

(4) No person shall fish for sockeye or pink salmon in that portion of the waters described in subsection (1) of this section designated as State Fishing Area No. 4 (Discovery Bay) with gill nets from the 25th day of July, 1971 to the 11th day of September, 1971, both dates inclusive, except with nets having mesh of not less than 8 inches extension measure.

(5) No person shall fish in that portion of the waters described in subsection (1) of this section lying easterly and inside of a line projected from Partridge Point on Whidbey Island to Smith Island Light to Lawson Reef Light to Langley Point on Fidalgo Island with gill nets from the 8th day of August, 1971 to the 4th day of September, 1971, both dates inclusive, except with nets having mesh of not more than 5¾ inches extension measure or of not less than 8 inches extension measure.

(6) No person shall fish for sockeye or pink salmon in that portion of the waters described in subsection (1) of this section lying westerly of a straight line drawn true south from the southeast tip of Point Roberts in the State of Washington (otherwise known as Lily Point) to the International Boundary line with nets from the 29th day of August, 1971 to the 18th day of September, 1971, both dates inclusive.

(7) 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 19th day of September, 1971 to the 2nd day of October, 1971, 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) 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 and pink salmon and for an equitable share of the season's catch by the fishermen of Canada and the United States, the approved regulations as detailed above were later adjusted on recommendation of the Commission as follows.

June 11, 1971—At the request of the Washington State Department of Fisheries Director, the Commission recommended closure of those Convention waters in State Fishing Area No. 4 lying southerly of a line projected from Cape George to Diamond Point from June 20 to September 25.

July 9, 1971—Because of a larger than anticipated subdominant Early Stuart sockeye run and because of greatly reduced fishing effort in Canadian Convention waters during the past two weeks due to a strike affecting most of the fishermen, the Commission recommended that the opening to fishing in those Canadian Convention waters lying easterly of William Head be advanced by 24 hours to be effective 8:00 a.m. Sunday, July 11 for two days instead of one day as originally scheduled.

July 13, 1971—Due to the continued abundance of Early Stuart sockeye and the smaller than normal United States fishing fleet, the Commission recommended an additional two days fishing in all United States Convention waters making a total of four days for the current week. In addition the Commission recommended an additional 24 hours fishing in all Canadian Convention waters lying easterly of William Head commencing 8:00 a.m. Thursday, July 15.

July 20, 1971—At the request of the Director of the Washington State Department of Fisheries, the Commission approved a maximum mesh size restriction of 6 inch extension measure for gill nets in State Fishing Area No. 4 from July 25 to August 8 for the protection of chinook salmon.

July 27, 1971—In the interest of division of the allowable catch and adequate harvest of the Chilko sockeye run, the Commission recommended the following regulatory changes in Convention waters: 1. Fishing time for all United States Convention waters be increased by 24 hours for a total of four days fishing for the current week; 2. Fishing time in Canadian Convention waters easterly of William Head be increased by 24 hours for a total of three days fishing for the current week; 3. That the start of fishing in Canadian waters lying westerly of William Head be advanced 24 hours with fishing commencing at 6:00 a.m. Sunday, August 1 for purse seines and 6:00 p.m. Sunday, August 1 for gill nets for three days fishing.

August 6, 1971—In the interest of obtaining the required escapements to Chilko and Stellako Rivers and because it appeared the pink run would probably exceed the pre-season maximum prediction, the Commission made the following recommendations for the week commencing August 8: 1. All Convention waters lying westerly of the Angeles Point-William Head line open as scheduled but for three days fishing only; 2. The release of pink salmon by purse seines and reef nets and the mesh restrictions on gill nets be rescinded for the week except for the 8 inch extension measure mesh size restriction in State Fishing Area No. 4; 3. That State Fishing Area No. 4 be closed to purse seines for the balance of August, in accordance with the Washington State ruling on the Initiative 77 line to conserve Puget Sound pink salmon; 4. That Canadian Convention waters lying easterly of William Head not open as scheduled; and 5. United States Convention waters lying easterly of Angeles Point open as scheduled but for three days fishing only.

August 9, 1971—In view of the increased Chilko and Stellako sockeye escapements, the Commission recommended that Canadian Convention waters lying easterly of William Head open at 6:00 p.m. Monday, August 9 and close at 8:00 a.m. Thursday, August 12 instead of the originally scheduled closure at 8:00 a.m. Wednesday, August 11.

August 11, 1971—Due to the continued abundance of Chilko sockeye in Canadian Convention waters lying westerly of William Head and in the interest of adequate harvest and division of the catch of sockeye, the Commission recommended that fishing in all United States Convention waters be extended by 24 hours to give a total of four days fishing for the current week.

August 13, 1971—To achieve closer division of the sockeye catch the Commission recommended that the following week's opening of United States Convention waters be advanced by 24 hours for four days fishing and that Canadian Convention waters lying westerly of William Head open as scheduled but for two days only. Due to the indicated size of the Fraser River pink salmon run, the Commission further recommended that for the week commencing August 15 in all Convention waters, purse seines and reef nets not be required to release pink salmon and the mesh size restriction for gill nets be rescinded except for State Fishing Area No. 4. Because the courts did not uphold the Washington State ruling excluding purse seines from fishing inside the Initiative 77 line, the Commission recommended that purse seines be permitted to fish in this area as originally scheduled except that, in order to protect runs of pink salmon to Puget Sound, State Fishing Area No. 4 be closed to fishing for sockeye and pink salmon with nets having a mesh of less than 8 inches extension measure and under regulation by the Washington State Director of Fisheries for the week commencing August 15.

August 17, 1971—In the interest of adequate harvest of Adams River sockeye and division of the catch, the Commission recommended that fishing time in all United States Conventon waters be extended by 48 hours for a total of six days for the current week.

August 20, 1971—To provide for the maximum harvest of Adams River sockeye and in the interest of the division of the catch, the Commission made the following recommendations for Convention waters for the week commencing August 22: 1. Canadian waters lying westerly of William Head open 24 hours earlier than scheduled for two days fishing; 2. All United States waters, excepting State Fishing Area No. 4, open to fishing 24 hours earlier than originally scheduled for three days fishing; 3. In order to protect pink salmon destined for Puget Sound streams, State Fishing Area No. 4 open as scheduled but for two days only, with nets having not less than 8 inches extension measure and under regulation of the Washington State Director of Fisheries, and that purse seine fishermen not retain any pink salmon; and 4. That

purse seines and reef nets not be required to release pink salmon and the mesh size restriction for gill nets be rescinded for this week, except in State Fishing Area No. 4, because of the indicated size of the Fraser River pink salmon run and its expected relative abundance to sockeye in the coming week in all Convention waters.

August 23, 1971—In the interest of the harvest of Adams and Chilko River sockeye and division of the catch, the Commission made the following recommendations: 1. That fishing time in Canadian Convention waters lying westerly of William Head be extended by 24 hours to give three days fishing; 2. That fishing time in all United States Convention waters be extended by 24 hours; 3. That fishing in Canadian Convention waters lying easterly of William Head be permitted for 24 hours commencing 8:00 a.m. Thursday, August 26. The Commission further announced that additional fishing time for all Convention waters lying westerly of William Head might be granted later in the week.

August 25, 1971—To insure Canadian fishermen the opportunity to fish a possible peak in the Adams River sockeye run, the Commission recommended that fishing in Canadian Convention waters lying westerly of Willaim Head resume at 6:30 a.m. Thursday, August 26 for 24 hours. In the interest of adequate harvest of this run, the Commission recommended 24 hours extension of fishing time in all United States Convention waters.

August 26, 1971—In the interest of harvest of the Adams River sockeye run and division of the catch, the Commission recommended that fishing in Canadian Convention waters lying westerly of William Head be extended by an additional 24 hours giving a total of five days fishing for the current week.

August 27, 1971—In order to achieve equitable catch division of sockeye and pink salmon and to adequately harvest the Adams River sockeye run, the Commission made the following recommendations for the week commencing August 29: 1. That Canadian Convention waters lying westerly of William Head be closed until further notice; 2. That the opening in all United States Convention waters be delayed 24 hours with reef nets starting at noon Monday, August 30, gill nets Monday evening August 30, and purse seines Tuesday morning August 31, for two days; 3. At the request of the Washington State Director of Fisheries, the waters lying southerly and easterly of a line projected from Dungeness Light to Smith Island Light to Lawson Reef red can buoy to the northwest corner of Deception Island to the Initiative 77 Marker on Fidalgo Island be closed to fishing until further notice for the protection of Puget Sound pink salmon; 4. That in all Convention waters, purse seines and reef nets not be required to release pink salmon and the mesh size restriction for gill nets be rescinded.

August 29, 1971—Due to the indicated abundance of sockeye in Convention waters and the need for maximum harvest of the Adams River sockeye run, and in the interest of the division of catch, the Commission made the following regulatory recommendations: 1. Canadian Convention waters lying westerly of William Head open for two days fishing commencing Monday morning, August 30 for purse seines and Monday evening for gill nets; 2. All Canadian Convention waters lying easterly of William Head open for 24 hours fishing commencing 8:00 a.m. Monday, August 30 instead of the originally proposed regulations; and 3. The originally scheduled closure of United States Convention waters lying westerly of the Lily Point line be rescinded for the current week.

August 31, 1971—The Commission made the following regulatory recommendations in the interest of the harvest of Adams River sockeye and division of catch: 1. That fishing in all United States Convention waters currently open be extended by 24 hours giving three days fishing for the current week; and 2. Fishing in Canadian Convention waters lying westerly of William Head be closed until further notice.

September 1, 1971—In view of the unfavorable weather and poor fishing conditions in United States Convention waters and in the interest of division, the Commission recommended that an additional 24 hours fishing be granted in all United States Convention waters currently open to fishing making a total of four days for the

current week. Also, after reviewing regulations for fishing in Canadian Convention waters lying easterly of William Head, the Commission further recommended that: 1. The Convention waters portion of District No. 1 lying westerly of a line drawn from Point Grey to the westerly end of the North Arm Jetty to the Sandheads Light to the International Boundary line at the northerly tip of Area 18, hereinafter referred to as the "Apex Line", be open to fishing for gill nets from 8:00 p.m. Wednesday, September 1 to 8:00 a.m. Friday, September 3 and for purse seines from 8:00 a.m. to 8:00 p.m. Friday, September 3; 2. Areas 17 and 18 open for gill nets from 8:00 p.m. Wednesday, September 1 to 8:00 a.m. Friday, September 3 and for purse seines from 8:00 p.m. Wednesday, September 1 to 8:00 p.m. Friday, September 3.

September 3, 1971—To aid in the harvest of Adams River sockeye and in the interest of division of catch of sockeye and pink salmon, the Commission recommended that an additional 24 hours or a fifth day of fishing be granted in all United States Convention waters currently open. Also, the Commission recommended that Canadian Convention waters lying easterly of William Head and westerly of the "Blue Line" open to fishing from 8:00 p.m. Friday, September 3 to 6:00 a.m. Saturday, September 4 and from 8:00 p.m. Saturday, September 4 to 6:00 a.m. Sunday, September 5 and from 8:00 p.m. Sunday, September 5 to 8:00 a.m. Monday, September 6. The Commission also made the following recommendations for the week commencing September 5: 1. That Canadian Convention waters lying westerly of William Head open to fishing commencing Wednesday, September 8 for two days; 2. That all United States Convention waters open as scheduled for three days with the exceptions that the West Beach-Discovery Bay area remain closed at the request of the Washington State Director of Fisheries, and the Lily Point line restriction be rescinded; 3. That the scheduled gill net mesh size restriction and the release of pink salmon by purse seines and reef nets in Convention waters not be required.

September 8, 1971—In view of division of catch, and conservation requirements of pink salmon and the need for harvesting surplus Adams River sockeye, the Commission made the following recommendations: 1. Fishing in Canadian Convention waters lying westerly of William Head be extended by 24 hours for three days fishing; 2. That fishing in those Canadian Convention waters lying between the Angeles Point-William Head line and the "Apex Line" be permitted from 8:00 p.m. Wednesday, September 8 until 8:00 a.m. Friday, September 10.

September 10, 1971—In order to obtain adequate escapement and division of the catch of pink salmon while harvesting surplus Adams River sockeye in the Strait of Georgia, the Commission made the following regulatory recommendations: 1. That current fishing time in Canadian Convention waters lying westerly of William Head be extended by 72 hours until Tuesday morning, September 14; 2. That fishing in those Canadian Conventon waters lying between the Angeles Point-William Head line and "Apex Line" be open to fishing from 8:00 p.m. Friday, September 10 until 8:00 a.m. Monday, September 13; 3. That all United States Convention waters remain closed until further notice; 4. That the Commission maintain regulatory control of all Convention waters lying westerly of the Angeles Point-William Head line until further notice; 5. The regulations requiring the release of pink salmon by purse seines and reef nets and the mesh size restriction for gill nets be rescinded in Convention waters for the balance of the season; and 6. That fishing with nets having an extension measure of not less than 8½ inches be permitted under authorization of the Regional Director of Fisheries Service in those Canadian Convention waters lying above the Brunswick Cannery-Oak Street Bridge Boundary during the week commencing September 12.

September 13, 1971—In the interest of division and harvest of catch the Commission made the following regulatory recommendations: 1. That the fishing time in Canadian Convention waters lying westerly of William Head be extended by an additional 48 hours until Thursday morning, September 16; 2. That fishing in those Canadian Convention waters lying between the Angeles Point-William Head line and the "Apex Line" be permitted from 8:00 p.m. Monday, September 13 to 8:00 a.m. Thursday, September 16; 3. All United States Convention waters, including the West Beach-Discovery Bay area, be opened to fishing for two days commencing at noon Tuesday, September 14, for reef nets, Tuesday evening, September 14, for gill nets and Wednesday morning, September 15 for purse seines.

September 16, 1971—To provide a harvest of pink salmon stocks currently migrating through Convention waters, the Commission recommended that 24 hours additional fishing time or a third day be granted in all United States Convention waters currently open to fishing.

September 17, 1971—Due to the lack of a significant upstream migration of Adams River sockeye and Fraser River pink salmon, and because of the indicated decline in abundance of pink salmon at the entrance to Juan de Fuca Strait, the Commission made the following recommendations: 1. That regulatory control of Convention waters lying westerly of the Angeles Point-William Head line be relinquished effective Sunday, September 19; 2. Fishing in all United States Convention waters lying easterly of Angeles Point open as scheduled with three days fishing except for the waters lying westerly of the Lily Point line which remain closed.

September 21, 1971—In order to appraise the numbers of pink salmon available for escapement and to aid in division of the catch of pink salmon, the Commission recommended a 24 hour fishery commencing at 8:00 p.m. Wednesday, September 22 in those Canadian Convention waters lying westerly of the "Blue Line" and easterly of William Head.

September 24, 1971—In the interest of division of catch of pink salmon, the Commission recommended that those Canadian Convention waters lying easterly of William Head and westerly of the "Blue Line" be opened for 24 hours fishing commencing 7:00 p.m. Sunday, September 26.

September 28, 1971—In the interest of division of the catch of pink salmon, the Commission recommended 24 hours fishing commencing 6:00 p.m. Wednesday, September 29 in those Canadian Convention waters lying between William Head and the "Blue Line".

September 30, 1971—In the interest of division of the catch of pink salmon, the Commission made the following recommendations: 1. That the current fishing time in Canadian Convention waters be extended by 14 hours until 8:00 a.m. Friday, October 1; 2. That effective Sunday, October 3, regulatory control of those portions of Canadian Convention waters known as Areas 17 and 18 be relinquished; 3. That regulatory control of that portion of United States Convention waters lying westerly and northerly of the Iwersen's Dock-Active Pass line be extended until Sunday, October 10 after which control would be relinquished.

October 4, 1971—In the interest of division of the catch of pink salmon, the Commission recommended that fishing be permitted in the Canadian Convention waters of District No. 1 from 7:00 a.m. to 6:00 p.m. on Wednesday, October 6.

October 8, 1971—In order to reduce the difference in division in the catch of pink salmon, the Commission recommended that fishing be permitted in the Canadian Convention waters of District No. 1 from 7:00 a.m. to 6:00 p.m. on Tuesday, October 12.

Since regulatory control of these waters was relinquished effective Wednesday, October 13 as originally scheduled, this action completed the Commission's regulatory obligations for Convention waters for the 1971 season.

SOCKEYE SALMON REPORT

The Fishery

The 1971 Fraser River sockeye run was considerably larger than anticipated on the basis of pre-season forecasts. The run totaled an estimated 7,604,000 fish. The number of Fraser sockeye entering Convention waters was 6,753,883, of which 5,858,765 (86.7%) were caught commercially, 153,220 (2.3%) were taken by the Indian fishery, and 741,898 (11.0%) were recorded on the spawning grounds (see Tables I to VI in Appendix). The commercial harvest represented the highest percentage ever obtained under Commission regulations. A total of 71,662 other sockeye stocks, mainly of fish destined for the Lake Washington system in Washington State, were caught in Convention waters. The estimated catches of Fraser

River sockeye in non-Convention waters in Johnstone Straits and off the west coast of Vancouver Island were 500,000 and 350,000 respectively. The Johnstone Strait catch of Fraser River sockeye was only 7.5% of the total commercial catch of Fraser sockeye in all areas, and 6.6% of the total run. The latter figure may be compared with a catch of 19.1% of the total run in 1967, the preceding cycle year. An unusually low percentage of the run approached the Fraser River from the northern passage in 1971.

The total Convention waters catch of 5,930,427 sockeye exceeded that of any year on this cycle dating back to 1899 and the total Fraser run was also the largest run on the cycle since 1899.

Canadian fishermen caught 3,114,298 sockeye in Convention waters, or 52.51%, and United States fishermen caught 2,816,129 sockeye, or 47.49%.

Early season closures imposed in recent years to protect declining Early Stuart runs are beginning to show profitable results. A small Early Stuart run in 1963 from which only 4,627 escaped to spawn has now been restored because of the severe restrictions imposed in 1967. From an escapement in the brood year, 1967, of 21,069, a run of about 300,000 returned in 1971 and about 165,000 of the total run were taken by the commercial fishery.

Several Fraser River sockeye races exceeded pre-season abundance estimates. The Chilko "subdominant" population totaled about 2,250,000, over twice the size of the 1,000,000 pre-season prediction and the total return was the largest Chilko run since 1960. This run originated from 8,765,000 smolts and the resultant smolt-adult survival rate of 25.7% was the highest on record during the 19-year period of studies. Chilko production on the 1967-1971 cycle year has averaged 1,533,000 for the three cycle returns in 1959, 1963 and 1967 compared to an average of 1,726,000 for the dominant year runs of 1960, 1964 and 1968. At the present time, no clear distinction can be made in establishing which Chilko run is dominant.

Heavy fishing intensity on the large Chilko run resulted in unavoidable over-fishing of other smaller populations migrating at a similar time such as the Stellako River and Birkenhead River runs. The normal overlap in timing of these populations was accentuated further by the extended duration of the Chilko run.

The subdominant Adams River run, predicted to be 2,250,000, was about 750,000 larger than anticipated. The run consisted of two peaks and this created an additional management problem that required a split fishing week in the Juan de Fuca Strait net fishery. In addition, Adams River sockeye followed an unusual migration path on the approach to the Fraser River when an estimated several hundred thousand sockeye migrated up the west side of Haro Strait and were unavailable to United States fishermen. This unusual migration pattern had not occurred since 1954. Despite intensive fishing in United States waters, with twenty-three days fishing from August 9 through September 8, United States fishermen were not able to catch the desired number of sockeye nor maintain an equitable balance in division of catch. Since a large escapement of Adams River sockeye was not considered desirable for this cycle, additional fishing time was granted to Canadian fishermen in the Strait of Georgia.

The Canadian catch of sockeye by the net and troll fishery in Juan de Fuca Strait and by the outside troll fishery was 1,736,100 or 55.75% of the total Canadian catch. The total net catch in Juan de Fuca Strait was 1,548,953, the highest on record for the cycle year. Purse seines caught 1,071,651 in Juan de Fuca Strait, or 36.66% of the total Canadian net catch, and gill nets caught 477,302, or 16.33% of the total Canadian net catch. These percentages are just slightly higher than in the brood year as shown in the 1967 Annual Report. In addition, the troll catch of sockeye in these areas was the largest ever recorded, 187,147, compared with 137,782 in 1967. In spite of the large catch taken in these waters, the Fraser River catch in District No. I was 1,292,183, also a record for this cycle.

The distribution of sockeye catch by gear in United States Convention waters was unusual in some respects. The purse seine catch was the highest on record for the cycle, but the percentage of total catch obtained declined from 66.5% in 1967 to 57.0% in 1971. On the other hand, the gill net catch was the largest ever taken in any year and the percentage catch was the highest for the cycle. Reef nets obtained a normal percentage of the total catch but the number caught was a record for the cycle.

The average weight of 4-year-old sockeye was 5.85 pounds, very close to the cycle average of 5.87 pounds.

Escapement

The net escapement of 741,898 sockeye represented 11.0% of the 1971 Fraser run to Convention waters and 9.8% of the calculated total Fraser River run. In spite of the intense commercial fishery, escapements to most areas were generally satisfactory (Table VI).

A very satisfactory escapement to the Early Stuart streams of 95,942 sockeye was obtained, the largest on this cycle recorded by the Commission. This year's escapement was more than four times that of the brood year and marks the third consecutive year that this spawning population has shown substantial improvement from the dangerously low levels of the mid-1960's. It had been indicated in previous years that a moderate fishery could be expected on this population upon rehabilitation of the stocks. Such a fishery was implemented during the 1971 run and over one half the total return was taken in the commercial fishery.

The escapement of 25,497 spawners to the Bowron River system was satisfactory and maintains the potential for this population which has been at maximum production on this cycle.

A total of 15,747 sockeye reached Nadina River, almost twice that of the brood year, 1967. Most of these fish were late run sockeye. Since further expansion of this particular race is restricted because of limited spawning area, a spawning channel is currently being constructed and will be completed in time for the dominant 1973 run.

The substantially improved escapement at Upper Pitt River compared with the brood year is attributed to the sockeye fry produced in the incubation channel. In spite of an intense fishery on this race, the escapement in 1971 showed considerable improvement compared with other early runs migrating at the same time such as Gates Creek and Early Nadina River. The latter two populations showed declines in adult escapement in 1971 compared with 1967 of 62.6% and 23.4% respectively, whereas the Pitt run showed an increase of 50.3%. The return of jacks to Gates Creek was the largest ever recorded and indicates that a substantial adult return may be expected from the first year of operation of the Gates Creek spawning channel in 1968.

Escapements into some of the main summer run spawning areas were good while others were less than satisfactory. The Seymour River escapement increased 39.4% over the brood year level but considerable increase in this stock is still needed. The escapement to Chilko River was about the same number as occurred in 1967 and is considered sufficient for this cycle. The Stellako, Raft and Birkenhead River escapements were considerably lower than desired for these areas. This is the second successive year on the two cycle years of maximum production that the Stellako River has not received an adequate escapement. A larger escapement could have been achieved, but to have accomplished this, excessive escapement into Chilko River would have resulted. The escapement to the Raft River was dangerously low and was the third consecutive cycle of reduced escapements. On the other hand, the nearby Fennell Creek population has increased for the third consecutive cycle. More detailed surveillance of the Raft River spawning population will be needed in future.

The Adams-Little River escapement of 280,079 was at about the number considered suitable for the subdominant cycle. The escapement of 156,000 in 1963 produced a run of 3,090,000 in 1967. The 1967 escapement of 839,651 produced a run in 1971 estimated to be about 3,000,000 or slightly less than in 1967. Therefore, the 1971 escapement is considered satisfactory in view of the relationships that appear to have existed in Shuswap Lake for many years between plankton, predators and the production and survival of young sockeye.

Escapements in other late running sockeye spawning areas were much below brood year levels and most of this reduction is attributable to the intensive fishery on Adams River sockeye which permitted only 9.3% of the run to reach the spawning grounds. The 1971 escapements to Weaver Creek, Cultus Lake and Harrison River declined 72.5% to 81.6% from the brood year, compared to a 66.6% decline in the Adams River escapement. The greater reduction in these three areas may have been the result of poorer sea survival rates since it is known that Cultus smolt-to-adult survival of 2,438,000 migrants was only about 4.1% compared with the 25.7% at Chilko.

The Portage Creek population declined drastically to an escapement of only 281 from 6,548 in the brood year. A similar but not as severe decrease occurred in the previous run of 1970. This run, which had increased significantly from just a few spawners in the early 1950's augmented by egg plants from Adams River, reached maximum production of total runs of 60,000 to 70,000 fish in 1966 and 1967 only to decrease to minor numbers in 1970 and 1971. As yet, no reasons have been found for this decline, although some undetected adverse condition at the spawning grounds is suspected.

The total escapement of 741,898 is considerably below that obtained in the brood years 1959, 1963, and 1967 (Table VI) but the escapements in those years were excessive. Strikes by Canadian fishermen in 1959 and in 1963 added about 350,000 and 950,000 excess escapement respectively to the summer runs. In 1967, the Adams River escapement was about 600,000 more than desired as a result of the difficult management problems encountered when the run coincided with a large Fraser River pink salmon run. If the above surplus escapements are subtracted from the totals shown in Table VI, escapements of 597,000, 649,000, and 755,000 spawners for the respective three years would have been obtained.

Water temperatures affecting both migrating and spawning sockeye were favorable during the 1971 season and, in general, success of spawning was excellent. At Chilko and Stellako Rivers, 94.0% and 97.2% of all females spawned successfully. All other major populations had similar rates of spawning success. At Gates Creek, Raft River, and Fennell Creek the success of spawning was only 36.8%, 52.7% and 46.5% respectively. However these populations formed only a small fraction of the total potential egg deposition.

PINK SALMON REPORT

The Fishery

Since 1957, Fraser River pink salmon runs have varied from a low of 1,884,000 fish in 1961 to a high of 12,740,000 fish in 1967. The 1971 total return of 9,707,007 Fraser River pinks was considerably above the maximum pre-season prediction of 5,000,000 fish. As shown in the following table the run was the second largest under Commission management, which started in 1957.

Detailed production information, shown in the table, indicates that the major source of variation in production has taken place between the fry and adult stages. Per cent survival from eggs to fry has varied over a range from 9.2% to 18.4% and has been relatively stable compared to the survival from fry to adult which has ranged from 0.8% to 5.0%. The adults returning in 1971 had the highest marine survival rate of any year for the period of record. Several other populations of pink salmon along the Pacific Coast were also more abundant than anticipated.

FRASER RIVER PINK SALMON PRODUCTION*

	Brood Year						
	1957	1959	1961	1963	1965	1967	1969
Total Spawners (millions)	2.425	1.078	1.094	1.953	1.191	1.831	1.529
Female Spawners (millions)	1.423	.596	.654	1.217	.692	1.015	.961
Potential Egg Deposition (billions)	2.8745	1.0847	1.5692	2.4348	1.4878	2.1321	2.0182
Fry Production (millions)	—	—	143.6	284.2	274.0	237.6	195.6
Adult Return (Catch + escapement) (millions)	6.459	1.890	5.326	2.271	12.850	3.849	9.707
Freshwater Survival	—	—	9.2%	11.7%	18.4%	11.1%	9.7%
Marine Survival	—	—	3.7%	0.8%	4.7%	1.6%	5.0%

* Fry production data not available prior to 1961.

The statistics in the following table show that a total of 7,352,110 pink salmon entered Convention waters in 1971, of which 5,963,741 or 81.1% were of Fraser River origin. The remaining portion of the run was destined for Canada non-Fraser streams (91,077) and United States streams (1,297,292). Of the total Fraser River run reaching Convention waters, 69.2% were caught by the commercial fishery compared with only 51.8% in 1969. For the United States run destined for Washington State streams, 25.6% were caught in 1971, a slight increase over the 21.1% in 1969. Special closures were implemented during the 1971 season to assist in rehabilitating this stock from the dangerously low level of abundance that occurred in 1969.

CALCULATED CATCHES AND PERCENTAGE HARVEST FROM PINK SALMON RUNS ENTERING THE CONVENTION AREA IN 1971

	Source of Run			
	United States	*Fraser River*	*Canada Non-Fraser*	*Total*
Total Entering Convention Area	1,297,292	5,963,741	91,077	7,352,110
Catch in Canadian Convention Waters				
Westerly of William Head	272,798	1,174,135	16,641	1,463,574
Easterly of William Head	—	671,607	2,156	673,763
Total	272,798	1,845,742	18,797	2,137,337
Per Cent Harvest	21.0	31.0		
Catch in United States Convention Waters	59,005	2,282,500	29,646	2,371,151
Per Cent Harvest	4.5	38.3		
Total Catch in Convention Area	331,803	4,128,242	48,443	4,508,488
Per Cent Harvest	25.6	69.2		

One of the unusual features of the 1971 pink salmon run was the absence of pink salmon off the coast of Washington State. Only 12,863 fish (Table X), or 0.54% of the United States total catch in Convention waters, were taken in the United States Convention waters troll fishery. The percentage troll catch was the lowest since 1949. A large proportion of the run made its landfall off the west coast of Vancouver Island and the 421,937 pink salmon landed in Canadian Convention waters by the troll fishery comprised a slightly lower percentage (19.74%) than in the previous two cycle years.

The first indication that the 1971 Fraser run would be greater than the maximum prediction was given by the early coastal troll landings. Although the United States landings were at an extremely low level of abundance, size of fish was small. The relatively good landings in Canadian waters associated with small size fish indicated that a good Fraser run could be expected. The average weight of pinks in 1971 was 5.06 pounds compared with 6.25 pounds in 1965, a year of poor return, and conformed to the established inverse relationship between population size and fish weight.

The 1971 catch in Convention waters was 4,508,488 in contrast to the 1,807,302 taken in the brood year 1969 (Table XI). The United States share of the catch was 2,371,151 (52.59%) compared with 2,137,337 (47.41%) for Canada.

The United States gill net catch represented the second highest percentage (14.09%) of the catch in Convention waters for all years dating back to 1935 when records were first compiled. The largest percentage occurred in 1961 when gill nets took 14.14% of the catch. The purse seine and reef net catch formed a normal percentage compared with the almost nonexistent troll catch. Distribution of the catch by gear in Canadian waters was similar to other years.

The 1971 Fraser pink salmon run was several days later in appearance in the net fishing areas of Convention waters compared with other years. Substantial numbers of pink salmon did not appear in Juan de Fuca Strait until August 26. Fortunately the pink salmon run was both late and larger than expected, thus averting the possible need of releasing pink salmon while harvesting a large Adams River sockeye run. In addition, there was a fairly good separation in timing between the early run segment of the Fraser pink run and the Adams River sockeye run.

A total of only 61.4% of the estimated total Fraser River pink salmon run reached Convention waters in 1971. In the previous return years for which total run size estimates are available, (1959 to 1969) the percentage of the total run reaching Convention waters varied from 71.8% in 1967 to 86.3% in 1965. It appears that an above average percentage of the Fraser pink run approached the Fraser River through Johnstone Strait, and the percentage of the total Fraser run caught in that area in 1971 was the highest (33.6%) of any year since detailed records were first compiled in 1959. The lowest percentage (8.6%) occurred in 1969.

In order to harvest Adams River sockeye, while at the same time affording protection to delaying pink salmon, the waters at the mouth of the Fraser River commonly referred to as the "south flats" were closed. The closure of this area effectively reduced exploitation of pink salmon that were needed for escapement and thus permitted greater commercial utilization of the Adams River sockeye run.

Escapement

The total 1971 escapement of pink salmon to the Fraser River was 1,803,752 fish (Table XIV) or about 18.6% of the total run. Of the estimated total of 5,963,741 Fraser pink run reaching Convention waters, 30.2% reached the spawning grounds. The total escapement in 1971 was 274,000 greater than in the brood year. Most of this increased escapement (232,000) was destined for early run streams and as a result, the 1971 early run escapement of 1,553,000 was almost equal to the largest early run escapement on record since 1957 (1,612,000).

Approximately 31.7% of the total escapement to the Fraser River migrated to the spawning areas above Hell's Gate. The escapement into the Thompson River system was only 258,203, slightly better than the 247,896 recorded in the brood

year. This level of escapement is down considerably from the 450,487 that reached the area in 1967 and is disappointing since historical records indicate this river system has a far greater potential than has been realized in recent years. While the escapement to the Thompson River in 1971 was only about 10,000 greater than the brood year, the Seton Creek population which comes through the fishery at the same time increased to a total escapement of 297,968, about 100,000 more than in the brood year. This run is augmented by fry production from two spawning channels and the escapement in 1971 was the largest on record and probably the largest since 1911. The escapement of about 5,000 pinks into the Quesnel River, about 400 miles upstream from the Fraser River mouth, was the largest yet observed.

The late run total escapement of 250,389 fish was only slightly better than the very small escapement of 208,260 in the brood year. The escapement of 73,881 into Harrison River was a decline from the 96,390 spawners recorded in 1969. In the Chilliwack-Vedder system an improvement in spawning potential was observed with the escapement estimated at 160,511 compared with 92,222 in the brood year.

It has been estimated that potentially the Fraser River pink salmon runs could produce catches of 22,000,000 pinks or more each cycle. In order to achieve this level of productivity, properly apportioned escapements substantially larger than the escapement of 2,425,000 fish in 1957 will be required.

Spawning conditions in the main Fraser River and in the Thompson River were considered to be good. Water temperatures were favorable and discharge levels were low, which would minimize loss due to winter exposure. In late run spawning areas environmental conditions were good except in the Chilliwack-Vedder system and in the Chehalis River where major floods occurred during and following spawning. There is little doubt that fry production in these areas will be affected adversely.

REHABILITATION

The Commission now operates two spawning channels for pink salmon at Seton Creek, spawning channels for sockeye at Weaver Creek and Gates Creek, and an incubation channel for sockeye at Upper Pitt River. A third spawning channel for sockeye is under construction at Nadina River. Details of the sizes and capacities of these channels are given below.

AREA AND CAPACITY OF SPAWNING AND INCUBATION CHANNELS

Channel	*Year First Operated*	*Area. Sq Yd*	*Design Capacity**
Seton, Upper	1961	6,030	6,030 pink spawners
Upper Pitt	1963	717	4,000,000 sockeye eggs
Weaver	1965	20,000	10,900 female sockeye spawners plus other species
Seton, Lower	1967	20,888	20,888 pink spawners
Gates Creek	1968	13,500	9,000 female sockeye spawners
Nadina		21,680	14,450 female sockeye spawners

* Based on 1 pink salmon spawner per sq yd and 0.67 female sockeye spawners per sq yd.

The records of fry production at the sockeye installations are summarized in the following tables. The egg-to-fry survival rates at the Weaver Creek and Upper Pitt River channels have remained consistently high, averaging over 81%. The gravel in the Pitt channel is cleaned by washing each summer when not in use. In the Weaver Creek channel there is a visible accumulation of organic debris in the gravel at depths below about 6 inches, but because survival rates have remained high it has not been considered necessary to clean the gravel yet. Like the Weaver channel, the Gates Creek channel has a settling basin to remove sediments from the water before it enters the channel. After the fry migration was over in the spring of 1970, indicating only 36.3% egg-to-fry survival, it was observed that the

SOCKEYE FRY PRODUCTION AT WEAVER CREEK SPAWNING CHANNEL

Brood Year	*Total Spawners*	*Female Spawners*	*Eggs Deposited*	*Fry Produced*	*Per Cent Survival*
1965	4,436	2,986	11,463,000	7,845,000	68.4
1966	6,541	3,424	13,120,000	10,758,000	82.0
1967	2,887	1,631	5,793,000	4,501,000	77.7
1968	1,910	784	2,971,000	2,559,000	86.1
1969	17,089	9,671	36,453,000	32,622,000	89.5
1970	4,723	2,519	9,740,000	8,193,000	84.1
1971	2,736	1,520	5,930,000		

SOCKEYE FRY PRODUCTION AT UPPER PITT RIVER INCUBATION CHANNEL

Brood Year	*Female Spawners*	*Eggs Taken*	*Fry Produced*	*Per Cent Survival*
1963	1,059	3,189,000	2,417,000	75.8
1964	1,118	3,700,000	3,256,000	88.0
1965	791	2,133,000	1,776,000	83.3
1966	1,198	3,658,000	2,868,000	78.4
1967	1,485	4,529,000	3,300,000	72.9
1968	985	3,163,000	2,673,000	84.5
1969	1,383	4,881,000	4,192,000	85.9
1970	619	2,151,000	1,744,000*	
1971	777	2,652,000		

* Preliminary estimate.

SOCKEYE FRY PRODUCTION AT GATES CREEK SPAWNING CHANNEL

Brood Year	*Total Spawners*	*Female Spawners*	*Eggs Deposited*	*Fry Produced*	*Per Cent Survival*
1968	6,284	3,572	7,920,000	6,971,000	88.0
1969	676	388	919,000	334,000	36.3
1970	735	16	23,000	*	
1971	1,501	197	258,000		

* No count made.

settling basin had accumulated about 1.5 feet depth of predominantly organic sediment. Some of the finer portions of this material had been filtered out by the gravel in the channel, and the reduced egg-to-fry survival was attributed to this accumulated sediment. The settling basin was cleaned out prior to the 1970 spawning, but cleaning of the gravel has been delayed pending development of methods which can be applied to this channel without damaging the plastic liner used to prevent leakage to the extremely porous subgrade. The gravel will be cleaned prior to the adult return in 1972. In 1971, the spawners were allowed to use only the lower half of the channel, which was less affected by the sediment.

Adult returns to the Weaver and Upper Pitt channels have exceeded expectations in terms of fish produced by each female spawner. The following table gives the returns produced per 4,000 eggs, which corresponds closely to the egg deposition of a 4-year-old female.

ESTIMATED TOTAL RUN PRODUCED PER 4,000 EGGS DEPOSITED

Brood Year	*Upper Pitt River*		*Weaver Creek*	
	River	*Channel*	*Creek*	*Channel*
1963	10.16	120.0	18.22	
1964	13.68	126.0	21.86	
1965	7.0	38.7	9.30	56.40
1966	3.8[p]	58.8[p]	0.59[p]	5.26[p]
1967	0.9*	16.9*	2.90*	33.3*
	Average 1963-67		Average 1965-67	
	7.11	72.08	4.3	31.6

[p] = Preliminary figure.
* Does not include 5-year-old fish returning in 1972.

At Pitt River, eggs deposited in the channel produced an average of 10 times more adults than eggs deposited in the natural spawning areas, and at Weaver Creek the channel eggs produced 7.4 times more adults than eggs deposited in the creek. The indicated variations in production from year to year are to be expected, since the channels only improve environmental conditions for one part of the salmon's life cycle. For example at Cultus Lake where all sockeye smolts are counted, the survival rate to returning adults was 16.2% for the 1965 brood, 1.8% for the 1966 brood and 4.1% for the 1967 brood. Smolts are also enumerated at Chilko Lake, and the marine survival rate for these fish has ranged from 1% to 26%.

A small run of sockeye to Fennell Creek in the North Thompson District continues to increase. In 1959, there were only 27 spawners in this stream, which is tributary to the Barriere River above North Barriere Lake. In that year 490,000 eyed sockeye eggs from Raft River were planted in Fennell Creek. Subsequent cycle escapements have been 439 in 1963, 920 in 1967 and 1,300 in 1971. This run is reared in North Barriere Lake, which has the capacity to rear the progeny of 13,000 female spawners.

Fry production at the two channels for pink salmon at Seton Creek are summarized in the following tables.

PINK SALMON FRY PRODUCTION AT SETON UPPER SPAWNING CHANNEL

Brood Year	*Total Spawners*	*Female Spawners*	*Eggs Deposited*	*Fry Produced*	*Per Cent Survival*
1961	6,711	3,322	6,860,000	3,592,000	52.4
1963	14,106	8,107	16,022,000	3,480,000	21.7
1965	7,000	4,082	7,767,000	2,681,000	34.5
1967	7,143	3,985	7,154,000	3,180,000	44.4
1969	3,975	2,452	4,781,000	2,743,000	57.4
1971	6,007	3,831	6,535,000		

PINK SALMON FRY PRODUCTION AT SETON LOWER SPAWNING CHANNEL

Brood Year	*Total Spawners*	*Female Spawners*	*Eggs Deposited*	*Fry Produced*	*Per Cent Survival*
1967	20,630	12,435	22,322,000	8,977,000	40.2
1969	14,868	8,717	16,998,000	10,509,000	61.8
1971	24,882	14,239	22,369,000		

The variation in numbers of female spawners that has occurred enables assessment of the effect of spawning density on the survival rate from eggs to fry. The combined data for the two channels (Figure 2) show that the highest survival is obtained at the lowest density of spawners. However, theoretically the conditions conducive to maximum survival rate do not necessarily result in the greatest numbers of fry produced. Based on the relationship shown in Figure 2, and knowing the average egg content of each female the numbers of fry produced per square yard can be calculated. The calculations indicate that maximum fry production is obtained at a density of about 0.6 to 0.7 females per square yard. The numbers of spawners admitted to the channels in 1971 were selected to approximate this density.

In the 1969 Annual Report, reference was made to the serious reduction in flow in the right bank channel in the lower part of Adams River to only 10% of the total river flow. This situation was rectified prior to the 1970 spawning, and during the winter of 1970-71 the flow in this channel was never less than 44% of the total flow. Sampling of redds in March and April 1971 indicated excellent survival from eggs to alevins. Because of high water in the fall of 1971 it was not possible to make any further adjustment in the division of flow to the right channel prior to the 1971 spawning. Measurements after completion of spawning showed that the right channel was receiving 41% of the total river flow. One of the three feeder channels opened up in 1970 was completely blocked again with gravel and debris, but the river had opened up another channel. The situation will be checked during the winter to ensure maintenance of flow in the right channel.

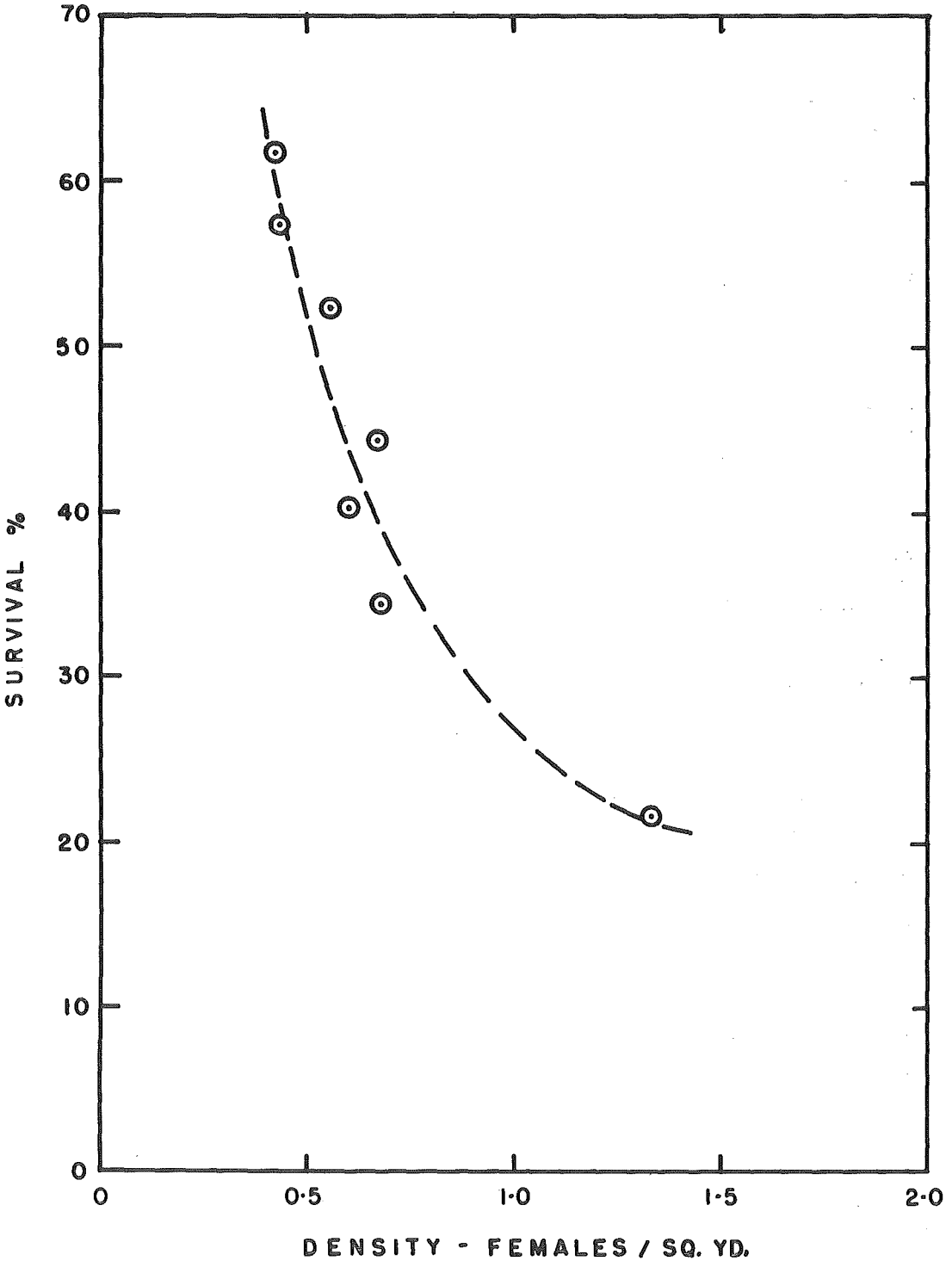

FIGURE 2—Effect of density of female pink salmon spawners on egg-to-fry survival rate at the Upper and Lower Seton Creek spawning channels.

Construction of the spawning channel in the Nadina River near Nadina Lake continued during 1971. The work on the channel has been proceeding in stages as permitted by the funds available. In 1970, a contract was let for site clearing, channel excavation and access roads, which cost approximately $96,500. Increased funds were made available in 1971, and two contracts totaling approximately $207,000 were let for rock excavation, channel rock lining, and placing of part of the water supply pipeline. Supplies and services purchased by the Commission brought the 1971 expenditure to approximately $228,000. Construction is scheduled to be completed during the early summer of 1973 so that the channel will be ready for the dominant cycle Late Nadina run returning in August of that year.

As reported last year, the viral disease infectious hematopoietic necrosis (IHN) has seriously hampered research on hatchery rearing of sockeye fry to smolt stage. However, at the suggestion of personnel at the Western Fish Disease Laboratory, Seattle, Washington, the majority of Cultus Lake sockeye eggs collected in 1970 were treated with organic iodine to kill IHN virus if present, while one group was maintained as an untreated control. Samples of ovarian fluid obtained when eggs were collected were subsequently found free of IHN virus during analyses at the Western Fish Disease Laboratory. Since IHN virus was apparently not present with the eggs, the efficiency of organic iodine treatment cannot be confirmed. However, the results are encouraging since the 1970 brood sockeye have been reared from fry to smolt size without evidence of IHN and are scheduled for release in the spring of 1972. Encouraged by the absence of IHN, eggs were collected from the 1971 spawning run and treated with organic iodine as a precautionary measure. It is planned to rear the fry to smolts with the aim of comparing smolt-to-adult survival rates for hatchery and wild stocks.

RESEARCH

The investigations undertaken by the Commission to develop and extend the Fraser River fisheries have been based on the premise that knowledge of the biology of the species is fundamental to fulfilling its terms of reference. Investigations on the natural life history of sockeye and pink salmon, and the influences of environmental variability, therefore, have continued as a major emphasis in the research program.

Research on the natural history of sockeye salmon has included four general areas of study: eggs and alevin in the spawning grounds, fry and fingerlings in the lakes, smolts, and adults. Studies of eggs and alevin have been directed primarily at examining those factors which may affect the survival potential of fry during subsequent lake residence. In addition to investigations on the incubation environment, studies on parental influences have also continued. The relationship of egg size to race, age of spawner, and length of female has been examined for a number of populations of Fraser River sockeye. The annual variation of egg size within a population is being studied as a possible cause of variability in fry survival during emergence and initial lake residence.

Studies have continued on the size composition of the gravel incubation medium used in incubation channels. In 1970, investigations on the use of stones larger than 2 inches in diameter showed higher mortality of eggs in the large

medium, which was attributed to silt and flow pattern. In 1971, the large stone environment was tested with improved flow distribution in experimental upwelling compartments and compared as an incubation medium with gravel mixtures presently used in upwelling incubation channels. Results have indicated that survival is in the same range for both substrates, and the size of fry emerging from both was the same. Timing of fry exiting the stone environment occurred four days sooner than from the gravel mixture and their yolk reserves showed that emergence was slightly premature. If further study confirms the present results, the large stone medium could be considered as an alternate incubation environment, in some situations.

As part of the program in rehabilitation research, sockeye-kokanee hybridization studies were undertaken to determine if a cross of sockeye and kokanee might be used as a base in developing new runs in lakes that do not now contain anadromous sockeye. Up to the fry stage, survival among the hybrids was good and their size was the same as pure stock of the maternal source. The next phase of investigation will examine growth during lake residence and emigration from the lake environment.

Examination of the migrating behavior of sockeye fry continued, with major emphasis given to the influence of olfactory cues on orientation. Fry show strong preference to migrate into water from a lake source. When given a choice of lake water and water from another tributary stream, they swim upstream in the lake water. If olfaction is inhibited by physically occluding the nares, the fry swim upstream but show a random response with respect to water source. Without olfactory occlusion and given only tributary water in which to migrate, the fry swim downstream. The orientation behavior of fry exemplifies their sensitivity to the environment and shows the need for caution in changing water quality.

Research into the lacustrine biology of young sockeye salmon continued this year with the bulk of the work being done on Cultus, Fraser, Harrison and Shuswap Lakes. Studies were made on the food supply and feeding habits of fry and fingerlings during lake residence to develop further an understanding of lake rearing capacity. Plankton density, species composition and relative size composition of plankters were determined for several lakes in the system as a continuing annual program in lake studies. In Shuswap Lake the plankton level during summer fry residence showed a recovery from the very low index of 1970, although it remained below that experienced on most other dominant cycles.

Timing of emergence, distribution of fingerlings and the nature of feeding migrations during lake residence were examined as part of the lake assessment program. The influence of emergence time on subsequent growth was shown to have a major affect on size. If the emerging fry are delayed entering the lake by a late spring, their feeding period can be reduced and growth affected. Samples of fry and fingerlings showed that their feeding behavior can be quite selective when food is relatively abundant. The young sockeye were not uniformly distributed in the lakes studied but were found to be concentrated in high densities in variable patterns. As part of the studies, the Fisheries Research Institute at the University of Washington conducted a survey of Shuswap Lake with a newly developed echo-integrator in a preliminary examination of the method for possible future application in the Fraser River system.

Sockeye smolt research is at present directed towards understanding the large variations in smolt-to-adult survival. This phase of investigation has examined the condition of the smolt, including physical measurements, fat analysis, screening for parasites and disease, seawater tolerance and stamina testing. Studies were made of orientation behavior of sockeye on their seaward migration when displaced from the lake outlet back into the lake to repeat their migration, and when displaced to an unfamiliar lake with a compass axis different than their native lake.

Research continued on the causes and possible control of the prespawning losses of Fraser River sockeye salmon that have occurred with greatest intensity among the early arriving segment of certain populations. To study the cause of the problem, histological examination of the early and peak segments of the Chilko run was made, as well as measurement of the cortisol-cortisone hormones and physical attributes of these segments as a general evaluation of their maturation and condition. In addition, injection of antibiotics was studied to determine if such prophylactic treatment would protect spawners from the effects of disease or prolong their life sufficiently to complete spawning. The study suggests that prespawning mortality might be reduced by antibiotics, however problems in application and side-effects of the treatment will have to be researched before such treatment can be considered a practical solution to prespawning mortality.

Pink salmon research has generally been directed to studies of spawning, incubation, and the early marine life history, the major emphasis each year being determined by the cyclic nature of the runs. In 1971, investigations on adult behavior and spawning success were undertaken on the Nicola River, a stream where minor numbers of pinks spawn only in the lower section of the river, in contrast to the large numbers observed distributed throughout the river prior to 1913. Adults transplanted to the upper portions of the river showed good evidence of having remained and spawned in the upper area. Research continued in 1971 toward definition of the relationship between early developmental temperatures and the subsequent survival of pink salmon eggs. Preliminary studies with the 1969 run showed that critical temperatures may occur in certain spawning areas on some years which could cause mortalities during incubation.

Protection of sockeye and pink salmon from pollution requires knowledge of tolerance to contaminants, evaluation of wastewater treatment methods and monitoring of water quality. In the case of contaminants, research continued on the tolerance of sockeye and pink salmon to heavy metals, including copper, mercury, zinc and cadmium. Continuous exposure to mercury during the incubation period indicated that eggs were killed during early embryological development at concentrations which were otherwise tolerated by eyed eggs, alevins, fry and smolts. Preliminary results indicated that eggs and fry accumulated copper and mercury residues in proportion to the level of exposure. Therefore, analyses of eggs and fry collected from the natural environment are expected to serve as indicators of the presence of these heavy metals in the environment. Initial experiments indicate that chronic exposure of eggs to zinc causes delay in hatching. It was reported previously that eggs and alevins were more tolerant of cadmium than were feeding fry. These tests also showed that tolerance of sockeye to copper, mercury and cadmium remained relatively constant from fry through fingerling stages.

Four kraft pulp mills are operating on the Fraser watershed and a fifth is under construction at Quesnel. Although this mill is located on the Quesnel River, the treated effluent will be piped to the Fraser River for dispersion. The existing mill at Kamloops is undergoing expansion from 290 to 1,250 tons per day and will be in operation at the expanded level in 1972.

Each mill is required to treat waste waters to meet biochemical oxygen demand and detoxification standards of Provincial and Federal regulatory agencies. However, since mill effluents have not met these standards in every case further study was undertaken to determine the reasons for substandard treatment. Initially, a cooperative project involving the mill at Kamloops, the Western Forest Products Laboratory and the Commission was carried out from January to September 1971. Spills of black liquor were found to contribute to treatment upset and in-plant changes were helpful in establishing control. A repeat study is contemplated after the expanded mill is put in operation. Substandard detoxification of effluents was not correlated solely with black liquor spills and the remaining factor or factors involved have yet to be determined. Selected samples were forwarded to the Forest Products Laboratory for isolation and identification of fish toxicants.

An intensive sampling program was started in November at the three pulp mills in Prince George to evaluate performance of pollution control facilities. Future development of this study will depend upon the results obtained during a preliminary testing period.

The Department of the Environment, Fisheries Service, has enforced strict control of the use of pesticides in the Fraser watershed to avoid potentially serious adverse effects on fish. Since it is known that chlorinated hydrocarbon pesticide residues, such as DDT, can be transferred from female salmon to their eggs, causing death of sac-fry in some instances, analyses were made to determine if residues could be found in salmon eggs. No pesticide residues were found in samples of sockeye and pink salmon eggs collected from watersheds where pesticides are used most frequently.

Much raw municipal sewage is discharged to the Fraser River and its tributaries but eventually these effluents are expected to receive primary treatment or better. Disinfection of treated sewage is usually required for public health reasons and chlorination is the method commonly used. While elimination of raw sewage discharges is desirable, the chlorine used in disinfection may pose a hazard for salmon, since residual chlorine compounds are toxic. In order to evaluate the potential hazard, a project to study the effect of chlorine residuals on Fraser River sockeye and pink salmon was started at year's end.

Water quality in the lower Fraser River has been monitored in the past by chemical tests but it has not been feasible to sample and analyse for every conceivable pollutant that might be present. Furthermore, since concentrations of pollutants may vary from day to day, periodic samples may fail to detect harmful conditions. In view of this, a continuous assessment of Fraser River water quality was needed. A biological monitoring program was started in April at Mission and

Steveston where juvenile salmon were exposed for a week at a time in a flow of water pumped from the Fraser River. In October, monitoring was expanded to include continuous exposure of groups of salmon eggs. In addition to biological monitoring, measurements of dissolved oxygen and biochemical oxygen demand were made to assess the pollution load. The results to date have not revealed any acutely harmful condition for survival of eggs, fry or smolts.

TABLE I

SOCKEYE CATCH BY GEAR

Gear		1959	1963	1967	1971
United States Convention Waters					
Purse Seines	Units	257	171	290	182
	Catch	1,401,819	862,616	1,387,370	1,607,117
	Per Cent	77.42	65.65	66.45	57.07
Gill Nets	Units	446	450	507	650
	Catch	241,163	365,873	595,580	1,016,984
	Per Cent	13.32	27.84	28.53	36.11
Reef Nets	Units	81	64	46	48
	Catch	163,093	85,110	104,694	191,682
	Per Cent	9.01	6.48	5.01	6.81
Troll	Catch	4,663	446	182	346
	Per Cent	0.25	0.03	0.01	0.01
TOTAL CATCH		1,810,738	1,314,045	2,087,826	2,816,129
Canadian Convention Waters					
Purse Seines	Units	74	73	102	173
	Catch	516,585	115,115	602,495	1,233,531
	Per Cent	32.66	16.76	32.12	39.61
Gill Nets	Units	1,488	1,328	1,767	1,357
	Catch	1,040,916	561,345	1,111,186	1,689,607
	Per Cent	65.80	81.75	59.25	54.25
Troll	Catch	24,382	10,221	161,801	191,160
	Per Cent	1.54	1.49	8.63	6.14
TOTAL CATCH		1,581,883	686,681	1,875,482	3,114,298

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*
1971			
Total Landings (No. Sockeye)	2,816,129	3,114,298	5,930,427
Share in Fish	47.49%	52.51%	
Total Pack (48-lb Cases)	262,307	281,145	543,452
Share in Pack	48.27%	51.73%	
1946-1971			
Total Landings (No. Sockeye)	43,013,753	42,774,170	85,787,923
Share in Fish	50.14%	49.86%	
Total Pack (48-lb Cases)	3,780,999	3,730,042	7,511,041
Share in Pack	50.34%	49.66%	
1971 *Cycle Catch*			
1971	2,816,129	3,114,298	5,930,427
1967	2,087,826	1,875,482	3,963,308
1963	1,314,045	686,681	2,000,726
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

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

TABLE III

DAILY CATCH OF SOCKEYE, 1959-1963-1967-1971 FROM UNITED STATES CONVENTION WATERS

Date	JULY				AUGUST				SEPTEMBER			
	1959	1963	1967	1971	1959	1963	1967	1971	1959	1963	1967	1971
1				1,068		112,848	83,010	9,704	23,297		17,852	79,685
2						72,265	94,322	145,517	18,812	1,282		60,079
3					51,046			94,802		1,032		87,853
4					91,067			53,159		47		56,222
5				12,708	89,417	81,546				10	11,025	1,411
6				8,111	139,733	48,585	5,594				11,025	87,582
7				9,281	167,337	29,274	88,268		5,401		6,254	69,145
8				4,588	132,596	18,439	58,194	7,447	10,197			33,948
9	CLOSED	CLOSED	251					155,896	7,266	28		
10			4,465		93,493			88,141	11,143	439		
11			3,762	1,714	124,278			58,076		421	2,548	
12				20,210	80,698	37,789		39,934			7,379	
13				17,672	74,075	12,228	152,217				4,728	
14				15,708		14,300	115,530	4,037			1,982	281
15				9,213			104,995	109,435	747			4,431
16			1,145				64,753	113,464	495			3,305
17			16,742		125,123			104,877	218			1,891
18			12,781	6,773	83,286			108,613		32	2,631	
19				56,405	64,087	6,193		76,550		6	604	175
20	7,112			45,037		4,269		50,385			515	1,163
21	5,962			37,835		2,680	189,061	547	154		198	980
22	5,008	33,394					197,978	112,368	99			594
23		110,105	5,072		942		156,371	93,858	56			
24		130,412	103,996		125,615		108,378	86,382	8			
25		94,278	74,382	16,459	67,372			55,063			11	
26		92,026	67,596	105,003	17,846	2,648		19,109			9	7
27	16,216	61,186	54,405	72,329	33,994	2,686					6	396
28	20,278			85,289		2,330			1,941			116
29	28,340	114,620		89,638		151	41,810		645			64
30	44,671	121,644	6,455				27,915	6,599	553	19		38
31		104,333	146,028		29,018		31,254	94,802				
Totals	127,587	861,998	497,080	615,041	1,591,005	448,231	1,519,650	1,688,765	81,032	3,316	66,767	489,366
Troll	437	240	143	122	4,188	203	34	190	27	1		6
Monthly Totals	128,024	862,238	497,223	615,163	1,595,193	448,434	1,519,684	1,688,955	81,059	3,317	66,767	489,372
June, Oct. and Nov. Totals									6,462	56	4,152	22,639
Season Totals									1,810,738	1,314,045	2,087,826	2,816,129

TABLE IV

DAILY CATCH OF SOCKEYE, 1959-1963-1967-1971 FROM CANADIAN CONVENTION WATERS

	JULY				AUGUST				SEPTEMBER			
Date	1959	1963	1967	1971	1959	1963	1967	1971	1959	1963	1967	1971
1				231			19,223	114,248	18,874			19,968
2				Strike			16,577	189,823	19,749	11,459		34,675
3				June 26-	15,439			113,015	6,740	8,062	2,170	124,765
4				July 10	16,614	91,288			1,581	10,160	29,490	16,483
5				953	5,000	70,820				106	27,699	20,106
6				915	Strike	54,485	73,831		3,831		476	50,720
7				850	July 26	44,820	184,860		7,269		639	
8				874	Aug. 9	9,987	89,770		14,422		441	40,196
9					Incl.		114,059	288,641	27,728	15,879		46,210
10					228,536			188,407	31,362	57		36,579
11	CLOSED			39,111	145,352			198,973	306	12	55,886	32,316
12		CLOSED		16,037	125,006	59,034					37,370	27,253
13					127,041	27,942					793	3,514
14						8,205	183,161		24,349		318	18,537
15				12,044		5,783	129,684		22,769			18,225
16		784					104,460	190,798	16,543	4		
17		1,503	10,864		165,960			87,209	22,802	2		
18			8,744		83,683				18		650	
19			6,984	21,756	41,091	43,585					371	
20	10,360			13,361		13,553					208	391
21	8,871					3,146	115,565		19,365			167
22	12,214	3,757				3,979	76,188	60,261	10,636		50,985	16,238
23		6,900			55,943	1,955	36,132	86,106	19,305	15,557		7,811
24		22,877	47,625		104,920			16,933	15,459			
25		Strike	21,971		49,084					6	234	
26		July 12	27,672	187,654	32,174	11,487		142,151		0	115	22,579
27	4,672	to	26,691	40,513		15,557		100,315			108	2,315
28	2,540	Aug. 4		18,266		1,157	66,008		6			
29		19,241				1,276	24,586		2			6,281
30		21,981				590	5,799	173,063	1			2,812
31		47,394	92,491		31,096		4,370	54,019				
Totals	38,657	124,437	243,042	352,565	1,226,939	468,687	1,244,273	2,003,962	283,117	61,304	207,953	548,141
Troll	2,163	1,673	32,565	21,857	21,458	5,028	125,490	166,518	608	3,057	3,470	2,460
Spring Salmon Gill Nets	506	732	1,142	617					37	618		4,786
Monthly Totals	41,326	126,842	276,749	375,039	1,248,397	473,715	1,369,763	2,170,480	283,762	64,979	211,423	555,387
April, June, Oct. and Nov. Totals									8,398	21,145	17.547	13.392
Season Totals									1,581,883	686,681	1,875.482	3.114.298

TABLE V

INDIAN CATCH OF SOCKEYE BY DISTRICT AND AREA, 1967 and 1971

District and Area	1967 Catch	1967 No. of Fishermen*	1971 Catch	1971 No. of Fishermen*
HARRISON-BIRKENHEAD				
Skookumchuck and Douglas	1,025	8	350	7
Birkenhead River and Lillooet Lake	5,325	29	6,100	23
Harrison and Chehalis	500	42	500	15
TOTALS	6,850	79	6,950	45
LOWER FRASER				
Coquitlam to Chilliwack	12,900	162	6,572	78
Chilliwack to Hope	10,150	66	19,430	74
Vedder River and Vicinity	100	17		
TOTALS	23,150	245	26,002	152
MIDDLE FRASER				
Hope to Lytton	28,800	231	47,556	308
Lytton to Lillooet	14,500	186	3,955	156
Bridge River Rapids to Churn Creek	3,000	78	25,145	195
TOTALS	46,300	495	76,656	659
CHILCOTIN				
Farwell Canyon	292		4,950	
Hances Canyon	684		700	
Alexis Creek	1,462		5,000	
Siwash Bridge	3,637		4,500	
Keighley Holes	468		175	
TOTALS	6,543	120	15,325	146
UPPER FRASER				
Churn Creek to Chimney Creek	733		2,800	62
Soda Creek	290		2,400	57
Quesnel	223		1,050	27
Shelley	266		215	24
TOTALS	1,512	119	6,465	170
NECHAKO				
Nautley and Stella Reserves	6,230	44	6,696	45
TOTALS	6,230	44	6,696	45
STUART				
Fort St. James	1,866	51	4,453	39
Tachie, Pinchi and Trembleur Villages	1,388	41	1,883	48
TOTALS	3,254	92	6,336	87
THOMPSON				
Main Thompson River	11,350	53	8,135	329
North Thompson River	350	47	200	32
South Thompson River	1,700	120	455	110
TOTALS	13,400	220	8,790	471
GRAND TOTALS	107,239		153,220	

* Number of permits issued to Indians in district.

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, 1959, 1963, 1967, 1971

District and Streams	1971 Period of Peak Spawning	Estimated Number of Sockeye				Jacks	Sex Ratio	
		1959	1963	1967	1971		Males 4-5 yr.	Females 4-5 yr.
LOWER FRASER								
Cultus Lake	Nov. 22-26	48,461	20,571	33,492	9,145	17	4,161	4,967
Upper Pitt River	Sept. 12-14	15,740	12,680	10,300	15,469	17	8,490	6,962
Widgeon Slough	Nov. 4-7	637	353	1,006	394	0	149	245
HARRISON								
Big Silver Creek	——	64	9	0	0	0	0	0
Harrison River	Nov. 10-12	28,562	22,287	20,577	3,790	0	1,820	1,970
Weaver Creek	Oct. 15-18	8,379	14,469	22,617	5,575	585	2,294	2,696
LILLOOET								
Birkenhead River	Sept. 22-25	38,604	67,151	58,036	32,278	8,043	7,633	16,602
SETON-ANDERSON								
Gates Creek	Sept. 3-5	867	4,858	1,665	2,291	1,865	128	298
Portage Creek	Nov. 1-4	572	2,011	6,548	281	0	126	155
SOUTH THOMPSON								
Seymour River	Sept. 3-5	52,325	71,690	13,361	18,628	0	8,383	10,245
Upper Adams River	——	0	6	——	0	0	0	0
Lower Adams River	Oct. 12-15	113,230	151,373	765,161	269,127	73	120,715	148,339
Little River	Oct. 12-15	21,080	5,148	74,490	10,952	0	5,350	5,602
South Thompson River	Oct. 15-18	472	45	270	10	0	5	5
Lower Shuswap River	Oct. 20-24	0	23	5,951	6,117	0	2,416	3,701
NORTH THOMPSON								
Raft River	Sept. 6-8	10,210	8,724	1,303	840	39	378	423
Barriere River	Aug. 25-27	203	92	16	5	0	2	3
Fennell Creek	Aug. 21-23	27	439	920	1,300	7	636	657
North Thompson River	Sept. 20-23	——	70	——	888	0	440	448
CHILCOTIN								
Chilko River	Sept. 24-28	470,621	1,002,252	176,337	174,266	17,073	57,727	99,466
Taseko River	Aug. 30-Sept. 1	16,410	31,667	5,700	10,500	0	4,830	5,670
QUESNEL								
Hosefly River	Aug. 30-Sept. 1	Present	86	119	171	0	65	106
Little Horsefly River	——	27	0	——	——	——	——	——
NECHAKO								
Endako River	Aug. 30-Sept. 1	1,463	2,540	949	284	0	128	156
Nadina River (Early)	Sept. 1-3	351	1,019	1,595	1,222	0	551	671
(Late)	Sept. 15-18	1,013	7,304	7,790	14,525	44	6,507	7,974
Nithi River	Aug. 20-23	218	763	1,688	1,796	0	810	986
Ormonde Creek	——	74	41	0	0	0	0	0
Stellako River	Sept. 25-27	79,355	138,805	90,680	38,768	30	18,512	20,226
STUART								
Early Runs								
Driftwood River	Aug. 5-8	3	14	52	335	0	167	168
Forfar Creek	Aug. 4-6	281	652	4,815	25,178	2	11,703	13,473
Gluske Creek	Aug. 3-5	97	0	1,368	14,305	0	6,899	7,406
Kynoch Creek	Aug. 5-7	1,123	2,147	6,694	22,932	0	10,572	12,360
Narrows Creek	Aug. 5-8	167	180	454	3,467	0	1,546	1,921
Rossette Creek	Aug. 2-5	911	1,600	6,566	16,454	0	7,908	8,546
Misc. Sreams	Aug. 3-10	81	34	1,120	13,271	0	5,930	7,341
Late Runs								
Kazchek Creek	Sept. 12-14	7	364	92	40	0	20	20
Middle River	Sept. 15-18	3,500	1,838	972	485	0	239	246
Tachie River	Sept. 15-18	2,500	1,035	576	200	0	99	101
NORTHEAST								
Upper Bowron River	Aug. 24-27	29,247	25,144	31,695	25,497	0	11,754	13,743
TOTALS*		946,882	1,599,484	1,355,295	741,898	27,795	309,645	404,458

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

TABLE VII

DAILY CATCH OF SOCKEYE, 1956-1960-1964-1968 FROM UNITED STATES CONVENTION WATERS

Date	JULY				AUGUST				SEPTEMBER			
	1956	1960	1964	1968	1956	1960	1964	1968	1956	1960	1964	1968
1					59,168	117,041		95,135		3,777	378	
2	4,286			749	41,245	54,285					377	3,109
3	3,885			223		45,840	79,585		1,418			2,239
4	2,365		CLOSED	24		45,845	73,612		606			1,796
5	1,038						59,668	3,291	500	1,784		1,076
6					141,861			69,286	454	1,524		
7					98,859	194,605		68,089	146	1,295		
8		CLOSED		CLOSED		181,344		50,987		614	163	
9	2,429					126,087		57,251			152	772
10	1,803					96,389			78		83	702
11	2,189					65,882			58	CLOSED		146
12	1,423					42,416		82,039	33			143
13			3,118		24,347		25,336	24,597	119			
14			1,463	28	21,450			3,519	100		314	
15				2,662	12,509			357			48	
16	4,677			4,530	9,102						104	46
17	8,146			5,079			15,456		43		143	88
18	12,101	6,574					12,122		146			83
19	15,053	6,329				CLOSED	5,160	12,075	49	50		59
20		6,823	6,956		13,151			9,103	23	130		
21		7,550	8,672	2,170	8,831			3,314	37	56	50	
22			16,773	44,615	4,955			35		38	49	
23	78,518			40,911	2,252						61	108
24	59,695			39,630			5,773		3		13	24
25	39,052	78,450		44,582			1,845		3			14
26	31,635	38,405					1,205	3,182	4	CLOSED		10
27		33,335	79,632		651			4,458	5			
28		32,087	54,204		727			2,172	5		22	
29			53,412	15,711	389	3,587		33			6	
30	113,200			96,552	542	2,064					4	20
31	70,572			86,860		3,024	681					
Totals	452,067	209,553	224,230	384,326	440,021	978,409	280,443	488,923	3,830	9,268	1,967	10,435
Troll and Outside Seine		142	165	90	3,816	851	113	66	34			
Monthly Totals	452,067	209,695	224,395	384,416	443,837	979,260	280,556	488,989	3,864	9,268	1,967	10,435
June, Oct. and Nov. Totals									7,104	746	1,169	2,030
Season Totals									906,872	1,198,969	508,087	885,870

TABLE VIII

DAILY CATCH OF SOCKEYE, 1956-1960-1964-1968 FROM CANADIAN CONVENTION WATERS

Date	JULY				AUGUST				SEPTEMBER			
	1956	1960	1964	1968	1956	1960	1964	1968	1956	1960	1964	1968
1				875	54,068					769	1,684	
2				1,761	25,441	47,301					103	1,823
3	8,554			2,481		194,327	114,881					5,017
4	4,731	7,347					42,299		4,403			655
5	6,501	6,170					22,772	233,366	1,448	491		584
6		4,544	CLOSED					57,248		222		
7										71	2,491	
8					154,050	108,471					664	
9				CLOSED	78,176	208,985					23	748
10	4,773					87,843						3,800
11	2,782	8,358				34,455			584			206
12	2,474	4,686					102,832	88,114	260	1,402		
13		4,341	2,441				28,793	25,694		464		
14					53,080			2,774		32	9	
15				3,565	15,765			83,013			9	
16				2,078		96,388						39
17	7,570					45,676	35,135					2,360
18	7,067	11,420				56,111	15,025					13
19	9,459	14,424					5,341	49,457	6,916			
20		24,164	6,922					4,318	2,753	CLOSED		
21			8,331		17,444			3,426			1,393	
22				29,390	5,804	53,752						
23				24,249		17,274					1	1,614
24	57,027						20,527		1,383		1	610
25	22,609	84,939					7,093		193		3	
26	29,237	51,124					953	698	94			
27		60,451	49,543					518	29			
28			13,561		6,907			10,970		614		
29			12,826	160,129	2,863	2,292				185	0	
30				44,117		806					0	2,269
31	181,981			28,164		885	4,927					
Totals	344,765	281,968	93,624	296,809	413,598	954,566	400,578	559,596	18,063	4,241	6,381	19,738
Troll and Outside Seine	91	670	1,775	25,627	111,659	2,092	1,637	10,841	57	109	15	107
Spring Salmon Gill Nets			675	268		253			220	268	565	
Monthly Totals	344,856	282,638	96,074	322,704	525,257	956,911	402,215	570,437	18,340	4,618	6,961	19,845
June, Oct. and Nov. Totals									6,383	11,028	9,298	7,106
Season Totals									894,836	1,255,195	514,548	920,092

TABLE IX

SUMMARY OF THE SOCKEYE ESCAPEMENT TO THE FRASER RIVER SPAWNING AREAS, 1956, 1960, 1964, 1968

District and Streams	1968 *Period of Peak Spawning*	*Estimated Number of Sockeye*			
		1956	1960	1964	1968
LOWER FRASER					
Cultus Lake	Nov. 20-26	14,133	17,689	11,143	25,736
Upper Pitt River	Sept. 3-10	32,258	24,511	13,804	16,988
Widgeon Slough	Oct. 28-31	1,000	400	667	1,552
HARRISON					
Bear Creek	——	——	189	41	——
Big Silver Creek	Sept. 8-10	6,187	4,522	3,926	1,090
Harrison River	Nov. 14-19	3,184	17,279	2,202	5,391
Weaver Creek	Oct. 10-14	8,472	7,042	1,370	4,516
LILLOOET					
Birkenhead River	Sept. 22-24	57,899	38,916	69,939	83,907
SETON-ANDERSON					
Gates Creek	Aug. 25-31	9,059	5,449	19,971	10,289
SOUTH THOMPSON					
Seymour River	Aug. 25-28	2,684	3,047	2,784	3,870
Lower Adams River	Oct. 15-18	7,512	2,152	796	3,983
Little River	——	661	66	0	0
Scotch Creek	——	163	11	0	126
South Thompson River	——	0	0	0	0
Upper Adams River	——	0	Present	162	——
Momich River	Aug. 25-28	——	1,000	823	617
NORTH THOMPSON					
Raft River	Aug. 23-31	9,582	5,553	5,500	10,697
Barriere River	Aug. 26-30	——	23	85	275
Fennell Creek	Aug. 21-24	——	0	146	954
North Thompson River	——	——	——	38	——
CHILCOTIN					
Chilko River	Sept. 23-27	647,479	420,746	238,601	414,446
Taseko Lake	——	1,995	2,524	433	——
QUESNEL					
Horsefly River	Sept. 3-8	2,944	3,087	19,800	5,686
Mitchell River	Sept. 5-8	14	5	169	4
Little Horsefly River	Sept. 20-25	——	23	355	73
NECHAKO					
Endako River	Sept. 1-3	18	0	7	18
Nadina River (Early)	Aug. 20-26	1,311	1,566	1,397	902
(Late)	Sept. 12-15		157	232	1,496
Nithi River	Aug. 20-25	36	31	13	20
Ormonde Creek	Aug. 25-28	331	158	180	81
Stellako River	Sept. 22-26	38,459	38,884	31,047	30,420
STUART					
Early Runs					
Driftwood River	——	50	34	2	——
Forfar Creek	Aug. 10-12	5,497	1,755	27	149
Gluske Creek	Aug. 9-10	4,619	2,138	218	18
Kynoch Creek	Aug. 8-12	9,535	4,154	1,147	833
Narrows Creek	Aug. 9-10	697	598	22	41
Rossette Creek	Aug. 5-7	3,863	4,558	952	518
Shale Creek	——	185	139	27	0
Misc. Streams	Aug. 8-10	711	1,196	26	28
Late Runs					
Kazchek Creek	Sept. 12-15	223	5	0	33
Middle River	Sept. 15-20	500	1,056	743	288
Tachie River	Sept. 18-22	600	1,687	1,157	149
Sakeniche River	——	131	0	0	0
NORTHEAST					
Upper Bowron River	Sept. 1-5	6,996	7,620	1,500	3.634
TOTALS*		878,988	619,970	431,452	629.337

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

TABLE X

PINK SALMON CATCH BY GEAR

Gear		1965	1967	1969	1971
United States Convention Waters					
Purse Seines	Units	230	315	270	218
	Catch	410,444	3,203,781	776,533	1,905,182
	Per Cent	73.51	83.71	82.10	80.30
Gill Nets	Units	234	505	236	507
	Catch	48,823	310,744	91,609	334,202
	Per Cent	8.74	8.12	9.69	14.09
Reef Nets	Units	49	50	9	48
	Catch	21,264	118,994	37,331	118,904
	Per Cent	3.81	3.11	3.95	5.01
Troll	Catch	77,849	193,521	40,324	12,863
	Per Cent	13.94	5.06	4.26	0.54
TOTAL CATCH		558,380	3,827,040	945,797	2,371,151
Canadian Convention Waters					
Purse Seines	Units	89	99	65	129
	Catch	336,478	2,289,207	277,592	939,737
	Per Cent	56.79	55.07	32.23	43.97
Gill Nets	Units	1,268	1,675	753	1,067
	Catch	182,059	892,447	366,005	775,663
	Per Cent	30.73	21.47	42.48	36.29
Troll	Catch	73,930	975,268	217,908	421,937
	Per Cent	12.48	23.46	25.29	19.74
TOTAL CATCH		592,467	4,156,922	861,505	2,137,337

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

TABLE XI

LANDINGS AND PACKS OF PINK SALMON FROM CONVENTION WATERS

	United States	*Canada*	*Total*
1971			
Total Landings (No. of Pinks)	2,371,151	2,137,337	4,508,488
Share in Fish	52.59%	47.41%	
Total Pack (48-lb Cases)	168,706	150,899	319,605
Share in Pack	52.79%	47.21%	
1957-1971			
Total Landings (No. of Pinks)	17,842,045	17,414,273	35,256,318
Share in Fish	50.60%	49.40%	
Total Pack (48-lb Cases)	1,266,558	1,247,305	2,513,863
Share in Pack	50.38%	49.62%	
1971 *Catch*	2,371,151	2,137,337	4,508,488
1969	945,797	861,505	1,807,302
1967	3,827,040	4,156,922	7,983,962
1965	558,380	592,467	1,150,847
1963	4,426,232	4,173,288	8,599,520
1961	508,544	545,128	1,053,672
1959	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

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

TABLE XII

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 XIII

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

Date	JULY				AUGUST				SEPTEMBER			
	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									13,508		55,538	16,822
Monthly 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 XIV

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.

TABLE XV

SUMMARY OF THE PINK SALMON ESCAPEMENTS TO UNITED STATES AND CANADIAN NON-FRASER RIVER SPAWNING AREAS*

United States Spawning Areas	1965	1967	1969	1971
Nooksack	12,500	20,000	15,000	40,000
Skagit	150,000	100,000	100,000	300,000
Stillaguamish	185,000	105,000	75,000	200,000
Snohomish	185,000	95,000	70,000	125,000
Puyallup	25,000	22,000	16,000	40,000
Dosewallips	125,000	190,000	20,000	45,000
Duckabush	30,000	70,000	20,000	50,000
Dungeness	75,000	95,000	14,400	46,000
Elwha	15,000	10,000	1,500	4,000
Miscellaneous	10,400	19,000	8,200	22,000
TOTALS	812,900	726,000	340,100	872,000

Canadian Non-Fraser Spawning Areas	1965	1967	1969	1971
Jervis Inlet	43,275	25,000	31,000	47,600
Howe Sound	81,000	37,000	23,600	23,700
Burrard Inlet	35,250	13,000	8,500	35,000
TOTALS	159,525	75,000	63,100	106,300

* These data were provided through the courtesy of the Washington State Department of Fisheries and the Canada Department of the Environment, Fisheries Service.

APPENDICES

REPORT OF THE INTERNATIONAL PACIFIC SALMON FISHERIES COMMISSION FOR THE YEAR 1946

The International Pacific Salmon Fisheries Commission was formed following the conclusion of the Sockeye Salmon Convention which was finally ratified by the governments of Canada and the United States on July 28, 1937. The treaty culminated over forty-five years of effort to establish joint control of the sockeye salmon fisheries by Canada and the United States.

The first international study of the sockeye salmon fishery was undertaken in December, 1892 when the representatives of Canada and the United States reported that the fishery was in a healthy condition. However, in 1905, after the virtual failure of the 1902-1903 runs, international consideration of the fishery again was stimulated. The "Prince Commission" of Canada and the Washington State Fish Commission carefully studied the problem and as a result of their findings, the Bryce-Root Treaty was drawn up and ratified in 1908. This treaty provided for joint control of all fisheries of international scope. The Commission agreed upon a uniform system of "protection, preservation, and propagation" of salmon in the Fraser River that was promptly approved by Canada. The delay in acceptance by the United States caused such bitter feeling that finally, in 1915, Canada withdrew her support.

The failure of the huge 1913 run to appear in its cycle year, 1917, led to the formation of the Canadian-American Fisheries Conference. A treaty was proposed (essentially the same as the Bryce-Root Treaty of 1908), but failed approval by the United States Senate both in 1919 and after revision in 1920. Canada then turned to the State of Washington for cooperation and in December, 1921, representatives met. After consideration of the declining fishery a complete cessation of salmon fishing was proposed for a period of five years but no agreement could be reached on future joint action. Another Fisheries Commission was formed in 1922 to open negotiations for a treaty but its efforts received little attention in Washington or Ottawa.

In the meantime there was no doubt that the once productive salmon fishery of the Fraser River had virtually failed and efforts to obtain joint remedial action were continued by interested parties in both countries. Late in 1928 a new treaty was drafted which provided that: (1) regulations promulgated by the Commission would be enforced by agencies of the respective governments, (2) the catch would be divided as equally as practicable between the two countries, and (3) the cost of investigations, fish cultural operations, and removal of obstruction would be shared equally by the two governments. The treaty was signed at Washington on March 27, 1929, but failed to be approved by either Canada or the United States.

The treaty was rewritten to include control of all nationals of either country who fished in the waters outside the entrance to Juan de Fuca Strait. The treaty was then ratified by Canada on May 29, 1930, but the United States Senate delayed formal ratification.

It was not until 1934 that an earnest attempt again was made to settle the differences that had prevented the acceptance of previous treaties. Following the recommendations of the fisheries committee of the Washington State Planning Council, Governor Martin called an informal discussion between fisheries represenatives of the two countries on November 13, 1934. At first the U.S. representatives planned to draw up a new treaty but after considerable discussion it was agreed to add three understandings to the treaty as ratified by Canada in 1930 which provided that: (1) the Commission would have no power to authorize any type of gear contrary to the laws of the State of Washington or the Dominion of Canada, (2) eight years of investigation covering two cycles of sockeye runs would be completed before undertaking regulation, and (3) the Commission would establish an Advisory Board composed of representatives of the various branches of the industry. The treaty then met approval by the U.S. Senate on June 16, 1936 and final ratifications were exchanged on July 28, 1937.

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