
**Report of the
Fraser River Panel
to the
Pacific Salmon Commission
on the
1990 Fraser River Sockeye
Salmon Fishing Season**



Prepared by the
**Pacific Salmon Commission
May, 1991**

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**REPORT OF THE
FRASER RIVER PANEL
TO THE PACIFIC SALMON COMMISSION
ON THE 1990 FRASER RIVER SOCKEYE
SALMON FISHING SEASON**

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M. Hunter
R. Kendall
J. Sam
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E. Birch
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Prepared by the

FISHERIES MANAGEMENT DIVISION

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PACIFIC SALMON COMMISSION

MAY, 1991

TABLE OF CONTENTS

	<u>Page</u>
I. EXECUTIVE SUMMARY	1
II. FRASER RIVER PANEL	2
III. INTRODUCTION	5
IV. MANAGEMENT ACTIONS	8
A. Pre-season Forecasts, Goals and TAC	8
B. Pre-season Regulations	9
C. In-season Regulations	13
V. CATCH SUMMARY	15
A. Canada	15
B. United States	17
VI. STOCK MONITORING	18
VII. RACIAL IDENTIFICATION	21
VIII. ESCAPEMENT	23
IX. ACHIEVEMENT OF OBJECTIVES	27
A. Escapement	27
B. International Allocation	27
C. Domestic Allocation	28
D. Conservation of Other Stocks	30
X. ALLOCATION STATUS	30
XI. APPENDICES	32
Appendix A: Fraser River Sockeye Salmon - 1990 Production Forecast and Escapement Goals	32
Appendix B: 1990 Regulations	33
Appendix C: 1990 Fraser River Panel In-Season Orders	35
Appendix D: Appendix Tables 1 to 7	40
Appendix E: Staff of the Pacific Salmon Commission in 1990 ..	44

I. EXECUTIVE SUMMARY

1. The 1990 fishing season was the second year of the second four-year cycle (1989-92) covered by the Pacific Salmon Treaty. The pre-season forecast of run size was 16,500,000 Fraser River sockeye salmon. Based on this forecast, Canada was entitled to 486,000 of these fish in addition to their TAC because they allowed fish from their 1986 Total Allowable Catch (TAC) to spawn in exchange for future benefits. The TAC was expected to be about 10,309,000 fish. Almost zero pink salmon were expected to return to the Fraser River in 1990: even-year runs of Fraser pinks are virtually non-existent.
2. The United States elected to target their harvest at 2,200,000 of the 4,645,000 fish left in their cumulative allocation of up to 7,000,000 Fraser River sockeye salmon for the 1989-92 period. A Commission agreement limited the United States harvest of summer-run sockeye to a total of 586,000 fish.
3. The Canadian catch of Fraser River sockeye salmon was expected to be about 8,300,000 in commercial fisheries and 700,000 in Indian food and other fisheries. The gross escapement goal was set by Canada at 5,830,000 fish.
4. The Fraser River Panel established pre-season regulations and a management plan based on the forecast return and the goals for catch and escapement. During the final planning phase, oceanographic conditions indicated that the migration of Fraser sockeye would occur later-than-normal and that a relatively high proportion (55%) of the run would migrate through Johnstone Strait. To ensure that the goals were achieved, the Panel met frequently throughout the fishing season to enact regulations fitted to the actual run timing and abundances of Fraser River stocks.
5. The total return of Fraser River sockeye salmon was about 22,006,000 fish, 5,506,000 more than forecast and the largest return since 1913. Total catches were estimated at 14,866,000 in commercial fisheries, 923,000 in Indian food fisheries and 136,000 in other non-commercial fisheries. United States fishermen caught 2,408,000 Fraser River sockeye salmon while Canadian fishermen caught 12,458,000.
6. The Stock Monitoring program provided in-season estimates of run timing, migration route and abundance of Fraser River sockeye stocks throughout the fishing season. These data were used to formulate fishing regulations to achieve escapement and catch goals. Summer-run stocks were about two weeks late in their arrival, compared to relatively normal arrival time of late-run stocks. This created a severe overlap in timing that led to a difficult management situation and contributed to the United States exceeding their allocation of summer-run stocks. A northerly landfall of Fraser River sockeye was evidenced by large catches of Fraser sockeye (1,330,000 fish) in fisheries north of Cape Caution. However, contrary to expectations, only 25% of the run that passed south of Cape Caution migrated through Johnstone Strait.
7. The Racial Analysis program was successful in identifying major stock groups of Fraser River sockeye throughout the season. Unexpected strength of summer-run stocks such as the Scotch/Seymour and Chilko groups, in combination with the late migration timing of these stocks, resulted in management uncertainty during late July and early August. Analysis of north coast fisheries provided an early warning that there was a substantial overlap in the migrations of summer- and late-run stocks. These findings resulted in significant departures from the pre-season management plan.
8. The gross escapement goals for Fraser River sockeye were adjusted during the season for a final total goal of 6,051,000 adults. The post-season estimate of gross escapements, based on spawning escapements and Indian food fishery catches, was 6,869,000 adults. Gross escapements of Early Stuart sockeye were 47,000 short of the goal, while the goals for summer- and late-run stocks were exceeded by 467,000 and 398,000 adults, respectively.

9. The total adult spawning escapement of 6,060,000 sockeye was 700,000 (13%) over the final goal of 5,360,000 Fraser sockeye. Spawning escapements of Early Stuart fish were 53,000 fish less than the goal, summer-run escapements were over by 361,000, while late-run escapements reached 3,924,000 fish, which was 392,000 above the goal.
10. The preliminary estimate of Total Allowable Catch (TAC) in 1990 is 14,368,000 Fraser River sockeye salmon. This TAC is based on a run size of 22,006,000 fish, a Canadian Escapement Add-on Benefit of 1,078,000 and other deductions (including net escapements, the Fraser River Indian food fishery exemption, and test fishing catches) totalling 6,560,000 fish.
11. The allocation goals for United States catches of Fraser River sockeye salmon were exceeded. United States fishermen caught 2,408,000 Fraser River sockeye, 208,000 over the goal of 2,200,000. This result was largely due to the unexpectedly large Alaska catch of about 251,000 Fraser River sockeye. In terms of the summer-run allocation, United States fishermen caught 887,000 summer-run fish, 301,000 over the goal of 586,000.
12. With respect to United States domestic allocation goals, the Treaty Indian harvest was 139,100 over the goal while the Non-Indian harvest was 31,300 fish over. Within the Treaty Indian catch, the catch in Areas 4B, 5 and 6C was slightly (about 4,000 fish) over the allocation and the catch in Areas 6, 7 and 7A was under by the same amount. Non-Indian gillnet and reefnet fishermen, respectively, caught 65,000 and 7,000 less than their allocations: these 72,000 fish represent an overage in the Non-Indian purse seine catch.
13. In Canada, gillnet fishermen were over their domestic allocation by 309,000 fish. Outside trollers were under their allocation by about 277,000 fish, inside trollers were under by 28,000 fish and purse seiners were under by 3,000 fish.
14. There were no major conflicts between the harvest of Fraser River sockeye salmon and concerns for the conservation of other species and stocks in 1990, partly because the concerns were taken into account during the design and implementation of the fishing plans. For example, the pre-season plan to harvest late-run sockeye along the migration route to minimize the incidental catch of Harrison River chinook in Canadian Area 29 was successfully implemented.
15. In the two years remaining in the 1989-92 cycle of the Treaty, the United States is entitled to a catch of up to 2,237,000 Fraser River sockeye salmon and up to 5,296,000 Fraser River pink salmon.

II. FRASER RIVER PANEL

Responsibility for the in-season management of fisheries targeting on Fraser River sockeye and pink salmon stocks within the Panel Area (Figure 1) rests with the Fraser River Panel of the Pacific Salmon Commission. Before the fishing season begins, the Panel normally recommends to the Commission the times and areas of regulatory control required for the conservation and harvest of these stocks. A Management Plan is established based on the pre-season forecast of abundance, the escapement goals set by Canada, international and domestic catch allocation goals, and the management needs of other salmon species/stocks harvested incidentally along with Fraser River sockeye and pink salmon. As well, information on the timing and migration routes of Fraser River sockeye and pink salmon are considered.

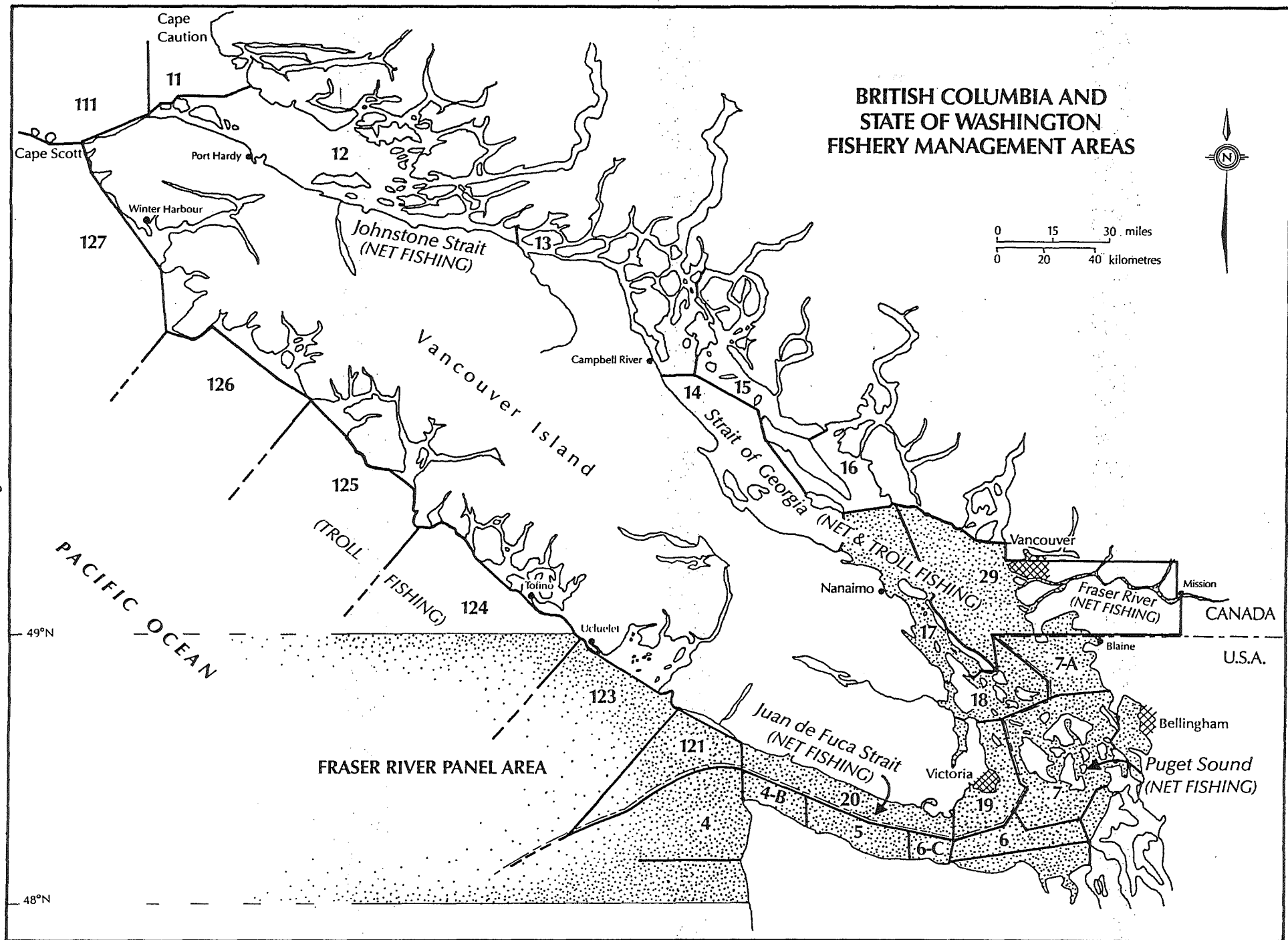


Figure 1. Fishery management areas in the Fraser River Panel Area, along Canada's south coast and in United States waters. The types of fisheries (net or troll) that operate in each area are also indicated.

As Fraser River sockeye and pink salmon appear in coastal fishing areas and migrate through the Panel Area, the Panel regulates fisheries on a weekly basis in an attempt to fulfil the escapement and catch allocation goals. The regulations must accommodate the in-season estimates of actual abundances, migration timing and migration speed (including delays off the river mouth). This flexibility to respond to the changing complexion of the fish migration is essential to successful management of the fisheries and achievement of the catch and escapement goals.

To make decisions with the greatest probability of correctness, the Panel relies on the in-season collection and analysis of data by staff of the Commission. Commercial and non-commercial catch data are collected while fisheries are occurring and immediately after the catch is landed. Test fishing in several locations along the south coast of British Columbia and in Puget Sound monitor the movement and abundance of fish between commercial fishing periods. Scales or tissue samples are collected from fish caught in commercial and test fisheries for analysis of racial composition. The proportions of Fraser River and non-Fraser fish (sockeye and pink salmon) in the catches and the contributions of individual Fraser River stocks (sockeye only) are estimated to obtain catch statistics on a stock-by-stock basis. Gross escapements are estimated by echo sounding in the Fraser River at Mission.

Analysis of these data provides estimates of run size and timing, which the Panel requires to assess weekly escapement needs and harvest opportunities for the various fisheries under its jurisdiction. These in-season estimates replace the pre-season forecasts used to develop the Management Plan.

To properly harvest the stocks and achieve the catch allocation goals, the Panel also relies on assistance and information from a broad segment of the commercial fishing industry in the two countries. Input to the decision-making process has been primarily through the national sections of the Panel where most user groups are represented. The Panel membership during the 1990 season was:

CANADA

Members:

Mr. F. Fraser, Chair
Chair, Fraser River Environmentally Sustainable
Development Task Force
Department of Fisheries and Oceans

Mr. M. Forrest
Gillnet fishermen

Mr. M. Hunter
Salmon processing industry

Ms. R. Kendall
Freshwater sport fishermen

Mr. J. Sam
Fraser River Indian food fishermen

Mr. L. Wick
Purse seine fishermen

UNITED STATES

Members:

Mr. R. Zuanich, Vice-Chair
Commercial salmon fishing industry

Mr. A.D. Austin
Washington Department of Fisheries

Ms. L. Loomis
Treaty Indian tribes

Mr. R. Schmitten
Director, Northwest Region
National Marine Fisheries Service

Alternates:

Mr. E. Birch
Gillnet fishermen

Mr. M. Griswold
Gulf troll fishermen

Mr. J. Hill
Salmon processing industry

Mr. H. Matsuzaki
Fishing equipment suppliers

Ms. M. Williams
Outside troll fishermen

Alternates:

Mr. R. Allen
Treaty Indian tribes

Dr. T. Kruse
Deputy Director, Northwest Region
National Marine Fisheries Service

Mr. L. Phinney
Deputy Assistant Director
Washington Department of Fisheries

Mr. R. Suggs
Commercial salmon fishing industry

III. INTRODUCTION

The 1990 run of Fraser River sockeye salmon was the largest since 1913. The total return of 22,006,000 fish was 33% larger than the pre-season forecast of 16,500,000 fish. This unexpectedly large return was reflected mostly in the catch - 15,925,000 sockeye compared to the pre-season forecast of 11,270,000. In contrast, the spawning escapement of 6,081,000 fish was 851,000 larger than the pre-season goal of 5,230,000. Abundance on this cycle has increased dramatically since 1962 (Figure 2).

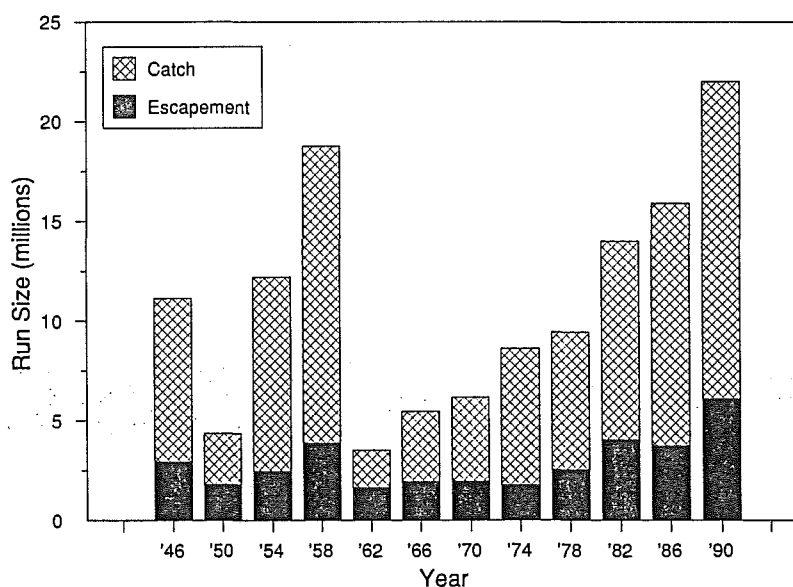


Figure 2. Catch, escapement and total run sizes for the 1990 cycle of Fraser River sockeye salmon for cycle years 1946-1990.

The 1987-90 annual average production of 12,950,000 Fraser sockeye is clearly near the levels present in the early 1900s (Figure 3). Although the dominant cycle years at that time were larger than the 1990 run, the off-year runs were smaller than the current off-year runs.

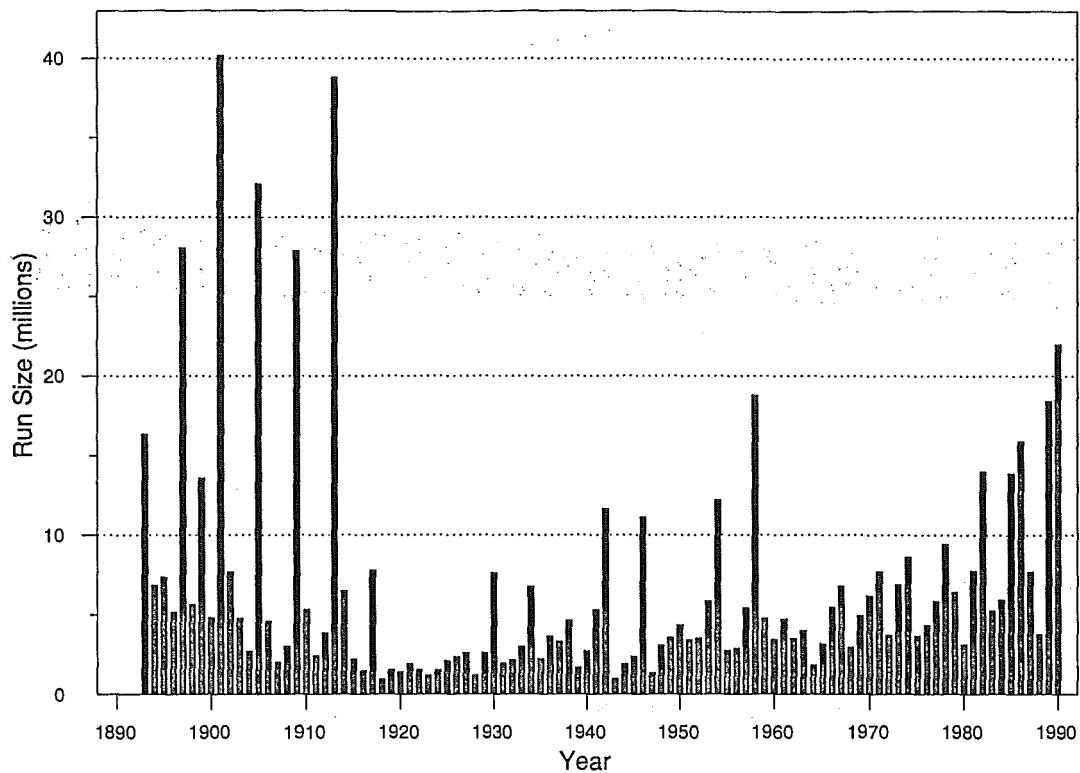


Figure 3. Estimated total run size of Fraser River sockeye salmon between 1893 and 1990.

Regulation of commercial fisheries for sockeye and pink salmon by the Fraser River Panel within the Panel Area (Figure 1) is divided into two distinct phases: pre-season establishment of a Management Plan and in-season regulation of the fisheries. The hierarchy of management objectives in these two processes is:

1. achieve gross escapement goals by stock group for Fraser River sockeye and a single total escapement for Fraser River pink salmon,
2. achieve international allocation of the Total Allowable Catch (TAC) in accordance with the Treaty and Commission agreements,
3. attain domestic allocation goals of the Parties by user group, gear type or fishery area, and
4. respond to management concerns for other species and stocks of salmon.

The Management Plan is a schedule of proposed fishery openings. It is developed prior to the fishing season using forecasts of run size and timing provided by Canada Department of Fisheries and Oceans (DFO) and incorporating the goals of the Parties. In developing the Management Plan, a range of fishing scenarios are examined with the aid of input from the resource users. The Panel then defines the set of objectives that guide it in the development of weekly fishing schedules during the season. The Management Plan is a guideline for the timing and sequence of fisheries, not a goal in itself. The Panel's objective is to meet escapement and catch allocation goals, not to insure fishing in particular areas with specific gear on certain dates.

In-season monitoring of commercial catches along with test fishing, echo sounding and racial analysis provide the data needed to assess the actual abundance and timing of each major Fraser River sockeye stock and of the Fraser pink salmon run. These assessments are the primary input in the development of weekly fishing patterns. Since the true abundance and timing inevitably depart from pre-season expectations, the in-season fishing schedule must correspondingly depart from the Management Plan. Because opportunities to consult with the industry during the season is limited, the Panel uses the guidelines set out during the pre-season planning phase to formulate fishing schedules that are consistent with the objectives of the Parties. In areas outside

of the Panel Area, DFO similarly adjusts their fishing schedule in response to the actual timing and abundance of Fraser River sockeye and pink salmon, to help achieve escapement and allocation goals.

In 1990, the timing and abundance of summer-run sockeye stocks departed significantly from the forecasts. Run sizes of some early summer- and summer-run stocks were much larger than forecast: South Thompson (Scotch/Seymour), 200%; Chilko, 260%; and Late Stuart stocks, 320%. Smaller but still substantial increases in run sizes were observed for the Quesnel (40%), Stellako (100%) and late-run South Thompson stocks (Adams/Lower Shuswap, 6%). All summer-run stocks arrived in coastal areas much later than normal (up to 2.5 weeks), severely overlapping with the migration of late-run sockeye which were only 2 to 3 days late (Figure 4). These difficult circumstances necessitated fishery openings that were a departure from the Management Plan. In the end, the contraction of the run into a shorter time-frame resulted in significant deviations from the Management Plan, with later starting dates and a shorter fishing season than scheduled.

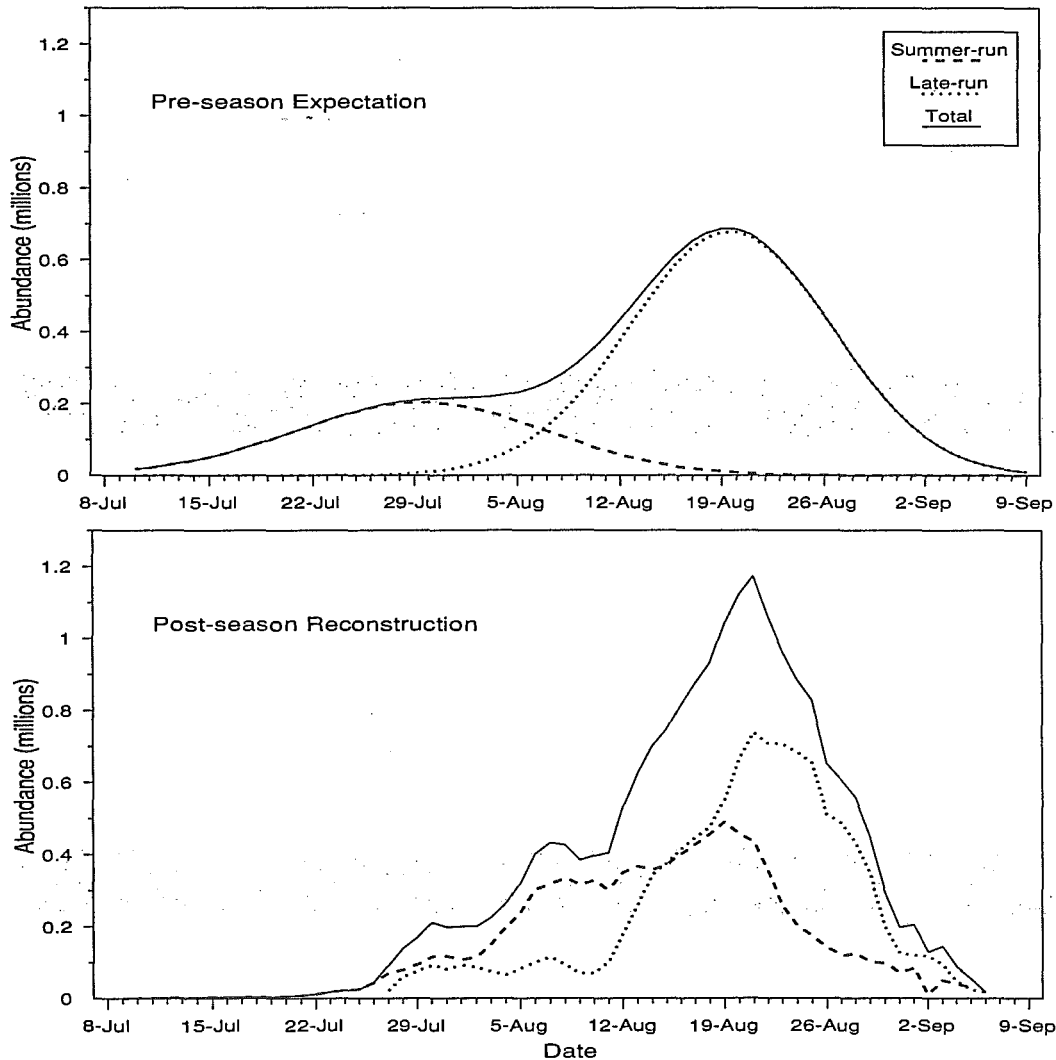


Figure 4. Pre-season expectations of the abundances of summer-run and late-run Fraser River sockeye salmon relative to Area 20 arrival timing, compared to the actual reconstructed timing and abundances in 1990.

The Panel exercised the flexibility in its management process to achieve the escapement and catch goals set prior to the season. This ability to react quickly to abnormal migration timing and unexpected abundances is essential if the Panel is to successfully achieve the goals set out by the Parties each year.

IV. MANAGEMENT ACTIONS

A. Pre-season Forecasts, Goals and TAC

The pre-season forecast of run size for Fraser River sockeye salmon, provided by Canada Department of Fisheries and Oceans in January, 1990, was 16,500,000 fish (Appendix A). The gross and net escapement goals were initially set at 5,730,000 and 5,230,000 fish, respectively, which included a projected catch of 500,000 in the Fraser River Indian food fishery. In March, the gross escapement goal was revised to 5,830,000 fish to allow for an increase of 100,000 fish in the anticipated Fraser River Indian food fishery catch.

Based on the forecast run size of 16,500,000 Fraser sockeye, the TAC of Fraser River sockeye salmon was estimated to be 10,309,000 fish (Table 1). Besides being dependent on the actual run size and the amount of the various deductions that would be finalized after the fishing season, the calculation of the TAC was subject to two caveats. First, if the Early Stuart run returned in greater-than-forecast abundances (i.e., > 125,000), Canada would increase the spawning escapement goal up to a maximum of 150,000 fish to help rebuild this stock. This change would potentially increase the adult escapement deduction in Table 1 to 5,210,000 and possibly effect the TAC (if the Early Stuart run exceeded 150,000). Second, because the Parties had not agreed on a final method for calculating the Canadian Escapement Add-on Benefit, the in-season TAC estimates were provisional.

Table 1. Pre-season estimates of the total allowable catch (TAC) and United States and Canadian allocations of Fraser River sockeye salmon in 1990.

		Sockeye
TOTAL ALLOWABLE CATCH		
Total Run Size		16,500,000
Canadian Escapement Add-on Benefit		486,000 *
Total Available to Share:		16,014,000
Deductions		
Adult Escapement Goal		5,180,000
Jack Escapement		50,000
Fraser River Indian Food Fishery Exemption		400,000
Test Fishing		75,000
Total Deductions		5,705,000
Total Allowable Catch:		10,309,000
UNITED STATES		
United States Share:		2,200,000 **
CANADA		
TAC minus United States Share		8,109,000
Canadian Escapement Add-on Benefit		486,000
Canadian Share:		8,595,000

* The Panel agreed on the method of calculation in February, 1991.

** The United States sockeye allocation in 1990 was the amount requested by the United States section of the Panel in accordance with the Treaty. This amount was limited to a maximum of 23.1% of the 1990 TAC (i.e., 2,381,000), and contributes to the United States 1989-92 cumulative total allocation of not more than 7,000,000 fish.

During the 1989-92 period, the Treaty specifies that the United States allocation cannot exceed 7,000,000 Fraser River sockeye salmon. To this amount was added 83,000 fish for a catch shortfall during the 1985-88 period, for a total potential catch of up to 7,083,000 Fraser sockeye. (The current estimate of the required payback is less than the 1989 estimate (88,000) because of adjustments to the estimated catches of Fraser sockeye in Alaska and northern British Columbia in 1987). Commission agreements allow the United States to choose the portion of this goal they

harvest each year, as long as the amount is less than a Treaty-defined percentage of the forecast TAC ($23.1\% \times 10,309,000 = 2,381,000$ in 1990). Thus, in 1990 the United States elected to harvest 2,200,000 fish, out of their maximum catch of 7,083,000 sockeye for the 1989-92 period and 4,645,000 remaining allocation for the 1990-92 period.

Canada's share of the forecast TAC was 8,109,000 Fraser River sockeye, to which was added a provisional estimated add-on benefit of 486,000 for allowing 146,000 additional fish from their 1986 allocation to spawn. From their total share of 8,595,000 sockeye, Canada increased the gross escapement goal by 200,000 fish (over the Treaty exemption of 400,000 sockeye) in anticipation of Fraser River Indian food fish needs. Also, approximately 86,000 fish were expected to be harvested in marine Indian food fisheries and sport fisheries. These adjustments left about 8,300,000 adult sockeye to be caught in the Canadian commercial fishery.

If the forecasts proved to be accurate and the various goals were achieved, the expected distribution of Fraser River sockeye was a spawning escapement of 5,180,000 adults and 50,000 jacks, a Fraser River Indian food fish catch of 600,000, and other catches totalling 10,670,000 (Table 2).

Table 2. Pre-season (March 14) forecasts of catches and escapements of Fraser River sockeye salmon by stock group for 1990.

Stock Group	River & Ocean Catch *	Fraser IFF ** Catch	Net Escapement	Gross *** Escapement	Total Run
Early Stuart	0	5,000	120,000	125,000	125,000
Early Summer-run Stocks	424,000	109,000	398,000	507,000	931,000
Summer-run Stocks	2,007,000	310,000	1,130,000	1,440,000	3,447,000
Late-run Stocks	8,189,000	176,000	3,532,000	3,708,000	11,897,000
Total Adults	10,620,000	600,000	5,180,000	5,780,000	16,400,000
Jacks	50,000	0	50,000	50,000	100,000
Total Sockeye	10,670,000	600,000	5,230,000	5,830,000	16,500,000

* Includes ocean and river catches in commercial, test and other fisheries, excluding the Fraser River Indian food fishery.

** IFF = Indian food fishery.

*** Gross Escapement = IFF Catch + Net (Spawning) Escapement.

The domestic allocation goals in Canada for Fraser River sockeye salmon, as established by the Minister of Fisheries, were: inside troll, 3.8%; outside troll, 22.7%; purse seine, 45.5%; and gillnet, 28.0%.

In the United States, Treaty Indian and Non-Indian fishermen were to share the catch of Fraser River sockeye salmon equally. In the Panel Area, the Treaty Indian catch was to be allocated by area: 142,600 sockeye in Areas 4B, 5 and 6C, and the balance in Areas 6, 7 and 7A. The Non-Indian catch was to be allocated by gear: purse seine, 51.5%; gillnet, 44.5%; and reefnet, 4.0%.

B. Pre-season Regulations

Using the forecast run size and migration timing, and a mathematical model that simulates the gauntlet fisheries in south-coast areas, the Fraser River Panel devised a pre-season fishing plan to achieve the escapement and allocation goals of the Parties. During this exercise, summer-run sockeye were forecast to arrive in the Panel Area approximately four days later than normal. Also, Fraser River sockeye were expected to have a higher-than-normal diversion rate through Johnstone Strait (Figure 5).

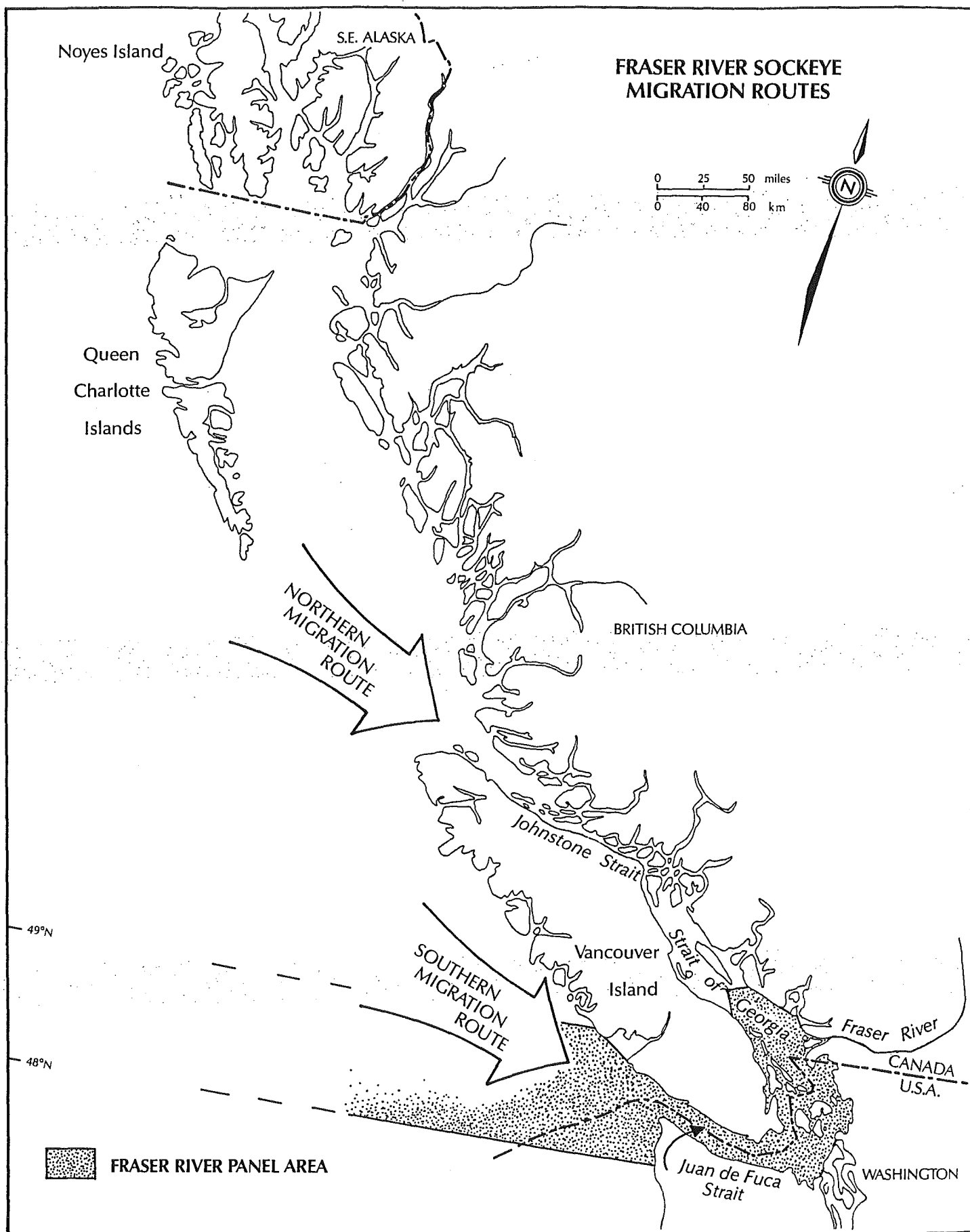


Figure 5. The northern (Johnstone Strait) and southern (Juan de Fuca Strait) routes for sockeye and pink salmon migrating to the Fraser River.

The primary target in the 1990 sockeye fishery was expected to be the late-run stocks, including Adams/Lower Shuswap and Birkenhead sockeye, with 11,897,000 fish forecast to return. The other major target was to be the early summer- and summer-run stocks such as the Quesnel (Horsefly), Chilko and Scotch/Seymour groups with forecast total abundances of 4,378,000 fish. The initial focus of the fishery was to be the Quesnel (Horsefly) and Chilko groups, which were forecast to peak in Canadian Area 20 on approximately July 30 and August 3, respectively. These stocks comprise the bulk of the summer-run stocks on the 1990 cycle. Later, the very large Adams/Lower Shuswap run was expected to peak in Area 20 near August 20.

Conservation concerns for species and stocks identified by the Parties were to be addressed in the Management Plan. The aspects of the plan that accommodated these concerns were:

1. Commercial fisheries in Panel Areas were not anticipated before mid July as part of an effort to rebuild the Early Stuart run after the very poor 1982 spawning, which suffered severe mortality during upstream migration. Early Stuart sockeye were forecast to return at a low 125,000 run size.
2. Conservation of Lake Washington sockeye in Panel Area fisheries was requested by WDF and the Washington Treaty Tribes. The goal for restricted harvest of this stock was accommodated by the conservation efforts directed towards Early Stuart sockeye, because these two stocks share a similar timing of their migrations through the Panel Area.
3. Canadian fisheries were designed to take into account the conservation concerns of Harrison River chinook. To achieve the dual objectives of protecting this stock and attaining the gillnet allocation for Fraser sockeye, the Panel planned fisheries for all gear-types in all Panel Areas to maximize the number of summer-run sockeye available for harvest by Area 29 gillnets in August, and scheduled no fishing in Area 29 after September 5.
4. The Panel agreed to restrict the Area 20 fishery if serious chinook by-catches occurred. In 1990, the Commission continued a joint program with DFO to monitor the catch of all five species of salmon plus steelhead in Area 20 purse seine fisheries. This option was not used in 1990 because the by-catch problem was small.

Fishing regulations for the Panel Area were adopted by the Fraser River Panel on May 11. The Commission accepted this plan and submitted it to the Parties for approval on May 14. Panel Areas were to be "CLOSED UNLESS OPENED": closed by the pre-season Regulations of the Commission (Appendix B) and opened only by in-season Orders of the Fraser River Panel (Appendix C).

While the Management Plan was being developed, it was initially assumed that approximately 25% (average for 1952-89) of Fraser River sockeye salmon would migrate through Johnstone Strait on their way to the Fraser River (Figure 5). However, oceanic conditions in early July indicated that a much higher diversion of 55% would occur. The Management Plan that was adopted by the Panel on July 20 was formulated using this higher diversion rate.

In the pre-season Management Plan, the proposed first openings for Panel-Area fisheries were the week of July 15-21 for Treaty-Indians in Areas 4B, 5 and 6C (Table 3), July 29-August 4 for Treaty Indians in Areas 6, 7 and 7A and for Non-Indians in all United States waters, July 29-August 4 in Canadian Area 29 (Table 4) and August 5-11 in Area 20. The late date of adoption for the pre-season plan was due to negotiations between Canada and the United States over how to share the early summer- and summer-run stocks. This was resolved with a Commission agreement that the United States harvest would be limited to 586,000 of the forecast TAC of 2,431,000 early summer- and summer-run fish.

The general strategy employed to achieve Canadian domestic allocation goals was for inside (Area 29) gillnet fishermen to take the majority of the summer-run catch, while most of the catch of late-run stocks would be taken in outside fisheries. Thus, inside fisheries in Areas 18 and 29 would commence first, after the Early Stuart run had migrated upstream past Mission, and Area 20 fisheries would not begin until late-run fish dominated in this area. In the United States, the pre-season plan called for Treaty Indians in outside Areas 4B, 5 and 6C to begin fishing first and to have extensive fishing opportunities throughout the season to ensure they achieved their

allocation. This fishery relies on catching summer-run sockeye because late-run stocks are not as available to the gillnets used in these areas. Treaty Indians and Non-Indians inside Puget Sound were to have reduced-length fishing periods during the passage of the summer-runs to allow weekly fishing without exceeding the summer-run catch limit of 586,000 fish.

Table 3. Proposed versus actual fishing times [(periods (hours))] by area in major United States net fisheries in the Fraser River Panel Area in 1990.

Date	Treaty Indian				Non-Indian *	
	Areas 4B, 5 and 6C		Areas 6, 7 and 7A		Areas 4B,5,6,6C,7,7A	
	Proposed	Actual	Proposed	Actual	Proposed	Actual
July 8-14	Closed	Closed	Closed	Closed	Closed	Closed
July 15-21	3 (72)	3 (72)	Closed	Closed	Closed	Closed
July 22-28	4 (96)	6 (156)	Closed	Closed	Closed	Closed
July 29-Aug. 4	4 (96)	7 (168)	1 (16)	Closed	1 (14)	Closed
Aug. 5-11	3 (72)	5 (112)	1 (16)	1 (16)	1 (14)	1 (14)
Aug. 12-18	3 (72)	Closed	3 (72)	Closed	3 (72)	Closed
Aug. 19-25	2 (48)	Closed	3 (72)	1 (28)	3 (72)	1 (32)
Aug. 26-Sept. 1	2 (48)	3 (40)	3 (72)	2 (40)	3 (72)	1 (14)
Sept. 2-8	Closed	2 (45)	2 (52)	3 (69)	Closed	1 (12)
Sept. 9-15	Relinq.	Relinq.	Closed	Closed	Closed	Closed
Sept. 16-22			Closed	Closed	Closed	Closed
Sept. 23-29			Closed	Closed	Closed	Closed
Sept. 30-Oct. 6			Relinq.	Closed	Relinq.	Closed
Oct. 7-13				Relinq.		Relinq.
Oct. 14-20						
Total	21 (504)	26 (593)	13 (300)	7 (153)	11 (244)	4 (72)

* Periods and hours are the sum for purse seine and gillnet gear in the area.

Table 4. Proposed versus actual fishing times (days) by gear type in major Canadian net fisheries in the Fraser River Panel Area in 1990.

Date	Area 20				Area 29	
	Purse Seine		Gillnet		Gillnet	
	Proposed	Actual	Proposed	Actual	Proposed	Actual
July 8-14	Closed	Closed	Closed	Closed	Closed	Closed
July 15-21	Closed	Closed	Closed	Closed	Closed	Closed
July 22-28	Closed	Closed	Closed	Closed	Closed	Closed
July 29-Aug. 4	Closed	Closed	Closed	Closed	1	Closed
Aug. 5-11	1	Closed	1	Closed	1	2
Aug. 12-18	1	2	2	2	2	2
Aug. 19-25	1	3	3	5	2	2
Aug. 26-Sept. 1	1	2	3	3	1	2
Sept. 2-8	Closed	Relinq.	Closed	Relinq.	Closed	2
Sept. 9-15	Relinq.		Relinq.		Closed	Closed
Sept. 16-22					Closed	Closed
Sept. 23-29					Closed	Closed
Sept. 30-Oct. 6					Closed	Closed
Oct. 7-13					Closed	Closed
Oct. 14-20					Relinq.	Relinq.
Total	4	7	9	10	7	10

C. In-season Regulations

The strategy embodied in the Management Plan is dependent on the various groups of fish arriving in Panel Areas at the forecast times and abundances. To achieve the escapement and allocation goals, this strategy is necessarily modified as in-season estimates of the real migration timing, routes and abundances are changed on a daily or weekly basis. Thus, in years when the actual migration patterns are substantially different than the forecasts, the actual fishing schedule will also be substantially different than the Management Plan. The 1990 fishing season was such a year.

The Fraser River Panel conferred, in-person and by telephone conference calls, 28 times between July 11 and October 5 to consider and enact regulations. The resulting schedule of fishing is summarized in the Orders of the Fraser River Panel (Appendix C). The proposed versus actual fishing times for the United States and Canada are shown in Table 3 and Table 4, respectively.

On July 11, Area 20 test fishing CPUE data and gross escapement estimates from Mission resulted in the estimated run size of the Early Stuart stock to be increased to 200,000 from the pre-season forecast of 125,000. In accordance with Canada's pre-season intention, this led to an increase in the net escapement goal to 150,000 Early Stuart sockeye.

The opening of the fishing season in most areas was later than planned, to ensure maximum escapement of the Early Stuart run and because summer-run sockeye had not arrived in expected abundances. The first opening in the Panel Area was for Treaty Indian drift gillnets in Areas 4B, 5 and 6C on July 18-21. The Panel Order to open this fishery actually preceded the adoption of the pre-season Management Plan on July 20.

The Treaty Indian drift gillnet fishery in Areas 4B, 5 and 6C was reopened from July 22-29 to accommodate United States domestic allocation goals. Because of the late arrival of summer-run fish and escapement concerns for the Early Stuart run, other Panel Area fisheries remained closed as scheduled.

During the week of July 29-August 4, the Treaty Indian drift gillnet fishery in Areas 4B, 5 and 6C was again opened while all other areas remained closed. Due to the low abundance of summer-run stocks in the Panel Area and consequent concerns over escapement goals, the fisheries planned in other United States Panel Areas and in Canadian Area 29 during this week could not be implemented. Assessment of the summer-run migration was difficult because late-run sockeye appeared to be returning on time, while summer-run sockeye were either late or returning in less-than-forecast abundances. There was concern that a normal run timing for late-run stocks was an indication that the timing for summer-run stocks was also close to normal, therefore implying the failure of the summer-run stocks.

With the vanguard of the Horsefly and Chilko runs finally arriving in Panel waters, albeit 10-15 days late, the Panel opened Canadian Area 29 to gillnets and trollers, and United States Areas 4B, 5, 6, 6C, 7 and 7A to both Treaty Indian and Non-Indian fishermen for fishing during the week of August 5-11. The intent of these openings was to begin harvesting summer-run sockeye and to fulfil international and domestic allocation goals. At a special meeting of the Panel to review Treaty Indian catches, the Treaty Indian fishery in Areas 4B, 5 and 6C was closed on August 9 because they had virtually achieved their allocation. The opening dates for fisheries in Canadian Area 29 and United States Areas 6, 7 and 7A were the latest since 1947. Canadian Area 20 was not opened because the fisheries here were to focus on the late-run stocks when they became dominant in the area.

Good catches of summer-run sockeye in the August 5-11 commercial fisheries brought the United States close to their summer-run allocation. The abundance of these fish remained high in Panel Areas during the following week. Consequently, Treaty Indian and Non-Indian fisheries in the Panel Area were not opened during the week of August 12-18 because these groups would

likely exceed their allocations. The United States was expected to catch the remainder of their summer-run allocation incidentally in fisheries targeted on late-run stocks. Canadian net fisheries proceeded in Canadian Areas 20 and 29, primarily to harvest summer-run fish.

On August 17, the Panel increased the run-size estimate to 17,500,000 fish, largely because of indications of continuing summer-run strength. Summer-run fish predominated in Panel Areas, but the abundance of late-run fish was also substantial and increasing. To continue harvesting these two groups of fish, fisheries were scheduled for the week of August 19-25 for net fishermen in Canadian Areas 20 and 29, troll fishermen in Canadian Area 29 and 18, Treaty Indian fishermen in United States Areas 6, 7 and 7A, and for Non-Indian fishermen in United States Areas 4B, 5, 6, 6C, 7 and 7A. Treaty Indian fisheries in Areas 4B, 5 and 6C remained closed as a result of United States domestic allocation considerations. The Canadian purse seine catch this week in Area 20 (about 2,035,000) turned out to be the largest weekly catch on record for this fishery.

As a result of the very large catches during the week of August 19-25, on August 24 the Fraser River Panel increased the estimated run size to 22,000,000 Fraser River sockeye. This estimate was approximately 5,500,000 higher than the pre-season forecast and potentially the largest run since 1913. Fisheries in all Panel Areas were opened during the week of August 26-September 1 to take the harvestable surplus, especially of summer-run fish, and to meet domestic and international allocation goals. The larger run-size estimate for summer-run sockeye (8,700,000 fish) and particularly for Chilko River fish, led DFO (Canada) to increase the gross escapement goals to 1,640,000 for summer-run sockeye and 6,101,000 for total Fraser sockeye.

There was an unusually sharp decrease in the abundance of Fraser River sockeye in Juan de Fuca Strait, leading the Panel to reduce the run-size estimate to 21,000,000 fish on August 31. To harvest the remaining allocations, summer- and late-run fish were targeted during the week of September 2-8 in Area 29 gillnet and troll fisheries in the Canadian Panel Area, and in Treaty Indian and Non-Indian net fisheries in United States Areas 4B, 5, 6, 6C, 7 and 7A. The last gillnet fishery in Area 29 closed on September 5, in accordance with the pre-season plan to protect the Harrison River chinook salmon run. The Panel relinquished control of Canadian Area 20 and United States Areas 4B, 5 and 6C on September 3, five days earlier than planned.

On September 7, the Panel announced that it did not expect to provide additional fishing time in Panel Areas, to conserve the remaining fish for escapement purposes. However, the Panel extended regulatory control of United States Area 7A and Canadian Areas 18-1 and -11 on September 28, although they did not open these areas for fishing. Regulatory control of these areas was relinquished on October 7. Finally, the Panel relinquished control of Canadian Area 29 on October 14.

The amount of actual fishing time was quite different than anticipated in the pre-season plan. Treaty Indian fishermen in Areas 4B, 5 and 6C fished five days more than the proposed 21 days (Table 3). In marked contrast, Treaty Indian fishermen in Areas 6, 7 and 7A fished about half (54%) as many days as proposed, while Non-Indians fished about one-third (36%) of the expected number of days. Except for Treaty Indian fishermen in Areas 4B, 5 and 6C, United States fishermen began fishing later than forecast as a consequence of the late arrival of the summer-runs. All fisheries were subject to mid-season unplanned interruptions because the United States had virtually obtained their allocation of summer-run fish before the late-run stocks were available.

There was a smaller difference between proposed and actual fishing times in Canadian fisheries than in United States fisheries in Panel Areas. Purse seines in Area 20 fished seven days compared to the proposed four (Table 4). Gillnets fished one day extra in Area 20 (ten days) and three days more than forecast in Area 29 (ten days). In all cases the first fishery was one week later than forecast, due to the late arrival of summer-run stocks in the Panel Area.

V. CATCH SUMMARY

The unexpectedly large return of 22,006,000 Fraser River sockeye salmon was reflected mostly in the catch: 15,925,000 fish (Table 5) compared to the pre-season projection of 11,270,000 (Table 2). This catch was the largest since 1913. Out of this catch, 14,866,000 fish were taken in commercial fisheries and 1,059,000 fish in non-commercial fisheries. Since 1913, catches have exceeded 10,000,000 in only five years, and four of these have occurred since 1985.

Fish were smaller than normal for the cycle with a mean weight of 2.61 kg (5.74 lb) per fish for all ages combined. A total of about 39,000,000 kg (85,000,000 lb) of Fraser sockeye were landed by commercial fishermen, with a landed value of approximately \$148,000,000 in Canadian dollars.

A. Canada

Total commercial catch in Canada was 12,458,000 Fraser River sockeye salmon, 7,047,000 of which were caught in Panel Area waters and 5,411,000 in non-Panel areas. This is the largest Canadian commercial catch ever recorded, and 306,000 larger than the previous record in 1989. The largest catches occurred in Area 20, Area 29 and Areas 11-16. Purse seines caught the largest share of the catch (45.5%), followed by gillnets (30.5%), outside troll (20.5%) and inside troll fishermen (3.5%) (Table 6). The Area 29 gillnet catch (3,032,000 fish) was the largest on record.

Of special note are the large troll (574,000 fish) and purse seine (505,000 fish) catches of Fraser sockeye in northern British Columbia (Areas 1 and 2W). These are substantially higher than any previous catches in these fisheries and are probably due to the combined effect of redirected effort from other species onto sockeye, a relatively northerly landfall and the high abundance of Fraser sockeye in 1990.

Appendix Tables 1-4 show the weekly catches in Canadian fishing areas. The largest weekly catch ever recorded for the Juan de Fuca Strait (Area 20) fishery, about 2,163,000 fish, occurred in the 3-day fishery during the week of August 19-25 (Appendix Table 1). A fleet of about 190 purse seines caught 2,035,000 of these fish. In a second record, trollers on the west coast of Vancouver Island (Areas 121-127) landed 1,359,000 fish during the week of August 12-18 (Appendix Table 3). The timing of these maximum weekly catches in Area 20 and landings in Areas 121-127 have been fairly consistent on this cycle. Peak weekly catches in other areas were: 960,000 fish in net and troll fisheries during the week of August 12-18 in the Strait of Georgia and lower Fraser River (Areas 17, 18 and 29, Appendix Table 2); and 824,000 fish in net and troll fisheries during the week of August 12-18 in Johnstone Strait and the northern Strait of Georgia (Areas 11-16, Appendix Table 4).

The Fraser River Indian food fish catch (809,000) was the largest on record. This is the third catch in five years that has been larger than 500,000 fish, the other two years being 1986 and 1989. Most of these (592,000 fish) were caught below North Bend (Appendix Table 5). The catches above and below North Bend were both records. The Indian food fish catch in ocean areas was also a record at 114,000 Fraser River sockeye. Approximately half of this latter catch was taken by purse seines between September 5-14 in Area 29, where delaying Adams/Lower Shuswap sockeye were concentrated and vulnerable. The previous record for Indian food fish catches in marine areas was 39,000 in 1989.

Table 5. Preliminary estimates of fishery catches and total run of Fraser River sockeye salmon during the 1990 fishing season, by country and area.

COMMERCIAL CATCH		
	Number of Fish	% of Run
CANADA		
Fraser River Panel Area		
Areas 121-124 Troll *	312,000	
Area 20 Net	3,379,000	
Areas 17-18 and 29 Troll	324,000	
Area 29 Net	3,032,000	
Total	7,047,000	32.0%
Non-Panel Areas		
Areas 1-10 Troll and Net	1,079,000	
Areas 11-16 Troll and Net	2,738,000	
Areas 124-127 Troll *	1,594,000	
Total	5,411,000	24.6%
CANADA TOTAL	12,458,000	56.6%
UNITED STATES		
Fraser River Panel Area		
Areas 4B, 5 and 6C Net	147,000	
Areas 6 and 7 Net	866,000	
Area 7A Net	1,144,000	
Total	2,157,000	9.8%
Non-Panel Areas		
Alaska Net	251,000	1.1%
UNITED STATES TOTAL	2,408,000	10.9%
COMMERCIAL TOTAL	14,866,000	67.6%
NON-COMMERCIAL CATCH		
CANADA		
Areas 12-13, 18, 20, 29, 123-124 Indian Food Fishery	114,000	
Area 12 Test Fishing	5,000	
Other Catches (Charters, etc.)	26,000	
Fraser River Indian Food Fishery	809,000	
Recreational Fishery	31,000	
Total	985,000	4.5%
UNITED STATES		
Ceremonial and Test Fishing	100	0.0%
COMMISSION		
Areas 123-127, 20 and 29 Test Fishing	61,000	
Areas 7 and 7A Test Fishing	13,000	
Total	74,000	0.3%
NON-COMMERCIAL TOTAL	1,059,000	4.8%
TOTAL CATCH	15,925,000	72.4%
ESCAPEMENT	6,081,000	27.6%
TOTAL RUN	22,006,000	100.0%

* Troll catch in Area 124 is divided between Panel and non-Panel Areas.

Table 6. Preliminary estimates of Canadian catches* of Fraser River sockeye salmon by gear type and area during the 1990 fishing season.

Areas	Inside Troll	Outside Troll	Purse Seine	Gillnet	Total
1-10	0	574,000	502,000	3,000	1,079,000
11-16	121,000	71,000	2,007,000	539,000	2,738,000
121-127	0	1,906,000	0	0	1,906,000
20	0	0	3,156,000	223,000	3,379,000
17, 18, 29	324,000	0	0	3,032,000	3,356,000
TOTAL	445,000	2,551,000	5,665,000	3,797,000	12,458,000
% of Catch	3.5%	20.5%	45.5%	30.5%	100.0%

* Preliminary catch data from fish sales slips from Canada Department of Fisheries and Oceans plus estimates of unreported catches by the Fisheries Management Division of the Pacific Salmon Commission.

B. United States

The United States commercial catch of Fraser River sockeye salmon was 2,408,000 fish, which includes 251,000 fish caught in Alaska waters (Table 7). This was the largest catch of Fraser River sockeye ever recorded for Alaska fisheries, and substantially higher than the previous record of 189,000 fish in the 1989 fishery. As in 1989, the large Alaska catch was due to a large run of Fraser River sockeye coinciding with an unusual availability of these sockeye in northerly waters.

Table 7. Preliminary estimates of United States catches* of Fraser River sockeye salmon by user group, gear type and area during the 1990 fishing season.

Treaty Indian					
Areas	Test and Ceremonial	Purse Seine	Gillnet	Reefnet	Total
4B, 5 and 6C	100	0	146,400	0	146,500
6 and 7	0	174,400	218,300	0	392,700
7A	0	280,200	369,700	0	649,900
6,7 and 7A Total	0	454,600	588,000	0	1,042,600
% of Catch	0.0%	43.6%	56.4%	0.0%	100.0%
Total	100	454,600	734,400	0	1,189,100
% of Catch	0.0%	38.2%	61.8%	0.0%	100.0%
Non-Indian					
Areas	Test and Ceremonial	Purse Seine	Gillnet	Reefnet	Total
4B, 5 and 6C	0	0	1,200	0	1,200
6 and 7	0	272,800	169,000	31,400	473,200
7A	0	297,700	196,100	100	493,900
Total	0	570,500	366,300	31,500	968,300
% of Catch	0.0%	58.9%	37.8%	3.3%	100.0%
Panel Area Total	100	1,025,100	1,100,700	31,500	2,157,400
Alaska (District 104) Catch					251,000
UNITED STATES TOTAL CATCH					2,408,400

* Preliminary Washington catch data from Washington Department of Fisheries "soft system" totals, plus estimates of unreported catches by the Fisheries Management Division of the Pacific Salmon Commission.

Most of the United States catch in the Panel Area occurred in net fisheries in Area 7A, followed by fisheries in Areas 6 and 7, and Areas 4B, 5 and 6C. This pattern was reflected in both the Treaty Indian and Non-Indian catches (Table 7). The Treaty Indian catch in Areas 4B, 5 and 6C was 146,500, compared to total catches in other areas of 1,042,600 Fraser River sockeye. The catch-by-gear for Treaty Indian fishermen in Areas 6, 7 and 7A was 454,600 (43.6%) in purse seines and 588,000 (56.4%) in gillnets. Non-Indian fishermen caught 968,300 Fraser sockeye in Panel Areas; 37.8% in gillnets, 58.9% in purse seines and 3.3% in reefnets.

Weekly catches in the United States Panel Area are shown in Appendix Table 6. The largest catches were taken after August 15 as the fisheries were managed to focus the United States harvest on late-run stocks. A significant portion of the catch was taken in Area 7A in late August and early September, when Adams/Lower Shuswap sockeye were harvested to achieve the allocation goals. This targeted group of late-run sockeye consisted of fish migrating through the area as well as fish delaying off the mouth of the Fraser River. The maximum weekly catch in the United States Panel Area was 711,000 fish during the week of August 19-25.

VI. STOCK MONITORING

Each year, the Commission conducts test fishing and echo-sounding studies as part of an overall stock monitoring program. This program is designed to assess stock size, daily abundance and timing of Fraser River sockeye stocks at different points along their migration route during the fishing season. These data are required for the development of fishing plans designed to attain annual escapement and allocation objectives.

Test fishing operations in 1990 were conducted by the Commission in the following areas:

Canadian Panel Areas

Areas 123-124	Troll	July 18-August 24
Area 20	Gillnet	June 21-September 4
Area 20	Purse Seine	August 7-September 2
Area 29-13	Gillnet	July 16-October 9
Area 29-16	Gillnet	June 25-September 27
Area 29-1 to 6	Troll	July 26-October 3

Canadian Non-Panel Areas

Areas 125-127	Troll	July 18-August 24
Area 2W	Troll	August 4-6
Area 16	Purse Seine	August 30-31

United States Panel Areas

Area 7	Gillnet	July 18-September 9
Area 7	Purse Seine	August 31
Area 7A	Gillnet	September 26-27

The test fishing operations in Canadian non-Panel areas were conducted with the approval of Canada Department of Fisheries and Oceans. At the request of the Commission, DFO operated a test fishing program in Area 12 between July 11-August 18 by gillnet and August 8-September 1 by purse seine. The upstream passage of sockeye was monitored by echo sounding at Mission between June 25-October 9, and visual observations at Hells Gate between July 4-October 11. Figure 6 shows estimates of daily escapements provided by the Mission echo sounding program and by gillnet test fishing at Cottonwood (Area 29-13).

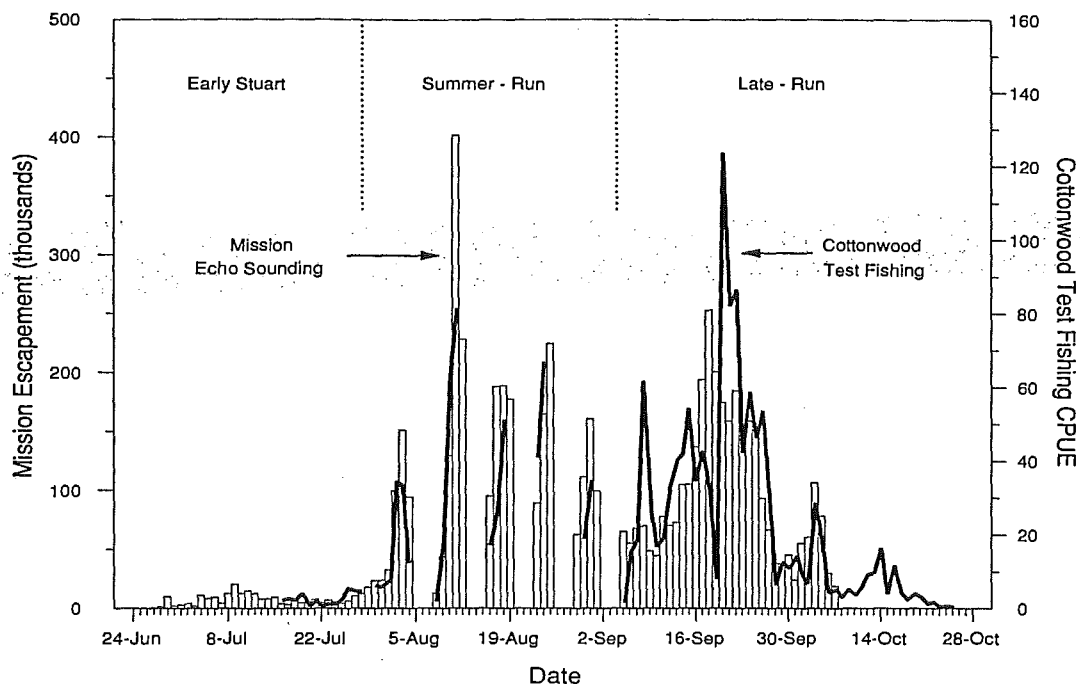


Figure 6. Daily escapements of sockeye salmon estimated at Mission, B.C. by echo sounding compared with prior-day test fishing CPUE at Cottonwood during 1990.

As in past years, the assessment of run size and timing of Early Stuart sockeye was based initially on Area 20 test fishing catch per unit effort (CPUE) data and subsequently updated using estimates of escapement at Mission. The efficiency of the Area 20 test fishing gillnets on Early Stuart sockeye is normally quite high and this was again the case in 1990. On July 11, the Early Stuart run was estimated at 200,000 with a peak in Area 20 on July 5, approximately 3 days later than the long-term average. The in-season estimate of Early Stuart gross escapements was 169,000 adults (Table 8). Post-season estimates of run size and gross escapements were 153,000 and 149,000 adult fish, respectively.

Table 8. Comparison of 1990 in-season goals and in-season and post-season estimates of the gross escapement (adults only) of Fraser River sockeye salmon stocks.

Stock	In-season Goals *	In-season Estimates **	Post-season Estimates
Early Stuart	196,000	169,000	149,000
Early Summer-run Stocks	507,000	726,000	570,000
Summer-Run Stocks	1,640,000	2,179,000 ***	2,044,000
Late-run Stocks	3,708,000	3,557,000	4,106,000
TOTAL	6,051,000	6,631,000	6,869,000

* As adjusted by Canada on August 24, 1990.

** Includes 105,000 sockeye salmon caught in Fraser River Indian food fisheries below Mission, B.C.

*** Includes Chilko Lake - South End sockeye.

With the pre-season projection of 50-60% northern diversion (i.e. migration via Johnstone Strait, Figure 5) and slightly later-than-normal timing of summer-run sockeye, stock monitoring efforts were directed at looking for early clues of the migration features of these stocks. Low catch rates in the troll test fisheries throughout the west coast of Vancouver Island and in the Area 12 gillnet test fishery during the period of July 18-25 indicated much later-than-normal timing of summer-run stocks or very modest returns. Also, there were indications from Area 12 gillnet test fishing that the diversion rate was climbing. However, this trend reversed and by the first week

in August the Johnstone Strait diversion rate was estimated to be approximately 30%. In past years, such as in 1980, 1981 and 1983, high diversion rates have been clearly indicated by the first week in August. Consequently, the low estimate of diversion rate in the first week of August was interpreted to be an indication of a low average diversion rate in 1990. High catches of Fraser River sockeye in northern and southern areas in late August was believed to indicate a broadly based land-fall of fish onto the coast. The proportion of sockeye actually entering Johnstone Strait was estimated at a season average of 25%.

The late timing and apparent small abundances of summer-run sockeye continued to be of concern, particularly with the identification of a group of late-run sockeye (Adams/Lower Shuswap) in Area 20 during late July (Figure 4). However, catches of summer-run fish in the Area 20 test fishery increased in early August and remained high until the first commercial fishery in that area on August 13. Escapements in excess of 100,000 per day were observed at the Cottonwood test fishing site commencing August 3 and the abundances of summer-run stocks in the Fraser River remained high throughout August. By August 10, the run size of summer-run sockeye was estimated to range between 5-6,000,000 fish. By August 17, the estimates ranged between 6-7,000,000 fish with an estimated peak timing in Area 20 of August 11. On August 24 the run size was estimated at over 9,500,000, based on continued large catches and escapements. Most of the increase in the summer-run abundance estimate was due to the very large Chilko River run. On August 24, DFO increased the gross escapement goal for summer-run stocks from 1,947,000 to 2,147,000 adults to ensure adequate escapements of non-Chilko summer-run stocks. By September 6, 2,800,000 summer-run fish were estimated to have escaped past Mission. The post-season estimate of summer-run gross escapement was 2,614,000 adults (Table 8).

Troll test fishing off the west coast of Vancouver Island did not indicate a clear separation of the summer-run and late-run sockeye migrations. This was subsequently confirmed by gillnet and purse seine commercial and test fishing in Areas 20 and 12. After an early migration of late-run sockeye (predominantly Adams/Lower Shuswap) through Area 20 during late July and early August, the abundance of late-run fish declined to low levels for approximately 7-10 days (Figure 4). After August 12, late-run abundance in Area 20 increased and remained at high levels for approximately two weeks. The estimated run size of the late-run group was 11-13,000,000 sockeye on August 24, with a peak in Area 20 on August 25. The estimate was subsequently reduced to 10,800,000 million sockeye on August 29, because of lower-than-expected catches in the August 27-28 fishery. Peak timing for late-run stocks through Area 20 was estimated to be August 21.

Late-run sockeye delay off the mouth of the Fraser River for up to four weeks prior to migration upstream. It is always important to estimate the abundance of these stocks entering the Strait of Georgia, to provide for gross escapements and additional commercial catches as necessary. In 1990, another factor that enhanced the importance of these abundance estimates was the necessity to control the sockeye escapement to the Strait of Georgia because conservation concerns for Harrison River chinook limited the opportunities to harvest late-run sockeye in the Strait. Three methods are used to estimate escapement to the Strait of Georgia. Two methods apply in-season estimates of harvest rates to late-run sockeye catches over the course of the migration. The other method is to subtract the cumulative catch from the total run size estimate obtained using CPUE data. The assessment of late-run escapement to the Strait was completed September 6, with estimates ranging between 3,500,000-4,500,000 sockeye. By October 9, 3,527,000 late-run sockeye were estimated to have passed the Mission echo sounding site. The final adult gross escapement estimate, including Fraser River Indian food fish catches and spawning ground escapements, was 4,106,000 late-run sockeye (Table 8).

Visual observations at Hells Gate showed that the passage of sockeye salmon proceeded smoothly, with large abundances of summer-run sockeye observed during the last two weeks of August. Strong migrations of late-run sockeye passed Hells Gate in late September and early October. No delays in the migration past Hells Gate were evident.

VII. RACIAL IDENTIFICATION

Scale pattern analysis is used by the Pacific Salmon Commission to identify stock groups of Fraser River sockeye salmon in mixed-stock fishery samples. (Refer to the 1988 Report of the Fraser River Panel to the Pacific Salmon Commission for a technical description of the technique). Results from these analyses have two primary uses: (1) to provide information on abundance and timing of co-migrating stocks as they pass through commercial fishing areas and enter the Fraser River, and (2) to account for the catch of Fraser River sockeye in Alaska, British Columbia and Washington State waters. These data are used by Commission staff, in conjunction with test fishing data and various stock assessment parameters, to assess the run timing and abundance of individual sockeye stock groups. Rapid availability of this information during the fishing season is essential for the development of detailed management strategies designed to meet stock-specific escapement objectives and to achieve international and domestic catch allocation goals.

In 1990, scale pattern analysis was used to estimate the contributions of 21 Fraser River sockeye stocks to commercial and test fishery catches and daily escapements past Mission, B.C.. Age-specific stock classification models were developed from prior-years spawning ground data and, based on these models, the 21 stocks were amalgamated into 11 stock groups. Each stock group consisted of one or more individual stocks exhibiting similar scale traits and migratory timing.

Linear discriminant function analysis was used to determine the rules for combining individual sockeye stocks into stock groups and, subsequently, for estimating the contribution rates of each stock group in mixed-stock fishery samples. To identify the Fraser sockeye catch by stock group in southern-area fisheries, four scale variables were used: circuli count to the first freshwater annulus, circuli count in the freshwater plus-growth zone, distance from the focus to the 5th circulus and distance from the focus to the first freshwater annulus. In northern British Columbia and southeast Alaska, age- and sex-specific scale samples from selected fisheries were subjected to a three-variable discriminant analysis that included two scale variables and fish length.

In-season scale analysis in 1990 was initiated in late June and continued through mid October. Using scale samples collected in both northern- and southern-area fisheries, estimates of stock composition were made each week. To assess the catch of Fraser River sockeye salmon in commercial fisheries, Commission staff sampled commercial sockeye landings at canneries in Bellingham, Blaine, Vancouver, Steveston, Ucluelet, Winter Harbour and Prince Rupert. In addition, the Commission provided funds to Alaska Department of Fish and Game for a comprehensive sampling program that was designed to estimate the catch of Fraser River sockeye salmon in the District 104 fishery. Stock composition estimates were multiplied by the catch in each fishery to generate summaries of catch by stock group by area. Racial estimates from Fraser River test fishing samples were applied to Mission echo-sounding data to estimate daily gross escapement by stock group.

Catches in the 1990 Fraser River Indian food fishery were expected to be higher than in previous years. Consequently, the Commission requested that DFO increase its sampling effort of this fishery to provide more complete estimates of catch by stock throughout the Fraser River watershed. Weekly scale samples were requested from the Agassiz, Lytton, Lillooet and Prince George areas. However, difficulties in obtaining weekly scale samples from these areas prevented a comprehensive analysis of catch by stock by area. Instead, stock-specific catches in Native fisheries from Steveston upstream to the spawning areas were made using run-reconstruction procedures.

Scale pattern analysis performed well in identifying the major stock groups present in 1990. The major difficulty encountered was in establishing in-season standards for those stocks where prior-year jack samples were lacking (primarily Horsefly and Stellako). Post-season revisions to preliminary in-season analyses will be conducted using 1990 spawning ground scale samples obtained from each stock by DFO.

Early Stuart sockeye salmon appeared in the Area 20 test fishery slightly later than expected. Other early summer-run stocks, such as Nadina, Bowron, Gates, Fennell and Early Chilko, were also late in their arrival timing. Along with late arrival timing, a stronger-than-forecast run strength occurred in the Scotch/Seymour stock group. This stock group was present in higher-than-expected proportions in Area 20 during late July and early August.

Contrary to pre-season expectations, only small percentages of summer-run fish were present in late-July and early-August samples from Area 20. This finding caused the Fraser Panel to take conservative management decisions until the abundance and timing of these stocks could be determined. Late timing of these stocks was substantiated when large proportions of Chilko and Quesnel sockeye were identified, along with late-run stock groups, in samples collected from early-August fisheries off of the Queen Charlotte Islands. Significant proportions of both summer- and late-run Fraser River sockeye were also present in scale samples collected in late July and in August from the District 104 fishery in southeast Alaska.

In contrast to summer-run stocks, late-run stocks dominated by the Adams/Lower Shuswap group showed relatively normal run timing. This resulted in a substantial overlap in the migrations of summer-run and late-run stocks, making it difficult for the Panel to achieve some of its pre-season management objectives. For example, to ensure that the United States achieved their total Fraser River sockeye allocation of 2,200,000 fish, the Panel was forced to implement regulations that resulted in the United States exceeding their early summer-run and summer-run catch goal of 586,000 pieces.

Table 9. Catches, escapements and exploitation rates for Fraser River adult sockeye salmon by stock group.

Stock Group	River & Ocean Catch *	Fraser IFF ** Catch	Net Escapement	Total Run	Portion of Total Run	Exploitation Rate	
						River & Ocean	All Areas
Early Stuart	4,000	52,000	97,000	153,000	0.7%	3%	37%
<u>Early Summer-run Stocks</u>							
Fennell/Bowron/Raft	16,000	32,000	23,000	71,000	0.3%	23%	68%
Nadina/Gates/Pitt	35,000	19,000	24,000	78,000	0.4%	45%	69%
Scotch/Seymour	909,000	84,000	388,000	1,381,000	6.3%	66%	72%
Total	960,000	135,000	435,000	1,530,000	7.0%	63%	72%
<u>Summer-run Stocks</u>							
Late Stuart	621,000	34,000	189,000	844,000	3.8%	74%	78%
Quesnel	1,939,000	137,000	488,000	2,564,000	11.7%	76%	81%
Chilko	3,335,000	236,000	833,000	4,404,000	20.0%	76%	81%
Stellako	355,000	33,000	94,000	482,000	2.2%	74%	80%
Total	6,250,000	440,000	1,604,000	8,294,000	37.8%	75%	81%
<u>Late-run Stocks</u>							
Birkenhead	483,000	4,000	169,000	656,000	3.0%	74%	74%
Adams/Lower Shuswap	7,228,000	177,000	3,715,000	11,120,000	50.6%	65%	67%
Misc. Late-run Stocks	175,000	1,000	40,000	216,000	1.0%	81%	81%
Total	7,886,000	182,000	3,924,000	11,992,000	54.6%	66%	67%
TOTAL ADULTS	15,100,000	809,000	6,060,000	21,969,000	100.0%	69%	72%
TOTAL JACKS	16,000	0	21,000	37,000			
TOTAL	15,116,000	809,000	6,081,000	22,006,000			

* Includes ocean and river catches in commercial, test and other fisheries, excluding the Fraser River Indian food fishery.

** IFF = Indian food fishery.

The total Fraser River sockeye return by stock was estimated by combining catch and racial data from commercial, test and Fraser River Indian food fisheries with net escapements from the spawning grounds. In 1990 the total return was 22,006,000 fish, of which 94.7% were age 4₂, 4.8% were age 5₂, 0.1% were age 5₃, and 0.2% were age 3₂.

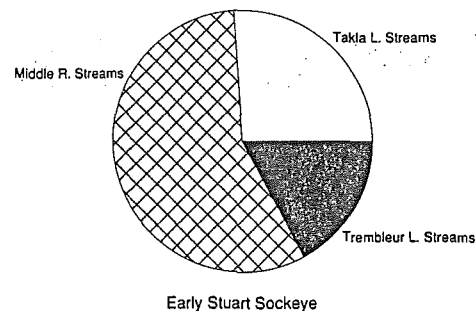
Catch and escapement by stock grouping are listed in Table 9. Of the early summer- and summer-run stocks, the Scotch/Seymour, Quesnel and Chilko stock groups produced large returns. The total adult production from the Scotch/Seymour group was 1,381,000 fish. This was the largest return for these stocks since racial identification assessments of Fraser River sockeye stocks began in 1952. The next largest return occurred in 1986 when the total production was 683,000 fish. The Quesnel system produced the largest recorded return for the sub-dominant cycle, 2,564,000 fish, up from the 1986 brood year return of 620,000 fish. The Chilko group produced a total return of 4,404,000 fish. As with the Scotch/Seymour group, this was the largest return on record and was much larger than the 1986 brood year return of 1,655,000 fish. The total adult production of these three groups was 8,349,000 fish, or approximately 38% of the total adult return.

Late-run production was dominated by the Adams/Lower Shuswap stock group in 1990, which is the dominant cycle year for this group. The adult return of 11,120,000 fish to this stock group, 51% of the total run, was close to the forecast abundance for Late Shuswap stocks. This was the largest production from the Shuswap system since 1958 when 15,110,000 fish returned. The Birkenhead run of 656,000 sockeye was the second largest on record. This large return was primarily progeny from the record spawning escapement of 336,000 fish in 1986, and occurred despite lower than expected survival rates (2.27 recruits per spawner). Returns of Weaver Creek sockeye and other small late-run stocks were poor.

VIII. ESCAPEMENT

Sockeye salmon escapements to spawning grounds in the Fraser River watershed are annually enumerated by Canada Department of Fisheries and Oceans. In 1990, adult (4- and 5-year-old) escapements totalled 6,060,000 fish (Appendix Table 7), 13% greater than the in-season goal of 5,360,000 fish. In addition, 21,000 jack (3-year-old males) sockeye reached the spawning grounds for a total escapement of 6,081,000 fish. This was the largest escapement to reach the spawning grounds since 1909. Stocks spawning in areas above Hells Gate accounted for 5,871,000 of the total. Many of the upriver stocks recorded escapements that were the largest on the cycle and were, in several cases, the largest of all years on record. Increases from brood-year (1986) escapements varied from 60% to 180% for major stocks, with an overall increase of 66%.

Early Stuart (A; Figure 7) sockeye were protected during their marine and lower Fraser River migration by complete closures of commercial fisheries. The spawning escapement of 97,000 was below the in-season goal of 150,000 but was a three-fold improvement over the 1986 escapement of 29,000 spawners. The Early Stuart stock is showing nearly complete recovery from the devastating losses suffered during upstream migration in 1982 when only 4,600 adults arrived on the spawning grounds. The majority of spawners were in Middle River tributaries, where most of the escapement typically spawns in non-dominant cycle years such as 1990. Approximately 17% of the 1990 escapement were 5-year-old fish from the 1985 dominant-cycle spawning.



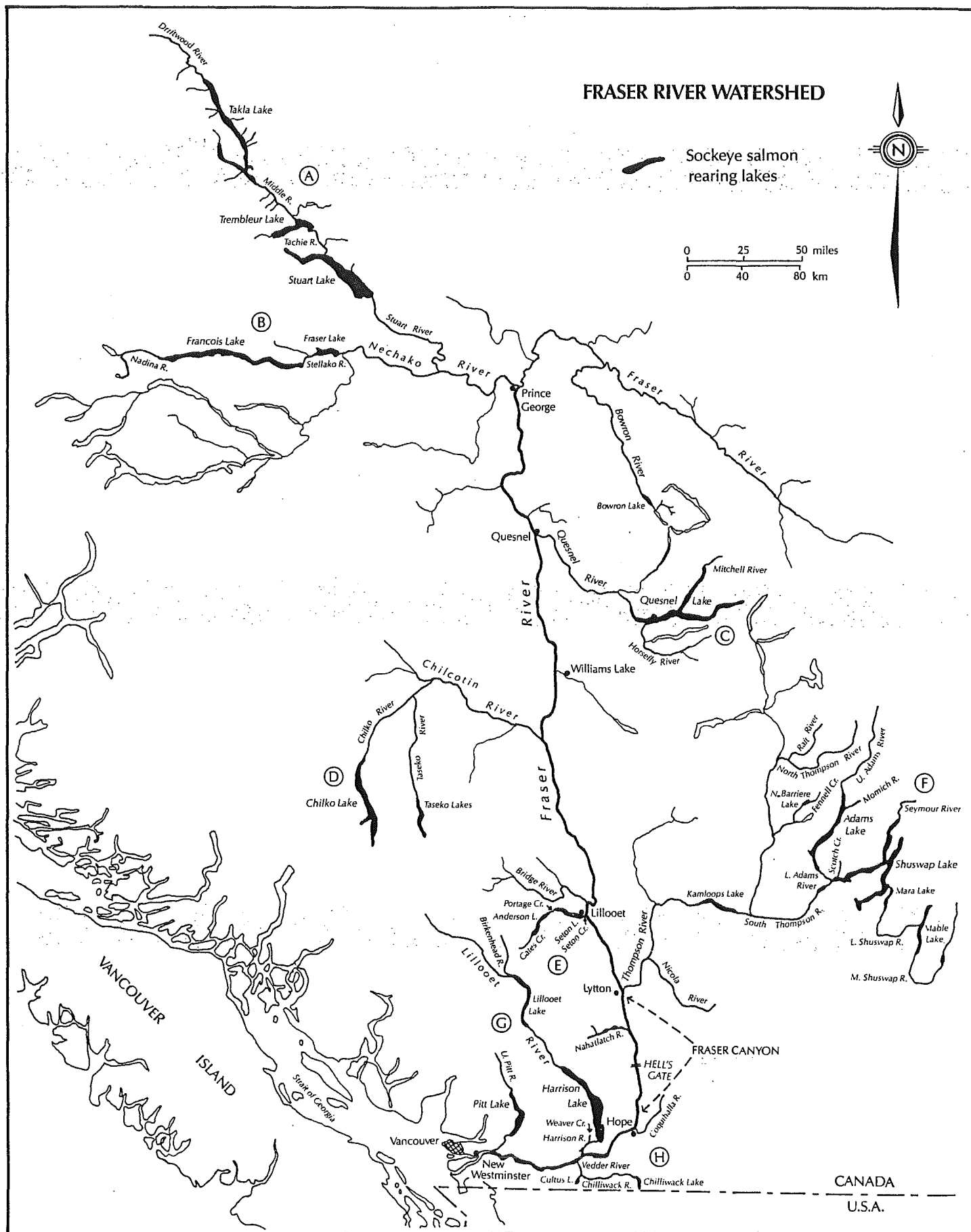
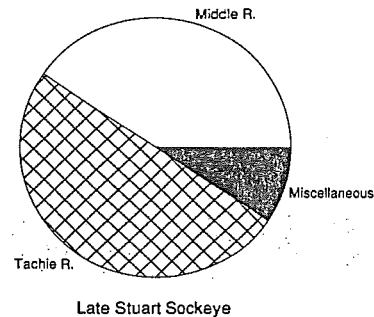


Figure 7. Sockeye salmon spawning grounds in the Fraser River watershed.

Unexpectedly large returns to Late Stuart spawning grounds were recorded as 189,000 adults arrived at Middle and Tachie Rivers and associated tributary streams. This was a six-fold increase from 1986 and was, by far, the largest escapement on any non-dominant cycle year (1987, 1988, 1990 cycles) yet observed. The majority of spawners were 4-year-old fish, but 10% were 5-year-olds from the very large 1985 brood.



Sockeye returns to spawning grounds in the Nechako River watershed (B; Figure 7) were similar to recent cycle years. The late Nadina River escapement was above 1986 levels with a total of 6,000 fish spawning, primarily in the spawning channel. However, no fish were observed in the areas used by the early Nadina stock. This latter stock is now depleted on all cycles, particularly the 1989 and 1990 cycles. On the other hand, the Stellako River escapement increased 22% to 94,000 spawners. The 1990 cycle has historically been the sub-dominant cycle, so growth here is encouraging.

Excellent production of Quesnel Lake area (C; Figure 7) stocks in 1990 gave rise to a large escapement of 488,000 sockeye. This is a 170% increase from 1986 and the largest sub-dominant-cycle escapement since the early 1900's. The 1990 return was approximately 78% 4-year-olds from the 1986 spawning and 22% 5-year-olds from the very successful 1985 brood. Distribution of spawning was excellent with 44,000 fish in Mitchell River and 439,000 in the Horsefly River system. Approximately 318,000 of the Horsefly River spawners reached the Upper Horsefly and McKinley Creek spawning areas, while 80,000 spawned in the Lower Horsefly River from the town of Horsefly down to the river mouth. Approximately half of these latter fish were 5-year-olds since the lower-river escapement in 1985 was large compared to 1986. Broader utilization of the available areas is a positive feature of the 1990 spawning. Canada Department of Fisheries and Oceans diverted 29,000 sockeye into the spawning channel constructed in 1989 near the town of Horsefly. Progeny of these spawners should increase the utilization of the Lower Horsefly River in future years.

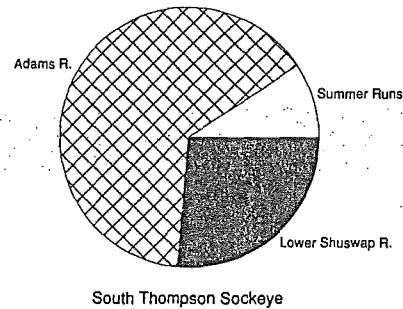
The unexpectedly large return of Chilko sockeye led to large escapements to both Chilko River and Lake spawning grounds (D; Figure 7). The combined population of 816,000 spawners was 2.8 times larger than in 1986. This escapement level has been exceeded only once (1963) since detailed records began in 1938. Dominant cycle escapements in 1948 and 1956 were slightly lower at 671,000 and 647,000 adults, respectively. Utilization of all natural spawning habitats was heavy. Ten thousand fish entered the spawning channel voluntarily or were transported into it.

A good increase in the escapement to Gates Creek (E; Figure 7) was recorded in 1990. In total, 5,400 fish spawned: 4,400 in the channel and 1,000 in the creek proper. In 1974, only four cycles earlier, the escapement totalled 70 adult sockeye. The 1990 cycle has historically had the smallest returns, but now compares favorably to the other non-dominant cycle years (1987 and 1989). Portage Creek has been dominant on this cycle and the escapement in 1990 was 18,000, an increase of 28% from the 1986 spawning. Although both Gates Creek and Portage Creek stocks tend to have stable spawning areas and both stocks rear in Seton Lake, their patterns of abundance differ substantially.

Historically, the largest component of the escapement on the 1990 cycle has been in the South Thompson drainage (F; Figure 7). Early-timed stocks returning to the South Thompson watershed showed exceptional production and escapement in 1990. Spawning escapements to Scotch Creek increased from 27,000 in 1986 to a record 83,000 spawners. Many fish were able to ascend into the upper portion of the stream which was previously inaccessible due to impassable falls: recent natural changes in the falls now permit fish to pass upstream. Spawning escapement for the largest of the early-timed South Thompson stocks, Seymour River sockeye, grew 116% to 272,000 spawners, also the largest escapement on record. The Anstey River sockeye escapement has increased rapidly in recent years and totalled 25,000 in 1990. Escapement to the Upper Adams

River remained similar to the brood year with 600 fish in 1990. This latter stock rears in Adams Lake, separate from the majority of early-timed South Thompson stocks which rear in Shuswap Lake.

The Adams River and associated spawning areas support the largest sockeye stock in the Fraser River watershed. Dominant-cycle escapements have averaged 1,735,000 spawners, and between 1950 and 1978 constituted an average of 74% of the annual sockeye escapement on the cycle. In 1990, the escapement of Adams sockeye was 2,633,000 fish, but constituted only 43% of the total 1990 spawning escapement. A more even distribution of spawners among the various spawning streams in the watershed may help to stabilize the production on this cycle.



The other large late-run stock in the South Thompson River drainage, the Lower Shuswap River sockeye, reached an escapement of 983,000 spawners, the largest on record. This stock has been increasing in abundance since 1974 and now constitutes the third largest spawning population in the Fraser River watershed after the Adams and Horsefly River stocks. In addition, 96,000 fish spawned in the Middle Shuswap River, a 20% increase from 1986.

Normally, minor numbers of sockeye spawners have returned to North Thompson streams on the cycle. Fennell Creek, however, produced well and had a good escapement of 12,000 fish, an increase of 97% from 1986. Raft River escapement dropped 70% to 600 spawners in 1990.

Declines in escapement levels were seen in stocks that spawn below Hells Gate. In the Harrison-Lillooet watershed (G; Figure 7), the Birkenhead River held 167,000 adult spawners, down 50% from the record 1986 spawning of 336,000 fish. The 1990 escapement was still, however, the third largest on record. Three of the past four years (1987-90) have seen escapements of 165,000 to 170,000 adults, resulting from an increased level of production from this stream.

The Harrison River population was estimated at 4,500 spawners, down 38% from 1986. This stock is unique in that the young fish spend two to four months in sloughs and the estuary of the lower Harrison and Fraser Rivers before migrating to the Strait of Georgia, and they return with a substantial proportion (44% in 1990) of 3-year-olds (both males and females). The influences on production, therefore, differ from most sockeye stocks which rear in lakes for one year. Weaver Creek and Channel held only 16,000 sockeye spawners, making 1990 the second consecutive year at unusually low abundances. This escapement, which was 86% less than the 1986 abundance, has been attributed to poor egg survival of the 1986 brood due to a severe outbreak of Infectious Hemopoietic Necrosis (IHN) during incubation. Approximately 10,000 spawners used the channel.

Lower Fraser stocks (H; Figure 7) also showed declines in 1990. Nahatlatch River and lakes held 7,000 spawners compared to 9,000 sockeye in 1986. Cultus Lake experienced a similar drop in escapement as only 1,900 fish arrived to spawn. Upper Pitt River sockeye have a large component of 5-year-old fish and, thus, escapements often do not correspond to spawning four years previous. The 1990 escapement was 12,000 fish, below both the 1985 (16,000) and 1986 (29,000) escapements.

The total escapement of 3,062,000 female sockeye had a high degree of spawning success (98%), at least partly due to their generally late arrival and favorable water temperatures during upstream migration. No stocks suffered significant pre-spawning mortality. Environmental conditions were generally favorable; however, mid-November floods in the lower Fraser watershed may reduce the production of sockeye from these systems in 1994 (also 1995 for Pitt River sockeye).

IX. ACHIEVEMENT OF OBJECTIVES

The mandate of the Fraser River Panel is to manage fisheries in the Panel Area to achieve the annual goals for gross escapement of Fraser River sockeye salmon, for allocation of the catch between the countries, for domestic allocation of the catch within each country's share, and to consider conservation concerns for other stocks and species of salmon when planning and conducting the fisheries. Panel management strategies are assessed after each season to determine if the goals were met, to estimate catch deficiencies that require future attention and to improve management techniques and data collection programs.

A. Escapement

The primary objective of the Fraser River Panel is to ensure that gross escapement goals are achieved. In March 1990, Canada set a gross escapement goal of 5,780,000 adults, which included an anticipated catch of 600,000 fish in the Fraser River Indian food fishery and an adult spawning escapement of 5,180,000 adults (Table 2). The gross escapement goal was revised on July 10 to 5,901,000. The purpose of the adjustment was to take advantage of the larger-than-forecast Early Stuart run and attempt to achieve an escapement of 150,000 Early Stuart spawners. Due to an increase in the estimated run size of summer-run stocks, Canada increased the gross escapement goal to 6,051,000 adults on August 24 (Table 8).

The actual gross escapement in 1990 was 6,869,000 adults, of which 6,060,000 reached the spawning grounds. The gross escapement for Early Stuart sockeye was 149,000 fish, 47,000 short of the goal of 196,000. The gross escapement goals for the early summer-run and the summer-run stocks were exceeded by 63,000 and 404,000, respectively, with actual gross escapements of 570,000 and 2,044,000 adults. Early in-season concerns about the abundance of the summer-run stocks and gross escapement requirements precluded additional commercial harvest of these stocks. Late-run gross escapements totalled 4,106,000 adults, which was 398,000 over the goal. The extra escapements, which occurred as a result of management imprecision, have not yet been classified in the post-season accounting.

B. International Allocation

Achieving the international catch-allocation objectives of the Treaty is the second priority of the Fraser River Panel during the fishing season. The preliminary estimate of the Canadian Add-on Escapement Benefit is 1,078,000 Fraser River sockeye salmon, based on early summer- and summer-run run size estimates of 1,530,000 and 8,294,000 fish (Table 9), respectively. Using this estimate of the add-on benefit, a run size of 22,006,000 Fraser sockeye and deductions totalling 6,560,000, the TAC in 1990 was 14,368,000 fish (Table 10).

For 1990, the United States chose a catch goal of 2,200,000 Fraser sockeye. The actual catch by United States fishermen was 2,408,000, or 208,000 larger than the goal. This overage was largely due to the record catch of Fraser sockeye by Alaska fishermen in District 104. Even with the overage, the United States catch was less than the maximum portion (23.1%) of the TAC that they could have taken in 1990.

The United States summer-run allocation was unavoidably exceeded, because the extreme overlap in the summer- and late-run migrations resulted in a situation where a summer-run overage was necessary if the total Fraser sockeye allocations were to be achieved. Summer-run sockeye catches in United States waters amounted to 887,000 fish, 301,000 larger than the allocation of 586,000 sockeye.

Table 10. Preliminary calculation of the international allocation status for Fraser River sockeye salmon.

		Sockeye
TOTAL ALLOWABLE CATCH		
Total Run Size		22,006,000
Canadian Escapement Add-on Benefit		1,078,000 *
	Total Available to Share:	20,928,000
Deductions		
Adult Escapement Goal		5,360,000
Jack Escapement		21,000
Escapement Over Goal		700,000 **
Fraser River Indian Food Fishery Exemption		400,000
Test Fishing		79,000
	Total Deductions	6,560,000
	Total Allowable Catch:	14,368,000
UNITED STATES		
	Initial Allocation:	2,200,000 ***
	Actual Catch:	2,408,000
	Deviation:	208,000
CANADA		
TAC minus United States Share		12,168,000
Canadian Escapement Add-on Benefit		1,078,000 *
	Calculated Share:	13,246,000
	Actual Catch:	13,038,000
	Deviation:	(208,000)

* Preliminary estimate based on method agreed to by the Panel on February 8, 1991.

** Preliminary assessment of sockeye spawning escapements (adults) in excess of the goal.

*** Sockeye allocation in 1990 was an amount requested by the United States as part of their 1989-1992 cumulative total allocation of not more than 7,000,000 fish.

C. Domestic Allocation.

The third priority of the Panel, to achieve the domestic allocation goals of the Parties, is somewhat limited because the Panel manages only those United States and Canadian fisheries that occur within the Panel Area. In 1990, this included the Canadian Areas 20 and 29 net fisheries, the Areas 18-1 and -11 and 29 troll fisheries and all Washington State fisheries directed at Fraser River sockeye. The Canadian outside troll fisheries, including the fisheries within the Panel Area (Areas 121-124), were regulated by Canada. DFO regulates fisheries in non-Panel areas with the objective of ensuring that the combined fisheries achieve the Canadian domestic allocation goals.

Canadian catches of Fraser River sockeye by gear type were close to the goals set by the Minister of Fisheries (Table 11). Inside trollers caught 28,000 fish less than their allocation of 3.8% of the Canadian commercial catch; outside trollers caught 277,000 fewer than their allocation of 22.7%; purse seine fishermen harvested 3,000 under their allocation of 45.5%; and gillnet fishermen caught 309,000 over their allocation of 28.0%.

Pre-season, the United States requested that the Panel divide their 1990 catch goal of 2,200,000 sockeye evenly between Treaty Indian and Non-Indian fishermen in Washington State. However, large catches of Fraser sockeye in Alaska District 104 caused the United States to modify the goals in the Panel Area on August 31. The modified goals for the Panel Area were 1,050,000 sockeye for Treaty Indians and 937,000 for Non-Indian fishermen. This modification was based on an assumed catch of 213,000 Fraser sockeye in Alaska so the total catch remained at 2,200,000 fish. The actual catches by Treaty Indian and Non-Indian fishermen in United States Panel Areas were 1,189,100 and 968,300, respectively, or 139,100 and 31,300 Fraser sockeye over their goals.

Other domestic sockeye allocations were established for 1990. Treaty Indian fishermen in Areas 4B, 5 and 6C caught 146,500 sockeye or about 4,000 greater than their allocation. There were no specific allocations among Treaty Indians in other Panel Areas. Among Non-Indian fishermen, purse seine fishermen caught 58.9% of the Non-Indian catch, gillnet fishermen caught 37.8%, and reefnet fishermen caught 3.3%, which represent 72,000 fish over, 65,000 under and 7,000 under the respective allocations for these gear.

Table 11. Preliminary estimates of overages and underages in the catches of Fraser River sockeye salmon in 1990.

User Category	Actual Catches		Catch Goals		Overage/ (Underage)
	Number of Fish	%	Number of Fish	%	
INTERNATIONAL: by Country					
United States	2,408,400	16.2%	2,200,000	14.8%	208,400
Canada	12,458,000	83.8%	12,666,400	85.2%	(208,400)
Total:	14,866,400	100.0%	14,866,400	100.0%	0
UNITED STATES: by Group					
Treaty Indian	1,189,100	55.1%	1,050,000 *	52.8%	139,100
Non-Indian	968,300	44.9%	937,000 *	47.2%	31,300
Washington	2,157,400	100.0%	1,987,000	100.0%	170,400
Alaska District 104	251,000		213,000 **		38,000
Total:	2,408,400		2,200,000		208,400
User Category	Actual Catches		Allocations		Overage/ (Underage)
	Number of Fish	%	Number of Fish	%	
UNITED STATES (Washington): by Area or Gear					
Treaty Indian					
Areas 4B, 5 and 6C	146,500	12.3%	142,600	12.0%	3,900
Areas 6, 7 and 7A	1,042,600	87.7%	1,046,500	88.0%	(3,900)
Total:	1,189,100	100.0%	1,189,100	100.0%	0
Non-Indian					
Purse Seine	570,500	58.9%	498,700	51.5%	71,800
Gillnet	366,300	37.8%	430,900	44.5%	(64,600)
Reef Net	31,500	3.3%	38,700	4.0%	(7,200)
Total:	968,300	100.0%	968,300	100.0%	0
Washington Total:	2,157,400		2,157,400		
CANADA: by Gear					
Inside Troll	445,000	3.5%	473,400	3.8%	(28,400)
Outside Troll	2,551,000	20.5%	2,828,000	22.7%	(277,000)
Purse Seine	5,665,000	45.5%	5,668,400	45.5%	(3,400)
Gillnet	3,797,000	30.5%	3,488,200	28.0%	308,800
Canadian Total:	12,458,000	100.0%	12,458,000	100.0%	0

* In-season adjusted goals.

** The Alaska catch is not a catch goal. It was assumed to be 213,000 fish for the purpose of deriving catch goals for Washington fisheries.

D. Conservation of Other Stocks

Part of the mandate of the Fraser River Panel is to accommodate the conservation and management needs of other salmon species and stocks identified by the Parties, when it is managing Panel Area fisheries targeting on Fraser River sockeye salmon. As outlined previously in the section on pre-season regulations (page 9), several measures were incorporated in the pre-season Management Plan to protect these other species and stocks. For example, fisheries targeting on late-run sockeye in the Strait of Georgia were restricted because of the necessity to minimize the by-catch of Harrison River chinook salmon. In 1990, no additional actions were required to protect the species and stocks of concern. The total catches of other species and non-Fraser stocks of sockeye in Panel Areas during Panel control are summarized in Table 12. The catches of other species in these fisheries were about 37,000 chinook, 178,000 coho and 3,000 chum salmon. A negligible number of non-Fraser sockeye were caught.

Table 12. Preliminary estimates of catches of non-Fraser sockeye salmon and of other salmon species in commercial fisheries regulated by the Fraser River Panel in 1990. *

Area	Non-Fraser Sockeye	Chinook	Coho	Chum
United States				
Areas 4B, 5 and 6C Net	71	2,876	20,679	31
Areas 6, 7 and 7A Net	0	8,121	10,287	694
Total	71	10,997	30,966	725
Canada				
Area 20 Net	0	12,112	139,406	1,480
Area 29 Net	0	12,995	5,452	391
Area 18-1, -11 and 29 Troll	0	521	1,807	5
Total	0	25,628	146,665	1,876
TOTAL	71	36,625	177,631	2,601

* Estimates are provided by the Washington Department of Fisheries and Canada Department of Fisheries and Oceans.

X. ALLOCATION STATUS

The international allocation status of Fraser River sockeye and pink salmon as of April, 1991, is summarized in Table 13. Under the terms of the Treaty, the United States catch entitlement is a maximum of 7,000,000 sockeye and 7,200,000 pink salmon for the period 1989-92, plus adjustments for catch shortfalls of 83,000 sockeye and 103,000 pink salmon that occurred during the four-year management period ending in 1988. Within a given year, the United States can harvest up to a treaty-defined percentage of the TAC (23.1% of the TAC for sockeye in 1990).

To retain enough fish for viable commercial fisheries in 1991 and 1992, the United States has elected to harvest below their maximum permissible share of sockeye in both 1989 and 1990. In 1990, the United States catch of 2,408,000 Fraser River sockeye salmon exceeded their stated harvest objective of 2,200,000 fish, but was well below the United States maximum allowable catch of 3,320,000 fish (i.e., 23.1% of the TAC). This brought the cumulative United States catch for 1989 and 1990 to 4,846,000 Fraser River sockeye, leaving a maximum cumulative allocation of 2,237,000 to be harvested in 1991 and 1992. The United States will be entitled to a maximum of 34.2% of the TAC of Fraser River sockeye salmon in 1991, provided their total sockeye harvest does not exceed 2,237,000 fish.

Since there is negligible production of Fraser River pink salmon in even years, there was no recorded harvest of Fraser River pink salmon by United States fishermen during 1990. The remaining cumulative allocation of Fraser River pink salmon for the United States to harvest in 1991 is a maximum of 5,296,000 fish. In 1991, United States fishermen are entitled to harvest up to 25.7% of the TAC of Fraser River pink salmon, provided this amount does not exceed 5,296,000 fish.

Table 13. Preliminary calculations of the international allocation status of Fraser River sockeye and pink salmon catches during the 1989-92 cycle of the Treaty.

	Sockeye Salmon		Pink Salmon
	1989	1990	1989
TOTAL ALLOWABLE CATCH			
Total Run Size	18,392,000	22,006,000	15,569,000
Escapement and Other Deductions	3,432,000	7,638,000	7,229,000
Total Allowable Catch:	14,960,000	14,368,000	8,340,000
UNITED STATES			
Paybacks *	83,000	-	103,000
Allocation **	2,150,000	2,200,000	2,145,000
Catch Goal	2,233,000	2,200,000	2,248,000
Actual Catch	2,438,000	2,408,000	2,007,000
Deviation: ***	205,000	208,000	(241,000)
REMAINING ALLOCATION FOR 1989-92 PERIOD			
Paybacks *	83,000		103,000
Allocation ****	7,000,000		7,200,000
Maximum Catch	7,083,000	4,645,000	7,303,000
Actual Catch	2,438,000	2,408,000	2,007,000
Maximum Remaining Catch:	4,645,000	2,237,000	5,296,000
CANADA			
TAC minus United States Allocation	12,727,000	12,168,000	6,092,000
Escapement Add-on Benefit	366,000	1,078,000	0
Allocation	13,093,000	13,246,000	6,092,000
Actual Catch	12,888,000	13,038,000	6,333,000
Deviation: ***	(205,000)	(208,000)	241,000

- * Paybacks to the United States for catch shortfalls in the 1985-88 period were 83,000 Fraser sockeye and 103,000 Fraser pink salmon.
- ** United States allocations of Fraser River sockeye and pink salmon in 1990 were:
Sockeye: The amount selected by the United States out of their 1989-92 allocation
Pink: Allocation = TAC x 3.6 / 14.0.
- *** Deviations in brackets represent catches less than the goals (underages).
Unbracketed deviations are catches over the goals (overages).
- **** United States allocations for the 1989-92 period are not to exceed 7,000,000 Fraser sockeye and 7,200,000 Fraser pink salmon.

XI. APPENDICES

APPENDIX A: FRASER RIVER SOCKEYE SALMON - 1990 PRODUCTION FORECAST AND ESCAPEMENT GOALS. (Provided to the Panel by Canada Department of Fisheries and Oceans, January 23, 1990).

Stock Grouping	Forecast Total Adults	Net Escapement Goal	Gross Escapement Goal
Early Stuart	125,000	120,000	125,000
Early Summer	931,000	398,000	452,000
Summer	3,447,000	1,130,000	1,362,000
Late	11,897,000	3,532,000	3,741,000
Total Adults	16,400,000	5,180,000	5,680,000
Jacks	100,000	50,000	50,000
Total Return	16,500,000	5,230,000	5,730,000

(NOTE: Canada increased the gross escapement goal to 5,830,000 fish on March 14, 1990)

APPENDIX B: 1990 REGULATIONS

The Fraser River Panel approved regulations for the management of the Fraser River sockeye salmon fishery in Panel Area waters at a meeting held May 11, 1990 and submitted these to the Pacific Salmon Commission. The Commission approved the Fishery Regime and Regulations and submitted these to the respective national governments for approval on May 14, 1990. The recommendations for Canadian and United States waters were implemented under the Fisheries Act, Pacific Commercial Salmon Fishery Regulations.

Canadian Fraser River Panel Area

In accordance with Article VI, Paragraph 5 of the Pacific Salmon Treaty, the Commission recommends to Canada the adoption of the following Fishing Regime developed by the Fraser River Panel as per Annex IV, Chapter 4 (1) (d) of the Treaty, namely:

1. a) No person shall fish for sockeye or pink salmon in Pacific Fishery Management Area 20-1, 3 and 4 with nets from the 17th day of June, 1990 to the 8th day of September, 1990, both dates inclusive.
b) No person shall troll commercially for sockeye or pink salmon in Pacific Fishery Management Area 20-1, 3 and 4 from the 22nd day of July, 1990 to the 8th day of September, 1990, both dates inclusive.
2. a) No person shall fish for sockeye or pink salmon in Pacific Fishery Management Areas 17 and 18 with nets from the 17th day of June, 1990 to the 29th day of September, 1990, both dates inclusive.
b) No person shall troll commercially for sockeye or pink salmon in Pacific Fishery Management Area 18-1 and 11 from the 22nd day of July, 1990 to the 29th day of September, 1990, both dates inclusive.
3. a) No person shall fish for sockeye or pink salmon with nets in Pacific Fishery Management Area 29 from the 17th day of June, 1990 to the 13th day of October, 1990, both dates inclusive.
b) No person shall troll commercially for sockeye or pink salmon in Pacific Fishery Management Area 29 from the 22nd day of July, 1990 to the 13th day of October, 1990, both dates inclusive.
4. The following Fraser River Panel Area waters are excluded:
 - a) High Seas westerly of the Bonilla Point-Tatoosh Island Lighthouse Line.
 - b) Pacific Fishery Management Area 19, Area 20-2 and 5 to 7 and Area 29-8.
 - c) Commercial troll fishing in Pacific Fishery Management Area 17, Area 18-2 to 10 and Area 29-5; and in Pacific Fishery Management Area 18-1 and 11, Area 20-1, 3 and 4 and Area 29-1 to 4 and 6, prior to July 22, 1990, provided that regulations formulated by the Canada Department of Fisheries and Oceans require the release of sockeye salmon taken by commercial troll gear during the period June 17 to July 21, 1990, inclusive.

During the 1990 season, the Fraser River Panel will adopt Orders establishing open fishing periods based on a 1990 Management Plan (to be adopted prior to the 1990 fishing season). This Plan will be designed to achieve Treaty-mandated international allocations of the catch and domestic goals of the Parties.

United States Fraser River Panel Area

In accordance with Article VI, Paragraph 5 of the Pacific Salmon Treaty, the Commission recommends to the United States Government the adoption of the following Fishing Regime developed by the Fraser River Panel as per Annex IV, Chapter 4 (1) (d) of the Treaty, namely:

Treaty Indian Fisheries:

1. No Treaty Indian shall commercially fish for sockeye or pink salmon in Puget Sound Salmon Management and Catch Reporting Areas 4B, 5 and 6C with drift gillnets or purse seines from the 17th day of June, 1990 to the 8th day of September, 1990, both dates inclusive.
2. No Treaty Indian shall commercially fish for sockeye or pink salmon in Puget Sound Salmon Management and Catch Reporting Area 6A with nets from the 17th day of June, 1990 to the 8th day of September, 1990, both dates inclusive.
3. No Treaty Indian shall commercially fish for sockeye or pink salmon in Puget Sound Salmon Management and Catch Reporting Areas 6, 7 and 7A with nets from the 17th day of June, 1990 to the 15th day of September, 1990, both dates inclusive.
4. No Treaty Indian shall commercially fish for sockeye or pink salmon with nets in that portion of the Puget Sound Salmon Management and Catch Reporting Area 7A lying westerly of a straight line drawn from the low water range marker in Boundary Bay on the International Boundary through the east tip of Point Roberts in the State of Washington to the East Point Light on Saturna Island in the Province of British Columbia from the 16th day of September, 1990 to the 29th day of September, 1990, both dates inclusive.

All-Citizen Fisheries:

1. No person shall fish for sockeye or pink salmon in Puget Sound Salmon Management and Catch Reporting Areas 4B, 5, 6A and 6C with nets from the 17th day of June, 1990 to the 8th day of September, 1990, both dates inclusive.
2. No person shall fish for sockeye or pink salmon in Puget Sound Salmon Management and Catch Reporting Areas 6, 7 and 7A with nets from the 17th day of June, 1990 to the 15th day of September, 1990, both dates inclusive.
3. No person shall fish for sockeye or pink salmon with nets in that portion of Puget Sound Salmon Management and Catch Reporting Area 7A lying westerly of a straight line drawn from the low water range marker in Boundary Bay on the International Boundary through the east tip of Point Roberts in the State of Washington to the East Point Light on Saturna Island in the Province of British Columbia from the 16th day of September, 1990 to the 29th day of September, 1990, both dates inclusive.

Treaty Indian and All-Citizen Fisheries:

The following Fraser River Panel Area waters and fisheries are excluded:

1. High Seas westerly of the Bonilla Point-Tatoosh Island Lighthouse Line.
2. Puget Sound Salmon Management and Catch Reporting Areas 6B, 6D, 7B, 7C, 7D and 7E.

During the 1990 season, the Fraser River Panel will adopt Orders establishing open fishing periods based on a 1990 Management Plan (to be adopted prior to the 1990 fishing season). This Plan will be designed to achieve Treaty-mandated international allocations of the catch and domestic goals of the Parties.

APPENDIX C: 1990 FRASER RIVER PANEL IN-SEASON ORDERS

To provide for adequate escapements of the various stocks of Fraser River sockeye salmon and for the prescribed allocation of catch (a) internationally, to the fishermen of United States and Canada and (b) domestically to the commercial user groups in Canada and the United States, the Fraser River Panel formulated the following Orders to regulate Panel Area fisheries in 1990:

- July 17 United States
Treaty Indian Fishery
Areas 4B, 5 and 6C:
Drift gillnets open 12:00 noon July 18 to 12:00 noon July 21.
- July 20 United States
Treaty Indian Fishery
Areas 4B, 5 and 6C:
Drift gillnets open 12:00 noon July 22 to 12:00 noon July 26.
- July 24 United States
Treaty Indian Fishery
Areas 4B, 5 and 6C:
Drift gillnets open 12:00 noon July 26 to 12:00 noon July 29.
- July 27 United States
Treaty Indian Fishery
Areas 4B, 5 and 6C:
Drift gillnets open 12:00 noon July 29 to 12:00 noon August 2.
- July 30 United States
Treaty Indian Fishery
Areas 4B, 5 and 6C:
Drift gillnets open 12:00 noon August 2 to 12:00 noon August 4.
- August 3 Canada
Area 29-1 to 7 and 9 to 17:
Gillnets open 8:00 a.m. August 6 to 8:00 a.m. August 7.
- Area 29-1 to 4 and 6 and Area 18-1 and 11:
Open to commercial trolling 12:01 a.m. to 11:59 p.m. August 10.
- United States
Treaty Indian Fishery
Areas 4B, 5 and 6C:
Drift gillnets open 12:00 noon August 4 to 12:00 noon August 9.
- Areas 6, 7 and 7A:
Open to net fishing 4:00 a.m. to 8:00 p.m. August 7.
- All-Citizen Fishery
Areas 4B, 5, 6, 6C, 7 and 7A:
Purse seines open 6:00 a.m. to 1:00 p.m. August 8.
Gillnets open 1:30 p.m. to 8:30 p.m. August 8.
- August 6 Canada
Area 29-1 to 7 and 9 to 17:
Gillnets extended from 8:00 a.m. August 7 to 8:00 a.m. August 8.

Area 29-1 to 4 and 6 and Area 18-1 and 11:

Open to commercial trolling from 12:01 a.m. August 10 to 11:59 p.m.
August 11.

United States

Treaty Indian Fishery

Areas 4B, 5 and 6C:

Drift gillnets extended from 12:00 noon August 9 to 12:00 noon August
12.

August 9

United States

Treaty Indian Fishery

Areas 4B, 5 and 6C:

Closed to drift gillnets effective 4:15 p.m. August 9.

August 10

Canada

Area 20-1,3 and 4:

Gillnets open 7:00 p.m. August 12 to 7:00 a.m. August 13.

Purse seines open 7:00 a.m. to 7:00 p.m. August 13.

Area 29-1 to 7 and 9 to 17:

Gillnets open 8:00 a.m. August 13 to 8:00 a.m. August 14.

August 13

Canada

Area 20-1, 3 and 4:

Gillnets open 7:00 p.m. August 13 to 7:00 a.m. August 14.

Purse seines open 7:00 a.m. to 7:00 p.m. August 14.

Area 29-1 to 7 and 9 to 17:

Gillnets open 8:00 a.m. August 15 to 8:00 a.m. August 16.

August 17

Canada

Area 20-1, 3 and 4:

Gillnets open 7:00 p.m. August 19 to 7:00 a.m. August 20; 7:00 p.m.

August 20 to 7:00 a.m. August 21; and 7:00 p.m. August 21 to 7:00
a.m. August 22.

Purse seines open 7:00 a.m. to 7:00 p.m. August 20 and August 21.

Area 29-1 to 7 and 9 to 17:

Gillnets open 8:00 a.m. August 20 to 8:00 a.m. August 21.

United States

Treaty Indian Fishery

Areas 6, 7 and 7A:

Open to net fishing 5:00 a.m. August 20 to 9:00 a.m. August 21.

All-Citizen Fishery

Areas 4B, 5, 6, 6C, 7 and 7A:

Reefnets open 5:00 a.m. to 9:00 p.m. August 19.

Gillnets open 2:00 p.m. August 21 to 7:00 a.m. August 22.

Purse seines open 6:00 a.m. to 9:00 p.m. August 22.

August 20

Canada

Area 29-1 to 7 and 9 to 17:

Gillnets open 8:00 a.m. August 22 to 8:00 a.m. August 23.

August 21 Canada
Area 20-1, 3 and 4:
Purse seines open 7:00 a.m. to 7:00 p.m. August 22.
Gillnets open 7:00 p.m. August 22 to 7:00 a.m. August 23 and 7:00 p.m.
August 23 to 7:00 a.m. August 24.

August 22 Canada
Area 29-4 and Area 18-1 and 11:
Open for commercial trolling 12:01 a.m. to 6:00 p.m. August 24.

August 24 Canada
Area 20-1, 3 and 4:
Gillnets open 7:00 p.m. August 25 to 7:00 a.m. August 26; 7:00 p.m.
August 26 to 7:00 a.m. August 27; 7:00 p.m. August 27 to 8:00 a.m.
August 28; 7:00 p.m. August 28 to 8:00 a.m. August 29; 7:00 p.m.
August 29 to 8:00 a.m. August 30; and 7:00 p.m. August 30 to 8:00
a.m. August 31.
Purse seines open 7:00 a.m. to 7:00 p.m. August 26 and August 27.

Area 29-1 to 7 and 9 to 17:
Gillnets open 8:00 a.m. August 26 to 8:00 a.m. August 27.

Area 29-4 and Area 18-1 and 11:
Extended for commercial trolling 6:00 p.m. August 24 to 11:59 August 25.

United States
All-Citizen Fishery
Areas 4B, 5, 6, 6C, 7 and 7A:
Purse seines open 6:00 a.m. to 2:00 p.m. August 30.
Gillnets open 2:00 p.m. to 10:00 p.m. August 30.

Treaty Indian Fishery
Areas 4B, 5, 6C:
Drift gillnets open 5:00 a.m. to 1:00 p.m. August 31.

Areas 6, 7 and 7A:
Open to net fishing 5:00 a.m. to 1:00 p.m. August 31.

August 27 Canada
Area 20-1, 3 and 4:
Gillnets closed until further notice effective 8:00 a.m. August 28.

Area 29-1 to 7 and 9 to 17:
Gillnets open 12:00 noon August 28 to 12:00 noon August 29.

United States
All-Citizen Fishery
Areas 4B, 5, 6, 6C, 7 and 7A:
Purse seines open 6:00 a.m. to 12:00 noon August 28.
Gillnets open 1:00 p.m. to 9:00 p.m. August 28.

Treaty Indian Fishery
Areas 4B, 5 and 6C:
Drift gillnets open 4:00 a.m. to 4:00 p.m. August 29.

Areas 6, 7 and 7A:
Open to net fishing 4:00 a.m. to 4:00 p.m. August 29.

August 29

United States

Treaty Indian Fishery

Areas 4B, 5, and 6C:

Extended for drift gillnets from 4:00 p.m. August 29 to 9:00 a.m. August 30.

Areas 6, 7 and 7A:

Extended for net fishing from 4:00 p.m. August 29 to 9:00 a.m. August 30.

All-Citizen Fishery

Areas 4B, 5, 6, 6C, 7 and 7A:

Reefnets open 5:00 a.m. to 9:00 p.m. September 2.

August 31

Canada

Area 29-1 to 7 and 9 to 17:

Gillnets open 8:00 a.m. September 2 to 8:00 a.m. September 3.

United States

Treaty Indian Fishery

Areas 4B, 5 and 6C:

Drift gillnets open 1:00 p.m. September 1 to 9:00 p.m. September 3.

Areas 6, 7 and 7A:

Open to net fishing 1:00 p.m. September 1 to 9:00 p.m. September 3.

All-Citizen Fishery

Areas 6, 7 and 7A:

Reefnets open 5:00 a.m. to 9:00 p.m. September 1.

Gillnets open 12:00 noon to 12:00 midnight September 5.

September 3

Canada

Area 20:

Relinquish regulatory control effective 9:00 p.m. September 3.

Area 29-1 to 7 and 9 to 17:

Gillnets open 12:00 noon September 4 to 12:00 noon September 5.

United States

Areas 4B, 5 and 6C:

Relinquish regulatory control effective 9:00 p.m. September 3.

Treaty Indian Fishery

Areas 6, 7 and 7A:

Extended for net fishing from 9:00 p.m. September 3 to 9:00 p.m. September 4.

All-Citizen Fishery

Areas 6, 7 and 7A:

Reefnets open 5:00 a.m. to 9:00 p.m. September 4.

Gillnets open 12:00 noon to 12:00 midnight September 5.

September 5 Canada
Area 29-4:
Open for commercial trolling from 12:01 a.m. to 12:00 noon September 7.

United States
All-Citizen Fishery
Areas 6, 7 and 7A (South of the Iwersen's Dock Line):
Gillnets open 12:00 noon to 12:00 midnight September 5.

September 7(a) Canada
Area 29-4:
Extended for commercial trolling from 12:00 noon to 3:00 p.m. September 7.

September 7(b) Canada
Area 29-4:
Extended for commercial trolling from 3:00 p.m. to 6:00 p.m. September 7.

September 28 Canada
Area 18-1 and 11:
Regulatory control extended until further notice. Remains closed to net and commercial troll fishing.

United States
Area 7A:
Regulatory control extended until further notice in that portion of Area 7A lying westerly of a straight line drawn from the low water range marker in Boundary Bay on the International Boundary through the east tip of Point Roberts to the East Point Light on Saturna Island in the Province of British Columbia. Remains closed to net fishing.

October 5 Canada
Area 18-1 and 11:
Relinquish regulatory control effective October 7.

United States
Area 7A:
Relinquish regulatory control of that portion of Area 7A lying westerly of a straight line drawn from the low water range marker in Boundary Bay on the International Boundary through the east tip of Point Roberts to the East Point Light on Saturna Island in the Province of British Columbia, effective October 7.

The Fraser River Panel relinquished regulatory control of the remaining Panel Areas on October 14, as scheduled. This completed the Panel's responsibility in the Panel Area for the 1990 fishing season.

All times herein cited are Pacific Daylight Saving Time.

APPENDIX D: APPENDIX TABLES 1 TO 7

Table 1. Commercial net catches of Fraser River sockeye salmon in Canadian Area 20 (Juan de Fuca Strait) by week for cycle years 1978-90.

Date *	1978	1982	1986	1990
June 17-23	0	0	0	0
June 24-30	0	0	0	0
July 1-7	500	400	0	0
July 8-14	500	300	0	0
July 15-21	800	1,000	0	0
July 22-28	1,500	3,100	0	0
July 29-Aug. 4	69,700	6,300	0	0
Aug. 5-11	70,900	6,600	0	1,000
Aug. 12-18	63,600	401,200	207,800	787,000
Aug. 19-25	352,800	568,800	960,800	2,163,000
Aug. 26-Sept. 1	2,400	691,400	719,300	428,000
Sept. 2-8	800	700	115,000	0
Sept. 9-15	200	1,700	600	0
Sept. 16-22	0	0	0	0
Sept. 23-29	0	0	0	0
Sept. 30-Oct. 6	0	0	0	0
Oct. 7-13	0	0	0	0
Total	563,700	1,681,500	2,003,500	3,379,000

* Dates for 1990. For other years, data from the nearest week was used.

Table 2. Commercial net and troll catches of Fraser River sockeye salmon in Canadian Areas 17, 18 and 29 (Strait of Georgia and lower Fraser River) by week for cycle years 1978-90.

Date *	1978	1982	1986	1990
June 17-23	0	0	0	0
June 24-30	700	0	0	0
July 1-7	3,000	0	0	0
July 8-14	300	300	0	0
July 15-21	900	300	100	0
July 22-28	21,900	500	200	0
July 29-Aug. 4	19,700	25,300	2,000	0
Aug. 5-11	1,300	33,300	507,700	310,000
Aug. 12-18	22,400	161,200	306,500	960,000
Aug. 19-25	130,700	134,300	138,800	738,000
Aug. 26-Sept. 1	127,500	62,500	178,700	866,000
Sept. 2-8	109,100	11,600	142,800	467,000
Sept. 9-15	53,800	41,300	33,100	9,000
Sept. 16-22	3,900	200	200	1,000
Sept. 23-29	2,400	171,100	966,600	0
Sept. 30-Oct. 6	61,800	220,300	467,300	2,000
Oct. 7-27	0	0	0	3,000
Total	559,400	862,200	2,744,000	3,356,000

* Dates for 1990. For other years, data from the nearest week was used.

Table 3. Commercial troll landings* of Fraser River sockeye salmon in Canadian Areas 121 to 127 (west coast of Vancouver Island) by week for cycle years 1978-90.

Date **	1978	1982	1986	1990
June 17-23	0	0	0	0
June 24-30	0	0	0	0
July 1-7	600	100	0	0
July 8-14	700	1,600	2,400	0
July 15-21	1,200	5,000	4,100	4,000
July 22-28	14,100	21,500	700	2,000
July 29-Aug. 4	84,600	342,800	27,700	0
Aug. 5-11	308,500	297,100	344,200	57,000
Aug. 12-18	164,300	658,600	1,029,900	1,359,000
Aug. 19-25	44,100	644,200	328,500	461,000
Aug. 26-Sept. 1	56,900	97,400	25,000	13,000
Sept. 2-8	8,100	19,100	0	7,000
Sept. 9-15	8,300	4,900	0	2,000
Sept. 16-22	10,300	8,400	0	1,000
Sept. 23-29	7,500	12,800	0	0
Sept. 30-Oct. 6	0	5,900	0	0
Oct. 7-13	0	0	0	0
Total	709,200	2,119,400	1,762,500	1,906,000

* Landings lag behind actual catches by an average of five days.

** Dates for 1990. For other years, data from the nearest week was used.

Table 4. Commercial net and troll catches of Fraser River sockeye salmon in Canadian Areas 11 to 16 (Johnstone Strait and northern Strait of Georgia) by week for cycle years 1978-90.

Date *	1978	1982	1986	1990
June 17-23	0	0	0	0
June 24-30	8,600	0	100	0
July 1-7	10,700	0	0	0
July 8-14	10,800	5,200	1,500	0
July 15-21	15,700	3,900	800	1,000
July 22-28	182,700	32,800	3,200	3,000
July 29-Aug. 4	179,100	120,100	3,900	27,000
Aug. 5-11	348,000	32,100	118,100	135,000
Aug. 12-18	962,800	520,000	353,800	824,000
Aug. 19-25	1,451,600	659,000	858,400	817,000
Aug. 26-Sept. 1	198,000	273,000	800,200	807,000
Sept. 2-8	14,400	31,000	98,600	117,000
Sept. 9-15	83,800	0	1,500	4,000
Sept. 16-22	7,500	0	5,200	3,000
Sept. 23-29	1,400	0	500	0
Sept. 30-Oct. 6	0	0	2,500	0
Oct. 7-13	0	0	0	0
Total	3,475,100	1,677,100	2,248,300	2,738,000

* Dates for 1990. For other years, data from the nearest week was used.

Table 5. Catches of Fraser River sockeye salmon in the Canadian Fraser River Indian food fishery by area (Fraser River mainstem or tributary areas) for cycle years 1978-90.*

	1978	1982	1986	1990
FRASER RIVER MAINSTEM				
Steveston	4,877	41,973	25,162	70,800
Deas to Mission	8,821	9,023	12,406	34,400
Mission to Hope	71,405	113,876	142,339	252,700
Hope to North Bend	54,845	101,976	165,181	234,500
North Bend to Churn Creek	38,625	67,395	86,393	109,000
Churn Creek to Hixon	4,588	20,465	16,139	22,400
Above Hixon	704	3,591	3,899	2,300
Total	183,865	358,299	451,519	726,100
TRIBUTARIES				
Harrison/Lillooet System	14,910	10,230	10,794	0
Thompson System	16,950	31,480	9,975	12,400
Chilcotin System	8,450	14,950	39,396	57,000
Nechako System	6,248	11,798	17,101	8,000
Stuart System	7,129	3,042	5,374	5,800
Total	53,687	71,500	82,640	83,200
TOTAL	237,552	429,799	534,159	809,300

* Data supplied by Canada Department of Fisheries and Oceans.

Table 6. Commercial net catches of Fraser River sockeye salmon in United States Areas 4B, 5, 6, 6C, 7 and 7A (Juan de Fuca Strait and northern Puget Sound) by week for cycle years 1978-90.

Date *	1978	1982	1986	1990
June 17-23	0	0	0	0
June 24-30	100	0	100	0
July 1-7	5,000	100	100	0
July 8-14	1,200	0	100	0
July 15-21	200	0	100	1,000
July 22-28	19,000	36,300	3,600	18,000
July 29-Aug. 4	44,200	132,100	6,200	10,000
Aug. 5-11	69,600	465,800	387,500	443,000
Aug. 12-18	48,100	479,500	551,500	0
Aug. 19-25	416,500	712,800	714,100	711,000
Aug. 26-Sept. 1	649,600	509,600	592,600	542,000
Sept. 2-8	100	469,200	372,300	426,000
Sept. 9-15	29,600	52,500	700	0
Sept. 16-22	53,400	200	100	0
Sept. 23-29	14,300	0	0	0
Sept. 30-Oct. 6	3,500	0	104,300	1,000
Oct. 7-27	0	0	0	5,000
Total	1,354,400	2,858,100	2,733,300	2,157,000

* Dates for 1990. For other years, data from the nearest week was used.

Table 7. Escapements of sockeye salmon to Fraser River spawning areas for cycle years 1978, 1982, 1986 and 1990.*

DISTRICT	1990 Period of	Estimated Number of Adult Sockeye				Jacks
Stream/Lake	Peak Spawning	1978	1982	1986	1990	1990
NORTHEAST						
Upper Bowron River	Sept. 1-5	3,141	1,647	3,118	7,860	132
STUART						
Early Runs						
Takla Lake Streams	Aug. 5-9	10,350	438	4,820	25,197	0
Middle River Streams	Aug. 5-9	31,889	3,595	19,882	55,114	14
Trembleur Lake Streams	Aug. 5-9	7,765	524	3,882	16,723	0
Early Stuart Total		50,004	4,557	28,584	97,034	14
Late Runs						
Middle River	Sept. 18-23	3,971	7,450	9,940	76,500	0
Tachie River	Sept. 18-23	7,850	7,528	13,617	94,570	830
Miscellaneous	Sept. 18-23	917	1,780	5,158	17,979	151
Late Stuart Total		12,738	16,758	28,715	189,049	981
NECHAKO						
Nadina River (Late)	n/a	211	194	130	359	1
Nadina Channel	Sept. 21-24	2,373	2,155	3,415	5,674	13
Stellako River	n/a	58,898	69,420	77,177	93,920	8
QUESNEL						
Upper Horsefly River	Sept. 3-8	6,803	27,799	129,397	318,468	0
Lower Horsefly River	Sept. 3-8	484	2,518	15,354	80,000	0
Horsefly Channel	Sept. 3-8	-	-	-	29,274	0
McKinley Creek	Sept. 3-8	90	5,657	5,635	11,743	0
Mitchell River	Sept. 8-14	1,237	3,829	30,827	43,755	6
Miscellaneous	Sept. 1-15	0	38	254	4,404	1
Quesnel Total		8,614	39,841	181,467	487,644	7
CHILCOTIN						
Chilko River	Sept. 21-Oct. 1	143,402	239,903	281,771	815,904	7,481
Chilko Channel	Sept. 21-Oct. 1	-	-	-	9,934	40
Chilko Lake-South End	n/a	3,440	9,675	12,033	(1)	(1)
SETON-ANDERSON						
Gates Creek	Sept. 8-13	111	101	394	993	397
Gates Channel	Sept. 8-13	147	829	3,178	4,381	1,116
Portage Creek	Oct. 28-Nov. 4	9,978	23,867	14,291	18,336	143
NORTH THOMPSON						
Raft River	Sept. 3-9	2,493	2,992	2,095	630	0
Fennell Creek	Aug. 30-Sept. 3	107	1,132	6,024	11,862	36
SOUTH THOMPSON						
Summer Runs						
Seymour River	Aug. 29-Sept.5	62,808	63,271	126,166	272,041	116
Scotch Creek	Aug. 29-Sept.5	2,056	4,709	26,624	83,388	18
Anstey River	Sept. 3-8	884	767	7,080	25,264	44
Eagle River	Sept. 3-8	189	1,642	7,138	4,147	0
Late Runs						
Adams/Little Rivers	Oct. 15-Nov. 3	1,571,761	2,309,158	1,551,867	2,433,212	5,331
Adams Channel	Oct. 15-Nov. 3	-	-	-	6,824	16
Lower Shuswap River	Oct. 15-21	187,134	513,897	600,370	983,481	73
Middle Shuswap River	Oct. 13-19	10,890	40,300	80,529	96,441	10
Misc. Late Runs	Oct. 15-Nov. 3	127,568	196,880	112,464	195,304	96
HARRISON-LILLOOET						
Birkenhead River	Sept. 29-Oct. 6	94,782	119,738	335,630	166,773	3,489
Harrison River	Oct. 18-23	19,717	9,189	7,265	4,515	100
Weaver Creek	Oct. 18-23	43,227	236,288	65,846	5,969	132
Weaver Channel	Oct. 18-23	31,944	57,795	44,892	10,396	307
LOWER FRASER						
Nahatlatch River	Sept. 5-9	600	2,734	8,996	7,044	0
Cultus Lake	n/a	5,076	16,725	3,256	1,860	10
Upper Pitt River	n/a	24,786	8,708	29,177	12,202	1
MISCELLANEOUS						
		5,726	12,848	8,046	8,313	511
ADULTS		2,484,805	4,007,720	3,657,738	6,060,754	
JACKS		29,513	16,541	59,706	20,623	
TOTAL		2,514,318	4,024,261	3,717,444	6,081,377	

* 1978 and 1982 data are from the Pacific Salmon Commission. Estimates for 1986 and 1990 are from Canada Department of Fisheries and Oceans.

n/a - Not yet available.

1 Chilko Lake - South End spawners included in Chilko River total.

APPENDIX E: STAFF OF THE PACIFIC SALMON COMMISSION IN 1990

Mr. I. Todd, Executive Secretary

Mr. W. Johnson, Deputy Executive Secretary

FISHERIES MANAGEMENT DIVISION STAFF

Dr. J. Woodey, Chief

Stock Monitoring Group

Mr. J. Cave, Head

Mr. P. Cheng, Hydroacoustics Biologist

Ms. V. Craig, Test Fishing Biologist (Term)

Racial Identification Group

Mr. J. Gable, Head

Mr. S. Cox-Rogers, Sockeye Racial Analysis Biologist

Mr. B. White, Pink Racial Analysis Biologist

Ms. C. Arffman, Senior Scale Analyst

Ms. H. Derham, Scale Lab Assistant

Ms. J. Parkin, Scale Analyst (Term)

Biometrics/Computer Services Group

Mr. I. Guthrie, Head

Ms. K. Mulholland, Computer Programmer/Analyst/Operator

Mr. D. Stelter, Catch Statistician

Mr. K. Forrest, Assistant Catch Statistician (Term)