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**Report of the  
Fraser River Panel  
to the  
Pacific Salmon Commission  
on the  
1987 Fraser River Sockeye  
and Pink Salmon Fishing Season**



*Prepared by*

**Pacific Salmon Commission  
August, 1988**

**REPORT OF THE  
FRASER RIVER PANEL  
TO THE  
PACIFIC SALMON COMMISSION  
ON THE  
1987 FRASER RIVER SOCKEYE  
AND PINK SALMON FISHING SEASON**

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**PACIFIC SALMON COMMISSION  
AUGUST, 1988**

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# I. EXECUTIVE SUMMARY

1. Management plans for harvesting Fraser River sockeye and pink salmon runs in the Panel Area during 1987 were developed by the Panel prior to the fishing season. These plans incorporated pre-season run-size estimates and goals for escapement and international sharing of harvests and for Canadian and United States allocations to user groups. A fishing regime and management plan was adopted by the Commission and submitted to the Parties in June.
2. In-season regulations for the management of the Panel Area fisheries were formulated by the Panel to adjust for actual run strengths and timing. Escapement goals and international and domestic allocation objectives guided the Panel in this process. The Panel met 29 times during the fishing season to adjust fishing schedules to achieve these objectives.
3. Fraser River sockeye returns totalled 7,662,000 fish, of which 5,747,000 were harvested and 1,915,000 reached their spawning grounds in the watershed. Commercial catches totalled 5,173,000 sockeye, divided between Canada (3,232,000) and the United States (1,941,000). In addition, Fraser River Indian food fisheries accounted for 468,000 sockeye while other non-commercial fisheries took 106,000 sockeye.
4. Estimated pink salmon returns of 7,065,000 fish were only 64% of the pre-season forecast (11,000,000) and, consequently, neither catch nor escapement reached expected levels. An estimated 3,841,000 Fraser River pink salmon were harvested in all areas, while 3,224,000 fish reached spawning grounds in the Fraser watershed. Canadian commercial fishery catches totalled 2,410,000 Fraser pink salmon while United States fishermen landed 1,256,000. Non-commercial catches accounted for 175,000 pink salmon.
5. Monitoring of the sockeye and pink salmon runs by test fishing and river echo sounding provided the Panel with reliable information that was used to schedule fisheries to meet catch and escapement objectives. Gross escapement of adult sockeye was estimated, in-season, at 2,152,000, compared with post-season reports of spawning escapements and Fraser River Indian food fishery catches upstream of Mission totalling 2,330,000 sockeye.
6. Racial analysis of commercial and test fishery catches provided information about Fraser sockeye stocks required to regulate the fishery to obtain the escapements of the various stocks specified by Canada. Genetic stock identification (GSI) techniques were applied to samples from Panel Area, south coast, and northern area pink salmon catches in efforts to identify and enumerate the Fraser River component. Racial identification of sockeye and pink salmon in distant, mixed-stock fisheries in northern British Columbia and southeastern Alaska permitted the Panel to fulfil its mandate to account for Fraser River sockeye and pinks wherever caught.
7. The total allowable catch (TAC) of sockeye was estimated post-season at 5,566,000 fish. The United States portion of the TAC was 2,003,000, including a payback of 100,000 sockeye for the 1986 catch shortfall. The actual United States catch was 61,000 short of this allocation figure. Similarly, United States pink salmon catches were short of the allocation goal by 115,000 fish. The small pink salmon run was insufficient to allow a directed harvest to balance the catch.
8. Escapements to Fraser watershed spawning grounds were estimated by Canada Department of Fisheries and Oceans at 1,915,000 sockeye including 1,896,000 adult spawners. This total exceeded the Canadian goal (1,760,000) by 136,000 fish. However, the distribution of spawning was well balanced, with most individual spawning area totals near or slightly in excess of the goals. Pink salmon escapements totalled 3,224,000 spawners which was 54% of the goal. The reduced total run of pink salmon did not permit the escapement objective to be fulfilled.

## II. INTRODUCTION

Under the terms of the Pacific Salmon Treaty, the Fraser River Panel is charged with the responsibility of managing the Fraser sockeye and pink salmon fishery for the Pacific Salmon Commission. The Panel receives direction from the Commission, and forecasts, escapement goals and catch allocation objectives from the Parties. Based on this information, the Panel recommends an annual fishery regime and management plan for the Panel Area that is designed to achieve international objectives for escapement and the orderly harvest of these stocks. During the actual fishing period, generally July through September, the Panel meets one or more times each week to develop regulations for Canadian and United States Panel Area fisheries. These regulations are implemented and enforced by the respective governments. In the process of both pre-season and in-season management, the Panel receives valuable information and advice from the governments; from commercial, Treaty Indian, subsistence and sport fishing interests; and from the Commission's Fisheries Management Division (the "Staff") who collect and analyze the catch and escapement data.

In making appointments to the Panel, both governments recognize that the participation of interest-group representatives on the Fraser River Panel aids the fishery management process. These representatives provide an avenue for user-group input to decision-making. The current (March, 1988) membership of the Panel and their user-group representation are listed below.

### CANADA

#### Members:

Mr. F. Fraser, Chair  
Area Manager, Fraser River, N.B.C.  
and Yukon Division  
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

#### Alternates:

Mr. E. Birch  
Gillnet fishermen  
Mr. M. Griswold  
Gulf troll fishermen  
Mr. J. Hill  
Salmon processing industry  
Mr. H. Matsuzaki  
Fishing equipment suppliers  
Mr. A. Roberts  
Purse seine fishermen  
Ms. M. Williams  
Outside troll fishermen

### UNITED STATES

#### Members:

Ms. L. Loomis, Vice-Chair  
Treaty Indian tribes  
Mr. R. Schmitten  
Director, Northwest Region  
National Marine Fisheries Service  
Mr. R. Turner  
Assistant Director  
Washington Department of Fisheries  
Mr. R. Zuanich  
Commercial salmon fishing industry

#### Alternates:

Mr. R. Allen  
Treaty Indian tribes  
Mr. D. Austin  
Chief, Harvest Management  
Washington Department of Fisheries  
Dr. T. Kruse  
Deputy Director, Northwest Region  
National Marine Fisheries Service  
Mr. R. Suggs  
Commercial salmon fishing industry

The Pacific Salmon Treaty, signed in 1985, provides for the annual allocation of Fraser River sockeye and pink salmon between Canada and the United States during the period, 1985-1988 (Annex IV, Chapter 4). Projections of run sizes and expected harvests were included in the Annex. The sharing of annual catches during this period was to be adjusted based on pre-season and in-season estimates of abundance. In addition, provisions were made for repayment of catch shortfalls and overages which might occur in either country due to management imprecision. Thus, the negotiators of the Treaty anticipated deviations from the projected total allowable catches (TAC) and sharing of Fraser River sockeye and pink salmon catches during the first four years of the agreement.

In 1987, the Commission and, thence, the governments agreed to further interpretations of the Treaty. These changes affected the management of the Fraser River sockeye and pink salmon stocks in the 1985-1988 period as well as in the second four-year period, 1989-1992 (Appendix A). Most important of these interpretations was that Canada could unilaterally increase spawning escapements above the levels originally stated for calculating TAC. While these increased escapements would be deducted from the Canadian catch share in that year, production benefits from these "escapement add-ons" would flow to Canada in the years of return. A committee of Canadian and United States technical advisors to the Fraser River Panel has the responsibility of recommending to the Panel procedures for computing the benefits arising from "escapement add-ons".

Other sections of the agreement define the sharing of catch in the 1989-1992 period and the latitude allowed the United States in spreading its catch over those four years. The Panel also agreed to a computation formula for TAC which excludes:

- a) adult spawner escapements up to the annual goals referenced in Treaty background documents or up to the actual escapement if the annual goals are exceeded because of management imprecision,
- b) jack sockeye in the spawning escapement,
- c) catches by Panel-approved test fisheries and research charters.

Management of Fraser River sockeye and pink salmon harvests in 1987 by the Fraser River Panel was conducted with the above agreements in place. Canada submitted forecasts of expected sockeye and pink salmon returns and escapement goals to the Commission in February, 1987 (Appendix B). Domestic allocation objectives were received from the Parties in March. Agreement on the 1987 Regulations and Management Plan was delayed pending settlement on harvest strategies and the payback to the United States of catch shortfalls that had occurred in 1985 and 1986. A Management Plan and Regulations were submitted to the Commission and approved and forwarded to the governments in June, 1987 (Appendix C).

### III. MANAGEMENT ACTIONS

#### A. Pre-Season Regulations

Canada provided the Commission with pre-season forecasts of 1987 stock abundances of Fraser River sockeye and pink salmon which indicated that the summer-run Chilko River and Stellako River stocks and the late-run Adams River stock would predominate in the sockeye return (Appendix B). The forecast total returns were 6,228,000 adult sockeye and 11,000,000 pink salmon. Spawning escapement goals were 1,760,000 adult sockeye allocated by stock and 6,000,000 pink salmon.

In addition to the Treaty-defined escapement goal of 1,500,000 adult spawners, Canada proposed to forego the catch in 1987 of 260,000 adult sockeye which would be allowed to spawn, having gained the assurance that future production benefits resulting from the increased escapement would flow to Canada. Canada also set aside an added 100,000 sockeye for the Fraser River Indian food fishery beyond the 400,000 sockeye exemption provided in the Treaty (Annex IV, Chapter 4). These additions raised the gross escapement goal to 2,260,000 sockeye; 1,760,000 for spawning escapement and 500,000 for the Fraser River Indian food fishery.

Of the TAC of sockeye, estimated at 4,330,000 fish pre-season, the Panel agreed that the United States share would be 1,581,000 sockeye, including a 100,000 fish payback to the United States for the catch shortfall that occurred in 1986. Summer-run (Chilko, Stellako, etc.) and late-run (Adams, Birkenhead, etc.) sockeye TAC's were to be allocated to the Parties in the same proportions. United States fishermen were also allocated 1,728,000 pink salmon, including a payback of 228,000 fish for the catch shortfall in 1985. Commercial catches of Fraser River salmon in Canada were expected to reach 2,389,000 sockeye and 3,172,000 pink salmon.

The domestic allocation objective in the United States for Treaty Indian and Non-Indian fisheries each to catch 50% of the available sockeye harvest was adjusted to compensate for a 45,000 fish shortfall in the Treaty Indian harvest in 1986. Treaty Indian and Non-Indian fishermen were to share the pink salmon catch equally.

In Canada, the Minister of Fisheries approved the Minister's Advisory Council (MAC) plan which allocated the Canadian share of Fraser River sockeye and south coast pink salmon to the various gear types and areas. Canada requested that the MAC allocation plan be implemented in the Panel Area. The Fraser River sockeye allocation was as follows:

- a) outside troll - 10.5% to 11.5%,
- b) inside troll - 1.5% to 3.5%,
- c) purse seine - 51.5% to 52.0%, and
- d) gillnet - 34.5% to 35.0%.

Pink salmon were to be allocated to the gear groups on the basis of total south coast catches of all stocks, including Fraser River and non-Fraser pink salmon. The outside troll fishery was to receive 29%; inside trollers, 4%; purse seines, 58%; and gillnets, 9% of the catch.

Regulations for the 1987 Panel Area fisheries for Fraser River sockeye and pink salmon were developed in June, 1987. The Panel agreed to regulate the Panel Area fisheries on a "CLOSED UNLESS OPENED" basis, in which the fishing areas were closed by pre-season Regulations of the Commission (Appendix C) and opened only via Orders of the Fraser River Panel. Such Orders were to be tailored to permit the harvest of the available stocks and provide for international and domestic allocations.

The Panel also developed a pre-season Management Plan that provided estimates of fishing times and approximate opening dates for the various fisheries. This Plan was developed using a computer model that simulates the migration of Fraser River sockeye and pink salmon, and the fisheries that target on these stocks. Coordination of management plans in Canada between the Panel and the Canada Department of Fisheries and Oceans (for non-Panel areas) took place in the pre-season and in-season periods to achieve the objectives of Canada for domestic allocation of the catch.

## **B. In-season Regulations**

The Fraser River Panel met 29 times between July 7 and October 9 to adopt fishing plans for the Panel Area (Figure 1) with the objective of achieving goals for escapement of sockeye and pink salmon to spawning grounds in the Fraser River, and goals for catch allocation among the fishermen of Canada and the United States. These management decisions are summarized in the Orders of the Fraser River Panel (Appendix D).

The summer-run sockeye stocks arrived later than expected, requiring the Panel to delay the opening of net fishing in all Panel Area waters (Tables 1 and 2). United States Treaty Indian fishing in Areas 4B, 5 and 6C was first opened July 28, to harvest the early segment of the Chilko River sockeye run. The Canadian gillnet fishery in Area 29 opened on August 4, the latest opening of the fishery on the cycle since 1947. United States Areas 6, 7 and 7A opened on August 5, with Treaty Indian and Non-Indian fishermen participating jointly. The first open period in Canadian Area 20 was delayed to August 10, two weeks later than originally planned.

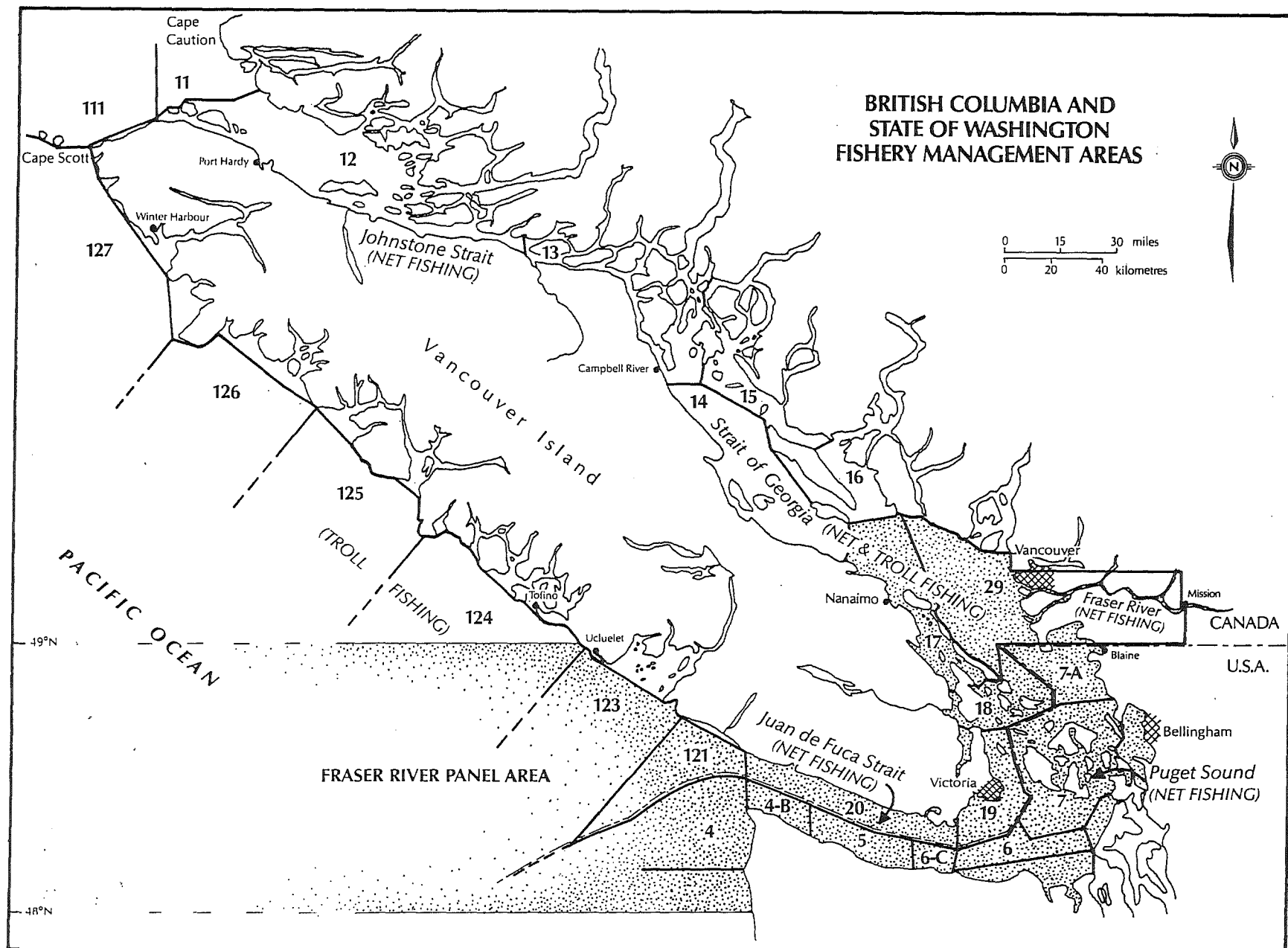


FIGURE 1. Fishery management areas in the Fraser River Panel Area, along Canada's south coast and in United States waters. The type of fishery (net or troll) that operates in each area is also indicated.



**TABLE 1.** Proposed versus actual fishing times (days) in major Canadian net fisheries in the Fraser River Panel Area.

Week	AREA 20		AREA 29	
	Proposed	Actual	Proposed	Actual
6/21-7/25	Closed	Closed	Closed	Closed
7/26-8/1	1	Closed	1	Closed
8/2-8	1	Closed	1	1
8/9-15	1	2	1	1
8/16-22	1	1	1	2
8/23-29	1	2	1	1 *
8/30-9/5	2	1	1	2
9/6-12	Closed	Closed	1 *	1 **
9/13-19	Relinq.	Closed	Closed	Closed
9/20-26		Relinq.	Closed	Closed
9/27-10/3			Closed	Closed
10/4-10			Closed	Closed
10/11-17			Relinq.	Closed
10/18-24				Relinq.
TOTAL	7	6	7	8

\* Restricted to Area 29-1 to 7, 9 and 10 or Area 29-1 to 6 (Strait of Georgia).

\*\* Restricted to Area 29-11 to 17 (Fraser River proper).

**TABLE 2.** Proposed versus actual fishing times (days) in major United States net fisheries in the Fraser River Panel Area.

Week	TREATY INDIAN				ALL-CITIZEN	
	AREAS 4B, 5 & 6C		AREAS 6, 7 & 7A		AREAS 7 & 7A*	
	Proposed	Actual	Proposed	Actual	Proposed	Actual
6/21-7/18	Closed	Closed	Closed	Closed	Closed	Closed
7/19-25	5	Closed	Closed	Closed	Closed	Closed
7/26-8/1	6	5	2	Closed	1	Closed
8/2-8	7	7	2	2	1	1
8/9-15	7	7	3	2	2	2
8/16-22	6	7	3	7	1	3
8/23-29	6	7	3	6	1	2
8/30-9/5	3	6	3	5	1	2
9/6-12	Closed		Closed	Closed	Closed	Closed
9/13-19	Relinq.		Closed	Closed	Closed	Closed
9/20-26			Relinq.	Closed	Relinq.	Closed
9/27-10/3				Relinq.		Relinq.
TOTAL	40	39	16	22	7	10

\* All-Citizen fishing times in Areas 4B, 5, 6, and 6C from 6/21 to 8/22 were the same as in Areas 7 and 7A, but these areas were closed after 8/22.

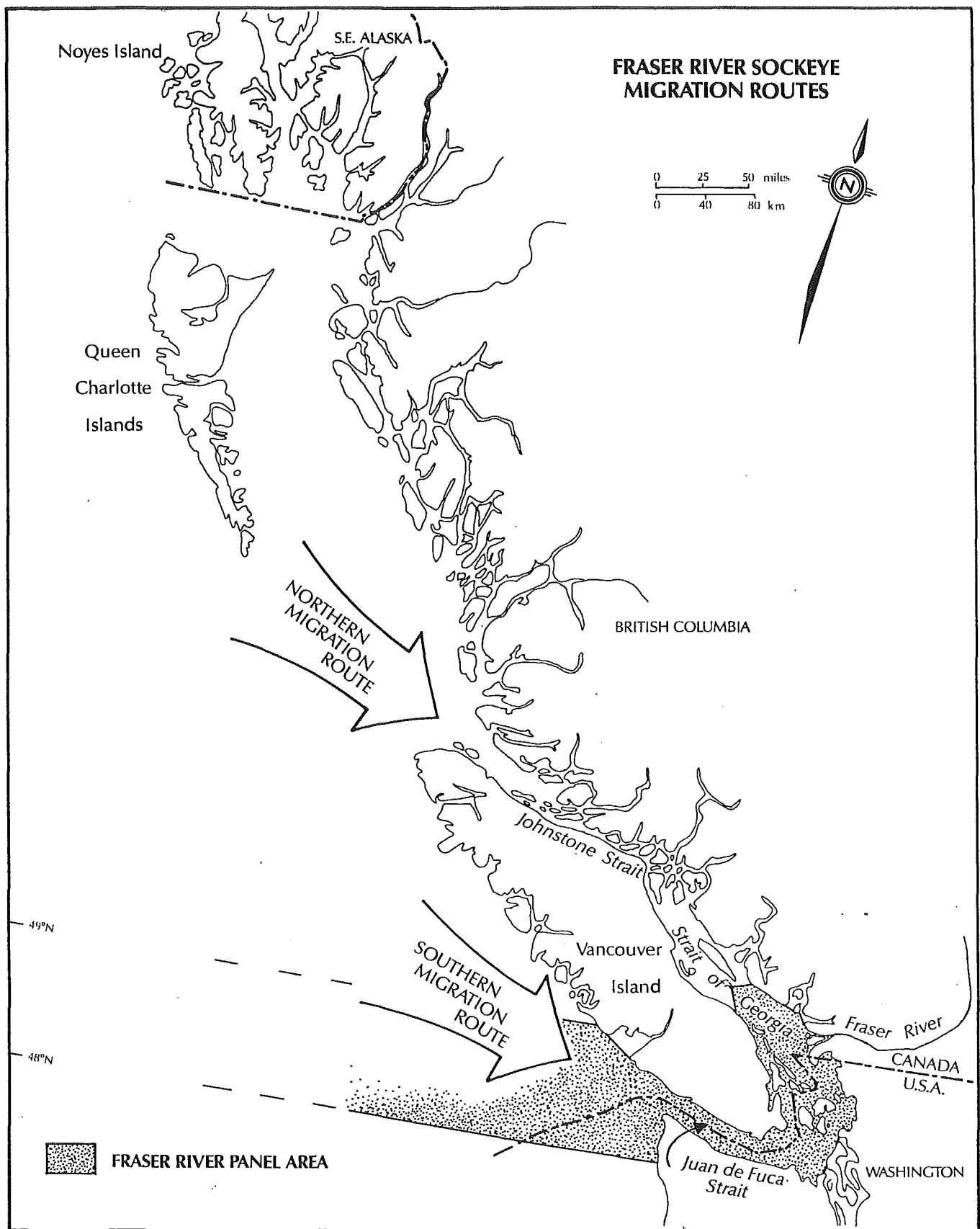


FIGURE 2. The Fraser River Panel Area in relation to the coast of British Columbia and northern Washington. The northern (Johnstone Strait) and southern (Juan de Fuca Strait) routes for sockeye and pink salmon migrating to the Fraser River are shown.

During the week of August 2-8, a strong shift in the migration of sockeye from the southern (Juan de Fuca Strait) route to the northern (Johnstone Strait) route (Figure 2) influenced the management of all south coast fisheries. The reduced abundance of fish entering United States waters via Juan de Fuca Strait required that all available southern-approach fish be reserved for United States fishermen to meet international allocation objectives. Canadian Area 20, therefore, remained closed at the commencement of the week of August 16-22. United States Areas 7 and 7A were opened for fishing on August 15 and Treaty Indian or All-Citizen fleets fished 18 of the next 19 days to achieve the United States allocation. By August 22, a shift back to the southern migration route caused the Panel to reopen the fishery in Canadian Area 20 to help meet Canada's allocation goals.

During the period of high Johnstone Strait migration the Panel focused on the dual objectives of balancing United States Treaty Indian and Non-Indian catches while achieving international catch allocation goals. Domestic allocation between Canadian purse seine and gillnet fishermen also required several adjustments to regulations. Because of the need to reserve most fish in the Johnstone Strait migration for escapement and Canadian Area 29 catch, close coordination of Panel Area fisheries and fisheries in Canadian non-Panel areas was required. This coordination of fishery management actions was extended to all Canadian outside troll areas.

The pre-season plans had been structured so that the abundance of late-run sockeye escaping into the Strait of Georgia would be sufficient for a limited Area 29 gillnet fishery on Adams River sockeye and for spawning escapement. Imbalances in international allocations required greater fishing time in approach-route fisheries and, consequently, insufficient numbers of late-run sockeye arrived in the Strait of Georgia to allow further harvest. The Fraser River portion of Area 29 was opened on September 12 for one day to harvest surplus Birkenhead River sockeye.

Actual pink salmon returns were lower than forecast. Consequently, directed fishing for pink salmon in both Canadian and United States Panel waters was severely restricted. Directed pink salmon fishing was limited to one day in Area 20 (September 2), and did not occur at all in United States waters or in Canadian Area 29. Harvest of pink salmon in these areas was limited to incidental catches during fisheries directed on sockeye salmon.

## IV. CATCH SUMMARY

### A. Sockeye Salmon

The 1987 run of Fraser River sockeye salmon was the second largest return on the cycle since 1899. The total return of 7,662,000 fish was 23% larger than the pre-season forecast of 6,228,000 adult sockeye and 50% larger than the parent 1983 return (Figure 3). The substantial return in 1987 was primarily 4-year-old sockeye (6,600,000) produced by the 1983 spawning and 5-year-old fish (1,000,000) from the very successful 1982 brood. The ratio of recruits to spawners for the 1983 brood was 6.8:1.0, which is very high considering the adverse affects of the "El Nino" event on the 1983 spawners. For many stocks, the size of spawning fish in 1983 was the smallest on record and escapements were below targeted levels. Because both these factors tended to reduce the total number of eggs deposited, the sizeable return in 1987 was more noteworthy than if it had resulted from a large spawning population of normally sized adults.

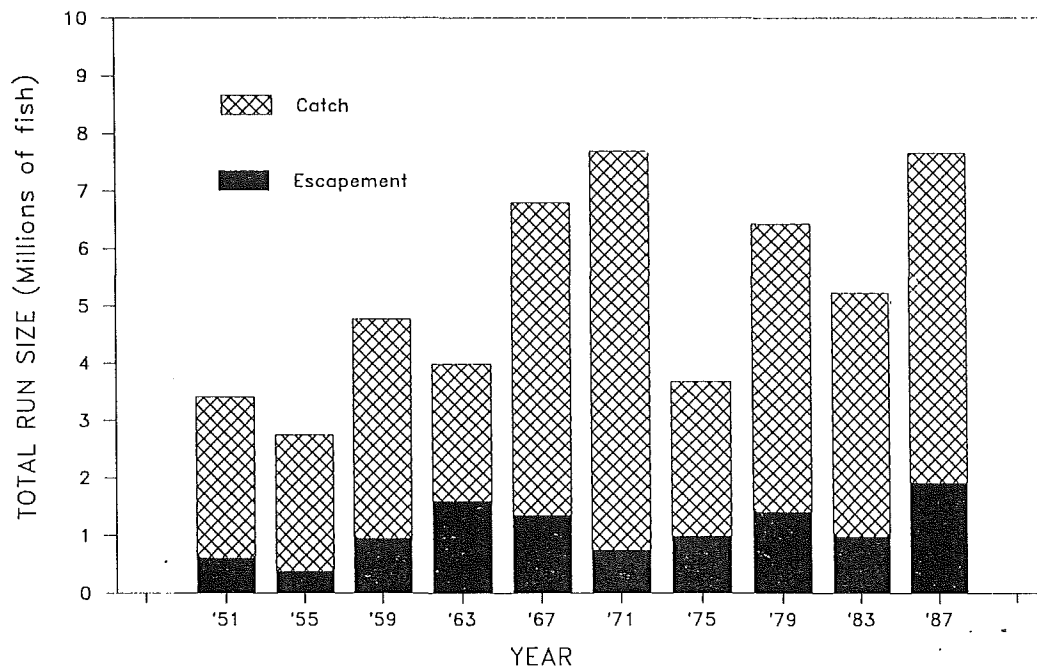


FIGURE 3. Catch, escapement and total run sizes for the 1987 cycle of Fraser River sockeye salmon for cycle years 1951-1987.

Catches of Fraser River sockeye totalled 5,747,000 fish, including 5,173,000 taken in commercial fisheries, 508,000 in Canadian Indian food fisheries, 8,000 in recreational fisheries and 53,000 in test fisheries (Table 3). Spawning escapements reached 1,915,000 fish, including 19,000 jack sockeye. The catch was the largest on the cycle since 1971, while the escapement was the largest estimated on this cycle dating back to 1899.

The pre-season projection of the total catch was about 4,500,000 of the forecast return of 6,228,000 sockeye. The observed return was 1,430,000 larger than expected and resulted in a catch that exceeded projections by 1,280,000 fish. Most of the additional catch was harvested in commercial fisheries.

Fish size in 1987 was slightly below average with 4-year-old sockeye weighing 5.8 lbs. (2.63 kg). Fishery catches averaged 6.2 lbs. (2.81 kg) due to the abundance of large 5-year-old fish in these catches.

**TABLE 3.** Preliminary estimates for total fishery catches of Fraser River sockeye salmon during the 1987 fishing season, by country and area.

COMMERCIAL CATCH:		No. of Fish	% of Run
<u>CANADA</u>			
Fraser River Panel Area:			
Areas 121-124 Troll		208,000	2.72
Area 20 Net		463,000	6.04
Areas 17-18 and 29 Troll		33,000	0.43
Area 29 Net		600,000	7.83
Subtotal		1,304,000	17.02
Non-Panel Area:			
Areas 1-10 Net and Troll		79,000	1.03
Areas 11-12, 124-127 Troll		277,000	3.61
Areas 11-16 Net		1,510,000	19.71
Areas 13-16 Troll		62,000	0.81
Subtotal		1,928,000	25.16
CANADA TOTAL		3,232,000	42.18
<u>UNITED STATES</u>			
Fraser River Panel Area:			
Areas 4B, 5 and 6C Net		64,000	0.84
Areas 6, 7 and 7B Net		1,174,000	15.32
Area 7A Net		698,000	9.11
Subtotal		1,936,000	25.27
Non-Panel Area:			
Alaska Net	Subtotal	5,000	0.07
UNITED STATES TOTAL		1,941,000	25.34
COMMERCIAL TOTAL		5,173,000	67.52
NON-COMMERCIAL CATCH:			
<u>CANADA</u>			
Areas 12-13, 18, 20, 123-124 Indian F.F.		40,000	0.52
Areas 125-127, 111, 12 Test Fishing		6,000	0.08
Fraser River Indian Food Fishery		468,000	6.11
Recreational Fishery		8,000	0.10
Spawning Channel Surplus Sales		5,000	0.06
Subtotal		527,000	6.88
<u>UNITED STATES</u>			
Area 5 Test Fishing	Subtotal	1,000	0.01
<u>COMMISSION</u>			
Areas 123-124, 20, 29 Test Fishing		40,000	0.52
Area 7 Test Fishing		6,000	0.08
Subtotal		46,000	0.60
NON-COMMERCIAL TOTAL		574,000	7.49
TOTAL CATCH		5,747,000	75.01
ESCAPEMENT:		1,915,000	24.99
TOTAL RUN		7,662,000	100.00

## 1. Canada

The harvest of Fraser River sockeye in Canada was managed by the Panel and the Canada Department of Fisheries and Oceans (DFO) to achieve the MAC-recommended allocation to the respective gear as approved by the Minister of Fisheries. Total commercial catch in Canada reached 3,232,000 sockeye, of which 1,304,000 were caught in the Panel Area and 1,928,000 in non-Panel areas (Table 3, Appendix Tables 1 to 4). The largest catch (1,510,000 fish; 47.7%) was taken by purse seines and gillnets in Areas 11 to 16 in Johnstone Strait. Fraser River (Area 29) gillnet catches reached 600,000 sockeye (18.6%) and Area 20 net catches totalled 463,000 sockeye (14.3%). The "outside" troll catch in Areas 121 to 127 was 464,000 Fraser sockeye. Troll catches in Areas 1 and 2W (71,000) and Areas 11 and 12 (21,000) brought the outside troll total to 556,000 fish (17.2%). Inside troll catches in Areas 13 to 18 and 29 summed to 95,000 sockeye (2.9%).

**TABLE 4.** Preliminary estimates for Canadian catches<sup>1</sup> of Fraser River sockeye salmon by gear type and area during the 1987 fishing season.

Areas	Troll		Purse Seine		Gillnet		Total	
	Catch	%	Catch	%	Catch	%	Catch	%
1-10	71,000	2.20	8,000	0.25	0	0.00	79,000	2.45
11-16*	21,000	0.65	1,143,000	35.37	367,000	11.35	1,531,000	47.37
13-16**	62,000	1.92	—	—	—	—	62,000	1.92
121-127	464,000	14.35	0	0.00	0	0.00	464,000	14.35
20	0	0.00	399,000	12.34	64,000	1.99	463,000	14.33
17,18,29	33,000	1.02	0	0.00	600,000	18.56	633,000	19.58
<b>TOTAL</b>	<b>651,000</b>	<b>20.14</b>	<b>1,550,000</b>	<b>47.96</b>	<b>1,031,000</b>	<b>31.90</b>	<b>3,232,000</b>	<b>100.00</b>

<sup>1</sup> Preliminary catch data from Canada Department of Fisheries and Oceans' fish sales slips plus estimates of unreported catches by the Fisheries Management Division of the Pacific Salmon Commission

\* Includes Areas 11 and 12 troll only (outside troll).

\*\* Includes Areas 13-16 troll only (inside troll).

The sockeye catch by gear in Canada (Table 4) showed that purse seines caught 1,550,000 fish (48.0%), gillnets harvested 1,031,000 (31.9%) and trollers caught 651,000 (20.1%). The outside troll catch exceeded the MAC allocation of 10.5-11.5%, reaching 17.2% of Canada's total. Consequently, both purse seine and gillnet catches were lower than the MAC allocations. Within the net sector, however, the distribution of the catch was within 1% of target ratio of 60% purse seine and 40% gillnet.

The overage in the troll catch off the west coast of Vancouver Island and northward was traced to (a) high catch rates near the end of the 10-day sockeye retention period for fisheries in Areas 121 to 127 and (b) large troll catches in northern areas combined with higher contributions of Fraser River sockeye than were estimated in-season. Management of these fisheries by Canada Department of Fisheries and Oceans suffered from the difficulty of estimating catch rates in the short, intense troll fisheries distributed along the extensive British Columbia coast.

The troll fishery was also affected by the rapid changes that occurred in the migratory behavior of sockeye. The outside troll fishery opened near the end of the first pulse of fish migrating southeastward along the west coast of Vancouver Island, when sockeye abundances were declining. That fishery initially was able to retain sockeye (August 7) during moderate fish abundances, because 50% to 60% of all sockeye were migrating through Johnstone Strait (i.e., the northern route) at that time instead of through Juan de Fuca Strait (i.e., the southern route). When the primary migration returned to the southern route about August 13, a second pulse of fish entered the main troll fishing areas along the west coast of Vancouver Island (Areas 123 and 124). This resulted in high catch rates and a catch overage by the time the fishery was closed on August 16.

The high northern diversion in early to mid August resulted in large weekly net fishery catches in Areas 11 to 16. In the week ending August 15, 682,000 Fraser River sockeye were harvested in these areas in 2 days of fishing (3.5 days for gillnets). The maximum weekly net fishery catch in 1987 exceeded 1983 levels: 654,000 sockeye in 2 days of fishing during the week ending August 13, 1983, when approximately 80% of that year's smaller run migrated via Johnstone Strait, yielding net and troll catches totalling 2,481,000 Fraser sockeye (Appendix Table 4). The total catch in Areas 11 to 16 during 1987 was 1,591,000 sockeye salmon.

Peak weekly catches in the various fishing areas occurred simultaneously in the week ending August 15 (Appendix Tables 1 to 4), partly due to the changing diversion rate and to the fishing schedules that were developed to meet the escapement and catch allocation objectives formulated by Canada. The peak weekly catch in Area 20 was 210,000 sockeye, which were harvested in two days of fishing. Area 29 catches in the week ending August 15 totalled 185,000 sockeye for one day of fishing. Troll catches in Areas 121 to 127 peaked during the week ending August 15, but landings in these areas peaked the following week when the large catches of August 13-16 were landed.

Canadian Indian food fishery catches were distributed among native fishermen along the Fraser River and its tributaries (468,000), and those fishing in marine areas (40,000) (Table 3). Fraser River catches were 28% larger than in 1983, primarily due to the larger gross escapement in 1987 (Appendix Table 6). Record low water levels during August adversely affected native fishing in certain areas.

## 2. United States

Fraser River sockeye catches in United States Panel Area waters reached 1,936,000 fish, the largest on the cycle since 1971. This total was over 5 times larger than the very poor 1983 harvest that resulted from an extremely high diversion of sockeye via Johnstone Strait in that year (Appendix Table 5).

**TABLE 5.** Preliminary estimates for United States catches<sup>1</sup> of Fraser River sockeye salmon by user group, gear type and area during the 1987 fishing season.

TREATY INDIAN								
Areas	Gillnet		Purse Seine		Reef Net		Total	
	Catch	%	Catch	%	Catch	%	Catch	%
4B, 5, 6C	61,000	6.30	0	0.00	0	0.00	61,000	6.30
6, 7, 7B	306,000	31.58	290,000	29.92	0	0.00	596,000	61.50
7A	207,000	21.36	105,000	10.84	0	0.00	312,000	32.20
TOTALS	574,000	59.24	395,000	40.76	0	0.00	969,000	100.00
NON-INDIAN								
Areas	Gillnet		Purse Seine		Reef Net		Total	
	Catch	%	Catch	%	Catch	%	Catch	%
4B, 5, 6C	3,000	0.31	0	0.00		0.00	3,000	0.31
6, 7, 7B	229,000	23.68	295,000	30.51	54,000	5.58	578,000	59.77
7A	126,000	13.03	260,000	26.89	0	0.00	386,000	39.92
TOTALS	358,000	37.02	555,000	57.40	54,000	5.58	967,000	100.00
GRAND TOTALS	932,000	48.14	950,000	49.07	54,000	2.79	1,936,000	100.00
UNITED STATES TEST FISHING (Treaty Indian catch):							1,000	
ALASKA (DIST. 104) CATCH:							5,000	
UNITED STATES TOTAL CATCH:							1,942,000	

<sup>1</sup> 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.

The harvest of Fraser sockeye in United States waters was to be allocated equally to Treaty Indian and Non-Indian fishermen, except for a payback of 45,000 sockeye to Treaty Indians to compensate for a catch shortfall in 1986. The catch by Treaty Indians (969,000) was similar to the Non-Indian catch (967,000 in Washington)(Table 5). Thus, the payback was not achieved despite an intensive fishery in which Treaty Indian fishermen fished 18 of 19 days from August 15 to September 3. Low daily abundance of sockeye approaching the Fraser River via the Juan de Fuca Strait in mid August required the Panel to provide extra fishing opportunity to United States fishermen to achieve the catch allocation goals. Because the daily exploitation rate for the Treaty Indian fleet was lower than for the larger Non-Indian fleet, Treaty Indians were allowed greater fishing time.

United States commercial catches of Fraser sockeye (1,941,000 fish) occurred primarily within the Panel Area (1,936,000). Most of these fish were caught in the Salmon Banks (Areas 6, 7 and 7B) fishery, which harvested 1,174,000 sockeye (Table 5). In the Point Roberts (Area 7A) fishery, 698,000 sockeye were caught. An additional 64,000 Fraser sockeye were landed in the Juan de Fuca Strait (Areas 4B, 5 and 6C) fishery. A catch of 5,000 Fraser River sockeye was harvested in the Alaska District 104 fishery.

Catch by gear in Washington State waters was divided nearly evenly between gillnets (932,000; 48.1%) and purse seines (950,000; 49.1%), while reef nets harvested 54,000 sockeye (2.8%) (Table 5). The bulk of the gillnet harvest was taken by Treaty Indian fishermen (574,000 fish) and, conversely, the larger share of the purse seine catch was by Non-Indian fishermen (555,000 fish). Within the Treaty Indian fishery, 59.2% of the catch was taken by gillnets and 40.8% by purse seines. A reversal of this trend was seen in the Non-Indian catch, with 57.4% taken by purse seines, 37.0% by gillnets and 5.6% by reef nets.

The catch-by-week statistics (Appendix Table 5) show the peak harvest of sockeye in the United States occurred during the week ending August 22 (853,000), with smaller amounts landed in the weeks ending August 15, August 8 and August 29. The peak daily catch was taken August 21.

Fishing times were more extensive than anticipated in the Management Plan because of the need to fish during low abundance periods in mid to late August. Pre-season expectations of fishing times to harvest sockeye salmon were 13 fishing days for Treaty Indians and 6 days for Non-Indian fishermen in the five weeks between July 26 and August 29 (Table 2). Actual fishing time amounted to 22 and 10 days, respectively, between August 2 and September 5.



## B. Pink Salmon

Fraser River pink salmon returns in 1987 were forecast at 11 million fish (range: 8 to 14 million). On the basis of this forecast abundance and the escapement goal of 6.0 million spawners, the fishery Management Plan developed by the Panel called for directed fishing on pink salmon only during the latter part of August and the first few days of September. While the anticipated pattern of fishing was realized as a result of meeting sockeye harvest objectives, directed fishing on pink salmon was limited to one day during early September in Canadian Area 20. No directed harvest of pink salmon was permitted in Area 29 or in United States waters.

Estimates of stock composition for pink salmon catches were obtained by genetic stock identification (GSI) techniques using protein electrophoretic analysis of tissue samples. The preliminary estimate of the Fraser River pink salmon run was 7,065,000 fish, which was 64% of the forecast and 12% below the minimum of the forecast range. This was the smallest run since 1975, and was less than one-half the abundance of each of the prior four returns 1979-1985 (Table 6).

**TABLE 6.** Total run size of Fraser River pink salmon stocks between 1959-1987.

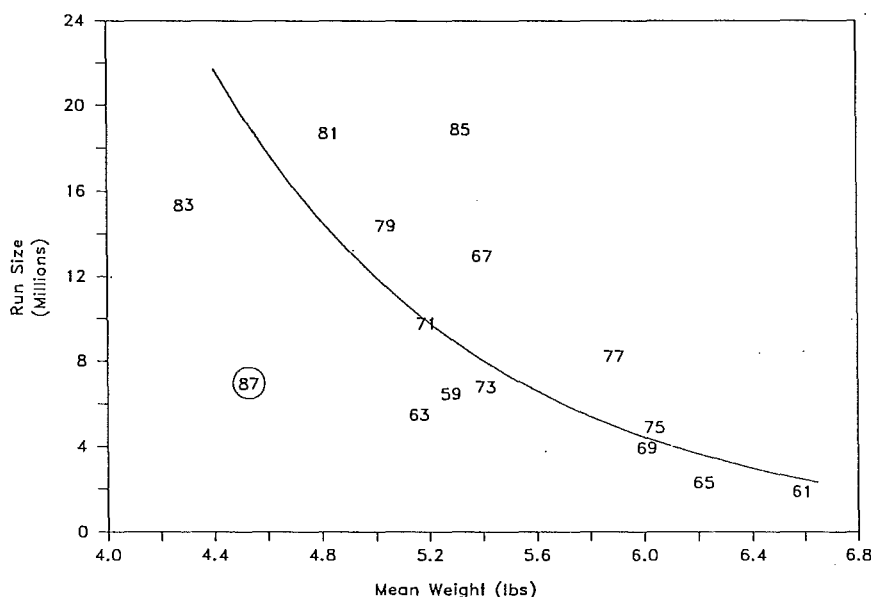
Year	Total Run
1959	6,460,000
1961	1,888,000
1963	5,477,000
1965	2,320,000
1967	12,968,000
1969	3,928,000
1971	9,767,000
1973	6,789,000
1975	4,894,000
1977	8,243,000
1979	14,404,000
1981	18,685,000
1983	15,346,000
1985	18,864,000
1987	7,065,000
Average	9,140,000

The poor return in 1987 resulted from a combination of poor egg-to-fry survival (4.3%) and a marine survival rate (2.8%) that was lower than the average for the 1961-1985 period (3.1%) (Table 7). The low freshwater survival was likely due to two factors during 1985: poor success of upriver (Seton Creek and Thompson River) stocks in reaching their spawning grounds and adverse environmental conditions in the fall. The rate of return (1.09:1.00) was the lowest since 1965, when 1.16 adults returned for each brood year spawner.

**TABLE 7.** Fraser River pink salmon production. (Fry production data not available prior to 1961).

	BROOD YEAR												
	1961	1963	1965	1967	1969	1971	1973	1975	1977	1979	1981	1983	1985
Total Spawners (millions)	1.094	1.953	1.191	1.831	1.529	1.804	1.754	1.367	2.388	3.561	4.488	4.632	6.461
Female Spawners (millions)	0.654	1.216	0.692	0.973	0.957	1.096	1.009	0.781	1.362	2.076	2.560	2.931	3.567
Potential Egg Deposition (billions)	1.569	2.435	1.488	2.132	2.018	1.923	1.865	1.493	2.960	3.787	4.814	4.702	5.900
Fry Production (millions)	143.6	284.2	274.0	237.6	195.6	245.0	292.4	279.2	473.3	341.5	590.2	554.8	256.1
Adult Return Catch + Escapement (millions)	5.477	2.320	12.968	3.928	9.767	6.789	4.894	8.243	14.404	18.685	15.346	18.864	7.065
Freshwater Survival	9.2%	11.7%	18.4%	11.1%	9.7%	12.7%	15.7%	18.7%	16.0%	9.0%	12.3%	11.8%	4.3%
Marine Survival	3.8%	0.8%	4.7%	1.7%	5.0%	2.8%	1.7%	3.0%	3.0%	5.5%	2.6%	3.4%	2.8%

Of the total 7,065,000 Fraser pink salmon, 3,841,000 were harvested while 3,224,000 reached the spawning grounds. Commercial fishery catches totalled 3,666,000 Fraser pink salmon, 77,000 were taken by Canadian Indian fishermen, 69,000 by sport fishermen and 29,000 in Panel-approved test fisheries (Table 8). Canadian catches by all users totalled 2,555,000 Fraser River pink salmon while United States catches totalled 1,257,000.



**FIGURE 4.** Run size of Fraser River pink salmon versus the mean weight per fish of pink salmon caught in Area 20 purse seine fisheries.

In the past, an apparent inverse relationship between average weight and the abundance of Fraser River pink salmon (Figure 4) has been used in-season to initially indicate run size. This method substantially overestimated run size in 1987: the observed run size of 7,065,000 fish was much smaller than indicated by the 4.5 lb. (2.04 kg) average weight of Area 20 purse seine catches. While Fraser pink salmon average weight per fish was the second smallest observed, the size of pink salmon from northern British Columbia and southeastern Alaska was larger than usual. Numerical abundance is obviously only one of a number of influences on Fraser River pink salmon size.

**TABLE 8.** Preliminary estimates for total fishery catches of Fraser River pink salmon during the 1987 fishing season, by country and area.

COMMERCIAL CATCH		No. of Fish	% of Run
<u>CANADA</u>			
Fraser River Panel Area:			
Areas 121-124 Troll		260,000	3.68
Area 20 Net		401,000	5.68
Areas 17-18 and 29 Troll		17,000	0.24
Area 29 Net		128,000	1.81
Subtotal		806,000	11.41
Non-Panel Area:			
Areas 1-10 Net and Troll		313,000	4.43
Areas 11-12, 124-127 Troll		190,000	2.69
Areas 11-16 Net		980,000	13.87
Areas 13-16 Troll		121,000	1.71
Subtotal		1,604,000	22.70
CANADA TOTAL		2,410,000	34.11
<u>UNITED STATES</u>			
Fraser River Panel Area:			
Areas 4B, 5 and 6C Net		67,000	0.95
Areas 6 and 7 Net		842,000	11.92
Area 7A Net		322,000	4.56
Areas 3, 4, 4B, 5 and 6C Troll		10,000	0.14
Subtotal		1,241,000	17.57
Non-Panel Area:			
Calif/Ore/Wash. Troll		15,000	0.21
Alaska		Nil	0.00
Subtotal		15,000	0.21
UNITED STATES TOTAL		1,256,000	17.78
COMMERCIAL TOTAL		3,666,000	51.89
NON-COMMERCIAL CATCH:			
<u>CANADA</u>			
Areas 12-13, 18, 20, 123-124 Indian F.F.		6,000	0.08
Areas 125-127, 111, 12 Test Fishing		6,000	0.08
Fraser River Indian Food Fishery		71,000	1.00
Recreational Fishery		68,000	0.96
Subtotal		151,000	2.14
<u>UNITED STATES</u>			
Recreational Fishery	Subtotal	1,000	0.01
<u>COMMISSION</u>			
Areas 123-124, 20, 29 Test Fishing		22,000	0.32
Area 7 Test Fishing		1,000	0.01
Subtotal		23,000	0.33
NON-COMMERCIAL TOTAL		175,000	2.48
TOTAL CATCH		3,841,000	54.37
ESCAPEMENT:		3,224,000	45.63
TOTAL RUN		7,065,000	100.00

## 1. Canada

The commercial catch accounted for 2,410,000 of the 2,555,000 Fraser River pink salmon taken in Canada. Of these, 806,000 were harvested in Panel Area fisheries and 1,604,000 were taken outside the Area.

In the Panel Area, 401,000 Fraser pink salmon were harvested in Area 20 and 260,000 in the outside troll fishery (Areas 121-124). Catches in Area 29 net fisheries totalled 128,000 pinks, all taken incidentally to the harvest of sockeye salmon. The peak catch in Area 29 was taken on September 12 when an incidental catch of 70,000 pink salmon occurred during a directed fishery for sockeye.

Outside of the Panel Area, Fraser pink salmon were caught primarily in net fisheries in Johnstone Strait (Areas 11-16) and by outside trollers fishing off the west coast of Vancouver Island (Areas 124-127) and north of Vancouver Island in Areas 1 and 2W (Table 8).

The MAC allocation of pink salmon catch applied to all south coast stocks including Fraser River pink salmon. The catch of Fraser stocks by gear type was distributed as follows: troll, 855,000; purse seine, 1,304,000; and gillnet, 251,000 (Table 9). The troll catch was divided between outside (717,000) and inside trollers (138,000).

The largest catch of Fraser River pink salmon in Area 20 was taken during the August 22-24 fishery. Maximum Johnstone Strait catches were taken in the week ending August 22. Troll landings from the west coast of Vancouver Island peaked in the weeks ending August 15 and August 22. Fraser River Indian food fishery catches totalled 71,000 pink salmon, a decline in catch from 1985 levels (102,000). Lower gross escapement appears to be the cause of this decrease. Additional native food fishery catches in Areas 12-13, 18, 20, and 123-124 totalled 6,000 Fraser River pink salmon.

**TABLE 9.** Preliminary estimates for Canadian catches<sup>1</sup> of Fraser River pink salmon by gear type and area during the 1987 fishing season.

Areas	Troll		Purse Seine		Gillnet		Total	
	Catch	%	Catch	%	Catch	%	Catch	%
1-10	267,000	11.08	46,000	1.91	0	0.00	313,000	12.99
11-16*	51,000	2.12	885,000	36.72	95,000	3.94	1,031,000	42.78
13-16**	121,000	5.02	—	—	—	—	121,000	5.02
121-127	399,000	16.55	0	0.00	0	0.00	399,000	16.55
20	0	0.00	373,000	15.48	28,000	1.16	401,000	16.64
17,18, 29	17,000	0.71	0	0.00	128,000	5.31	145,000	6.02
<b>TOTAL</b>	<b>855,000</b>	<b>35.48</b>	<b>1,304,000</b>	<b>54.11</b>	<b>251,000</b>	<b>10.41</b>	<b>2,410,000</b>	<b>100.00</b>

<sup>1</sup> Preliminary catch data from Canada Department of Fisheries and Oceans' fish sales slips. Racial analysis by GSI (protein electrophoresis) methods.

\* Includes Areas 11 and 12 troll only (outside troll).

\*\* Includes Areas 13 to 16 troll only (inside troll).

## 2. United States

Treaty Indian and Non-Indian commercial catches of Fraser River pink salmon were 583,000 and 673,000 fish, respectively, for a total of 1,256,000 fish (Table 10). These catches were taken primarily in fisheries at Salmon Banks (Areas 6, 7; 842,000 fish), Point Roberts (Area 7A; 322,000 fish), and Juan de Fuca Strait (Areas 4B, 5 and 6C; 67,000 fish). Coastal troll fishermen from Washington, Oregon and California took 25,000 Fraser River fish.

Traditionally, purse seine fishermen harvest the vast majority of pink salmon in Puget Sound. However, in 1987 the fraction of Fraser River pink salmon taken by this gear (71.3%) was the lowest on record although the catch was substantial (897,000 fish). Gillnet fishermen caught 313,000 pinks and 21,000 fish were harvested by reef nets. The Treaty Indian catch-by-gear was divided between purse seines (369,000 fish), gillnets (201,000 fish) and troll (13,000). Non-Indian gear catches of Fraser River pink salmon were 528,000 for purse seines, 112,000 for gillnets, and 21,000 for reef nets and 12,000 for trollers. The troll catches were primarily taken incidentally to the harvest of other species by Treaty Indian fishermen in the Panel Area and by Non-Indian fishermen south of Panel Area waters.

TABLE 10. Preliminary estimates for United States catches<sup>1</sup> of Fraser River pink salmon by user group, gear type and area during the 1987 fishing season.

TREATY INDIAN										
Area	Gillnet		Purse Seine		Reef Net		Troll		Total	
	Catch	%	Catch	%	Catch	%	Catch	%	Catch	%
Areas 4B, 5, 6C	65,000	11.08	0	0.00	0	0.00			65,000	11.08
Areas 6, 7	99,000	16.98	315,000	54.09	0	0.00			414,000	71.07
Area 7A	37,000	6.43	54,000	9.26	0	0.00			91,000	15.69
Calif/Ore/Wash							13,000	2.17	13,000	2.17
TOTALS	201,000	34.49	369,000	63.35	0	0.00	13,000	2.17	583,000	100.00
NON-INDIAN										
Area	Gillnet		Purse Seine		Reef Net		Troll		Total	
	Catch	%	Catch	%	Catch	%	Catch	%	Catch	%
Areas 4B, 5, 6C	2,000	0.34	0	0.00	0	0.00			2,000	0.34
Areas 6, 7	84,000	12.47	323,000	47.98	21,000	3.17			428,000	63.62
Area 7A	26,000	3.78	205,000	30.35	0	0.00			231,000	34.13
Calif/Ore/Wash							12,000	1.91	12,000	1.91
TOTAL	112,000	16.59	528,000	78.33	21,000	3.17	12,000	1.91	673,000	100.00
GRAND TOTAL	313,000	24.88	897,000	71.39	21,000	1.70	25,000	2.03	1,256,000	100.00
ALASKA (DIST. 104) CATCH:									Nil	
RECREATIONAL CATCH:									1,000	
UNITED STATES TOTAL CATCH:									1,257,000	

<sup>1</sup> Preliminary Washington catch data from Washington Department of Fisheries "soft system" totals. Racial analysis by GSI (protein electrophoresis) methods.

## V. STOCK MONITORING

The stock monitoring program provides the basic data needed to determine when and where fisheries should be scheduled to meet escapement and harvest objectives for Fraser River sockeye and pink salmon. This program supplies estimates of stock abundance, migration timing, diversion rate (i.e., proportion migrating through Johnstone Strait) and escapements. The first three variables are derived from commercial and test fishing catch data. Escapement estimates are determined through echo sounding on the Fraser River at Mission, B.C., and by monitoring at Hells Gate further upriver.

Prior to the fishing season, Canada forecasts sockeye and pink salmon abundance, migration timing and diversion rate, and sets escapement goals for each Fraser River sockeye salmon stock and for the total Fraser River pink salmon run. These forecasts and goals are used by the Fraser Panel to determine a pre-season management plan. In-season, these forecasts are modified according to stock monitoring results, which are used by the Fraser Panel to establish the fishing schedule.

Various methods are used to analyze catch and escapement data to determine run timing and stock size. In recent years, a computer model has been used to estimate the timing, duration and run size of migrating sockeye and pink salmon stocks. Catch and escapement information by stock, adjusted to a common migration point to compensate for travel time between areas, are combined to develop cumulative abundance curves. These are compared with theoretical curves and curves from prior years to estimate run parameters. Run sizes of larger stocks such as Chilko River and Adams River sockeye and Fraser River pinks are also estimated using relationships between historical run sizes and catch per unit effort data (maximum daily catch per purse seine) in Canadian Areas 12 and 20.

Estimates of escapement from the migratory-area fisheries to the Strait of Georgia are critical in the management of late-run stocks such as Adams River sockeye and pink salmon, which typically delay at the mouth of the Fraser River for three to six weeks before moving upstream to spawn. Three techniques are used to estimate escapement to the gulf: 1) total catch subtracted from the various estimates of total run size, 2) exploitation rate estimates for summer-run stocks applied to catches of late-run stocks, and 3) historical effort and exploitation patterns for the northern and southern approaches applied to current-year catches. All techniques were applied in 1987 and provided estimates that the Panel used to manage the late-run stocks.

In 1987, test fishing operations were conducted by the Commission in Panel Area waters and by Canada Department of Fisheries and Oceans in non-Panel areas at the request of the Fraser River Panel. Panel Area test fisheries included Canadian Area 123 troll, Area 20 gillnet and purse seine, United States Area 7 (Salmon Banks) gillnet, Areas 18-1 and 29-1 to 6 (Strait of Georgia) troll and Area 29-13 and 29-16 (Fraser River) gillnet test fisheries (Figure 1). Canada operated Areas 125-127 troll and Area 12 gillnet and purse seine test fishing programs as requested by the Panel.

Early-season test fishing in Area 20 was conducted to obtain information on the abundance and timing of Early Stuart sockeye prior to their arrival in the lower Fraser River. Monitoring data indicated that the 1987 Early Stuart run was slightly less abundant than forecast, which was confirmed by echo sounding at Mission. No commercial harvest of these fish had been planned. However, this information allowed Canada to implement conservation measures for the Fraser River Indian food fishery in time to achieve escapement goals.

All migratory-area test fisheries operating in the mid- to late-July period, including Area 123 troll and Areas 12 and 20 gillnet test fisheries, indicated the Chilko River sockeye and other summer-run sockeye stocks were late in arriving. Planned commercial openings, which were already scheduled to occur later than normal, were delayed by one to two weeks to allow the less productive, early-timed stocks to escape in numbers approaching the goals set by Canada. Test fishing catches on the southern-approach route increased in late July (Figure 5), indicating an increase in the abundance of Chilko sockeye. On the basis of estimates of cumulative escapement and increasing abundance of summer-run stocks in migratory areas, all areas were opened in early August for commercial fishing.

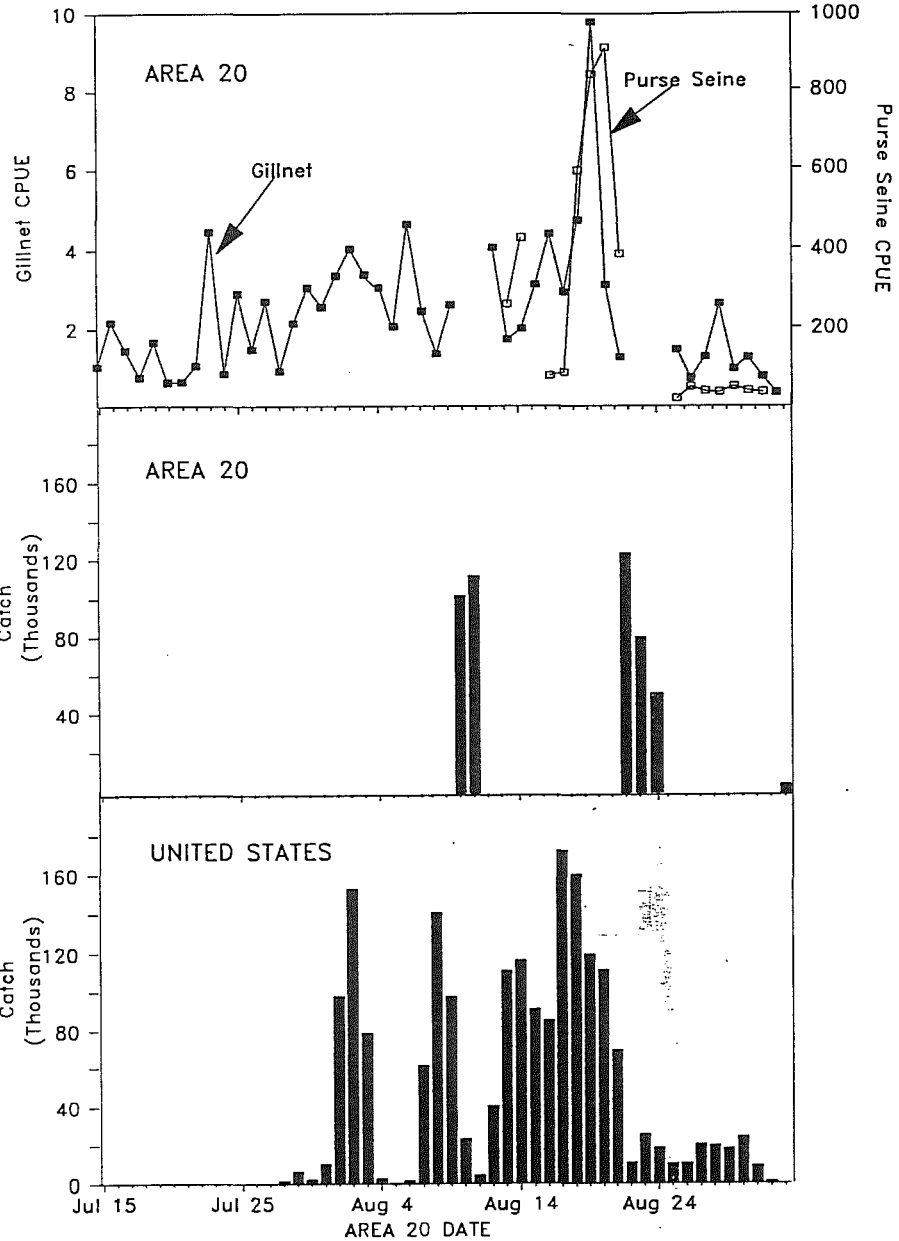


FIGURE 5. Comparison of Area 20 gillnet and purse seine test fishery catch per unit of effort (CPUE) to Area 20 and United States catches of southern migration route sockeye salmon in 1987.

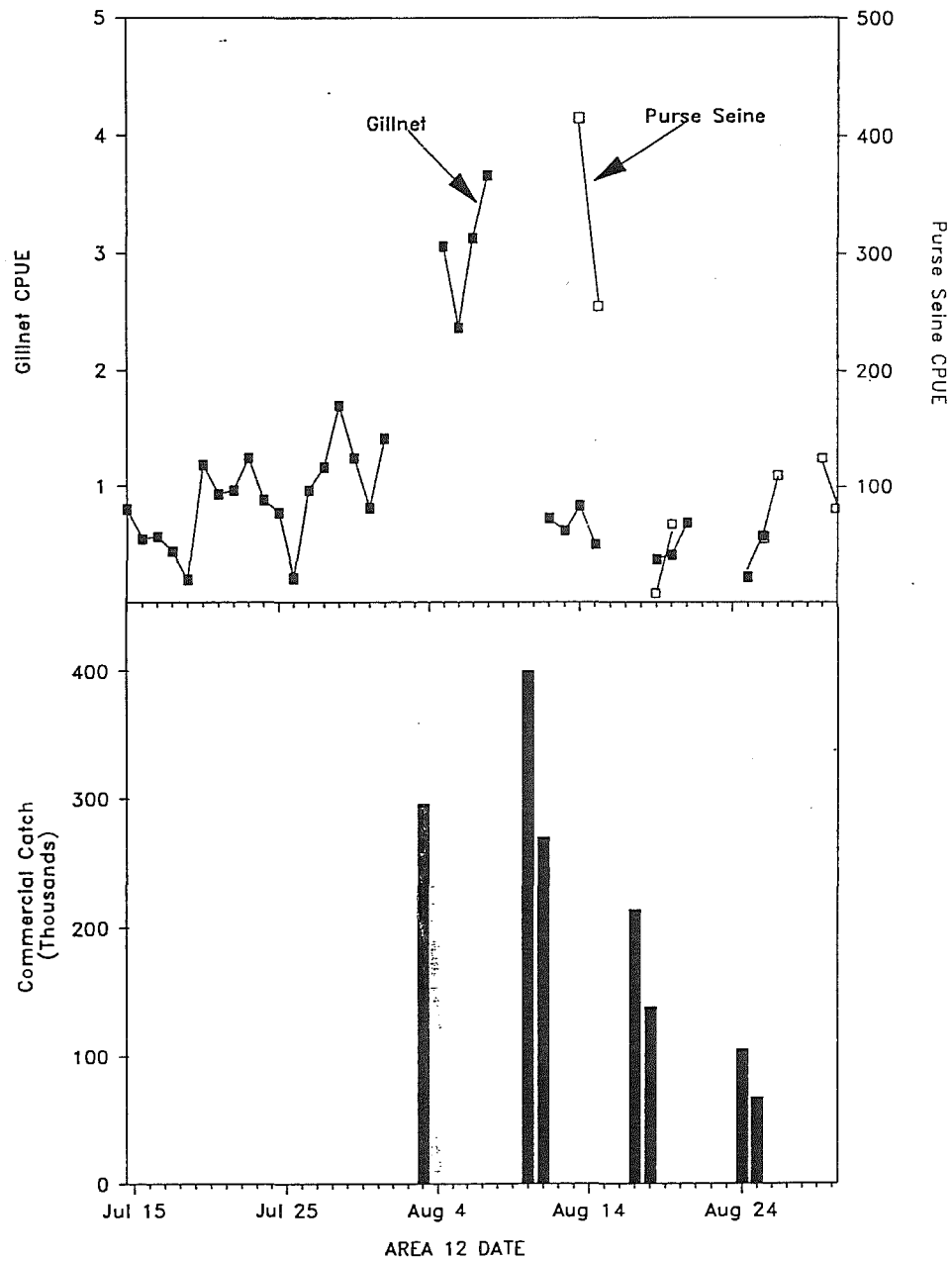


FIGURE 6. Comparison of Area 12 gillnet and purse seine test fishery catch per unit of effort (CPUE) to Areas 11 to 16 catches of northern migration route sockeye salmon in 1987.

An increase in the diversion of migrating sockeye salmon from the southern to the northern route was evident around August 5-8. In the northern approach, the gillnet test fishery in Area 12 showed a strong increase in CPUE during August 5-8 (Figure 6) followed by large commercial catches on August 9-11. This evidence of increased abundance in Johnstone Strait coincided with declining catches in the Area 123 test and commercial troll fisheries, and in the Area 20 gillnet test fishery (Figure 5). Regulatory action by the Panel and Canada was coordinated to ensure that adequate numbers of sockeye passed through Johnstone Strait to achieve escapement and catch goals in the Fraser River area (Area 29). Meanwhile, southern-approach fish were allocated primarily to United States fisheries to help the United States achieve its catch allocation.

A subsequent southward shift in the migration pathway of sockeye was reflected in increased commercial troll landings, increased troll test fishing CPUE and a peak of abundance in Area 20 gillnet and purse seine test fishing operations on August 18-20 (Figure 5). The Panel responded by opening the Area 20 fishery, in order to insure the harvest of late-run sockeye stocks in Canada and to meet the domestic allocation goals of Canada.

Test fisheries were also used to monitor pink salmon abundance along the south coast. Particularly important in this regard were purse seine test fisheries in Areas 12 and 20. Initial indications of run size were lower than the pre-season forecast of 11 million fish. However, sizeable catches of Fraser River pink salmon by Canadian trollers in Area 2W suggested that a more northerly summer distribution of pink salmon than usual may have caused lower commercial and test fishing indices of abundance in the south. Low mean weight of pink salmon in south-coast catches also suggested a good pink salmon run (Figure 4). However, a cautious approach to the harvest of pink salmon resulted in a limited directed harvest in Canadian waters during early September. Low catches in these fisheries confirmed the weak run strength indicated by test fishing. The Panel subsequently closed all Panel Area waters to fishing and Canada closed Areas 11-16 to conserve the remaining Fraser River pink salmon run. Close monitoring of the subsequent migration via purse seine test fishing in Areas 12 and 20 and by troll test fishing in the Strait of Georgia gave strong evidence that spawner escapement would fall short of the 6.0 million goal.

Escapement estimates from hydroacoustic monitoring at Mission are the most valuable data for managing summer-run sockeye stocks. Because these stocks quickly pass through the marine approaches into the Fraser River, prompt assessment of escapement levels are necessary if balanced escapements of the many stocks are to be achieved through fishery regulation. In 1987, low escapements (Figure 7) of early stocks required the closure of Panel Area fisheries. When the more abundant Chilko and Stellako River sockeye arrived, the commercial fisheries in Area 29 and United States waters were opened. Monitoring of the daily escapement of sockeye passing Mission throughout the run provided the Panel with vital information with which to establish fishing schedules.

Between September 8 to October 10, the upstream migration of Adams River sockeye and pink salmon was assessed at Mission using 1) standard echo sounding equipment from boats and 2) a more elaborate hydroacoustic setup consisting of an array of fixed, downward-facing transducers on the surface and upward-facing transducers on the river bed along both shores. A second mobile operation was carried out downstream at Haney, B.C. Accurate estimation of pink salmon abundance by hydroacoustic methods has been unsuccessful in the past. Improved accuracy was the aim of the 1987 program which included the use of fixed equipment in the in-shore area. The program provided accurate estimates of late-run sockeye escapement but was, again, inaccurate in estimating pink salmon escapement. Review of these data will help in designing programs to accurately estimate pink salmon escapement using hydroacoustic methods.

In-season estimates indicated that a total escapement of approximately 2,152,000 adult sockeye salmon migrated upstream. Post-season assessments of Fraser River Indian food fishery catches upstream of Mission, B.C. and escapements to spawning grounds provided an estimate of 2,330,000 total escapement, which was 178,000 (8.3%) higher than estimated in-season.

In addition to stock abundance and timing information, test catches provided scales, tissue samples and other biological data which contributed to the determination of the racial composition of the catches. This racial information was combined with test fishing CPUE data to estimate the run size of stocks entering the southern and northern approaches. Racial data from troll test fishing operations was used to direct the outside troll fishery onto late-run sockeye stocks, while conserving early-timed summer-run stocks.



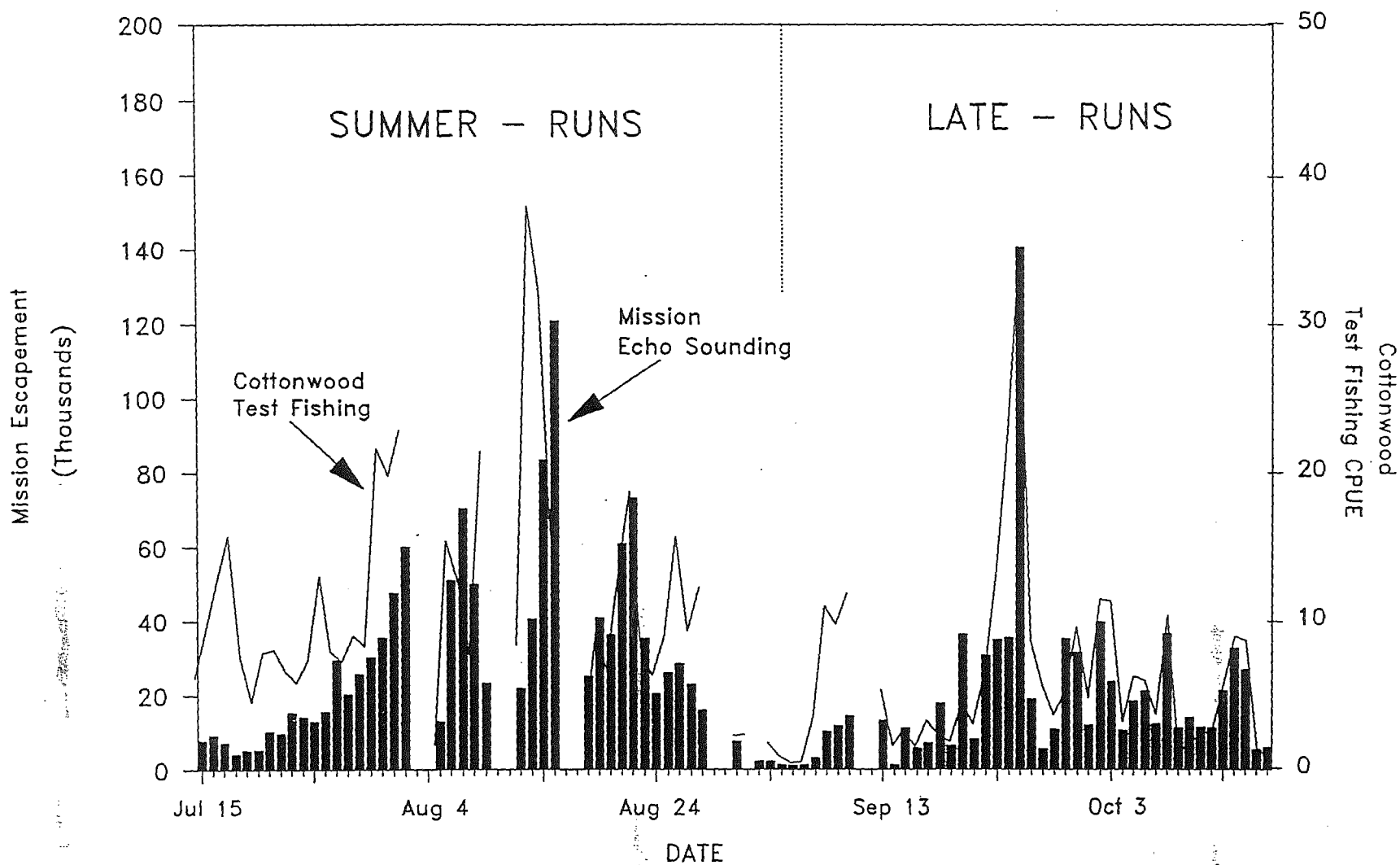


FIGURE 7. Daily escapements of sockeye salmon estimated at Mission, B.C. by echo sounding compared with prior-day test fishing CPUE at Cottonwood during 1987.

## VI. RACIAL IDENTIFICATION

Management of Fraser River sockeye and pink salmon is, in reality, the management of 20 or more individual sockeye salmon stocks and five major pink salmon stocks. The in-season management of this complex of stocks requires that the contribution of Fraser River sockeye and pink salmon stocks in catches by coastal fisheries be identified and quantified through the season. The Commission staff conduct programs to provide this information on a timely basis.

Racial identification of sockeye is based primarily on the analysis of freshwater growth patterns on scales. Information about age composition, fish length and historical patterns of stock-specific timing and behavior are used to augment the use of scale data for racial identification.

Scale analysis depends on the use of characters that are affected by annual freshwater environmental conditions and fish density. This necessitates annual sampling of spawning ground populations to generate "learning standards" for the formation of annual stock groupings and for post-season confirmation of in-season analyses. Analyzing the catch of coastal fisheries that intercept Fraser River sockeye stocks involves sampling and processing many thousands of scales each season, but is relatively quick and cost-effective.

Pink salmon stock composition in mixed-stock fisheries is determined using genetic stock identification (GSI) techniques. Tissue samples collected from catches are subjected to protein electrophoresis, and the results compared with those obtained from spawning ground samples. Genetic characters used in identifying pink salmon are stable from year to year, which obviates the need for annual sampling of spawning populations. However, electrophoretic samples are costly to obtain and process, resulting in high costs to provide accurate assessments of stock composition in commercial catches. Because this technique is relatively new, it will undergo further testing and refinement.

Under the Pacific Salmon Treaty, the Fraser River sockeye and pink salmon component in fishery catches are to be estimated and accounted for wherever they are taken. Consequently, scales, length and sex data were collected from sockeye salmon caught in Canadian and United States fisheries in Panel Areas and in non-Panel area waters of British Columbia and southeastern Alaska (Table 11). Test fishing catches were sampled as well. Pink salmon tissue samples were collected in most coastal areas from Puget Sound to southeastern Alaska (Table 12). Canada supplied sockeye scale and biological data from the Fraser River Indian food fishery and from sockeye spawning grounds throughout the watershed. The analysis of sockeye salmon scales was performed entirely by Commission staff. For pink salmon, the protein electrophoresis of tissue samples was contracted to an independent laboratory, and the laboratory results analyzed by Commission staff.

The analysis of sockeye scales yielded estimates of stock composition for each fishery. These results were applied to the area-specific catch data to estimate catch by stock by area. In addition, results from analyzing scales sampled in Area 29 (Fraser River) test fisheries combined with data from the Mission echo sounding program produced estimates of gross sockeye escapement by stock. The pink salmon electrophoretic analysis produced estimates of area-specific catches of Fraser pink salmon. There are insufficient differences among the five major spawning populations of Fraser River pink salmon (Main Fraser, Seton, Thompson, Harrison and Chilliwack-Vedder stocks) to calculate the contributions of these populations to the catch or total returns.

With respect to Fraser sockeye, the most abundant stocks in 1987 were forecast to be Chilko River, Stellako River and Adams River sockeye (Appendix B). These stocks were expected to provide the bulk of the commercial and Indian food fishery harvests. Early Stuart sockeye and other stocks that arrived before the peak of migration of Chilko River sockeye were given maximum protection under the 1987 management plan.

Preliminary post-season analyses of the racial catch data and spawning escapements show that total returns of the major sockeye salmon stocks were higher than forecast. Estimated returns were, respectively: Chilko River and Lake stocks - 1,900,000 (forecast = 1,890,000), Stellako River - 1,090,000 (820,000), Birkenhead River - 750,000 (400,000) and Adams-Lower Shuswap stocks - 2,600,000 (2,000,000). These returns were augmented by 300,000 Weaver Creek sockeye, 370,000 Seymour River fish and 170,000 Early Stuart fish. The total production of these nine stocks (7,180,000) was 94% of the Fraser River run. While returns for most sockeye stocks in 1987 were not the largest for the cycle, many were relatively strong and most were larger than average.

**TABLE 11.** Week-ending totals of the number of commercially caught sockeye salmon sampled for scales and other data in north and south-coast areas in Canadian and United States waters during 1987.

SOUTH COAST										
Week Ending	Canada						United States		Totals	
	Areas	Area	Area	Area	Area	Area	Area	Area		
	123-124 Troll	125-127 Troll	20 Net	29 Net	12 Net	13 Net	16 Net	7 Net		7A Net
Aug. 1	—	—	—	—	—	—	—	—	—	0
Aug. 8	879	236	—	470	450	230	—	636	478	3,379
Aug. 15	2,753	1,697	710	230	431	359	120	616	710	7,626
Aug. 22	605	—	240	470	230	354	237	1,193	1,173	4,502
Aug. 29	—	—	470	192	228	230	113	327	924	2,484
Sept. 5	—	—	236	472	—	474	—	499	598	2,279
Sept. 12	—	—	—	—	—	—	—	—	0	—
Sept. 19	—	—	—	240	—	—	—	—	—	240
Totals	4,237	1,933	1,656	2,074	1,339	1,647	470	3,271	3,883	20,510

NORTH COAST										
Week Ending	Canada						United States		Totals	
	Area	Area	Area	Area	Area	Area	Area	Dist.		
	1 Net	1 Troll	2W Net	2W Troll	3 Net	4 Net	5 Net	6 Net		104 Net
July 18	230	—	—	—	209	244	—	—	216	899
July 25	230	—	—	—	230	476	—	230	424	1,590
Aug. 1	230	—	—	—	230	240	240	230	257	1,427
Aug. 8	233	60	99	247	230	240	230	230	240	1,809
Aug. 15	218	247	—	173	230	470	274	230	230	2,072
Aug. 22	230	117	—	240	230	249	470	—	—	1,536
Aug. 29	—	—	—	—	—	—	—	—	—	0
Totals	1,371	424	99	660	1,359	1,919	1,214	920	1,367	9,333
TOTAL ALL AREAS										29,843

TABLE 12. Week-ending totals of the number of pink salmon sampled for tissues to be used for racial analysis, in north- and south-coast areas in Canadian and United States waters during 1987.

SOUTH COAST											
Week Ending	Canada								United States		Totals
	Areas 123-124 Troll	Area 127 Troll	Area 20 Net	Area 29 Net	Area 12-1 Net	Area 12-9 Net	Area 13 Net	Area 16 Net	Area 7 Net	Area 7A Net	
July 11											—
July 18						(93)					93
July 25		(259)				(80)					339
Aug. 1	(121)	(172)				(120)					413
Aug. 8	(200)	108			148	140	125				721
Aug. 15	137	200	150		150	125	127		70		959
Aug. 22	150	155	137		148	149	150	150	300	300	1,639
Aug. 29					150	150	252		300	150	1,002
Sept. 5			300		75	150	150	150	150	150	1,125
Sept. 12				150							
Totals	608	894	587	150	671	1,007	804	300	820	600	6,441

NORTH COAST										
Week Ending	Canada							United States		Totals
	Area 1 Net	Area 1 Troll	Area 2W Net	Area 2W Troll	Area 4 Net	Area 6 Net	Area 8 Net	Dist. 104 Net		
July 18	150	150					150	150		600
July 25	150	150		150	150	150	150	300		1,200
Aug. 1	137	150				150	150	150		737
Aug. 8		150	150	150		149	150	150		899
Aug. 15	150			151	150					451
Totals	587	600	150	451	300	449	600	750		3,887
TOTAL ALL AREAS										10,328

( ) Test fishing catches.

Catches were generally proportional to run strength with the exception that early-timed fish were partially protected from harvest, resulting in lower catch rates on these stocks. Adams River sockeye comprised the largest component of the commercial catch at 1,855,000 fish. Contributions by other stocks were 1,330,000 fish, 880,000 fish and 580,000 fish by Chilko, Stellako and Birkenhead stocks, respectively. The majority of Chilko, Stellako and Adams sockeye were 4-year-old fish from the 1983 brood. However, nearly one-half of the 1987 return of Birkenhead sockeye were large, 5-year-old fish of the very successful 1982 brood. The 1982 spawning of Birkenhead River sockeye has produced 1,600,000 fish between 1985 to 1987, the largest production on record for this stock.

The Fraser River adult sockeye escapement estimate of 1,896,000 fish was 7.7% higher than the goal of 1,760,000 spawners. In-season estimates of gross escapement did not indicate this discrepancy would occur. However, a portion (32,000) of the added escapement was the result of a shortfall in the Fraser River Indian food fishery catch.

Pre-season goals for gross escapement of each stock were based on spawning escapement goals and estimated Fraser River Indian fishery harvests. In-season estimates of stock abundances were close to these escapement goals (Table 13). However, final estimates of upstream catches and escapements exceeded the in-season estimate by 178,000 fish. Significant deviations were found in the escapement estimates of Chilko Lake, Stellako, Birkenhead and Adams sockeye stocks.

**TABLE 13.** Comparison of 1987 pre-season goals and in-season and post-season estimates of gross escapement.

	Pre-season Goals	In-season Estimates	Post- Season <sup>1</sup>
EARLY STUART	200,000	175,000	164,000
Summer-run stocks:			
Bowron/Fennell	56,000	85,000	42,000
Nadina/Raft/Gates/Pitt	169,000	188,000	154,000
Seymour/Scotch	60,000	152,000	123,000
Chilko River/Lake	515,000	456,000	605,000
Stellako	250,000	185,000	291,000
Subtotals	1,055,000	1,066,000	1,217,000
Late-run stocks:			
Birkenhead	145,000	251,000	185,000
Adams/Lower Shuswap	750,000	577,000	683,000
Weaver/Cultus, etc.	115,000	84,000	111,000
Subtotals	1,010,000	912,000	979,000
TOTALS	2,260,000	2,153,000	2,360,000

<sup>1</sup> Includes 30,000 Indian food fishery catch below Mission.

## VII. ASSESSMENT

The mandate of the Fraser River Panel is to manage fisheries in the Fraser River Panel Area to achieve the allocations of Fraser River sockeye and pink salmon escapement and catch set by the Parties and agreed to by the Commission. The Panel assesses the performance of the fishery management strategies after the season to 1) determine if conservation goals were met, 2) determine the catch deficiencies which need to be balanced in the future, and 3) provide the data required to understand where management techniques and data collection can be improved.

### A. Escapement

The primary goal of the Fraser River Panel is to ensure that conservation requirements are met. Securing the reproductive potential for future sockeye and pink salmon runs is paramount in managing the stocks. In 1987, Canada set goals of 1,760,000 adult sockeye and 6,000,000 pink salmon spawners. The total number of sockeye that spawned was estimated at 1,896,000 adults, 7.7% above the escapement goal.

The escapement goals for major stock groupings were 150,000 Early Stuart, 705,000 summer-run and 905,000 late-run adult sockeye. Escapements of Early Stuart (148,000) and late-run (889,000) stocks were close to the goals set by Canada. However, the summer-run sockeye escapement (859,000) was 21.8% higher than the goal.

Total pink salmon escapement (3,224,000) was only 54% of the goal because of low abundances of returning salmon. Most of the pink salmon harvest was taken incidentally in fisheries directed at sockeye and, therefore, little flexibility was available to the Panel to reach the escapement goal set by Canada.

### B. International Allocation

The international catch allocation requirements of the Treaty were the focus of Panel deliberations throughout the fishing season. Catches were to be shared not only in total, but by stock grouping as well. Summer-run and late-run sockeye were to be allocated to Canada and the United States at the Treaty-defined sharing rate for 1987. Post-season analysis showed that the TAC was 5,566,000 sockeye and that the United States share was 2,003,000 sockeye, including paybacks of 1986 catch shortfalls (Table 14). The total United States catch was 1,942,000 sockeye, producing a shortfall of 61,000 fish (3.0% of the allocation). The United States share of the TAC of summer-run sockeye was 920,000 fish, compared to the actual catch of 939,000 sockeye. The United States caught 1,003,000 late-run sockeye, 80,000 fish less than their share of 1,083,000.

The post-season evaluation of allocation success differed from in-season estimates because Canadian catches using sales-slip data were higher than estimated using field observations during the fishing season. This larger catch raised the observed run size and TAC after all sockeye had completed their migration through United States waters. Therefore, no additional catch could be provided to United States fishermen. This source of inaccuracy has led to shortages in United States catches in past years, as well.

Post-season reevaluation of the racial composition of the catch affected the TAC's, allocations and catch estimates of summer-run and late-run sockeye stocks. The resulting shift of fish from one stock grouping to another can change the appraisal of the Panel's success at achieving the allocation goals.

Goals for pink salmon catch allocation between fishermen of Canada and the United States were also not achieved. Preliminary racial estimates applied to catches from all fisheries indicated a TAC of 3,812,000 Fraser River pink salmon. The United States was entitled to 1,372,000 of this total under the pre-season agreement for a complete payback of the United States catch shortfall in 1985 (Table 14). The preliminary estimate of the actual United States catch was 1,257,000 Fraser River pink salmon, leaving a shortfall of 115,000 fish.

The small run of Fraser River pink salmon created management difficulties because most of the catch was taken in fisheries directed at other species and stocks, including the distant troll fisheries along the north coast of British Columbia. Due to the small run and restrictions on fishing after the first week of September the Panel could not balance the catch or achieve the allocation goals.

**TABLE 14.** Preliminary calculations of the total allowable catch (TAC) of Fraser River sockeye and pink salmon in 1987.

	<u>SOCKEYE</u>	<u>PINK</u>
TOTAL RUN	7,662,000	7,065,000
DEDUCT:		
Treaty-Designed Escapement	1,500,000	3,224,000
Jack Escapement	19,000	-
Inadvertent Escapement <sup>1</sup>	120,000	-
Fraser River Indian Food Fishery Exemption	400,000	-
Panel-Approved Test Fishing	52,000	29,000
Spawning Channel Surplus-Sale	5,000	-
Total Deductions:	2,096,000	3,253,000
TOTAL ALLOWABLE CATCH	5,566,000	3,812,000
UNITED STATES ALLOCATION		
Sockeye: $(1.06/3.10 \times 5,566,000)$	1,903,000	
Pink: $(3.6/12.0 \times 3,812,000)$		1,143,000
Payback	100,000	229,000
	2,003,000	1,372,000
CANADA ALLOCATION	3,563,000	2,439,000
CURRENT STATUS:		
1987 United States Allocation	2,003,000	1,372,000
1987 Estimated Catch	1,942,000	1,257,000
Difference <sup>2</sup>	(61,000)	(115,000)
Payback Carry-Over	(37,000)	-
TOTAL:	(98,000)	(115,000)

<sup>1</sup> Panel agreement of February 19, 1988.

<sup>2</sup> ( ) indicates a negative number or shortfall.

### C. Domestic Allocation

Canadian catches of both sockeye and pink salmon by gear type diverged from the goals set by Canada. Outside (west coast of Vancouver Island and north coast) troll catches of sockeye were larger than anticipated. This was partly due to the difficulties in monitoring catch in these on-going fisheries, because many vessels did not land their catch until the end of the fishery. The troll catch of Fraser stocks was, therefore, not identified early enough in the season to prevent the unbalanced domestic allocation.

United States Treaty Indian fishermen did not catch their allocation of sockeye and pink salmon. Treaty Indian sockeye catches (969,000) were close to the Non-Indian total (967,000, in Washington waters), although the pre-season plan called for a payback of 45,000 fish to Treaty Indians due to a 1986 catch shortfall. This shortfall remains despite Treaty Indians fishing 18 of 19 days between August 15 and September 3 in 1987.

Fraser River pink salmon catches by Treaty Indian fishermen were approximately 90,000 less than those of Non-Treaty fishermen. This difference existed when the need for conservation of pink salmon became apparent during the first week of September. Closure of all fishing prevented the Panel from rectifying this catch imbalance.

#### D. Conservation of Other Stocks

Although the escapement and harvest requirements of Fraser River sockeye and pink salmon drive the management of fisheries in the Panel Area from late June to early October, the Fraser River Panel fishing plan must also accommodate the conservation needs of other co-migrating salmon species and stocks.

Panel control was limited to the net fisheries within the Panel Area and to the troll fisheries in Areas 18-1, 18-11 and 29. Total catches of other species and non-Fraser stocks of sockeye and pink salmon during Panel control are summarized in Table 15.

**TABLE 15.** Catches of non-Fraser sockeye and pink salmon and other salmon species in commercial fisheries regulated by the Fraser River Panel in 1987. Figures are preliminary estimates by Washington Department of Fisheries and Canada Department of Fisheries and Oceans.

Area	Non-Fraser Sockeye	Non-Fraser Pink	Chinook	Coho	Chum
United States					
Areas 4B, 5, 6C Net	207	28,994	5,530	27,071	198
Areas 6, 7, 7A Net	0	372,435	28,182	29,657	145
Subtotal	207	401,429	33,712	56,728	343
Canada					
Area 20 Net	0	115,689	10,307	126,676	1,224
Area 29 Net	0	0	10,990	6,236	3,972
Areas 18-1 and 11, 29 Troll	0	Nil	302	1,331	0
Subtotal	0	115,689	21,599	134,243	5,196
TOTAL	207	517,118	55,311	190,971	5,539

Fishery closures for Early Stuart sockeye prevented the overharvest of Lake Washington sockeye, which returned in lower-than-expected abundance and were targeted for maximum protection by Washington Department of Fisheries.

Pre-season plans restricting the Canadian harvest of Fraser River sockeye and pink salmon in Area 20 gave protection to Puget Sound pink salmon stocks. Actual regulations were more restrictive than anticipated due to the small run of Fraser River pink salmon. However, unexpectedly high catches (359,000) of Puget Sound pink salmon occurred in United States waters, possibly because of a) larger than expected Puget Sound runs and b) the intense United States fishery from August 15 to September 3.

Conservation of Fraser River chinook salmon in Area 29 was possible because the timing and harvest requirements of sockeye and pink salmon minimized the period of river fishing (August 4-September 12). The incidental catch of coho and chum salmon in Area 29 was low due to limiting sockeye and pink salmon fisheries in the Fraser River (Area 29-11 to 17) to one 24-hour fishery during September and October.



## VIII. ALLOCATION STATUS

The allocation status of Fraser River sockeye and pink salmon is updated periodically after the fishing season as revised catch estimates are derived from final sales-slip and landing-slip data and from final estimates of racial composition. The estimated allocation status available in February, 1988 is summarized in Table 16. Updated estimates for the 1987 and previous fishing seasons will be published in future reports.

The February status of sockeye allocation shows a cumulative shortfall of 98,000 fish for the United States and a corresponding overage in Canada. Similarly, the United States had a cumulative shortfall of 115,000 pink salmon.

The Pacific Salmon Commission, in February, 1988, approved a policy for payback of catch shortfalls of Fraser River sockeye and pink salmon (Appendix E). This policy specifies that catch shortfalls and overages be compensated during the following year for sockeye salmon, and during the next cycle year (the second following year) for pink salmon. Neither Party is required to pay back more than 5% of its share of the TAC during any given year. Under this policy, a part of the United States 1987 sockeye shortfall would be compensated in 1988.

TABLE 16. Allocation status of Fraser River sockeye and pink salmon for 1985-1987.<sup>1</sup>

	SOCKEYE			PINK	
	1985	1986	1987	1985	1987
TOTAL RUN:	13,879,000	15,898,000	7,662,000 <sup>1</sup>	8,864,000	7,065,000
ESCAPEMENT & OTHER DEDUCTIONS:	2,522,000	4,043,000	2,096,000	6,479,000	3,253,000
TOTAL ALLOWABLE CATCH	11,357,000	11,855,000	5,566,000	12,385,000	3,812,000
UNITED STATES:					
ALLOCATION	3,013,000 <sup>4</sup>	2,795,000 <sup>5</sup>	1,903,000 <sup>6</sup>	4,053,000 <sup>7</sup>	1,143,000 <sup>8</sup>
ACTUAL CATCH	2,925,000	2,746,000	1,942,000	3,824,000	1,257,000
ANNUAL ALLOCATION STATUS <sup>2</sup>	(88,000)	(49,000)	39,000	(229,000)	114,000
CUMULATIVE ALLOCATION STATUS <sup>2</sup>	(88,000)	(137,000)	(98,000)	(229,000)	(115,000)
CANADA:					
ALLOCATION	8,344,000	9,060,000	3,663,000	8,332,000	2,669,000
ACTUAL CATCH/ESCAPEMENT <sup>3</sup>	8,432,000	9,109,000	3,624,000	8,561,000	2,555,000
ANNUAL ALLOCATION STATUS <sup>2</sup>	88,000	49,000	(39,000)	229,000	(114,000)
CUMULATIVE ALLOCATION STATUS <sup>2</sup>	88,000	137,000	98,000	229,000	115,000

1 — Based on Commission interpretations and Panel agreements in February, 1988.

2 — ( ) indicate a negative number or shortfall.

3 — Includes escapement add-ons requested or approved by Canada which will generate future benefits.

4 — (1.78/6.60 million x 11,357,000) — 50,000

5 — (3.0/12.5 million x 11,855,000) — 50,000

6 — (1.06/3.1 million x 5,566,000)

7 — (3.6/11.0 million x 12,385,000)

8 — (3.6/12.0 million x 3,812,000)

## IX. ESCAPEMENT

*(Provided by Canada Department of Fisheries and Oceans)*

Escapements to sockeye and pink salmon spawning grounds in the Fraser River watershed were estimated by Canada Department of Fisheries and Oceans via spawner enumeration programs. These estimates were provided to the Panel to assess Commission programs for stock monitoring and racial analysis.

### A. Sockeye Salmon

Escapement of Fraser River sockeye to the spawning grounds totalled 1,915,000 fish, including 19,000 jack (3-year-old) and 1,896,000 adult (4- and 5-year-old) spawners (Appendix Table 7). This escapement was the largest estimated for the cycle since 1899, and about double the escapement in 1983. The distribution of spawning among Fraser stocks was near the goals set by Canada in February, 1987.

In the Stuart district (A; Figure 8) the first run of the year, Early Stuart sockeye, arrived in desired numbers with 148,000 adult spawners. This was the largest spawning escapement recorded for the cycle. The majority of fish spawned in Middle River tributary streams. However, 27,600 fish spawned in Takla Lake tributaries, over twice the highest previous total, and should lead to increased production on the cycle. Pre-spawning mortalities were near normal, despite high Fraser River water temperatures during migration. Very low river discharges during July may have offset the stress of high water temperatures by making the upstream migration of Early Stuart fish easier.

Late Stuart sockeye escapement improved three-fold over the brood-year (1983) escapement, but only 6,500 adult fish spawned. This cycle has had poor returns since 1979.

Nechako River watershed stocks (B; Figure 8) showed mixed success in achievement of escapement goals. Early Nadina sockeye declined to less than 900 adult spawners while the Late Nadina run had 37,600 fish, the second largest on record. Of these latter fish, 29,700 entered the spawning channel. The largest stock returning to the Nechako area in 1987, Stellako River sockeye, produced 211,000 spawners, the second largest on record but only slightly above the pre-season goal.

Quesnel Lake stocks (C; Figure 8) have been very weak on the 1987 cycle since the early 1900's. However, an excellent escapement of 20,600 spawners occurred in 1987. The majority were 5-year-old fish from the 1982 brood, which had already produced a strong return of 4-year-old fish in 1986. Most spawned in the Horsefly River (16,800), but Mitchell River also had a good return (3,800).

Spawning escapements of sockeye stocks in the Chilcotin district (D; Figure 8) exceeded the pre-season goal of 350,000 with 421,000 spawners. However, the distribution of escapement between Chilko River and Lake was unexpected. Escapement goals for the Chilko Lake and Chilko River stocks were 50,000 and 300,000 fish, respectively, but actual escapements were 181,000 and 240,000 adult spawners. The combined total was the largest experienced on the cycle since 1963. Excellent conditions for spawning prevailed during the season.

Escapements of Gates Creek (E; Figure 8) sockeye on this cycle have gradually increased to a high of 9,400 fish in 1987. Most adults (7,700) used the spawning channel. The spawning population of Portage Creek sockeye, which are late-run fish, declined slightly from 1983 levels to 6,800 sockeye in 1987.

The Thompson River watershed (F; Figure 8) is divided into the North Thompson and South Thompson districts. North Thompson stocks are minor sockeye producers due to spawning-ground limitations. In 1987, the Fennell Creek escapement was the largest on record with 16,600 spawners. The Raft River spawning stock declined from an escapement of 2,800 fish in 1983 to 1,400 fish.

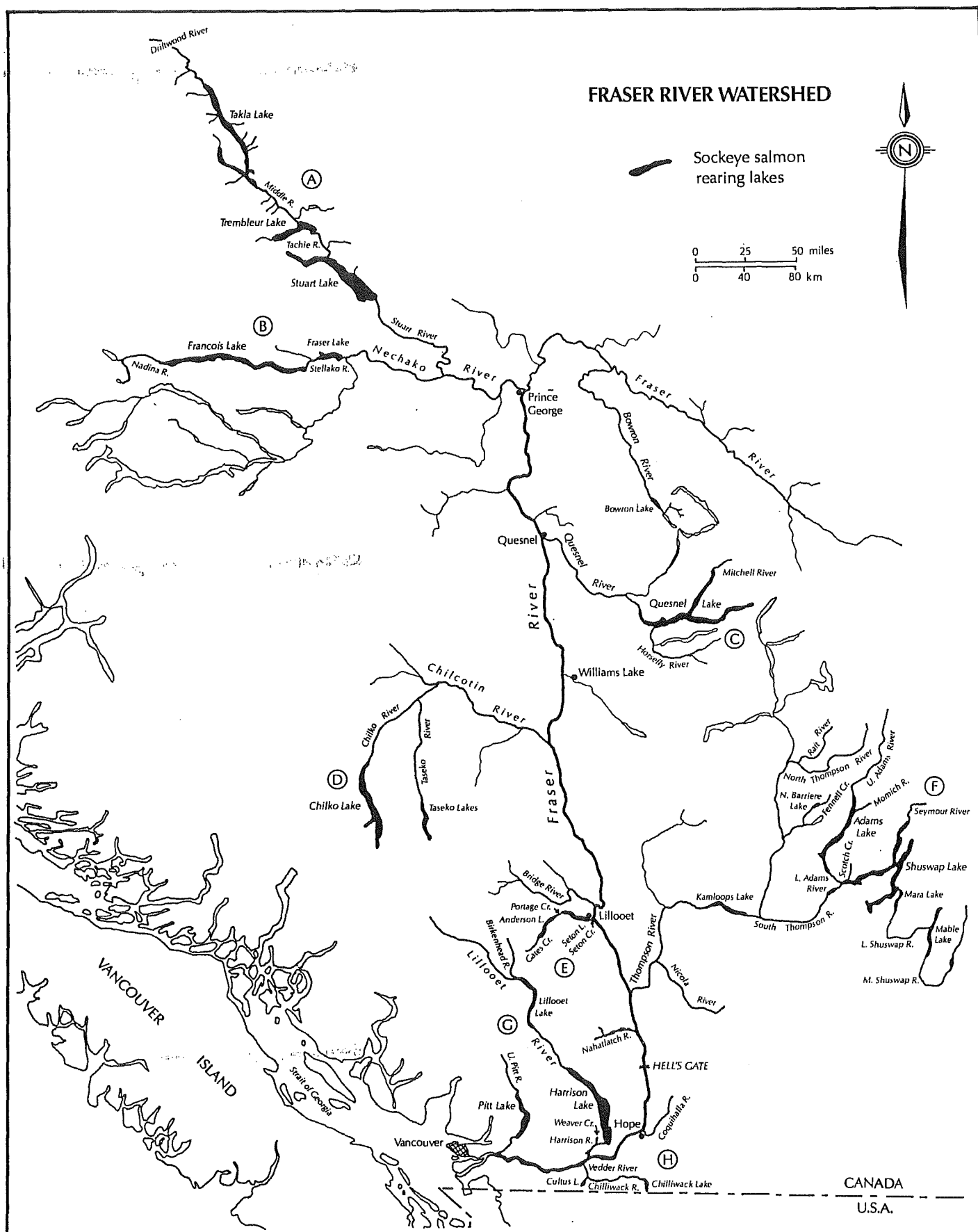


FIGURE 8. Sockeye salmon spawning grounds in the Fraser River watershed.

Most sockeye salmon from the South Thompson watershed spawn in tributaries to Shuswap Lake, which is the rearing lake for the juvenile fish. Foremost among these stocks is the late-run Adams sockeye population. The 1987 return of late-run fish was very strong for the cycle and the escapement reached 606,000 fish. Most spawned in the Lower Adams River (568,000) and in the adjacent Little River spawning grounds (18,000). Additional spawning occurred along Shuswap Lake beaches and in smaller tributaries. Approximately 14,000 Adams sockeye appear to have spawned in the Thompson River below Savona, B.C., possibly because they migrated from the Strait of Georgia too late in the season to travel successfully to the Adams River. Fry from these fish will likely not survive because they cannot migrate to a lake to rear.

Lower Shuswap River sockeye also rear in Shuswap Lake and have similar migration and spawning times as Adams sockeye. The escapement of 10,000 spawners was near the average of the prior three cycles.

Early-timed stocks in the South Thompson also had strong escapements in 1987. Seymour River (84,000 spawners), Scotch Creek (2,100) and Anstey River (2,300) populations were all the largest recorded for the cycle.

In the Harrison-Lillooet system (G; Figure 8), the Birkenhead River had the second largest adult escapement (165,000) since escapements here were first enumerated in 1938. Escapement of the second major stock in this watershed, Weaver Creek sockeye, was 60,000 spawners, of which 34,000 entered the spawning channel. The spawning escapement of Harrison River sockeye was 5,200 fish.

Significant runs to Lower Fraser River tributaries (H; Figure 8) were observed at the Upper Pitt River (13,600 adult spawners) and at Cultus Lake (32,000). The Nahatlatch River system received the largest spawning escapement (13,500) recorded for this watershed.

Water levels were low and stable in most spawning areas in 1987. Water temperatures, although higher than average, did not seriously affect spawning. Pre-spawning mortalities were low with the exception of Gates Creek and Gates channel; however, mortalities here were near normal levels.

## **B. Pink Salmon**

Although the total return of Fraser River pink salmon was 64% of the forecast, the escapement of 3,224,000 spawners was only 54% of the goal. This escapement was the lowest since 1977 and was less than one-half the brood year escapement (Appendix Table 8). In 1985, the Main Fraser River spawning grounds supported 81% (5,249,000) of the escapement including the majority of upriver spawners that failed to negotiate the Fraser Canyon. The trend of large spawning populations using the Main Fraser River was reversed in 1987, when only 1,066,000 pink salmon (33%) used these areas. Conversely, escapements to the four major tributaries in 1987 were all numerically larger than in 1985 and, in sum, more than doubled from 1,016,000 spawners in 1985 to 2,135,000 in 1987.

Pink salmon stocks that migrate above Hells Gate primarily spawn in the Seton Creek/Bridge River area and in the Thompson River below Kamloops Lake. Escapements to these streams increased from 470,000 spawners in 1985 to 996,000 pink salmon in 1987. Seton Creek and the two spawning channels located there were populated by 678,000 spawners while Bridge River had 44,000 pink salmon. The Seton Creek escapement was the largest on record and was a 226% increase over the 1985 level. The Thompson River pink salmon escapement increased 31% to 253,000 spawners.

The upriver stocks of pink salmon showed normal patterns in migration timing in 1987 and no signs of difficulty migrating through the Fraser Canyon in spite of their small average size (4.5 lbs.). Pink salmon bound for upriver areas were not subject to the congestion and subsequent delay and dropback suffered by pink salmon in 1985. River levels were stable, and, although record low discharges occurred, the conditions presented few points of difficult passage. The daily abundance entering the Fraser Canyon in 1987 was moderate, preventing build-ups from developing at these points. Also, Canada Department of Fisheries and Oceans improved passage at Hells Gate fishways by illuminating the area at night to allow 24-hour migration. As a result of the above factors, in 1987, migrating pink salmon did not accumulate at Hells Gate for the first time since 1979.

Escapements of late-run pink salmon to the Harrison River and Chilliwack/Vedder River were the largest for many years. Harrison River pink salmon are the latest-timed stock and were, therefore, well protected by closures to the commercial fishery after early September. The spawning population of 1,029,000 fish was the largest since escapement enumeration began in 1957. The Chilliwack/Vedder escapement totalled 110,000 pinks, slightly above the parent year escapement.

Although the small size of pink salmon in 1987 resulted in lower-than-average fecundities (number of eggs per female spawner), the success of spawning was high. Below-normal rainfall through fall and early winter resulted in stable water levels, which promote high egg-to-fry survival.

## X. APPENDICES

### APPENDIX A: REPORT OF THE FRASER RIVER PANEL TO THE PACIFIC SALMON COMMISSION

1. In recognition of escapements provided from the Canadian share of the Total Allowable Catch in the 1985 to 1988 period, the United States agrees that the productions resulting from these contributions shall accrue solely to Canada and shall not be included in the calculations of the Total Allowable Catches from which the United States allocations are determined. The Parties agree to develop a means of identifying productions from these added escapements.
2. The United States aggregate harvest of sockeye in the period 1989 to 1992 shall not exceed 7 million (subject to adjustment for shortfalls that may occur due to management measures in the first four year period 1985 to 1988).
3. The United States cannot harvest in excess of the annual proportion of the Total Allowable Catch set out below:

1989	25.1 %
1990	23.1 %
1991	34.2 %
1992	32.2 %
4. While the Fraser River Panel, pursuant to para. 1(f), Annex IV, Chap. 4, shall determine the annual United States catch level in the 1989-1992 period, both Parties acknowledge the desire to establish for planning and management purposes a numerical harvest ceiling for the United States in each respective year so as to avoid undue disruptions of fisheries and to provide stability.
5. The Panel will plan and manage the United States fishery to harvest this numerical ceiling or the proportion of the Total Allowable Catch set out above, whichever is less.
6. Notwithstanding the above limitations contained in paras. 2 & 3, the United States Total Allowable Catch would be adjusted to account for shortfalls created by management measures which result in the United States failing to achieve its annual proportion or numeric ceiling, whichever is less.
7. If the Panel establishes a United States harvest ceiling lower than the product of the United States proportional share and the Total Allowable Catch, and the actual harvest is less than the established ceiling, such a shortfall shall be compensated in subsequent years with the requirement not to disrupt fisheries unduly.
8. Similarly, should the United States exceed its proportional share in any year, its Total Allowable Catch in the subsequent year shall be reduced by the resulting numerical excess.
9. The United States recognizes that Canada added fish to the escapement in 1986. Consistent with the above, the United States will work with Canada to provide it the benefits of added escapement. For 1986, the United States Total Allowable Catch shall be calculated on an actual escapement level adjusted for the Canadian-added escapement and "payback" provisions shall be similarly adjusted. Unless undue disruptions of a fishery will result, payback shall occur in 1987.

**APPENDIX B: FORECASTS OF ABUNDANCE OF 1987 FRASER SOCKEYE AND PINK SALMON RETURNS AND NET ESCAPEMENT GOALS.**  
(Provided to the Panel by Canada Department of Fisheries and Oceans).

Stock	4 <sub>2</sub> Forecast	5 <sub>2</sub> Forecast	Total Adults	Net Escapement Goal	Catch
<b>Sockeye:</b>					
Early Stuart	200,000	1,000	201,000	150,000	51,000
Bowron	50,000	0	50,000	25,000	25,000
Fennell	40,000	4,000	44,000	10,000	34,000
Pitt	40,000	6,000	46,000	25,000	21,000
Gates	25,000	1,000	26,000	20,000	6,000
Late Nadina	70,000	0	70,000	50,000	20,000
Chilko Lake	140,000	0	140,000	50,000	90,000
Seymour	300,000	5,000	305,000	30,000	275,000
Raft	15,000	1,000	16,000	7,000	9,000
Late Stuart	35,000	2,000	37,000	8,000	29,000
Chilko	1,700,000	49,000	1,749,000	300,000	1,449,000
Stellako	800,000	19,000	819,000	175,000	664,000
Birkenhead	200,000	197,000	397,000	120,000	277,000
Adams	1,900,000	23,000	1,923,000	670,000	1,253,000
Lower Shuswap	25,000	4,000	29,000	10,000	19,000
Weaver	150,000	41,000	191,000	50,000	141,000
Harrison	20,000	0	20,000	20,000	0
Cultus	50,000	0	50,000	25,000	25,000
Portage	55,000	0	55,000	10,000	45,000
Miscellaneous	50,000	10,000	60,000	5,000	55,000
<b>TOTALS</b>	<b>5,865,000</b>	<b>363,000</b>	<b>6,228,000</b>	<b>1,760,000</b>	<b>4,468,000</b>
<b>Pink Salmon:</b>			<b>11,000,000</b>	<b>6,000,000</b>	<b>5,000,000</b>



## APPENDIX C: 1987 REGULATIONS

The Fraser River Panel approved regulations for the management of the Fraser River sockeye and pink salmon fishery in Panel Area Waters at a meeting held June 19, 1987 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 June 19, 1987. The United States Government informed the Commission of its approval on July 8, 1987. The recommendations for Canadian waters were implemented under the Fisheries Act, Pacific Commercial Salmon Fishery Regulations.

The recommendations of the Commission were as follows:

### 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 21st day of June, 1987 to the 12th day of September, 1987, 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 26th day of July, 1987 to the 12th day of September, 1987, 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 21st day of June, 1987 to the 26th day of September, 1987, 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 26th day of July, 1987 to the 26th day of September, 1987, both dates inclusive.
3. a) No person shall fish for sockeye or pink salmon with nets in Pacific Fishery Management Area 29 from the 21st day of June, 1987 to the 10th day of October, 1987, both dates inclusive.  
b) No person shall troll commercially for sockeye or pink salmon in Pacific Fishery Management Area 29 from the 26th day of July, 1987 to the 10th day of October, 1987, 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 26; provided that regulations formulated by the Canada Department of Fisheries and Oceans conserve sockeye by requiring the release of sockeye taken by commercial troll gear during the period June 21 to July 25, inclusive.

The Fraser River Panel will develop In-Season Orders during the fishing season based on the proposed 1987 Management Plan, attached, to achieve Treaty mandated international allocation 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 gill nets and purse seines from the 21st day of June, 1987 to the 12th day of September, 1987, 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 21st day of June, 1987 to the 12th day of September, 1987, 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 21st day of June, 1987 to the 19th day of September, 1987, 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 20th day of September, 1987 to the 26th day of September, 1987, both dates inclusive.

### **All-Citizen Fishery:**

1. No person shall fish for sockeye or pink salmon in Puget Sound Salmon Management and Catch Reporting Areas 4B, 5, 6, 6A and 6C with nets from the 21st day of June, 1987 to the 12th day of September, 1987, both dates inclusive.
2. No person shall fish for sockeye or pink salmon in Puget Sound Salmon Management and Catch Reporting Areas 7 and 7A with nets from the 21st day of June, 1987 to the 19th day of September, 1987, 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 20th day of September, 1987 to the 26th day of September, 1987, both dates inclusive.

### **Treaty Indian and All-Citizen Fisheries:**

The following Fraser River Panel Area Waters 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, 7C, 7D and 7E.
3. Puget Sound Salmon Management and Catch Reporting Area 7B, provided that regulations formulated by the Washington Director of Fisheries and Tribal authorities conserve sockeye by requiring 7-inch minimum mesh for gill nets and by requiring the release of sockeye taken by other gear during the period, June 21 to July 25, inclusive.

The Fraser River Panel will develop In-Season Orders during the fishing season based on the proposed 1987 Management Plan, attached, to achieve Treaty mandated international allocation of the catch and domestic goals of the Parties.

## **APPENDIX D: 1987 FRASER RIVER PANEL IN-SEASON ORDERS**

In order to provide for adequate escapement of the various stocks of Fraser River sockeye and pink salmon and for the prescribed allocation of catch (a) internationally, to the fishermen of the United States and Canada and (b) domestically, to the commercial user groups in Canada and the United States, the Fraser River Panel promulgated Orders for the regulation of Panel Area fisheries as follows:

### ***July 27, 1987***

For the harvest of early summer-run sockeye appearing in Juan de Fuca Strait, the Panel approved opening United States Areas 4B, 5 and 6C for Treaty Indian drift gillnet fishing commencing 12:00 p.m. (noon) July 28 for 5 days of fishing.

### ***July 31, 1987***

To provide for harvest of early summer-run sockeye stocks, the Panel approved the following regulations for the week commencing August 2: 1) Canadian Area 29-1 to 7 and 9 to 17 open for gillnets August 4 for 1 day of fishing; 2) Canadian Area 18-1 and 11 and Area 29-1 to 4 and 6 open for trolling August 6 for 1 day; 3) United States Areas 4B, 5 and 6C remain open for Treaty Indian drift gillnet fishing; 4) United States Areas 6, 7, and 7A open for Treaty Indian net fishing August 4 for 2 days; and 5) United States Areas 4B, 5, 6, 6C, 7 and 7A open for All-Citizen net fishing August 5 for 1 day.

### ***August 7, 1987***

To provide for harvest of summer-run sockeye stocks, the Panel approved the following regulations for the week commencing August 9: 1) Canadian Area 20-1, 3 and 4 open August 10 for 1 day of fishing; 2) Canadian Area 29-1 to 7 and 9 to 17 open to gillnets August 10 for one day of fishing; 3) United States Areas 6, 7 and 7A open to Treaty Indian nets August 11 for 2 days of fishing; and 4) United States Areas 4B, 5, 6, 6C, 7 and 7A open for All-Citizen net fishing August 11 for 2 days.

### ***August 10, 1987***

For the harvest of Chilko sockeye, the Panel approved a 1 day extension in Canadian Area 20-1, 3 and 4 making a total of 2 days of fishing for the week.

### ***August 14, 1987***

To meet international and domestic sockeye catch allocation objectives, the Panel approved the following regulations for the period commencing August 15: 1) Canadian Area 29-1 to 7 and 9 to 17 open to gillnets August 17 for 1 day of fishing; 2) United States Areas 6, 7 and 7A open to Treaty Indian nets August 15 for 3 days of fishing; and 3) United States Areas 4B, 5, 6, 6C, 7 and 7A open for All-Citizen net fishing August 17 for 2 days.

### ***August 15, 1987***

In order to harvest Seymour River sockeye the Panel approved advancing the opening of Canadian Area 29-1 to 7 and 9 to 17 for gillnet fishing to August 16 for 2 days.

***August 17, 1987***

In order to provide additional opportunity for harvest of sockeye, the Panel approved a 1 day extension of United States Areas 6, 7 and 7A for Treaty Indian net fishing on August 19.

***August 19, 1987***

In order to harvest additional sockeye in United States waters, the Panel approved the following regulations: 1) Extension of Treaty Indian net fishing in United States Areas 6, 7 and 7A by 2.5 days; and 2) Reopening of United States Areas 4B, 5, 6, 6C, 7 and 7A for All-Citizen nets August 21 for 1 day making a total of 3 days of fishing for the current week.

***August 20, 1987***

In order to provide late-run sockeye harvest opportunities in Canada, the Panel approved opening Canadian Area 20-1, 3 and 4 to nets August 22 for 1 day of fishing.

***August 21, 1987***

For the harvest of Adams River sockeye, the Panel approved the following regulations: 1) Extension of Canadian Area 20-1, 3 and 4 by 1 day making 2 days of fishing for the current period; and 2) Extension of United States Treaty Indian net fishing in Areas 6, 7 and 7A by 2 days.

***August 22, 1987***

In order to meet the sockeye catch goal in the United States, the Panel approved the following regulations: 1) Extension of United States Treaty Indian net fishing in Areas 6, 7 and 7A by 1.5 days making a total of 10 days of fishing in the current period; and 2) United States Areas 7 and 7A open for All-Citizen net fishing August 24 for 1 day.

***August 23, 1987***

For the harvest of late-run sockeye, the Panel approved the following regulations: 1) Extension of net fishing in Canadian Area 20-1, 3 and 4 by 1 day making a total of 3 days of fishing for the current period; and 2) Canadian Area 29-1 to 7 and 9 and 10 open to gillnets August 25 for 1 day of fishing.

***August 26, 1987***

In order to meet international catch allocation, the Panel approved the following regulations: 1) United States Areas 6, 7 and 7A open for Treaty Indian net fishing August 27 for 2 days; and 2) United States Areas 7 and 7A open for All-Citizen net fishing August 27 for 1 day.

***August 28, 1987***

For the harvest of Birkenhead sockeye and to meet international allocation goals, the Panel approved the following regulations: 1) Canadian Area 29-1 to 7 and 9 to 17 open to gillnets August 30 for 1 day of fishing; 2) Extension of Treaty Indian net fishing in United States Areas 6, 7 and 7A by 3.5 days; and 3) United States Areas 7 and 7A open for All-Citizen net fishing August 31 for 1 day.

***August 31, 1987***

In order to assess the Fraser River pink salmon run strength and to meet international and domestic allocation of sockeye, the Panel approved the following regulations: 1) Canadian Area 20-1, 3 and 4 open for nets September 2 for 1 day of fishing; 2) Canadian Area 29-1 to 7 and 9 to 17 open to gillnets September 2 for 1 day of fishing; 3) Closure of Treaty Indian drift gillnet fishing in United States Areas 4B, 5 and 6C effective 12:00 p.m. (noon) September 5 after a total of 39 consecutive days of fishing; 4) Extend Treaty Indian net fishing in United States Areas 6, 7 and 7A by 3.5 days making a total of 8 days of fishing for the current period; and 5) United States Areas 7 and 7A open for All-Citizen net fishing September 2 for 1 day.

***September 11, 1987***

For the conservation of pink salmon in marine areas and for harvest of Birkenhead sockeye in the Fraser River, the Panel approved the following regulations: 1) Extend regulatory control in Canadian Area 20 and United States Areas 4B, 5, 6 and 6C until further notice, and; 2) Canadian Area 29-11 to 17 open to gillnets September 12 for 1 day of fishing.

***September 18, 1987***

Due to declining numbers of pink salmon in Juan de Fuca Strait and to give protection to the pink salmon remaining in Puget Sound, the Panel approved the following regulations: 1) Relinquish regulatory control of Canadian Area 20-1, 3 and 4 and United States Areas 4B, 5 and 6C effective September 20; 2) Extend regulatory control in United States Areas 6, 7 and 7A to September 27; and 3) Extend regulatory control to October 4 in Canadian Areas 17 and 18 and that portion of United States Area 7A lying northerly and westerly of a straight line drawn from the low water range marker in Boundary Bay through the east tip of Point Roberts to the East Point Light on Saturna Island.

***October 1, 1987***

For conservation of sockeye and pink salmon remaining in the Strait of Georgia, the Panel extended regulatory control to October 11 in Canadian Area 18-1 and 11 and that portion of United States Area 7A lying northerly and westerly of a straight line drawn from Iwersen's Dock on Point Roberts to Georgina Point Light.

***October 9, 1987***

For protection of late-run sockeye, the Panel extended regulatory control of Canadian Area 29 until October 18.

The Fraser River Panel relinquished regulatory control of remaining Panel Area waters effective October 18, thus completing the Panel's regulatory responsibility in Area waters for the 1987 season.

**APPENDIX E: FRASER RIVER PANEL REPORT ON PAYBACK POLICY**  
(November 24, 1987)

The Panel has reached agreement upon the following points regarding payback:

1. The Panel notes that early PSC experience, the allocation of Fraser River sockeye and pink salmon, and current management information suggests that overages in catches above treaty-established allocations are likely to accrue to Canada.
2. Until the Fraser River Panel can receive better and more timely catch data from catch areas beyond the current Panel Area, it will be difficult for the Panel to reduce the tendency towards Canadian overages.
3. In 1987, the Panel reached agreement on how the TACs for Fraser River pink and sockeye salmon were to be calculated for 1985 and 1986. No change to this calculation method is proposed for future years, but the Panel notes that occasions may arise in which the Panel will be required to give direction to the staff on how certain elements of the runs be treated in any given year.
4. It is the primary responsibility of the Panel to meet the annual international allocation goals as defined by the treaty Annex.
5. The Panel has also agreed to an annual distribution of early and late run stocks.

On the basis of the above, the Panel recommends the following:

In order to accomplish the primary responsibility, each Party's share shall be adjusted each year in the amount of any harvest overage or underage of the same species from the previous year or years. In making this adjustment no Party's share will be reduced by more than 5% because of the adjustment, unless otherwise agreed. Any remaining balance from the harvest overage or underage shall be incorporated in the subsequent year's allocation.

Notwithstanding the provisions intended to meet annual international allocation goals, the Panel also seeks to manage fisheries to meet agreed-to distribution goals for early- and late-timed stocks. If the harvest of early- or late-timed stocks by either Party consistently exceeds its distribution goal, either Party may raise a point of concern about management of the harvest which shall be addressed by the Panel in order to develop management measures which insure that the harvest does not continue to exceed its distribution goal.

# APPENDIX F:

**APPENDIX TABLE 1.** Net catches of Fraser River sockeye salmon in Canadian Area 20 (Juan de Fuca Strait) by week-ending period for cycle years 1975-1987.

Week-ending Date		1975*	1979	1983	1987
June	27	18,707	745	64	
July	4	2,292	1,252	265	
	11	1,923	331	262	
	18	1,807	1,125	353	
	25	5,876	3,699	2,038	
Aug.	1	5,581	4,927	3,102	
	8	4,564	156,669	1,938	
	15	2,130	105,315	310	209,758
	22	19,160	33,421	511	123,829
	29	14,649	14,976	3,749	124,033
Sept.	5	1,331	1,314	459	5,150
	12	392			
	19	305			
	26	42			
Oct.	3	17			
	10				
TOTALS		78,776	323,774	13,051	462,770

\* Canadian industry strike between July 25 and August 25.

**APPENDIX TABLE 2.** 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-ending period for cycle years 1975-1987.

Week-ending Date		1975*	1979	1983	1987
June	27	1,169	1,405		
July	4	46,264	1,470	63	
	11	40,153	32,092	512	
	18	29,100	9,653	277	
	25	37,603	39,298	1,453	
Aug.	1	32,557	155,642	79,658	
	8	86,315	470,606	110,778	145,379
	15	29,453	117,202	1,548	185,228
	22	33,243	127,066	2,052	179,751
	29	63,420	82,091	145,993	37,842
Sept.	5	42,532	22,152	16,063	61,470
	12	40,263	34,520	33,964	12,717
	19	22,185	991	73,492	11,164
	26	13,520	284	89,930	
Oct.	3	9,589	2,319	548	
	10	661		561	
TOTALS		528,027	1,096,791	556,892	633,551

\* Canadian Industry strike between July 25 and August 25.

**APPENDIX TABLE 3.** Troll landings of Fraser River sockeye salmon in Canadian Areas 121 to 127 (west coast of Vancouver Island) by week-ending period for cycle years 1975-1987.

Week-ending Date		1975*	1979	1983	1987
June	27	1,872	668	49	
July	4	2,991	411	106	
	11	5,814	2,178	341	
	18	16,068	9,321	136	
	25	60,670	13,733	140	
Aug.	1	1,658	188,453	2,483	
	8	12,718	74,329	9,593	10,196
	15	15,673	24,759	2,496	203,531
	22	6,298	11,636	8,764	245,779
	29	3,109	3,486	6,775	4,404
Sept.	5	598	244	1,946	
	12	723	851	1,774	
	19	430	172	607	
	26	403	220		
Oct.	3	238	114		
	10	400	835		
TOTALS		129,663	331,410	35,210	463,910

\* Canadian industry strike between July 25 and August 25.

**APPENDIX TABLE 4.** Net and troll catches of Fraser River sockeye salmon in Canadian Areas 11 to 16 (Johnstone Strait and northern Strait of Georgia) by week-ending period for cycle years 1975-1987.

Week-ending Date		1975*	1979	1983	1987
June	27	2,120			
July	4	2,841	7,147		
	11	8,165	1,114	2,833	
	18	12,844	8,479	8,277	68
	25	42,625	52,836	47,892	492
Aug.	1	112,026	340,184	172,886	206
	8	13,743	280,781	496,251	332,607
	15	6,818	160,318	692,279	689,518
	22	9,409	38,754	536,983	362,465
	29	12,496	26,468	450,426	172,753
Sept.	5	2,329	5,841	101,899	33,300
	12	4,475	1,649	31,720	
	19	597	108	44,879	
	26	11	4		
Oct.	3	21			
	10	17			
TOTALS		230,537	923,683	2,586,326	1,591,409

\* Canadian industry strike between July 25 and August 25.



**APPENDIX TABLE 5.** Net catches of Fraser River sockeye salmon in United States Areas 4B, 5, 6, 6C, 7, 7A and 7B (Juan de Fuca Strait and northern Puget Sound) by week-ending period for cycle years 1975-1987.

Week-ending Date		1975	1979	1983	1987
June	27	2,441			
July	4	1,915	1,689	21	
	11	115,516	562		
	18	43,587	15,688		
	25	177,336	214,061	1,176	
Aug.	1	481,824	211,588	54,367	15,796
	8	5,145	939,205	122,251	341,264
	15	408,908	154,690	74,194	354,694
	22	214,706	171,871	38,282	853,362
	29	54,143	43,004	61,017	277,653
Sept.	5	12,090	2,036	10,285	92,848
	12	1,569	1,774	1,529	90
	19	458	5	4,778	2
	26	243		570	2
Oct.	3	40		67	
	10	38		3	
TOTALS		1,519,959	1,756,173	368,540	1,935,711

1983

**APPENDIX TABLE 6.** 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 1979-1987.<sup>1</sup>

	1979	1983	1987
<b>FRASER RIVER MAINSTEM:</b>			
Steveston	8,471	6,023	26,501
Deas to Mission	12,426	5,647	8,458
Mission to Hope	79,745	72,018	89,917
Hope to North Bend	45,936	87,356	158,359
North Bend to Churn Creek	71,046	87,285	100,277
Churn Creek to Hixon	4,618	23,850	11,645
Above Hixon	750	3,085	2,534
Subtotals	222,992	285,264	397,691
<b>TRIBUTARIES:</b>			
Harrison/Lillooet System	14,000	10,081	7,680
Thompson System	2,860	1,255	3,525
Chilcotin System	20,926	44,600	28,134
Nechako System	21,294	15,241	22,311
Stuart System	9,637	5,115	8,682
Subtotals	68,717	76,292	70,332
TOTALS	291,709	361,556	468,023

<sup>1</sup> Fraser River Indian food fishery catch statistics provided by Canada Department of Fisheries and Oceans.

**APPENDIX TABLE 7.** Escapements of sockeye salmon to Fraser River spawning areas for cycle years 1975-1987.<sup>1</sup>

DISTRICT Stream/Lake	1987 Period of Peak Spawning	Estimated Number of Adult Sockeye				1987 Jacks
		1975	1979	1983	1987	
STUART						
Early Runs						
Forfar Creek	Aug. 1-5	6,818	15,805	3,591	23,374	21
Gluske Creek	Aug. 2-8	10,370	10,040	3,781	19,963	10
Kynoch Creek	Aug. 3-9	25,109	34,223	7,815	41,367	57
Rossette Creek	July 29-Aug. 6	8,543	15,881	3,304	16,002	34
Takla Lake Streams	Aug. 2-10	8,560	6,318	3,130	27,164	85
Trembleur Lake Streams	Aug. 1-5	6,352	10,479	2,246	19,974	37
Early Stuart Totals		(65,752)	(92,746)	(23,867)	(148,294)	(244)
Late Runs						
Middle River	Sept. 17-20	6,704	18,111	639	2,441	0
Tachie River	Sept. 17-20	7,525	10,940	853	2,398	52
Late Stuart Totals**		(14,229)	(31,918)	(2,246)	(6,472)	(52)
NECHAKO						
Nadina River (Early)	Sept. 9-12	481	1,809	1,337	891	0
Nadina River (Late)	Sept. 22-25	4,013	14,474	3,035	7,890	0
Nadina Channel (Late)	Sept. 20-24	11,296	41,207	23,841	29,734	0
Stellako River	Sept. 29-Oct. 3	175,941	290,042	121,692	211,085	26
NORTHEAST						
Upper Bowron River	Aug. 28-Sept. 3	29,700	35,000	6,451	11,071	8
QUESNEL						
Horsefly River (Area)	Sept. 6-8	193	511	2,036	16,795	13
Mitchell River	Sept. 18-20	0	—	119	3,751	0
CHILCOTIN						
Chilko River	Sept. 28-Oct. 4	199,739	234,924	329,220	239,601	2,102
Chilko Lake South End	Late Sept.	44,892	23,467	53,613	181,414	7,375
Taseko Lake	Sept. 8-12	4,394	—	1,630	3,571	21
SETON-ANDERSON						
Gates Creek	Sept. 2-7	370	572	811	1,725	32
Gates Channel	Sept. 2-8	1,612	3,256	6,573	7,692	373
Portage Creek	Nov. 10-14	3,175	3,575	7,747	6,820	222
NORTH THOMPSON						
Raft River	Sept. 3-6	2,609	1,758	2,780	1,436	76
Fennell Creek	Aug. 29-Sept. 2	4,005	15,565	4,977	16,633	238
SOUTH THOMPSON						
Early Runs						
Seymour River	Sept. 1-6	36,828	49,306	29,831	84,315	94
Scotch Creek	Sept. 1-5	0	0	239	2,089	8
Anstey River	Sept. 1-5	14	41	382	2,257	0
Late Runs						
Lower Adams River	Oct. 22-30	147,056	275,383	201,610	567,989	71
Little River	Oct. 1-Nov. 2	7,237	10,410	Present*	17,998	2
Lower Shuswap River	Oct. 22-27	11,622	10,048	7,308	10,343	0
Misc. Late Runs	—	1,434	3,418	2,447	20,995	0
HARRISON-LILLOOET						
Birkenhead River	Oct. 1-10	61,538	60,988	44,029	164,849	3,992
Harrison River	Nov. 15-20	5,987	45,615	4,239	5,228	69
Weaver Creek	Oct. 13-17	11,303	24,428	20,727	26,272	1,555
Weaver Channel	Oct. 24-28	1,433	20,598	18,614	33,696	1,661
LOWER FRASER						
Cultus Lake	—	11,349	32,031	19,944	32,184	152
Nahatlatch River	—	2,909	2,648	2,186	13,501	286
Upper Pitt River	Sept. 9-19	39,920	37,542	16,852	13,637	25
Widgeon Slough	Mid-Nov.	911	599	943	1,549	8
ADULTS**		920,793	1,368,139	964,917	1,895,947	
JACKS**		69,923	39,689	10,984	18,796	
TOTAL**		990,716	1,407,828	975,901	1,914,743	

<sup>1</sup> 1975, 1979 and 1983 estimates are from Pacific Salmon Commission data. Estimates for 1987 are from Canada Department of Fisheries and Oceans.

\* Included in Lower Adams River population.

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

**APPENDIX TABLE 8.** Escapements of pink salmon to Fraser River spawning areas for cycle years 1981-1987.<sup>1</sup>

District and Streams	1987 Period of Peak Spawning	Estimated Number of Pink Salmon			
		1981	1983	1985	1987
EARLY RUNS					
LOWER FRASER					
Main Fraser	Oct. 14-20	2,252,368	3,307,834	5,248,742	1,066,032
FRASER CANYON					
Coquihalla River	Oct. 7-11	24,029	29,190	118,921	6,029
Jones Creek	Oct. 2-15	4,485	973	3,095	1,404
Misc. Tributaries	Oct. 3-25	14,720	16,293	42,421	4,303
SETON-ANDERSON					
Seton Creek	Oct. 14-20	519,393	407,791	169,957	627,966
Upper Seton Channel	Oct. 14-20	10,402	9,691	4,485	13,060
Lower Seton Channel	Oct. 14-20	33,846	31,045	33,807	36,696
Portage Creek	Oct. 16-22	18,733	10,202	4,116	21,117
Bridge River	Sept.22-Oct.10	43,940	41,909	61,755	44,200
Gates Creek		88	0	0	247
THOMPSON					
Thompson River and Tributaries	Oct. 5-22	1,166,348	512,398	193,448	253,139
TOTALS*		4,097,269	4,373,049	5,886,698	2,074,659
LATE RUNS					
HARRISON					
Harrison River	Oct. 14-20	314,519	146,014	438,022	1,028,892
Chehalis River		169	452	0	0
Weaver Creek	Oct.28-Nov.3	1,006	1,439	3,310	5,212
Weaver Channel	Oct. 25-30	1,287	1,887	4,772	1,168
CHILLIWACK-VEDDER					
Chilliwack-Vedder River	Oct. 14-20	68,601	99,240	95,556	104,524
Sweltzer Creek	Oct. 16-22	5,213	9,134	14,712	5,467
TOTALS*		391,067	258,572	573,918	1,148,862
GRAND TOTALS*		4,488,336	4,631,621	6,460,616	3,223,521

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

<sup>1</sup> 1981, 1983 and 1985 estimates are from Pacific Salmon Commission data.

Estimates for 1987 are from Canada Department of Fisheries and Oceans.