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PACIFIC SALMON COMMISSION

JOINT CHUM SALMON

TECHNICAL COMMITTEE REPORT

REPORT TCCHUM (92)-1

FINAL 1990 POST SEASON SUMMARY REPORT

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ATTACHMENTS

Chapter 6 of Annex IV of the Pacific Salmon Treaty
Treaty Letter of Transmittal, May 16, 1990
U.S. and Canadian Statistical Area Maps

INTRODUCTION

This Joint Chum Salmon Technical Committee report presents the appropriate information for 1990 chum salmon in southern British Columbia and Washington, as required in Chapter 6 of Annex IV of the Pacific Salmon Treaty (PST) (Attachment 1). In addition, the Pacific Salmon Treaty Letters of Transmittal dated May 16, 1990 paragraph 6, provided for an amendment to Chapter 6 of Annex IV of the PST (Attachment 2). Detailed information may be found in the Canadian and United States agency reports appended to this report (see Chapters 2 and 3).

STATUS OF TREATY REQUIREMENTS

Chum stocks and fisheries in southern B.C. and in U.S. areas 4B, 5, 6C, 7, and 7A are managed under the terms set out in the Pacific Salmon Treaty. The following provides a brief synopsis of the PST chum annex provisions (*italics*) and of Canadian and United States management actions in 1990.

1. *The Parties shall maintain a Joint Chum Technical committee to review stock status, develop new methods for stock management and report on management and research findings.*

[Reports published in 1990 are listed in Section 1.6, 1990 Technical Committee Publications.] The committee provided a report detailing estimates of Canadian and U.S. interceptions of Southern British Columbia and Washington chum salmon.

2. *Canada was to manage its Inside fisheries to provide rebuilding of depressed naturally spawning stocks and minimize increased interceptions of U.S. chum.*

In 1990, the gross escapement of Inside chum totalled 1,711,000. Wild escapement totalled 1,468,000 which was 73% of the Clockwork goal of 2,000,000. The Fraser River wild escapement was 626,000 or 89% of the 700,000 goal. Although stock composition samples were taken, the technical committee has not addressed the issue of whether increased interceptions were minimized.

Terminal area fisheries scheduled by Canada to harvest specific stocks with identified surpluses included; mid Vancouver Island (Area 14), Cowichan (Area 18) and Fraser River (Area 29). These fisheries were managed to limit interceptions of U.S. origin or other non-targeted stocks.

3. *In 1990, Canada was to manage its Johnstone Strait Clockwork harvest to set levels dependent on the run size entering Johnstone Strait as determined in-season. The catch level of chum salmon in U.S. fishing areas 7 and 7A was determined by the catch of chum salmon in Johnstone Strait. In addition, the traditional proportion of effort and catch between Areas 7 and 7A was to be maintained*

The Clockwork Harvest Plan was reviewed after the end of the 1988 fishing season; no subsequent changes were incorporated for 1990. The inseason estimate of Johnstone Strait run size was 3,790,000 providing for a harvest of 30% or 1,137,000 chum. Post season, the run size was 3,514,000 chum resulting in an overall harvest rate was 36.7% for clockwork assessment purposes.

The total allowable catch for U.S. areas 7 and 7A was 140,000; however this was increased by a 41,700 chum underage from the U.S. fishery in 1989 (Table 1). The total catch for this fishery in 1990 was 181,000 chum. The U.S. catch in Areas 7 and 7A was disproportionately harvested in Area 7A. The traditional proportion is an even distribution of catch between the two areas.

4. *In 1990, the U.S. was to maintain the limited effort nature of its chum fishery in U.S. Areas 4B, 5, and 6C to minimize increased interceptions of Canadian chum. In addition, the U.S. was to monitor this fishery for increasing interceptions of Canadian chum.*

The U.S. chum fishery in the Strait of Juan de Fuca (Areas 4B, 5, and 6C) was limited, as it has been in past years, to participation by gillnet fishermen from the four Tribes that fish in the Strait of Juan de Fuca. The catch of 52,200 chum was similar to the 1989 catch level. Genetic Stock Identification (GSI) samples were taken to determine whether this catch resulted in higher interceptions of Canadian chum.

5. *When the catch of chum salmon in U.S. Areas 7 and 7A fails to achieve the specified ceiling, the ceiling in subsequent years will be adjusted accordingly.*

Post season, a minor shortfall in 1990 catch of 850 chum was identified in the U.S., Area 7 and 7A fishery (Table 1).

6. *Catch compositions in fisheries covered by this chapter were to be estimated post season using methods agreed upon by the Joint Chum Technical Committee.*

Fisheries, covered by this chapter, were sampled; and estimates were provided to the Joint Interception Committee. However, methods for estimating stock composition are under review by the committee.

7. *In 1990, Canada was to manage the Nitinat net chum fishery to minimize the harvest of non-targeted stocks.*

The boundaries of the Nitinat fishery were the same as in 1988 and 1989. Canada conducted GSI sampling to quantify the incidence of interceptions of passing stocks.

8. *In 1990, Canada was to conduct GSI sampling of the West Coast Vancouver Island troll fishery (Areas 121-124) if catch levels were predicted to reach levels similar to those in 1985 and 1986.*

Early season catch information from the West Coast Vancouver Island troll fishery did not indicate that the season's total chum catches would reach 1985 and 1986 levels. As a result, Canada did not conduct GSI sampling of this fishery.

9. *As per the Pacific Salmon Treaty Letters of Transmittal dated May 16, 1990, paragraph 6, the Commission recognized the U.S. fishery harvested approximately 41,700 chum salmon less than agreed to for 1989 and that this underage would be taken in years when the Johnstone Strait catch of chum would exceed 225,000.*

The Canadian catch of chum in Johnstone Strait exceeded 225,000, therefore U.S. fisheries harvested the 41,700 shortfall from 1989.

CHAPTER 1

JOINT SUMMARY REPORT

1.1 RUN SIZES

Southern British Columbia

The two areas of concern under the PST are those waters inside of Vancouver Island from Johnstone Strait to the southern portion of Vancouver Island (Inside) and those waters of the west coast of Vancouver Island (West Coast).

Inside Chum

The run size of fall chum salmon expected to return through Johnstone Strait was 2,929,000 of which 1,349,000 were predicted to be produced from Inside wild spawning areas, 1,480,000 from Inside enhancement facilities and 100,000 from Puget Sound. The size of the Fraser River component in the expected total run was predicted to be 1,186,000 chum, including 598,000 from wild spawning areas and 588,000 from enhancement facilities. The remaining wild spawning areas in the Inside area were expected to produce 751,000 chum salmon, while the remaining enhanced return, the majority of which originate from the mid Vancouver Island area, was expected to be 892,000.

The post-season Clockwork assessment of chum salmon, including Inside gross escapements, U.S. and Inside chum caught in Johnstone Strait and the Strait of Georgia, and the catch of Canadian chum in Areas 7 and 7A commercial fisheries, was 3,514,000 or 120% of the expected run size. The overall harvest rate for clockwork assessment purposes was 36.7%. The total return of Fraser River chum was 1,424,000 or 120% of the expected run size. The Fraser River run size includes estimates of catches in U.S. and Canadian commercial, test and Indian food fisheries.

West Coast Chum

The expected surplus to the hatchery Nitinat chum salmon was 60,000. The return of wild origin chum salmon the Nitinat area was not predicted.

The postseason estimate of the run size of chum salmon of Nitinat origin was 327,000 including chum of enhanced and wild origin.

United States

The two regions to be reported under the PST are those waters along the U.S./Canada border from the outer Strait of Juan de Fuca to Point Roberts (including Puget Sound) and the waters along the outer coast of Washington State (Washington Coastal).

Puget Sound Chum

The total Puget Sound run size (all timing components) expected to return to Washington State waters was 1,576,000, which was approximately equal to the average even year run size. Of these, 1,029,000 were expected from wild spawning areas and 547,000 were expected from enhancement facilities. The stocks that were expected to produce the largest returns were: South Puget Sound (454,000) and Hood Canal (302,000).

The post-season run size, as estimated from run reconstruction, was 1,357,000 or 86% of the preseason forecast. This run size was smaller than the 1986 brood year return of 1,535,000. Both the South Puget Sound and Hood Canal regions were lower than preseason expectations; however, most other regions exhibited increases.

Washington Coastal Chum

On the Washington coast, chum salmon return in significant numbers to Grays Harbor and Willapa Bay. In addition, a small return of enhanced origin chum salmon occurs in the Quinault River. The 1990 preseason expected total run size of the Washington coastal chum salmon was 57,200. The actual return, as estimated by run reconstruction, was 57,100.

1.2 MANAGEMENT OF FISHERIES

Southern British Columbia

Inside Fisheries

Management of the fall chum salmon fisheries in Inside waters utilized the Clockwork management strategy which combines stock assessment, harvest management, and allocation of catch.

The Clockwork is a variable harvest rate strategy directly tied to the size of the fall chum run passing through Johnstone Strait. This strategy was designed to permit limited fishing in most years while rebuilding the wild stock escapements. Maximum catch levels for Johnstone Strait are determined by applying the appropriate Clockwork harvest rate to the estimated stock size. Fishing plans are designed to limit catches to this overall Clockwork allowable harvest.

Stock size assessment uses both commercial and test fishing information to estimate returning stock abundance. The initial in-season run size estimate is provided by a third week of September commercial assessment fishery. If the assessment indicates the fall chum run through Johnstone Strait exceeds 3 million, then further commercial harvesting will occur. If commercial and Indian Food Fish harvesting in Johnstone Strait exceeds 225,000 chum, the directed chum harvests in U.S. Areas 7 and 7A will occur.

The Fraser River Chum Harvest Management Plan, formalized in 1988, dictates management of the Fraser River terminal fishery. Under this plan, past linkages with the Johnstone Strait Clockwork have been removed and harvests in the Fraser River are dependent on escapement to the river. A preliminary estimate of the run size of Fraser River chum is estimated from Johnstone Strait commercial assessment and test fishery data prior to mid-October. Scheduling of fisheries is determined by subsequent estimates of returns to the river determined from Fraser River test fishing data.

The Qualicum fishery is managed as a terminal fishery for mid Vancouver Island area enhanced chum salmon. Objectives include limiting the catch of local coho and chinook stocks. The Cowichan terminal fishery in Area 18 harvests primarily wild chum salmon returning to the Cowichan and Koksilah Rivers. GSI data were used during the season to determine stock in the Qualicum fishery.

West Coast Fisheries

The management of the Nitinat area fishery was planned to achieve the necessary escapements to both the wild spawning grounds and the hatchery. In addition to biological considerations, management plans included provisions for achieving domestic allocations and fleet safety. Canada conducted GSI sampling to quantify the incidence of interception of passing stocks in the Nitinat net fishery.

United States

The management objective for the Strait of Juan de Fuca (Areas 4B, 5, 6C) was to maintain the limited effort nature of fishery through limiting participation to local Treaty Indian Tribes and gillnet gear. This fishery harvested primarily Puget Sound stocks. In 1990, the fishery was limited to two days during the first week because of coho management objectives and thereafter proceeded as usual.

In Areas 7 and 7A, the objective was to conduct fisheries to harvest 181,300 chum, based on the PST limit of 140,000, given the applicable Johnstone Strait harvest and accounting for the 41,300 due to the U.S. from a shortfall in 1989 catch (Table 1). An additional objective of the U.S. management in Areas 7 and 7A was to regulate the harvests between Treaty and non-Treaty fishermen to achieve domestic allocation.

Table 1. Summary of U.S. Treaty chum allocations and catches for Areas 7 & 7A, 1986-1990.

YEAR	SPECIFIED TREATY CATCH	ADJUSTED U.S. 7 & 7A CATCH ¹	ACTUAL CATCH	CURRENT DUE U.S.
1986	80,000	80,000	92,984	N/A
1987	20,000	20,000	26,323	-6,323
1988	140,000	133,677	131,356	2,321
1989	120,000	122,321	81,021	41,300
1990	140,000	181,300	180,544	756

1. Takes into account underages or overages from previous years.

1.3 REVIEW AND EVALUATION OF FISHERIES

Southern British Columbia

Inside chum

Fall chum salmon fishing occurred in Johnstone Strait (Areas 11 to 13) and mid Vancouver Island (Area 14), Cowichan (Area 18) and Fraser River (Area 29). Fisheries in Johnstone Strait and Qualicum have the potential to harvest U.S. origin chum incidentally during harvests directed at Canadian origin chum.

In Johnstone Strait, the third week of September stock size assessment fishery harvested 123,000 chum. Data from this fishery indicated an estimated stock size of 3,000,000 chum. As announced on October 5, the subsequent test fishing assessment increased this estimate to 3,480,000 chum and a commercial fishery was scheduled. Analysis of the data from this commercial fishery combined with the further test fishing data, resulted in an announced run size of 3,790,000 on October 19. This raised the Clockwork harvest rate from 20% to 30% and provided approximately 220,000 additional harvest in Johnstone Strait of approximately 220,000. A ten hour fishery was scheduled for October 22 and harvested 363,000 chum. The final clockwork harvest rate was 36.7%.

The total Johnstone Strait fall chum catch was 1,102,000. Summer run catches in Johnstone Strait were 43,400 chum and were not included in the Clockwork calculations.

As a result of the lower than expected production of mid Vancouver Island stocks and harvesting in the Johnstone Strait fishery, the mid Vancouver Island early fishery was limited to three weeks of harvesting by gillnet gear. The total Area 14 catch was 143,000 chum.

Three weeks of gillnet fishing also occurred in the terminal Cowichan fishery. The total catch reported was 40,300 chum.

Based on terminal abundances, two Fraser River chum terminal fisheries were scheduled, harvesting a total of 96,600 chum.

West Coast Chum

The commercial chum salmon fishery in Area 21 was conducted over two weeks, starting from September 17 to 25 and harvested 11,300 chum. The fishing area was the same as in the previous two years. The West Coast Vancouver Island troll catch was 8,300 chum.

United States

The major fisheries intercepting Canadian origin chum salmon in the U.S. are in the Strait of Juan de Fuca (Areas 4B, 5, 6C), San Juan Islands (Area 7) and Point Roberts (Area 7A). A significant proportion of the chum catch in these fisheries is currently believed to be of Canadian origin.

Area 4B, 5 & 6C

Gillnet fisheries in Areas 4B, 5, and 6C occurred from October 7th into early-November with a total of 52,200 chum caught by Treaty Indians. This was roughly equal to the previous years' catch in this fishery.

Area 7 & 7A

The commercial catch of chum in Areas 7 and 7A was 56,700 and 123,800 respectively totalling 181,000. Of these, 700 were taken in PSC controlled fisheries and 23,600 were taken incidentally in coho directed fisheries prior to fall chum management. Four days of chum fishing by Treaty Indians and four days by non-treaty fishermen during October caught 156,000 chum.

1.4 ESCAPEMENT

Southern British Columbia

Inside Chum

Total fall chum salmon escapement was 1,711,000. The wild spawning escapement of 1,468,000 was 73% of the Clockwork interim escapement goal of 2 million and approximately equal to the 1983-88 average wild escapement. The total Fraser River wild escapement of 626,000 was 89% of the spawning goal and accounted for 43% of the total inside fall chum escapement.

West Coast Chum

The Nitinat total escapement of chum salmon was approximately 306,000 which included 230,000 to the wild spawning grounds and 76,000 which were used for broodstock or sold as surplus to hatchery requirements.

United States

Puget Sound Chum

The Puget Sound chum salmon escapement of 428,000 was somewhat below the previous two even year average of 560,000. The total chum escapement was 91% of the preseason expectations.

Washington Coastal Chum

The wild chum escapements in Willapa Bay, Grays Harbor and the Quinault River totalled 42,500, 25% below the goal.

1.5 REVIEW OF GSI PROGRAMS

The Canadian chum salmon fishery areas sampled for GSI data included Johnstone Strait (Area 12) commercial and test fisheries, mid Vancouver Island (Qualicum, Area 14 and Cowichan, Area 18) and Nitinat (Area 21) commercial fisheries. A total of 7,800 samples were taken in 1990.

The West coast of Vancouver Island troll fishery was not was not sampled because of low catch rates relative to 1985 and 1986 levels.

The GSI samples collected in U.S. waters were from commercial and test fisheries in the San Juan Islands and Point Roberts (Areas 7 and 7A) and the Strait of Juan de Fuca (Area 5). A total of 2,930 samples was analyzed in 1990.

In addition, a GSI subcommittee continued its task of reviewing and reconciling differences in approach to GSI by Canada and the U.S. The GSI subcommittee work remains incomplete at this time.

1.6 1989 TECHNICAL COMMITTEE PUBLICATIONS

TCCHUM (90)-1 Final 1988 Post Season Summary Report.

CHAPTER 2

REVIEW OF 1990 WASHINGTON CHUM SALMON FISHERIES

2.1 INTRODUCTION

This report was prepared by the United States (U.S.) section of the joint chum technical committee formed under provisions of the Pacific Salmon Treaty (PST). It provides a general overview of the 1990 chum salmon fisheries in Washington State and a more detailed review of those fisheries that intercept chum salmon of Canadian origin.

The fisheries in Washington State waters that are believed to harvest significant numbers of southern British Columbia origin chum salmon are those in the western Strait of Juan de Fuca (areas 4B,5,6C), the San Juan Islands (Area 7) and Point Roberts (Area 7A). The majority of the harvest in areas 4B,5,6C is of U.S. origin; consequently, management objectives in these areas are based primarily on the needs of stocks originating in Puget Sound. The chum fishery in these areas is restricted to a limited Treaty Indian gillnet fishery in which four Treaty Indian Tribes participate. The harvest in areas 7 and 7A is primarily chum salmon of Canadian origin and in recent years has been managed to meet the terms of the chum annex (Chapter 6, Annex IV) of the PST. Additional U.S. fishing areas that could likely contain chum salmon of Canadian origin include the eastern Strait of Juan de Fuca (Area 6) and West Beach (Area 6A). Little or no chum catch occurred in either area in 1990.

Other Puget Sound and Washington coastal fisheries are primarily terminal fisheries targeted on a specific stock or group of stocks, with little or no interception of non-target stocks.

2.2 MIXED STOCK FISHERIES (Strait of Juan de Fuca, San Juan Islands and Point Roberts)

2.2.1. MANAGEMENT STRATEGY

At the conclusion of the May, 1990 meetings of the Pacific Salmon Commission, the Commission elected to readopt with slight modification Chapter 6 of Annex IV of the Pacific Salmon Treaty from 1989. The modification was identified in the Treaty Letters of Transmittal, dated May 16, 1990, and provided for a 1989 shortfall in the U.S. allocation to be made up in a year in which the Canadian harvest in Johnstone Strait exceeded 225,000 fish. As a result of these limited changes, the U.S. management strategy for areas 4B, 5 and 6C as well as areas 7 and 7A remained relatively unchanged from that instituted in 1989.

The Strait of Juan de Fuca fishery was again conducted with Treaty Indian gillnets only.

The limited effort nature of this fishery is maintained (1) by prohibiting non-indian participation in the fishery, (2) by limiting Treaty Indian participation to 4 Tribes out of the 20 Treaty Tribes in western Washington, and (3) by limiting effort to gillnet gear only. Fishing was opened initially for two days, from October 7 to October 9. Although this opening was technically during the coho management period, the fishery intent was to accelerate the start of the chum fishery. Chum fishing resumed on October 14 and continued daily until November 7.

Harvest quotas for areas 7 and 7A were again triggered by catch levels in the Canadian fishery in Johnstone Strait (based on the Clockwork management plan). The 1990 regime called for an area 7/7A ceiling of 20,000 chum if the total chum catch in Johnstone Strait was less than 225,000 (10% Clockwork harvest rate); a 7/7A ceiling of 120,000 chum if the total Johnstone Strait catch was between 225,000 and 640,000 (20% Clockwork harvest rate); and a 7/7A ceiling of 140,000 chum if the Johnstone Strait catch was greater than 640,000 (30% or greater Clockwork harvest rate). The annex also required the U.S. to attempt to maintain a traditional proportion of effort and catch between areas 7 and 7A. In practice, this requirement is implemented by maintaining an historical fishing pattern (both areas opened simultaneously) when fisheries are scheduled.

2.2.2. FISHERY REVIEW

The fall chum management period for areas 4B, 5 and 6C began October 10th. Catches of chum taken prior to October 7 totaled 131 fish. The two day fishery during the last two days of the coho management period from October 7 to October 9 harvested 7,500 chum. Catches throughout the chum management period were as expected, with peak catches occurring during the latter part of October. The commercial catch totaled 52,200 when the fishery closed on November 7 (Table 1).

Prior to chum management in areas 7 and 7A, significant non-directed chum catches were taken during coho directed fisheries, although a small by-catch of 690 chum was taken during Fraser Panel jurisdiction. The chum harvest in areas 7/7A during both periods totaled 24,300 (Table 1).

Throughout the fall chum season, U.S. and Canadian technical staffs maintained close communication with regard to the status of the chum run size entering Johnstone Strait. On October 8, U.S. technicians were informed by DFO that the Clockwork area run size estimate had increased to 3.48 million and that the Johnstone Strait fishery would open for two days starting on October 9. Since this opening would undoubtedly increase the Canadian harvest in Johnstone Strait to over 225,000, U.S. managers scheduled directed chum fisheries in areas 7 and 7A, beginning with a two day Treaty Indian opening on October 9. The target for U.S. chum fisheries at this time was 120,000, as provided in Chapter 6, Annex IV of the PST, plus 41,700 from an allocation shortfall that occurred in 1989. On October 15, DFO staff informed U.S. managers that the total Clockwork area run size had been updated to 3.88 million, and that the total Johnstone Strait catch stood at 708,000 chum. This level provided an area 7/7A quota of 140,000, plus the shortfall from 1989 (181,700 total).

The first Treaty Indian fishery, from October 9 to 11, harvested 25,300 chum. A two day non-treaty fishery was then scheduled from October 15 to 17, with a resultant catch of 63,900. The tribes scheduled a second two day opening on October 18, catching an additional 31,400 chum, and concluding the treaty harvest for the season. A second non-treaty opening was scheduled for one day beginning October 22, and harvested 32,500 chum. This brought the total area 7/7A harvest to 178,400 (Table 1). Since few fish remained to be harvested in the quota, and because of high catches experienced in area 7A, the last non-treaty opening was restricted to area 7 and was limited to one day with slightly reduced hours. This fishery occurred on October 29 and harvested only 2,200 chum. The total commercial catch in Areas 7 and 7A reached 180,500, plus 244 chum taken in test fisheries to collect GSI samples, for a total harvest of 180,800 chum. Approximately 900 chum of the 1990 quota were left unharvested.

2.3 PUGET SOUND INSIDE FISHERIES

2.3.1. PRESEASON EXPECTATIONS

Management 2/ Puget Sound chum salmon fisheries attempts to achieve fixed spawner escapement goals for natural and/or hatchery returns to each production unit of Puget Sound. Domestic management and allocations are established for harvestable surpluses returning to several broad regions of origin. Although management within a region may address the escapement objectives of one or more specific stocks, Puget Sound fishery descriptions in this report provide only a brief overview of regional management strategies.

The preparation of annual management plans, including preseason run size forecasts and management recommendations, is developed for Puget Sound according to the Puget Sound Salmon Management Plan (PSSMP). This plan specifies a schedule for the Washington Department of Fisheries (WDF) and the Treaty Tribes to develop and exchange methodologies and recommendations on preseason forecasts, escapement goals and other aspects of preseason management planning. The planning efforts are documented in a published report each season.

The preseason expectation of abundance for 1990 Puget Sound origin chum salmon of all timing components was 1,576,000, of which 1,029,000 were expected to be of natural origin and 547,000 were expected to be of enhanced origin. This projection was about average for recent even year runs to Puget Sound.

2.3.2. FISHERIES DESCRIPTIONS, CATCHES AND SPAWNING ESCAPEMENTS

The actual return of 1,357,000 was 86% of the preseason forecast and was somewhat smaller than the 1986 return of 1,553,000. However, the natural component was about as expected with a total return of 1,062,000. The hatchery runs totaled only 295,000 and continued a declining trend in this component of the run since the peak hatchery return of 702,000 in 1987. Of particular concern to managers was the low incidence of age 3 fish in the runs. The return

of age 3 fish declined in both 1988 and 1989 for both natural and hatchery components, but the 1990 return of age 3 fish was the lowest on record with only 2.3% of the natural run made up of this age class. Overall, age 3 chum were less than 10% of normal levels, possibly indicating a shift to lower than normal brood survivals. The total Puget Sound escapement of 428,400 chum was 85% of the goal.

A summary of the preseason forecasts, final in season updates of abundance, final 1990 run sizes, and escapements is presented in Table 2, with a breakdown of hatchery and natural components by stock timing in Table 3. Additional information on each stock is available through the Puget Sound run reconstruction reports. These run size estimates do not include Canadian harvests of U.S. origin chum or catches (from both commercial and test fisheries) in U.S. waters of Canadian origin chum salmon. Detailed information on chum harvests in each Puget Sound catch area is provided in Table 4. A comparison of 1985 through 1990 total Puget Sound run sizes and escapements is provided in Table 5. The following is an overview of stock status and management actions for each of the Puget Sound regions of origin.

Strait of Juan de Fuca Tributaries

Chum salmon from Strait of Juan de Fuca tributaries are of natural origin and consist of two run timings: early and normal. The early stock return of 358 was only 10% of the forecast, while the normal timed stock return of 1,100 was 9% of the forecast. Likewise, spawning escapements for both the early and normal stocks totaled 356 and 945 respectively and were only 17% and 27% of the respective escapement goals. Terminal catches were minor. Increased effort continued to be devoted to determining the amount and extent of spawning in individual streams.

Nooksack/Samish Region

The total chum return of 74,800, largely of natural origin, was 46% above preseason expectations, with both hatchery and natural components exceeding preseason expectations. The spawning escapement of 38,000 was 59% above the goal.

Skagit Region

The natural chum return to the Skagit River of 282,200 fish exceeded the preseason forecast by 88% and was 6% over the in-season run size update. Estimated escapement totaling 110,700 was short of the goal by only 5%.

Stillaguamish/Snohomish Region

Chum salmon from this region are all of normal timing, and are predominantly of natural origin. The chum return of 243,200 was 8% below the preseason forecast of 263,000, but escapement totaling 76,600 was 12% above the goal.

South Puget Sound Region

This region supports early, normal and late timed chum. The early and late chum are largely natural origin. The majority of the normal timed chum are also of natural origin, with some hatchery production. Returns of the early component exceeded preseason expectations, but the late component was far below the preseason prediction. The early timed return of 72,700 was 58% above the forecast and represented a continuation of the excellent survival rates for these stocks since 1986. The escapement of 19,500 was 43% below the goal.

The normal timed return of 325,200 was roughly average for an even year return, and was 34% above the 1986 cycle return. The final post season run was 28% below the preseason forecast, but 21% above the in-season run size update, resulting in an actual escapement of 120,800, 29% over the goal.

The late timed return of 55,800 was 56% below the preseason forecast and represented a four year decline in survival since the run peaked in 1987; however, the return was close to the long term average for this natural stock. The spawning escapement of 16,600 chum was 46% lower than the goal.

Hood Canal Region

Hood Canal supports stocks of early and normal timed chum salmon, but fisheries are managed primarily for hatchery harvest and escapement needs. Achieving the biological escapement goal for either stock is not a primary management concern.

The normal timed chum are predominantly of hatchery origin. The return of the normal timed segment was 300,600, which was 36% below the preseason forecast. The in-season update of run strength was 26% larger than the actual run size, resulting in an escapement of 44,400, 45% below the expectation.

The early timed chum return of 1,400 represented a 67% decline from preseason expectations. Adult spawners totaling 500 fish fell short of the expected escapement by 87%.

Areas 6B and 9

Admiralty Inlet (Area 9) is a mixed stock fishing area containing stocks originating primarily from three regions of origin: Hood Canal, South Puget Sound and Stillaguamish/Snohomish. Fisheries are scheduled in this area after in-season verification of the run strengths for the stocks returning to the three regions of origin. In 1990, there were no commercial openings in either area except for an on-reservation Indian set net fishery.

2.4 WASHINGTON COASTAL FISHERIES

The 1990 coastal chum runs returned at a level even lower than the 1989 returns, which represented a 10 year low for these stocks. All three major chum systems, Willapa Bay, Grays Harbor and the Quinault River, had extremely low runs. Run sizes, catches and escapements for Washington coastal stocks are presented in Table 6.

Willapa Bay

The Willapa Bay run size was 39,900 compared to a ten-year average of 94,900 (1981-1990). The 1990 catch was 5,900 and represents a 88% decline from average harvest levels. Chum salmon are managed entirely for natural escapement in Willapa Bay, though some hatchery escapement occurs. Natural chum escapement of 32,100 was 91% of the goal.

Grays Harbor

In 1990, 12,600 chum returned to Grays Harbor, and exceeded the preseason expectation by 25%. When compared to the ten year average of 56,900, however, the 1990 return represented a decline of 78%. The 1990 harvest of 3,600 was 89% below the average of 32,300 fish. Grays Harbor chum are entirely of natural origin and the 9,000 adult escapement fell short of the goal by 57%.

Quinault

Chum salmon returning to the Quinault River are almost entirely of hatchery origin, although significant straying to natural spawning areas occurs. The actual run size in 1990 was 4,600, and was 37% below the preseason expectation. The total escapement was 2,900 with 1,500 returning to the Quinault National Fish Hatchery and 1,400 straying to natural spawning areas.

2.5 STOCK COMPOSITION AND RUN RECONSTRUCTION

During 1990, Puget Sound genetic stock identification (GSI) studies of chum salmon consisted of collecting replicate and additional baseline samples from Washington stocks (Table 7) as well as samples for stock composition analysis from test and commercial fisheries in mixed stock areas in northern Puget Sound and the Strait of Juan de Fuca (Table 8).

The 1990 sampling design followed closely that employed in 1989, except that there was no attempt to oversample the commercial fisheries in areas 7 and 7A this year to compare stock composition estimates by gear type. As in 1989, the 1990 sampling design in areas 7 and 7A focused on collecting one sample of 400 fish each week from each area during commercial

fisheries. The weekly sampling goal for area 5 remained at one sample of 200 fish. Test fisheries were again planned for the Point Roberts area during weeks in which no commercial fishery was scheduled to evaluate trends in stock composition over the season.

The results of the 1990 studies are in Phelps, et al (1991). The sampling goal for commercial fisheries was reached each week in area 5 and was achieved in two out of four weeks in area 7A, but difficulty was again encountered in reaching the Area 7 sampling goals. Only two partial samples, one of 208 fish and one of 165 fish, were obtained during two of the five weeks the commercial fishery was conducted. One test fishery sample was collected in area 5 and one in area 7A. Neither test fishery sample was analyzed due to insufficient sample size.

All 1990 commercial fishery samples were assayed for 35 loci. Twenty one of these loci were used for stock composition analysis. The same 21 locus baseline database used for chum GSI estimates in 1988 and 1989 was again used in 1990. The Chum Technical Committee is nearing completion of its investigations into the usefulness of increasing the number of loci for GSI analysis.

Puget Sound run reconstruction incorporated stock composition proportions derived from 1990 GSI estimates for the Strait of Juan de Fuca and San Juan Island fisheries. In addition, stock composition proportions for the Strait and San Juan fisheries were recalculated for 1980 through 1989, using respective GSI estimates for 1986 through 1989, and incorporating a 5 year mean stock composition (1986-1990) for 1980 through 1985. Run reconstruction estimates for Puget Sound stocks from 1980 through 1989 were recalculated as a result and are available from the WDF.

Table 1. 1990 Commercial chum harvest in selected Puget Sound catch reporting areas.

Areas	Opening/ Week	Indian GN	Indian PS	Indian Total	Non-Indian GN	Non-Indian PS	Non-Indian RN	Non-Indian Total	Grand Total
Area 7A	PSC Control - Prior to 9/16	9	15	24	5	0	0	5	29
	Coho to 10/8	8,895	5,168	14,063					14,063
	10/9 to 10/12	16,782	3,094	19,876					19,876
	10/14 to 10/17				22,384	20,877		43,261	43,261
	10/18 to 10/20	16,789	4,586	21,375					21,375
	10/22 to 10/23			0	21,669	3,540		25,209	25,209
	10/29 to 10/30			0				0	0
Area 7A Total		42,475	12,863	55,338	44,058	24,417	0	68,475	123,813
Area 7	PSC Control - Prior to 9/16	52	605	657	4	0	0	4	661
	Coho to 10/8	2,730	6,146	8,876			651	651	9,527
	10/9 to 10/12	1,110	4,345	5,455			918	918	6,373
	10/14 to 10/17				7,594	12,883	200	20,677	20,677
	10/18 to 10/20	5,111	4,930	10,041				0	10,041
	10/22 to 10/23			0	3,796	3,493	0	7,289	7,289
	10/29 to 10/30				843	1,277	43	2,163	2,163
Area 7 Total		9,003	16,026	25,029	12,237	17,653	1,812	31,702	56,731
Areas 7/7A Total				80,367				100,177	180,544
Areas 4B, 5 and 6C	prior to 10/7	131							
	10/7 to 10/13	7,499	(2 days)						
	10/14 to 10/20	14,982	(7 days)						
	10/21 to 10/27	19,028	(7 days)						
	10/28 to 11/3	2,548	(7 days)						
	11/4 to 11/10	8,037	(4 days)						
Areas 4B, 5 and 6C total		52,225							

Table 2. Summary of 1990 Puget Sound Chum Salmon Management Information by Region of Origin (using run reconstruction).

Region	Preseason Forecast	Final Inseason Update	Final Run Size	Observed Escapement	Escapement Expectation	Escapement Goal
Strait of Juan de Fuca						
Early	3,500	3,500	358	356	3,366	2,100
Normal	12,200	12,272	1,104	945	11,689	3,550
Nooksack/Samish	51,200	69,796	74,769	37,957	24,370	23,850
Skagit River	149,800	266,056	282,157	110,669	116,850	116,500
Stillaguamish/Snohomish	263,000	206,142	243,236	76,574	68,300	68,300
South Puget Sound						
Early	45,900	45,900	72,745	19,486	34,201	34,400
Normal	452,748	268,443	325,204	120,815	94,913	93,600
Late	125,500	74,723	55,817	16,648	33,036	30,810
Hood Canal						
Early	4,200	4,200	1,402	529	4,048	41,200
Normal	467,800	403,698	300,553	44,431	81,061	90,550
Total	1,575,848	1,354,730	1,357,345	428,410	471,834	502,760

Source: WDF, Puget Sound Indian Tribes and NWIFC, 1990 Puget Sound Chum Salmon Forecasts and Management Recommendations. WDF Stock Strength Calculation Summary (5/20/91).

Table 3. 1990 Puget Sound Post-Season Chum Salmon Run Size Estimates

Region	Production	Early	Normal	Late	Total
Strait of Juan de Fuca	Natural	358	1,104		1,462
	Hatchery				0
Nooksack/Samish	Natural		63,825		63,825
	Hatchery		10,944		10,944
Skagit River	Natural		281,897		281,897
	Hatchery		260		260
Stillaguamish/Snohomish	Natural		200,928		200,928
	Hatchery		42,308		42,308
South Puget Sound	Natural	54,571	286,720	54,516	395,807
	Hatchery	18,174	38,484	1,301	57,959
Hood Canal	Natural	1,402	117,114		118,516
	Hatchery		183,439		183,439
Total		74,505	1,227,023	55,817	1,357,345

All Regions	Early	Normal	Late	Total
Natural	56,331	951,588	54,516	1,062,435
Hatchery	18,174	275,435	1,301	294,910
Total	74,505	1,227,023	55,817	1,357,345

Region	Early	Normal	Late	Total
Strait of Juan de Fuca	358	1,104		1,462
Nooksack/Samish		74,769		74,769
Skagit River		282,157		282,157
Stillaguamish/Snohomish		243,236		243,236
South Puget Sound	72,745	325,204	55,817	453,766
Hood Canal	1,402	300,553		301,955
Total	74,505	1,227,023	55,817	1,357,345

Source: WDF Stock Strength Calculation Summary (5/20/91).
Off-station plant returns have been included with hatchery returns.

Table 4.

WASHINGTON STATE DEPARTMENT OF FISHERIES
SALMON COMMERCIAL CATCH - PUGET SOUND AREAS

12/12/91

		CUMULATIVE CATCH IN NUMBERS OF FISH						DATE RANGE USED - 1/1/90 TO 12/31/90							
		INDIAN						NON-INDIAN							
AREA ABBREVIATED	CODE AREA NAME	GILLNET	SETNET	PURSE SEINE	BEACH SEINE	OTHER GEAR	TROLL	SUB-TOTAL	GILLNET	PURSE SEINE	OTHER GEAR	TROLL	SUB-TOTAL	AREA TOTAL	
4B MARINE 4B		368	2	0	0	0	1	371	0	0	0	0	0	371	
5 MARINE 5		49436	56	0	0	0	4	49496	0	0	0	0	0	49496	
6C MARINE 6C		1035	0	0	0	0	0	1035	0	0	0	0	0	1035	
*** SUB-TOTAL		50839	58	0	0	0	5	50902	0	0	0	0	0	50902	
6 MARINE 6		1323	8	0	0	0	0	1331	2	0	0	0	2	1333	
6A MARINE 6A		0	0	0	0	0	0	0	0	0	0	0	0	0	
7 MARINE 7		7346	0	17360	0	0	0	24706	12565	17339	1649	0	31553	56259	
7A MARINE 7A		37661	18	18812	0	0	0	56491	43503	24776	3	0	68262	124773	
6D MARINE 6D		0	45	0	0	0	0	45	42	0	0	0	42	87	
74B SAIL RIVER		0	0	0	0	0	0	0	0	0	0	0	0	0	
75A CLALLAM RV		0	0	0	0	0	0	0	0	0	0	0	0	0	
75B DEEP CREEK		0	0	0	0	0	0	0	0	0	0	0	0	0	
75C HOKU RIVER		0	1	0	0	0	0	1	0	0	0	0	0	1	
75D LYRE RIVER		0	4	0	0	0	0	4	0	0	0	0	0	4	
75E PYSHT RVR		0	16	0	0	0	0	16	0	0	0	0	0	16	
75F SEKIU RVR		0	1	0	0	0	0	1	0	0	0	0	0	1	
75G TWIN RIVER		0	0	0	0	0	0	0	0	0	0	0	0	0	
76A DUNGENESS		0	0	0	0	0	0	0	0	0	0	0	0	0	
76B ELWA RVR		0	79	0	0	0	0	79	0	0	0	0	0	79	
76C MORSE CRK		0	0	0	0	0	0	0	0	0	0	0	0	0	
76D SALT CREEK		0	0	0	0	0	0	0	0	0	0	0	0	0	
*** SUB-TOTAL		0	146	0	0	0	0	146	42	0	0	0	42	188	
7B MARINE 7B		5522	250	2	0	0	0	5774	7755	479	0	0	8234	14008	
77B UPP. NOOKSC		12530	3998	0	0	0	0	16528	0	0	0	0	0	16528	
77C LOW. NOOKSC		100	38	0	0	0	0	138	0	0	0	0	0	138	
7C MARINE 7C		0	0	29	0	0	0	29	7	0	0	0	7	36	
77D SAMISH RVR		0	0	0	0	0	0	0	0	0	0	0	0	0	
7D MARINE 7D		124	205	0	0	0	0	329	110	0	0	0	110	439	
7E MARINE 7E		0	0	0	0	0	0	0	1	81	0	0	82	82	
77A CALIF. CRK		0	0	0	0	0	0	0	0	0	0	0	0	0	
77G DAKOTA CRK		0	0	0	0	0	0	0	0	0	0	0	0	0	
*** SUB-TOTAL		18276	4491	31	0	0	0	22798	7873	560	0	0	8433	31231	
8 MARINE 8		31614	559	12	0	0	0	32185	50112	18817	0	0	68929	101114	
78B SAUK RIVER		0	0	0	0	0	0	0	0	0	0	0	0	0	
78C LOW. SKAGIT		11550	4855	0	0	0	0	16405	0	0	0	0	0	16405	
78D UPP. SKAGIT		2386	33580	0	0	0	0	35966	0	0	0	0	0	35966	
*** SUB-TOTAL		45550	38994	12	0	0	0	84556	50112	18817	0	0	68929	153485	
6B MARINE 6B		0	0	0	0	0	0	0	0	0	0	0	0	0	
9 MARINE 9		10	1094	0	0	0	0	1104	126	0	0	0	126	1230	
*** SUB-TOTAL		10	1094	0	0	0	0	1104	126	0	0	0	126	1230	
8A MARINE 8A		49812	993	336	0	184	0	51325	27863	57735	0	0	85598	136923	
78F SHDHOHISH		0	0	0	0	0	0	0	0	0	0	0	0	0	
78G STILLAGUAM		4134	6637	0	0	0	0	10771	0	0	0	0	0	10771	
8D MARINE 8D		154	6835	0	33	203	0	7225	418	336	0	0	754	7979	
*** SUB-TOTAL		54100	14465	336	33	387	0	69321	28281	58071	0	0	86352	155673	
10 MARINE 10		17619	122	16512	0	0	0	34253	48974	67223	0	0	116197	150450	
10A MARINE 10A		1168	28	0	0	0	0	1196	7	0	0	0	7	1203	
80B DUWA-GREEN		77	856	0	0	0	0	933	0	0	0	0	0	933	
10C LK. WA. 10C		0	0	0	0	0	0	0	0	0	0	0	0	0	
80A CEDAR RVR		0	0	0	0	0	0	0	0	0	0	0	0	0	
10D LK. SA. 10D		0	0	0	0	0	0	0	0	0	0	0	0	0	
10E MARINE 10E		9579	644	0	0	0	0	10223	0	0	0	0	0	10223	
10F LK. UN. 10F		32	15	0	0	0	0	47	0	0	0	0	0	47	
10G LK. WA. 10G		0	6	0	0	0	0	6	0	0	0	0	0	6	
11 MARINE 11		5291	318	0	0	0	328	5937	8043	23106	0	0	31149	37086	
11A MARINE 11A		26	0	0	0	0	0	26	0	0	0	0	0	26	
81A CARBON RVR		0	0	0	0	0	0	0	0	0	0	0	0	0	
81B PUYALLUP R		710	136	0	0	0	0	846	0	0	0	0	0	846	
81C WHITE RVR		0	0	0	0	0	0	0	0	0	0	0	0	0	
13 MARINE 13		62	13	0	21	0	0	96	0	0	0	0	0	96	
83D NISQUALLY		10229	30014	0	1	0	0	40244	0	0	0	0	0	40244	
83F MCALLISTER		0	1597	0	2	0	0	1599	0	0	0	0	0	1599	
13A MARINE 13A		1224	1888	0	230	4	0	3346	0	0	0	0	0	3346	
83C WINTER CRK		0	868	0	0	0	0	868	0	0	0	0	0	868	
83E PUROY-CASE		0	0	0	0	0	0	0	0	0	0	0	0	0	
13B MARINE 13B		0	0	0	0	0	0	0	0	0	0	0	0	0	
13C MARINE 13C		70	4	0	13	0	0	87	0	0	0	0	0	87	
83H CHAMBERS C		0	0	0	0	0	0	0	0	0	0	0	0	0	
13D MARINE 13D		7138	2164	0	1689	0	0	10991	0	0	0	0	0	10991	
13E MARINE 13E		0	0	0	0	0	0	0	0	0	0	0	0	0	
13F MARINE 13F		9	0	0	0	0	0	9	0	0	0	0	0	9	
83A DESCHUTES		0	0	0	0	0	0	0	0	0	0	0	0	0	
13G MARINE 13G		3174	1099	0	0	0	0	4273	0	0	0	0	0	4273	
13H MARINE 13H		13338	505	0	0	0	0	13843	0	0	0	0	0	13843	
13I MARINE 13I		0	5958	0	0	0	0	5958	0	0	0	0	0	5958	
13J MARINE 13J		0	0	0	955	0	0	955	0	0	0	0	0	955	
13K MARINE 13K		0	59	0	0	0	0	59	0	0	0	0	0	59	
*** SUB-TOTAL		69746	46294	16512	2911	4	328	135795	57024	90329	0	0	147353	283148	
9A MARINE 9A		0	2187	0	0	0	0	2187	0	0	0	0	0	2187	
12 MARINE 12		97459	1513	784	0	0	0	99756	32125	82414	0	0	114539	214295	
82A BIG BEEF C		0	0	0	0	0	0	0	0	0	0	0	0	0	
12A MARINE 12A		61	306	0	5	0	0	372	2	0	0	0	2	374	
82F QUILCENE R		0	2	0	0	30	0	32	0	0	0	0	0	32	
12B MARINE 12B		3729	1422	0	0	0	0	5151	140	838	0	0	978	6129	
82C DOSEWALLIP		0	0	0	0	0	0	0	0	0	0	0	0	0	
82D DUCKABUSH		0	0	0	0	0	0	0	0	0	0	0	0	0	
82E HAMMA-HAMM		0	0	0	0	0	0	0	0	0	0	0	0	0	
12C MARINE 12C		1298	7969	0	0	0	0	9267	0	0	0	0	0	9267	
82B DEWATTO RV		0	111	0	0	0	0	111	0	0	0	0	0	111	
82G SKOKOMISH		1831	7601	0	0	0	0	9432	0	0	0	0	0	9432	
82J PUROY C-HC		0	0	0	0	0	0	0	0	0	0	0	0	0	
12D MARINE 12D		0	0	0	0	0	0	0	0	0	0	0	0	0	
82H TAHUYA RVR		0	0	0	0	0	0	0	0	0	0	0	0	0	
82I UNION RVR		0	0	0	0	0	0	0	0	0	0	0	0	0	
*** SUB-TOTAL		104378	21111	784	5	30	0	126308	32267	83252	0	0	115519	241827	
TOTALS		389229	126679	53847	2949	421	333	573458	231795	293144	1652	0	526591	1100049	

Table 5. Total Puget Sound Chum Run Sizes, Catches and Escapements (1985-1990).

Year	Total Run Size	Escapement	Total Catch
1985	1,466,000	501,000	965,000
1986	1,553,000	499,000	1,054,000
1987	1,761,000	475,000	1,286,000
1988	2,037,000	622,000	1,415,000
1989	1,044,000	240,000	804,000
1990	1,357,000	428,000	929,000

Table 6. 1990 Washington coastal chum run sizes, catches, and escapements.

	Willapa Bay	Grays Harbor	Quinault R.	Total
Preseason Forecast	40,800	10,100	7,300	77858,200
Actual Run Size	39,900	12,600	4,600	57,100
Harvest	5,900	3,600	1,700	11,200
Natural Esc. Goal	35,400	21,000	None	56,400
Natural Escapement	32,100	9,000	1,400	42,500
Hatchery Esc. Goal	None	None	2,500	
Hatchery Escapement	1,900	0	1,500	3,400

Table 7. 1990 Chum Samples for WDF GSI Baseline

Locality	Number Sampled
Strait of Juan de Fuca Pysht	27
Hood Canal Big Beef Creek	100
South Puget Sound Elson Creek	100

Source: WDF GSI lab.

Table 8. Summary of 1990 Chum Salmon GSI Samples Taken From Fisheries in Northern Puget Sound

Location	Statistical Week	No. Fish Sampled	No. Fish Analyzed	Gear Type	Fishery Type
Straits of Juan de Fuca (Area 5)	40	91		GN	Test
	41	210	209	GN	Commercial
	42	210	210	GN	Commercial
	43	210	210	GN	Commercial
	44	213	210	GN	Commercial
	45	210	210	GN	Commercial
Salmon Banks (Area 7)	41	208	208	Mixed	Commercial
	42	165	165	Mixed	Commercial
Point Roberts (Area 7A)	40	400	395	GN	Commercial
	41	374	373	Mixed	Commercial
	42	330	326	GN	Commercial
	43	400	400	GN	Commercial
	44	244		GN	Test
Total		3,265	2916		

GN = gillnet

PS = purse seine

Source: Phelps, LeClair, CdeBaca, and Beattie. 1991. Genetic Stock Identification Estimates of 1990 Washington Commercial Chum Fisheries in the Strait of Juan de Fuca and North Puget Sound. WDF, the Nooksack Tribe, and the NWIFC.

CHAPTER 3

REVIEW OF THE 1990 SOUTHERN BRITISH COLUMBIA

CHUM SALMON FISHERIES

3.1 INTRODUCTION

The treaty between the governments of Canada and the United States of America (U.S.) concerning Pacific salmon was designed to facilitate cooperation between the two countries in the management, research and enhancement of Pacific salmon stocks. Chapter 6 of Annex IV of the Pacific Salmon Treaty (PST) required that certain fisheries for chum salmon in southern British Columbia (B.C.) and Washington be managed in a specified manner in 1990. Other fisheries, while not specifically mentioned in the PST, are known to harvest chum of the other country's origin. This report discusses various aspects of the chum present in B.C. waters between Vancouver Island and the mainland and off the west coast of Vancouver Island and discusses the management actions of Canada in relation to the PST requirements.

Southern B.C. chum salmon stocks and fishing areas are, for the purposes of management, analysis and reporting, divided into two major components. The stocks of Johnstone and Georgia Straits, herein termed Inside chum, and those of the West Coast of Vancouver Island, including Juan de Fuca Strait, termed West Coast chum. The primary fisheries of concern are the West Coast Vancouver Island troll, Nitinat net, and fisheries in Johnstone, Georgia and Juan de Fuca Straits and the Fraser River.

3.2 INSIDE CHUM

3.2.1 Conservation and Harvest Management Requirements

Inside chum are managed with the long term objective of providing maximum benefits to the fishing industry. The general approach adopted by the Department of Fisheries and Oceans (DFO) is to achieve the present estimate of optimum wild escapements, while augmenting production through enhancement of selected stocks. In practice, this approach is achieved through the application, in mixed stock fishery areas, of harvest rates which are compatible with wild stock productivity. If there are stocks which return to their area of origin in numbers above that area's escapement goal, they may be subjected to additional harvesting in the appropriate terminal area.

The following describes the clockwork strategy for 1990, PST requirements for Inside chum and discusses Inside, Fraser River, and mid Vancouver Island chum stocks in relation to these plans.

3.2.1.1 Clockwork Harvest Strategy for Johnstone Strait

This strategy was more fully described in the Final 1985 Post Season Summary Report of the Joint Chum Technical Committee (TCCHUM 87-4). The clockwork strategy is designed to rebuild wild chum stocks to the estimated optimum escapement levels by limiting the overall harvest rate. Specific objectives of this strategy are to:

- a. achieve the rebuilding objective within 12 to 15 years: the optimum wild escapement objective is defined to be 2.5 million chum;
- b. reduce the number of years during which no commercial chum fishing is permitted; and
- c. consider wild stock production when establishing harvest management plans.

Under this scheme, harvest rates are directly related to the total run size of the chum run migrating through Johnstone Strait as estimated during the season. The allowable harvest rates for the expected magnitudes of chum salmon run sizes in 1990 were:

- a. below 3.0 million, up to a 10% harvest rate;
- b. 3.0 to 3.7 million, maximum of 20% harvest rate;
- c. 3.7 to 5.2 million, maximum of 30% harvest rate; and
- d. over 5.2 million, maximum of 40% harvest rate.

The clockwork strategy was developed to limit the harvest in those areas containing numerous mixed stocks; however, it was recognized that harvesting in terminal areas would be required, particularly in areas of major enhancement. In 1990, it was anticipated that terminal harvesting would occur in the following areas; mid Vancouver Island (Qualicum, Area 14), Nanaimo (Area 17), Cowichan (Area 18) and Fraser River (Area 29).

3.2.1.2 Canada/U.S. Treaty

No changes were made to the chum chapter of the PST in 1990, however, an understanding with regard to the timing of the harvest of the 1989 U.S. shortfall was made. As in 1989, Canada was to manage the 1990 chum fisheries in Johnstone Strait, Strait of Georgia and Fraser River areas in a manner consistent with the clockwork plan and minimize, where practicable, interceptions of United States origin stocks. The U.S. would limit its harvest of Canadian chum in some areas to negotiated catch ceilings as specified in Chapter 6 of Annex IV of the PST. In addition, it was agreed that the U.S. would have a 41,700 chum payback from 1989 which would be in addition to the U.S. Area 7 and 7A established ceiling.

During the third week of September, the Johnstone Strait third week of September assessment fishery indicated a stock size of 3.0 million. Subsequent test fishing indicated increased stock strength and the run size was estimated at 3.48 million on October 5. Further analysis of test fish and commercial catch suggested the seasonal Clockwork run size was approximately 3.8 million (October 26). On the basis of these run size estimates and the level

of Canadian catch, the U.S. commercial fisheries in Area 7 & 7A had a target of 140,000 chum plus the agreed payback from the 1989 season. An assessment of the management of the 1990 season is included in Section 3.25 of this report.

3.2.1.3 Fraser River Chum Management Strategy

Chum produced from the Fraser River were of major importance during the development of the clockwork harvest strategy and the negotiation of the PST. While the Johnstone Strait Clockwork plan was designed to conserve all Inside chum in the Johnstone Strait mixed stock fishery area, this strategy potentially results in terminal Fraser River surpluses. As part of the revisions to the 1988 clockwork, terminal harvesting of Fraser River chum was no longer directly linked to the harvesting pattern in Johnstone Strait but rather terminal abundance as assessed by two in river test fisheries. The removal of this linkage required the adoption of a harvesting plan for the Fraser River (Area 29).

The harvest management plan for Fraser River chum conservation was implemented to provide management goals and fishing limits for the harvest of Fraser River chum in the terminal area. The terminal run is further divided into early and late segments with escapement goals and harvest guidelines set independently for each segment. In 1990, the minimum spawning escapement goal for the early and late segments was set at 360,000 and 390,000 respectively. The plan provided for either escapement goal to be increased inseason if the return to the river exceeded the escapement goal. Harvest of chum exceeding the escapement goal was limited to one half of the surplus.

3.2.1.4 Strait of Georgia Chum

The chum produced in the mid Vancouver Island area are primarily from enhancement facilities. In 1990, a substantial portion of this return was harvested in Johnstone Strait, under the inseason 30% clockwork harvest rate. Minimal harvesting occurred in the mid Vancouver Island area. Terminal harvesting was directed at a mix of surplus mid Vancouver Island wild and enhanced chum, with the conservation requirements of passing chum stocks considered. In 1990, conservation requirements of local chinook and coho salmon in this fishery area were also considered in determination of terminal area closures for the Area 14 chum fishery.

3.2.2 Run Size Estimation

Preseason run size forecasts were prepared to facilitate the planning of potential conservation actions as well as domestic and international allocations. As the season progressed, revisions to the run size projection were used to amend harvest plans in accordance with the clockwork approach.

3.2.2.1 Preseason

The wild run size forecast was determined from the application of past average returns per spawner, adjusted for expected variations and past average percent return by age group, to the appropriate brood year spawning abundance. The 1990 preseason forecast of Inside chum originating from wild spawning areas was 1,349,000 including 748,000 Fraser River and 601,000 non Fraser chum (Table 1).

The number of Inside chum returning to enhanced spawning areas was determined through the application of average survival rates for each type of enhancement facility and the average returns by age group to the number of fry released by the facilities. The 1990 run size estimate for enhanced origin Fraser River chum was 588,000 while the mid Vancouver Island area was expected to produce 739,000 enhanced chum. In addition, there were 153,000 enhanced origin chum estimated to return to other areas, including Howe Sound, lower Vancouver Island, and Jervis Inlet areas. The total run size estimate for enhanced Inside chum was 1,480,000 (Table 1).

The total Inside chum run size was forecast to be 2,829,000 (1,349,000 wild and 1,480,000 enhanced). In addition, past data show that U.S. chum migrate through Johnstone Strait. For computational purposes, the forecasted run size of U.S. chum forecast to migrate through Johnstone Strait was set at 100,000. This brought the total run size expected to return through Johnstone Strait to 2,929,000 chum.

3.2.2.2 Inseason

The first inseason run size projection, made on October 5, was based on the chum catch and effort data from the upper Johnstone Strait test fisheries and the third week of September assessment fishery. Run size was projected to be 3.48 million. In response to this run size update, a commercial fishery was scheduled for October 9 and 10. Analysis of the catch from this fishery combined with the balance of the October 13 week end test fishing results suggested that the clockwork chum run size was 3.88 million. This was announced October 15. Although this increase moved the harvest rate from 20% to 30% making the balance to harvest approximately 220,000 chum, advisors agreed to confirm these estimates with additional test fishing. The run size was updated on October 19 to 3.79 million chum and a ten hour commercial fishery was scheduled for October 23. Subsequent test fishing through to early November showed a sharp decrease in stock migration, suggesting the run size may have been overestimated inseason. The final inseason run size was 3.47 million chum.

Initial estimates of Fraser River total run size were made from Johnstone Strait commercial and test fishing assessments combined with GSI estimates. Fraser River test fishing was used after mid October to determine the estimated return to the terminal area. The final inseason projection of total Fraser River run size available from Johnstone Strait test fishing was 834,000 chum. Test fishing on the Fraser River was conducted from October 1 to early December. Based on test fishing to October 21, the inseason projection of terminal run size to

the Fraser River was 818,000 and a ten hour gillnet fishery was scheduled for October 23. The run size was updated on Oct 28 to 898,000 and a second ten hour gillnet fishery was scheduled for November 5. The final inseason projection of the terminal run size to the Fraser River was 794,000 chum (Table 2).

3.2.2.3 Post season

At the end of the season, the total catch in all inside areas plus the catch of Canadian chum in U.S. Areas 7 and 7A plus Inside chum gross escapements were summed to estimate the total Clockwork assessed run size (Table 9). The post season clockwork run size estimate was 3,514,000 chum, comprised of 1,711,000 escapement and 1,803,000 total catch (Table 7). The post season estimate was only 1.3% larger than the final inseason projection of 3,470,000 chum salmon and 120% of the preseason forecast of 2,929,000 chum.

The Fraser River post season terminal run size estimate was 875,000. The post season Fraser River total chum stock size, including the catch of Fraser River chum in U.S. and Canadian waters, was 1,424,000 (751,000 gross escapement and 673,000 total catch in Canadian and U.S. waters). This run size was 107% of the preseason forecast.

U.S. catches of Fraser chum were 144,000 in areas 7 and 7a and 15,700 in areas 4B, 5, and 6C¹. The catches of Fraser River chum in the Johnstone Strait, Strait of Georgia, and Nitinat commercial net fisheries were estimated, through analysis of GSI data, to be 379,100 chum, 9,900 chum, and 2,000 chum, respectively. The use of current GSI analysis to determine Fraser River interceptions in the Nitinat catch is under review. The catch of Fraser river origin chum salmon in the U.S. Juan de Fuca, Area 20 and Nitinat fisheries is not included in the clockwork estimated catch.

3.2.3 Catch

Fall chum in Inside waters are harvested by commercial, Indian food, and test fishermen and by biological samplers. In 1990, these harvests totalled 1,520,700. The catch by each fishing group and area is presented below.

3.2.3.1 Commercial

Commercial catch of chum in Inside waters occurs in three main areas: Johnstone Strait, Strait of Georgia and the Fraser River. The 1990 Johnstone Strait fishery (Areas 11, 12 and 13), began in July and ended in late October. During the July and August period, the Johnstone Strait fishery was directed at harvesting Fraser River sockeye and pink salmon. During those two months, 43,400 chum salmon were harvested (Table 3). These chum are assumed to be comprised mainly of summer chum destined for streams in the Johnstone Strait and Canadian central coast areas and are not part of the clockwork management plan.

1. Bases on the assumption that the percentage of Fraser River chum caught in the U.S Point Roberts, San Juan Islands and Juan de Fuca fisheries is 90%, 56% and 32% respectively.

As part of the clockwork plan, a commercial assessment fishery during the third week of September is required to provide a run size estimate. In 1990, this Johnstone Strait chum assessment fishery harvested 123,000 chum. The preliminary estimate of this catch was used to develop the first inseason run size estimate of 3,000,000 chum announced on September 25.

The next announced run size update of 3,480,000 chum occurred October 5 after two weeks of test fishing. Based on an increased run size and available catch at the 20% clockwork harvest rate, a one day commercial fishery occurred October 9. Analysis of the commercial catch and test fishing results for the balance of the week ending October 13 suggested a run size of 3,880,000 million. (October 15 announcement). This estimate raised the clockwork harvest rate to the 30% level and left a further balance for harvest. Further test fishing confirmed the run estimate and a run size estimate of 3.79 million was made on October 19. This announcement indicated that a Johnstone Strait commercial catch balance of approximately 220,000 was available. A 10 hour fishery was scheduled for October 22 to harvest this balance and achieve the 30% clockwork harvest rate. The total seasonal Johnstone Strait commercial catch was 1,102,000 chum.

Fishing in the Strait of Georgia was moderate and limited to mid Vancouver Island (Area 14) and Cowichan (Area 18) in 1990. Commercial fisheries were directed primarily at enhanced chum in Area 14: the first opening occurred October 15. Two subsequent commercial fisheries occurred on October 22 and October 29. The total catch for these fisheries was 142,000 (Table 3). There was no late cleanup fishery in Area 14 as a result of reduced production and the harvest of mid Vancouver Island stocks in the earlier Johnstone Strait fisheries. In Area 18, fisheries occurred November 5, 12 and 26 with catches of 23,700, 11,400 and 8,900 chum respectively.

Under the Fraser River Chum Harvest Management Plan, two commercial fisheries were permitted on October 23 and November 5 based on terminal surpluses identified in the early portion of the run. Catches for these fisheries were 71,000 and 25,000 respectively. As expected, the late portion of the run was weaker and no commercial fisheries were scheduled after November 12.

3.2.3.2 Test and Sample

The abundance of chum was monitored through test fishing programs in Johnstone Strait and the Fraser River. In addition, sampling for GSI purposes was conducted in Johnstone Strait and the Strait of Georgia.

The abundance of chum in Johnstone Strait was assessed, in part, through test fishing by two seine vessels in Area 12. The test fishing in Area 12 began in early September and continued until early November (Table 4). During that time the two vessels enumerated a total of 184,000 chum, the majority of which were released. Included in the commercial catch reporting are 20,800 chum retained as payment for the operation of test fishing vessels. In addition 2,535 chum were sampled for biological purposes (Table 8).

The Area 12 test fishing data were utilized to determine relative weekly chum abundance and the magnitude of the total run entering Johnstone Strait. The weekly data indicated a peak of abundance in the first week of October (Table 4). The relationship between catch per unit effort in the test fishery and the total run size was monitored weekly throughout October to assist in the determination of the inseason estimates of the run size (Table 2).

Within the Strait of Georgia, 866 chum from the commercial fisheries in Area 14 were sampled for GSI information (Table 8).

Two test fisheries were conducted within the Fraser River. Fishing occurred daily at the Cottonwood site in the lower river near Ladner, and in the upper commercial fishing area near Albion from October 1 to early December. A total of 13,200 chum were caught in both test fisheries (Table 5).

3.2.3.3 Indian

Native people of British Columbia are permitted to harvest chum for their food fish needs. Indian food fish catches occur in Johnstone and Georgia Straits and within streams flowing into these areas. The largest single system from which Indians harvest food fish is the Fraser River.

In 1990, the Indian food fishery in the Inside waters harvested 59,100 chum, of which the food fishery in Johnstone Strait harvested a total of 23,300 chum, the majority of which were taken in marine waters in October. In the Strait of Georgia there were 22,000 chum taken in the Indian food fishery. The majority of the Indian food fish caught in the Strait of Georgia are taken in streams or estuaries, often as surplus chum from enhancement facilities. The food fishery in the Fraser River system took an estimated total of 13,800 chum.

3.2.4 Escapement

Chum which elude the commercial, test, sampling, and Indian fisheries form the gross escapement to Inside chum streams. This gross escapement is made up of chum which spawn in wild areas, those which are spawned in enhancement facilities, and those which are surplus to facility requirements and are removed from the spawning areas. Gross escapement estimates are used in reconstruction of the total run size in a given year.

3.2.4.1 Spawning

Some of the streams within the Inside area contain summer run spawners. These are relatively minor stocks and because of their distinctively early run timing in Johnstone Strait, i.e. July to late August, are not included in the escapement total for the fall chum run. The total escapement of summer chum in 1990 was 11,700 chum.

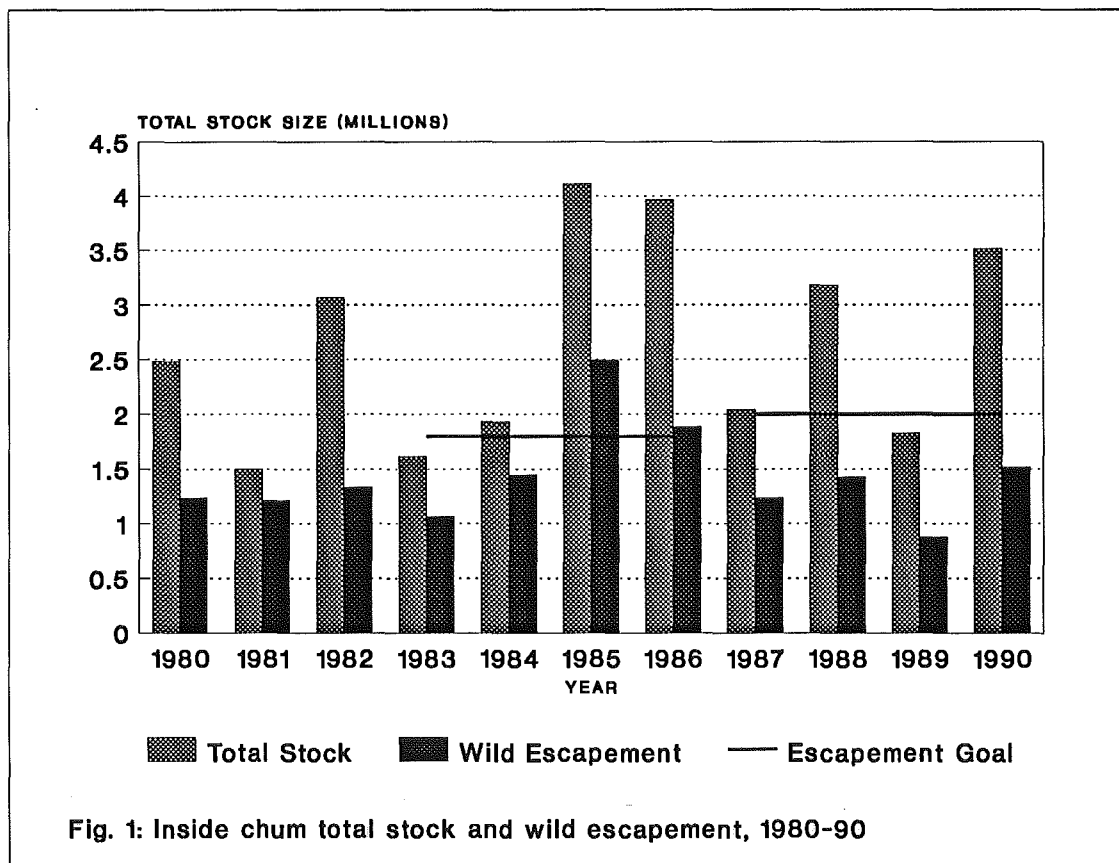
The stocks which are managed within the context of the clockwork plan and are of concern to the PST are the fall run chum. These chum enter Johnstone Strait during the

September to November time period. The estimated number of all Study Area fall chum spawning in wild spawning areas was 1,468,000 chum. This escapement was 101% of the 1983 to 1989 average escapement.

Gross escapement to the Fraser River system was 751,000. The actual number of net spawners was 626,000 as 125,000 chum were either used as broodstock, surplus to hatchery requirements or sold as fish surplus to spawning requirements on individual sloughs. The enhanced systems showed very strong returns, with smaller systems exhibiting variable returns.

In seven of the fourteen major spawning areas, the 1990 chum escapement was below the average observed during the 1983-90 period (Table 6). Overall, the fall chum spawning escapement in wild spawning areas for 1990 was 73% of the present interim total spawning goal of 2,000,000 chum. Only two (Jervis and Burrard Inlets) of the fourteen stock areas received an escapement at or above the goal.

Figure 1 shows total Inside chum stock size and wild escapement for the years prior to Clockwork management (1980-1982) and under Clockwork management (1983-1990). Data are provided in Table 7.



3.2.4.2 Enhanced

The primary enhanced escapement areas are presently limited to the mid Vancouver Island and Fraser River areas. The enhancement facilities in the mid Vancouver Island area received 78% of their spawning requirements (Table 6). All major Fraser River enhancement facilities met or exceeded broodstock requirement. Wherever possible, enhanced chum not required for broodstock were diverted to wild spawning areas.

3.2.4.3 Gross Escapement

The gross escapement in 1990 was estimated at 1,711,000 fall chum of which 1,468,200 spawned in wild or natural spawning areas. Of the remaining balance, 141,000 were spawned in enhancement areas or facilities and 102,000 were surplus to hatchery requirements (Table 6).

3.2.5 Status of Treaty Requirements

3.2.5.1 Overall Fishery Management

The inseason management decisions by DFO in 1990 reflected run size estimates and their revisions based on assessments of inseason data from test and commercial fishing. The commercial assessment fishery in the third week of September indicated a run size of 3,010,000 chum which was slightly higher than the preseason forecast and limited the harvest rate to 20% of the total run. Early October test fishing assessment estimates increased this initial run size and a portion of the allowable clockwork was harvested on October 9/10. Subsequent analysis increased the run size to 3,790,000 chum and a 30% harvest rate in Johnstone Strait. This revised run size estimate was calculated to allow a 1.14 million clockwork chum harvest. Inseason calculations of the clockwork catch indicated a higher than desired catch of 1,273,000 and a 33.5 % harvest rate.

Final test fishing and commercial assessments resulted in a seasonally estimated run size through Johnstone Strait of 3,470,000 chum. The subsequent post season review indicated the actual run size through Johnstone Strait was 3,514,000 chum, slightly larger than the final inseason assessment calculation but below that figure used inseason to manage the Johnstone Strait fishery. The post season harvest rate was 36.7 % of the total clockwork return.

The total clockwork assessed run size includes the gross escapement of Inside chum, the total catch in Inside areas, and the apportionment of the commercial catch in U.S. areas 7 and 7A which was of Canadian origin. The 1990 gross escapement was 1,711,000; the Inside chum catch (commercial, test, and sampled) 1,443,000; the IFF catch 59,100; and the United States estimated catch of Canadian origin chum 157,000. The run size was estimated to be 3,514,000 chum. The total clockwork catch, as calculated, including the appropriate Canadian and U.S. fisheries, was 1,291,000 with an overall clockwork harvest rate of 36.7% (Table 9).

An assessment of clockwork management is provided for the years 1983 to 1990 in Table 10.

3.2.5.2 Stock Identification

Genetic stock identification (GSI) was conducted in a number of areas in 1990. The majority of the GSI work concentrated on sampling of commercial fishing areas or commercial catches.

The commercial fishing areas sampled in 1990 were upper Johnstone Strait (Area 12), mid Vancouver Island (Area 14) and Cowichan (Area 18). The samples in Areas 14 were from the commercial catch. In Area 12, the samples were from chum caught by test fishing vessels and in the commercial fishery (Table 8).

Table 1. Preseason run forecasts by stock, 1990.

Stock	Origin	Expected run size		Percent run size	
<u>Canadian Inside Chum</u>					
Fraser River:	Wild	598,400		20.4%	
	Enhanced	588,000		20.1%	
	sub-total		1,186,400		40.5%
Mid Vancouver Island:	Wild	a.			
	Enhanced	739,000		25.2%	
	sub-total		739,000		25.2%
Non-Fraser Stocks:	Wild	750,600		25.6%	
	Enhanced	153,000		5.2%	
	sub-total		903,600		30.9%
Total Inside Stocks:	Wild	1,349,000		46.1%	
	Enhanced	1,480,000		50.5%	
	Total		2,829,000		96.6%
<u>U.S. Chum</u>					
Puget Sound:		100,000		3.4%	3.4%
GRAND TOTAL			2,929,000	100.0%	100.0%

a. Included in Total Inside Stocks, wild total

Table 2. Summary of pre-season, in-season and post-season chum run size estimates, 1990.

Week Ending	Total through J.St.	U.S.	Canadian Total	Fraser River	Mid Vancouver Island	Other Inside Canadian
PRESEASON	2,929,000	100,000	2,829,000	1,186,400	739,000	754,000
INSEASON (a) (Johnstone Strait fishery)						
25-Sep	3,000,000	100,000	2,900,000	1,219,000	744,000	937,000
05-Oct	3,480,000	100,000	3,348,000	1,437,000	781,000	1,130,000
15-Oct	3,880,000	100,000	3,780,000	1,618,000	811,000	1,351,000
19-Oct	3,790,000	100,000	3,690,000	1,578,000	804,000	1,308,000
26-Oct	3,800,000	100,000	3,700,000	1,582,000	805,000	1,313,000
(Estimates from Fraser River test fishing - terminal run size)						
15-Oct	-	-	-	716,000	-	-
28-Oct	-	-	-	898,000	-	-
11-Nov	-	-	-	910,000	-	-
25-Nov	-	-	-	888,000	-	-
10-Dec	-	-	-	834,000	-	-
23-Dec	-	-	-	794,000	-	-
POSTSEASON (b)	3,492,000	-	-	1,424,000 (c)	-	-

- a. Inseason total run size estimates based on the following:
 USA assumed constant at 100,000.
 Fraser River and MVI same proportion as pre-season.
 Non-Fraser is the remaining difference.
- b. Post-season estimate is Total Study Area Stock.
- c. Fraser River post-season includes chum caught in US areas 4B,5,6C,7,7A and in Canadian areas 12,13,14,17,20,21, and 29.

Table 3. Catch of chum salmon by statistical area for commercial and test fishing vessels and by and by Indian food fisheries, 1990.

Week ending	Statistical Areas							Total
	11	12	13	14	15-19	20	29	
08-Sep	48	7,535	2,932	0	211	7	232	10,965
15-Sep	16	17	13	2	1	0	101	150
22-Sep	9	93,895	28,658	25	11	0	411	123,009
29-Sep	0	1,690	3,423	61	253	0	880	6,307
06-Oct	0	0	1,781	282	450	0	1,553	4,066
13-Oct	0	268,146	302,760	2	210	0	2,997	574,115
20-Oct	0	18,767	8,116	67,656	190	0	3,267	97,996
27-Oct	0	156,646	206,766	37,399	487	0	70,895	472,193
03-Nov	0	0	472	37,260	1,199	0	1,646	40,577
Nov.4 to Dec. 1	0	0	0	23	40,544	0	27,698	68,265
Dec 3 to Dec.31	0	0	0	0	0	0	5	5
TOTAL	73	546,696	554,921	142,710	43,556	7	109,685	1,397,648
Prior to 02-Sep	8,685	29,802	4,871	75	143	1,330	156	45,062
Indian Food Fishery	0	3,045	20,219	976	21,024	0	13,833	59,097
Grand total	8,758	579,543	580,011	143,761	64,723	1,337	123,674	1,501,807

Source: British Columbia Catch Statistics, 1989.

Table 4. Catch, effort, and catch per unit effort in Johnstone Str. test fisheries, 1990.

Week Ending	Stat Week	Weekly Catch	Effort (sets)	Catch per set
Upper Johnstone St.				
02-Sep	9/1	NA	NA	NA
09-Sep	9/2	975	18	54.2
16-Sep	9/3	2,383	12	198.6
23-Sep	9/4	10,840	36	301.1
30-Sep	10/1	44,919	42	1069.5
07-Oct	10/2	13,453	24	560.5
14-Oct	10/3	17,686	33	535.9
21-Oct	10/4	1,672	20	83.6
28-Oct	10/5	5,849	19	307.8
04-Nov	11/1	NA	NA	NA
sub total		97,777	204	avg. 388.9
Mid Johnstone St.				
02-Sep	9/1	474	18	26.3
09-Sep	9/2	2,262	18	125.7
16-Sep	9/3	1,636	12	136.3
23-Sep	9/4	38,599	34	1135.3
30-Sep	10/1	20,210	36	561.4
07-Oct	10/2	13,807	25	552.3
14-Oct	10/3	5,259	29	181.3
21-Oct	10/4	2,497	20	124.9
28-Oct	10/5	1,120	18	62.2
04-Nov	11/1	NA	NA	NA
sub total		85,864	210	avg. 322.9
Grand Total		183,641	414	avg. 443.6

Table 5. Weekly total catch and catch per unit effort in the Fraser River chum test fisheries, 1990.

Week Ending	Cottonwood		Albion	
	Catch	CPUE	Catch	CPUE
08-Oct	508	32.6	557	42.1
15-Oct	1,135	85.5	1,307	79.0
22-Oct	892	71.6	1,354	87.8
29-Oct	1,020	67.3	1,353	93.8
05-Nov	996	100.4	1,489	96.1
12-Nov	193	17.2	393	31.4
19-Nov	29	7.4	524	46.4
26-Nov	98	10.5	644	46.5
03-Dec	57	6.2	492	35.3
10-Dec	-	-	165	14.0
17-Dec	-	-	20	7.2
Total	4,928	366.1	8,298	579.6

Table 6. Number (thousands) of inside chum spawning in wild areas, and number spawning in enhar facilities or otherwise utilized by hatcheries, in 1990, compared to spawning capacity and previous year averages.

Spawning Areas by Stock Group	Target Escapement	1990 Estimate	1990 as a percentage of Target	1983 - 89 Average	1990 as a percentage of 83-89 Avg
WILD STOCKS					
Upper Vanc Is	67.0	0.3	0%	0.5	54%
Kingcome	196.0	0.3	0%	9.1	3%
Bond/Knight(1)	346.0	19.5	6%	33.4	59%
Johnstone St	180.0	80.2	45%	54.8	146%
Lough/Bute(1)	436.0	73.3	17%	135.1	54%
Mid Vanc Is	230.8	140.6	61%	130.2	108%
Toba Inlet	172.0	0.1	0%	10.3	1%
Jervis Inlet	140.1	160.5	115%	105.0	153%
Lower Vanc Is	130.0	66.4	51%	64.9	102%
South Vanc Is	216.5	185.3	86%	172.7	107%
Howe/Sunshine	357.5	72.5	20%	151.1	48%
Burrard Inlet	35.0	43.4	124%	29.4	148%
Fraser River	700.0	625.8	89%	592.4	106%
Boundary Bay	5.0	0.1	2%	0.4	29%
WILD TOTAL	3211.9 a	1468.4	46%	1489.2	99%
ENHANCED STOCKS					
Mid Vanc Is	149.0	116.8	123%	149.2	78%
Fraser River	30.0	125.4	418%	32.9	382%
ENHANCED TOTAL	179.0	242.3	194%	182.1	133%
GRAND TOTAL	3390.9	1710.7	51%	1671.3	102%

a. Current long term goal. Interim goal for 1987-1990 is 2,000,000.

Table 7. Total stock, catch, escapement, wild escapement and Clockwork and actual harvest rate for Inside chum, 1980-1990.

Year	Total Clockwork Assessed Stock	Total Clockwork Catch	Total Wild & Enhanced Escapement	Total Study Area Wild Escapement	Desired Clockwork Harvest Rate	Actual Harvest Rate
1980	2,482,000	N/A	1,325,000	1,231,800	NA	46.9%
1981	1,496,900	N/A	1,291,100	1,209,100	NA	13.9%
1982	3,064,800	N/A	1,480,000	1,333,300	NA	49.6%
1983	1,617,700	193,600	1,232,900	1,066,700	10.0%	12.0%
1984	1,930,900	103,400	1,595,200	1,442,700	10.0%	5.4%
1985	4,109,300	761,900	2,477,200	2,493,200	30.0%	18.5%
1986	3,963,100	1,395,800	2,086,800	1,885,100	30.0%	35.2%
1987	2,040,000	174,800	1,406,200	1,234,600	10.0%	8.6%
1988	3,177,600	1,224,800	1,615,900	1,425,500	20.0%	38.5%
1989	1,827,200	533,100	1,052,700	876,500	10.0%	30.3%
1990	3,514,000	1,290,600	1,710,700	1,517,200	30.0%	36.7%

1. Wild escapement goal for 1983-86 was 1.8 million.
2. Wild escapement goal for 1987-90 was 2.0 million.
3. Actual harvest rate 1980-82 is Total Catch/Total Study Area Stock.

Table 8. Number of chum salmon sampled for GSI data, 1989.

Area	Weeks Sampled	Commercial Samples	Test fish Samples
Johnstone Strait	9	2,800	2,537
Qualicum	3	1,331	0
Nanaimo	0	0	0
Cowichan	1	126	0
Nitinat	3	402	604
Total		4,659	3,141

Source: Can. Data Report of Fisheries and Aquatic Sciences No. 841.

Table 9. Summary of Clockwork catch, escapement and harvest rate, 1989.

Fishery Type	Areas	Total Catch	Contribution to Clockwork	Clockwork Catch
Commercial and Test	12 & 13	1,101,700	100%	1,101,700
	14	142,700	8% ^a	8,300
	29	109,700	0%	0
	other	43,600	0%	0
	sub total	1,397,700		1,110,000
Indian Food	12 & 13	23,300	100%	23,300
	29	13,800	0%	0
	other	22,000	0%	0
	sub total	59,100		23,300
U.S.	7	56,700	70% ^b	39,700
	7A	123,800	95% ^b	117,600
	sub total	180,500		157,300
Total Clockwork catch				1,290,600
Total Escapement				1,710,700
Total Clockwork Assessed Stock				3,541,000 ^c
Clockwork Harvest Rate				36.7%
Total Study Area Stock Size				3,492,100 ^d

a. Based on GSI data.

b. Based on apportionment methods as per Chum Technical Report 88-4

c. Total Clockwork Assessed Stock Size (Commercial, IFF, Test and Sampled catch, plus Hatchery Rack Sales for Area 11-20 plus the Canadian component of the US catch in Areas 7 & 7a.

d. Total Study Area Run Size (Commercial, IFF and Test catch Area 11-20 & 29 plus Canadian component of the US catch Areas 4b,5,6c,7, & 7a plus Can. Area 21(Nitinat) catch of Study Area origin minus Can. catch of US origin chum in the Study Area)

Table 10. Clockwork assessment of in-season and post season stock size and escapement.

CLOCKWORK ASSESSMENT 1983 - 1990								
	1983	1984	1985	1986	1987	1988	1989	1990
1. INSEASON...								
Inseason Assessment *	1,420,000	1,810,000	2,970,000	3,730,000	2,480,000	4,153,000	3,000,000	3,790,000
Date Assessed	-	-	Oct 18	Oct 20	Oct 19	-	Oct 18	Oct 19
Assessed Total Stock	1,420,000	1,810,000	2,970,000	3,806,000	2,305,600	4,217,000	2,635,000	3,470,000
Desired HR	10.0%	10.0%	20.0%	30.0%	10.0%	30.0%	20.0%	30.0%
Apparent HR	13.6%	5.7%	25.7%	37.4%	7.0%	29.5%	18.4%	34.1%
2. POST SEASON...								
Clockwork Assess Stoc	1,617,700	1,930,900	4,109,300	3,963,100	2,039,900	3,177,600	1,827,200	3,514,000
COMM & TF A11-13	101,800	38,200	516,300	1,131,400	68,400	1,086,900	458,000	1,101,700
COMM & TF A29	7,800	2,000	51,800	97,300	9,900	NA	NA	NA
COMM A 14 FR	61,700	22,400	36,600	61,300	26,700	4,700	8,000	8,300
IFF A11-13,29	20,300	39,500	18,600	28,900	48,600	24,700	23,000	23,300
US 7-7A	2,000	1,300	138,600	76,900	21,200	108,500	64,100	157,300
Total	193,600	103,400	761,900	1,395,800	174,800	1,224,800	553,100	1,290,600
Desired HR	10.0%	10.0%	30.0%	30.0%	10.0%	20.0%	10.0%	20.0%
Actual HR	12.0%	5.4%	18.5%	35.2%	8.6%	38.5%	30.3%	36.7%
3. ESCAPEMENT...								
Goal	1,800,000	1,800,000	1,800,000	1,800,000	2,000,000	2,000,000	2,000,000	2,000,000
Estimated wild	1,066,700	1,442,700	2,493,200	1,885,100	1,234,600	1,425,500	876,500	1,517,200
Difference	-733300	-357300	693200	85100	-765400	-574500	-1123500	-482800

Note: 1. Clockwork catch 1983-87 included commercial catches from Areas 11-13 (After Sept. 1) Area 14 Fraser origin catch and Area 29, IFF catches Areas 11-13 and 29 for years 1983-87 (in 1988 and 1989, IFF catches are from Areas 11-13 only), Test catches from Area 11-13 and 29, and U.S. catches of Can. chum in Areas 7 and 7A.
2. Clockwork catches for 1988 excluded catch from the Area 29 fishery. Fraser River catches were accounted for in the Fraser River clockwork.
3. Clockwork total Stock is Commercial, IFF and Test Catches for Areas 11-20 and 29 plus the Canadian component of US Areas 7 and 7A.
4. 1989 and 1990 catches PRELIMINARY
5. Inseason Assessed Total Stock is the assessed run size prior to the last fishery.

3.3 WEST COAST VANCOUVER ISLAND (WCVI) CHUM

3.3.1 Conservation and Harvest Management Requirements

Then Nitinat fishery is directed at the group of stocks originating from river systems and the hatchery in the Nitinat Lake area. The escapement goals include 150,000 in the Nitinat River, 25,000 in other Nitinat Lake tributaries and 25,000 in Area 21 tributaries for a total of 200,000. This includes a hatchery equivalent of 9,000 females for broodstock.

The management of this fishery is based on achieving a fixed escapement of 175,000 for Nitinat Lake. Surpluses to the escapement requirement are harvested by gillnet and seine fisheries in waters adjacent to Nitinat Lake (generally Area 21.) The fishing area is inside a line two miles due south of Pachena Point and Bonilla Point. Besides escapement, the management regime attempts to achieve assessment, quality and allocation requirements. A seine test fishery and a commercial gillnet fishery are initiated in mid September to provide inseason information to confirm the availability of surpluses. The gillnet catch rates in these early fisheries are used to assess run strength and run timing. Subsequent fishing opportunities for seines and gillnets depend on inseason determination of available surplus for catch rates and escapement. A gillnet test vessel and visual surveys of the river, are used to determine escapement into Nitinat Lake area.

Troll catch of chum salmon is a by-catch in this mixed stock fishery. Management consists of monitoring catch and providing GSI samples when catches reach significant levels.

3.3.2 Run Size Estimation

The 1990 preseason expected surplus to the hatchery was 60,000, based on return at age correlations. The inseason information generally confirmed a low run size. Consequently, fisheries were limited to two weeks of gillnet fishing.

The post season estimate of the total Nitinat area chum stock (hatchery plus wild components) includes commercial and test catch, native food fish, hatchery brood stock and rack sales and escapement. Catch of Nitinat stock in the commercial fishery is determined by stock composition estimates based on uncorrected GSI results from the fishery (note that the methodology is "preliminary" at this time). The 1990 post season estimate of the total Nitinat stock is 327,000 chum (including 230,000 escapement plus 8,200 commercial gillnet catch of WCVI stock plus 13,400 seine test catch plus 4,600 gillnet test catch plus 71,100 hatchery rack).

Stock composition in the commercial fishery is based on GSI results. Samples (n=200) for each commercial fishery were collected from the Vancouver docks, for a total of 402 fish. Preliminary results were used to estimate WCVI chum contribution to the catch (note that the CTC has not yet finalized a methodology for analysis and application of WCVI GSI results). Three samples (n=200) were taken from the three WCVI chum test vessels at Nitinat on October

16, for a total of 604 fish. Estimates of WCVI contribution were not significantly different between the three test samples.

3.3.3 Catch

The commercial chum salmon fishery in Area 21 was conducted over two weeks, starting September 17 and finishing September 25. Catch rates in this fishery were used to determine run strength and timing. Commercial openings were for gillnets only, and included 4 days from September 17-20 and 2 days of September 24-25. Catches were 3,300 and 8,000 chum respectively. Based on these low catch rates, along with low escapements through October, no further fisheries were conducted.

The seine test fishery outside Nitinat Lake operated from September 26 to October 15. The test fishery harvested an estimated 13,400 chum. The test fishery in Nitinat Lake started October 11 and harvested 4,600 chum.

Native food fishermen reported a harvest of 500 chum in Area 22.

The hatchery took approximately 16,000 chum for brood stock. Hatchery rack sales, including brood stock, totalled 71,100 chum.

Catch in the commercial troll fishery off the WCVI (Areas 121-127) was 8,300 chum during the entire troll season. The majority of the catch occurred in July and August. These stocks were thought to be returning to streams in the north and central coast area of B.C.

3.3.4 Escapement

The escapement to the wild spawning grounds of the Nitinat River was 230,000 chum. Other tributaries to Nitinat Lake had very poor escapements; totalling about 1,000 for those systems inspected. Flooding in November and December was thought to have substantially reduced the effective spawn, perhaps by 50% based on subjective assessments by local Fisheries Officers.

Indications from test fishing and escapement counts are that the chum run timing into the Nitinat system may have been two weeks late; about 40% of the escapement occurred after November 15.

3.3.5 Status of Treaty Requirements

Canada was to manage the Nitinat net chum fishery to minimize the harvest of non-targeted stocks. Fisheries were conducted in a restricted area and GSI samples were taken to determine stock composition. Baseline samples were taken from Nahmint River. Because of the limited chum catch, no GSI sampling was conducted in the troll fishery.

3.3.6 Tables

Table 1. Summary of Nitinat Catch, Escapement and Run Size, 1990.

Statistical Week	Week Ending	Catch
8/4	Sep 03	0
9/1	Sep 10	0
9/2	Sep 17	0
9/3	Sep 24	3,291
9/4	Oct 01	7,973
10/1	Oct 08	0
10/2	Oct 15	0
10/3	Oct 22	13,418
10/4	Oct 29	0
10/5	Nov 05	0
Total Catch		24,682
Total Catch Nitinat Stock (GSI)		21,637
Wild Nitinat Escapement		230,000
Other (broodstock, rack, test)		75,724
Nitinat Run Size		327,361

(Data from catch database on PBS VAX)

Table 2. Summary of Nitinat Catch and Escapement, 1985 - 1990.

Year	Total Catch	Total Escapement ¹
1985	1,609,364	210,000
1986	387,470	142,820
1987	395,397	50,200 ²
1988	1,795,354	256,800
1989	293,843	146,553
1990	97,361	230,000 ³

1. Includes both wild fish and those used for enhancement purposes.

2. High Pre-spawning mortalities high because of a lake turnover.

3. Hatchery rack returns included in catch.

LITERATURE CITED

- Phelps, S.R., L. LeClair, C. CdeBaca and W. Beattie. 1991. Genetic Stock Identification Estimates of 1990 Washington Commercial Chum Fisheries in the Strait of Juan de Fuca and North Puget Sound. Washington Department of Fisheries, the Nooksack Indian Tribe and the Northwest Indian Fisheries Commission.
- Hop Wo, L., A.P. Gould and W.H. Luedke. 1990. Biochemical Stock Identification of Chum Salmon in Southern British Columbia 1990.

ATTACHMENT 1

CHAPTER 6 OF ANNEX IV OF THE PACIFIC SALMON TREATY

1990 CHAPTER

Chapter 6

SOUTHERN BRITISH COLUMBIA AND WASHINGTON STATE CHUM SALMON

1. The Parties shall maintain a Joint Chum Technical Committee (Committee) reporting, unless otherwise agreed, to the Southern Panel and the Commission. The Committee, inter alia, will undertake to

- (a) identify and review the status of stocks of primary concern;
- (b) present the most current information on harvest rates and patterns on these stocks, and develop a joint data base for assessments;
- (c) collate available information on the productivity of chum stocks to identify escapements which produce maximum sustainable harvests and allowable harvest rates;
- (d) present historical catch data, associated fishing regimes, and information on stock composition in fisheries harvesting those stocks;
- (e) devise analytical methods for the development of alternative regulatory and production strategies;
- (f) identify information and research needs, to include future monitoring programs for stock assessment; and,
- (g) for each season, make stock and fishery assessments and evaluate the effectiveness of management.

2. In 1990, Canada will manage its Johnstone Strait, Strait of Georgia, and Fraser River chum fisheries to provide continued rebuilding of depressed naturally spawning chum stocks, and, to the extent practicable, minimize increased interceptions of United States origin chum. Terminal fisheries conducted on specific stocks with identified surpluses will be managed to minimize interception of non-targeted stocks.

3. In 1990,

(a) for Johnstone Strait run sizes less than 3.0 million

- (i) Canada, taking into account the catch of Canadian chum in United States Areas 7 and 7A, will limit its harvest rate in Johnstone Strait to less than 10 percent, resulting in a Johnstone Strait catch level of up to 225,000 chum; and,
- (ii) when the catch in Johnstone Strait is 225,000 chum or less, the United States catch of chum in Areas 7 and 7A shall be limited to chum taken incidentally to other species and in other minor fisheries, but shall not exceed 20,000, provided, however, that catches for the purposes of electrophoretic sampling shall not be included in the aforementioned limit;

(b) for Johnstone Strait run sizes from 3.0 million to 3.7 million

- (i) Canada, taking into account the catch of Canadian chum in United States Areas 7 and 7A, will limit its harvest rate in Johnstone Strait to 20 percent, resulting in a Johnstone Strait catch level of 225,000 to 640,000 chum; and,
- (ii) when the catch in Johnstone Strait is from 225,000 to 640,000 chum, the United States catch of chum in Areas 7 and 7A shall not exceed 120,000;

(c) for Johnstone Strait run sizes of 3.7 million and greater

- (i) Canada, taking into account the catch of Canadian chum in United States Areas 7 and 7A, will harvest at a rate in Johnstone Strait of 30 percent or greater, resulting in a Johnstone Strait catch level of 640,000 chum or greater; and,
- (ii) when the catch in Johnstone Strait is 640,000 chum or greater, the United States catch of chum in Areas 7 and 7A shall not exceed 140,000;

- (d) it is understood that the Johnstone Strait run sizes, harvest rates, and catch levels referred to in 3(a), 3(b), and 3(c) are those determined in season, in Johnstone Strait, by Canada; and,
 - (e) the United States shall manage in a manner that, as far as practicable, maintains a traditional proportion of effort and catch between United States Areas 7 and 7A, and avoids concentrations of effort along the boundary in Area 7A.
4. In 1990, the United States shall conduct its chum fishery in the Strait of Juan de Fuca (United States Areas 4B, 5 and 6C) so as to maintain the limited effort nature of this fishery, and, to the extent practicable, minimize increased interceptions of Canadian origin chum. The United States shall continue to monitor this fishery to determine if recent catch levels indicate an increasing level of interception.
5. If the United States chum fishery in Areas 7 and 7A fails to achieve the 1990 catch levels specified in paragraphs 3(a)(ii), 3(b)(ii), and 3(c)(ii), any differences shall be compensated by adjustments to the Areas 7 and 7A fishery in subsequent years, except that chum catches below the level specified in paragraph 3(a)(ii) shall not be compensated.
6. Catch compositions in fisheries covered by this chapter will be estimated by post-season analysis using methods agreed upon by the Joint Chum Technical Committee.
7. Canada will manage the Nitinat net chum fishery to minimize the harvest of non-targeted stocks.
8. In 1990, Canada shall conduct electrophoretic sampling of chum taken in the West Coast Vancouver Island troll fishery if early-season catch information indicates that catch totals for the season may reach levels similar to 1985 and 1986. Sampling, should it occur, will include catches taken from the southern areas (Canadian Areas 121-124).

ATTACHMENT 2

TREATY LETTER OF TRANSMITTAL

MAY 16, 1990



The Honourable Bernard Valcourt, P.C., M.P.
May 16, 1990
Page 6

Beginning in January of 1992, the Commission and Panels, as appropriate, will discuss the results of the workshop and determine by February 1992 if it would be of benefit to continue this initiative, considering further provisions if necessary.

6) With respect to Annex IV, Chapter 6, the Commission recognizes that the U.S. fishery harvested in 1989 approximately 41,700 chum salmon less than the harvest permitted under Annex IV, Chapter 6, paragraph 3(c)(ii). The U.S. agrees that the additional chum will be taken in years when the Johnstone Strait catch exceeds 225 thousand.

7) With respect to implementation of Article III, paragraph 1 of the Pacific Salmon Treaty, the Commission has agreed to "An Understanding between the Canadian and the United States sections of the Pacific Salmon Commission concerning equity-related issues" (Attachment 7).

8) The Commission also wishes to note its continuing concern about its significant funding problem, brought to the attention of the Parties by letter dated January 12, 1990. The Standing Committee on Finance and Administration met again May 10, 1990 to undertake a comprehensive review of expenditure needs identified by the Secretariat. The Commission endorses the Committee finding that contributions of \$1,100,000 (Canadian) will be required from each Party beginning April 1, 1991 if the Secretariat is to continue its responsibilities to provide administrative support to the Commission and scientific support to the Fraser River Panel. The Commission would appreciate your support to assist us in continuing to carry out the important work of the Pacific Salmon Treaty.

The Commission respectfully requests your approval of these recommendations.

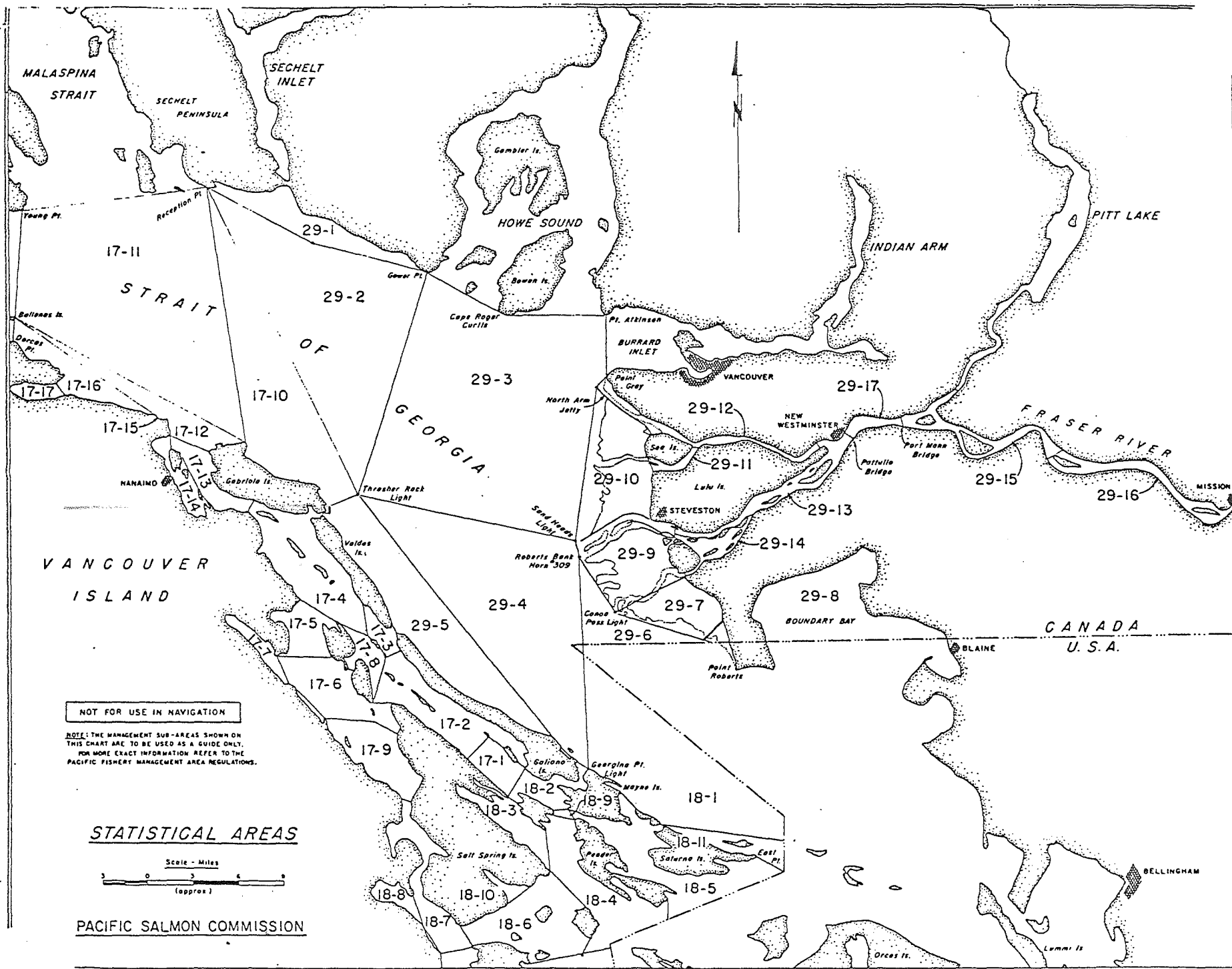
Yours truly,

PACIFIC SALMON COMMISSION

for D. W. Collinsworth, Chair

ATTACHMENT 3

U.S. AND CANADIAN STATISTICAL AREA MAPS



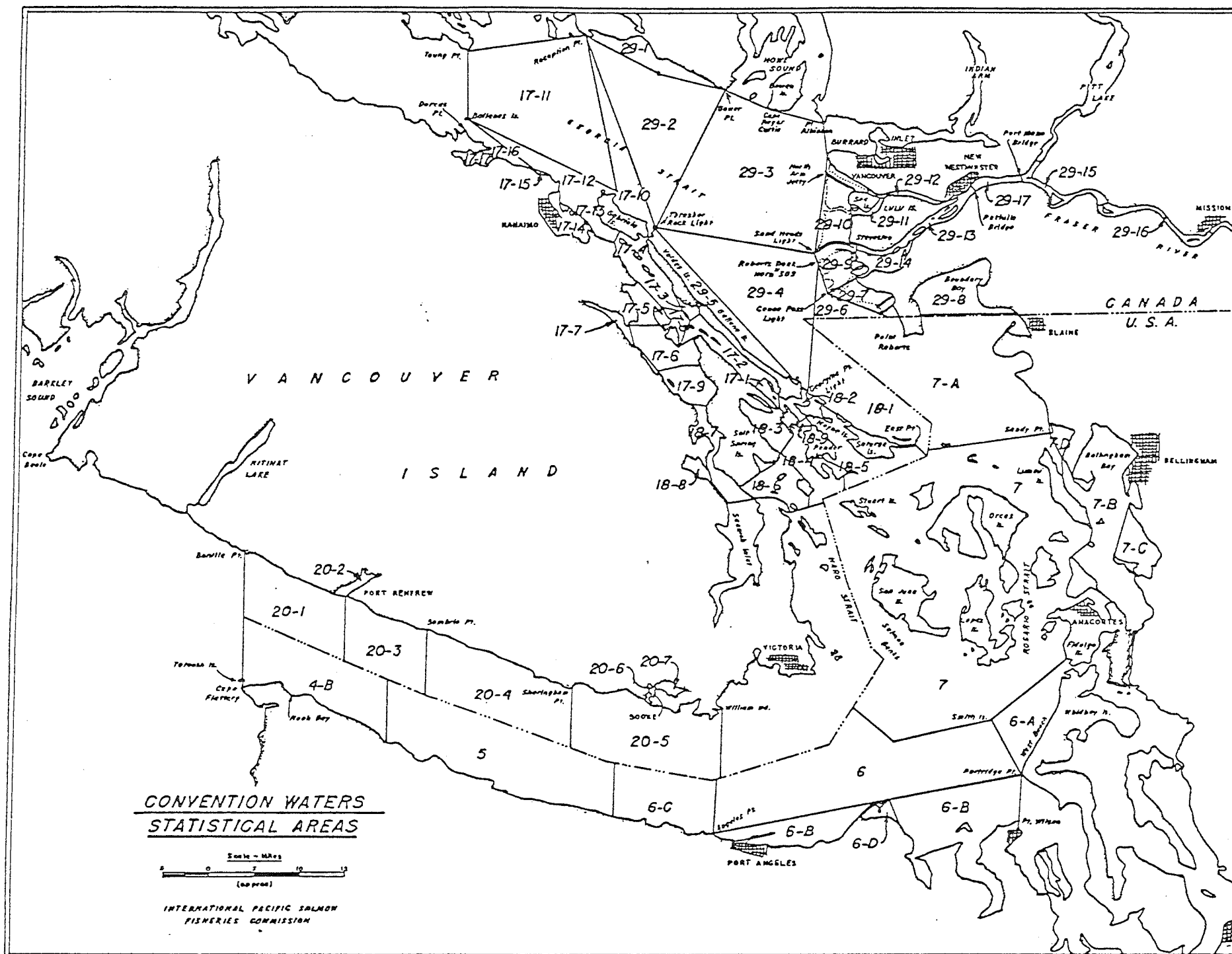
NOT FOR USE IN NAVIGATION

NOTE: THE MANAGEMENT SUB-AREAS SHOWN ON THIS CHART ARE TO BE USED AS A GUIDE ONLY. FOR MORE EXACT INFORMATION REFER TO THE PACIFIC FISHERY MANAGEMENT AREA REGULATIONS.

STATISTICAL AREAS



PACIFIC SALMON COMMISSION



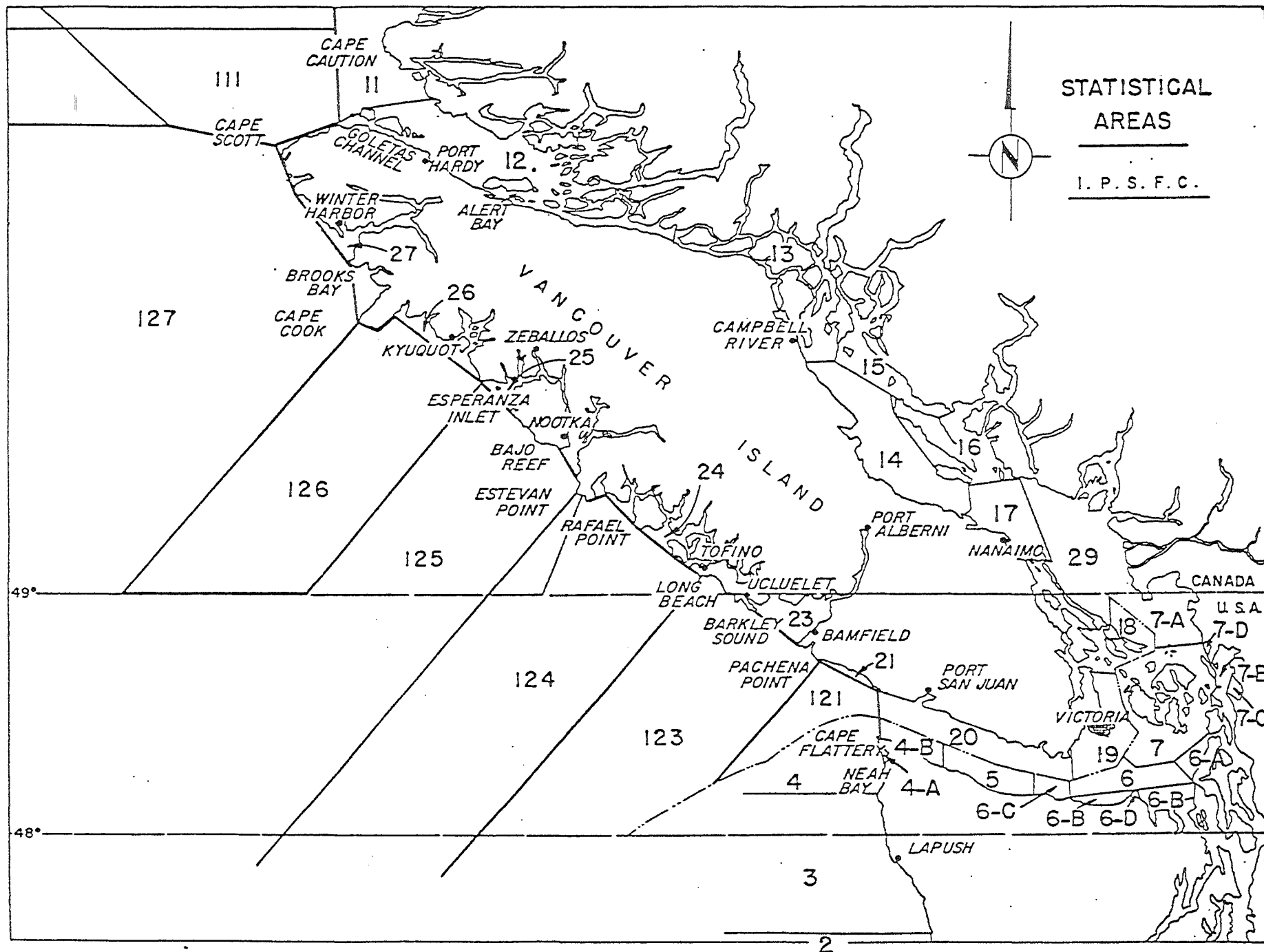


Figure 2.

