PACIFIC SALMON COMMISSION
JOINT CHUM SALMON TECHNICAL COMMITTEE REPORT

FINAL 1991 POST SEASON SUMMARY REPORT
REPORT TCCHUM (93)-1

March, 1993

TABLE OF CONTENTS

INTRODUCTION

This Joint Chum Salmon Technical Committee report presents the appropriate information for 1991 chum salmon stocks and fisheries 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 17, 1991 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 1991.

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.*

   The Joint Chum Technical Committee convened on three separate occasions during the year to address various assignments. The following report was published: The 1989 Post-Season Summary Report.

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 1991, the gross escapement of Inside chum totalled 1,686,000. Escapement to natural spawning areas totalled 1,475,000 which was 74% of the Clockwork goal of 2,000,000. The Fraser River escapement was 621,000, or 89% of the 700,000 goal.

   Terminal area fisheries scheduled by Canada to harvest specific stocks with identified surpluses included; mid Vancouver Island (Area 14), Cowichan (Area 18), Nanaimo (Area 17) and Fraser River (Area 29). These fisheries were managed to limit interceptions of U.S. origin or other non-targeted stocks. Stock composition samples were taken, but the technical committee has not addressed the issue of "minimizing increased interceptions".

3. *In 1991, Canada was to manage its Johnstone Strait Clockwork harvest to set levels dependent on the run size entering Johnstone Strait, as determined inseason. 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 and revised after the end of the 1988 fishing season; no further changes were incorporated in 1991. The inseason estimate of Johnstone Strait run size was 2,700,000, providing for a harvest rate of 10% or 270,000 chum. Post-season, the run size was estimated at 2,733,000 chum. The overall harvest rate for clockwork management purposes was 16.3%.

   The total allowable catch for U.S. Areas 7 and 7A was 120,000, based on a total chum harvest in Johnstone Strait which exceeded 225,000 fish. The total commercial catch for this fishery in 1991 was 137,000 chum. This fishery was managed to maintain a traditional fishing pattern with both areas opened simultaneously. However, the U.S. catch in Areas 7 and 7A was disproportionately harvested with 70% of the total taken in Area 7A. The traditional proportion is an even distribution of catch between the two areas.

4. *In 1991, 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 commercial catch of 49,500 chum was within 5% of the Strait harvests of the last 2 years. Genetic Stock Identification (GSI) samples were taken. However, the technical committee has not addressed the issue of whether increased interceptions were minimized.

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.*

   The U.S. Area 7 and 7A fishery exceeded the 1991 ceiling by 18,000 fish. Thus, a future adjustment will be required (Table 1, Sec. 1.2).

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 continuing review by the committee.

7. *In 1991, Canada was to manage the Nitinat net chum fishery to minimize the harvest of non-targeted stocks.*

The boundaries of the Nitinat fishery were expanded in 1991 to include a portion of Area 20-1 . Canada conducted GSI sampling to quantify the incidence of interceptions of passing stocks in Area 121. Additional GSI samples were not collected from Area 20-1. The technical committee has not determined whether the harvest of non-target stocks has been minimized.

8. *In 1991, 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 17, 1991, paragraph 3.c.iii, the Pacific Salmon Commission agreed that the U.S. would not harvest the cumulative chum salmon shortfall through 1990 in Areas 7 and 7A.*

A cumulative catch shortfall of 756 fish in the U.S. Area 7 and 7A fishery was foregone when setting the 1991 ceiling.

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 post-season Clockwork assessment of chum salmon was 81% of the expected run size of 3,279,000. The overall harvest rate for clockwork assessment purposes was 16.3%. The total return of Fraser River chum was 984,000 or 82% of the expected run size.

West Coast Chum

The expected surplus of chum salmon to the Nitinat hatchery was 25,000. The return of wild origin chum salmon the Nitinat area was not predicted. The post-season estimate of Nitinat origin chum was 972,000 including enhanced and wild origin fish.

United States

The two regions to be reported under the PST are those waters south of the U.S./Canada border from the western Strait of Juan de Fuca to Point Roberts (Puget Sound) and the embayments and rivers along the 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 1,176,000. Of these, 694,000 were expected from natural spawning areas and 482,000 were expected from enhancement facilities. The stocks that were expected to produce the largest returns included South Puget Sound (444,000) and Hood Canal (359,000).

The post-season run size, as estimated from run reconstruction, was 1,256,000, or 107% of the preseason forecast. The natural component totaled 704,000 fish while the enhanced component reached 552,000 fish. This run size represents a continued increase in this cycle, which reached a low of 175,000 fish in 1979. The return to South Puget Sound region was lower than the preseason expectation, but the Hood Canal run exhibited a 50% increase relative to the

preseason forecast of 355,000 chum.

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 chum salmon occurs in the Quinault River. The 1991 preseason run estimate of the Washington coastal chum stock was 172,000. The actual return, as estimated by run reconstruction, was 141,000 fish.

1.2 MANAGEMENT OF FISHERIES

Southern British Columbia

Inside Fisheries

Management of the fall chum salmon fisheries in Johnstone Strait 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 inseason run size estimate is provided by a late September commercial fishery in Johnstone Strait. If the assessment indicates the fall chum run through Johnstone Strait will exceed 3,000,000, then further commercial harvesting will occur. If commercial and Indian Food Fish harvesting in Johnstone Strait exceeds 225,000 chum, then directed chum harvests in U.S. Areas 7 and 7A are scheduled.

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.

The Qualicum fishery is managed as a terminal fishery for mid Vancouver Island area enhanced chum. Objectives include limiting the catch of local coho and chinook stocks. The Nanaimo and Cowichan terminal fisheries, (Area 17 and 18) harvest primarily wild chum.

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.

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 by limiting participation to local Treaty Indian Tribes using gillnet gear. This fishery harvests primarily Puget Sound stocks.

In Areas 7 and 7A, the objective was to conduct fisheries to harvest 120,000 chum using traditional fishing patterns, given the applicable Johnstone Strait harvest. An additional objective of the U.S. management in Areas 7 and 7A was to apportion the harvests between Treaty and non-Treaty fishermen to achieve domestic allocation.

1.3 REVIEW AND EVALUATION OF FISHERIES

Southern British Columbia

Inside chum

During July and August an incidental catch of summer chum occurred during commercial fisheries directed at Fraser River sockeye and pinks. The catch for these two months was 42,000.

Fall chum salmon fishing occurred in Johnstone Strait (Areas 11 to 13) and mid Vancouver Island (Area 14), Nanaimo (Area 17), 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.

The first inseason run size projection of 2,600,000 was made on October 5. This estimate was based on the chum catch and effort data from the Johnstone Strait test fisheries and from the commercial assessment fishery in September. The chum catch during the Johnstone Strait assessment fishery totalled 177,000. Continued test fishing through to October did not project a run size greater than 3,000,000 therefore no additional harvest occurred. The final inseason run size estimate was 2,700,000 chum.

Fishing in the Strait of Georgia was limited to mid Vancouver Island (Area 14), Nanaimo (Area 17) and Cowichan (Area 18) in 1991. Commercial fisheries were directed primarily at enhanced chum in Area 14. Commercial fisheries occurred on October 15, 21, 28 and November

4. The total catch for Area 14 was 270,000. In Area 17 a fishery occurred on October 21 which caught 16,000 chum. In Area 18, fisheries occurred on November 4, 11, 18 and 25 with catches of 10,000, 49,000, 71,000 and 24,000 chum respectively. The total catch for Area 18 was 154,000 chum.

Under the Fraser River Chum Harvest Management Plan, two commercial fisheries were permitted on October 22 and November 12 based on terminal surpluses identified in the early portion of the run. The total catch for these commercial fisheries was 50,200 chum. The late portion of the run was not abundant enough to allow any commercial harvest after November 12.

West Coast Chum

Catch in the commercial troll fishery off the WCVI (Areas 121-127) was 12,976 chum during the entire troll season. The majority of the catch occurred in July and August.

The commercial chum salmon fishery in Area 21 started fishing two days per week for three weeks starting September 23. By October 7 Nitinat Lake had sufficient escapement to allow a seine fishery. The seine fishery was conducted October 15 and caught approximately 165,000 chum. A combined gear fishery was initiated October 19 and continued through October 26. The catch during this period was approximately 237,000 chum. The total commercial catch was 495,000.

Native food fishermen reported a harvest of 2,000 chum salmon in Area 22. Other catch in Nitinat Lake (Area 22) included test fishery payment, hatchery brood stock, and rack sales, for a total of approximately 110,000 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).

Strait of Juan de Fuca

Gillnet fisheries in Areas 4B, 5, and 6C occurred from October 14th to October 23, with a total of 49,500 chum caught by four Treaty Indian Tribes using gillnet gear only. The fishery proceeded as usual during the first week of the management period with 5 days of scheduled fishing, but was truncated during the second week after only 3 fishing days due to unexpected high catch rates and the potential impact on specific Puget Sound stocks. The harvest was roughly equal to the previous years' catch in this fishery.

San Juan Islands

The commercial catches of chum in Areas 7 and 7A were 41,000 and 96,000, respectively, totalling 137,000. Of these, 1,200 were taken in PSC controlled sockeye and pink fisheries. Two

36 hour chum fishing periods by Treaty Indians, and 7 days of reef net fishing along with four days of gillnet/purse seine fishing by non-treaty fishermen during October and November, caught 136,000 chum.

Table 1. Summary of U.S. Treaty chum allocations and catches for Areas 7 & 7A, 1986-1991.

YEAR	PST SPECIFIED CATCH LEVEL	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[2]
1991	120,000	120,000	138,361	-18,361

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

2. 1990 accumulated U.S. shortfall foregone through P.S.C. agreement.

1.4 ESCAPEMENT

Southern British Columbia

Inside Chum

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 1991 was 8,300.

The chum stocks which are managed within the context of the Clockwork plan are the fall runs. 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 1,474,800 chum. This escapement was 101% of the 1983 to 1990 average escapement. In addition, escapement to enhanced areas was 210,800. The total escapement of wild and enhanced chum was 1,685,600.

The terminal run size to the Fraser River system was 698,000. This left an escapement of approximately 621,000 after commercial, test, and Indian Food Fish catches were subtracted. The enhanced systems in the Fraser River drainage showed very strong returns and the smaller

drainages exhibited variable returns. The overall escapement to the Fraser River was approximately 93% of the net escapement goal.

Overall, the fall chum spawning escapement in wild spawning areas for 1991 was 74% of the present interim total spawning goal of 2,000,000 chum.

West Coast Chum

The escapement to the wild spawning grounds of the Nitinat River system was estimated to be 350,000, exceeding the goal of 250,000. Other tributaries to Nitinat Lake had very poor escapements.

United States

Puget Sound Chum

The total Puget Sound chum salmon escapement was 390,000, 31% above the escapement goal. The previous cycle escapement in 1987 was 475,000 fish.

Washington Coastal Chum

The chum escapements in Willapa Bay, Grays Harbor and the Quinault River totaled 67,900, 18% above the goal.

1.5 REVIEW OF GSI PROGRAMS

In 1991, all GSI sampling requirements were met. The commercial fishing areas sampled in 1991 were upper Johnstone Strait (Area 12), mid Vancouver Island (Area 14) and Nanaimo (Area 17). The samples in Areas 14 were from the commercial catch and samples from Area 17 were from test fishing. In Area 12, the samples were from chum caught by test fishing vessels and in the commercial fishery.

For the west coast of Vancouver Island, 200 samples were collected from each commercial fishery at the Vancouver docks, for a total of 800 samples. Uncorrected results were used to estimate WCVI contribution to the catch (note that the Chum Technical Committee has not yet finalized a methodology for analysis and application of WCVI GSI results).

The WCVI troll fishery 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 3,528 samples were analyzed in 1991.

Several replicate and some new GSI baseline samples were collected from both Washington stocks and from stocks within Georgia Strait and the West Coast of Vancouver Island. In addition, a GSI subcommittee continued its task of evaluating approaches to GSI. The GSI subcommittee work is ongoing at this time.

1.6 1991 CHUM TECHNICAL COMMITTEE PUBLICATIONS

TCCHUM (91)-1 Final 1989 Post-Season Summary Report.

CHAPTER 2

REVIEW OF 1991 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 1991 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 Strait chum fishery is restricted to limited Treaty Indian gillnet effort 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 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). A small chum catch occurred in Area 6 in 1991, but no harvest was recorded for Area 6A.

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-Washington stocks.

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

2.2.1 Management Strategy

The Sixth Annual Meeting of the Pacific Salmon Commission concluded in May, 1991 by adopting a two year chum salmon fishery regime for 1991 and 1992. That regime was identical to Chapter 6 of Annex IV of the PST for 1990. The Commission also formulated additional understandings with regard to the 1991 and 1992 fishery regimes in the letters of transmittal, dated May 17, 1991. These understandings provided that: (1) the U.S. would forego the harvest of the Areas 7 and 7A chum salmon shortfall that had accumulated through 1990; and (2) the Commission would "initiate discussions on chum within the Southern Panel area with a view toward clarifying and improving the understanding of the conservation concerns and management approaches of the Parties". Since the 1990 fishery regime remained unchanged, the U.S. management strategy for the Strait of Juan de Fuca, the San Juan Islands and Point Roberts

fisheries was identical to the 1990 fishing plan.

The management strategy for the Strait of Juan de Fuca fishery has consisted of limiting the total effort in this fishery and keying management decisions on the needs of Puget Sound stocks. This strategy was again implemented in 1991. The limited effort nature of this fishery is maintained by: (1) prohibiting non-indian participation in the fishery; (2) limiting treaty indian participation to 4 tribes out of the 20 Treaty tribes in western Washington; and (3) limiting effort to gillnet gear only.

The management strategy as well as the harvest quotas for Areas 7 and 7A are contained in Chapter 6, Annex IV of the PST. According to the Annex, fishing schedules for both areas should maintain an historical proportion of effort and catch between the two areas. In practice, this requirement is implemented by opening both areas simultaneously when fisheries are scheduled. Harvest quotas for Areas 7 and 7A are triggered by catch levels in the Canadian fishery in Johnstone Strait. The 1991 regime called for an Area 7 and 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 and 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 and 7A ceiling of 140,000 chum if the Johnstone Strait catch was greater than 640,000 (30% or greater Clockwork harvest rate).

2.2.2 Fishery Review

The fall chum management period for Areas 4B, 5 and 6C began on October 13th. Catches of chum taken prior to October 13 totaled 509 fish, and most of this catch (457) was from test fisheries scheduled to collect GSI samples during the two weeks prior to the start of the management period. The commercial fishery began on October 14 and remained open for 5 days the first week. Fishing resumed on October 21, but fishing was terminated on October 23 when high catch rates and the resultant impact on some terminal fisheries and escapement became a concern to Puget Sound managers. The total harvest during the targeted commercial fishery was 49,340 chum. Test fishing for genetic stock identification (GSI) samples continued for an additional 2 weeks after the end of the commercial fishery, and harvested 279 chum. For the season, 50,186 chum were harvested in the Strait of Juan de Fuca in target, nontarget and test fisheries combined (Table 1).

Prior to the chum management period in Areas 7 and 7A (10/6 & 10/13 respectively), few chum were harvested incidental to fisheries targeting on sockeye and pink salmon during Fraser Panel jurisdiction. The pre-management period chum harvest in Areas 7 and 7A totaled 1,177 fish.

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. Indications from the initial evaluation fishery on September 23 and 24, and on subsequent test fisheries in late September/early October were that the run was lower than expected, with an estimated run size of less than 3 million fish. However, the U.S. was notified by DFO staff by

mid October that the total chum catch in Johnstone Strait had exceeded 225,000 fish. Under provisions of the chum annex of the PST, this catch level in Johnstone Strait triggers a catch quota of 120,000 chum in U.S. fishing Areas 7 and 7A. A letter was sent from the Washington Department of Fisheries to the Canadian Department of Fisheries and Oceans confirming the U.S. understanding of these harvest levels and expressing the intent to open chum fisheries in Areas 7 and 7A.

The first chum openings scheduled in Areas 7 and 7A were non-treaty reef net fisheries conducted on October 6 and 7, and again on October 14 through October 18. The U.S. quota in effect during these fisheries was 20,000 chum, and total catches were expected to be minor. Only 2,056 chum were taken during 7 days of fishing. Test fisheries for collection of GSI samples were also initiated during these two weeks, harvesting 809 chum.

Once the quota of 120,000 was confirmed, a treaty indian fishery was scheduled in Areas 7 and 7A for thirty six hours, beginning at 6:00 am Sunday, October 20 and ending at 6:00 pm Monday, October 21. After total catches were estimated, a second thirty six hour fishery was scheduled from 6:00 am Wednesday, October 23 to 6:00 pm Thursday, October 24. The total Treaty catch in both fisheries reached 49,446 chum.

Non-treaty chum fisheries in Areas 7 and 7A resumed the week of October 27. Gillnet and purse seine fisheries were scheduled for two days, October 28 and October 29. The harvest in these fisheries was 38,177 chum, bringing the total Areas 7 and 7A harvest to 91,665. To harvest the remaining quota, a second non-treaty fishery was scheduled for two days beginning 4:00 pm on November 4 and ending 8:00 pm on November 6. Because of the late timing of this fishery, it was anticipated that catches would be less than in the previous week's fishery. However, the actual catch was 46,483 chum, exceeding expectations and bringing the total area catch to 138,152 fish. Since the target quota of 120,000 had been exceeded, no additional commercial fishing was scheduled. One additional test fishery was conducted to collect GSI samples, and harvested 209 fish. The total season catch in Areas 7 and 7A was 138,361 fish, 18,361 fish in excess of the quota.

Areas 6B and 9 constitute the primary mixed stock management areas inside Puget Sound. Although the actual stock composition in these areas has not been established quantitatively, it is assumed that any harvest in these areas is composed of Puget Sound stocks. Generally, Area 6B has remained closed by joint agreement between the Washington Department of Fisheries and the treaty tribes. Fisheries may be scheduled in Area 9 after inseason verification of run strength for stocks returning to the Hood Canal, Stillaguamish/Snohomish and South Puget Sound regions of origin. In 1991, there were no commercial openings in either area except for an on-reservation Treaty set net fishery in Area 9.

2.3 PUGET SOUND INSIDE FISHERIES

2.3.1 Preseason Expectations

Puget Sound chum salmon fisheries are managed 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 for Puget Sound stocks, proceeds according to schedules documented within the Puget Sound Salmon Management Plan (PSSMP). Both the Washington Department of Fisheries (WDF) and the Treaty Indian Tribes develop and exchange methodologies and recommendations on preseason forecasts, escapement goals and other aspects of preseason management planning according to these schedules. The planning efforts are documented in a published status report each season.

The preseason expectation of abundance for 1991 Puget Sound origin chum salmon of all timing components was 1,176,000, of which 694,000 were expected to be of natural origin and 482,000 were expected to be of enhanced origin. This projection was above the total run in 1989 but lower that the average for recent odd year runs to Puget Sound.

2.3.2 Fisheries Descriptions, Catches and Spawning Escapements

The actual return of 1,256,000 was only slightly above the preseason forecast, although some regional components of the total run varied significantly from preseason expectations. The combined natural component returned as expected with a total of 704,000. The hatchery runs totaled 552,000 fish.

The returning 1991 hatchery run component reversed the previous 3 year decline in survival exhibited by Puget Sound hatchery stocks. In addition, the incidence of age 3 fish in the natural run component increased from the record low of 1.9% of the total in 1990 to 25.2% this season, but the age 4 return within the natural run totaled only 308,500 fish and was the lowest return for this age class since 1984. The total Puget Sound escapement of 390,300 chum salmon exceeded the goal by 31%.

A summary of the preseason forecasts, final inseason updates of abundance, final 1991 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 include Puget Sound origin stocks harvested within Washington waters only. Detailed information on chum harvests in each Puget Sound catch area is provided in Table 4. A comparison of 1985 through

1991 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 terminal 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 both summer and fall run timings. The summer stock return of 300 was 83% below the preseason forecast, while the fall timed stock return of 1,900 was 65% below the forecast. Likewise, spawning escapements for both the summer and fall stocks totaled 300 and 1,800 respectively and were below the respective escapement goals by 77% and 51%. 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 78,000, largely of natural origin, exceeded the preseason expectations by 68%, with both hatchery and natural components above preseason expectations. The spawning escapement of 38,000 was 49% above the goal.

Skagit Region

The natural chum return to the Skagit River of 86,500 fish was 20% below the preseason forecast and 37% below the inseason run size update. Estimated escapement totaling 22,000 was short of the goal by 45%. No significant hatchery production exists within the Skagit system.

Stillaguamish/Snohomish Region

Chum salmon from this region are all of fall timing, and historically have been of natural origin. The hatchery program at Tulalip Bay, however, is beginning to have a greater influence on the total run. In 1991, 39% of the chum return of 159,400 was composed of hatchery fish. The total run was 25% below the preseason forecast of 211,600, with both hatchery and natural components falling short of preseason expectations. Total escapement of 31,700 was 4% above the goal.

South Puget Sound Region

This region supports summer, fall and winter timed chum stocks. The summer and winter chum are largely of natural origin. The majority of the fall timed chum are also of natural origin, with some hatchery production. Returns of the summer component exceeded preseason expectations, as has been the case for each of the last 6 years. The excellent survival rates exhibited by these stocks since 1986 has been aided, in part, by a natural stock supplementation program. The total return of 56,900 in 1991 was 36% above the forecast, while total escapement

of 17,400 was 48% above the goal.

The fall timed return of 295,300 was roughly average for an odd year return. The final post-season estimate of the run size was 5% below the preseason forecast and 6% above the inseason run size update. Estimated escapement of 102,400 exceeded the goal by 34%.

The winter timed return of 41,800 represented a 54% decline from the preseason forecast and continued a four year slide in survival since the run peaked in 1987. The return was close to the long term average for this natural stock, however. The spawning escapement of 31,900 chum was 52% above the goal.

Hood Canal Region

Hood Canal supports stocks of summer and fall timed chum salmon of both natural and hatchery origin, but fisheries are managed primarily for hatchery harvest and escapement needs.

The natural summer chum return of 1,800 represented a 52% decline from preseason expectations. Adult spawners totaling 1,000 fish fell short of the expected escapement by 61%.

The fall timed chum are predominantly of hatchery origin. The return of the fall timed segment was 534,600, which was 51% above the preseason forecast. The inseason update of run strength also underestimated the actual run by 22%. This helped to push estimated escapement of 143,400 above the escapement expectation by 122%.

2.4 WASHINGTON COASTAL FISHERIES

The 1991 coastal chum runs returned at levels more than twice those of the 1990 runs, which represented a ten-year low for these stocks. Two of the three major chum systems, Willapa Bay and Grays Harbor, had roughly 10% and 20% below-average runs, respectively, while the Quinault River had very close to an average return. Run sizes, catches and escapements for Washington coastal stocks are presented in Table 6.

Willapa Bay

The Willapa Bay run size was 87,100 chum, compared to the ten-year average of 94,800 (1981-1990). The 1991 catch was 43,800 fish and nearly equaled the 10-year average catch of 49,800 chum. Chum salmon are managed entirely for natural escapement in Willapa Bay, though some hatchery escapement occurs. Total natural chum escapement of 41,800 exceeded the escapement goal by 30%.

Grays Harbor

In 1991, 44,800 chum returned to Grays Harbor, exceeding the 1990 return of 12,600. The previous ten-year average was 56,800 fish. The 1991 catch of 26,900 was 17% below the

previous ten-year average of 32,300. Grays Harbor chum are entirely of natural origin and the 17,900 adult escapement fell short of the goal by 15%.

Quinault

Chum salmon returning to the Quinault River are almost entirely of hatchery origin, although significant straying to natural spawning areas occurs. The return to the Quinault River in 1991 was close to the 10-year average run size. The total return was 9,300, of which 2,600 were caught in the Treaty Indian net fishery. Total escapement reached 6,700. 600 fish either returned to the Quinault National Fish Hatchery or were captured from the river; the remaining 6,100 fish were allowed to spawn naturally.

2.5 STOCK COMPOSITION AND RUN RECONSTRUCTION

During 1991, Puget Sound 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 1991 commercial sampling design followed closely that employed in 1990. As in 1990, the 1991 sampling plan 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 200 fish. Test fisheries were scheduled for the Strait of Juan de Fuca in the two weeks preceding and following the commercial fishery openings and for the Point Roberts area during weeks in which no commercial fishery was planned. The sampling goal of the test fisheries was identical to that of the commercial fisheries, with the exception that, in Area 7A, an additional goal was set to collect 200 samples from the contracted test fishers during Treaty commercial openings. The primary purpose of the test fisheries was to ensure that weekly GSI samples were available to evaluate trends in stock composition over the season.

The results of the 1991 commercial fishery studies are in Phelps, et al (1992), while results of the 1991 test fishery studies are in Baker, et al (1992). The sampling goal was reached each week for commercial fisheries in Area 5 during management weeks 42 and 43 (10/13-10/19; 10/20-10/26). During the peak week (week 42) 400 samples were taken for increased estimate precision. During the three weeks that commercial fisheries were scheduled in Areas 7 and 7A (weeks 43,44,45), the sampling goal was achieved in all three weeks in Area 7A and in two of the three weeks in Area 7 (weeks 43,44). Additional samples were collected during week 45 from Area 7, but it was discovered that they came from a graded lot of fish, and were therefore excluded from GSI analysis. Test fishery sample goals were achieved in weeks 40 and 41 in Area 5, and during weeks 41 and 43 in Area 7A. The test fishery sample collected during week 45 in Area 5 was not of sufficient size for stock composition analysis and was therefore combined with the week 44 sample. Additional test fishery samples were also collected in Area 7A during week 42 and week 46, but the week 46 sample size was not sufficient for stock composition analysis, and the week 42 sample was not analyzed due to insufficient funds to

complete the analysis.

All 1991 commercial and test fishery samples were assayed for 30 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, 1989 and 1990 was again used in 1991. The Chum Technical Committee is nearing completion of its investigations into the utility of increasing the number of loci for GSI analysis.

Puget Sound run reconstruction incorporated stock composition proportions derived from 1991 GSI estimates for the Strait of Juan de Fuca and San Juan Island fisheries. Stock composition estimates for these areas have been based, either directly or indirectly, on GSI estimates since 1980.

Table 1. 1991 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
San Juans and Point Roberts									
Area 7A	Prior to 9/29 *	61	143	204	30	64	0	94	298
	9/29 to 10/12 **	-	-	-	-	-	-	-	-
	10/13 to 10/19	-	-	-	-	-	-	-	-
	10/20 to 10/26	30,729	5,863	36,592	0	0	0	0	36,592
	10/27 to 11/2	0	2	2	22,640	3,414	0	26,054	26,056
	11/3 to 11/9	0	0	0	24,444	9,027	0	33,471	33,471
	post 11/10	-	-	-	-	-	-	-	-
Area 7A Total		30,790	6,008	36,798	47,114	12,505	0	59,619	96,417
Area 7	Prior to 9/29 *	99	571	670	15	70	124	209	879
	9/29 to 10/5 **	-	-	-	-	-	-	-	-
	10/6 to 10/19	0	0	0	0	0	2,056	2,056	2,056
	10/20 to 10/26	3,837	9,017	12,854	0	0	0	0	12,854
	10/27 to 11/2	0	0	0	5,838	6,285	0	12,123	12,123
	11/3 to 11/9	0	2	2	4,798	8,214	0	13,012	13,014
	post 11/10	-	-	-	-	-	-	-	-
Area 7 Total		3,936	9,590	13,526	10,651	14,569	2,180	27,400	40,926
Areas 7/7A Total				50,324				87,019	137,343
Strait of Juan de Fuca									
Areas 4B,	Prior to 9/15 *	50							
5 and 6C	9/15 to 10/12 **	2							
	10/13 to 10/19	40,443	(5 days)						
	10/20 to 10/26	8,897	(3 days)						
	10/27 to 11/2	0							
	11/3 to 11/9	12							
	11/10 to 11/16	44							
	11/17 to 11/23	2							
Areas 4B, 5 and 6C total		49,450							

* PSC Fraser Panel management control relinquished 9/15 in 4B,5,6C, 9/29 in 7 and 7A S. and E. of East Point line, and 10/6 for remainder of area.

** Coho management period

Table 2. Summary of 1991 Puget Sound Chum Salmon Management Information by Region of Origin

Region	Preseason Forecast	Final Inseason Update	Post-Season Run Estimate	Estimated Escapement	Preseason Escapement Expectation	Escapement Goal
Strait of Juan de Fuca						
Summer	1,700	-	297	295	1,632	1,300
Fall	5,607	-	1,940	1,757	4,881	3,550
Nooksack/Samish	46,350	87,400	77,968	38,472	23,070	25,900
Skagit River	108,000	138,000	86,451	22,004	40,040	40,350
Stillaguamish/Snohomish	211,600	156,496	159,420	31,707	30,500	30,500
South Puget Sound						
Summer	41,900	-	56,913	17,411	11,800	11,800
Fall	310,200	279,077	295,327	102,385	74,269	76,200
Winter	91,500	48,308	41,753	31,863	20,236	21,000
Hood Canal						
Summer	3,740	-	1,810	994	2,543	20,100
Fall	354,942	436,627	534,572	143,373	64,605	68,000
Total	1,175,539	1,145,908	1,256,451	390,261	273,576	298,700

Source: WDF, Puget Sound Indian Tribes and NWIFC, 1991 Puget Sound Chum Salmon Forecasts and Management Recommendations. WDF Stock Strength Calculation Summary (6/17/92).

Table 3. 1991 Puget Sound Post-Season Chum Salmon Run Size Estimates

Region	Production Type	Summer	Fall	Winter	Total
Strait of Juan de Fuca	Natural	297	1,922		2,219
	Hatchery		18		18
Nooksack/Samish	Natural		65,737		65,737
	Hatchery		12,231		12,231
Skagit River	Natural		86,435		86,435
	Hatchery		16		16
Stillaguamish/Snohomish	Natural		97,009		97,009
	Hatchery		62,411		62,411
South Puget Sound	Natural	39,714	225,196	38,978	303,888
	Hatchery	17,199	70,131	2,775	90,105
Hood Canal	Natural	1,810	146,911		148,721
	Hatchery		387,661		387,661
Subtotal	Natural	41,821	623,210	38,978	704,009
	Hatchery	17,199	532,468	2,775	552,442
Total		59,020	1,155,678	41,753	1,256,451

Region	Summer	Fall	Winter	Total
Strait of Juan de Fuca	297	1,940		2,237
Nooksack/Samish		77,968		77,968
Skagit River		86,451		86,451
Stillaguamish/Snohomish		159,420		159,420
South Puget Sound	56,913	295,327	41,753	393,993
Hood Canal	1,810	534,572		536,382
Total	59,020	1,155,678	41,753	1,256,451

Source: WDF Stock Strength Calculation Summary (6/17/92).
Off-station plant returns have been included with hatchery returns.

Table 4. 1991 Commercial Chum Salmon Catch -- Puget Sound Areas

	Indian					Non-Indian					
Area Code & Name	Gillnet	Purse Seine	Beach Seine	Troll	Sub-Total	Gillnets	Purse Seine	Reefnet	Troll	Sub-Total	Area Total
4B-Neah Bay	373	0	0	3	376	0	0	0	0	0	376
5 -Sekiu	48663	0	0	208	48871	0	0	0	0	0	48871
6C-Crescent By	448	0	0	0	448	0	0	0	0	0	448
Sub-Total	49484	0	0	211	49695	0	0	0	0	0	49695
6 -Pt Angeles	2896	0	0	2	2898	0	0	0	0	0	2898
6A-West Beach	0	0	0	0	0	0	0	0	0	0	0
7 -San Juan Is	3941	9591	0	0	13532	10651	14569	2180	0	27400	40932
7A-Pt Roberts	30762	6008	0	0	36770	47114	12505	0	0	59619	96389
Sub-Total	37599	15599	0	2	53200	57765	27074	2180	0	87019	140219
6D-Dungeness By	14	0	0	0	14	43	0	0	0	43	57
74B-Sail R	0	0	0	0	0	0	0	0	0	0	0
75A-Clallam R	0	0	0	0	0	0	0	0	0	0	0
75B-Deep Cr	0	0	0	0	0	0	0	0	0	0	0
75C-Hoko R	0	0	0	0	0	0	0	0	0	0	0
75D-Lyre R	0	0	0	0	0	0	0	0	0	0	0
75E-Pysht R	11	0	0	0	11	0	0	0	0	0	11
75F-Sekiu R	0	0	0	0	0	0	0	0	0	0	0
76A-Dungeness R	0	0	0	0	0	0	0	0	0	0	0
76B-Elwha R	15	0	0	0	15	0	0	0	0	0	15
76C-Morse Cr	0	0	0	0	0	0	0	0	0	0	0
76D-Salt Cr	0	0	0	0	0	0	0	0	0	0	0
Sub-Total	40	0	0	0	40	43	0	0	0	43	83
7B-Bellingham By	14282	13	0	0	14295	9948	450	0	0	10398	24693
77B-Low Nooksck R	10620	0	0	0	10620	0	0	0	0	0	10620
77C-Upr Nooksck R	0	0	0	0	0	0	0	0	0	0	0
7C-Samish Bay	0	0	0	0	0	0	0	0	0	0	0
77D-Samish R	0	0	0	0	0	0	0	0	0	0	0
7D-Lummi Bay	5	0	0	0	5	0	0	0	0	0	5
7E-East Sound	0	0	0	0	0	26	0	0	0	26	26
77A-California Cr	0	0	0	0	0	0	0	0	0	0	0
Sub-Total	24907	13	0	0	24920	9974	450	0	0	10424	35344
8 -Skagit Bay	18568	0	0	0	18568	10679	3339	0	0	14018	32586
78B-Sauk R	0	0	0	0	0	0	0	0	0	0	0
78C-Low Skagit R	25819	0	0	0	25819	0	0	0	0	0	25819
78D-Upr Skagit R	0	0	0	0	0	0	0	0	0	0	0
Sub-Total	44387	0	0	0	44387	10679	3339	0	0	14018	58405
6B-Discovry By	0	0	0	0	0	0	0	0	0	0	0
9 -Admirality	70	0	0	0	70	24	0	0	0	24	94
Sub-Total	70	0	0	0	70	24	0	0	0	24	94
8A-Port Susan	49852	0	195	0	50047	25000	29620	0	0	54620	104667
78F-Snohomish R	1	0	0	0	1	0	0	0	0	0	1
78G-Stilagumsh R	5012	0	0	0	5012	0	0	0	0	0	5012
8D-Tulalip Bay	8917	0	396	0	9313	193	153	0	0	346	9659
Sub-Total	63782	0	591	0	64373	25193	29773	0	0	54966	119339

Table 4. 1991 Commercial Chum Salmon Catch -- Continued

Area Code and Name	Indian Gillnet	Indian Purse Seine	Indian Beach Seine	Indian Troll	Indian Sub-Total	Non-Indian Gillnets	Non-Indian Purse Seine	Non-Indian Reefnet	Non-Indian Troll	Non-Indian Sub-Total	Area Total
10-Seattle	15760	15093	0	0	30853	53982	63699	0	0	117681	148534
10A-Elliott Bay	1289	0	0	0	1289	0	0	0	0	0	1289
80B-Duwamish R	399	0	0	0	399	0	0	0	0	0	399
10C-S Lk Washngtn	0	0	0	0	0	0	0	0	0	0	0
10D-Lk Sammamish	0	0	0	0	0	0	0	0	0	0	0
10E-E Kitsap	10850	0	0	0	10850	0	0	0	0	0	10850
10F-Ship Canal	68	0	0	0	68	0	0	0	0	0	68
10G-N Lk Washngtn	0	0	0	0	0	0	0	0	0	0	0
11-Tacoma	7074	0	0	0	7074	11223	21159	0	0	32382	39456
11A-Commencmt By	34	0	0	0	34	0	0	0	0	0	34
81A-Carbon R	0	0	0	0	0	0	0	0	0	0	0
81B-Puyallup R	1565	0	0	0	1565	0	0	0	0	0	1565
81C-White R	0	0	0	0	0	0	0	0	0	0	0
13-Nisqually Rch	1	0	5	0	6	0	0	0	0	0	6
83D-Nisqually R	7871	0	0	0	7871	0	0	0	0	0	7871
83F-McAllistr Cr	472	0	0	0	472	0	0	0	0	0	472
13A-Carr Inlet	5689	0	1135	0	6824	0	0	0	0	0	6824
83C-Minter Cr	0	0	0	0	0	0	0	0	0	0	0
13C-Chambers By	5	0	3	0	8	0	0	0	0	0	8
83H-Chambers Cr	0	0	0	0	0	0	0	0	0	0	0
13D-Case Inlet	1090	0	130	0	1220	0	0	0	0	0	1220
13E-Hendersn Inlt	0	0	0	0	0	0	0	0	0	0	0
13F-Budd Inlet	6	0	0	0	6	0	0	0	0	0	6
13G-Eld Inlet	1447	0	0	0	1447	0	0	0	0	0	1447
13H-Totten Inlet	794	0	0	0	794	0	0	0	0	0	794
13I-Skookum Inlet	0	0	0	0	0	0	0	0	0	0	0
13J-Hammersley In	0	0	0	0	0	0	0	0	0	0	0
13K-Upr Case Inlt	0	0	0	0	0	0	0	0	0	0	0
Sub-Total	54414	15093	1273	0	70780	65205	84858	0	0	150063	220843
9A-Pt Gamble	191	0	0	0	191	0	0	0	0	0	191
12-N Hood Canal	96237	0	0	0	96237	12020	135983	0	0	148003	244240
12A-Dabob Bay	715	0	13	0	728	79	0	0	0	79	807
82F-Quilcene R	343	0	0	0	343	0	0	0	0	0	343
12B-C Hood Canal	2296	0	0	0	2296	377	11487	0	0	11864	14160
82C-Dosewallip R	0	0	0	0	0	0	0	0	0	0	0
82D-Duckabush R	0	0	0	0	0	0	0	0	0	0	0
82E-Hamma-Hamma R	0	0	0	0	0	0	0	0	0	0	0
12C-S Hood Canal	94836	0	0	0	94836	42	0	0	0	42	94878
82B-Dewatto Cr	0	0	0	0	0	0	0	0	0	0	0
82G-Skokomish R	9303	0	0	0	9303	0	0	0	0	0	9303
82J-Purdy Cr	0	0	0	0	0	0	0	0	0	0	0
12D-SE Hood Canal	0	0	0	0	0	0	0	0	0	0	0
82H-Tahuya R	0	0	0	0	0	0	0	0	0	0	0
82I-Union R	0	0	0	0	0	0	0	0	0	0	0
Sub-Total	203921	0	13	0	203934	12518	147470	0	0	159988	363922
Grand Total	258335	15093	1286	0	274714	77723	232328	0	0	310051	584765

Table 5. Total Puget Sound Chum Run Sizes, Catches and Escapements (All Run Timings).

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
1991	1,256,000	390,000	866,000

Table 6. 1991 Washington Coastal Chum Run Sizes, Catches, and Escapements.

	Willapa Bay	Grays Harbor	Quinault R.	Total
Preseason Forecast	93,900	72,300	6,100	172,300
Actual Run Size	87,100	44,800	9,300	141,200
Harvest	43,800	26,900	2,600	73,300
Wild Escapement Goal	32,100	21,000	-	53,100
Wild Escapement	41,800	17,900	6,100	65,800
Hatchery Escpmt Goal	1,900	-	2,500	4,400
Hatchery Escapement	1,500	0	600	2,100

Table 7. 1991 Chum Salmon Genetic Baseline Collections

Region of Origin	Number Sampled
West Coast Vancouver Island	
Nitinat	100
Sarita River	100
Georgia Strait	
Mamquam River	100
Tzoonie River	100
Big Qualicum Hatchery	100
Little Qualicum Hatchery	100
Strait of Juan de Fuca	
Pysht	90
Nooksack/Samish Rivers	
Bellingham Maritm. Hrtg. Hatchery	100
Samish Hatchery	100
Thomas Creek	27
Skagit River	
Dan Creek Slough	53
County Line Slough	13 *
Stillaguamish/Snohomish Rivers	
Tulalip Hatchery	100
N. Fork Stillaguamish River	39
Hood Canal	
Hamma Hamma River	145
Dosewallips River	105
Dewatto River	92
Tahuya River	2 *
Dewatto River (late)	10 *
N. Fork Skokomish River	105
South Puget Sound	
Kennedy Creek	403 **
Perry Creek	100
Nisqually River	100
Keta Creek Hatchery	50
Carbon River	150
Fennel Creek	100
Goldsborough Creek	100
Mill Creek	58

* These samples are not being used for baseline analysis

** 303 samples were muscle only for genetic mark monitoring

Source: WDF GSI lab.

Table 8. Summary of 1991 Chum Salmon GSI Samples Taken From Fisheries in the Strait of Juan de Fuca and Northern Puget Sound

Location	Statistical Week	No. Fish Sampled	No. Fish Analyzed	Gear Type	Fishery Type
Strait of Juan de Fuca (Area 5)	40	200	200	GN	Test
	41	188	188	GN	Test
	42	403	200	GN	Commercial
	43	264	200	GN	Commercial
	44	112		GN	Test
			193		
	45	81		GN	Test
Salmon Banks (Area 7)	43	400	394	Mixed	Commercial
	44	380		Mixed	Commercial
			385		
	45	232		Mixed	Commercial
Point Roberts (Area 7A)	41	400	397	GN	Test
	42	399	*	GN	Test
	43	400	398	Mixed	Commercial
	43	174	174	GN	Test
	44	400	399	Mixed	Commercial
	45	400	400	Mixed	Commercial
Total		4,433	3,528		

GN = gillnet PS = purse seine

* Samples not analyzed due to insufficient funds.

Source: Phelps, Baker, Miller, CdeBaca, and Beattie. 1992. Genetic Stock Identification Estimates of 1991 Washington Commercial Chum Fisheries in the Strait of Juan de Fuca and North Puget Sound. WDF, the Nooksack Tribe, and the NWIFC.

Baker, Phelps, Miller, CdeBaca, and Beattie. 1992. Genetic stock Identification Estimates of 1991 Washington Test Chum Fisheries in the Strait of Juan de Fuca and Northern Puget Sound. WDF, the Nooksack Tribe, and the NWIFC.

CHAPTER 3

REVIEW OF THE 1991 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 1991. 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, 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 1991, 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;
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 1991 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 1991, 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 1991. Canada would continue to manage the 1991 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 forego the harvest of the Areas 7 and 7A chum salmon shortfall that had accumulated through 1990 and the Commission would initiate discussions on chum within the Southern Panel area with a view toward clarifying and improving the understanding of the conservation concerns and management approaches of the Parties.

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 Johnstone Strait Clockwork, terminal harvesting of Fraser River chum was no longer directly linked to the harvesting pattern in Johnstone Strait. Fraser River harvest would be dependent on abundance assessments by two in-river test fisheries. The removal of this linkage required the adoption of a harvest management plan for the Fraser River (Area 29).

The harvest management plan for Fraser River chum 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 1991, the minimum gross escapement goal for the early and late segments was set at 390,000 and 350,000 respectively, including Indian Food Fish and test fishing requirements. The plan provided for either escapement goal to be increased inseason if the return to the river exceeded the escapement goal. For the early chum run the harvest was not to exceed 10% on a terminal run size in the range of 425,000 to 550,000 and for a terminal run of over 550,000 the harvest rate was increased to 15%. For the late chum run the harvest was not to exceed 10% on a terminal run size in the range of 385,000 to 500,000 and for a terminal run of over 500,000 the harvest rate was increased to 15%. This allowed an upward scaling of the escapement goal with an increase in the run size.

3.2.1.4 Strait of Georgia Chum

The chum produced in the mid Vancouver Island area are primarily from enhancement facilities. In 1991, a minimal portion of this return was harvested in Johnstone Strait, under the inseason 10% Clockwork harvest rate. 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 1991, conservation requirements of local chinook and coho salmon in this fishery area were also considered in determination of 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 1991 pre-season forecast of Inside chum returning to wild spawning areas was 2,060,000 including 795,000 Fraser River and 1,265,000 non-Fraser chum (Table 1).

The number of Inside chum returning to enhanced spawning areas was determined through the application of average survival rates by enhancement facility and the average returns by age to the number of fry released by the facilities. The 1991 pre-season forecast for enhanced origin

Fraser River chum was 407,000 while the mid Vancouver Island area was expected to produce 679,000 enhanced chum. In addition, there were 33,000% '*^U ^^d 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 1,119,000 (Table 1).

The total Inside chum stock size was forecast to be 3,179,000 (2,060,000 wild and 1,119,000 enhanced). In addition, past data show a portion of U.S. chum migrate through Johnstone Strait and for computational purposes this number is set at 100,000. Therefore, the total forecast run through Johnstone Strait was 3,279,000 chum.

3.2.2.2 Inseason

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).

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 mid 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).

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 fourth week of September assessment fishery. Run size was projected to be 2,600,000. The early chum catches combined with the chum catch during the Johnstone Strait assessment fishery of the fourth week of September totalled more than 225,000. Under the Pacific Salmon Treaty this catch level allowed the U.S. to schedule a fishery for 120,000 chum salmon in areas 7 and 7A. Continued test fishing through to October confirmed a run size of less than the 3,000,000 required for additional harvest. The final inseason run size was 2,700,000 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 estimate the return to the terminal area. The final inseason projection of total Fraser River run size available from Johnstone Strait test fishing was 990,000 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 1,022,000 and a gillnet fishery was scheduled for October 22. The run size was updated on November 11 to 816,000 and a second gillnet fishery was scheduled for November 12. The final inseason projection of the terminal run size to the Fraser River was 698,000 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 of 2,662,000 was 1% smaller than the in-season estimate of 2,700,000. In addition, the post-season estimate was 81.2% of the pre-season forecast.

The Fraser River post-season terminal run size estimate was 698,000. The post-season Fraser River total chum stock size, including the catch of Fraser River chum in U.S. and Canadian waters, was 983,600 (620,700 escapement and 362,900 total catch in Canadian and U.S. waters). This run size was 82% of the preseason forecast.

U.S. catches of Fraser chum were 110,500 in areas 7 and 7a and 17,000 in areas 4B, 5, and 6C. 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 105,800 chum, 38,700 chum, and 13,500 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 fisheries and by biological samplers. In 1991, these harvests totalled 841,000. 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 1991 Johnstone Strait fishery (Areas 11, 12 and 13), began in July and ended in late September. During the July and August period, the Johnstone Strait fishery was directed at harvesting Fraser River sockeye and pink salmon. During those two months, 42,000 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.

As part of the Clockwork plan, a commercial assessment fishery during the fourth week of September is required to provide a run size estimate. In 1991, this Johnstone Strait chum assessment fishery harvested 177,000 chum.

Fishing in the Strait of Georgia was moderate and limited to mid Vancouver Island (Area 14), Nanaimo (Area 17) and Cowichan (Area 18) in 1991. Commercial fisheries were directed primarily at enhanced chum in Area 14: the first opening occurred October 15. The subsequent

commercial fisheries occurred on October 21, October 28 and November 04. The total catch for these fisheries was 270,000 (Table 3). In Area 17 a fishery occurred on October 21 which caught 16,000 chum. In Area 18, fisheries commenced November 4, 11, 18 and 25 with catches of 10,000, 49,000, 71,000 and 24,000 chum respectively.

Under the Fraser River Chum Harvest Management Plan, two commercial fisheries were permitted on October 22 and November 12 based on terminal surpluses identified in the early portion of the run. The total catch for these commercial fisheries was 50,200 chum. 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 salmon 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.

A total of 4,877 chum were sampled from Inside waters for biological purposes (Table 8). Samples were collected from Johnstone Strait, Qualicum and Nanaimo fishing areas.

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 river area near Albion. From October 1 to early December the chum test catch was 11,014 (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 Indian food fishery in the Inside waters harvested 74,500 chum, of which the food fishery in Johnstone Strait harvested a total of 28,200 chum, the majority of which were taken in marine waters in October. In the Strait of Georgia there were 30,500 chum taken in the Indian food fishery. The majority of the Indian food fish caught in the Strait of Georgia were surplus chum from enhancement facilities and were harvested in streams or estuaries. The food fishery in the Fraser River system took an estimated total of 15,800 chum (Table 7).

3.2.4 Escapement

Chum which escape 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 1991 was 8,300.

The stocks which are managed within the context of the Clockwork plan 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 1,474,800 chum. This escapement was 101% of the 1983 to 1990 average escapement.

The terminal run size to the Fraser River system was 698,000. This leaves an escapement of approximately 621,000 after commercial, test, and Indian Food Fish catches are subtracted.

The enhanced systems in the Fraser River drainage showed very strong returns and the smaller drainages exhibited variable returns. The overall escapement to the Fraser River was approximately 93% of the net escapement goal.

In nine of the fourteen major spawning areas, the chum escapement was below the average observed during the 1983-90 period (Table 6). Overall, the fall chum spawning escapement in wild spawning areas was 74% of the present interim total spawning goal of 2,000,000 chum.

The total Inside chum stock size and wild escapement for the years prior to Clockwork management (1980-1982) and under Clockwork management (1983-1991) are presented 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 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 1991 was estimated at 1,685,600 fall chum of which 1,474,800 spawned in wild or natural spawning areas. Of the remaining balance, 210,800 were spawned in enhancement areas or facilities. (Table 6).

3.2.5 Status of Treaty Requirements

3.2.5.1 Overall Fishery Management

During the fourth week of September, the Johnstone Strait assessment fishery indicated a stock size of 2,600,000. Subsequent test fishing indicated increased stock strength and the run size was estimated at 2,900,000 on October 7. Further analysis of test fish and commercial catch suggested the seasonal Clockwork run size was approximately 2,700,000 (November 01). Based on these run size estimates, no further fishing occurred in Johnstone Strait, however the Canadian catch had exceeded the 225,000 catch threshold which under the treaty allows the U.S. a catch of 120,000. The U.S. commercial fisheries in Area 7 & 7A had a target of 120,000 chum.

Final test fishing and commercial assessments estimated a run size through Johnstone Strait of 2,662,000 chum. The subsequent post season review indicated an actual run size of 2,733,000 chum. The inseason calculation of the Clockwork catch of 434,700 (16.3%) was higher than the desired catch of 270,000 (10%) (Table 9).

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 1991 gross escapement was 1,686,000; the Inside chum catch (commercial, test, and sampled) 751,400; the IFF catch 74,500; and the United States estimated catch of Canadian origin chum 127,500. An assessment of clockwork management is provided for the years 1983 to 1991 in Table 10.

3.2.5.2 Stock Identification

Genetic stock identification (GSI) was conducted in a number of areas in 1991. The majority of the GSI work concentrated on sampling commercial and test fishery catches in the various statistical areas.

The commercial fishing areas sampled were upper Johnstone Strait (Area 12), mid Vancouver Island (Area 14) and Nanaimo (Area 17). The samples in Areas 14 were from the commercial catch and the samples from Area 17 was from test fishing. In Area 12, the samples were from chum caught by test fishing vessels and in the commercial fishery (Table 8).

3.3 WEST COAST CHUM

3.3.1 Conservation and Harvest Management Requirements

Chum salmon stocks return to most areas on the west coast of Vancouver Island (WCVI). The major stock, and the stock which has implications for the PST, is the Nitinat group of stocks, originating from tributaries to Nitinat Lake (Statistical Area 22) including a major hatchery on the Nitinat River. The net spawning escapement requirement for the Nitinat Lake tributaries totals

175,000, including 150,000 into the Nitinat River and 25,000 into other tributaries. Additional requirements for hatchery and test fishing may total up to 75,000. Therefore, the gross escapement requirement was 250,000 chum. This represents an increase of 50,000 over 1990, to address actual hatchery requirements.

The management of this fishery is based on achieving the total escapement requirement of 250,000 into Nitinat Lake. Weekly escapement targets are set to ensure that all timing components of the run are represented. Weekly fisheries are scheduled in Area 21 and surrounding waters to harvest any identified surplus. Secondary objectives of the management regime are to achieve stock assessment, fish quality, and allocation requirements.

Gillnet and seine vessels take part in the Nitinat area fishery. A gillnet assessment fishery begins in late September to provide information for stock assessment. If weekly escapement targets are achieved and a further surplus is identified, then seines will be allowed to fish to a catch equal to the gillnets. During these single gear fisheries, the outer fishing boundary is a line between a point two miles due south of Pachena Point and a point two miles south of Bonilla Point (Figure 1). Subsequent fisheries may be open to both gear types, depending on achievement of the weekly escapement targets. During combined gear fisheries, a gillnet only area is provided in Area 20-1 (extending the line two miles offshore eastward). This action is meant to increase the exploitation rate on the Nitinat chum stock and thereby reduce the risk of over-escapement into Nitinat Lake. Increased exploitation rates result mainly from reduced congestion in the regular area, which increases the efficiency of the seine fleet. Migration of the Nitinat chum stock through the extension area also provides some increased exploitation by gillnets. Safety concerns for smaller gillnet vessels are also a consideration for the extended area. A gillnet test vessel, along with visual surveys of the river, are used to determine escapement into Nitinat Lake.

3.3.2 Run Size Estimation

The 1991 preseason expected surplus to the hatchery was 25,000. The catch rates in the early gillnet fisheries resulted in continued gillnet opportunities. The weekly escapement target required to initiate a seine fishery was achieved October 8-9. The resultant seine fishery occurred October 15. Daily rates of movement into Nitinat Lake were high; the gross escapement was achieved by approximately October 17. Consequently the combined gear fishery was initiated October 19 and continued through October 26. An apparent turnover in Nitinat Lake on October 25-26 resulted in closure of the fishery.

The post season estimate of the total Nitinat area chum stock includes commercial and test catch of Nitinat stock, native food fish, and hatchery requirements. 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 1991 post season estimate of the total Nitinat chum stock is 976,400 chum (Table 11).

Stock composition in the commercial fishery is based on GSI results. Two hundred were collected from each commercial fishery at the Vancouver docks, for a total of 800 samples.

Uncorrected results were used to estimate WCVI contribution to the catch (note that the Chum Technical Committee has not yet finalized a methodology for analysis and application of WCVI GSI results).

3.3.3 Catch

The commercial chum salmon fishery in Area 21 began with gillnets fishing two days per week for three weeks starting September 23. By October 9 sufficient escapement was inside Nitinat Lake to allow a seine fishery. The seine fishery was conducted October 15 and caught approximately 165,000 chum. At this time it was apparent that there was a major movement of chum salmon directly into Nitinat Lake, with little pooling outside. A combined gear fishery was initiated October 19 and continued through October 26 with one day missed due to weather. The catch during this period was approximately 236,000 chum.

Native food fishermen reported a harvest of 2,000 chum salmon in Area 22. Other catch in Nitinat Lake (Area 22) included test fishery payment, hatchery brood stock, and rack sales, for a total of approximately 110,000 chum.

Catch in the commercial troll fishery off the WCVI (Areas 121-127) was 12,976 chum during the entire troll season. The majority of the catch occurred in July and August and were thought to be returning to streams in the north and central coast areas of British Columbia. Due to the limited chum catch, no GSI sampling was conducted in the troll fishery.

3.3.4 Escapement

The net escapement to the wild spawning grounds of the Nitinat River system was estimated to be 350,000. Other tributaries to Nitinat Lake had very poor escapements. Pre-spawn mortality due to lake turnover was estimated at 50,000. Hatchery utilization totalled 110,000. The hatchery obtained approximately 34,000,000 chum eggs for release in the spring of 1992.

3.3.5 Status of Treaty Requirements

Canada was to manage the Nitinat chum fishery to minimize the harvest of non-targeted stocks. To accomplish this, fisheries were conducted in a restricted area and GSI samples taken to determine stock composition.

Table 1. Preseason run forecasts by stock, 1991.

Stock	Origin	Expected run size		Percent run size	
Canadian Inside Chum					
Fraser River:	Wild	795,000		24.2%	
	Enhanced	407,000		12.4%	
	sub-total		1,202,000		36.7%
Mid Vancouver Island:	Wild	a.			
	Enhanced	679,000		20.7%	
	sub-total		679,000		20.7%
Non-Fraser Stocks:	Wild	1,265,000		38.6%	
	Enhanced	33,000		1.0%	
	sub-total		1,298,000		39.6%
Total Inside Stocks:	Wild	2,060,000		62.8%	
	Enhanced	1,119,000		34.1%	
	Total		3,179,000		97.0%
U.S. Chum					
Puget Sound:		100,000		3.0%	3.0%
	GRAND TOTAL		3,279,000	100.0%	100.0%

a. Included in Total Inside Stocks, wild total

Table 2. Pre-season and weekly estimates of Study Area chum stock size, 1991.

Week Ending	Total Stock (1)	U.S. (2)	Canadian Total	Fraser River	Mid Vancouver Island	Other Canadian
PRE-SEASON (3)	3,279,000	100,000	3,179,000	1,202,000	679,000	1,298,000
IN-SEASON (4) (Johnstone Strait fishery)						
30-Sep	2,600,000	100,000	2,520,000	953,000	538,000	1,029,000
07-Oct	2,900,000	100,000	2,812,000	1,063,000	601,000	1,148,000
15-Oct	2,750,000	100,000	2,666,000	1,008,000	569,000	1,089,000
21-Oct	2,700,000	100,000	2,618,000	990,000	559,000	1,069,000
28-Oct	2,700,000	100,000	2,618,000	990,000	559,000	1,069,000
01-Nov	2,700,000	100,000	2,618,000	990,000	559,000	1,069,000
(Estimates from Fraser River test fishing - terminal run size)						
14-Oct	-	-	-	669,000	-	-
28-Oct	-	-	-	869,000	-	-
11-Nov	-	-	-	816,000	-	-
25-Nov	-	-	-	759,000	-	-
20-Dec	-	-	-	698,000	-	-
POST-SEASON (5)	-	-	2,733,000	1,246,000	606,000	881,000

(1) Total Stock is the sum of Stock Components (i.e. enhanced and wild Study Area chum, and the U.S. origin chum).

(2) U.S. assumed constant at 100,000.

(3) Pre-season estimate from Table 1.

(4) In-season estimate = In-season Clockwork Stock Estimate from Table 3. Stock estimates to week 10/4 calculated from Johnstone Strait commercial and test fishery data. Estimates after week 10/4 for Fraser River stock only from in-river test fishing.

(5) Post-season Canadian Total is Total Study Area Stock.

Table 3. Catch of chum salmon by statistical area for commercial and test fishing vessels and by statistical area for Indian food fisheries, 1991.

Week ending	Statistical Areas 11	12	13	14	15-19	20	28-29	Total
07-Sep	190	2,209	348	4	19	118	1	2,889
14-Sep	52	9,873	4,749	9	26	8	179	14,896
21-Sep	64	22	425	43	0	5	581	1,140
28-Sep	15	115,758	60,876	189	451	0	568	177,857
05-Oct	0	3,950	36,890	178	822	0	7,250	49,090
12-Oct	0	0	693	0	0	0	1,689	2,382
19-Oct	0	9,918	0	65,657	218	0	3,235	79,028
26-Oct	0	0	0	93,881	16,113	1,016	26,954	137,964
02-Nov	0	0	0	52,031	359	0	1,250	53,640
Nov.3 to Nov.30	0	0	0	58,498	154,423	0	19,392	232,313
Dec.1 to Dec.28	0	0	0	0	0	0	209	209
TOTAL	321	141,730	103,981	270,490	172,431	1,147	61,308	751,408
Prior to 01-Sep	6,968	27,332	7,634	2	90	905	207	43,138
Indian Food Fishery	0	3,277	24,935	1,112	29,352	0	15,803	74,479
Grand total	7,289	172,339	136,550	271,604	201,873	2,052	77,318	869,025

Source: British Columbia Catch Statistics, 1991.

Table 4. Catch, effort, and catch per unit effort in Johnstone Strait test fisheries, 1991.

Week Ending	Stat Week	Weekly Catch	Effort (sets)		Catch per set
Upper Johnstone St.					
07-Sep	9/1	NA	NA		NA
14-Sep	9/2	708	18		39.3
21-Sep	9/3	3,174	27		117.6
28-Sep	9/4	11,618	18		645.4
05-Oct	10/1	8,799	36		244.4
12-Oct	10/2	11,645	34		342.5
19-Oct	10/3	4,074	29		140.5
26-Oct	10/4	5,042	36		140.1
02-Nov	10/5	1,090	17		64.1
09-Nov	11/1	914	14		65.3
	sub total	47,064	229	avg.	216.7
Mid Johnstone St.					
07-Sep	9/1	487	31		15.7
14-Sep	9/2	855	22		38.9
21-Sep	9/3	1,841	32		57.5
28-Sep	9/4	5,004	18		278.0
05-Oct	10/1	13,668	36		379.7
12-Oct	10/2	8,826	35		252.2
19-Oct	10/3	11,408	24		475.3
26-Oct	10/4	7,590	36		210.8
02-Nov	10/5	3,625	20		181.3
09-Nov	11/1	NA	NA		NA
	sub total	53,304	254	avg.	209.9
	Grand Total	100,368	483	avg.	207.8

Table 5. Weekly total catch and catch per unit effort in the Fraser River chum test fisheries, 1991.

Week Ending	Cottonwood Catch	Cottonwood CPUE	Albion Catch	Albion CPUE
07-Oct	454	40.88	822	55.24
14-Oct	251	18.74	1263	79.87
21-Oct	1086	77.55	1672	110.74
28-Oct	498	35.76	507	39.57
04-Nov	235	23.54	677	50.01
11-Nov	684	50.40	575	54.68
18-Nov	177	16.78	500	33.84
25-Nov	348	31.94	378	32.25
02-Dec	194	19.00	541	39.50
09-Dec	62	5.19	73	6.89
16-Dec	-	-	17	1.70
Total	3989	319.78	7025	504.29

Table 6. Number (thousands) of inside chum spawning in wild areas, and number spawning in enhanced facilities or otherwise utilized by hatcheries, in 1991, compared to spawning capacity and to previous seven year averages.

Spawning Areas by Stock Group	Target Escapement	1991 Estimate	1991 as percent of Target	1983 - 90 Average	1991 as percent of 83-90 Ave
Wild Spawning Areas					
Upper Vancouver Island	67.0	0.2	0%	0.5	41%
Kingcome Inlet	196.0	7.9	4%	8.1	98%
Bond to Knight Inlet	346.0	10.5	3%	30.6	34%
Johnstone Strait	180.0	75.4	42%	57.7	131%
Loughborough/Bute Inlet	436.0	20.0	5%	126.0	16%
Mid Vancouver Island	230.8	143.4	62%	127.2	113%
Toba Inlet	172.0	0.7	0%	9.1	8%
Jervis Inlet	140.1	75.6	54%	107.8	70%
Lower Vancouver Island	130.0	70.9	55%	65.1	109%
Southern Vancouver Island	216.5	199.4	92%	170.6	117%
Howe Sound/Sunshine Coast	357.5	124.6	35%	137.7	90%
Burrard Inlet	35.0	27.0	77%	31.2	87%
Fraser River	700.0	719.3	103%	590.8	122%
Boundary Bay	5.0	0.0	0%	0.3	4%
WILD TOTAL	3211.9 (a)	1474.8	46%	1462.6	101%
Enhanced Spawning Areas					
Mid Vancouver Island (b)	149.0	129.2	87%	156.4	83%
Fraser	30.0	81.6	272%	44.4	184%
ENHANCED TOTAL	179.0	210.8	118%	200.8	105%
GRAND TOTAL	3390.9	1685.6	50%	1663.4	101%

a. Current long term goal. Interm goal for 1987-1990 is 2,000,000.
b. Includes small enhancement projects in the area

Table 7. Total Clockwork assessed stock, Clockwork catch, total escapement, wild and gross enhanced escapement and desired Clockwork and actual harvest rate for Inside chum, 1980 - 1991.

YEAR	TTL CLCKWK ASSESSED STOCK	TOTAL CLCKWRK CATCH	TTL WILD & ENHANCED ESCPMNT	TTL STUDY AREA WILD ESCPMNT	DESIRED CLCKWRK HR	ACTUAL HARVEST RATE
1980	2,474,000	N/A	1,325,300	1,232,000	NA	46.9%
1981	1,489,000	N/A	1,291,200	1,209,200	NA	13.8%
1982	3,056,000	N/A	1,480,100	1,333,400	NA	49.6%
1983	1,573,500	193,800	1,214,900	1,048,700	10.0%	12.3%
1984	1,918,600	103,500	1,595,600	1,443,100	10.0%	5.4%
1985	4,040,800	762,600	2,700,400	2,467,400	30.0%	18.9%
1986	3,879,500	1,314,800	2,098,700	1,865,400	30.0%	33.9%
1987	1,923,400	174,900	1,346,400	1,163,400	10.0%	9.1%
1988	3,116,400	1,224,700	1,616,600	1,416,100	20.0%	39.3%
1989	1,738,500	553,900	1,023,300	840,200	10.0%	31.9%
1990	3,477,200	1,349,700	1,711,200	1,456,400	30.0%	38.8%
1991	2,661,700	434,700	1,685,600	1,474,800	10.0%	16.3%

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

Table 8. Number of chum salmon sampled for GSI data, 1991.

Area	Weeks Sampled	Commercial Samples	Test fish Samples
Johnstone Strait	9	899	2,547
Qualicum	4	1,352	0
Nanaimo	1	0	79
Nitinat	4	1,300 (1)	0
Total		3,551	2,626

(1) 450 samples were not analyzed due to quality.

Table 9. Summary of Clockwork catch, escapement and harvest rate, 1991.

Fishery Type	Areas	Total Catch	Contribution to Clockwork		Clockwork Catch
Commercial and Test	11 to 13	246,032	100%		246,000
	14	270,490	14%	a	38,700
	29	61,308	0%		0
	other	173,899	0%		0
	sub total	751,729			284,700
Indian Food	12 & 13	28,212	100%		28,200
	29	15,803	0%		0
	other	30,464	0%		0
	sub total	74,479			28,200
U.S.	7	41,073	70%	b	28,751
	7A	96,955	95%	b	92,107
	sub total	138,028			120,900

Total Clockwork catch	433,800
Total Escapement	1,686,000
Total Clockwork Assessed Stock Size	2,661,700 c
Clockwork Harvest Rate	16.3%
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 Stock 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. Assessment of Clockwork management, 1983-1991.

	1983	1984	1985	1986	1987	1988	1989	1990	1991
1. INSEASON									
Inseason Assessment Total Stock	1,420,000	1,810,000	2,970,000	3,730,000	2,480,000	4,100,000	3,000,000	3,790,000	2,700,000
Date Assessed	-	-	Oct 18	Oct 20	Oct 19	Oct 17	Oct 18	Oct 19	Oct 21
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	2,682,000
Desired HR	10.0%	10.0%	20.0%	30.0%	10.0%	30.0%	20.0%	30.0%	10.0%
Apparent HR	13.6%	5.7%	25.7%	35.2%	7.1%	29.9%	18.5%	35.6%	16.1%
2. POST SEASON									
Total Clockwork Assessed Stock (1)	1,573,500	1,918,600	4,040,800	3,879,500	1,923,400	3,116,400	1,738,500	3,477,200	2,661,700
Clockwork Assessed Catch (2,3)									
COMM & TF A11-13	101,800	38,200	516,300	1,048,700	68,400	1,086,900	458,800	1,160,200	246,000
COMM & TF A29	7,900	2,100	52,500	99,000	10,000	(4)	(4)	(4)	(4)
COMM A 14 FR	61,800	22,400	36,600	61,300	26,700	4,600	8,000	8,500	38,700
IFF A11-13,29	20,300	39,500	18,600	28,900	48,600	24,700	23,000	23,700	28,200
US 7-7A	2,000	1,300	138,600	76,900	21,200	108,500	64,100	157,300	121,800
Total	193,800	103,500	762,600	1,314,800	174,900	1,224,700	553,900	1,349,700	434,700
Desired HR	10.0%	10.0%	30.0%	30.0%	10.0%	20.0%	10.0%	20.0%	10.0%
Actual HR	12.3%	5.4%	18.9%	33.9%	9.1%	39.3%	31.9%	38.8%	16.3%
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	2,000,000
Estimated wild	1,048,700	1,443,100	2,467,400	1,865,400	1,163,400	1,416,100	840,200	1,456,400	1,474,800
Difference(5)	(751,300)	(356,900)	667,400	65,400	(836,600)	(583,900)	(1,159,800)	(543,600)	(525,200)

(1) Total Clockwork Assessed Stock includes Total Clockwork Catch plus Escapement . Total Clockwork Catch includes all Study Area catches (Areas 11-19,28,29).

(2) Clockwork Assessed Catches for 1983 - 87 include commercial catches from Areas 11 - 13 and 28 (after Sept. 1), Area 14 Fraser origin catch and Area 29 (all catch), IFF catches in Areas 11 - 13 (prior to 1988 Fraser River IFF included), test fishery payment catches from Areas 11 -13 and 29 and U.S. catches of Canadian chum in Areas 7 and 7A. Note: Clockwork Assessed Catch is based primarily on Johnstone Strait fishery (Areas 11 - 13).

(3) Bute Inlet terminal catches were not included in Clockwork Assessed Catch.

(4) Clockwork catches from 1988 to 1991 exclude catch from the Area 29 fishery. Fraser River catches were accounted for in the Fraser River Clockwork.

(5) Bracketed value indicates below goal escapement.

Table 11. Summary of Nitinat Catch, Escapement and Run Size, 1991.

Statistical Week	Week Ending	Catch
8/4	Aug 31	0
9/1	Sep 07	0
9/2	Sep 14	0
9/3	Sep 21	0
9/4	Sep 28	3,846
10/1	Oct 05	32,863
10/2	Oct 12	55,781
10/3	Oct 19	165,053
10/4	Oct 26	230,414
10/5	Nov 02	6,680
Total Catch Area 21		494,637
Total Catch Nitinat Stock (GSI)		466,445
Wild Nitinat Escapement		350,000
Other Area 22 (broodstock, rack, test, pre-spawn mortality)		160,000
Nitinat Run Size		976,445

(Other Area 22 includes 50,000 estimated pre-spawn mortality)

Table 12. Summary of Nitinat Catch and Escapement, 1985 - 1991.

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]
1991	567,445	350,000[2]

1. Includes both wild fish and those used for enhancement purposes.
2. High Pre-spawning mortalities due to a lake turnover.
3. Hatchery rack returns included in catch.

LITERATURE CITED

Baker, B.M., S. Phelps, M. Miller, C. CdeBaca and W. Beattie. 1992. Genetic Stock Identification Estimates of 1991 Washington Test Chum Fisheries in the Strait of Juan de Fuca and Northern Puget Sound. Washington Department of Fisheries, the Nooksack Indian Tribe and the Northwest Indian Fisheries Commission.

Phelps, S.R., B. Baker, M. Miller, C. CdeBaca and W. Beattie. 1992. Genetic Stock Identification Estimates of 1991 Washington Commercial Chum Fisheries in the Strait of Juan de Fuca and Northern Puget Sound. Washington Department of Fisheries, the Nooksack Indian Tribe and the Northwest Indian Fisheries Commission.

Hop Wo, L., S.C. Di Novo, A.P. Gould, and W.H. Luedke. 1992. Biochemical Stock Identification of Chum Salmon in Southern British Columbia, 1991. Fisheries Branch, Department of Fisheries and Oceans, South Coast Division.

ATTACHMENT 1

CHAPTER 6 OF ANNEX IV OF THE PACIFIC SALMON TREATY

1991 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 1991 and 1992, 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.

92 HB

3. In each of 1991 and 1992,

(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;

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(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 1991 and 1992, 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 1991 and 1992 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 1991 and 1992, 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).

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ATTACHMENT 2

TREATY LETTER OF TRANSMITTAL

MAY 17, 1991

Appendix D

Recommendations of the Commission to the Parties for Amendments to Annex IV and other understandings to give effect to the agreed fishery regimes for 1991 and 1992

PACIFIC SALMON COMMISSION

The Honorable James A. Baker, III
Secretary of State
U.S. Department of State
2201 C Street N.W.
Washington, D.C. 20520

The Honourable Barbara MacDougall, P.C., M.P.
Secretary of State for External Affairs
Ottawa, Ontario
K1A 0G2

The Honorable Robert A. Mosbacher
Secretary of Commerce
U.S. Department of Commerce
14th Street N.W.
Washington, D.C. 20230

The Honourable John C. Crosbie, P.C., M.P.
Minister of Fisheries and Oceans
Ottawa, Ontario
K1A 0E6

Dear Sir:

I have the honour to report to you on understandings that have been reached by the Pacific Salmon Commission and to recommend changes in Annex IV of the Pacific Salmon Treaty.

In accordance with Article XIII, Paragraph 2 of the Treaty, the Commission recommends that Chapters 3, 5, and 6 of Annex IV be amended. The entire text of Annex IV as proposed by the Commission is attached. Pursuant to Article XIII, Paragraph 3 of the Treaty, amendments to the Annex may be implemented through an exchange of notes between the Governments. The Commission recommends that an exchange of notes occur implementing these proposals as soon as possible. The Commission expects that the relevant management agencies will manage fisheries under their responsibility consistent with these agreements.

The amended chapters are of two years duration, consistent with the intent of the Commission to provide the time necessary to develop longer-term approaches to addressing the needs of the Parties.

The Commission has also reached the following understandings as to the implementation of the Pacific Salmon Treaty:

1.) With respect to Annex IV, Chapter 3, the Commission agrees that:

a) in 1991 and 1992, the Southeast Alaska all gear catch shall consist of the base ceiling, with a ceiling adjustment for 1991 only, as specified in Annex IV, Chapter 3, plus a catch of new Alaska hatchery add-on chinook to be calculated in-season using the procedures approved by the Commission for the 1990 add-on and as described in Alaska's February 4, 1991 report to

the Commission; the preseason expectation of the 1991 hatchery add-on is 57,800 chinook salmon;

the U.S. agrees to continue tagging and catch sampling rates which provide precision of hatchery contribution estimates similar to that of recent years and provide a report to the Commission in November 1992 describing the results of the 1991 and 1992 hatchery add-on programs;

the Commission agrees to consider a reduced risk adjustment level for 1992 based upon evaluation and review by the Chinook Technical Committee of the following information to be provided by the United States by November 1991:

i) the computational procedures for estimating the coefficient of variation associated with the add-on;

ii) the effects of hatchery add-on fisheries, if any, on the rebuilding of wild stocks including information on the stock composition of chinook catches in the June fisheries and on the duration of subsequent chinook non-retention periods;

b) with respect to terminal exclusions, the Commission agrees that the CWG with the assistance of the CTC and the findings reported in TCCHINOOK (91)-2, shall recommend standards and criteria to the Commission by January 1993, to govern consideration for future proposals for terminal exclusions. With regard to the exclusion of selected terminal area chinook catches from the Northern and Central B.C. catch ceiling, the Commission agrees to the provisions detailed in Attachment A;

c) with respect to the west coast Vancouver Island troll fishery, and in light of the below average forecast of chinook abundance in 1991, Canada will manage this fishery in a manner consistent with the spirit and intent of the Treaty and the rebuilding program. Prior to the start of each season, Canada will provide the U.S. with details regarding its plans and intentions for this fishery;

d) with respect to the adjustments in catch ceilings for the 1991 Southeast Alaska and Northern and Central B.C. fisheries, the Parties agree that the overage/underage policy set forth in Chapter 3, paragraph 1(e)(vii) is to be applied to the base ceiling levels of 263,000 chinook;

e) with respect to the Strait of Georgia fisheries, Canada agrees to provide a report to the Commission on the evaluation of the effectiveness of the management measures taken in 1988, 1989 and 1990 to reduce the harvest rates on depressed chinook stocks following completion of the PSARC and domestic review processes; and,

f) the Parties remain committed to evaluating management regimes for chinook that might better address the Parties' long term objectives and are consistent with the fundamental principles established in Article III of the Pacific Salmon Treaty.

To this end, in January 1991, the Parties held a workshop to explore alternative chinook management approaches. There was an overall view among the participants that the Workshop was a good forum for exploring new management ideas and for understanding problems that jurisdictions face implementing management approaches. The participants identified information needs and policy issues that must be resolved before completing development of alternative management approaches. Accordingly, the Commission agreed that the Chinook Work Group, in cooperation with the Chinook Technical Committee, shall:

(i) develop operational definitions for policy issues such as rebuilding, rebuilt, pass through, and stocks of concern which are necessary components of a longer term chinook management approach;

(ii) advise the Commission on processes to ensure active participation by the Panels in the development of options for a long term chinook management approach;

(iii) identify technical tasks that need to be addressed before the management approaches can be fully evaluated, and a timetable for completion of these tasks; and,

(iv) consistent with paragraph 1(b) of Annex IV, Chapter 3, present the Commission with management options to respond to short-term variations in abundance in a manner consistent with the conservation and equity principles of the Treaty.

The Chinook Work Group will provide a progress report to the Commission in November 1991 containing a proposed workplan and a prioritized schedule for completion of these assignments with a view toward completion of the work for consideration by the Commission at the 1993 annual meeting.

2.) With respect to Annex IV, Chapter 4, the Commission agrees to the provisions of Attachment 3: "Establishment of Fraser Sockeye and Pink Salmon Escapement Goals for 1991 and 1992 for the Purposes of Computing the Total Allowable Catch; and Attachment 4: "Fraser Panel Agreement on Sockeye Escapement Add-On Computation";

3.) With respect to Annex IV, Chapter 5, the Commission agrees:

a) For 1991 and 1992, Canada will not conduct a directed coho net fishery in Area 20 and the U.S. may conduct a directed coho fishery in Areas 7 and 7A subject to U.S. domestic management processes;

b) Although the Parties hold differing views on the appropriateness of the directed coho fishery in Areas 7 and 7A, they agree that the enhancement based approach proposed by the U.S. appears to be a positive step forward and agree to explore the merits of this approach to address the Areas 7 and 7A directed coho issue. In doing so, both Parties have agreed to clarify the technical and procedural questions which will form the basis for making an informed decision on the proposed approach.

The parties have also identified the need to jointly develop a time frame and methodology for the purpose of assessing how well the average annual contributions of new specified U.S. production to Canadian fisheries compare to the average interceptions that may occur in directed Areas 7 and 7A coho fisheries.

c) that, with respect to the 1990 directed coho fishery in Areas 7 and 7A:

i) to jointly estimate the level of interceptions that occurred in the 1990 Areas 7 and 7A directed coho fishery (recognizing that the estimates generated for this purpose may not necessarily reflect improved stock composition estimates that will eventually be available to the Parties when currently on-going joint technical studies are completed);

ii) to establish a base period and level of production from which the new increased production could be measured and clarify which Canadian fisheries

would receive benefits from the new specified U.S. production. (It is recognized the Parties have differing opinions on whether it is appropriate to apply actions taken prior to 1991);

iii) that the U.S. will not harvest the cumulative Areas 7 and 7A chum salmon shortfall through 1990 (as provided in Annex IV, Chapter 6, Paragraph 5); and

iv) that if the above steps are determined not to adequately address compensating measures for the 1990 Areas 7 and 7A directed coho fishery, the Parties will consider and agree to appropriate additional compensating measures by no later than the February 1992 annual meeting of the Pacific Salmon Commission;

d) to complete discussions on compensating measures for the 1990 Area 7/7A fishery and assess the merits of the long term enhancement based approach. Results of these discussions will be provided to the Commission in February 1992;

e) to initiate discussions on coho within the Southern Panel area with a view toward clarifying and improving understanding of the conservation concerns and the management approaches of the Parties; and,

f) to adjust the date of the workshop on southern coho issues to January 1992 and to report the findings to the Commission during the January 1992 meetings of the Commission.

4.) With respect to Annex IV, Chapter 6, the Commission agrees to initiate discussions on chum within the Southern Panel area with a view toward clarifying and improving understanding of the conservation concerns and the management approaches of the Parties.

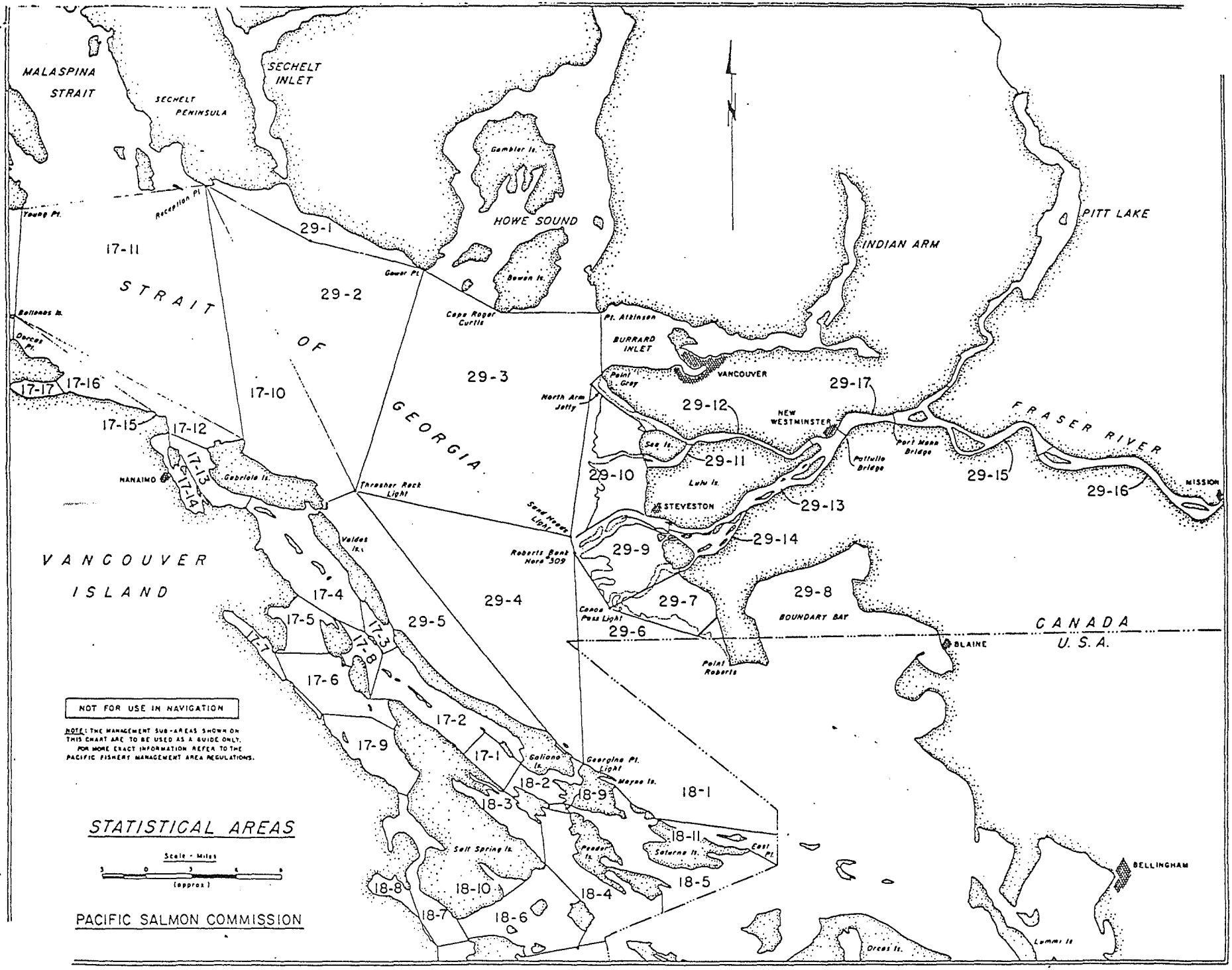
5.) With respect to implementation of Article III, Paragraph 1 of the Pacific Salmon Treaty, the Commission agrees that:

The Parties are committed to developing a mutually acceptable approach to identify and resolve equity issues in a timely manner. In the "Understanding Between the Canadian and United States Sections of the Pacific Salmon Commission Concerning Equity Related Issues", Item 7 identifies that the Parties will "hold a bilateral workshop in September 1991 for the purpose of exchanging alternative technical approaches for determining each Party's benefits in relation to salmon production and interceptions." To coordinate this workshop, the Commission has established a Steering Group which will meet in June 1991 to develop a schedule, agenda, attendance requirements, and format for the workshop. Workshop discussions will be structured around selected topics and papers identified in advance by the Parties. At the conclusion of the workshop, the Steering Group, supported by Commission staff, will compile the papers, work products, discussion comments, and a summary of the workshop and provide these to the Commission by October 1991.

The Commission respectfully requests your approval of these recommendations.

ATTACHMENT 3

U.S. AND CANADIAN STATISTICAL AREA MAPS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Bowen Is.
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PITT LAKE
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STRAIT OF GEORGIA
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Cape Roger Curtis
Pt. Atkinson
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Point Grey
VANCOUVER
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NEW WESTMINSTER
FRASER RIVER
Port Mann Bridge
Pattullo Bridge
29-15
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Lulu Is.
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STEVESTON
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Sand Heads Light
Thrasher Rock Light
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NANAIMO
Gabriola Is.
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Ballenas Is.
Dorcas Pt.
VANCOUVER ISLAND
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BOUNDARY BAY
Canoe Pass Light
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CANADA
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BLAINE
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Georgina Pt. Light
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Salt Spring Is.
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18-10
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18-7
18-6
Orcas Is.
Lummi Is.
BELLINGHAM
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
Scale - Miles
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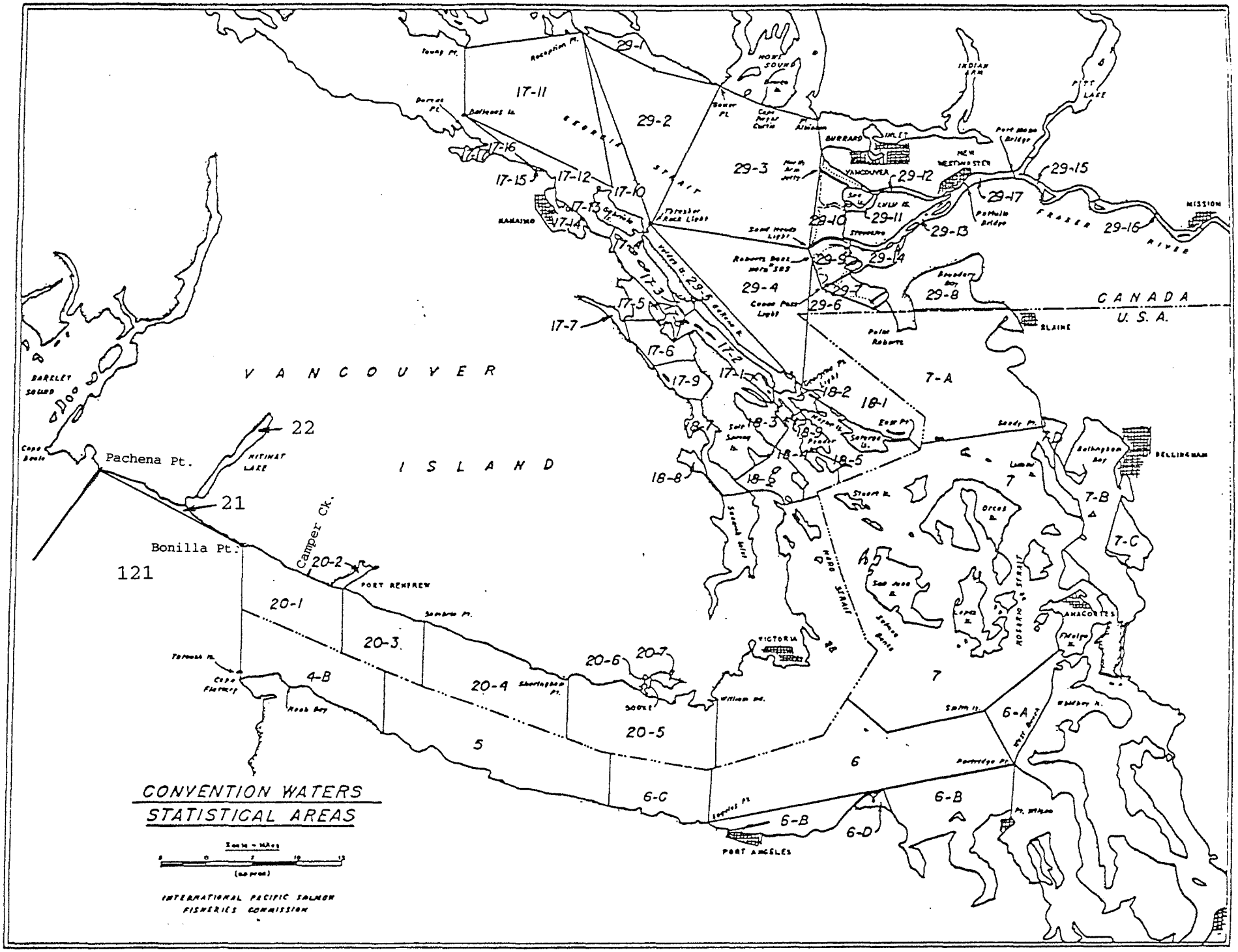
(approx.)
PACIFIC SALMON COMMISSION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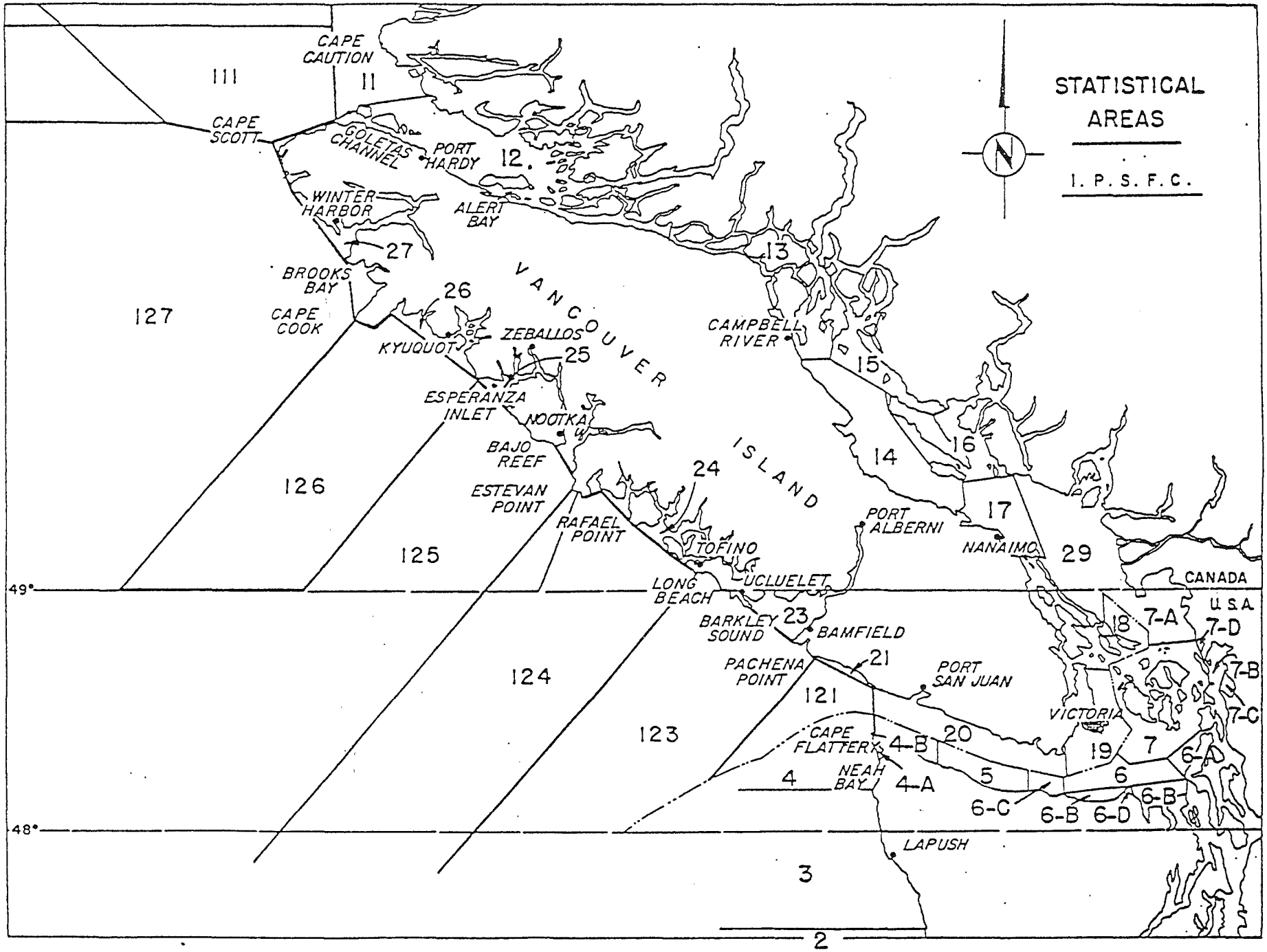
INTERNATIONAL PACIFIC SALMON
FISHERIES COMMISSION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CAPE SCOTT
GOLETAS CHANNEL
PORT HARDY
WINTER HARBOR
ALERT BAY
BROOKS BAY
CAPE COOK
KYUQUOT
ZEBALLOS
ESPERANZA INLET
NOOTKA
BAJO REEF
ESTEVAN POINT
RAFAEL POINT
VANCOUVER ISLAND
CAMPBELL RIVER
PORT ALBERNI
NANAIMO
TOFINO
UCLUELET
LONG BEACH
BARKLEY SOUND
BAMFIELD
PACHENA POINT
PORT SAN JUAN
VICTORIA
CAPE FLATTERY
NEAH BAY
LAPUSH
CANADA
U.S.A.
49°
48°
111
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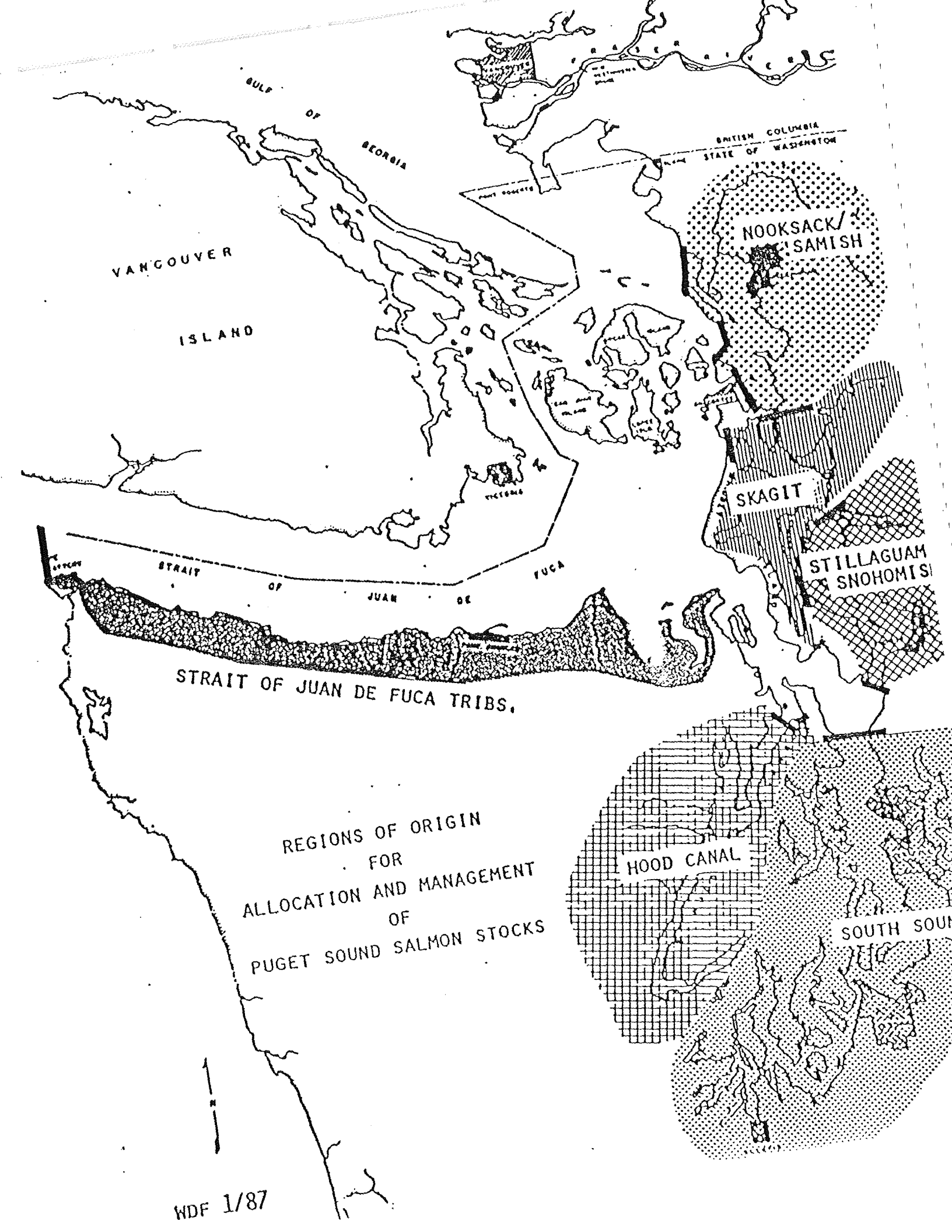
127
126
125
124
123
121
7
7-A
7-B
7-C
7-D
6
6-A
6-B
6-C
6-D
5
4
4-A
4-B
3
2


GULF OF GEORGIA
BRITISH COLUMBIA
STATE OF WASHINGTON
VANCOUVER ISLAND
NOOKSACK/ SAMISH
SKAGIT
STILLAGUAM
SNOHOMIS
STRAIT OF JUAN DE FUCA
STRAIT OF JUAN DE FUCA TRIBS.
HOOD CANAL
SOUTH SOU
REGIONS OF ORIGIN
FOR
ALLOCATION AND MANAGEMENT
OF
PUGET SOUND SALMON STOCKS
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