

**PACIFIC SALMON COMMISSION  
JOINT CHUM TECHNICAL COMMITTEE  
2007 POST SEASON SUMMARY REPORT**

**TCCHUM (10)-1**

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## 1. INTRODUCTION

This Pacific Salmon Commission (PSC) Joint Chum Salmon Technical Committee report presents the information on chum salmon stocks and fisheries in southern British Columbia and Washington for the year 2007 to address the specific provisions and requirements of the 2007 version of Chapter 6, Annex IV of the Pacific Salmon Treaty (PST) (Attachment 1).

The treaty between the governments of Canada and the United States of America (U.S.) concerning Pacific salmon was designed to facilitate co-operation between the two countries in the management, research and enhancement of Pacific salmon stocks. Chapter 6 of Annex IV (Chum Annex) of the PST required that certain fisheries for chum salmon in southern British Columbia (B.C.) and Washington be managed in a specified manner. In each country other fisheries, while not specifically mentioned in the PST, are known to harvest chum salmon originating in the other country. This report presents various aspects of the chum found in Washington State and 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 and the U.S. in relation to the PST requirements.

In 1999 a new Chum Annex was negotiated and adopted by the parties for a term of 10 years (Appendix 1). Certain provisions of this Annex were updated, relative to earlier versions, to be consistent with the changes in the “Clockwork” management strategy implemented by Canada for fisheries in Johnstone Strait. It also included additional conservation provisions to address concerns of the United States for Hood Canal-Strait of Juan de Fuca summer chum salmon, which have been listed as a “threatened” species under the United States’ Endangered Species Act.

In 2002, Canada implemented a significant change in Southern B.C. chum management replacing the “Clockwork” stepped exploitation rates in favor of a fixed fishing schedule designed to approximate a total harvest rate of 20%. The Parties managed their fisheries through 2006 within the spirit of the existing Annex and the Commission’s guidance.

In 2004, the Parties were given additional Commission guidance that modified certain provisions of the Chum Annex (Appendix 2). The purpose of the guidance document was to provide Commission direction to the Southern Panel on the conduct of southern chum salmon fisheries for the years 2004 to 2008. This direction was not intended to replace Annex IV, Chapter 6 of the Pacific Salmon Treaty but to address a change in Canadian management, which suspended development of pre-season run size estimates of chum to Canadian waters. The guidance document outlined agreements on fishery modifications. One modification disconnected the harvest levels in the U.S. from catch volume in Canada. The U.S. fishery in Areas 7 and 7A was managed pursuant to the Commission guidance to the Southern Panel on the management of southern chum fisheries. Another modification further provided for an additional linkage of the U.S. fishery, in Area 7 and 7A, to the abundance of chum salmon returning to the Fraser River. Additionally, the guidance document provided for conditional exploitation rates for Canadian fisheries based on specific levels of abundance.

In 2006, a new agreement was concluded between the Government of Canada and the Government of the United States of America which amends Annex IV of the PST (1985). In 2007, the two parties managed their fisheries in accordance with this agreement as described in Attachment 1.

## 2. STATUS OF TREATY REQUIREMENTS

Chum stocks and fisheries in southern British Columbia and in United States Areas 4B, 5, 6C, 7, and 7A (*See: Attachment 1*) were managed under the terms set out in the 2006 Chum Agreement of the PST. The following provides a brief synopsis of the provisions of the Chum Chapter and of the Canadian and U.S. management actions taken to meet its provisions in 2006.

### 2.1 Paragraph 1:

*The Parties were to maintain a Joint Chum Technical Committee (Committee) to review stock status, develop new methods for stock management and report on management and research findings.*

After the 2007 fishing season the Committee convened twice in 2008, during the PSC post-season meeting and for additional work in Washington State later in the year. The Committee completed the 2006 annual post season report and worked on development of criteria for endowment fund projects pertinent to chum salmon. The Committee also provided technical support to the Southern Panel in its efforts to re-negotiate the Chum Annex which was scheduled to expire at the end of 2008.

### 2.2 Paragraph 2:

*The catch composition of fisheries covered by this chapter will be estimated by post-season analysis using methods agreed upon by the Committee.*

The Committee used agreed-upon methods to assess catch composition estimates for 2007 fisheries, using historical estimates of stock contribution. These historical estimates may no longer be representative of the current chum catch composition in Southern B.C. fisheries. The Committee is currently evaluating new methods of assessing chum catch composition.

### 2.3 Paragraph 3:

*Canada and the United States assess catch levels and make attempts to collect additional genetic samples from any chum salmon caught during the July 1 through September 15 time period in the boundary area fisheries (U.S. Areas 4B, 5, 6C, 7 and 7A; Canadian Areas 18, 19, 20, 21, and 29).*

Tables 3 and 11 provide the harvest of chum salmon during the period of summer chum migration in boundary areas. Due to the low numbers of chum encountered during this time period, neither party collected any GSI samples.

### 2.4 Paragraph 4:

*During the period from July 1 through September 15, Canada will require the live release of chum salmon from all purse seine gear fishing in the Strait of Juan de Fuca (Canadian Area 20) and the United States will require the same for the non-Indian seine fisheries in Areas 7 and 7A. Note: Purse seine fisheries are not permitted in U.S. Areas 4B, 5 and 6C.*



Regulations were implemented by both countries to require the live release of chum salmon in these areas during this time period.

## 2.5 Paragraph 5:

*In the years 2006 through 2008, Canada will manage its Johnstone Strait, Strait of Georgia, and Fraser River chum salmon fisheries to provide continued rebuilding of depressed naturally spawning chum salmon stocks, and, to the extent practicable, not increase interceptions of U.S. origin chum salmon. Terminal fisheries conducted on specific stocks with identified surpluses will be managed to minimize interception of non-targeted stocks.*

Table 1 provides an evaluation of the performance of the Clockwork (1997–2001) and the current Johnstone Strait management strategy (2002–2007). Historical GSI results and genetic estimates from 2006 and 2007 indicated a continued low contribution of U.S. stocks in Johnstone Strait, Strait of Georgia and Fraser River chum salmon fisheries.

Information regarding the contribution of depressed natural spawning chum to the catch was not obtained. Current levels of genetic resolution cannot distinguish individual populations.

Fishery descriptions (see section 3.4) indicated that terminal areas fisheries were generally managed to minimize the interception of non-targeted stocks.

## 2.6 Paragraph 6:

*In the years 2006 through 2008, Canada will manage its Johnstone Strait mixed stock fishery as follows:*

- a) In the years 2006 through 2008, chum salmon abundance levels of less than a provisional threshold of 1.1 million will be defined, for purposes of this chapter as critical. By the end of 2008, Canada will determine a revised critical threshold.*
- b) For run sizes above the critical threshold, Canada will conduct fisheries with a combined exploitation rate of up to 20% in Johnstone Strait.*
- c) When run sizes are expected to be below the critical threshold, Canada will notify the United States and will only conduct assessment fisheries and non-commercial fisheries. Other commercial fisheries targeting chum salmon will be suspended.*

While no specific estimates of Inside chum abundance were available, Canada indicated during the season, on the basis Inside area fisheries, that the Inside area run size was not at critical level. The U.S. was notified by Canada of the abundance status. Canada planned and managed its Johnstone Strait fishery for a maximum total exploitation rate of 20% (Table 1).

## 2.7 Paragraph 7:

*In the years 2006 through 2008, Canada will manage its Fraser River fisheries for chum salmon as follows:*

- a) *For Fraser River terminal area run sizes, identified inseason, at abundance levels lower than 900,000 chum salmon, the Canadian commercial chum salmon fisheries within the Fraser River and in associated marine areas (Area 29), will be suspended.*
- b) *For Fraser River terminal area run sizes, identified inseason at levels greater than 900,000 chum salmon, Canadian commercial chum salmon fisheries within the Fraser River, shall be guided by the limits of the in-river Total Allowable Catch set by Canada.*

In 2007, inseason estimates indicated a terminal return higher than the specified Fraser River gross escapement threshold. Fisheries proceeded as per the Fraser River management rules (section 3.3.2).

#### 2.8 Paragraph 8:

*Canada will manage the Nitinat gillnet and purse seine fisheries for chum salmon to minimize the harvest of non-targeted stocks.*

In 2007, Canada addressed specific bycatch concerns by delayed opening dates (to early October), the use of reduced fishing areas, the use of weed lines, and species selective fishing techniques.

#### 2.9 Paragraph 9:

*For the years 2006 through 2008, Canada shall conduct a genetic sampling program of chum salmon taken in the West Coast Vancouver Island troll fishery if early-season catch information indicates that catch totals for the July 1 through September 15 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).*

Chum catch levels in the 2007 West Coast Vancouver Island troll fishery were significantly below the 1985 and 1986 levels. Therefore, no GSI sampling occurred.

#### 2.10 Paragraph 10:

*In the years 2006 through 2008, the United States will manage its chum salmon fishery in Areas 7 and 7A as follows:*

- a) *In the years 2006 through 2008, chum salmon abundance levels of less than a provisional threshold of 1.1 million will be defined, for purposes of this chapter, as critical. By the end of 2008, Canada will determine a revised critical threshold.*
- b) *For run sizes above the critical threshold, the base catch ceiling for the U.S. chum salmon fisheries in Areas 7 and 7A will be 130,000 chum salmon.*
- c) *For run sizes below the critical threshold, the U.S. catch of chum in Areas 7 and 7A shall be limited to chum salmon taken incidentally to other species and in*

*other minor fisheries, but shall not exceed 20,000, provided that catches for the purpose of genetic stock identification sampling shall not be included in the aforementioned limit.*

- d) The Fraser River chum salmon abundance estimate will be updated no later than October 22. If the run size is estimated to be less than 900,000, the United States will take immediate action to restrict its fishery impacts on Fraser chum. The Parties will then meet within 3 days of the update to discuss further U.S. fishing opportunities to meet conservation objectives*
- e) U.S. commercial fisheries for fall chum salmon in Areas 7 and 7A will not occur prior to October 10.*
- f) The United States will manage the Areas 7 and 7A fisheries for chum salmon with the intent to minimize, to the extent practicable, the harvest of non-targeted species.*

In 2007, U.S. fisheries in Areas 7 and 7A were conducted in accordance with the above provisions (see section 5.3.1 and 5.3.2).

#### 2.11 Paragraph 11:

*In the years 2006 through 2008, the United States' annual total harvest ceiling for chum salmon in Areas 7 and 7A, shall be defined as follows:*

- a) It is the intent of the parties to eliminate the accumulated historical difference (138,000 total, as of the start of 2006), by 2008. Therefore, in any non-critical year in which a portion of the assigned difference is not taken, that portion shall be foregone.*
- b) When the chum salmon run size is below the critical threshold, the base catch ceiling will be 20,000 chum salmon. When the fishery is limited to 20,000 chum salmon, the portion of the accumulated historical difference will not be added to the catch ceiling and the remaining accumulated historical difference will be recalculated and applied to subsequent years, up to and including 2008.*
- c) When the chum salmon run size is above the critical threshold, the base catch ceiling will be 130,000 chum salmon, plus 46,000 chum salmon of the accumulated historical difference, plus any shortfall of up to a maximum of 15,000 chum salmon generated from a failure to capture the preceding non-critical year's base catch ceiling, minus any amortized overage adjustment caused by a prior year's overage of that year's total harvest ceiling.*
- d) It is also the intent of the Parties to avoid future accumulations. Therefore any annual shortfall below the base catch ceiling of 130,000 chum salmon shall be limited to a maximum of 15,000 chum salmon and shall be added to the next available non-critical season's base ceiling. If it is not taken in that fishery, it shall be foregone.*

- e) *Adjustments due to past overages shall not be limited, but they may be amortized over subsequent years, up to and including 2008.*
- f) *When the chum salmon run size is below the critical threshold, no shortfalls may be accrued; however, any overages shall be carried forward as indicated above.*

The 2007 Annex specified a default total annual catch ceiling which was the sum of a base catch ceiling of 130,000, plus an amortized historical accumulated difference of 46,000 plus an amount of up to 15,000 if the previous year's base catch was not met. It also specified that the amortized historical accumulated difference and the 15,000 carryover, if not taken, would be foregone. For 2007, the U.S. catch ceiling for Areas 7 and 7A was 191,000.

In 2007, the U.S. commercial fisheries in Area 7 and 7A commenced on October 11<sup>th</sup> and continued through the balance of the season (Table 12 and 13). These fisheries were managed to avoid the capture of non-targeted species. These fisheries did not need further modification based on the status of the Fraser River abundance.

#### 2.12 Paragraph 12:

*In the years 2006 through 2008, the United States shall conduct its chum salmon 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, not increase interceptions of Canadian origin chum salmon. The United States shall continue to monitor this fishery to determine if recent catch levels indicate an increasing level of interception.*

This fishery has continued to be restricted to gillnet gear only and to treaty Indian fishers from four tribes. The technical committee has not specifically addressed interception estimates during the 1994 through 2007 time period. The Committee has also not addressed the issue of "minimizing increased interceptions" in 2007, because of the extremely low level of harvest. However, GSI samples collected from this fishery in prior years indicate the majority of the catch is chum salmon of U.S. origin, and the total catch and effort in this fishery has declined significantly in recent years (see Table 10). Therefore, interceptions have likely decreased as well.

#### 2.13 Paragraph 13:

*All information concerning bycatch of other salmon species from the chum salmon fisheries covered by this chapter will be shared between the Parties in the annual Post Season Report.*

Bycatch species were reported in the annual post season reports of the Parties.

### 3. CANADIAN INSIDE CHUM

#### 3.1 Introduction

Southern B.C. chum salmon stocks and fishing areas (Attachment 2) are, for the purposes of management, analysis and reporting, divided into three major components. The stocks of Johnstone Strait, the Strait of Georgia and the Fraser River are described as Inside chum. The primary fisheries of concern for 2007 are the chum directed fisheries that occur in those three areas.

#### 3.2 Status of Treaty Requirements

A bilateral agreement for sharing of chum salmon was reached on June 30, 1999. Canada and the U.S. agreed to implement, without any prejudice to future agreements, the most recently expired sharing arrangement as outlined in Chapter 6 of Annex IV of the Pacific Salmon Treaty. Canada implemented a significant change in Southern B.C. chum management beginning in 2002, replacing the “Clockwork” stepped exploitation rates in favor of a fixed fishing schedule designed to approximate a total harvest rate of 20%. As a result of this change, guidance was provided by the Commission in 2004 (Attachment 2) pertaining to the management of the Inside chum fisheries. The purpose of this document was to provide Commission direction to the Southern Panel on the conduct of southern chum salmon fisheries for the years 2004 to 2008. This direction was not intended to replace Annex IV, Chapter 6 of the Pacific Salmon Treaty but was to be used on an interim basis.

#### 3.3 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 Fisheries and Oceans Canada (CDFO) is to achieve the present target 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 or natural 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 harvest strategies and fishing plans for Inside chum stocks (Johnstone Strait, Fraser River, and mid Vancouver Island/Strait of Georgia) in relation to these above requirements.

##### 3.3.1 Johnstone Strait Chum Management Strategy

The Clockwork strategy in use from 1983 to 2001 was described in the Final 1985 Post Season Summary Report of the Joint Chum Technical Committee (TCCHUM 87-4). The Clockwork strategy was designed to rebuild wild chum stocks to the estimated optimum escapement levels by limiting the overall harvest rate. Ryall *et al.* 1999 (Canadian Stock Assessment Secretariat Research Document 99/169), provided an assessment of the effectiveness of the Clockwork strategy. The Clockwork management strategy required accurate estimates of catch and escapement and the reliability of this strategy depended upon the quality of these data. During the time period in which Inside chum stocks were managed by the Clockwork strategy, the high

variability in chum returns, the inadequate escapement coverage, and highly unstable fishing opportunities demonstrated a need to move to an alternative approach.

Following extensive technical reviews and several years of discussions with First Nations, stakeholders and the commercial fishing industry, the stepped exploitation rate approach (“Clockwork”(described in TCCHUM 87-4)) was replaced by a stable fishing schedule designed to approximate a fixed exploitation rate (~20%). Some of the key objectives of this strategy are to ensure sufficient escapement levels while providing more stable fishing opportunities. The exploitation rate is set at 20% across all harvesters, when abundance is above critical level. Of this 20%, 15% is allocated to the commercial sector, and the remaining five percent is set aside to satisfy Food/Social/Ceremonial (FSC), recreational, test fish requirements and to provide a buffer to the commercial exploitation. Tagging studies conducted in 2000, 2001 and 2002 helped in the development of this strategy by assessing the migration timing and harvest rate on an available abundance of chum in the Johnstone Strait. The impact of the Johnstone Strait fisheries, Clockwork years (1998–2001) and new approach (2002–2007), on Inside chum stocks are detailed in Table 1.

For 2007, the specific objectives of the fixed exploitation strategy were to:

- a. Continue to rebuild/maintain stocks to the optimum wild escapement objective (defined as 2.5 million wild Inside chum);
- b. Establish a preseason fishing plan to achieve an exploitation rate of 20% on Inside chum;
- c. Stabilize commercial catch to provide opportunities at both low and high abundance levels.

### 3.3.2 Fraser River Chum Management Strategy

The harvest management plan for Fraser River chum provides management goals and fishing limits for chum fisheries in the Fraser River. Management of this fishery is structured to achieve the current spawning escapement goal of 800,000, based on inseason estimates of abundance provided from the Albion test fishery. Decision rules that guide the management of Fraser River chum fisheries are summarized in Table 2.

Table 1. Assessment of Clockwork and the current Johnstone Strait Chum Management 1998–2007.

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
PRE-SEASON										
Forecast	Above Average	Below Average	Below Average	Below Average	Average to Above Average	Below Average	Average	Average to Above Average	Average to Above Average	Average to Above Average
POST-SEASON										
Inside Area Abundance <sup>1</sup>	7,529,698	3,859,027	1,243,128	4,881,017	5,116,605	3,546,995	5,453,179	3,086,000	4,157,070	2,462,848
Inside Area Catch	2,681,229	447,590	270,805	768,113	1,628,932	1,334,373	1,839,017	1,282,324	1,548,671	802,916
Estimated Harvest rate	35.6%	116%	21.8%	15.7%	31.8%	37.6%	33.7%	41.6%	37.3%	32.6%
Johnstone Strait (JS) Catch										
Commercial Areas 11-13 <sup>2</sup>	1,570,279	38,002	176,980	209,914	668,936	924,505	1,176,611	856,029	859,201	480,620
First Nations Areas 11-13	2,479	20598	13,621	23,562	17,131	14,780	27,041	16,841	16,2453	14,859
Johnstone Total	1,572,758	58,600	190,601	233,476	686,067	939,285	1,203,652	872,870	875,403	495,479
Target Harvest Rate <sup>3</sup>	40%	20%	10%	20%	20%	20%	20%	20%	20%	20%
Estimated Harvest Rate	20.9%	1.5%	15.3%	4.8%	13.4%	26.5%	22.1%	28.3%	21.1%	20.1%
ESCAPEMENT (includes wild and enhanced) <sup>4</sup>										
	4,848,469	3,411,437	972,323	4,112,904	3,487,673	2,212,622	3,614,162	1,803,676	2,608,399	1,659,932

(1) Total Inside Area stock includes total Inside Area catch plus escapement. Total Inside Area catch includes all Inside Area catches (Inside Area catch composition based on historic GSI for all fisheries).

(2) Includes commercial, sport and test fishery catches

(3) Desired harvest rate pre 2002 based on Clockwork management strategy. Desired harvest rates post-2001 are based on 20% fixed harvest rate approach.

(4) Escapement numbers do not include any removals associated with hatchery rack. Those values are included in catch.

Table 2. Key decision points for Fraser River chum.

Run Size	Harvest Plan	First Nations	Commercial	Recreational
<800,000 in Fraser	<10%	Limited (Reduced hours and days / week fishing)	Closed	Restricted openings
800,000–916,000 in Fraser	Catch not to exceed 81,000 (72,000 First Nations and 9,000 test fishing)	Normal (72,000)	Closed	Tributary openings
916,000–1,050,000 in Fraser	Commercial catch not to exceed 10% for chum.	Normal (72,000)	Open (35,000– 105,000)	Open
>1,050,000 in Fraser	Commercial catch not to exceed 15% for chum.	Normal (72,000)	Open	Open

Other considerations which affect Fraser River chum management include conservation needs for Interior Fraser coho and steelhead. In order to limit incidental impacts on Interior Fraser coho, fishing for all sectors (First Nations, recreational, and commercial) is restricted from early September to mid October in the Lower Fraser Area. Conservation measures taken to protect Interior Fraser steelhead are developed in conjunction with the B.C. Ministry of Environment on an annual basis. Further measures which are taken to reduce impacts on stocks of concern in the Area E commercial fishery include the release of all steelhead and coho and the mandatory use of revival tanks. The use of short nets and reduced soak times has been tested since 2002.

### 3.3.2.1 Fraser River Inseason Run Size Estimation

The Albion test fishery has operated on the Fraser River since 1978, providing the catch data used to estimate the abundance of chum salmon returning to the river. In 2000, a Bayesian model was developed that incorporated pre-season knowledge of run size and migration timing, with inseason information on chum CPUE from the Albion test fishery, to estimate the run size of returning Fraser River chum (Gazey and Palermo 2000). This Bayesian procedure was judged to be superior to the classical test fisheries approach of using a simple predictive regression of cumulative CPUE on run size, based on a retrospective analysis of 1979–1998 data. This Bayesian model has been in use since the 2000 fishing season. The first inseason estimate of the total escapement of Fraser chum is typically provided on or about October 15<sup>th</sup>. Limited Food, Social, and Ceremonial (FSC) fisheries for Fraser chum may be permitted prior to this date, unless a conservation concern has been identified.

In 2007, estimates of Fraser River total abundance were computed from test fishing conducted on the Fraser River from September 1<sup>st</sup> through November 30<sup>th</sup>.



### 3.3.3 Strait of Georgia Chum Management Strategy

Chum stocks returning to the terminal areas are directly affected by the harvest in Johnstone Strait. A portion of this return is harvested in Johnstone Strait. Chum returning to mid Vancouver Island (Area 14) are primarily from enhancement facilities. Terminal harvesting is directed at a mix of surplus mid Vancouver Island wild and enhanced chum, with the conservation requirements of passing chum stocks considered. Conservation requirements of local Chinook and coho salmon in this fishery area are also considered in determination of area closures for the Area 14 chum fishery.

Terminal surpluses were estimated from escapement, test and commercial harvesting. Areas for potential terminal fishing in the Strait of Georgia occur at mid Vancouver Island (Area 14), Jervis Inlet (Area 16), Nanaimo (Area 17) and Cowichan (Area 18). Terminal area harvests occurred when surpluses were identified.

### 3.4 Inside Area Fishery Descriptions.

Fall chum in Inside waters are harvested by commercial, First Nations, recreational and test fisheries. Commercial catch of chum in Inside waters occurs in three main areas: Johnstone Strait, Strait of Georgia and the Fraser River. Fall chum fisheries generally begin in late September and end in November. In addition, a bycatch of chum may occur in fisheries directed at sockeye and pink. This chum bycatch is assumed to be comprised mainly of summer chum and is not part of the directed chum fishery management plan. The summer chum catches in boundary area fisheries are presented in Table 3.

Table 3. Catch of chum salmon by statistical area for commercial, research and test fishing vessels<sup>1</sup> (July through the second week of September).

Year	Statistical Week	Statistical Area					Total
		18	19	20	21	29 <sup>2</sup>	
1998	7/1–9/2	0	0	50	0	46	96
1999	7/1–9/2	0	0	35	0	49	84
2000	7/1–9/2	0	0	37	0	72	109
2001	7/1–9/2	0	0	26	0	77	103
2002	7/1–9/2	0	0	37	0	197	234
2003	7/1–9/2	0	0	27	0	54	81
2004	7/1–9/2	0	0	17	0	686	702
2005	7/1–9/2	0	0	0	0	115	115
2006	7/1–9/2	0	0	52	0	419	471
2007	7/1–9/2	0	0	0	0	49	49
Area Total		0	0	281	0	1,763	2,045

<sup>1</sup> Catches do not include PSC test fisheries

<sup>2</sup> Majority of this catch is fresh water based

The annual detailed summary is a description of the run size and harvest strategies on a weekly or commercial fishery basis. The description contains run size forecasts, commercial opening times, harvest rate goals, and commercial and First Nations' catches.

Preseason expectations for 2007 indicated an average to above average return for Inside chum salmon stocks based on above average returns in 2002, 2003 and 2004 brood years.

### 3.4.1 Johnstone Strait

There were no Johnstone Strait chum test fisheries in 2007 due to the Laroque court decision in Canada. These test fisheries played an important role in establishing run timing, relative abundance, and stock structure information. Without that tool available there would be increased uncertainty around the post season evaluation of the targeted chum exploitation in Johnstone Strait for planning model calibrations.

In 2007, Competitive seine, troll and gillnet fisheries were conducted based on the preseason plan. Modifications to the purse seine and gillnet plans were made to account for variation in effort participation compared to the pre-season expectations. Table 4 outlines the duration of fishery openings during the 2007 season.

There were ten competitive commercial chum fisheries in Johnstone Strait in 2007 and one troll individual transferable quota (ITQ) fishery. The first competitive purse seine fishery occurred on October 1<sup>st</sup> (12 hours). The catch for this fishery was 108,000 chum. The second competitive fishery occurred on October 2<sup>nd</sup>–4<sup>th</sup> (troll 72 hours) and harvested a 10,000 chum. The third fishery on October 4<sup>th</sup>–6<sup>th</sup> (gillnet 41 hours) harvested 16,000 chum. The next fishery (gillnet 41 hours) on October 9<sup>th</sup>–11<sup>th</sup> caught 32,000 chum. The fifth fishery (troll 72 hours) on October 9<sup>th</sup>–11<sup>th</sup> harvested 16,000 chum. Another gillnet fishery (for 41 hours) occurred on October 15<sup>th</sup>–17<sup>th</sup> harvesting an additional 23,000 chum. The seventh fishery occurred on October 15<sup>th</sup>–17<sup>th</sup> (troll 72 hours) with a catch of 8,000 chum. The eighth fishery was another competitive purse seine opening occurred on October 22<sup>nd</sup> (10 hours) harvested 191,000 chum. Due to lower than anticipated effort in the two purse seine openings and additional fishery was conducted on October 23<sup>rd</sup> (3 hours) with a catch of 55,000 chum. The last gillnet fishery (for 41 hours) occurred on October 28<sup>th</sup>–30<sup>th</sup> and harvested 16,000 chum. The effort based troll ITQ fishery occurred throughout the month of October with the total catch of 5,000 chum.

The total 2007 commercial catch for Johnstone Strait (Areas 12 and 13) was 480,000 chum. There were no directed chum fisheries in terminal areas of Johnstone Strait. In addition, First Nation and recreational catches were estimated at 15,000 and 7,000 chum respectively for the 2007 season.

Table 4. Johnstone Strait chum commercial openings 2007 (hours open).

Year	Statistical Week	Statistical Area					
		12			13		
		Seine	Gillnet	Troll	Seine	Gillnet	Troll
2007	10-1	12	41	72	12	41	72
	10-2		41	72		41	72
	10-3		41	72		41	72
	10-4	13			13		
	10-5		41			41	
2007 Total		25	164	216	25	164	216

### 3.4.2 Strait of Georgia

All Qualicum (Area 14) commercial fisheries occurred in the Puntledge River surrounding area. There were no openings in the Big and Little Qualicum river areas. The gillnet openings occurred on October 9<sup>th</sup>–11<sup>th</sup>, 15<sup>th</sup>–17<sup>th</sup>, 22<sup>nd</sup>–25<sup>th</sup> and 29<sup>th</sup>–31<sup>st</sup>, November 5<sup>th</sup>–7<sup>th</sup>. The total gillnet catch was 25,400. The troll fishery opened on October 6<sup>th</sup> and closed on November 7<sup>th</sup> and caught 270 chum. Seine fisheries occurred on November 5<sup>th</sup>–6<sup>th</sup> resulting in a catch of 60 fish.

No commercial fisheries occurred in Jervis Inlet (Area 16). In Nanaimo (Area 17) one gillnet opening occurred for 48hrs from November 2<sup>nd</sup>–4<sup>th</sup> for a total catch of 330 chum. A troll fishery opening occurred from November 2<sup>nd</sup>–8<sup>th</sup>, with no vessels fishing.

In Cowichan (Area 18), the marine approach area was assessed (enumeration and biological sampling) by seine vessel commencing on October 31 for 2 days per week over a 3 weeks period. A limited-entry gillnet opening (3 vessels) occurred from November 5<sup>th</sup>–7<sup>th</sup>, with a catch 400 chum. A commercial gillnet (full fleet) fishery occurred from November 21<sup>st</sup>–23<sup>rd</sup> for a catch of approximately 6,500. No commercial seine or troll openings occurred.

The approach area to Goldstream (Area 19) was assessed by seine vessel (2 days per week) for 3 weeks, commencing October 31. No surplus was identified and no commercial fisheries occurred.

The total catch estimated by the creel survey and reported, as Strait of Georgia catch retained is approximately 200 (not including Area 13 which was 5,300). First Nation catch was approximately 5,600 Excess Salmon Spawning Requirements (ESSR) in the Puntledge Hatchery (in-river) and 3,700 FSC in the Cowichan terminal marine area.

### 3.4.3 Fraser

In 2007, there were two Area E gillnet fisheries in the Fraser River, on October 25<sup>th</sup> (gillnet, 11 hours) and on November 2<sup>nd</sup> (gillnet, 10 hours). Total estimated chum catches in these fisheries were 41,114 and 14,433, respectively, for a total of 55,547 chum salmon. The First Nation fishery in the lower Fraser River caught 92,642 chum, of which 15,152 were FSC and 77,490 were Economic Opportunity (EO) harvests. The final inseason Fraser River terminal run size at Albion (based on Fraser River chum test fishery data) was estimated to be 1.138 million.

### 3.4.4 Escapement

Chum that escape the commercial, First Nations, recreational and test fisheries form the gross escapement to Inside chum streams. This gross escapement is made up of chum that 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.

Some Inside Area streams support summer chum populations. These are relatively minor stocks and because of their distinctively early run timing in Johnstone Strait, *i.e.* July to late August, they are not included in the escapement total for the fall chum run.

The primary enhanced escapement areas are presently limited to the mid Vancouver Island, Squamish River, Burrard Inlet and Fraser River areas. The enhancement facilities in the mid Vancouver Island consist of Big Qualicum, Little Qualicum and Puntledge rivers. There is one enhancement facility in the Burrard Inlet (Capilano River Hatchery: limited chum hatchery enhancement), and the Squamish watershed (Tenderfoot Creek Hatchery) and five in the Fraser River watershed (Inch Creek Hatchery, Chilliwack, Chehalis, and Weaver). The principal use of chum returning to hatcheries in the Lower Fraser and Squamish watersheds is for First Nations (ESSR) fisheries. Enhancement on the Capilano is opportunistic only using chum that return to the hatchery directly for broodstock.

The stocks which are managed within the context of the Inside chum plan are the fall run chum. These chum enter Johnstone Strait during the September to November time period. Escapement estimates, for Inside chum since 1998, are presented in Table 5.

Table 5. Inside chum spawning escapement for wild and enhanced groupings (Fraser and Non-Fraser) for 1998–2007\*.

Grouping	1998 Estimate	1999 Estimate	2000 Estimate	2001 Estimate	2002 Estimate	2003 Estimate	2004 Estimate	2005 Estimate	2006 Estimate	2007 Estimate
Fraser (Wild + Enhanced)	3,471,107	2,891,985	667,730	3,037,342	2,243,216	1,451,961	2,633,549	1,264,071	1,875,939	1,026,701
Non- Fraser (Wild + Enhanced)	1,377,362	519,452	304,593	1,094,002	1,244,457	760,661	980,613	539,605	732,460	633,231
Total	4,848,469	3,411,437	972,323	4,112,904	3,487,673	2,212,622	3,614,162	1,803,676	2,608,399	1,659,932

\*Does not include chum which are surplus to facility requirements and are removed from the spawning areas as they do not contribute to production in subsequent years. Those chum are identified as rack and assigned as catch.

#### 4. WEST COAST VANCOUVER ISLAND CHUM

##### 4.1 Conservation and Harvest Management Requirements.

Chum salmon stocks return to all Statistical areas on the west coast of Vancouver Island (WCVI). The most significant WCVI group of stocks is the Nitinat group (Area 22) which includes a major hatchery on the Nitinat River. The net spawning escapement requirement for the Nitinat system 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 is 250,000 chum.

The management of this fishery is based on achieving the gross escapement requirement of 250,000 into the Nitinat watershed. Escapement targets are set to ensure that all timing components of the run are represented. Weekly fisheries are generally scheduled in Area 21 and surrounding waters to harvest any identified surplus.

The fishing plan was based on providing early opportunities for gillnet followed by a seine fishery to balance allocation and then a seine/gillnet fishery at the peak of the run. Fisheries are dependent on reaching weekly escapement milestone levels into Nitinat Lake. Early season opportunities are constrained by concerns over Thompson River steelhead bycatch.

Gillnet and seine vessels take part in the Nitinat area fishery. A gillnet in-lake assessment fishery begins in late September. If weekly escapement targets are achieved and a further surplus is identified, then seines are allowed. Subsequent fisheries may open to both gear types, depending on achievement of the weekly escapement targets. A gillnet test vessel, along with visual surveys of the river, is used to determine escapement into Nitinat Lake.

Since 1995, bycatch concerns at Nitinat have been addressed by delayed opening dates, reduced fishing area, increased use of weed lines, and species selective fishing techniques. In 1998, to minimize encounters of passing stocks of coho and Interior Fraser River steelhead, the first commercial gillnet fishery was delayed until the beginning of October. In addition, the initial fishing area was reduced to within a one-mile boundary between lines true south from Pachena and Dare Points, based on information from the gillnet test fishery. To reduce mortality of coho and steelhead and to improve the quality of catch data, the following measures were implemented for the entire season:

- non-retention of coho and steelhead (seine and gillnet)
- mandatory functional revival tanks (seine and gillnet)
- daylight fishing only (gillnet)
- onboard observers (portions of seine and gillnet fleet)
- logbooks and weekly hail-ins (seine and gillnet)
- two-meter weed line for gillnets

In 2007, all measures continued to be implemented with the exception of on-board observers.

With the exception of near-terminal areas, such as Nitinat or Tlupana Inlet, where hatchery stocks dominate, WCVI chum fisheries are managed to approximately a 20% exploitation rate. The exploitation rate is controlled by fishing migration areas and limiting effort to one or two days per week, depending on the number of vessels participating in the fishery. Both commercial gillnet and seine fleets target WCVI chum. Seine opportunities generally occur when surplus to escapement/brood requirements are identified (Nitinat and Tlupana).

First Nations fisheries remain a priority and occur in terminal areas. ESSR fisheries have also occurred at Nitinat Lake targeting hatchery surplus production

#### 4.2 Catch, Escapement, and Run Size

Catch in Nitinat (Area 21) has traditionally occurred by gillnet and seine (Table 6) outside the lake in marine areas. In the past, catch of non West Coast chum has occurred in the outside seaward portion of the fishing area. Management actions have been implemented to reduce this catch by restricting harvest closer to the terminal area. More recently, First Nations' harvests occurred within the lake (Area 22). Escapements of natural spawners have varied over the years (1998–2007) from a high of 435,000 to a low of 22,000.

Pre-season forecasts were based on escapement, survival of each year class and previous years' environmental factors. The pre-season forecast for 2007 return to Nitinat was 830,000 chum salmon.

Table 6. Nitinat area catch and escapement 1998–2007 (Areas 21 and 22).

Year	Area 21		Area 22	
	Seine Catch	Gillnet Catch	In-lake Catch & Broodstock	Natural Spawners
1998	537,000	157,000	410,000	192,000
1999	12,000	85,000	89,000	153,000
2000	2,000	7,000	11,000	22,000
2001	89,000	75,000	178,000	303,000
2002	466,000	81,000	383,000	40,000
2003	265,000	190,000	78,000	243,000
2004	72,000	156,000	166,000	250,000
2005	385,000	294,000	237,000	310,000
2006	224,000	230,000	145,000	135,000
2007	0	180,000	22,000	116,000
Average	205,000	146,000	172,000	176,000

The Nitinat commercial chum fishery (Area 21) is the largest on the west coast and targets returning Nitinat River hatchery stocks. The commercial TAC is based on the pre-season forecast. This fishery provides opportunities for both seine and gillnet fleets. Gillnet and seine fishing opportunities are dependent on reaching established in-lake escapement milestones by specific dates. Fleet size has varied over the past 15 years influenced by pre-season forecasts and fish value. The size of the gillnet fleet in the 1990's ranged as high as 240 vessels. Over the past 5 years the gill fleet size has fluctuated between 30 and 90 vessels. The seine fleet size typically will vary from 20 to 100 vessels.

Weekly gillnet fisheries commenced in Area 21 Nitinat on October 1<sup>st</sup>. There were 6 days of gillnet fishing with the last day of fishing occurring on the 11<sup>th</sup> of October. Fleet size during the two weeks of fishing averaged 90 vessels per day. The catch estimate for gillnets in Area 21 is 180,000 chum salmon. In 2007 there were no seines fisheries for Nitinat chum.

The Dididaht First Nation conducts FSC and ESSR fisheries in Nitinat Lake. Combined FSC and ESSR fishery catch in 2007 was 4,000 chum.

Commercial chum fisheries in Barkley Sound (Area 23), Clayquot Sound (Area 24) and Outer Nootka Sound / Tlupana and Esperanza Inlet (Areas 25) are managed to a specific number of vessel fishing days per week. This harvest rate approach is designed to maintain a harvest rate of approximately 20% or less on all stocks. In 2004 and 2005 limited fleet chum assessment fisheries occurred in both Barkley Sound and Esperanza Inlet. In 2006 the Esperanza Inlet fishery was an open limited fleet fishery. In 2007 a four vessel chum assessment fishery was conducted in portions of Clayquot Sound while the Barkley Sound fishery continued as an assessment fishery.

The commercial chum assessment fishery in Barkley Sound (Area 23) targets returning wild stocks. This gillnet fishery is limited to 8 vessels to a maximum of 16 vessel days per week. This fishery is assessing the feasibility of harvesting low levels of chums from areas that have not been fished for many years. Vessels fish in pre-determined zones on the first day and on the second day all vessels were free to choose among the zones. Coho were allowed to be retained. One onboard observer was required in this fishery. The 2007 chum catch estimate for gillnets in Area 23 was 7,800 chum salmon.

The 2007 Clayquot Sound (Area 24) chum assessment fishery was designed to avoid Chinook interceptions. The fishery starting date was October 8th, two weeks later than the Barkley Sound and Esperanza Inlet fisheries. The fleet size was restricted to four vessels in the first year. The chum catch estimate for gillnets in Area 24 is 4,500 chum salmon.

There are 3 fishing areas in Area 25, Outer Nootka Sound, Tlupana Inlet and Esperanza Inlet targeting both wild and hatchery stocks. The Outer Nootka gillnet fishery is limited to 50 vessel days per week. The Esperanza Inlet gillnet fishery is restricted to a maximum of 8 vessels and is open in conjunction with the outer Nootka gillnet fishery. Fishing opportunities in Tlupana Inlet are dependent on identifying surplus returns to the Conuma River Hatchery. Weekly gillnet fisheries commenced in Area 25 on September 25th. There were 4 days of gillnet fishing over the following 3 weeks in Outer Nootka Sound and Esperanza Inlet. There were no directed chum fisheries in Tlupana in 2007. The last day of gillnet fishing occurred on the 11<sup>th</sup> of October. The catch estimate for gillnets in Area 25 was 16,600 chum salmon. Tseshaht and Hupacasath Bands harvested 6,300 chums collectively for FSC purposes.

## 5. UNITED STATES STOCKS AND FISHERIES

### 5.1 Washington Run Sizes, Catches, and Spawning Escapements

Tables 7 through 9 provide the pre-season forecasts of run size, post-season estimates of spawning escapement and the total run size for the various chum salmon runs returning to Puget Sound and Coastal Washington areas. The tables provide estimates for three major groupings which are defined by their return timings (summer, fall, and winter chum). Table 10 provides chum catch information from the Strait of Juan de Fuca (SJF) fisheries—Areas 4B, 5, and 6C and the San Juan Islands/Point Roberts (SJI/PR) fisheries—Areas 7 and 7A (*see*—Attachment 2). The table also includes annual chum harvest totals for the Puget Sound and the Washington Coastal areas.

Paragraph 10 of the Chum Annex requires that Canada and the United States assess catch levels of summer chum salmon caught during the August 1<sup>st</sup> through September 15<sup>th</sup> time-period in boundary area fisheries. Table 11 provides chum catch during the summer chum management period for U.S. boundary area fisheries.

Table 7. Washington summer chum salmon pre-season and post-season estimates of abundance and estimated spawning escapements (1998–2007).

Region	Type	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Strait of Juan de Fuca	Pre-Season	1,310	869	792	941	1,468	3,131	4,739	6,803	8,238	8,566
	Post-Season	1,316	577	987	3,982	6,981	7,016	9,360	9,734	8,281	3,320
	Escapement	1,269	573	983	3,955	6,955	6,959	9,341	9,682	8,246	3,295
Hood Canal	Pre-Season	10,856	6,742	6,988	6,871	7,846	10,128	18,078	18,060	19,780	23,729
	Post-Season	4,274	4,527	9,506	13,375	13,170	36,024	95,077	16,165	29,395	12,788
	Escapement	4,001	4,114	8,649	12,044	11,454	35,696	69,995	15,757	26,753	10,781
South Puget Sound <sup>1</sup>	Pre-Season	149,950	121,039	84,867	75,599	155,000	47,788	99,317	38,334	55,300	39,840
	Post-Season	87,504	23,545	39,028	84,111	58,545	49,817	178,199	44,993	78,797	57,786
	Escapement	80,404	23,461	27,705	62,821	46,798	45,945	120,782	24,701	63,345	52,669

<sup>1</sup>South Puget Sound estimates include only commercial catch and escapement within Puget Sound.



Table 8. Washington fall chum salmon pre-season and post-season estimates of abundance and estimated spawning escapements (1998–2007).

Region	Type	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Willapa Bay	Pre-Season	35,000	78,010	69,188	79,892	79,892	75,817	45,352	38,038	37,854	23,236
	Post-Season	76,714	26,409	46,991	53,384	92,334	85,283	32,022	28,275	23,137	17,542
	Escapement	65,092	24,751	40,030	29,623	59,750	47,347	17,115	11,924	14,907	17,256
Grays Harbor	Pre-Season	13,370	46,400	32,000	21,182	35,773	42,064	79,183	63,441	29,370	12,000
	Post-Season	37,161	15,198	10,432	26,049	39,997	48,652	103,658	20,397	15,786	12,167
	Escapement	35,188	12,260	8,942	24,898	31,405	37,947	73,828	13,058	11,268	11,342
Strait of Juan de Fuca	Pre-Season	3,130	3,029	2,823	1,841	1,761	2,494	2,438	3,460	3,830	2,143
	Post-Season	1,535	1,313	269	1,737	5,198	1,177	3,237	2,382	1,567	757
	Escapement	1,419	1,272	219	1,562	4,603	1,071	2,739	2,034	1,313	491
Nooksack / Samish	Pre-Season	82,000	25,378	95,598	95,598	171,000	81,921	78,484	126,869	135,100	19,414
	Post-Season	149,600	94,000	18,878	131,412	109,591	133,464	89,850	64,496	66,605	48,928
	Escapement	89,206	34,594	5,244	75,919	86,284	112,683	53,563	44,512	29,289	21,868
Skagit	Pre-Season	186,000	59,345	168,000	45,000	304,049	52,410	109,715	25,695	164,094	90,481
	Post-Season	148,970	50,393	41,393	98,617	410,293	37,209	171,185	53,684	213,476	39,661
	Escapement	121,500	36,767	22,377	73,368	210,028	18,017	150,196	34,600	105,239	21,602
Stillaguamish / Snohomish	Pre-Season	338,331	151,012	184,867	113,600	685,100	245,246	264,542	225,113	445,800	287,993
	Post-Season	352,800	123,100	56,093	361,347	689,850	214,565	382,825	84,821	479,927	235,784
	Escapement	243,991	91,091	39,050	85,119	377,481	172,354	212,463	38,787	272,925	43,652
South Puget Sound	Pre-Season	500,000	662,000	402,000	214,000	241,500	448,365	470,048	655,742	466,700	408,040
	Post-Season	682,700	234,500	234,976	940,776	955,726	753,706	1,023,908	412,820	927,676	1,036,327
	Escapement	430,589	163,403	105,857	313,570	320,817	316,816	356,712	136,552	354,587	614,896
Hood Canal	Pre-Season	662,659	1,158,571	624,623	299,944	446,616	342,061	501,100	749,593	668,400	587,155
	Post-Season	575,300	147,300	153,346	793,359	898,754	1,272,657	1,194,733	345,701	776,450	678,659
	Escapement	244,354	87,095	62,931	255,371	370,840	333,118	231,758	98,761	187,358	163,323

Table 9. Washington winter chum salmon pre-season and post-season estimates of abundance and estimated spawning escapements (1998–2007)

Region	Type	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
South Puget Sound	Pre-Season	36,748	51,973	33,568	54,631	11,700	34,575	76,464	142,406	149,200	81,065
	Post-Season	77,885	17,579	11,323	158,380	219,205	53,507	134,003	72,739	75,833	105,933
	Escapement	76,676	15,691	8,524	139,046	206,468	50,050	98,579	43,917	58,785	73,442

Table 10. Catch of summer, fall, and winter chum salmon in SJF, SJI/PR, Puget Sound and Washington coastal areas (1998–2007).

Region	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
SJF	18,577	7,190	5,621	10,209	1,554	734	5,994	11,560	4,461	6,632
SJI/PR	40,939	79	433	3,247	111,976	81,613	166,170	77,536	105,838	27,384
Puget Sound <sup>1</sup>	752,685	236,235	280,506	1,457,426	1,837,633	1,469,146	1,936,236	645,420	1,536,071	1,239,983
WA Coast <sup>2</sup>	29,911	12,552	23,333	26,383	41,642	49,738	47,500	23,866	13,530	2,711
Total	842,112	256,056	309,893	1,497,265	1,992,805	1,601,250	2,155,900	758,382	1,659,900	1,276,710

<sup>1</sup>All other Puget Sound freshwater and marine catch reporting areas except Strait of Juan de Fuca or San Juan Islands Fisheries.

<sup>2</sup>Coastal Areas combine Catch and Reporting Areas 1–4 including Grays Harbor, Willapa Bay, and Columbia River.

Table 11. Catch of chum salmon in the Strait of Juan de Fuca and the San Juan Islands' commercial fisheries during the summer chum accounting period.

Periods:	7/1–8/11 <sup>1</sup>	8/12–8/18	8/19–8/25	8/26–9/1	9/2–9/8	9/9–9/15
95–97 GSI <sup>2</sup>	0.68	0.68	0.397	0.45	0.14	0.07
1998	44	16	1	0	0	0
1999	7	0	0	0	0	0
2000	11	2	0	0	0	0
2001	29	0	0	0	0	0
2002	44	0	0	0	0	0
2003	219	110	70	0	0	15
2004	149	15	0	15	31	25
2005	11	18	17	17	3	34
2006	38	61	51	10	28	3
2007	0	0	0	0	0	9

<sup>1</sup>Indicates cumulative catch through this period.

<sup>2</sup>Proportion of Hood Canal/Strait of Juan de Fuca summer chum from GSI samples from 1995–1997.

## 5.2 United States Strait of Juan de Fuca Fisheries (Areas 4B, 5, 6C)

### 5.2.1 Management Intent

During the 2007 season 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 of chum salmon. The regime of this fishery has been maintained by limiting access to four Treaty Indian tribes using only gillnet gear.

This fishery has been constrained by low catch rates, low market prices, and inclement weather conditions, resulting in relatively modest catch levels, which have had a decreasing trend over the period of 1998–2007 (Table 10). The catch in 2007 increased relative to recent years, however, catch and effort were still below historical levels.

### 5.2.2 Fishery Description

As in previous years, the chum fishery in Areas 4B, 5, 6C was restricted to Treaty Indian gillnet gear only. The fall chum fishery opened the week of October 7<sup>th</sup>, with a five day per week

schedule. At the end of the first week, the fishing schedule expanded to seven days per week in order to provide further opportunity to the few participants and concluded on November 10<sup>th</sup>.

Incidental catches of chum salmon were limited in 2007, primarily because of the lack of openings during the sockeye management period. Only 9 (summer) chum were recorded through September 15<sup>th</sup> (Table 11). An additional 366 chum were harvested incidental to coho fisheries prior to the fall timed chum management period. During the fall chum fishery, 6,257 chum were harvest after October 7<sup>th</sup>, resulting in an area catch total of 6,632 chum (Tables 10 and 11).

### 5.3 San Juan Islands / Point Roberts Fisheries (Areas 7 and 7A)

#### 5.3.1 Management Intent

The U.S. fishery in Areas 7 and 7A was managed pursuant to the Commission guidance to the Southern Panel on the Management of Southern Chum Fisheries (Attachment 2), which was a provisional modification to Annex IV, Chapter 6 Chum Annex of the PST. The purpose of the document was to provide Commission direction to the Southern Panel on the conduct of southern chum salmon fisheries for the years 2004 to 2008. This direction was not intended to replace Annex IV, Chapter 6 of the Pacific Salmon Treaty. Additionally, the guidance document outlined certain modifications to the limits for the U.S. chum salmon fishery in Areas 7 and 7A, which disconnected the U.S. harvest limits from the harvest levels in the Johnstone Strait fishery. In summary, the guidance provided for the harvest limit of 130,000 chum salmon, unless Canada indicated that a critically low abundance condition was evident. The guidance document provided conditional actions in U.S. Areas 7 and 7A fisheries and reiterated a consistency with Chapter 6, provision 3(a)(ii) of the Annex identifying a catch ceiling of 20,000 given pre-season critical abundance.

The guidance document also included U.S. catch compensation due to the U.S. for harvest shortfalls from prior years, with the intent to eliminate the total accumulated catch difference by 2008. Consistent with Annex IV, Chapter 6, paragraph 5, the difference between actual catches and catch levels specified by this chapter is a total historical accumulated difference of 228,300 chum salmon, (accumulated from 1991 through 2003); the difference will be amortized over the years of the agreement described in the guidance. In 2007 the adjustment amount was 46,000 (Table 12).

The guidance document also provided that U.S. fisheries, for chum salmon, may start in these areas no earlier than October 10. It also provided for management responses in the U.S. Areas 7 and 7A fisheries, when inseason estimates indicated a low abundance (less than 900,000 fish) entering the Fraser River.

Table 12. Summary of U.S. Areas 7 and 7A limits and catches in 2007. The adjusted catch limit includes a portion (46,000) of the amount that was due to the U.S.

Year	PSC Guidance Specified Limit	Adjusted Limit <sup>1,2</sup>	Actual Catch	Annual Overage or Shortfall	Accumulated Balance Remaining	Total Accumulated Balance Plus Shortfall Due
2003			81,613	0	228,300 <sup>1</sup>	228,300
2004	130,000	176,000 <sup>1</sup>	166,170	0	182,300	182,300
2005	130,000	176,000 <sup>1</sup>	77,536	15,000 <sup>2</sup>	136,300	151,300
2006	130,000	191,000 <sup>1,2</sup>	105,838	15,000 <sup>2</sup>	90,300	105,300
2007	130,000	191,000 <sup>1,2</sup>	27,384	15,000 <sup>2</sup>	44,300	59,300

<sup>1</sup>The adjusted catch limit includes a portion (46,000) of the amount that was due to the U.S. That amount is subtracted from the total accumulated difference, whether actually harvested or not.

<sup>2</sup>This value is identified in the Commission's guidance document to the Southern Panel (Attachment 2).

Paragraph 3 of the Chum Annex also provides for the U.S. to manage its fishery to maintain a traditional proportion of the catch between Areas 7 and 7A and to avoid concentrations of effort along the international boundary in Area 7A. There have been only five years with a significant fishery during this time-period and the percentage of the catch in Area 7A ranged from 23.8% to 53.4% (Table 13). Historically, the catch had been distributed approximately 50/50 between the two areas.

Table 13. Distribution of catch between areas 7 and 7A (1998–2007).

Catch Area	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
7	30,913	0	430	2,241	69,475	39,990	77,412	56,904	64,907	17,315
7A	9,634	79	2	1,006	42,501	41,642	88,758	20,632	40,931	10,069
% in 7A	23.8%	*	*	*	38.0%	51.0%	53.4%	26.6%	38.7%	36.8%

\*Non-fishing years; primarily incidental catches.

### 5.3.2 Fishery Description

Preseason forecasts were for a good return of fall chum in Puget Sound. Inseason updates of abundance indicated that numerous runs were significantly more abundant than the preseason forecast. The harvest level for Areas 7 and 7A, as specified in the 2004 agreement (Commission guidance to the Southern Panel on the management of southern chum fisheries [February 13, 2004], Attachment 2), was 130,000 chum salmon plus an adjustment of 46,000 chum salmon from previous U.S. harvest shortfalls for a total target catch of 176,000 chum salmon. No specific forecast or inseason abundance estimates were available for overall Canadian Inside chum stock but Canada indicated the run size was not at a critically low level. The abundance below the critical threshold was not identified by Canada in 2007 and under the terms of the guidance, fisheries proceeded as planned.

After the Panel's release of control, Non-Treaty reef net fisheries targeting marked coho salmon were conducted until October 9 and remained open, targeting chum salmon from October 10 through November 17. Before October 10, bycatch in this fishery was 562 chum. The reef net fishery required the release of all Chinook, sockeye, chum, and unmarked coho. After October 1, retention of chum and marked coho were allowed.

The Treaty Indian gillnet and purse seine fishery was opened for one day fishing on October 10, followed by a day of fishing on October 13. The Non-Treaty fishery was opened for two days of combined gillnet and purse seine fishing on October 11 and 12.

In the week beginning October 14, the Treaty Indian fishery was open for three days (October 14–16) and Non-Treaty fishery was open for the following three days (October 17–19). Beginning October 20, the Treaty Indian fishery opened continuously from October 22 through November 17. The Non-Treaty fishery was open continuously from October 22 through November 17.

Catches per vessel were very low through the first weeks of the fishery, slowly decreasing thereafter. Effort remained relatively low throughout the fishery primarily because of the availability of alternate fishing opportunities in the Puget Sound area, as well as because of intervening periods of inclement weather. In the last three weeks of the fishery, there was very little catch and effort. Chum prices have improved over the past several years, but this fishery did not reach its base catch ceiling in 2007. Despite reports of improved chum prices in the fishery fell short of its catch ceiling in 2007 by 85.7% (Table 12), possibly due to low abundances in the area.

There was no summer-timed chum reported caught in Areas 7 and 7A prior to September 16. There were 562 chum harvested during the September 16 to October 10 time period. Catch during the chum directed fishery totaled 26,822. The total chum catch by all gears in 7 and 7A reported through November 19 was 27,384.

## 6. STOCK IDENTIFICATION

### 6.1. Tagging of Adult Chum Salmon

No adult tagging projects were reported by either United States or Canada in marine or near shore areas in 2007.

### 6.2 Coded Wire Tagging, Otolith and Fin Marking

#### United States

A summer chum salmon supplementation program was started in 1992 at the Quilcene National Fish Hatchery to address severe declines in the numbers of summer chum returning to the Quilcene River and Hood Canal. In recent years, an adipose-only clip was utilized to aid in identifying hatchery fish for terminal fisheries management and project evaluation purposes. Brood year 2003 was the final year summer chum were marked and released from the hatchery.

A number of other hatchery supplementation and reintroduction programs for summer chum in the Hood Canal and Strait of Juan de Fuca regions, and fall chum in the Lower Columbia have utilized otolith marks to aid in assessing the success of the programs and to determine the proportion of hatchery and natural origin fish on the spawning grounds (Table 14). Supplementation summer chum releases for recovery ended at Discovery, Chimacum, and Union with brood year 2003.

Table 14. Numbers of summer and fall chum salmon released with otolith marks, by brood year and location (2000–2007).

Brood Year	Puget Sound Summer Chum							
	Sequim	Discovery Bay <sup>1</sup>	Chimacum <sup>1</sup>	Big Beef	Hamma Hamma	Lilliwaup	Union <sup>1</sup>	Tahuya
2002	20,887	118,347	57,300	72,622	61,000	96,000	82,636	
2003	49,897	88,610	57,435	76,353	75,356	103,913	35,343	111,232
2004	76,982			14,814	57,000	99,500		118,872
2005	57,300			5,685	117,837	106,466		119,260
2006	79,428				303,100	177,600		133,826
2007	73,840				48,530			53,632
	Lower Columbia River Fall Chum							
	Grays River Hatchery		Sea Resources Hatchery			Washougal Hatchery		
2002	398,000		84,818			218,283		
2003	357,000		102,132			75,952		
2004	163,000		0			0		
2005	155,501		0			19,578		
2006	129,427							
2007	77,609							

<sup>1</sup>Program discontinued after brood year 2003.

## Canada

Thermal marking of otoliths has been used as a technique of mass marking hatchery raised salmonids in B.C. since 1992. The method involves manipulating the temperature of the rearing water by at least 2°C to induce a mark on the otolith. The change in water temperature can be accomplished through the use of two different water sources, through heating the water or by chilling it. By altering water temperatures over a period of time a unique mark can be created. Thermal marking was first used on chum from Nitinat hatchery in 1993 and continues to be used as a means of estimating hatchery contribution to both fisheries and escapement (Table 15). Thermal marking is currently the only method of marking being applied to chum from Nitinat hatchery (due to the dropping of the Multiple Fin Clip program). Transplanting thermally marked chum into Klanawa River started with the 2001 brood and ended with 2006 brood year.

Conuma Hatchery first began thermal marking several stocks with the 1998 brood year. A comprehensive sampling program occurred during the fall chum fisheries and permitted a better understanding of timing and distribution of the different stocks in Nootka Sound.

Enhanced contributions of chum from major hatchery facilities are based on marking a portion of the fry released with an adipose clip and coded-wire tag (Ad-cwt) or a ventral fin clip with or without an adipose clip, and subsequent recovery of these marks in the commercial fishery and escapement programs. Released chum marked with fin clips include the Big Qualicum River (since 1964) and Little Qualicum River (1979–2002). Since egg and fry mortality generally is less than 10%, fry enumeration is considered very accurate. Not all release groups are represented by a mark. Contributions for those groups are estimated by associating them with a marked release group with a similar size and release timing. Tables 16 and 17 provide a summary of marks applied from 2002–2007 brood years.

Table 15. Releases of thermally marked chum salmon from WCVI based Canadian hatchery facilities, 2002–2007.

Brood Year	Hatchery Facility							
	Nitinat Release Sites		Conuma Release Sites					
	Nitinat River & Lake	Klanawa River	Conuma River	Conuma Estuary	Tlupana River	Sucowa River	Canton River	Deserted River
2000	5,153,902		543,511	1,296,654	998,400	139,090	1,009,746	269,284
2001	27,093,836	3,162,846	569,118	1,649,290	390,754	200,803	1,070,539	272,395
2002	22,757,842	2,915,502	0	1,792,758	1,038,542	445,007	892,140	341,635
2003	21,252,421	2,516,338	0	1,585,534	425,261	410,872	484,570	798,330
2004	32,684,608	2,631,539	0	1,882,230	932,556	1,023,658	679,554	0
2005	36,724,205	2,739,742	0	914,381	744,834	256,296	434,449	0
2006	26,323,943	2,585,428	0	1,455,119	1,139,028	181,333	133,731	0
2007	13,004,189	0	0	271,820	109,922	15,701	47,846	0

Table 16. Releases of CWT (coded-wire tag) chum salmon (and the associated unclipped releases) from southern BC based Canadian hatchery facilities, 2000–2007.

Brood Year	Hatchery Release Sites							
	Inch Creek				Sliammon River			
	CWT + Adipose clip	Adipose clip only	Unclipped	Total	CWT + Adipose clip	Adipose clip only	Unclipped	Total
2000	49,759	264	926,658	976,681	99,615	879	500,628	601,122
2001	49,931	100	1,124,599	1,174,630	-	-	-	0

Table 17. Releases of marked chum salmon (Clip Type—AD: adipose; LV: left ventral; RV: right ventral; AN: anal; D: dorsal) from southern BC based Canadian hatchery facilities, 2002–2007.

Stock	Brood Year	Clip Type	# Clipped	# Poor Clips / Unclipped	Total
Big Qualicum River	2001	ADRV	245,794	8,596	254,390
	2002	ADRV	252,260	10,359	262,619
	2003	ADRV	251,939	4,856	256,795
	2004	ADRV	261,366	6,579	267,945
	2005	ADRV	252,585	9,775	262,360
	2006	ADRV	252,016	6,853	258,869
	2007	ADRV	251,329	9,471	260,800
Conuma River	2000	ADLV	97,906	4,720	102,626
	2001	ADLV	102,059	4,018	106,077
Deserted/NWVI	2000	RV	76,928	1,174	78,102
Little Qualicum River	2001	ADLV	266,330	7,874	274,204
	2002	ADLV	249,887	120	250,007
Salloomt River	2001	LV	97,015	4,595	101,610
	2002	LV	100,637	4,742	105,379
	2003	LV	103,148	1,054	104,202
Theodosia River	2002	LV	101,029	0	101,029
Sucwoa River	2000	LV	76,400	0	76,400
	2001	LV	76,516	0	76,516
Sugsaw Creek	2000	LV	13,000	0	13,000
	2001	LV	31,000	0	31,000
	2002	LV	11,000	0	11,000
	2003	LV	11,000	0	11,000
	2004	LV	20,600	0	20,600

### 6.3 Genetic Stock Identification

In 2007, the Committee began to develop a joint recommendation to the Southern Panel concerning the type of stock identification methodology to be used for immediate and future application of Canada and United States (U.S.) chum stock assessment. Under the Pacific Salmon Treaty (Annex IV, Chapter 6, Section 2):



*“When the Parties provide stock composition information for fisheries, the Committee shall evaluate and report its conclusions using bilaterally agreed upon methods.”*

Fisheries of interest include Canadian fisheries (Johnstone Strait, Qualicum, Fraser River, and Nitinat) and U.S. fisheries (Point Roberts, San Juan Islands and the Strait of Juan de Fuca).

### 6.3.1 Fishery Sample Collection for DNA Stock Identification.

#### **United States**

In a joint study of CDFO (P. Van Will and T. Beacham) and NWIFC (G. Kirby), mixed stock fishery estimates were made in U.S. fisheries Areas 7 and 7A (Kirby 2008). During 2007, October 8<sup>th</sup>–November 11<sup>th</sup>, 2007 DNA tissues were collected from 1,387 chum collected in the Areas 7 (687) and 7A (700) commercial fishery. Additionally, through another project, 600 DNA tissue samples were collected in the Puget Sound Area 9 from October 23<sup>rd</sup> through November 7<sup>th</sup> as the third year of an on-going study.

Estimates to 9 regional groupings were made for 675 fish (Area 7) and 700 fish (Area 7A) for Management Weeks 41–43, and 41, 42, 43, and 45, respectively. A 14-locus mSAT baseline consisting of 67 Canadian populations and 18 U.S. stocks (*unpublished*) was used for the mixture analysis. Funding was provided by PSC Southern Boundary Restoration and Enhancement Fund for 2 years (Kirby 2008).

In 2007, WDFW used genetic techniques to clarify otolith marking data in the monitoring of Hood Canal summer chum supplementation projects. All returning supplementation-origin summer chum were otolith-marked, but there was ambiguity between marks for some programs, meaning that fish could be identified as supplementation or natural-origin, but some supplementation fish could not be identified to their program of origin. Where possible, analysis of DNA samples from fish with ambiguous marks was used to identify fish to the program of origin.

During 2007, chum salmon DNA samples were collected for both baseline purposes and in support of short term stock identification studies. Baseline collections occurred at multiple locales in Washington (Puget Sound, Hood Canal, Strait of Juan de Fuca, Lower Columbia River) and Oregon (Lower Columbia River); see Section 6.3.2 for more details on baseline collections. Additionally, DNA samples were collected during the chum directed commercial fisheries occurring Areas 7 and 7A for stock identification purposes.

Among focused studies, WDFW continued its use of GSI techniques in the discrimination of supplementation-origin returning adult summer chum in Hood Canal. In particular, microsatellite DNA sequence data were used to clarify the uncertain hatchery assignments generated from otolith thermal marks. In total, 54 of 58 summer chum spawners were successfully assigned to one of six possible hatchery supplementation programs (Small and Dean, *unpublished memo*). WDFW also conducted a juvenile stock assignment study in the Strait of Juan de Fuca and Hood Canal during 2007. This study focused mainly on documenting

the emigration timing and relative production patterns of summer and fall chum salmon in key populations. WDFW and tribal scientists also completed a multi-year research study quantifying the impacts of supplementation programs on the genetic diversity of summer chum in Hood Canal during 2007 (Small et al. 2009).

Additionally, The Tulalip Tribes continued sampling activities aimed at assessing the persistence of genetically marked fall chum salmon phenotypes in the Tulalip Hatchery chum population. Genetic marking efforts (i.e., selective breeding that altered allele frequencies for mIDHP-1 and mMEP-2 allozyme loci) were initiated at the hatchery in the early 1990s to help quantify its contribution to regional fry production, catch, and spawning escapement in neighboring streams (Rawson 2005). Fishery and hatchery escapement tissue samples were collected during 2007 and are being stored for processing at a future date (K. Rawson, Tulalip Tribes, *personal comm.*).

### Canada

GSI samples were collected during the Johnstone Straits competitive purse seine fisheries in 2007. A summary of historic chum GSI sampling is presented in Table 18.

Table 18. Number of chum salmon sampled for GSI data, 1998–2007.

Year	Commercial Samples			Test Fishery Samples		
	Johnstone Strait	Qualicum	Nitinat	Johnstone Strait	Qualicum	Nitinat
1998	150	0	0	150	0	0
1999	0	0	0	0	0	0
2000	300	0	0	0	0	0
2001	300	0	0	0	0	0
2002	0	0	0	0	0	0
2003	600	0	0	100	0	0
2004	600	0	0	0	0	0
2005	0	0	0	0	0	0
2006	720	0	0	0	0	0
2007	865	0	0	0	0	0

### 6.3.2 Baseline Collection for DNA Stock Identification.

#### United States

During 2007, WDFW continued its baseline sampling of relevant Washington State populations of chum salmon (Table 19). In total, 1,914 fin tissues were collected from a combination 26 freshwater and marine areas. While more than half of these samples were from Hood Canal, several lower Columbia River locations were also sampled. Few locations/populations inside Puget Sound were sampled during 2007. Fin tissues were clipped and stored in alcohol for future analyses of DNA-based genetic variation.

Table 19. Chum salmon genetics tissue collections from Washington in 2007 (T. Kassler 2009).

Collection Code	Run Type	2007 Collection Name	Number of Samples
07ES	unknown	Jimmycomelately Creek	7
07ET	mixed	Bangor Navel Base	160
07FL	mixed	Cowlitz River @Hatchery separator	8
07GF	mixed	Union River	159
07GO	mixed	Jimmycomelately Creek	90
07GP	mixed	Salmon Creek	32
07GQ	mixed	Snow Creek	35
07GR	mixed	Chimacum Creek	21
07GT	mixed	Dosewallips River	62
07GU	mixed	Duckabush River	129
07GV	mixed	Hamma Hamma River	204
07GW	mixed	Lilliwaup River	109
07JH	mixed	North Fork Lewis	23
07JI	mixed	Skamokawa Creek	6
07JK	mixed	Hamilton Creek	52
07JL	mixed	Hamilton Creek Springs 28.03031	38
07JM	mixed	Hardy Creek	12
07JN	mixed	Multnomah Falls Area / Col. R.	52
07JO	mixed	Ives Island Complex	34
07JQ	mixed	Woods Landing/Columbia River	100
07JS	mixed	Horsetail Falls Area/Columbia River	5
07JT	mixed	Big Creek Hatchery	1
07JV	mixed	Grays River	77
07JY	mixed	Duncan Creek @ Spawning Channels	35
07KH	hatchery	Grays River Hatchery	134
07KT	mixed	Coweeman River	1
07KX	unknown	Areas 7/7A	197
07LB	mixed	Green R @ Hatchery/Duwamish Basin	100
07LP	mixed	Salmon Creek juvenile chum	31
TOTAL			1914

## Canada

### 6.3.3 Inter-laboratory GSI standardization

No additional inter-lab microsatellite standardization efforts took place during 2007. WDFW did, however, purchase primers for 68 different SNP loci (mitochondrial and nuclear) from the Alaska Department of Fish and Game's GSI lab. Given that SNP-based stock identification requires little interpretation (i.e., it relies on sequence data), any application of this GSI tool should be equivalent to that of other labs using the same loci. WDFW plans to fully develop its SNP-based stock identification capabilities in the next few years

## REFERENCES

- Gazey, W.J. and R.V. Palermo. 2000. A preliminary review of a new model based on test fishing data analysis to measure abundance of returning chum stocks to the Fraser River. DFO Canadian Stock Assessment Secretariat Research Document 2000/159. 30 p. [http://www.dfo-mpo.gc.ca/csas/Csas/English/Research\\_Years/2000/2000\\_159E.htm](http://www.dfo-mpo.gc.ca/csas/Csas/English/Research_Years/2000/2000_159E.htm).
- Johnson, T., J. Ames, K. Adicks, C. Weller, N. Lampsakis. 2006. 2005 progress report on Hood Canal and Strait of Juan de Fuca summer chum salmon. Unpublished memorandum report, WDFW and PNPTC.
- Kessler, T. 2009. Chum salmon genetics tissue collections from Washington in 2007. WDFW, Olympia, WA.
- Kirby, G. 2008. Southern Study Area Chum Stock Distribution Assessment in Washington San Juan Islands–Pt. Roberts and in British Columbia Southern Gulf Fisheries. Unpublished Technical Report, June 2008, NWIFC, Olympia, WA. Final Report to Pacific Salmon Commission Southern Boundary Restoration and Enhancement Fund.
- Rawson, K. Initial results 2002, 2003 (adult), and 2004 (fry) chum GSI collections. Tulalip Tribes Unpublished Memo. Tulalip, WA. 11 pp.
- Ryall, P., C. Murray, V. Palermo, D. Bailey, and D. Chen. 1999. Status of clockwork chum salmon stock and review of the Clockwork Management Strategy. DFO Canadian Stock Assessment Secretariat Research Document 99/169. 134 pp. [http://www.dfo-mpo.gc.ca/csas/Csas/English/Research\\_Years/1999/a99\\_169e.htm](http://www.dfo-mpo.gc.ca/csas/Csas/English/Research_Years/1999/a99_169e.htm).
- Small, M., K. Currens, T.H. Johnson, A.E. Frye, and J.F. Von Bargen. 2009. Impacts of supplementation: genetic diversity in supplemented and unsupplemented populations of summer chum salmon in Puget Sound. *Can. J. Fish. Aquat. Sci.* 66:1216-1229.
- Washington Department of Fish and Wildlife and Point No Point Treaty Tribes. 2007. Five-year review of the Summer Chum Salmon Conservation Initiative: Supplemental Report No. 7, Summer Chum Conservation Initiative—An Implementation Plan to Recover Summer Chum in the Hood Canal and Strait of Juan de Fuca Region. December, 2007. Wash. Dept. Fish and Wildlife. Olympia, WA. 235 p., including Appendices. <http://wdfw.wa.gov/fish/chum/library/chumsupp7.pdf>.

## **ATTACHMENTS**



ATTACHMENT 1:

ANNEX IV, CHAPTER 6, OF THE PACIFIC SALMON TREATY [2006–2008]

Southern British Columbia and Washington State Chum Salmon

The provisions of this Chapter shall apply for the period 2006 through 2008.

1. The Parties shall maintain a Joint Chum Technical Committee (“the Committee”) reporting, unless otherwise agreed, to the Southern Panel and the Commission. The Committee will undertake to, *inter alia*:
  - (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. The catch composition of fisheries covered by this chapter will be estimated by post-season analysis using methods agreed upon by the Committee.
3. Canada and the United States shall assess catch levels and make attempts to collect additional genetic samples from any chum salmon caught during the July 1 through September 15 time period in the boundary area fisheries (U.S. Areas 4B, 5, 6C, 7 and 7A; Canadian Areas 18, 19, 20, 21, and 29).

4. During the period from July 1 through September 15, Canada will require the live release of chum salmon from all purse seine gear fishing in the Strait of Juan de Fuca (Canadian Area 20) and the United States will require the same for the non-Indian seine fisheries in Areas 7 and 7A. Note: By U.S. regulation, purse seine fisheries are not permitted in U.S. Areas 4B, 5 and 6C.
5. In the years 2006 through 2008, Canada will manage its Johnstone Strait, Strait of Georgia, and Fraser River chum salmon fisheries to provide continued rebuilding of depressed naturally spawning chum salmon stocks, and, to the extent practicable, not increase interceptions of U.S. origin chum salmon. Terminal fisheries conducted on specific stocks with identified surpluses will be managed to minimize interception of non-targeted stocks.
6. In the years 2006 through 2008, Canada will manage its Johnstone Strait mixed stock fishery as follows:
  - a) In the years 2006 through 2008, chum salmon abundance levels of less than a provisional threshold of 1.1 million will be defined, for purposes of this chapter as critical. By the end of 2008, Canada will determine a revised critical threshold.
  - b) For run sizes above the critical threshold, Canada will conduct fisheries with a combined exploitation rate of up to 20% in Johnstone Strait.
  - c) When run sizes are expected to be below the critical threshold, Canada will notify the United States and will only conduct assessment fisheries and non-commercial fisheries. Other commercial fisheries targeting chum salmon will be suspended.
7. In the years 2006 through 2008, Canada will manage its Fraser River fisheries for chum salmon as follows:
  - a) For Fraser River terminal area run sizes, identified inseason, at abundance levels lower than 900,000 chum salmon, the Canadian commercial chum salmon fisheries within the Fraser River and in associated marine areas (Area 29), will be suspended.
  - b) For Fraser River terminal area run sizes, identified inseason at levels greater than 900,000 chum salmon, Canadian commercial chum salmon fisheries within the Fraser River, shall be guided by the limits of the in-river Total Allowable Catch set by Canada.
8. Canada will manage the Nitinat gillnet and purse seine fisheries for chum salmon to minimize the harvest of non-targeted stocks.

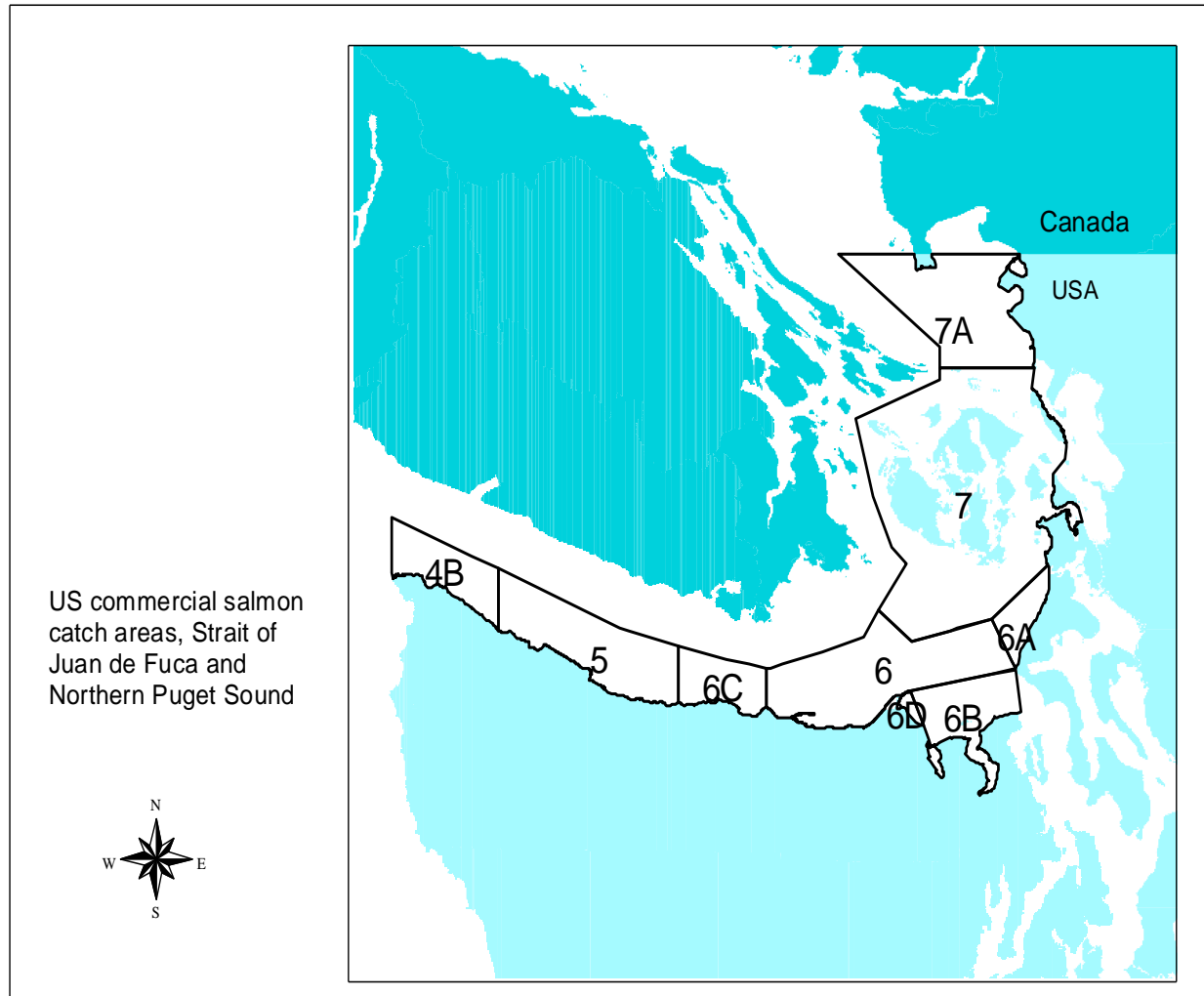


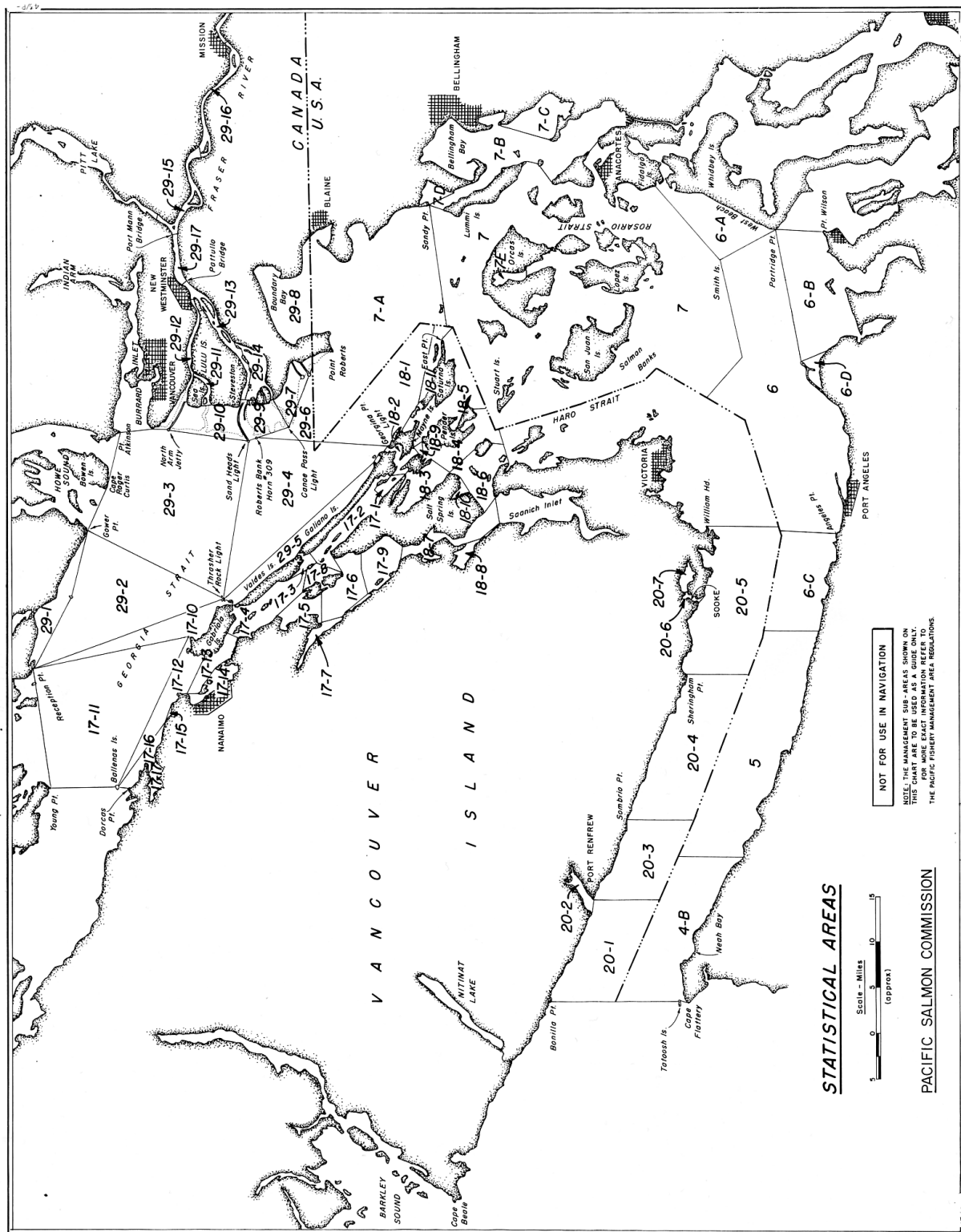
9. For the years 2006 through 2008, Canada shall conduct a genetic sampling program of chum salmon taken in the West Coast Vancouver Island troll fishery if early-season catch information indicates that catch totals for the July 1 through September 15 season may reach levels similar to 1985 and 1986. Sampling, should it occur, will include catches taken from the southern areas (Canadian Areas 121-124).
10. In the years 2006 through 2008, the United States will manage its chum salmon fishery in Areas 7 and 7A as follows:
  - a) In the years 2006 through 2008, chum salmon abundance levels of less than a provisional threshold of 1.1 million will be defined, for purposes of this chapter, as critical. By the end of 2008, Canada will determine a revised critical threshold.
  - b) For run sizes above the critical threshold, the base catch ceiling for the U.S. chum salmon fisheries in Areas 7 and 7A will be 130,000 chum salmon.
  - c) For run sizes below the critical threshold, the U.S. catch of chum in Areas 7 and 7A shall be limited to chum salmon taken incidentally to other species and in other minor fisheries, but shall not exceed 20,000, provided that catches for the purpose of genetic stock identification sampling shall not be included in the aforementioned limit.
  - d) The Fraser River chum salmon abundance estimate will be updated no later than October 22. If the run size is estimated to be less than 900,000, the United States will take immediate action to restrict its fishery impacts on Fraser chum. The Parties will then meet within 3 days of the update to discuss further U.S. fishing opportunities to meet conservation objectives.
  - e) U.S. commercial fisheries for fall chum salmon in Areas 7 and 7A will not occur prior to October 10.
  - f) The United States will manage the Areas 7 and 7A fisheries for chum salmon with the intent to minimize, to the extent practicable, the harvest of non-targeted species.
11. In the years 2006 through 2008, the United States' annual total harvest ceiling for chum salmon in Areas 7 and 7A, shall be defined as follows:
  - a) It is the intent of the parties to eliminate the accumulated historical difference (138,000 total, as of the start of 2006), by 2008. Therefore, in any non-critical year in which a portion of the assigned difference is not taken, that portion shall be foregone.

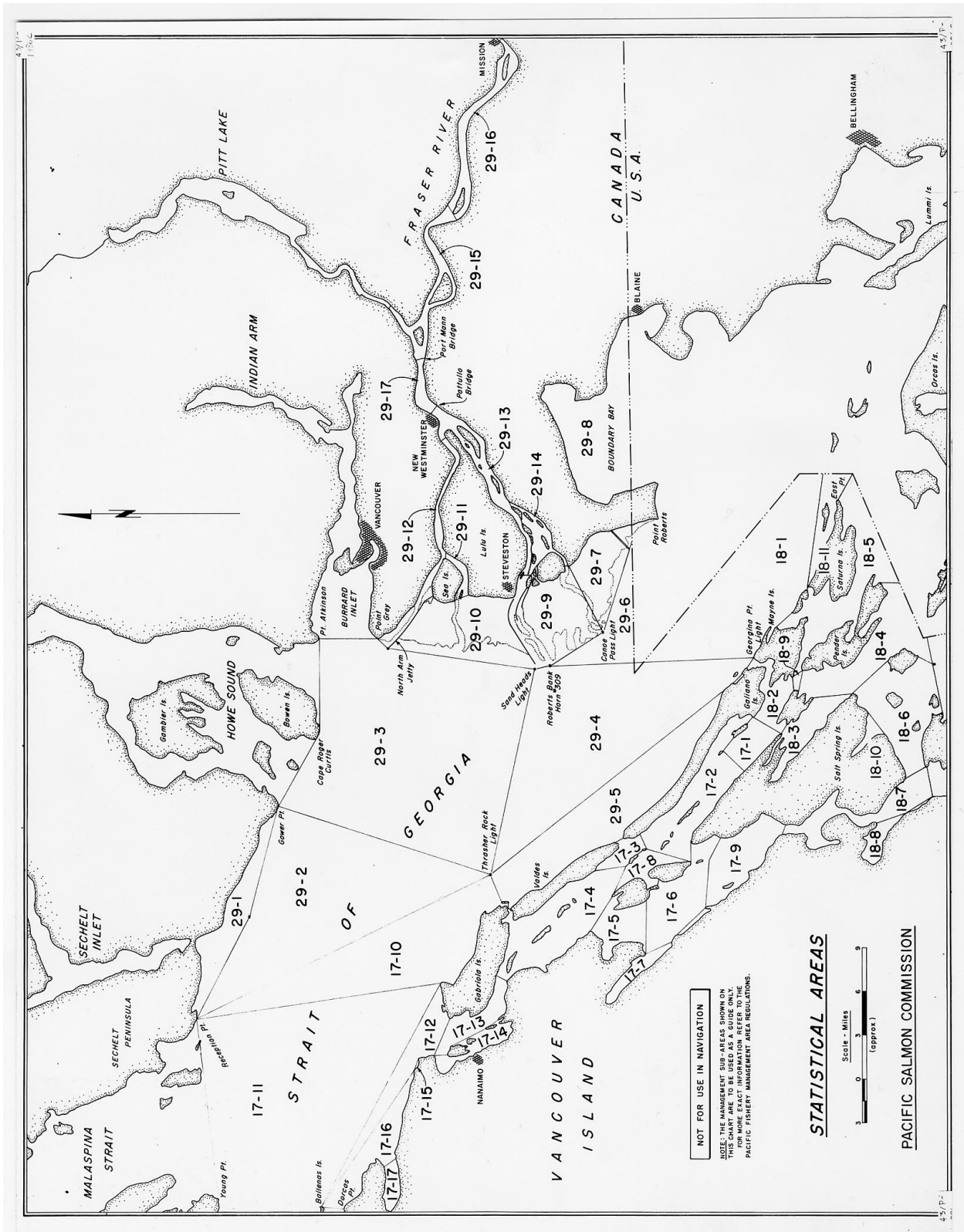
- b) When the chum salmon run size is below the critical threshold, the base catch ceiling will be 20,000 chum salmon. When the fishery is limited to 20,000 chum salmon, the portion of the accumulated historical difference will not be added to the catch ceiling and the remaining accumulated historical difference will be recalculated and applied to subsequent years, up to and including 2008.
  - c) When the chum salmon run size is above the critical threshold, the base catch ceiling will be 130,000 chum salmon, plus 46,000 chum salmon of the accumulated historical difference, plus any shortfall of up to a maximum of 15,000 chum salmon generated from a failure to capture the preceding non-critical year's base catch ceiling, minus any amortized overage adjustment caused by a prior year's overage of that year's total harvest ceiling.
  - d) It is also the intent of the Parties to avoid future accumulations. Therefore any annual shortfall below the base catch ceiling of 130,000 chum salmon shall be limited to a maximum of 15,000 chum salmon and shall be added to the next available non-critical season's base ceiling. If it is not taken in that fishery, it shall be foregone.
  - e) Adjustments due to past overages shall not be limited, but they may be amortized over subsequent years, up to and including 2008.
  - f) When the chum salmon run size is below the critical threshold, no shortfalls may be accrued; however, any overages shall be carried forward as indicated above.
12. In the years 2006 through 2008, the United States shall conduct its chum salmon 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, not increase interceptions of Canadian origin chum salmon. The United States shall continue to monitor this fishery to determine if recent catch levels indicate an increasing level of interception.
13. All information concerning bycatch of other salmon species from the chum salmon fisheries covered by this chapter will be shared between the Parties in the annual Post Season Report.

ATTACHMENT 2:

UNITED STATES AND CANADIAN STATISTICAL AREA MAPS



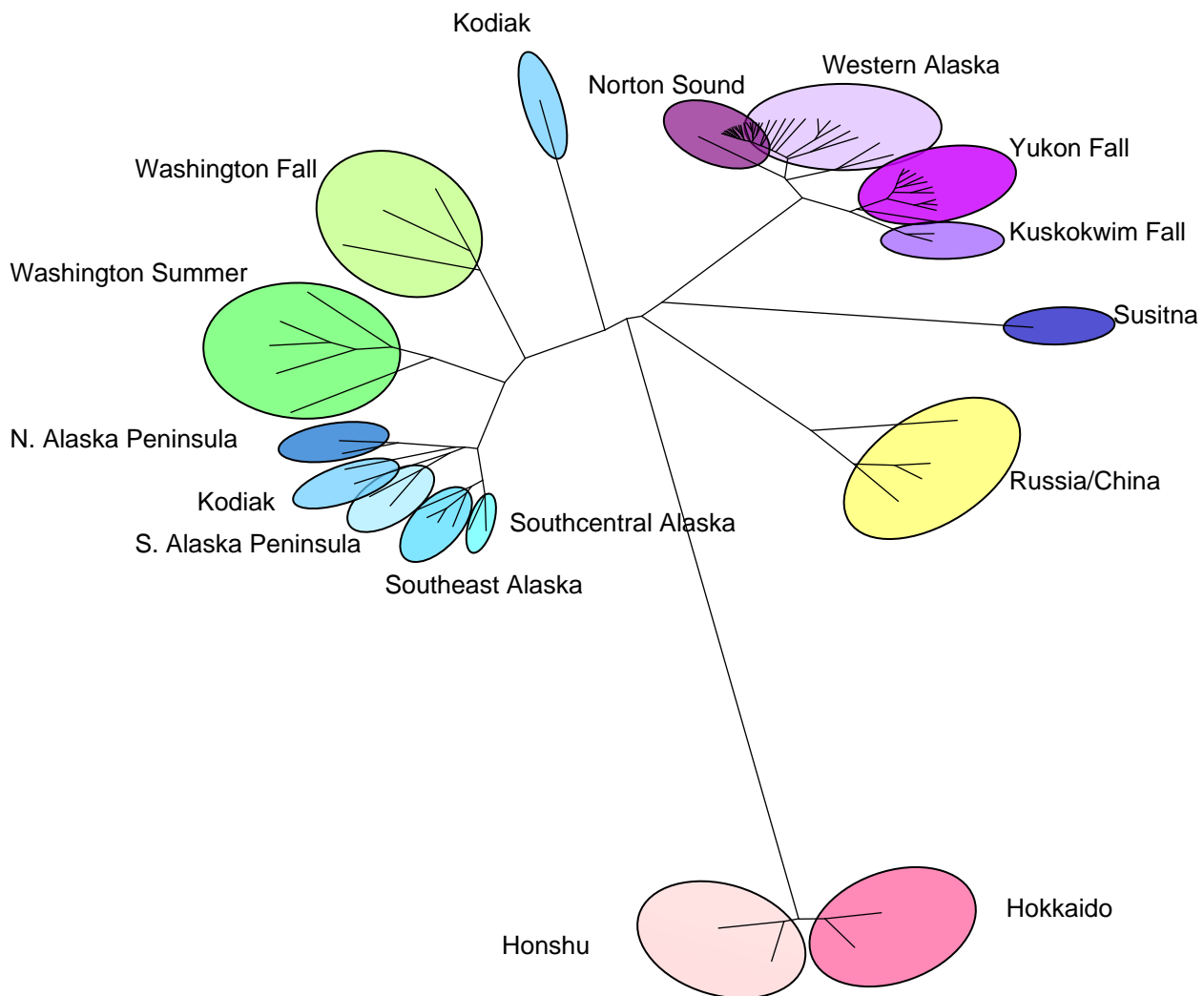




### ATTACHMENT 3:

Pacific Rim survey evaluation of genetic variation at 31 single nucleotide polymorphism (SNP) loci (Seeb et al. 2005).

Several Washington State collections were included in the study; no B.C. stocks were made available.



## **APPENDICES**





## APPENDIX 1:

### ANNEX IV, CHAPTER 6, OF THE PACIFIC SALMON TREATY

#### Chapter 6:

#### Southern British Columbia and Washington State Chum Salmon

The provisions of this Chapter shall apply for the period 1999 through 2008.

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

- (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 database 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 the years 1999 through 2008, Canada will manage its Johnstone Strait, Strait of Georgia, and Fraser River chum fisheries to provide continued rebuilding of depressed naturally spawning chum stocks, and, to the extent practicable, minimize increased interceptions of United States origin chum. Terminal fisheries conducted on specific stocks with identified surpluses will be managed to minimize interception of non-targeted stocks.

3. In the years 1999 through 2008,

- 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 280,000 chum; and

(ii) when the catch in Johnstone Strait is 280,000 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 3.9 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 280,000 to 745,000 chum; and

(ii) when the catch in Johnstone Strait is from 280,000 to 745,000 chum, the United States catch of chum in Areas 7 and 7A shall not exceed 120,000;

(c) for Johnstone Strait run sizes of 3.9 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 745,000 chum or greater; and

(ii) when the catch in Johnstone Strait is 745,000 chum or greater, the United States catch of chum in Areas 7 and 7A shall not exceed 140,000;

(d) it is understood that the Johnstone Strait run sizes, harvest rates, and catch levels referred to in 3(a), 3(b), and 3(c) are those determined inseason, 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 the years 1999 through 2008, 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, in any year, the United States chum fishery in Areas 7 and 7A fails to achieve the 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 Committee.
7. Canada will manage the Nitinat net chum fishery to minimize the harvest of non-targeted stocks.
8. In the years 1999 through 2008, 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).
9. During the period of August 1 through September 15 of each year, Canada will require the live release of chum salmon from all purse seine gear fishing in the Strait of Juan de Fuca (Canadian Area 20) and the United States will require the same for non-Indian seine fisheries in Areas 7 and 7A. Note: purse seine fisheries are not permitted in U.S. Areas 4B, 5 and 6C.
10. Canada and the United States shall assess catch levels and make attempts to collect additional genetic samples from any chum salmon caught during the August 1 through September 15 time period in the boundary area fisheries (U.S. Areas 4B, 5, 6C, 7 and 7A; Canadian Areas 18, 19, 20, 21 and 29).

## APPENDIX 2:

### COMMISSION GUIDANCE TO THE SOUTHERN PANEL ON THE MANAGEMENT OF SOUTHERN CHUM FISHERIES (FEBRUARY 13, 2004)

The purpose of this document is to provide Commission direction to the Southern Panel on the conduct of southern chum salmon fisheries for the years 2004 to 2008. This direction is not intended to replace Annex IV, Chapter 6 of the Pacific Salmon Treaty.

#### Johnstone Strait

For run sizes above the critical level of 800K–1.5M, Canada will conduct fisheries with a combined exploitation rate of up to 20% in Johnstone Strait. The Johnstone Strait Canadian commercial fisheries will follow a pre-season plan designed with a fixed fishing schedule to achieve a maximum of 15% exploitation rate.

For run sizes below the critical level, Canada will reduce its exploitation rate. Under a critical level run size, Canada will conduct assessment fisheries and other commercial fisheries will be suspended.

#### Fraser River

For Fraser River terminal fisheries, with an identified run size under 900,000 the Canadian commercial fishery will not occur within the Fraser River (Area 29). For run sizes greater than 900,000 Canadian commercial fisheries will likely not occur prior to October 22.

### Agreement on Modification to the Limits for the U.S. Chum Salmon Fishery

#### 1. Catch Ceiling

(a) If a critical abundance level, as provided by Canada, of inside southern bound chum stocks is not identified, the base catch ceiling for the U.S. Areas 7 and 7A chum fisheries will be 130,000 chum.

(b) If a pre-season critical abundance level forecast of inside southern bound chum stocks is expected and/or the first Canadian Johnstone Strait commercial seine fishery identifies this level, the U.S. catch of chum in Areas 7 and 7A will not exceed 20,000 consistent with Chapter 6, provision 3(a)(ii).

(c) U.S. Areas 7 and 7A chum fisheries will not occur prior to October 10.

(d) Fraser River chum abundance will be updated no later than October 22. If the run size is estimated to be less than 900,000, the U.S. will take immediate action to restrict their fishery impacts on Fraser chum. The Parties will then meet within 3 days of the update to discuss further U.S. fishing opportunities to meet conservation objectives.

2. Catch Compensation

(a) The intent of this agreement is to eliminate the total accumulated catch difference by 2008.

(b) Consistent with Annex IV, Chapter 6, paragraph 5, the difference between actual catches and catch levels specified by this chapter is a total historical accumulated difference of 228,300 chum, (1991 to 2003).

(c) The historical accumulated difference shall be amortized over the years of this agreement (in 2004 the amount is 46,000).

(d) Annual differences are defined as actual catches less than the 130,000 base catch ceiling or catches greater than the adjusted total annual catch ceiling. If the base catch ceiling is 20,000 any accumulated difference will be recalculated and re-applied to subsequent years.

(e) The total annual catch ceiling includes; first, the base catch ceiling, then the amortized historical accumulated difference and the amortized annual difference (to a maximum of 15,000 from any annual shortfall; no limit on overage). The total annual catch ceiling will be calculated each year.

(f) In any given year, if the U.S. fisheries fail to reach the total annual catch ceiling, the historical accumulated difference and annual difference will not be carried to subsequent years.

3. Bycatch

All bycatch information will be shared between the Parties.

4. Agreement

This agreement will be in effect through 2008 or until the replacement of Annex IV, Chapter 6 related to chum. Modification to this agreement will be subject to approval of both parties.