

Canadian Manuscript Report of  
Fisheries and Aquatic Sciences 2877

2009

CERTIFICATION UNIT PROFILE:  
INNER SOUTH COAST PINK SALMON  
(EXCLUDING FRASER RIVER)

by

P. Van Will, R. Brahniuk, and G. Pestal<sup>1</sup>

Fisheries & Aquaculture Management Branch  
Department of Fisheries and Oceans  
200 - 401 Burrard St  
Vancouver, BC  
V6C 3S4

---

<sup>1</sup>SOLV Consulting Ltd., Vancouver, BC V6H 4B9



Fisheries and Oceans  
Canada

Pêches et Océans  
Canada

Canada

© Her Majesty the Queen in Right of Canada, 2009.

Cat. No. Fs 97-4/2877E-PDFISSN 1488-5387

Correct citation for this publication:

Van Will P. R. Brahniuk, and G. Pestal . 2009. Certification Unit Profile: Inner South Coast Pink Salmon (Excluding Fraser River). Can. Man. Rep. Fish. Aquat. Sci. 2877: vii + 63p.

# Table of Contents

<b>Abstract.....</b>	<b>vi</b>
<b>Résumé .....</b>	<b>vi</b>
<b>Preface.....</b>	<b>vii</b>
<b>1 Introduction.....</b>	<b>1</b>
1.1 Stocks covered in this document .....	1
1.2 Fisheries covered in this document .....	1
<b>2 Background and Stock Objectives .....</b>	<b>3</b>
2.1 Life history .....	3
2.1.1 Stock units.....	3
2.1.2 Stock characteristics.....	6
2.2 Stock enhancement activities .....	7
2.2.1 Enhancement approach .....	7
2.2.2 Inner South Coast pink salmon enhancement facilities.....	8
2.3 Fisheries intercepting Inner South Coast pink salmon.....	10
2.3.1 Overview.....	10
2.3.2 First Nations.....	10
2.3.3 Recreational.....	11
2.3.4 Commercial.....	12
2.4 Stock objectives.....	13
2.4.1 Regional objectives .....	13
2.4.2 Conservation objectives for Inner South Coast pink salmon.....	13
2.4.3 Management objectives for Inner South Coast pink salmon fisheries.....	14
2.4.4 Performance Measures .....	15
<b>3 Management Framework.....</b>	<b>17</b>
3.1 Regional approach to salmon harvest.....	17
3.2 Harvest strategy for Inner South Coast pink salmon.....	17
3.3 Decision Guidelines for Commercial Fisheries.....	18
3.3.1 Mainland inlets terminal pink fisheries (Area 12/13).....	18
3.3.2 Pink salmon retention in other Inner South Coast salmon fisheries (Areas 11 to 19).....	20
<b>4 Assessment Framework.....</b>	<b>23</b>
4.1 Overview .....	23
4.2 Annual Monitoring .....	23
4.2.1 Escapement .....	23
4.2.2 Other abundance monitoring programs .....	23
4.2.3 Catch .....	24

4.3	Analysis .....	26
4.3.1	Stock Composition and Exploitation Rates .....	26
4.3.2	Pre-season Outlook .....	27
4.3.3	Trend Summaries .....	27
<b>5</b>	<b>Stock Status .....</b>	<b>29</b>
5.1	Regular status evaluations .....	29
5.2	Present Status .....	29
5.2.1	Conservation priorities .....	29
5.2.2	Production objectives .....	29
5.3	Trends .....	30
5.3.1	Escapement .....	30
5.3.2	Catch and Exploitation Rate .....	31
5.3.3	Survey coverage .....	31
5.3.4	Index of escapement by population (Pavg) .....	31
<b>6</b>	<b>Conservation Measures in Inner South Coast Pink Salmon Fisheries .....</b>	<b>32</b>
6.1	Coast-wide conservation strategy .....	32
6.2	Pink salmon conservation measures .....	32
6.3	Measures to reduce incidental harvest and by-catch in pink salmon fisheries .....	33
	<b>References .....</b>	<b>35</b>
	<b>Tables .....</b>	<b>36</b>
	<b>Figures .....</b>	<b>47</b>

## List of Tables

Table 1. Population Structure of Inner South Coast pink salmon.....	36
Table 2. Escapement summary for Inner South Coast pink salmon .....	38
Table 3. Catch summary for Inner South Coast pink salmon – Odd years.....	41
Table 4. Catch summary for Inner South Coast pink salmon – Even years .....	42
Table 5. Operational Management Escapement Goals (MEG) for Inner South Coast pink salmon – Management Areas. ....	43
Table 6. Operational Management Escapement Goals (MEG) for Inner South Coast pink salmon – Major Systems.....	44
Table 7. Salmon fishery closures in Johnstone Strait .....	45

## List of Figures

Figure 1. Aggregate escapement and exploitation rate trends for Inner South Coast pink salmon .....	47
Figure 2. Trend summary for Inner South Coast chum salmon – Upper Vancouver Island Even .....	48
Figure 3. Trend summary for Inner South Coast chum salmon – Johnstone Strait Even.....	49
Figure 4. Trend summary for Inner South Coast chum salmon – Mid Vancouver Even .....	50
Figure 5. Trend summary for Inner South Coast chum salmon – Kingcome Even.....	51
Figure 6. Trend summary for Inner South Coast chum salmon – Bond to Knight Even.....	52
Figure 7. Trend summary for Inner South Coast chum salmon – Loughborough to Bute Even .....	53
Figure 8. Trend summary for Inner South Coast chum salmon – Upper Vancouver Island Odd.....	54
Figure 9. Trend summary for Inner South Coast chum salmon – Johnstone Odd.....	55
Figure 10. Trend summary for Inner South Coast chum salmon – Mid Vancouver Island Odd .....	56
Figure 11. Trend summary for Inner South Coast chum salmon – Kingcome Odd .....	57
Figure 12. Trend summary for Inner South Coast chum salmon – Bond to Knight Odd .....	58
Figure 13. Trend summary for Inner South Coast chum salmon – Loughborough to Bute Odd .....	59
Figure 14. Trend summary for Inner South Coast chum salmon – Toba Inlet Odd .....	60
Figure 15. Trend summary for Inner South Coast chum salmon – Jervis Inlet Odd .....	61
Figure 16. Trend summary for Inner South Coast chum salmon – Howe Sound Odd .....	62
Figure 17. Trend summary for Inner South Coast chum salmon – Burrard Inlet Odd .....	63

## **ABSTRACT**

Van Will P. R. Brahniuk, and G. Pestal . 2009. Certification Unit Profile: Inner South Coast Pink Salmon (Excluding Fraser River). Can. Man. Rep. Fish. Aquat. Sci. 2877: vii + 63p.

This profile includes information about stock status, management reference points, management approach for fisheries in the area, assessment programs, and specific conservation measures.

## **RÉSUMÉ**

Van Will P. R. Brahniuk, and G. Pestal . 2009. Certification Unit Profile: Inner South Coast Pink Salmon (Excluding Fraser River). Can. Man. Rep. Fish. Aquat. Sci. 2877: vii + 63p.

Le présent profil comprend des données sur l'état des stocks, les points de référence pour la gestion, l'approche de gestion pour les pêches dans la région, les programmes d'évaluation et les mesures de conservation particulières.

## **PREFACE**

### **MSC Ecocertification**

Ecocertification is intended to link market incentives to the sustainability of fisheries, and a rapidly growing body of academic work is exploring the theoretical aspects of certification. However, substantial challenges remain in the practical implementation of certification programs, particularly in terms of transparency and consistency across different fisheries, species, and regions.

The Marine Stewardship Council (MSC) has developed a comprehensive and thoroughly documented certification process, with sufficient flexibility in the details to allow for adaptation to different settings. A standardized set of assessment criteria was recently released ([www.msc.org](http://www.msc.org)).

### **This Document**

This Certification Unit Profile (CUP) for Inner South Coast pink salmon includes information about stock status, management reference points, management approach for fisheries in the area, assessment programs, and specific conservation measures.

CUPs are available for all of the pink and chum certification units identified for ecocertification by the Marine Stewardship Council (MSC): North Coast and Central Coast chum salmon, West Coast Vancouver Island chum salmon, Inner South Coast chum salmon (excluding Fraser chum), Fraser chum salmon, North Coast and Central Coast pink salmon, Inner South Coast pink salmon (excluding Fraser pink), Fraser pink salmon.

A more general *Pink & Chum Management Summary* is also available. The management summary describes laws and policies, the structure of the management system, coast-wide conservation and recovery measures, as well as processes for collaboration and public consultation.

This CUP captures the official DFO position expressed in published materials, through staff interviews, and in written staff contributions. Almost all of the information contained in this document has been previously distributed to the public by DFO. Some of the text in this CUP is directly carried over from the earlier BC sockeye submissions, the departmental response to the draft assessment of BC sockeye, the 2008 IFMP, the Wild Salmon Policy, DFO websites, and DFO draft reports. Any material copied verbatim from sources other than these is put into “quotes”. Where possible, cited material is followed by a web link to the source or a catalogue number for DFO’s online library WAVES, which can be accessed at <http://inter01.dfo-mpo.gc.ca/waves2/index.html>.

### **Acknowledgments**

Preparation of this report was mainly funded by the *Canadian Pacific Sustainable Fisheries Society* in support of the MSC Certification of BC Pink & Chum Fisheries. *Fisheries and Oceans Canada* contributed most of the information as well as a substantial amount of staff time, and supplementary funding. Overall, almost a hundred DFO staff contributed data, text, clarifications, and revisions to the full series of documents. The *Pacific Salmon Commission* contributed catch data, as well as descriptions of stock identification and run size estimation methods.

# 1 INTRODUCTION

## 1.1 Stocks covered in this document

This profile covers all pink salmon spawning in watersheds in Johnstone Strait and the Strait of Georgia (statistical areas 11 to 19, and 28), except for Fraser River pink salmon. Pink salmon distribution throughout the Inner South Coast can be summarized by statistical area:

- *Area 11 – Northeast Vancouver Island:* No major pink salmon runs originate here.
- *Areas 12 and 13 - Mainland Inlets, Johnstone Strait, and Mid Vancouver Island :* Major systems on the mainland coast include Knight Inlet, Thompson Sound, Bond Sound, Kingcome Inlet, Wakeman Inlet, Loughborough Inlet, and Bute Inlet. Major pink salmon runs on the Vancouver Island coast include Cluxewe Creek, Quatse River, and Keogh River in Area 12, as well as Amor de Cosmos Creek, Quinsam River, and Salmon River in Area 13. Minor systems include the islands of the Broughton Archipelago and up into Wells Passage.
- *Area 14 – Mid Vancouver Island:* Major pink salmon runs originate from Puntledge River, Oyster River, and Tsolum River in the northern part of Area 14, and from the Englishman River in the southern part.
- *Areas 15 and 16 – Toba Inlet and Jervis Inlet:* Major pink salmon runs originate from Skwawka River and Deserted River in Jervis Inlet.
- *Areas 17, 18, and 19:* No major pink salmon runs originate here, but the Nanaimo River supports a small, persistent run of pink salmon.
- *Area 28 – Fraser approach areas:* Persistent populations observed in Squamish-Howe Sound, Burrard Inlet-Indian Arm, and Boundary Bay/Strait of Georgia.

## 1.2 Fisheries covered in this document

This profile covers fisheries harvesting pink salmon in Johnstone Strait and the Strait of Georgia (statistical areas 11 to 19). Harvesters include First Nations, recreational, and commercial (seine, gill net and troll).

Targeted commercial fisheries have occurred terminally in the Mainland Inlets when run size exceeded the escapement targets. No targeted commercial fisheries have taken place here since 1999 due to low abundance.

Inner South Coast pink salmon are also retained in commercial fisheries targeting Fraser River pink salmon on odd-year returns, and other salmon species (mainly Fraser sockeye) in all years, including the Fraser River Panel Area (Areas 121-124 Troll, Area 20 Net, Areas 17-18 and 29 Troll and Area 29 Net) and non-Panel Areas (Areas 1-10 Troll and Net, Areas 11-16 Troll and Net, Areas 124-127 Troll).

First Nations harvest local pink stocks in marine areas (Areas 12 to 20 and 121 to 126; Area 29-1-7) in food, social and ceremonial (FSC) fisheries. Long-term harvest patterns depend on the local abundance of all salmon species. Annual pink catches depend on in-season assessments of actual stock strength, management measures taken to ensure conservation of individual stocks, and targeted fishing effort by First Nations.

Recreational salmon harvests in tidal waters and freshwater occur throughout the Inner South Coast, but harvest relatively few pink salmon. Marine angler effort is spread out throughout Johnstone Strait and the Strait of Georgia, with the majority catch and effort in Johnstone Strait. The only freshwater fishing opportunity for pink salmon is on the Campbell/Quinsam River in Area 13.



In United States Fisheries, pink salmon are caught commercially in Panel Areas 4B, 5, 6C and 6 & 7 Net, and Washington Troll and in non-Panel Areas Washington, Oregon and California Troll and Alaska Troll and Net, and also in recreational and US Ceremonial Fisheries.

Inner South Coast pink salmon are also caught in test fisheries in Areas 123-127, 16, 20, and 29.

This profile covers fisheries on the Inner South Coast (i.e. Johnstone Strait and the Strait of Georgia) in detail. The terminal fishery on the Fraser is covered in the 2009 *Fraser Pink Salmon Profile*.

## 2 BACKGROUND AND STOCK OBJECTIVES

### 2.1 Life history

#### 2.1.1 Stock units

##### 2.1.1.1 Definition of stock units for Inner South Coast pink salmon

Populations of BC salmon are organized into a hierarchy of biological units: Natal streams, watershed aggregates, run-timing aggregates, statistical area and management sub-area aggregates, and Conservation Units (CU).

Different components of the management system focus on different levels within this hierarchy. The basic planning units for fisheries are watershed aggregates (e.g. escapement targets), but in-season implementation operates at the level of statistical areas and sub-areas (e.g. area closures to reduce incidental harvest of weak stocks). Stock assessment collects data at the level of natal streams and watershed aggregates. Conservation strategies under the *Wild Salmon Policy* emphasize the preservation of conservation units and their component populations.

Section 2.2.2 of the *Pink & Chum Management Summary* includes more information about each of these biological units and how they are used in the management system.

Pink salmon (*Oncorhynchus gorbuscha*) are common to many streams in Johnstone Strait and the Strait of Georgia (statistical Areas 11 to 19), with observations of spawning pink salmon in more than 175 streams. Streams are identified according to the standardized stream naming and numbering system used by DFO and the Province of BC. Pink salmon distribution throughout the Inner South Coast can be summarized by statistical area:

- *Area 11 – Northeast Vancouver Island:* 7 streams with at least one pink salmon escapement record, but no major pink salmon runs originate here.
- *Areas 12 and 13 - Mainland Inlets, Johnstone Strait, and Mid Vancouver Island:* 111 streams with at least one pink salmon escapement record. Major systems on the mainland coast include Knight Inlet, Thompson Sound, Bond Sound, Kingcome Inlet, Wakeman Inlet, Loughborough Inlet, and Bute Inlet. Minor systems include the islands of the Broughton Archipelago and up into Wells Passage. Within Bond to Knight Inlet area the Glendale, Kakweiken, Ahta and Ahnuhati watersheds contribute significantly to pink production. The glacial systems of Kingcome and Wakeman Rivers historically contributed most of the pink salmon production in the northern area of the Mainland Inlets. The major pink salmon runs in Loughborough and Bute Inlets originate from Phillips River and Grassy Creek. Major pink salmon runs on the Vancouver Island coast include Cluxewe Creek, Quatse River, and Keogh River in Area 12, as well as Amor de Cosmos Creek, Quinsam River, and Salmon River in Area 13.
- *Area 14 – Mid Vancouver Island:* 18 streams with at least one pink salmon escapement record. The major pink salmon runs originate from Puntledge River, Oyster River, and Tsolum River in the northern part of Area 14, and from the Englishman River in the southern part.
- *Areas 15 and 16 – Toba Inlet and Jervis Inlet:* 33 streams with at least one pink salmon escapement record. The major pink salmon runs originate from Skwawka River and Deserted River in Jervis Inlet.
- *Areas 17, 18, and 19:* No major pink salmon runs originate here, but the Nanaimo River supports a small, persistent run of pink salmon.

- *Area 28 – Fraser approach areas:* Persistent populations of pink salmon in Squamish-Howe Sound are observed in the Cheakamus River, Elaho River, Mamquam River, Stawamus River, and Squamish River, with escapements of 100,000 or more historically recorded in the Cheakamus, Mamquam, and Squamish rivers. Tributaries of Burrard Inlet and Indian Arm that support pink salmon include Lynn Creek, MacKay Creek, Seymour River, Capilano River (Brothers Creek), and Indian River. Most of these populations are persistent at low abundance levels (<1000), except for the Indian River with a relatively large productive potential and a recent upward trend in escapement. The Nicomekl River in Boundary Bay supports a small but persistent population of pink salmon.

Table 1 summarizes the population structure of Inner South Coast pink salmon.

#### 2.1.1.2 Conservation units for Inner South Coast pink salmon

The *Wild Salmon Policy* (DFO 2005) formally expresses many years of conceptual and practical development in the department's management of Pacific salmon. It serves as a crucial platform for launching and coordinating comprehensive planning processes for the long-term conservation and sustainability of wild Pacific salmon. The WSP maps out 4 key elements:

- Identifying irreplaceable groupings of salmon stocks, called Conservation Units (CU), formally defined as “a group of wild salmon sufficiently isolated from other groups that, if extirpated, is very unlikely to recolonize naturally within an acceptable timeframe” (DFO 2005). Populations within a CU are assumed to experience similar survival conditions and fishery management actions are taken to address conservation of the entire CU, with the objective of ensuring spawner abundance is distributed across populations within the area.
- Identifying upper and lower benchmarks to monitor the status of each CU. The lower benchmark will be established at a level of abundance high enough to ensure there is a substantial buffer between it and any level of abundance that could lead to a CU being considered at risk of extinction by COSEWIC. The upper benchmark will be established to identify whether harvests are greater or less than the level expected to provide, on an average annual basis, the maximum annual catch for a CU, given existing environmental conditions (DFO 2005).
- Assessing habitat and ecosystem status of conservation units
- Implementing a public process for establishing strategic plans that cover all Conservation Units and identify resource management actions required to address declines in status of CUs, habitat and ecosystems.

Section 3.2.2 of the *Pink and Chum Management Summary* summarizes the intent, development, and regional implementation of the *Wild Salmon Policy*, including the development of status benchmarks for each CU. Formal evaluations of CU status have not been completed, but there have been regular status assessments of Inner South Coast pink salmon (Section 5.1).

Holtby and Ciruna (2007) developed a comprehensive approach for identifying conservation units of anadromous Pacific salmon, based on a combination of the ecological context, the life history of each population, and population's genetic structure. To identify CUs for each species, they applied the following considerations in sequence:

- Map out *Joint Adaptive Zones* (JAZ) based on a combination of freshwater characteristics and marine characteristics.
- Within each JAZ, species were further divided into conservation units based on differences in life history, spawning time, and other ecological characteristics.

Holtby and Ciruna (2007) grouped pink populations in Johnstone Strait and the Strait of Georgia into the 7 conservation units (CU) based on their evolutionary lineage, life history, productivity, and ocean migrations:

- *Even-years*: Georgia Strait, Southern Fjords
- *Odd-years*: Southern Fjords, Nahwitti, East-Vancouver Island – Johnstone Strait, Georgia Strait.

Three spawning sites in Statistical Area 13 (Cumsack Creek, Klinaklini River, and Homathko River) were grouped with the *Homathko-Klinaklini-Rivers-Smith-Bella Coola Dean* CU on the Central Coast, based on “predominant genetic clusters in closely related Freshwater Adaptive Zones” (Holtby and Ciruna 2007)

Total pink escapements and index escapements to assess population trends are evaluated within these CUs. Populations within a CU are assumed to experience similar survival conditions. Fishery management actions are taken to address conservation of the entire CU, with the objective of ensuring spawner abundance is distributed across populations within the area.

Table 1 lists the management areas and spawning sites for each of these conservation units. A complete and up-to-date list of sites for all CUs is available at [http://www-comm.pac.dfo-mpo.gc.ca/pages/consultations/wsp/CUs\\_e.htm](http://www-comm.pac.dfo-mpo.gc.ca/pages/consultations/wsp/CUs_e.htm).

Holtby and Ciruna (2007) also document the defining characteristics for each conservation unit:

- Chapter 5 summarizes the distribution, life history, ecotypes, and genetic population structure of pink salmon.
- Figure 5 (p. 127) shows locations with records of odd-year pink salmon.
- Table 2 (p. 128) summarizes pink salmon presence in each of the *Joint Adaptive Zones*.
- Table 8 (p.151) summarizes classification criteria for even-year pink salmon CUs, shown in Figure 15 (p. 153), and Table 9 (p. 152) summarizes classification criteria for odd-year pink salmon CUs, shown in Figure 16 (p. 154).
- Appendix 1 summarizes the zoological, geographic, and physical characteristics of each *Freshwater Adaptive Zone* (e.g. salmon species, other fish fauna, major drainages, geology, hydrology, temperatures)

#### 2.1.1.3 Indicator Stocks

Consistent monitoring programs for pink salmon escapement are in place for 35 systems on the Inner South Coast; the majority of these enumerated systems are in the Mainland Inlets and in Johnstone Strait. These range from historically abundant and productive stocks such as the Glendale and Kakweiken populations to historically small stocks such as Lull Creek and Viner Bay Creek. Bi-weekly stock-assessment bulletins for Mainland Inlet pink salmon are available at [http://www-ops2.pac.dfo-mpo.gc.ca/xnet/content/salmon/sc%20stad/bulletins.htm#Area\\_12\\_Mainland\\_Inlet\\_Pink](http://www-ops2.pac.dfo-mpo.gc.ca/xnet/content/salmon/sc%20stad/bulletins.htm#Area_12_Mainland_Inlet_Pink).

In addition to intensive surveys in these indicator systems, escapement estimates in each statistical area are compiled for a fairly stable set of index streams and for a variable set of additional streams. Section 4.2.1 summarizes assessment coverage for Inner South Coast pink salmon. Table 1 identifies systems that are currently monitored for escapement.

#### 2.1.1.4 Agreement on stock units

Extensive research has been completed to identify the population structure of BC pink salmon. The analyses were peer-reviewed and accepted through the PSARC process, which includes scientists from outside the management agency, and some have been published in peer-reviewed journals:

- Management units for Inner South Coast pink salmon have been in place for decades, and generally follow distinct geographic features (i.e. watersheds and inlets), which also create spatially distinct terminal fishing areas (e.g. Zyblut and Anderson 1973)
- Beacham *et al.* (1985), Beacham *et al.* (1988), and other genetic studies since then have confirmed the reproductive isolation of odd-year and even-year broodlines.
- Beacham *et al.* (1988) identified a southern regional group of odd-year pink salmon which includes the Fraser and Thompson Rivers, Northeast Vancouver Island and the south coast to Loughborough Inlet.
- Holtby and Ciruna (2007) document the multi-criteria approach used to delineate conservation units under the Wild Salmon Policy. Their Appendix 8 lists the consultations conducted to develop the initial list of conservation units. Up-to-date materials for continuing public consultations on the definition of conservation units for BC pink salmon are available at [http://www-comm.pac.dfo-mpo.gc.ca/pages/consultations/wsp/CUs\\_e.htm](http://www-comm.pac.dfo-mpo.gc.ca/pages/consultations/wsp/CUs_e.htm).

### 2.1.2 Stock characteristics

#### 2.1.2.1 Abundance and distribution

Inner South Coast pink salmon follow a strict 2 year life cycle, such that even-year runs and odd-year runs are functionally distinct. The abundance of individual runs of Inner South Coast pink salmon is highly variable, both across years and across 2-year cycles. Some systems have predominantly odd-year runs, some have predominantly even-year runs, and some systems have substantial runs in both odd and even years.

In even years, total observed spawning escapement of non-Fraser pink salmon on the Inner South Coast has averaged 1.4 million since 1954, with peak escapement of 5 million in 2000, and a lowest observed escapement of 227,000 in 1960.

In odd years, total observed spawning escapement of non-Fraser pink salmon on the Inner South Coast has averaged 830,000 since 1954, with peak escapement of 2.2 million in 2001, and a lowest observed escapement of 214,000 in 1969.

Note that survey coverage fluctuates across years, and comparisons of annual estimates must be approached with caution. Section 4.3 briefly describes how observed escapements are adjusted to reconstruct escapement trends, estimate run size, and calculate harvest rates.

Pink salmon tend to spawn closer to the ocean than other Pacific salmon species. They generally are not capable of passing waterfalls, cascades, or high-velocity barriers.

#### 2.1.2.2 Age / size / fecundity

All Inner South Coast pink salmon remain in the ocean for one winter and return to spawn as two year olds (Heard 1991). This life history is identified as 2<sub>0</sub> in the Gilbert-Rich age designation system.

Pink are the smallest of the five Pacific salmon species (Heard, 1991). Stream-specific size data are collected periodically, and are available upon request (e.g. beach seine sampling on the Kakweiken River in 2004 and

2006, on the Ahnuhati River in 2004, and on the Cluxewe River in 2005, annual dip net and/or beach seine sampling on Glendale Creek)

Observed fecundities range from about 1,000 to 2,000 eggs per female in hatchery broodstock at Quinsam and Puntledge Hatcheries.

The egg to fry survival of Inner South Coast pink salmon is influenced largely by fluctuations in environmental conditions, particularly rainfall and water temperature. By comparison, fry to adult survival may be related to competition for resources and predation during the marine stages (and to a lesser extent during the short period of freshwater rearing).

#### 2.1.2.3 Migration timing

Inner South Coast pink fry emerge from the gravel as early as February and migrate downstream from February through June with peak migration generally occurring from mid-April to early May). Similar to other species of Pacific Salmon, pink salmon migrate out of the Inner South Coast Area over a relatively short time period, although there is evidence some populations may remain in the Strait until September (Sweeting, personal communication). The majority of juvenile pink salmon tend to exit the Strait of Georgia through Johnstone Strait en-route to offshore waters and the Gulf of Alaska. In their first year in the North Pacific, pink are primarily located along the coast of North America and into the Gulf of Alaska (Heard, 1991).

Return migrations are of considerable distance, and the beginning of return migrations is not well documented. For Inner South Coast populations, the timing of arrival in streams and peak spawning differs across and within areas. Generally, pink salmon are first observed in streams from mid-August to early September, with the peak of spawning occurring in mid-September for most systems. Spawning is generally complete by mid-October for Inner South Coast populations. Systems where pink salmon typically return and spawn earlier include the Klinaklini River, Ahnuhati River, Kakweiken River, Wakeman River, and Nimpkish River in Area 12. Systems with later returns of pink salmon include Driftwood Creek in Area 11 and Knox Bay Creek in Area 13. Observed timelines for stream arrival and peak spawning have been compiled for most of the pink runs on the Inner South Coast, and are available from the DFO South Coast Area Office.

Migration timing has been studied in more detail for Knight Inlet stocks, which are harvested in directed terminal commercial fisheries when abundance allows (Zyblut 1970, Schutz 1971). Migration through Johnstone Strait typically begins late July- early August, peaking around mid to late August and usually complete around mid to late September. The tagging in even years confirmed that the earliest runs encountered were destined for the Ahnuhati River and upper Knight Inlet. Stocks destined for the Kakweiken and Glendale systems began to show up in late July – early August with peaks in the approach waters by late August. Odd-year tagging results showed a different pattern of arrival, with Kakweiken fish much earlier than Glendale (different from what occurred in the even year study). Annual variation in timing can be substantial, and no further work has been done since.

## 2.2 Stock enhancement activities

### 2.2.1 Enhancement approach

DFO leads or supports enhancement activities to:

- Rebuild or re-establish salmon runs by enhancing abundance of spawners in an area (e.g. re-establishing pink and coho populations in lower Fraser tributaries where there is historic evidence of spawning populations)

- Provide fishing opportunities either in targeted fisheries or through enhancement of populations contributing to mixed stock fisheries.

In addition, some enhancement activities provide stock assessment information.

In recent years, the emphasis has been shifting from production to conservation and rebuilding, and many enhancement facilities do both.

The *2009 Pink & Chum Management Summary* includes additional information about salmon enhancement in BC. Specifically:

- Section 3.2.5 describes the regional approach to salmon enhancement, reviews the history of the *Salmon Enhancement Program* (SEP), summarizes coast-wide pink and chum enhancement activities, and briefly discusses enhancement in the context of the *Wild Salmon Policy*.
- Section 2.4.2 describes the regional approach to monitoring and assessing BC pink and chum salmon, including estimation of enhanced contributions to chum harvest and escapement.

All hatchery releases are counted and made publicly available through the facility descriptions on the SEP website at [http://www-heb.pac.dfo-mpo.gc.ca/facilities/salmonid\\_e.htm](http://www-heb.pac.dfo-mpo.gc.ca/facilities/salmonid_e.htm), and through integrated data resources such as *Mapster*, available at [http://www-heb.pac.dfo-mpo.gc.ca/maps/maps-data\\_e.htm](http://www-heb.pac.dfo-mpo.gc.ca/maps/maps-data_e.htm).

Annual production targets for each salmon species and enhancement facility are publicly reviewed as part of the *Integrated Fisheries Management Plan*, which also includes a review of enhancement activities in the previous year (e.g. Sections 4.7 and 9.7 of the 2008 South Coast Salmon IFMP).

The *Federal-Provincial Introductions and Transfers Committee* was formed with a Memorandum of Understanding among DFO, the BC Ministry of Environment, Lands and Parks and the BC Ministry of Agriculture, Fisheries and Food. It is a technical committee whose primary role is to advise the above agencies on fish introduction and transfer issues. It meets at least four times per year, and consists of up to six members (two from each of DFO, and the appropriate provincial ministries). For example, the committee evaluates applications for pink salmon supplementation programs in Johnstone Strait and the Strait of Georgia against federal and provincial legislation, and coordinates cross-agency reviews. New broodstock transfers and off-site releases are only implemented after approval by this committee.

The remainder of this document explains how the regional approach to the harvest and assessment of wild and enhanced pink salmon are implemented on Inner South Coast.

### **2.2.2 Inner South Coast pink salmon enhancement facilities**

Pink salmon enhancement on the Inner South Coast has focused on restoring depressed runs and stabilizing local recreational fishing opportunities. Commercial fisheries do not specifically target enhanced pink salmon runs in terminal areas, but do harvest them as part of the mixed stock fisheries throughout Johnstone Strait and the Strait of Georgia (Section 2.3.4).

In 2006, DFO began discussions with the Province of BC to investigate options to provide more opportunities for recreational fishing in Georgia Basin using pink salmon releases from sea pens – building on the experience of Quinsam and Puntledge Hatcheries. A contract was let by the Province to compile a list of potential release sites and DFO wrote a preliminary set of guidelines for project development. In 2007, three new sea pen sites received approval for operation: Deep Bay, Gibsons and Cowichan Bay. In 2008, revised guidelines and a process for project proposals are under development. The brood 2007 projects will be reviewed. As in previous years, egg transfers will occur based on strength of the donor stocks and a prioritized plan.

DFO hatcheries currently supplement pink salmon runs as follows:

- *Quinsam River hatchery*: This hatchery has played a vital role in restoring natural spawning runs to the Campbell/Quinsam Rivers as well as supplementing production of other systems such as the Puntledge and Oyster rivers. A facility description is available at [http://www-heb.pac.dfo-mpo.gc.ca/facilities/quinsam/background\\_e.htm](http://www-heb.pac.dfo-mpo.gc.ca/facilities/quinsam/background_e.htm). Five to eight million unfed pink salmon fry have been released annually since the mid-1980s to stabilize local recreational fishing opportunities with an expected return of about 160,000 adults. Quinsam also provides a target of one million pink fry for seapen release in Discovery Pass. In addition, Quinsam provides broodstock to community and public involvement enhancement projects on the Cowichan River (Target: 200,000 unfed fry for sea pen release in Cowichan Bay for an expected return of about 5,000 adults), Englishman River (Target one million unfed fry, 23,000 adults), Fanny Bay (Target: one million unfed fry for release in Coal Creek, 23,000 adults), and Nile Creek (Target: one million unfed fry, 23,000 adults). Depending on availability, this amounts to ~7M eggs over and above the Quinsam broodstock target. To reduce pressure on the Quinsam/Campbell pink population, in 2007 some projects collected eggs from returns from previous transplants. This will continue and possibly expand in 2008.
- *Puntledge River hatchery*: This facility was built to support the recovery of Puntledge River chinook, but has also been used to supplement other salmon runs. Two to three million unfed pink salmon fry, raised here from Quinsam River broodstock, have been released annually since the mid-1980s to stabilize local recreational fishing opportunities with an expected return of about 23,000 adults. In addition, Puntledge looks after the unmanned Glendale River spawning channel, which has a target of about 19 million fry for an expected return of 370,000 adults. Puntledge also provides Quinsam River broodstock to the Tsolum River hatchery, with a target of 1 million fry for an expected return of about 23,000 adults. The Tsolum River used to have a considerable pink salmon population more than 20 years ago. Tsolum Copper mine tailings are being contained and the enhancement program is a component of on-going restoration efforts.

There is currently no active hatchery supplementation for Mainland Inlet pink salmon. The Glendale Channel is kept in condition to allow pink salmon to spawn there, but is not otherwise actively managed.

In addition to the above, Inner South Coast pink salmon populations are enhanced in small-scale supplementation programs managed by local groups. These include:

- *Chapman Creek hatchery*: Target is to release 250,000 fry from Chapman Creek brood stock in Chapman Creek, for an expected return of about 2,400 adults.
- *Nanaimo River hatchery*: Target is a 900,000 sea pen release from Nanaimo River broodstock in the Nanaimo area, for an expected return of about 22,000 adults.
- *Nile Creek hatchery*: Target is a 450,000 sea pen release from Big Qualicum brood stock in Deep Bay, for an expected return of about 16,000 adults. (This is in addition to the Quinsam brood stock raised for local release in Nile Creek, as listed earlier)

A complete list of these small-scale supplementation programs is included in the annual *Integrated Fisheries Management Plan* (IFMP).

In addition to these active supplementation programs, pink salmon are also enhanced with unmanned spawning channels and fishways:

- Fishways were installed in Kakweiken in 1964 and 1979 to improve access to the upper river for pink salmon.



- Un-manned spawning channels were constructed at Glendale (1988) and Kakweiken (1999).
- A vertical slot fishway was installed on lower Embley Creek to improve migration of pink during periods of low flow (1978).

Detailed information about pink salmon enhancement on the Inner South Coast is publicly available and evaluated regularly. For example, Section 4.7.5 of the 2008 South Coast Salmon IMFP lists brood production targets for pink salmon for 2008, and Section 9.7.4 reviews enhancement activities from 2007.

## **2.3 Fisheries intercepting Inner South Coast pink salmon**

### **2.3.1 Overview**

Pacific salmon fisheries fall into one of three basic categories:

- *Food, Social, and Ceremonial (FSC) fisheries* are communal aboriginal fisheries. FSC fish cannot be sold legally.
- *Commercial fisheries* harvest salmon for sale during openings that are clearly delineated by time, location, gear, and sometimes even by the number of vessels.
- *Recreational fisheries* target salmon for personal consumption or as a sport (i.e. catch-and-release).

Three additional types of fisheries have evolved in recent years, each with a distinct legal setting:

- *Treaty fisheries* are covered under formalized agreements that specify FSC allocations and commercial allocations to a First Nation.
- *Economic Opportunity fisheries* are designed to improve First Nations' access to economic benefits. The long-term intent is to formalize communal FSC fisheries and economic opportunity fisheries as part of the treaty process
- *Excess Salmon to Spawning Requirements (ESSR) fisheries* may occur when salmon stocks return to a system after passing through the various fisheries and are at a level in excess of their spawning target. These fisheries have occurred on a regular basis in the Skeena River for sockeye and pink, on the Nass River for sockeye, and at a number of hatchery sites throughout the South Coast (e.g. Puntledge, Qualicum).

Priority of access for these different fisheries depends on the salmon species, as set out in the *Allocation Policy*.

The *2009 Pink & Chum Management Summary* includes additional information about salmon fisheries in BC. Specifically:

- Section 1.3.2 summarizes allocation principles and their implementation.
- Section 2.2.3 provides a brief overview of fisheries targeting BC pink and chum salmon.
- Section 2.5 summarizes the planning and implementation of pink and chum fisheries, including access controls and compliance measures.

### **2.3.2 First Nations**

First Nations target local and passing salmon stocks for FSC purposes throughout the Inner South Coast. Sockeye salmon are a priority species for First Nations, but the overall objective expressed by First Nations

in consultation is to access a diversity of fishing opportunities throughout the season and across species. Pink salmon are an important part of that diversity for First Nations in Johnstone Strait and the Strait of Georgia.

Section 1.1.5 of the *2009 Pink and Chum Management Summary* describes the different elements of First Nations' access to fishing opportunities in more detail.

First Nations access to salmon for FSC purposes is managed through communal licences. These licences are designed for the effective management and regulation of First Nations fisheries through a negotiated series of mutually acceptable conditions wherever possible. The dates, times, and locations where harvesting may occur, acceptable gear types, and other conditions are described in these licences. Communal licences can be amended in-season for resource conservation and other purposes. DFO seeks to provide for the effective management and regulation of First Nations fisheries through negotiation of mutually acceptable and time-limited Fisheries Agreements.

On the Inner South Coast, First Nations harvest of pink salmon is typically small with an aggregate communal licence harvest target of 45,000 for Inner South Coast First Nations out of a total South Coast target of 60,000 (Section 6.3 of the *2008 Integrated Fisheries Management Plan for Salmon – South Coast*). Harvest patterns differ between even and odd years' returns and the majority of catch is harvested from passing Fraser pink salmon on odd year returns.

### **2.3.3 Recreational**

DFO regulates sport fisheries in tidal waters, and salmon fisheries in freshwater. DFO's regulations for salmon sport fisheries in freshwater are published as a supplement to provincial regulations for all freshwater fisheries. Recreational limits and regulations are announced pre-season, with in-season updates where necessary:

- 2007-2009 BC Tidal Waters Sport Fishing Guide and the 2007 to 2009 BC Freshwater Salmon Supplement are available at [http://www.pac.dfo-mpo.gc.ca/recfish/SFG\\_e.htm](http://www.pac.dfo-mpo.gc.ca/recfish/SFG_e.htm)
- 2007-2008 BC Freshwater Fishing Regulations are available at [www.env.gov.bc.ca/fw/fish/regulations/](http://www.env.gov.bc.ca/fw/fish/regulations/).
- Local in-season changes to recreational limits and regulations are announced and archived at [www-ops2.pac.dfo-mpo.gc.ca/xnet/content/fns/index.cfm?pg=fishery\\_search&lang=en&ID=recreational](http://www-ops2.pac.dfo-mpo.gc.ca/xnet/content/fns/index.cfm?pg=fishery_search&lang=en&ID=recreational).

In marine waters off the Pacific coast of British Columbia, hook and line harvest of pink salmon is permitted up to a daily bag limit of 4, with a possession limit of 8. Coast-wide selective fishing measures such as barbless hooks apply.

Recreational pink salmon harvests occur in tidal waters throughout the Inner South Coast, with catches concentrated in Areas 12 and 13 (Johnstone Strait), subject to an extensive set of local area closures for conservation purposes (Table 7). The only freshwater fishing opportunity for pink salmon is on the Campbell/Quinsam River in Area 13 which has bag limit of 4 per day from Aug 15 to Sept 15 with area restrictions (both on odd and even years)

On odd-year runs, when fisheries and assessment programs are directed at abundant Fraser River pink salmon runs, the total recreational catch of non-Fraser pink salmon for Areas 11 to 19 has been about 10,000 to 25,000 in recent years, compared to a long-term average escapement of about 830,000 (Table 2). The exception is 2007, with a total recreational catch of about 122,000 non-Fraser pink salmon, compared to an escapement of 785,000. Fraser and non-Fraser pink salmon are distinguished in the catch based on genetic stock identification programs (Section 4.3.1).

On even-year runs, without a significant Fraser component, the total recreational harvest of Inner South Coast pink salmon has been about 15,000 to 30,000 in recent years, compared to a long-term average escapement of about 1.4 million (Table 2).

These catches include terminal area harvests of enhanced stocks (Section 2.2.1).

### **2.3.4 Commercial**

#### **2.3.4.1 Mainland Inlets terminal pink fisheries (Areas 12 and 13)**

These stocks are harvested in terminal areas in years of large abundance, and provide opportunities for all three commercial gear types, although seines catch the majority of fish. Fleet size during these commercial fisheries is highly variable and depends on other fisheries occurring during the same time period (e.g. Fraser River sockeye fisheries) as well as market prices. Over-flights are used to assist in estimating abundance in the terminal areas, as well as to provide in-season river escapement estimates.

Targeted commercial fisheries have occurred terminally in the Mainland Inlets when run size exceeded the escapement targets. No targeted commercial fisheries have taken place here since 2001 due to low abundance.

Commercial fisheries targeting other pink salmon stocks or other salmon species are modified to reduce interceptions of Mainland Inlet pink salmon when poor returns are expected. For example, fisheries are limited to below Lewis Point from late July to mid-August, extending a boundary closure already in place to protect Nimpkish sockeye until the end of July. This measure protects the early portion of the Mainland Inlet pink run, which includes the Ahnuhati River, Kakweiken River, and other systems which have recently experienced periods of low abundance. Another example is the ribbon boundary on the mainland side of Johnstone Strait in effect to protect Mainland Inlet pink salmon during directed fisheries for Fraser sockeye and Fraser pink from the end of July to the end of August (Table 7).

#### **2.3.4.2 Interceptions in other salmon fisheries**

Interceptions of Inner South Coast (non-Fraser) pink salmon in other salmon fisheries are determined by year-to-year patterns in abundance, as well as effort distribution those fisheries, particularly in Queen Charlotte Strait and the Johnstone Strait mixed-stock fisheries (Areas 12 and 13). In general, interception patterns differ between odd-year runs with large pink salmon returns to the Fraser, and even-year runs without a Fraser component.

For odd-year runs, commercial interceptions of Inner South Coast (non-Fraser) pink salmon are typically concentrated in:

- Seines in Areas 12, 13, and 20 used to harvest several hundred thousand pink salmon a year in the early 1990s, but were substantially reduced over 1999 to 2003, and have been negligible since 2005 (i.e. total South Coast commercial catch less than 2,000 non-Fraser pink salmon). This catch reduction has been triggered by the persistent low abundance of some pink stocks in Areas 12 and 13, as well as conservation measures for other salmon stocks of concern (i.e. interior Fraser coho, Late-run Fraser sockeye, Lower Georgia Strait chinook).
- Catches in WCVI troll fisheries (Areas 121 to 127) have been negligible in since 1997, ranging from 0 to 8,000 fish, but were larger in the 1990s, ranging from 40,000 to 135,000 fish. This catch reduction has been triggered mainly by conservation measures for other salmon stocks of concern. These stocks of concern include Mainland Inlet pinks on the northern end of Vancouver Island, passing Interior Fraser coho, and local chinook stocks.

For even-year runs, interceptions of Inner South Coast (non-Fraser) pink salmon are typically concentrated in Areas 11, 12, and 13, with very little retention in Area 20. The majority of pink salmon retention occurs during fisheries targeting Fraser River sockeye.

## **2.4 Stock objectives**

### **2.4.1 Regional objectives**

Pacific salmon are managed under a comprehensive umbrella of laws, treaties, and policies. Particularly relevant for the year-to-year management of Inner South Coast chum are the *Fisheries Act*, the *Oceans Act*, the *Species at Risk Act*, the *Wild Salmon Policy*, the *Pacific Salmon Treaty*, the *Selective Fishing Policy*, and the *Salmon Allocation Policy*.

The provisions of these laws, treaties, and policies form the basis for long-term objectives that shape the management of Inner South Coast pink salmon and the fisheries that harvest them.

The *2008 Pink & Chum Management Summary* includes additional information about regional objectives. Specifically:

- Chapter 1 summarizes the legal and policy context for the management of Pacific salmon, with a section for each of the acts and policies listed above.
- Section 2.3 reviews long-term objectives and explains the use of management reference points for BC chum.
- Chapter 3 describes the different elements of DFO's conservation strategy, outlines integrated management initiatives, and includes a coast-wide inventory of major conservation initiatives.

Annual conservation objectives for specific stocks, and the resulting conservation measures in Fraser pink fisheries, are publicly reviewed each year as part of the *South Coast Integrated Fisheries Management Plan for Salmon*, which are available at <http://www-ops2.pac.dfo-mpo.gc.ca/xnet/content/MPLANS/MPlans.htm>. Draft versions are publicly available each spring through the Salmon Consultation Website at [http://www-ops2.pac.dfo-mpo.gc.ca/xnet/content/consultations/salmon/sapdefault\\_e.htm](http://www-ops2.pac.dfo-mpo.gc.ca/xnet/content/consultations/salmon/sapdefault_e.htm).

### **2.4.2 Conservation objectives for Inner South Coast pink salmon**

The fundamental conservation objectives for Pacific salmon contained in national legislation and regional policies can be summarized as follows:

- Maintain healthy and diverse populations by conserving functionally distinct groups of salmon, called *Conservation Units*.
- Protect the integrity of each conservation unit by ensuring sufficient escapement for component populations.
- Monitor the status of conservation units relative to formal benchmarks for conservation and long-term production.

DFO has established a comprehensive assessment and management system to work towards these objectives through close monitoring, adaptive management, habitat protection, and enforcement.

For Inner South Coast pink salmon, these fundamental objectives translate into a cautionary approach to fisheries management, with a focus on:

- Identifying targeted fishing opportunities in terminal areas based on in-season abundance estimates and observed escapements into the natal streams (Mainland Inlets, Section 3.3.1)
- Monitoring catch and exploitation rate in mixed-stock fisheries targeting Fraser River sockeye and pink salmon.

While some pink salmon stocks on the Inner South Coast are reasonably healthy, components of the Mainland Inlet runs have experienced substantial declines in abundance in recent years. Targeted fisheries were curtailed and fisheries targeting other salmon stocks have been adjusted (Section 3.3.1.5).

The overall conservation objective for wild pink salmon in Areas 12 to 13 is to minimize fishery impacts on Mainland Inlet stocks to the greatest degree possible while still maintaining fisheries targeting other stocks and species. An extensive research program has been initiated with a focus on increased monitoring and research into potential factors contributing to the recent decline, particularly parasitic sea lice (Sections 3.3.1.6 and 4.2.2.3). Resource Restoration programs continue to be implemented (Section 2.2.2) in the Inner South Coast.

#### **2.4.3 Management objectives for Inner South Coast pink salmon fisheries**

The fundamental management objectives for Pacific salmon contained in national legislation and regional policies can be summarized as follows:

- Plan and implement sustainable, equitable, and efficient fisheries.
- Minimize incidental harvest of non-target salmon stocks, and by-catch of non-target species.

The primary management tool is to control fishing effort through restricting the length of fishery openings and the number of licensed vessels fishing within an area. Other tools include altering gear efficiency or fishing power through manipulation of permitted gears (e.g. net length or depth, mesh sizes, methods used). Any available surplus stocks are harvested by nets and troll terminally, adjacent to natal stream using knowledge of run timing as a management tool to limit by-catch of non-target stocks and species. Time and area closures, as well as selective fishing techniques, are used to protect specific non-target populations or species of concern.

Examples include:

- Table 7 lists salmon fishery closures in Johnstone Strait, and describes the reason for the each closure (e.g. Ribbon Boundary to protect Mainland Inlet pink salmon).
- The mandatory non-retention of coho, chinook and steelhead to minimize impacts on stocks of concern during all pink fisheries. All non-target species must be released back into the water from which they were caught in the manner that causes the least harm
- The mandatory use of revival boxes during all pink fisheries to minimize impacts on encountered non-target species.
- In-season (field inspections) and post-season (catch analysis) monitoring of net fisheries to assess fleet compliance to fishery regulations and guidelines and confirm in-season phone-in and hail data from fishery participants.
- By-catch of non-target species is closely monitored in-season to ensure impacts on these stocks are within management goals.

- Gill net mesh restrictions to reduce coho interceptions are in effect for all pink gill net fisheries as per the Pacific Fishery Regulations.
- Limited duration soak times are in effect during all pink fisheries. Soak time is either 45 minutes or 1 hour maximum, depending on fishing location, to limit the encounters of non-target species and minimize impacts on species of concern.
- Daylight only seine and troll fisheries to reduce chinook or coho encounters and to minimize fishery impacts is a management option which may be used in areas of known high by-catch; it is not normally required in pink fisheries.
- Mandatory brailing and sorting of catch during seine fisheries to increase release survival rates of non-retention species.
- Mandatory use of barbless hooks for troll to increase release survival rates of non-retention species.

Section 3 describes the specific management objectives for the terminal fishery on Mainland Inlet pinks (when abundance permits), as well as for mixed-stock fisheries in Johnston Strait and the Strait of Georgia, which mainly target Fraser sockeye and pink salmon.

In recent years, commercial fisheries in some terminal areas have shifted towards more direct effort control with small-scale, share-based quota fisheries where the fleet self-determines the most efficient participation. These “demonstration fisheries” are part of regional fisheries restructuring initiatives, which are described more fully in the *2008 Pink and Chum Management Summary*.

#### **2.4.4 Performance Measures**

Performance measures for most of the ISC pink salmon objectives relate back to estimates of escapement and total returns:

- Annual escapement into major watersheds is the main performance measure for Inner South Coast pink salmon. Annual escapement is the main performance measure for management areas. Formal Limit Reference Points (LRP) or Target Reference Points (TRP) have not yet been developed for Inner South Coast pink stocks. However, operational *Management Escapement Goals* (MEG) have been identified for each of the management areas (Table 5), and the major systems within each management area (Table 6). These operational equivalents were developed by interviewing DFO managers, biologists and contract field enumeration staff who had considerable years of local knowledge of particular streams and corresponding escapements of salmonids, and have been in use since they initially were established in the 1970s (Anderson and MacKinnon 1979). The MEGs represent the best estimate by these local experts and are used in a non-technical way as the operational equivalent for long-term benchmarks reflecting highly productive stocks (i.e. high sustainable yields). These escapement targets drive the annual management of targeted terminal pink salmon harvests. For example, directed pink salmon fisheries in the Mainland Inlets have been closed since 2001 due to low abundance (i.e. returns well below escapement targets).
- Performance relative to genetic diversity objectives is measured in terms of the distribution across spawning sites in each CU, as well as the proportion of returns from wild and enhanced populations.
- Escapement estimates, together with catch estimates, are also used to evaluate forecast performance.
- For hatcheries, performance is measured in terms of brood-stock targets and releases, which are reported in the annual *Integrated Fisheries Management Plans*, for all but smaller Public Involvement projects.

- Post-season performance reviews are compiled annually. These reviews report catch and escapement statistics and describe whether or not the fishery met objectives. Post-season reviews are included in the annual *Integrated Fisheries Management Plans*.

Several regional policy and conservation initiatives are establishing formal performance measures (refer to the listed section in the *2009 Pink & Chum Management Summary* for details):

- Formal status benchmarks for each conservation unit are being developed under the *Wild Salmon Policy* (Section 3.2.2).
- WSP benchmarks are consistent with the precautionary reference points defined as part of Canada's national implementation strategy for the precautionary approach to fisheries (Section 1.2.2.3).
- Operational performance measures are being developed for the sustainability checklists under the *New Resource Management Sustainable Development Framework* (Section 1.2.2.2)

## 3 MANAGEMENT FRAMEWORK

### 3.1 Regional approach to salmon harvest

Pacific salmon fisheries are managed in a regular annual cycle of pre-season planning, in-season implementation, and post-season review. Each phase of this cycle incorporates extensive levels of public participation:

- Pre-season planning centers on the development and broad public review of *Integrated Fisheries Management Plans* (IFMP). These management plans include general decision guidelines for each fishery, expectations for the year, anticipated fishing plans, and a detailed review of the previous year.
- In-season management is subject to rapidly changing, uncertain information. The department works with stakeholder representatives to develop appropriate responses to these changing circumstances, adhering, where possible, to the general decision guidelines and specific fishing plans documented in the IFMP.
- Post-season review meetings in the fall provide a broad public forum for sharing information about the stocks and fisheries, reviewing management actions, and identifying opportunities for future improvements.

The *2009 Pink & Chum Management Summary* includes additional information about the regional approach to salmon harvest, and the participatory processes that inform each step in the planning cycle. Specifically:

- Section 2.4 outlines monitoring and assessment programs.
- Section 2.5 describes planning and implementation of Pacific salmon fisheries, including long-term decision guidelines, access controls, and conservation measures.
- Section 2.6 compares the three types of compliance mechanisms in place for Pacific salmon fisheries: incentives, education, and enforcement.
- Section 2.7 summarizes DFO's toolkit for monitoring and assessment.
- Section 3.2.4 reviews selective fishing initiatives and other impact reduction measures.
- Section 3.4 contains an inventory of major conservation efforts in the Pacific Region, and describes how they are linked to the annual management of fisheries harvesting BC pink and chum salmon.
- Chapter 4 outlines DFO's strategy for enabling public participation in the management of salmon fisheries.

### 3.2 Harvest strategy for Inner South Coast pink salmon

To limit exploitation rate or to meet escapement targets for Inner South Coast pink salmon, the primary management tool is to control fishing effort through restricting the length of fishery openings and the number of licensed vessels fishing within an area. Other tools include altering gear efficiency or fishing power through manipulation of permitted gears (e.g. net length or depth, mesh sizes, methods used).

Pink salmon originating from the Inner South Coast are harvested in commercial fisheries throughout Johnston Strait and the Strait of Georgia.

Targeted commercial fisheries have occurred terminally in the Mainland Inlets when run size exceeded the escapement targets. No targeted commercial fisheries have taken place here since 2001 due to low abundance.



Inner South Coast pink salmon are also retained in commercial fisheries targeting other salmon species, particularly in Queen Charlotte Strait and the Johnstone Strait mixed-stock fisheries (Areas 12 and 13). Pink retention in these fisheries is normally permitted, based on long term trends in abundance, interception rates, and effort. In general, interception patterns differ between odd-year runs with large pink salmon returns to the Fraser, and even-year runs without a Fraser component. For mainland inlet pinks, in even years if it is anticipated that abundances will be low, management actions may include pink non-retention in Johnstone Strait and Queen Charlotte Strait above Lewis Point in late July to early August. This measure has not been implemented to date but is considered in fishery planning based on pre-season and in-season information on abundance levels.

### **3.3 Decision Guidelines for Commercial Fisheries**

#### **3.3.1 Mainland inlets terminal pink fisheries (Area 12/13)**

##### **3.3.1.1 Fisheries**

Mainland Inlet pink salmon are comprised of two main stocks, the Kakweiken River in Thompson Sound and the Glendale system in Knight Inlet. Another significant Mainland Inlet stock is the Phillips River. The abundance of these stocks can be highly variable and there are difficulties in assessing these stocks due to glacial water conditions and limitations of available assessment methods.

These stocks are mainly harvested in terminal areas and provide opportunities for all three commercial gear types, although seines catch the majority of fish.

The migration of these stocks to the terminal areas normally begins in early to mid-August and is usually complete by the middle to the end of September. These stocks may be managed as an aggregate early in the season (provided surpluses are expected for both stocks) and then separately as they enter the terminal areas. Seine and troll test fisheries in the terminal areas can be used as a tool for in-season assessment in years when good returns are expected.

Fleet size during these commercial fisheries is highly variable and depends on other fisheries occurring during the same time period (e.g. Fraser River sockeye fisheries) as well as market prices. Over-flights are also used to assist in estimating abundance in the terminal areas, as well as provide in-season river escapement estimates.

Other fisheries include:

- *First Nations FSC*: First Nations fishing opportunities on these stocks are normally available but interest is usually low. First Nations harvest opportunities are provided to meet FSC requirements.
- *Recreational*: Recreational fishing opportunities have been provided at normal limits in recent years, but effort is usually low.
- *ESSR fishery*: None in recent years.
- *Sampling*: When there were expected surpluses there were seine and troll fisheries to get early indications of abundance. None since fisheries closed in 2001.

### 3.3.1.2 Management Objectives

In the past, terminal pink salmon opportunities have occurred in a variety of locations:

- *Earlier fisheries*: Tribune Channel and Fife Sound, targeting mainly Kakweiken pinks with earlier run timing.
- *Later fisheries*: Knight Inlet targeting mainly Glendale pinks.

Terminal harvest opportunities each year are only considered on identified local surpluses. Generally the required escapement is secured within the streams or behind boundaries near the estuary location before fisheries are allowed to proceed, and fishing locations are usually in channels or inlets adjacent to the natal stream of the target stocks.

Mainland inlet pink salmon are managed to stock-specific escapement targets, listed in Table 6.

### 3.3.1.3 Planning

Initial openings in the terminal fishery are planned based on pre-season escapement expectations, which are based on long-term trends (Section 4.3.2), but due to generally persistent low abundances of pink salmon in recent years, the emphasis has shifted towards in-season monitoring of abundance to determine if any harvest opportunities are available.

### 3.3.1.4 Implementation

Commercial representatives are consulted through in-season advisory bodies (e.g. Area B seine, Area D gillnet, and Area H troll committees of the Commercial Salmon Advisory Board)

Weekly assessments to determine abundance and potential fishing opportunities are based on over-flights, on-grounds surveys of the terminal areas, and in some past years, test fisheries (seine, gill net, and troll). In the future, small-scale, controlled-effort fisheries (e.g. troll fishery with share-based quota in late July) could be used to gauge terminal abundance.

When terminal fisheries targeting Mainland Inlet pink salmon do take place, they are actively managed with locally adapted area closures (Table 7), mandatory daily catch reports, charter patrols, and on-grounds fisheries staff.

### 3.3.1.5 Conservation Measures

Targeted commercial fisheries on Mainland Inlet pink salmon have been closed since 2001 due to low abundance. A comprehensive collaborative research and recovery program, the *Pink Salmon Action Plan* (next section), has been launched to investigate the factors contributing to the observed low abundance, as described in the next section.

When directed pink fisheries occur in the Mainland Inlets, they are subject to comprehensive conservation measures, which may include:

- Restriction to terminal areas to allow stock-specific harvests.
- Requirements for selective fishing measures (e.g. brailing, sorting, revival boxes) consistent with the rest of the coast.
- Daylight only fisheries to reduce encounters of coho and chinook salmon, as well as allow better monitoring of selective fishing requirements.

- Establishment of fishing boundaries to minimize encounters of chinook, coho, sockeye and chum, and to ensure escapement targets are reached (Table 7). For example, the Upper Knight Inlet boundary is implemented to conserve weaker stocks of pink salmon.
- Management of Kakweiken and Glendale pink stocks separately based on differences in return timing and local abundance.

Commercial fisheries targeting other pink salmon stocks or other salmon species are modified to reduce interceptions of Mainland Inlet pink salmon when poor returns are expected. For example, fisheries may be limited to below Lewis Point from late July to mid-August, extending a boundary closure already in place to protect Nimpkish sockeye until the end of July to protect. This measure protects the early portion of the Mainland Inlet pink run, which includes the Ahnuhati River, Kakweiken River, and other systems experiences recent periods of low abundance.

#### 3.3.1.6 On-going Developments

The *Pink Salmon Action Plan* was initiated by DFO in 2003, with a focus on increased monitoring and research into potential factors contributing to the recent decline, particularly parasitic sea lice. Data collected under the *Pink Salmon Action Plan* is publicly available:

- Background information about the action plan is available at <http://www.pac.dfo-mpo.gc.ca/science/aquaculture/pinksalmon-saumonrose/index-eng.htm>.
- An overview of research programs is available at <http://www.pac.dfo-mpo.gc.ca/science/aquaculture/sok-edc/index-eng.htm>.
- Each year, survey results are published in bi-weekly bulletins. An archive of bulletins and annual summaries is available at <http://www.pac.dfo-mpo.gc.ca/science/aquaculture/pinksalmon-saumonrose/results-resultats/index-eng.htm>.
- 2004 - *Pink Salmon Action Plan: Sea Lice on Juvenile Salmon and on Some Non-Salmonid Species in the Broughton Archipelago in 2003* by Jones, and Nemec. CSAS Research Document 2004/105 ([www.dfo-mpo.gc.ca/csas/Csas/DocREC/2004/RES2004\\_105\\_e.pdf](http://www.dfo-mpo.gc.ca/csas/Csas/DocREC/2004/RES2004_105_e.pdf))
- An interim report on research findings is available at <http://www.pacificsalmonforum.ca/pdfs-all-docs/2007InterimFindingsFeb8-08.pdf>
- A detailed summary of on-going research projects is available at <http://www.pacificsalmonforum.ca/pdfs-all-docs/BroughtonResearchStatusReportOct2007.pdf>
- A detailed ecosystem overview has been completed. *Broughton Archipelago: A State of Knowledge* by Pearsall is available at <http://www.pacificsalmonforum.ca/pdfs-all-docs/BroughtonStateofKnowledgeMay08.pdf>

Funding for 2007 and 2008 project implementation has come from the BC Pacific Salmon Forum.

### 3.3.2 Pink salmon retention in other Inner South Coast salmon fisheries (Areas 11 to 19)

#### 3.3.2.1 Odd-year returns

Mixed-stocks fisheries harvesting pink salmon on odd-year returns are shaped mainly by the management strategy for Fraser River pink salmon, and by conservation measures for stocks of concern.

In recent years, these fisheries have unfolded as follows:

- *Johnstone Strait net fisheries (Areas 11 to 13)*: Directed Fraser River pink fishing opportunities are generally anticipated from late August to mid-September, subject to abundance levels and conservation measures for Cultus Lake sockeye, late run Fraser River sockeye, and Interior Fraser coho. Directed fishing opportunities on Fraser River pink salmon will likely require a controlled fishery in order to meet these objectives. Controlled fishery measures include limiting effort in order to reduce harvest levels to ensure stock of concern impacts are not exceeded, or recently through a share-based management approach where individual licence holders can be assigned individual catch quotas.
- *Strait of Georgia net fisheries (Areas 14 to 19)*: Consideration may be given in-season for Fraser River sockeye and pink fisheries in Sabine Channel if warranted, based on available opportunities in Johnstone Strait, and subject to Sakinaw Lake sockeye constraints as well as constraints for other stocks of concern. These constraints are determined through encounter rates of these stocks, including Interior Fraser coho, Strait of Georgia coho and Strait of Georgia Chinook.
- *Area G Troll (Outside)*: Directed Fraser pink fishing opportunities are generally expected in Areas 123 to 127 on the West Coast of Vancouver Island, and possibly Areas 11, 111, and the upper portion of Area 12. These opportunities are subject to Fraser River pink abundance, allocation status and fishery management objectives for stocks of concern, including Cultus Lake sockeye, Fraser River Late run sockeye and Interior Fraser coho. Small fleet (limited effort) assessment fisheries may be required in advance of regular fisheries to confirm fishing opportunities that may be available based on pink salmon catch rates in various locations and encounter rates of stocks of concern.
- *Area H Troll (Inside)*: Generally permitted to retain any intercepted pink salmon in Fraser River sockeye fisheries occurring in Areas 12, 13, 18, and 29 with the possible exception of the waters of Queen Charlotte Strait north of Lewis Point where pink non-retention may be required to protect migrating Mainland Inlet pink. Consideration may be given to a stepped opening and closing strategy to allow the earliest possible opening time (e.g. open northern Area 12 first before southern Area 12 followed by Area 13). Area H is exploring options to optimize pink fishing opportunities by gear limitation experiments and by conducting limited effort fisheries in advance of full fleet opportunities to determine locations of high pink abundance and low encounter rates on stocks of concern.

#### 3.3.2.2 Even-year returns

- *Johnstone Strait net fisheries (Areas 11 to 13)*: In recent years, there have been no directed pink salmon fishing opportunities on even year returns without a Fraser River component, due to generally low abundances of mainland inlet pink stocks. In years when pre-season expectations and in-season monitoring early in the season (late July) indicate low abundances a management tool available to protect mainland inlet pink stocks is non-retention of pinks in late July to early August in Johnstone Strait and Queen Charlotte Strait and Sound above Lewis Point during directed Fraser sockeye fisheries. In recent years any net or troll terminal directed pink fisheries are determined based on in-season information on abundances.
- *Strait of Georgia (Areas 14 to 19)*: In the last number of years no directed commercial pink fisheries have occurred due to low pink abundances in these areas. Opportunities in Sabine Channel, if available, would only occur on odd years targeting Fraser pink.
- *Area G Troll (Outside)*: There are no directed pink salmon fisheries on these stocks. If troll fisheries on other species occur in July, pink non-retention may be implemented in Areas 125 to 127 prior to the end of July if Mainland Inlet pink stocks are anticipated to be low.

- *Area H Troll (Inside)*: Generally permitted to retain any intercepted pink salmon in Fraser River sockeye fisheries occurring in Areas 12, 13, 18, and 29 with the possible exception of the waters of Queen Charlotte Strait north of Lewis Point where pink non-retention may be required to protect migrating Mainland Inlet pink. Consideration may be given to a stepped opening and closing strategy to allow the earliest possible opening time (e.g. open northern Area 12 first before southern Area 12 followed by Area 13). Area H is exploring options to optimize pink fishing opportunities by gear limitation experiments and by conducting limited effort fisheries in advance of full fleet opportunities to determine locations of high pink abundance and low encounter rates on stocks of concern.

## 4 ASSESSMENT FRAMEWORK

### 4.1 Overview

Catch and escapement of Inner South Coast pink salmon are assessed annually. Test or assessment fisheries sample for DNA and some morphometric traits (e.g. size). Estimates of aggregate escapement to each management area are based on regular surveys of major systems and a variable number of additional streams. Catches and exploitation rates for each management area are estimated by accounting for the origin of the catch in each fishing area and the total escapement in each management area. Specifically, harvest in Inner South Coast areas is divided into Fraser and Non-Fraser catches in odd-years based on genetic stock identification. Even-year catches are all assumed to be from non-Fraser stocks. In both cases, total catch of Inner South Coast pink salmon is then apportioned across management areas based on the relative contribution of each area to the total escapement.

The *Pink & Chum Management Summary* includes general information about monitoring and assessment. Specifically:

- Section 2.4 describes the regional assessment approach (stock assessment program, catch monitoring initiatives, data management)
- Section 2.7 summarizes DFO's toolkit for assessment, monitoring, and enforcement (e.g. role of charter patrols)

The remainder of this chapter describes how this regional approach is implemented for Inner South Coast pink salmon.

### 4.2 Annual Monitoring

#### 4.2.1 Escapement

In most cases, escapement estimates for Inner South Coast pink salmon are derived through visual observations (aerial and foot inspections) typically resulting in a peak count or Area-under-the-curve estimate based on several visits. The extended survey life (the time that an individual animal can be observed in the survey area) of pinks in the area (20-40 days) suggest that these counts provide a reasonable index of abundance. However the accuracy and precision of the counts is unknown through most of the data set and is suspected to be poor. The reliability of these estimates improves as the season progresses and fish begin to move from the holding pools out onto the spawning grounds.

Table 1 identifies systems with regular escapement surveys.

In-season bulletins for the Mainland Inlet pink salmon monitoring program are available at [www-ops2.pac.dfo-mpo.gc.ca/xnet/content/salmon/sc%20stad/bulletins.htm](http://www-ops2.pac.dfo-mpo.gc.ca/xnet/content/salmon/sc%20stad/bulletins.htm).

#### 4.2.2 Other abundance monitoring programs

##### 4.2.2.1 Test fisheries

Test fisheries apply a standardized fishing procedure using a commercial vessel under contract. The purpose is to develop abundance indices and collect additional information, such as run timing, stock composition, and fish condition.

Inner South Coast pink salmon are caught in purse seine test fisheries in Areas 12 and 13 (Johnstone Strait) and Area 20 (Juan de Fuca). Methods and results are documented in the annual reports of the Fraser River

Panel, available at [http://www.psc.org/publications\\_annual\\_fraserreport.htm](http://www.psc.org/publications_annual_fraserreport.htm). In odd-years, these test fisheries collect information about run timing, stock composition, morphometrics, and abundance for pink salmon migrating through Johnstone Strait, but predominantly focus on Fraser stocks. In even years, these test fisheries only record pink salmon catch-per-unit-effort, and do not cover the full extent of pink salmon migration timing. Year-to-date test fishing summaries are available at [http://www.psc.org/info\\_testfishing\\_summaries.htm](http://www.psc.org/info_testfishing_summaries.htm), and daily test fishing reports are available at [http://www.psc.org/info\\_testfishing\\_collections.htm](http://www.psc.org/info_testfishing_collections.htm).

#### 4.2.2.2 Assessment Fisheries

Assessment fisheries are regular commercial fisheries, but with a strict effort limitation (e.g. number of vessels, short opening). The purpose is to collect abundance information and provide low-impact fisheries.

Assessment fisheries may be implemented in terminal areas where a local surplus abundance of pink salmon is expected (e.g. if pre-season expectations point to a surplus abundance of Mainland Inlet pinks).

#### 4.2.2.3 Intensive Enumeration Programs

Salmon counting fences are used throughout the Inner South Coast. The following intensive enumeration facilities currently collect pink data:

- Adult counting fence on Keogh River focusing on pink and coho. The fence provides an abundance index for Upper Vancouver Island pink stocks, and serves a rough proxy for overall trends in ISC pink abundance.
- Fry splitter on Glendale Spawning Channel and rotary screw trap on Glendale main stem focusing on pink salmon egg-to-fry survival since 2007. Frequent in-season bulletins describe the operational details and make observations publicly available. The bulletins are available at [http://www-ops2.pac.dfo-mpo.gc.ca/xnet/content/salmon/sc%20stad/bulletins.htm#Glendale\\_Creek\\_Juvenile](http://www-ops2.pac.dfo-mpo.gc.ca/xnet/content/salmon/sc%20stad/bulletins.htm#Glendale_Creek_Juvenile).
- DIDSON on Glendale mainstem since 2006 to calibrate overflight visual estimates.
- Fishway counter on Embley Creek to improve escapement estimates for Kingcome Inlet since 2007.

### 4.2.3 Catch

#### 4.2.3.1 Commercial

Ocean and terminal fisheries are monitored to estimate both catch and effort. Fisheries may also be sampled to determine the stock composition of the catch, either directly from boats in the fishery or from combined catch at processing plants.

Commercial gillnet, seine and troll catch data are collected through a comprehensive monitoring and reporting framework:

- Daily harvest logs documenting date, location, species encounters, species kept, and species released are completed by each fishery participant. This data are collated and accessible at the regional level. Appendix 9 of the 2008 *Integrated Fisheries Management Plan for Salmon* includes sample logbook pages for each licence area.
- Daily or weekly phone-in of in-season harvest information by all fishery participants is collated and accessed at the regional level.

- Frequent inspections by enforcement patrol staff surveying harvest information and monitoring compliance to all fishery restrictions and management guidelines (e.g. use of revival boxes when mandatory).
- Charter patrols collect daily hail information and observed the implementation of the fishery.
- Sales slip data encompassing information such as catch by species, statistical area of catch, date of catch, and gear type is generated as each fishery participant lands catch. The data are available at the regional level through database queries.

Commercial hail-in data are verified occasionally by on-water inspections of catch by Fishery Officers, dock-side monitoring and auditing of sales slip data. Nearly all commercial harvesters submit catch information to DFO.

The *2009 Pink & Chum Management Summary* describes on-going regional catch monitoring initiatives. Specifically:

- Section 1.2.9 describes the changing structure of Pacific Fisheries. Catch monitoring and enhanced accountability are key elements of *Pacific Fisheries Reform* (PFR), the *Pacific Integrated Commercial Fisheries Initiative* (PICFI), and the pilot projects for operational implementation.
- Section 2.4.2.6 summarizes fishery monitoring and catch reporting programs.
- Section 2.4.3.2 describes how catch data are compiled and managed. Detailed commercial catch records are available at [www.pac.dfo-mpo.gc.ca/sci/sa/Commercial/AnnSumm\\_e.htm](http://www.pac.dfo-mpo.gc.ca/sci/sa/Commercial/AnnSumm_e.htm).

Catch monitoring in commercial salmon fisheries on the Inner South Coast is sufficient for estimating total removals of pink salmon originating from the Inner South Coast (excluding Fraser). Information for odd-year runs is more detailed, because of the additional monitoring effort for Fraser pink salmon. Trends in catch and harvest rate are discussed in Section 5.3.

Removal estimates at a finer level of detail are highly uncertain for Inner South Coast pink salmon stocks due to the presence of passing stocks, high variability in migration routes, run timing, and abundance of individual populations. However, the harvest strategy for Inner South Coast pink salmon limits the risk associated with this uncertainty through terminal fisheries on local abundances identified in-season and through non-retention of pink salmon in areas with persistently low returns (e.g. approach areas to Mainland Inlets).

Catch monitoring programs also track by-catch and monitor compliance with conservation restrictions. Data from catch monitoring programs may be used to assess the impacts of fishing on non-target species and to determine if conservation targets for stocks of concern are being met. For example, post-season estimates of coho and chinook by-catch are derived from in-season monitoring by charter patrol boats, weekly call-in by individual harvesters, log book data, and sale slip data.

Any fisheries with share-based quotas are subject to 100% dockside validation of catch.

#### 4.2.3.2 Recreational

Pink salmon are generally not heavily targeted by recreational harvesters, but there is some increasing interest in terminal beach angling (e.g. Puntledge), and local fishing opportunities are being supplemented through enhancement programs (Section [2.2.1](#))

Recreational catch is monitored through the Inner South Coast Creel Survey. Creel surveyors gather catch-per-unit-effort data and take biological samples from boat landing sites throughout Inner South Coast area.



These data are augmented by logbook and manifest records of catch and effort submitted by lodges operating guided trips. Effort is determined through periodic aerial surveys of fishing areas. These data are compiled and analyzed to produce catch and effort statistics by area and species. The Johnstone Strait Creel program generally runs in July and August and surveys the area around Port Hardy. The Strait of Georgia survey starts in April or May and ends in October, while the Victoria survey generally runs all year round.

Annual summaries of recreational catch and effort are available at [http://www.pac.dfo-mpo.gc.ca/sci/sa/Recreational/default\\_e.htm](http://www.pac.dfo-mpo.gc.ca/sci/sa/Recreational/default_e.htm)

#### 4.2.3.3 First Nations

First Nations fishing opportunities on these stocks are normally available but interest is usually low. First Nations harvest opportunities are provided to meet FSC requirements. As a condition of their communal licences, in most cases FN are required to provide catch reports on a weekly basis. In some cases, electronic logbooks have been implemented and are in use by Aboriginal Fishery Guardians.

### 4.3 Analysis

#### 4.3.1 Stock Composition and Exploitation Rates

Estimates of stock composition are required to identify the presence of weaker stocks in a fishing area. Stock composition of Inner South Coast pink salmon catches is estimated in two steps:

- Identify the contribution of non-Fraser pink salmon originating from the Inner South Coast.
- Assign parts of the non-Fraser catch to management areas based on their proportion of escapement, with some adjustments based on fishing locations relative to migration pathways.

Exploitation rates are then estimated by accounting for the origin of the catch in each fishing area and the observed total escapement into each management area.

##### 4.3.1.1 Odd-year returns

For odd-year returns, the first step uses Genetic Stock Identification (GSI). GSI analyzes tissue samples collected from pink salmon caught in mixed-stock fisheries to estimate the contribution of Fraser River pink salmon (White 1996). Canada South Coast (non-Fraser) and Washington pink salmon stocks are also often present in the stock contribution estimates, although generally in lower proportions than Fraser stocks. GSI sampling is conducted in odd-year Canadian (south of Cape Caution) and Washington pink salmon fisheries. From 1989 to 2005 protein electrophoretic analysis of allozymes was employed and starting in 2007 microsatellite DNA analysis has been conducted. GSI estimates indicate that the contribution of Fraser River pink salmon to fisheries occurring in Johnstone Strait, the west coast of Vancouver Island, Salmon Banks and Point Roberts (U.S. Areas 7 and 7A respectively) often exceeds 80% during the peak marine migration of Fraser pinks from mid-August to early September.

Catch of non-Fraser South Coast pink salmon was then apportioned based on proportional escapement to the various systems, the location of the catch occurred (e.g. Area 11 and 12), and the location of the management areas relative to the fishing area (e.g. Bond/Knight is north of Area 13, so none of the Area 13 catch was assigned to Bond/Knight stocks). This calculation implicitly assumes that most of the migration follows the northern diversion route around Vancouver Island.

The main estimation issue with this approach is poor escapement survey coverage in the southern parts of the Inner South Coast (Howe Sound and Burrard Inlet), which in recent years can contribute significant abundance to the Inner South Coast aggregate. As a result, exploitation rate estimates for the northern

management units are likely overestimated (i.e. Catch of Howe Sound And Burrard Inlet pink salmon attributed to other management areas).

#### 4.3.1.2 Even-year return

For even years, pink salmon caught in Areas 11 to 19 are assumed to primarily originate within the Inner South Coast.

All catch was assumed to originate from the main production areas for even year stocks identified in Section [2.1.1](#). Most of the systems monitored in the even year-time series for escapement constitute a high proportion of the escapement of pinks to the entire area, based on higher coverage typically in the 1980s (i.e. assume that a majority of pink salmon escapement is covered by the systems that are currently monitored in each management area).

Catch was apportioned based on proportional escapement to the various systems, the location of the fishery (e.g. Area 11 and 12), and the location of the management areas relative to the fishing area (e.g. Bond/Knight is north of Area 13, so none of the Area 13 catch was assigned to Bond/Knight stocks). This calculation implicitly assumes that most of the migration follows the northern diversion route around Vancouver Island.

No catch was assigned to any fisheries outside of the ISC area, mainly because stock-identification data from northern fisheries is not available for even-year catches.

The resulting local estimates of exploitation rate should only be considered as trend indicators, because there is large uncertainty in the escapement component used to derive those estimates. The exploitation is likely an overestimate of the total impact of the ISC fisheries. Most large even-year catches were typically attributed to terminal fisheries targeting identified surpluses to systems such as Kakweiken and Glendale. The exploitation rate calculated for the entire aggregate should be a reasonable estimate, and provide a strong indication of trend over time.

#### 4.3.2 Pre-season Outlook

Quantitative abundance forecasts for Inner South Coast pink salmon are not routinely calculated, but the necessary methods have been developed and peer-reviewed (Holtby 2003). Currently, a more general outlook is provided based on observed trends in each cycle, the trajectory of those trends and the relative performance of the returns in recent years for both even and odd year cycles. For example, the latest stock outlooks are available at <http://www.pac.dfo-mpo.gc.ca/fm-gp/species-especes/salmon-saumon/index-eng.htm>.

#### 4.3.3 Trend Summaries

This section describes the time series shown in Figure 2 to Figure 17.

##### 4.3.3.1 Escapement and survey coverage

Pink salmon abundance is highly variable from year to year and across systems, and survey coverage for pink salmon escapement also fluctuates over time. Comparisons of annual estimates must therefore be approached with caution.

Time series of survey coverage for each management area plot the number of systems surveyed, and the % of long-term escapement covered by those systems. Note that the resulting trend in survey coverage only reflects the number of assessed systems, not the intensity of monitoring at each site (e.g. reduced number of

inspections may miss the actual peak of spawning). System-by-system inspection records are available upon request.

Escapement reconstructions account for the fluctuation in survey coverage. Briefly, total escapements for each statistical area are estimated by adjusting observed escapement index streams by expansion factors that reflect the relative annual contribution of each index stream, the contribution of all index streams to the total observed escapement, and the estimated observer efficiency for the predominant survey type.

#### 4.3.3.2 Catch and exploitation rate

Catch and exploitation rate for each management area are determined based on the estimated contribution of non-Fraser pink salmon to the total catch, and the estimated relative abundance of pinks originating from each area (Section 4.3.1).

#### 4.3.3.3 Index of escapement by population ( $P_{avg}$ )

In addition to aggregate trends in observed and reconstructed escapement (bottom panel), Figure 2 to Figure 17 also show an index of escapement by population ( $P_{avg}$ ), calculated as follows:

- Calculate the long-term average escapement for each stream (geomean, numerical records only). This establishes a more robust reference point for scaling annual escapements from many diverse and highly variable streams than the largest observed escapement (i.e. less sensitive to a single outlier). Also, the axis of the  $P_{avg}$  figure is more intuitive this way: if the index is around 1, then the individual populations are around their long-term average (on average).
- $P_{avg}$  = Average of annual escapements scaled as a percentage of long-term escapement across all streams with a numerical escapement record in a given year.

Figure 2 to Figure 17 show two versions of  $P_{avg}$ :

- *Unweighted  $P_{avg}$*  treats all index streams equally, so that good escapements on abundant stocks do not mask poor escapements on small stocks.
- *Weighted  $P_{avg}$*  weighs the annual escapement proportions based on the long-term average, so that the performance of abundant stocks can be isolated and compared to catch patterns.

## 5 STOCK STATUS

### 5.1 Regular status evaluations

DFO evaluates the status of Inner South Coast pink salmon annually as part of the public post-season review process. These reviews report catch and escapement statistics and describe whether or not the fishery met objectives. Post-season summaries are included in the annual *Integrated Fisheries Management Plans*, as well as the annual reports of the Pacific Salmon Commission.

More detailed status evaluations are completed regularly by DFO scientists and stock assessment biologists in collaboration with external experts. These status evaluations are publicly available, and are peer-reviewed through the *Pacific Science Advice Review Committee* (PSARC) where appropriate. Recent evaluations of Inner South Coast pink salmon include:

- Annual assessment reports, including status assessments were compiled throughout the 1970s and 1980s (e.g. Anderson and McKinnon (1979). As harvests and exploitation rates dropped (Figure 1), so did the frequency of status assessment.
- *Strategy for the management of pink salmon stocks in the Mainland Inlets* (Robinson and Sontag 1988)
- *Forecast for mainland inlet pink salmon in 2003* (Holtby 2003)

The remainder of this section summarizes the conclusions from these status evaluations and provides updated information on key trend indicators.

Formal status evaluations will be completed for each conservation unit as part of the *Wild Salmon Policy* implementation process.

### 5.2 Present Status

#### 5.2.1 Conservation priorities

Pink salmon returns to the Inner South Coast are variable for the total aggregate (Figure 1), and highly variable for individual management areas (Figure 2 to Figure 17) Aggregate pink salmon escapement declined substantially in 2001 and 2002 (i.e. on returns from the 1999 and 2000 brood years). The decline has since continued for even-year runs, but reversed for odd-year runs.

The major factor contributing to low production in recent years is low marine productivity. Even with low productivity, the persistence of Conservation Units for Inner South Coast pink salmon (Table 1) is not immediately threatened. However, if any of the conservation units declined to a point where its persistence was threatened, the *Species at Risk Act* (SARA) provides a legislative and policy framework for recovery.

The recent returns to the Mainland Inlets (Kingcome Inlet, Bond to Knight Inlets, Loughborough to Bute Inlets) are well below the historic average, however have recently shown signs of improvement.

#### 5.2.2 Production objectives

Pink production is generally quite variable. Productivity of Inner South Coast pink salmon groupings has been average to below average in recent years, most likely related to lower than normal marine survival rates.

Long-term production objectives for Inner South Coast pink salmon have been captured in operational escapement goals for each of the management areas (Table 5), and for the pink salmon streams within each

area (Table 6). Note that the goals are the same for even and odd year returns, but not all systems have established runs on both cycle lines.

Table 5 compares recent escapement observations to the operational targets:

- *Even years:* Recent average escapement is near or above the long-term escapement goal ( $> 2/3$  of target) for Johnstone Strait and Bond to Knight Inlets, and below the long-term goal ( $>1/3$ ) for Mid Vancouver Island, Kingcome Inlet, and Loughborough to Bute Inlets. Recent average escapement to Upper Vancouver Island is about 10% of the long-term escapement goal. Overall, average total escapement has been about half of the total escapement goal for the Inner South Coast.
- *Odd-years:* Returns for have been substantially lower on odd-year returns for Upper Vancouver Island, Johnstone Strait, Kingcome Inlet, Loughborough to Bute Inlets (i.e. “even-year dominant systems, where escapement goals apply only to even year returns). Escapements for Mid Vancouver Island, Bond to Knight Inlets, and Burrard Inlet have been near or at the long-term escapement goal ( $> 2/3$  of target). Recent escapements for Toba Inlet and Jervis Inlet both fall far below the long-term goal, but the trends differ (Section 5.3.1). No recent pink salmon escapement estimates are available for Howe Sound. Overall, average total escapement has been about a quarter of the total escapement goal for the Inner South Coast.

## 5.3 Trends

### 5.3.1 Escapement

Overall pink escapement is highly variable from year to year and across systems. Figure 2 to Figure 17 show escapement trends for each management area:

- *Even years - Overall:* Escapement levels for all six management areas with even-year runs increased substantially around 1990, reaching record totals for the aggregate, but were followed by drastic declines. Escapements since then have been highly variable, with another peak around 2000. For Mainland Inlet pinks this pattern was particularly pronounced, with a sharp decline after 2000.
- *Odd Years - Overall:* Escapement levels have recently increased for Upper Vancouver Island, Johnstone Strait, and Mid-Vancouver Island, and Burrard Inlet. No recent pink salmon escapement estimates are available for Howe Sound. Toba Inlet pink salmon escapements declined rapidly in the 1960s, and have persisted at low abundance since then. Jervis Inlet pink salmon have persisted at low abundance for decades, but run reconstructions in recent years hint at an increase in escapement. However, this trend for Jervis is highly uncertain due to the substantial decrease in survey coverage over the same period.
- *Mainland Inlets:* Returns to the Mainland Inlets have been depressed since the significant declines that occurred in 2002 and 2003, both of which were preceded with the area’s highest escapement levels relative to the historic data series. Since then we have seen some minor rebuilding in the odd cycle line up to 2007 but abundance is still well below average stock levels. The even-year still appears highly variable and well below average stock levels. The trend in escapement is highly variable from one brood year to the subsequent return 2 years later. Recently there seems to be some rebuilding of escapement to the odd cycle of the Bond/Knight Inlet area after the decline in survival that was encountered in the 2003 return year. The opposite trend is apparent in the odd cycle Kingcome/Wakeman area with fairly low escapements since the early 1990s. The even year trend for both areas is showing some minor improvement over the significant declines that were encountered in the 2002 return year.

### **5.3.2 Catch and Exploitation Rate**

Most of the fisheries harvest pink salmon originating in different parts of the Inner South Coast, except for terminal fisheries (e.g. Mainland Inlets) that specifically target local abundances near the natal streams when observed abundance permits. Since 2002, there have been no terminal pink salmon fisheries in the Inner South Coast, so that exploitation rate estimates are based on aggregate abundance and aggregate catch (Section 4.3)

Aggregate catch and exploitation rate have declined drastically since the 1980s, for both even and odd year returns (Table 3, Table 4, and Figure 1). Up to 1990, exploitation rates ranged from 40 to 70%. Exploitation rates have declined to below 40% since 1990, with a further drop below 10% since 2004.

Pink salmon originating from different parts of the Inner South Coast are not intercepted at the same rates in the various fisheries, but exploitation rates have declined in all of the management areas. Area-specific exploitation rates, shown in Figure 2 to Figure 17, were calculated based on the location of the different fisheries, but formal run reconstructions have not been completed (Section 4.3.1).

### **5.3.3 Survey coverage**

Survey coverage is extensive (Section 4.2.1), but has generally declined since the 1950s. Typically, assessments have focused on more abundant systems, so that the proportion of escapement covered by surveys has declined less than the number of systems surveyed. Escapement surveys still capture about 75% or more of the long-term escapement in most of the areas, with the exception of Toba Inlet, Jervis Inlet, and Howe Sound in odd years.

These overall declines in survey coverage concurred with changing harvest strategies and substantially reduced catches.

### **5.3.4 Index of escapement by population ( $P_{avg}$ )**

The escapement index by population tends to track the aggregate abundance closely in all areas for most of the available time series. Abundant stocks generally follow a similar pattern as smaller stocks, with some exceptions. For example, the observed peak escapement for Johnstone Strait even-year pinks in 2000 was due to large escapements on the Adam River and the Salmon River, while the rest of the systems were around or below their long-term average.

## **6 CONSERVATION MEASURES IN INNER SOUTH COAST PINK SALMON FISHERIES**

### **6.1 Coast-wide conservation strategy**

The *2009 Pink & Chum Management Summary* describes the elements of DFO's conservation strategy (Section 3.2), summarizes integrated management initiatives (Section 3.3), and provides an inventory of major conservation and recovery efforts (Section 3.4). The management summary also includes an appendix that lists local conservation measures by statistical area.

Coast-wide conservation strategies are reflected in the fishery management plans for each area. Pre-season fishing plans use existing data from previous years to anticipate stock levels returning in any given year. These pre-season plans are established through consultation with Departmental managers, biologists and scientists as well as industry and First Nations representatives. Fisheries commence each year using the established pre-season plan. As in-season catch and escapement data becomes available through the season, fishing plans are adjusted on a daily or weekly basis to reflect these 'real time' data. General conservation measures in salmon fisheries include:

- In-season (field inspections) and post-season (catch analysis) monitoring of net fisheries to assess fleet compliance with fishery regulations and guidelines and confirm in-season phone-in and hail data from fishery participants.
- By-catch of non-target species is closely monitored in-season to ensure impacts on these stocks are within management goals.
- In-season information may not provide a clear-cut indication of run status. In this case, management actions use a precautionary approach on stocks of concern.

This section highlights some examples of local conservation measures in Inner South Coast pink salmon fisheries. The fisheries descriptions in Section 3 of this report document the details.

### **6.2 Pink salmon conservation measures**

These stocks are harvested in terminal areas in years of large abundance, and provide opportunities for all three commercial gear types, although seines catch the majority of fish. Fleet size during these commercial fisheries is highly variable and depends on other fisheries occurring during the same time period (e.g. Fraser River sockeye fisheries) as well as market prices. Over-flights are used to assist in estimating abundance in the terminal areas, as well as to provide in-season river escapement estimates.

Targeted commercial fisheries have occurred terminally in the Mainland Inlets when run size exceeded the escapement targets. No targeted commercial fisheries have taken place here since 2001 due to low abundance.

Commercial fisheries targeting other pink salmon stocks or other salmon species are modified to reduce interceptions of Mainland Inlet pink salmon when poor returns are expected. For example, fisheries are limited to below Lewis Point from late July to mid-August, extending a boundary closure already in place to protect Nimpkish sockeye until the end of July. This measure protects the early portion of the Mainland Inlet pink run, which includes the Ahnuhati River, Kakweiken River, and other systems which have recently experienced periods of low abundance. Another example is the ribbon boundary on the mainland side of Johnstone Strait in effect to protect Mainland Inlet pink salmon during directed fisheries for Fraser sockeye and Fraser pink from the end of July to the end of August.

Localized conservation measures for pink salmon stocks are typically in the form of area and timing closures (as listed in Table 7).

Specific examples are::

- Seines in Areas 12, 13, and 20 used to harvest several hundred thousand pink salmon a year in the early 1990s, but were substantially reduced over 1999 to 2003, and have been negligible since 2005 (i.e. total South Coast commercial catch less than 2,000 non-Fraser pink salmon). This catch reduction has been triggered by the persistent low abundance of some pink stocks in Areas 12 and 13, as well as conservation measures for other salmon stocks of concern (i.e. interior Fraser coho, Late-run Fraser sockeye, Lower Georgia Strait chinook).
- Catches in WCVI troll fisheries (Areas 121 to 127) have been negligible in since 1997, ranging from 0 to 8,000 fish, but were larger in the 1990s, ranging from 40,000 to 135,000 fish. This catch reduction has been triggered mainly by conservation measures for other salmon stocks of concern. These stocks of concern include Mainland Inlet pinks on the northern end of Vancouver Island, passing Interior Fraser coho, and local chinook stocks.

### **6.3 Measures to reduce incidental harvest and by-catch in pink salmon fisheries**

Salmon fishing effort has been reduced where stocks of concern are intercepted. For example, commercial fisheries harvesting odd-year runs of pink salmon on the Inner South Coast have been substantially reduced, even though they focus on abundant Fraser-bound pink stocks. Specifically:

- Seines in Areas 12, 13, and 20 used to harvest several hundred thousand pink salmon a year in the early 1990s. Since the 1990s opportunities to harvest were substantially reduced and catches have been negligible since 2005 (i.e. total South Coast commercial catch less than 2,000 non-Fraser pink salmon). This catch reduction has been triggered by the persistent low abundance of some pink stocks in Areas 12 and 13, as well as conservation measures for other salmon stocks of concern (i.e. Interior Fraser River coho, Late-run Fraser sockeye, Lower Georgia Strait chinook).
- Catches in WCVI troll fisheries (Areas 121 to 127) have been negligible in since 1997, ranging from 0 to 8,000 fish, but were larger in the 1990s, ranging from 40,000 to 135,000 fish. This catch reduction has been triggered mainly by conservation measures for other salmon stocks of concern. These include Mainland Inlet pinks on the northern end of Vancouver Island, passing Interior Fraser River coho, and local chinook stocks.

To protect specific non-target populations or species of concern, time and area closures, as well as selective fishing techniques, are used on addition to total catch reductions. Examples include:

- Table 7 lists salmon fishery closures in Johnstone Strait, and describes the reason for the each closure (e.g. finfish closure in Parson Bay to protect juvenile chinook).
- Time and area net restrictions to limit encounters of non-target stocks and species to minimize fishery impacts (i.e. Interior Fraser River coho, Lower Strait of Georgia chinook, Early Stuart sockeye, Cultus Lake sockeye, and Sakinaw sockeye).
- Non-retention of coho, chinook and steelhead to minimize impacts on stocks of concern.
- Limited duration soak times are in effect during all pink fisheries. Soak time is either 45 minutes or 1 hour maximum, depending on fishing location, to limit the encounters of non-target species and minimize impacts on species of concern.



- Daylight only fisheries to reduce chinook or coho encounters and minimize fishery impacts is an option in known areas of high by-catch encounters but is normally not required in pink fisheries.
- Mandatory brailing and sorting of catch during seine fisheries to increase release survival rates of non-retention species.
- Mandatory use of barbless hooks for troll to increase release survival rates of non-retention species.

## REFERENCES

- Anderson, A.D. and C.N. Mackinnon (1979) The 1977 return of pink salmon stocks to the Johnstone Strait Study area and prospects for 1979. Fisheries and Marine Service Technical Report 893
- DFO (2005) Canada's policy for conservation of wild pacific salmon (ed F.a.O. Canada), pp. 49. Fisheries and Oceans Canada.
- Beacham, T.D., Whithler, R.E., Gould, A.P., 1985. Biochemical genetic stock identification of pink salmon (*Oncorhynchus gorbuscha*) in souther British Columbia. Can. J. Fish. Aquat. Sci. 42, 1474-1483.
- Beacham, T.D., Whithler, R.E., Murray, C.B., Barner, L.W., 1988. Variation in Body Size, Morphology, Egg Size, and Biochemical Genetics of Pink Salmon in British Columbia. Transactions of the American Fisheries Society: Vol. 117, No. 2 pp. 109–126
- Heard, W.R. (1991). Life History of Pink Salmon. In Pacific Salmon Life Histories (eds C. Groot & L. Margolis), p. 119-230. UBC Press, Vancouver, BC.
- Holtby, B. (2003) Forecast for mainland inlet pink salmon in 2003. CSAS Research Document 99/125.
- Holtby, B and K Ciruna (2007) Conservation Units for Pacific Salmon under the Wild Salmon Policy. CSAS Research Document 2007/070 ([http://www.dfo-mpo.gc.ca/CSAS/Csas/Publications/ResDocs-DocRech/2007/2007\\_070\\_e.htm](http://www.dfo-mpo.gc.ca/CSAS/Csas/Publications/ResDocs-DocRech/2007/2007_070_e.htm)).
- Holtby, B., J. Irvine, R. Tanasichuk and K. Simpson (1999). Forecast for Southern British Columbia Coho Salmon in 1999. Simpson Canadian Stock Assessment Secretariat Research Document - 1999/125 ([http://www.dfo-mpo.gc.ca/csas/Csas/publications/ResDocs-DocRech/1999/1999\\_125\\_e.htm](http://www.dfo-mpo.gc.ca/csas/Csas/publications/ResDocs-DocRech/1999/1999_125_e.htm))
- Robinson, D. and Sontag (1988) Strategy for the management of pink salmon stocks in the Mainland Inlets. ESSA Environmental.
- Schutz, D.C (1970) The 1970 Report on the Status of Even - Year Pink Salmon Stocks in the Johnstone Strait Study Area and on the Prospects for 1970. Department of Fisheries and Forestry - Fisheries Service Technical Report 1970 – 2.
- White, B.A. 1996. Genetic stock identification of Fraser River pink salmon: methodology and management application. Pacific Salmon Comm. Tech. Rep. No.7: 44 p.
- Zyblut, E.R. and A.D. Anderson (1973) The 1973 Report on the Odd-Year Pink Salmon Stocks of the Johnstone Strait Study Area –Department of the Environment Fisheries and Marine Service Technical Report 1973-6.

## TABLES

**Table 1. Population Structure of Inner South Coast pink salmon**

**Bold font** indicates systems which are currently surveyed for escapement estimates. A complete list of sites for each Conservation Unit (CU) is available at [http://www-comm.pac.dfo-mpo.gc.ca/pages/consultations/wsp/CUs\\_e.htm](http://www-comm.pac.dfo-mpo.gc.ca/pages/consultations/wsp/CUs_e.htm). *Underlined italic font with an asterisk\** marks systems with active hatchery enhancement. Methods for identifying CUs are documented in Holtby and Ciruna (2007). Note that pink salmon CUs distinguish between even-year returns and odd-year returns.

Conservation Units		Stat Area	Assessment Area	Spawning Sites (Note: some sites only have even or odd-year runs)
Even	Odd			
Southern Fjords	Southern Fjords <sup>2</sup>	11	Seymour Inlet	Eva Creek, Driftwood Creek, Pack Lake Creek, Rainbow Creek, Seymour River, Waump Creek
		12	Loughborough to Bute	Blind Creek, Boughey Creek, Fulmore River, Robbers Knob Creek
			Bond to Knight	<b>Ahnuhati River</b> , <b>Ahta River</b> , Ahta Valley Creek, Call Creek, <b>Gilford Creek</b> , <b>Glendale Creek</b> , Hoeya Sound Creek, <b>Kakweiken River</b> , Kamano Bay Creek, Klinaklini River <sup>2</sup> , <b>Kwalate Creek</b> , <b>Lull Creek</b> , Maple Creek, Matsui Creek, McAlister Creek, Port Harvey Lagoon Creeks, Potts Lagoon Creek, Protection Point Creek, Sallie Creek, Shoal Harbour Creek, Sim River, <b>Viner Sound Creek</b>
		East VI - JS	Johnstone Strait	<b>Adam River</b> , Charles Creek, Eve River, Hyde Creek, <u><i>Kokish River*</i></u> , Mills Creek, Naka Creek, <b>Nimpkish River</b> , Stranby River, Thiemer Creek, <b>Tsitika River</b> , Tuna River
		HKRSBCD <sup>1</sup>	Kingcome Inlet	Bughouse Creek, Carriden Creek, Charles Creek, Cohoe Creek, <b>Embley Creek</b> , Hauskin Creek, Health Lagoon Creek, Jennis Bay Creek, <b>Kingcome River</b> , Mackenzie River, Nimmo Creek, Scott Cove Creek, Simoom Sound Creek, <b>Wakeman River</b> , Waldon Creek
	Nahwitti		Upper Vancouver Island	<u><i>Cluxewe River*</i></u> , <b>Keogh River</b> , Nahwitti River, <u><i>Quatse River*</i></u> , Shushartie River, Songhees Creek, Stranby River, Tsulquate River
S. Fjords & Georgia Strait	Southern Fjords <sup>2</sup>	13	Loughborough to Bute	<b>Apple River</b> , Cameleon Harbour Creek, Clear Creek, Cumsack Creek <sup>2</sup> , Drew Creek, Fanny Bay Creek, Frazer Creek, Frederick Arm Creek, George Creek, Granite Bay Creek, <b>Grassy Creek</b> , <b>Gray Creek</b> , Hemming Bay Creek, Heydon Creek, Homathko River <sup>2</sup> , Hyacinthe Creek, Kanish Creek, Knox Bay Creek, Open Bay Creek, <b>Orford River</b> , <b>Phillips River</b> , Quatam River, <b>Read Creek</b> , Southgate River, St. Aubyn Creek, Stafford River, Teaquahan River, Thurston Bay Creek, <b>Wortley Creek</b>
	East VI-JS & GS		Johnstone Strait	<b>Amor de Cosmos Creek</b> , <b>Menzies Creek</b> , <b>Mohun Creek</b> , Quatam River, <b>Salmon River</b> , White River
Georgia Strait	Georgia Strait	13	Mid-Vancouver Island	<u><i>Campbell River*</i></u> , <u><i>Quinsam River*</i></u> , Simms Creek, Pye Creek
		14	Mid-Vancouver Island	Brooklyn Creek, <u><i>Englishman River*</i></u> , French Creek, Headquarters Creek, Little Qualicum River, Millard Creek, Morrison Creek, <u><i>Nile Creek*</i></u> , <u><i>Oyster River*</i></u> , <u><i>Puntledge River*</i></u> , Qualicum River, Trent River, Tsable River, <u><i>Tsolum River*</i></u> , Wilfred Creek
		15	Toba Inlet Jervis Inlet	Brem River, Brem River Tributary, Forbes Bay Creek, Klite River, Okeover Creek, Theodosia River, Toba River <b>Lang Creek</b> , Sliammon Creek, Whittall Creek

Conservation Units		Stat Area	Assessment Area	Spawning Sites (Note: some sites only have even or odd-year runs)
Even	Odd			
		16	Jervis Inlet	Angus Creek, Brittain River, Carlson Creek, <u>Chapman Creek*</u> , Deserter River, Gray Creek, Sechelt Creek, Shannon Creek, Skwawka River, Tzoonie River, Vancouver River
		17		Holland Creek, <u>Nanaimo River*</u>
		29	Boundary Bay	<u>Nicomekl River*</u>
	East Howe Sound / Burrard Inlet	28	Squamish – Howe Sound	Cheakamus River, Elaho River, Mamquam River, Stawamus River, Squamish River
			Burrard Inlet – Indian Arm	Lynn Creek, MacKay Creek, <u>Seymour River*</u> , Capilano River (Brothers Creek), and Indian River

<sup>1</sup> Homathko-Klinaklini-Rivers-Smith-Bella Coola Dean

<sup>2</sup> These populations fall mostly into the *Southern Fjords* CU, except for Cumsack Creek, Klinaklini River, and Homathko River, which were grouped with the *Homathko-Klinaklini-Rivers-Smith-Bella Coola Dean* CU based on “predominant genetic clusters in closely related Freshwater Adaptive Zones” (Holtby and Ciruna 2007).

**Table 2. Escapement summary for Inner South Coast pink salmon**

Note that survey coverage fluctuates across years, and comparisons of annual estimates must be approached with caution. Section 4.3 briefly describes how the observed escapements presented here are standardized to identify the escapement trends shown Figure 1 to Figure 17. Table 1 lists the major systems within each of these management areas.

**ODD**

Total	Year	Management Area										
		Total Escapement	Upper Vancouver Island	Johnstone Strait	Mid-Vancouver Island	Kingcome Inlet	Bond to Knight	L-borough to Bute	Toba Inlet	Jervis Inlet	Howe Sound	Burrard Inlet
	1953	<b>774,700</b>	21,150	20,800	57,775	39,250	61,125	53,450	120,000	106,150	195,000	100,000
	1955	<b>810,000</b>	15,925	17,775	54,450	38,525	211,250	110,800	112,500	57,275	116,500	75,000
	1957	<b>1,134,900</b>	82,150	187,675	100,575	42,900	160,900	89,700	140,000	94,500	111,500	125,000
	1959	<b>966,876</b>	50,700	42,575	23,576	42,525	192,600	75,950	40,000	216,950	157,000	125,000
	1961	<b>1,093,450</b>	23,950	71,150	20,100	38,525	191,425	69,300	37,000	257,400	384,200	400
	1963	<b>1,703,102</b>	9,125	170,475	22,202	42,500	155,700	104,275	46,750	220,075	732,000	200,000
	1965	<b>618,775</b>	30,050	104,700	9,150	38,500	104,625	159,975	18,000	43,275	75,500	35,000
	1967	<b>346,110</b>	7,100	8,750	7,650	11,050	176,850	45,950	17,750	24,510	39,000	7,500
	1969	<b>214,050</b>	3,100	8,600	2,025	15,200	99,550	11,175	11,400	31,000	24,500	7,500
	1971	<b>925,850</b>	6,225	76,575	3,675	217,700	395,050	95,525	24,750	47,650	23,700	35,000
	1973	<b>1,167,313</b>	17,240	71,800	9,543	100,275	522,950	240,675	23,500	10,830	135,500	35,000
	1975	<b>1,553,480</b>	7,680	97,950	42,875	49,025	987,525	245,125	20,500	24,300	43,500	35,000
	1977	<b>271,014</b>	2,175	6,075	8,225	50,000	104,615	44,250	5,200	25,399	3,075	22,000
	1979	<b>285,677</b>	316	7,010	24,286	22,300	157,090	29,250	5,600	13,150	4,675	22,000
	1981	<b>1,101,723</b>	420	16,003	34,144	186,010	661,320	110,336	10,560	29,430	13,500	40,000
	1983	<b>1,578,116</b>	15,912	26,380	25,489	132,000	1,152,225	193,185	450	7,050	1,425	24,000
	1985	<b>942,297</b>	36,435	21,525	35,150	114,900	686,750	25,730	1,550	9,057	1,200	10,000
	1987	<b>470,566</b>	3,810	70,300	184,200	45,000	71,656	21,300	300	28,000	11,000	35,000
	1989	<b>448,840</b>	2,305	74,150	43,300	69,150	158,650	27,535	11,500	15,250	9,000	38,000
	1991	<b>419,862</b>	4,505	6,700	169,550	4,800	62,010	47,850	300	12,947	8,200	103,000
	1993	<b>668,427</b>	1,525	50,170	64,962	4,825	348,924	19,749	400	12,772	30,100	135,000
	1995	<b>305,978</b>	2,330	10,750	28,645	4,170	236,969	5,000	3,298	14,816		
	1997	<b>436,875</b>	2,925	2,470	75,494	530	348,551	760	14	6,131		
	1999	<b>827,921</b>	1,860	3,507	238,686	4	582,736	744	176	208		
	2001	<b>2,166,806</b>	9,627	28,651	451,338	2,197	1,506,346	17,761	500	5,913		144,473
	2003	<b>503,333</b>	16,637	8,420	186,500	3,048	188,189	1,205	162	1,024		98,148
	2005	<b>747,203</b>	33,077	64,125	246,625	121	262,579	645	4,267	2,924		132,840
	2007	<b>784,977</b>	22,093	220,398	162,019	914	316,241	1,786	314	882		60,330

Table 2 continued...

**EVEN**

Total	Year	Total Escapement	Management Area Upper		Mid-		Bond to Knight	L-borough to Bute	Toba Inlet	Jervis Inlet	Howe Sound	Burrard Inlet
			Vancouver Island	Johnstone Strait	Vancouver Island	Kingcome Inlet						
	1954	<b>568,550</b>	76,750	114,300	192,250	30,000	137,775	17,475				
	1956	<b>585,625</b>	202,250	79,050	59,400	22,000	187,475	35,450				
	1958	<b>754,600</b>	176,500	142,150	193,650	57,000	165,775	19,525				
	1960	<b>226,950</b>	56,550	50,975	15,850	26,200	72,200	5,175				
	1962	<b>684,425</b>	207,400	106,450	8,900	57,500	245,550	58,625				
	1964	<b>619,750</b>	134,500	107,900	7,450	26,000	215,175	128,725				
	1966	<b>1,322,575</b>	506,500	144,575	17,700	44,750	334,575	274,475				
	1968	<b>1,476,875</b>	453,500	175,000	14,875	54,500	311,300	467,700				
	1970	<b>1,149,655</b>	458,700	129,425	14,555	203,500	234,075	109,400				
	1972	<b>713,150</b>	124,700	171,925	20,625	250,750	54,325	90,825				
	1974	<b>1,122,400</b>	181,250	211,325	23,325	341,600	169,325	195,575				
	1976	<b>1,677,735</b>	237,235	128,975	45,175	337,600	758,500	170,250				
	1978	<b>1,089,485</b>	159,700	78,900	19,335	59,500	633,450	138,600				
	1980	<b>1,405,716</b>	136,000	36,124	35,982	71,000	922,085	204,525				
	1982	<b>545,824</b>	41,200	6,850	3,612	71,000	313,162	110,000				
	1984	<b>358,582</b>	54,506	6,500	4,213	33,000	246,053	14,310				
	1986	<b>1,358,698</b>	172,100	62,900	217,020	175,500	692,328	38,850				
	1988	<b>1,874,016</b>	79,225	105,360	210,691	369,000	1,032,250	77,490				
	1990	<b>3,465,219</b>	100,050	495,300	588,619	552,500	1,264,900	463,850				
	1992	<b>2,375,842</b>	138,005	45,600	278,888	68,500	1,426,624	418,225				
	1994	<b>1,263,668</b>	9,300	61,010	104,505	34,900	811,272	242,681				
	1996	<b>2,476,033</b>	60,600	249,800	217,112	255,850	1,452,641	240,030				
	1998	<b>2,193,380</b>	19,540	260,606	88,963	249,000	1,465,156	110,115				
	2000	<b>5,021,355</b>	27,029	802,062	181,033	378,034	3,092,875	540,322				
	2002	<b>891,317</b>	148,897	206,871	168,256	72,149	50,775	244,369				
	2004	<b>1,466,179</b>	118,093	204,351	41,970	125,735	950,288	25,742				
	2006	<b>586,250</b>	25,927	131,118	49,513	67,544	268,785	43,363				

Table 2 continued...

**Summary (Rounded)**

	Management Area										
	Total Escapement	Upper Vancouver Island	Johnstone Strait	Mid-Vancouver Island	Kingcome Inlet	Bond to Knight	L-borough to Bute	Toba Inlet	Jervis Inlet	Howe Sound	Burrard Inlet
<b>Before 1990 - Even Years</b>											
Min	227,000	41,000	7,000	4,000	22,000	54,000	5,000				
<b>Avg</b>	<b>974,000</b>	<b>192,000</b>	<b>103,000</b>	<b>61,000</b>	<b>124,000</b>	<b>374,000</b>	<b>120,000</b>				
Max	1,874,000	507,000	211,000	217,000	369,000	1,032,000	468,000				
<b>Since 1990 - Even Years</b>											
Min	434,000	9,000	46,000	42,000	9,000	51,000	26,000				
<b>Avg</b>	<b>2,017,000</b>	<b>66,000</b>	<b>260,000</b>	<b>182,000</b>	<b>181,000</b>	<b>1,085,000</b>	<b>243,000</b>				
Max	5,021,000	149,000	802,000	589,000	553,000	3,093,000	540,000				
<b>Before 1990 - Odd Years</b>											
Min	214,000	320	6,000	2,000	11,000	61,000	11,000	300	7,000	1,000	400
<b>Avg</b>	<b>864,000</b>	<b>18,000</b>	<b>58,000</b>	<b>37,000</b>	<b>68,000</b>	<b>329,000</b>	<b>92,000</b>	<b>34,000</b>	<b>66,000</b>	<b>110,000</b>	<b>51,000</b>
Max	1,703,000	82,000	188,000	184,000	218,000	1,152,000	245,000	140,000	257,000	732,000	200,000
<b>Since 1990 - Odd Years</b>											
Min	306,000	2,000	2,000	29,000	0	62,000	640	10	210	8,000	60,000
<b>Avg</b>	<b>762,000</b>	<b>11,000</b>	<b>44,000</b>	<b>180,000</b>	<b>2,000</b>	<b>428,000</b>	<b>11,000</b>	<b>1,000</b>	<b>6,000</b>	<b>19,000</b>	<b>112,000</b>
Max	2,167,000	33,000	220,000	451,000	5,000	1,506,000	48,000	4,000	15,000	30,000	144,000
<b>Change (Average Before/After 1990) - Even Years</b>											
Even	107.1%	-65.6%	152.4%	198.4%	46.0%	190.1%	102.5%				
Odd	-11.8%	-38.9%	-24.1%	386.5%	-97.1%	30.1%	-88.0%	-97.1%	-90.9%	-82.7%	119.6%

Note: Changes in observed escapement for Toba Inlet, Jervis Inlet, and Howe Sound need to be interpreted with caution. The “before 1990” average is high because of large escapements observed in the 1950s and early 1960s. The survey coverage for these systems has been reduced in recent years, so that the true trends are difficult to isolate. However, these systems seem to track the recent trend observed for the Loughborough to Bute management areas, which is located just north of these systems. Section 4.3 briefly describes how the observed escapements presented here are standardized to identify the escapement trends shown Figure 1 to Figure 17.

**Table 3. Catch summary for Inner South Coast pink salmon – Odd years**

Catch information is based on a combination of sources, including sales slips, logbooks, and phone-in hails. For odd-year returns, catch is separated between Fraser and non-Fraser pink salmon (Section 4.3.1).

<b>Catch by Area and Sector</b>										
Total Catch	Year	Total Catch	Inner SC Comm	Juan de Fuca	WCVI Troll	Test Fishing	SC Marine FN	SC Rec	NC Total**	US Total
	1971	<b>663,871</b>								
	1973	<b>1,019,992</b>								
	1975	<b>689,791</b>								
	1977	<b>487,877</b>								
	1979	<b>424,300</b>								
	1981	<b>885,400</b>								
	1983	<b>1,236,000</b>								
	1985	<b>1,026,100</b>								
	1987	<b>477,000</b>								
	1989	<b>1,550,360</b>	936,099	152,571	135,119	3,973	0	12,192	181,254	129,152
	1991	<b>939,346</b>	389,766	49,786	102,848	2,987	0	15,659	222,906	155,394
	1993	<b>981,953</b>	718,747	4,013	39,418	2,144	0	10,525	101,627	105,478
	1995	<b>468,528</b>	155,659	30,163	65,636	7,527	1,956	11,191	122,678	73,718
	1997	<b>408,159</b>	282,304	10,904	1,293	2,187	1,290	5,188	7,577	97,418
	1999	<b>29,303</b>	1,400	0	176	2,718	3,201	20,450	0	1,358
	2001	<b>301,642</b>	207,182	221	222	16,884	18,749	23,619		34,764
	2003	<b>294,676</b>	246,473	275	7	9,063	0	14,399		24,459
	2005	<b>92,762</b>	1,775	0	0	29,431	39,392	11,556		10,608
	2007	<b>76,542</b>	1,837	0	0	7,392	2,210	26,416		38,687

Note: SC = South Coast, Comm = Commercial, WCVI = West Coast Vancouver Island, FN = First Nation, NC = North Coast

\*\* Genetic Stock Identification (GSI) programs for pink salmon were discontinued north of Cape Caution after 1997 because fisheries shifted to more terminal areas predominantly harvesting local stocks. The *2009 North Coast and Central Coast Pink Salmon Profile* describes the details.



**Table 4. Catch summary for Inner South Coast pink salmon – Even years**

Catch information is based on a combination of sources, including sales slips, logbooks, and phone-in hails. Even-year runs do not have a significant Fraser River component.

Catch by Area and Sector											
Total Catch	Non- Mainland Inlet Catch	Year	Total Catch	Areas 11 to 12 Comm	Area 13 Comm	Terminal Mainland Inlets Comm	Other SC Comm	Test Fishing	Area 11- 13 Marine FN	Other SC Marine FN	Inside Rec
		1970	2,426,471	2,241,673	184,798						
		1972	782,739	699,290	83,449						
		1974	1,590,762	1,416,942	173,820						
		1976	3,891,494	3,774,412	117,082						
		1978	1,350,283	1,255,706	94,577						
		1980	1,202,029	1,131,498	70,531		0				
		1982	194,182	172,147	19,208		0				2,827
		1984	239,474	204,872	24,361		0				10,241
		1986	572,412	496,370	72,958		0				3,084
		1988	994,423	648,640	65,144	272,019					8,620
		1990	4,053,364	274,520	314,811	3,451,121			1,563	0	11,349
		1992	1,221,834	818,063	203,489	175,719			5,580	93	18,890
		1994	240,569	194,965	25,858		0		50	1,517	18,179
		1996	77,946	47,601	20,719		0		2,096	0	7,530
		1998	124,203	71,778	28,932		0		18,482	1	5,010
		2000	1,490,538	287,969	299,997	858,998			10,483	36	33,056
		2002	163,127	108,097	36,245		0		2,341	2	16,442
		2004	134,483	96,285	21,031		0		786		16,381
		2006	74,168	43,304	13,373		0		573		16,919

Note: SC = South Coast, Comm = Commercial, FN = First Nation, NC = North Coast

**Table 5. Operational Management Escapement Goals (MEG) for Inner South Coast pink salmon – Management Areas.**

Operational goals are intended as long-term benchmarks reflecting highly productive stocks (i.e. high sustainable yields). Fisheries are adjusted in areas where escapement consistently falls short of the operational goals, as illustrated by the exploitation rate trends in Figure 1 to Figure 17. Aggregate MEG are calculated as the sum of all stream-specific MEG, which are listed in Table 6. Note that formal benchmarks are under development for each Conservation Unit (see Table 1) as part of the coast-wide implementation of the Wild Salmon Policy (Section 2.4.4). Also note that pink salmon abundance is variable across systems within a statistical area (i.e. don't expect all systems to have strong runs in the same year, but assume that achieving aggregate MEGs translates into strong runs on some systems each year, and frequent strong runs on all systems). Table 1 lists the major systems within each of these management areas. Finally, note that survey coverage fluctuates across years, and comparisons of annual estimates must be approached with caution, especially for minimum values (Figure 1 to Figure 17). Section 4.3 briefly describes how the observed escapements presented here are standardized to identify the escapement trends shown Figure 1 to Figure 17. Run reconstructions for North Coast and Central Coast pink salmon use expansion factors ranging from 1.5 to 2.08 to account for observer efficiency and changes in survey coverage (Gazey and English 1999, English *et al.* 2006). Similar analyses have not been completed for Inner South Coast pink salmon.

Management Area	Long-term production benchmark	Recent Observed Escapement					
		Even Years (1996 - 2006)			Odd Years (1997 to 2007)		
		Min	Avg	Max	Min	Avg	Max
Upper Vancouver Island	690,000	19,540	<b>66,681</b>	148,897	1,860	<b>14,370</b>	33,077
Johnstone Strait	298,000	131,118	<b>309,135</b>	802,062	2,470	<b>54,595</b>	220,398
Mid Vancouver Island	320,000	41,970	<b>124,475</b>	217,112	75,494	<b>226,777</b>	451,338
Kingcome Inlet	282,000	67,544	<b>191,385</b>	378,034	4	<b>1,136</b>	3,048
Bond to Knight	920,000	50,775	<b>1,213,420</b>	3,092,875	188,189	<b>534,107</b>	1,506,346
Loughborough to Bute	502,000	25,742	<b>200,657</b>	540,322	645	<b>3,817</b>	17,761
Toba Inlet	88,500	No substantial pink salmon runs in even years			14	<b>905</b>	4,267
Jervis Inlet	256,400				208	<b>2,847</b>	6,131
Howe Sound	422,500				no data		
Burrard Inlet	100,000				60,330	<b>108,948</b>	144,473
<b>Total*</b>	<b>3,879,400</b>	<b>586,250</b>	<b>2,105,752</b>	<b>5,021,355</b>	<b>436,875</b>	<b>911,186</b>	<b>2,166,806</b>

\* Range of total observed escapements is calculated from total annual escapement, not as the sum of the area-specific ranges (i.e. last row is not the sum of the other rows, except in first column).

Section 4.3 briefly describes how the observed escapements presented here are standardized to identify the escapement trends shown Figure 1 to Figure 17.

**Table 6. Operational Management Escapement Goals (MEG) for Inner South Coast pink salmon – Major Systems.**

All escapement numbers rounded to the nearest 1000. Operational goals are intended as long-term benchmarks reflecting highly productive stocks (i.e. high sustainable yields). These MEGs have been in use since they initially were established in the 1970s (Anderson and MacKinnon 1979). Fisheries are adjusted if escapement falls short of the operational goals, as illustrated by the exploitation rate trends in Figure 1. MEGs are available for all of the streams listed in Table 1, but included here only for major systems with  $MEG \geq 10,000$ . Note that formal benchmarks are under development for each Conservation Unit (see Table 1) as part of the coast-wide implementation of the Wild Salmon Policy (Section 2.4.4).

Stat Area	System	MEG	Stat Area	System	MEG	Stat Area	System	MEG
12	Kakweiken River	500,000	13	Phillips River	175,000	14	Tsolum River	100,000
	Glendale Creek	232,000		Quinsam River	140,000		Oyster River	35,000
	Shushartie River	200,000		Amor de Cosmos Ck	100,000		Puntledge River	15,000
	Ahnuhati River	125,000		Wortley Creek	75,000			
	Cluxewe River	100,000		Apple River	60,000	15	Brem river	35,000
	Embley Creek	100,000		Orford River	35,000		Toba River	35,000
	Keogh River	100,000		Salmon River	35,000		Klite River	15,000
	Kingcome River	100,000		Campbell River	30,000			
	Quatse River	100,000		Heydon Creek	30,000	16	Skwawka River	240,000
	Wakeman River	80,000		Frazer Creek	20,000			
	Nahwitti River	75,000		Read Creek	20,000			
	Stranby River	75,000		Stafford River	20,000			
	Adam River	70,000		Grassy Creek	15,000			
	Nimpkish River	50,000		Cameleon Harbour Ck	10,000			
	Tsulquate River	35,000		Granite Bay Creek	10,000			
	Ahta River	20,000		Gray Creek	10,000			
	Ahta Valley Creek	20,000		Homathko River	10,000			
	Hoeya Sound Creek	10,000						
	Kokish River	10,000						
	Mills Creek	10,000						
	Tsitika River	10,000						

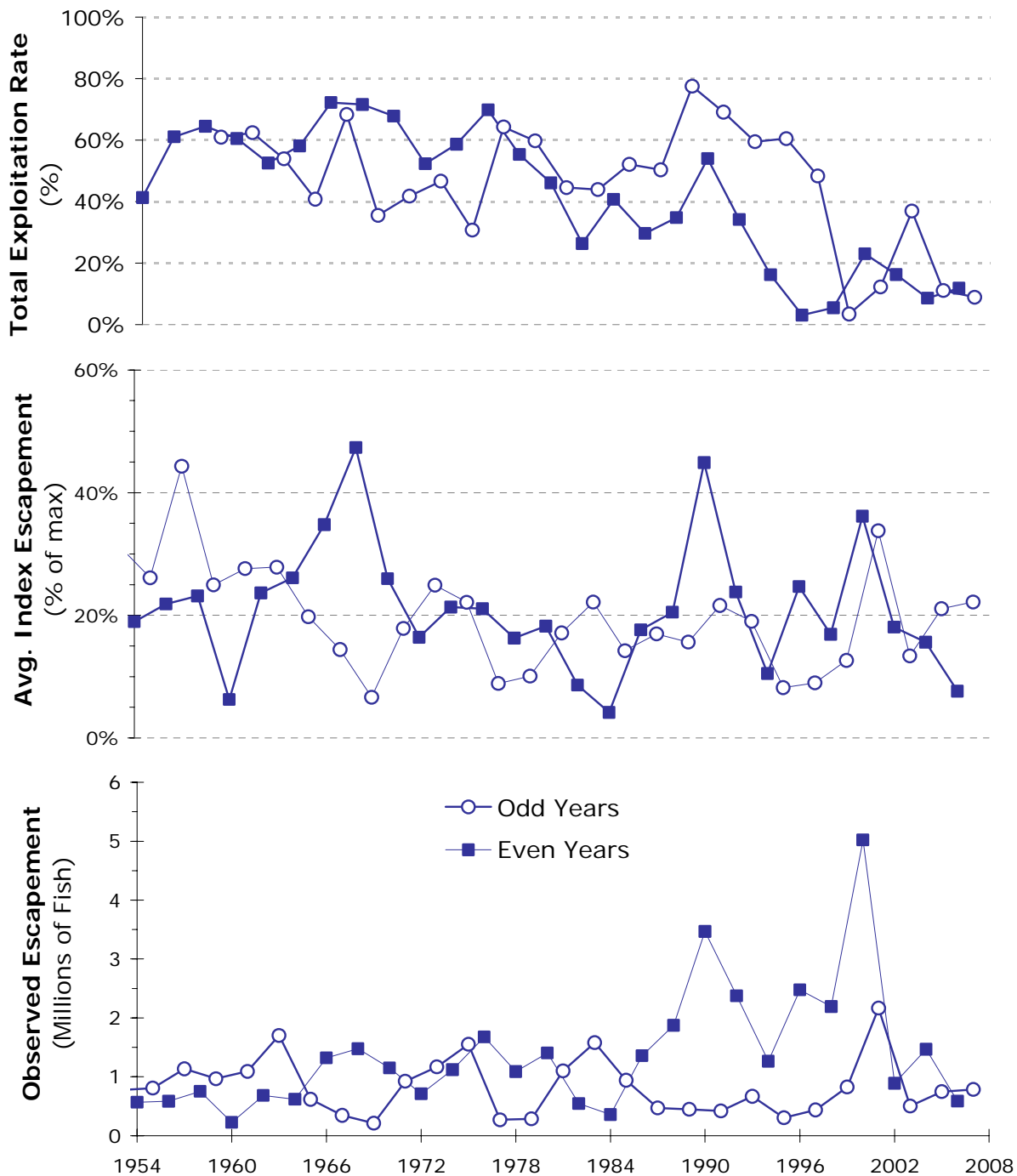
**Table 7. Salmon fishery closures in Johnstone Strait**

This table includes current salmon closures in Johnstone Strait (Areas 12 and 13) that apply commercial or recreational fisheries.

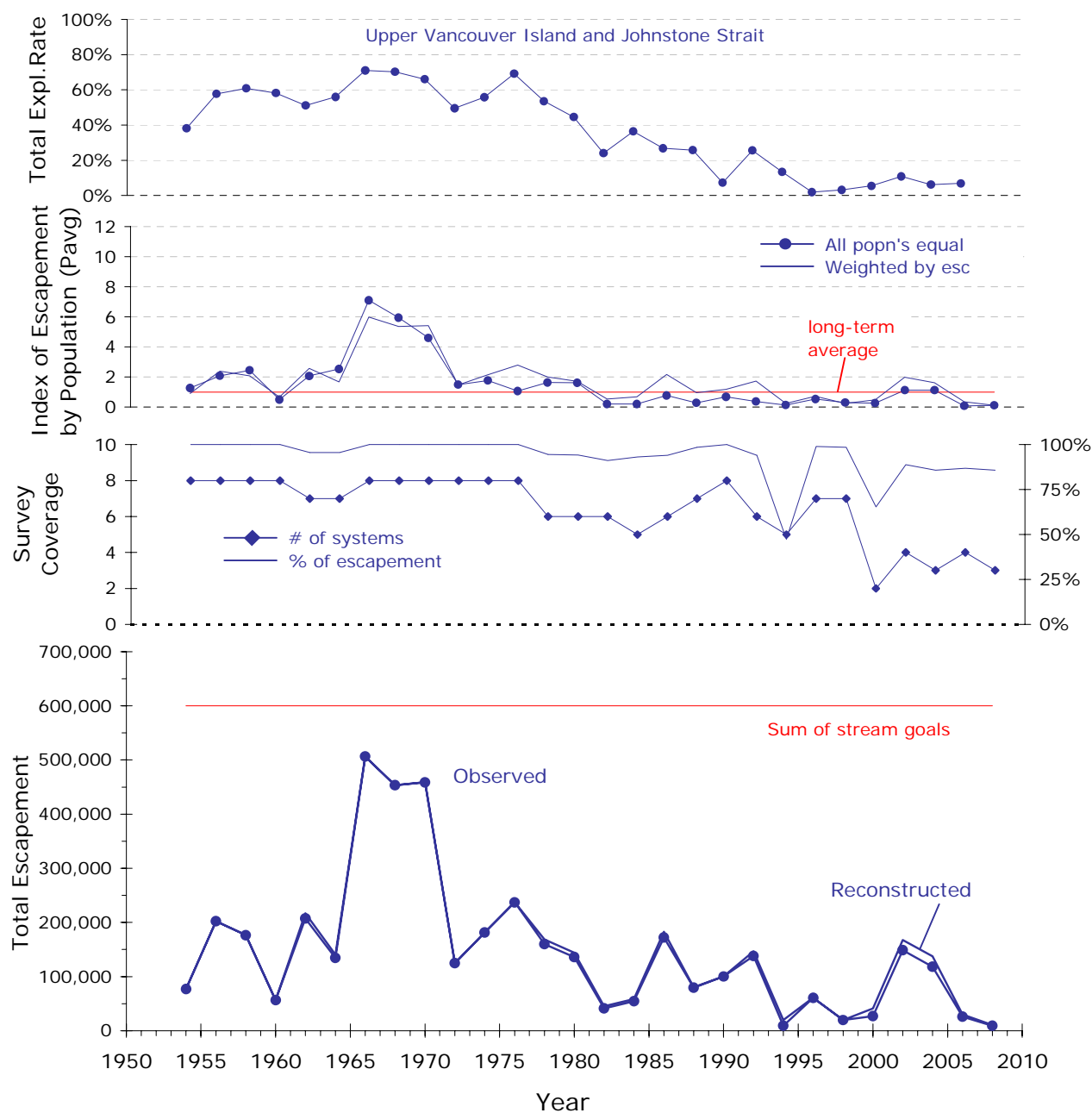
Closure	Applies to	Description	Reason for Closure	Length of Closure
Ribbon Boundary	Seine	The 0.5 nautical mile seine ribbon boundary is in effect in Areas 12 and 13 from Cracroft Point east to Brougham Point.	Protection of mainland pinks	End of July - end of August
Tsitika River Mouth (Robson Bight)	Seine, Gillnet, Recreational	The boundary is from the inside a line drawn from two triangular yellow boundary signs located approximately 1 nautical mile on each side of the mouth of the Tsitika River.	Protection of all salmon species	All year
Box Boundary	Seine, Gillnet	Close Sub Area 12-2	Protection of Eve/Adam River pinks	End of July - end of August
Port McNeil Bay	Recreational	Those waters of Port McNeill Bay westerly of a line from a boundary sign at the north end of the Western Forest Products jetty, true north to a boundary sign on the opposite shore of Ledge Point Peninsula	Finfish closure to protect of Bear Creek coho.	From Aug 15 to Dec 31
Klinaklini River (Knight Inlet)	Recreational	The mouth of the Klinaklini River (Knight Inlet) shoreward of a line from a fishing boundary signs at the southern entrance to Wahshihlas Bay to a fishing boundary sign at Rubble Point	Finfish closure to protect chinook.	All year.
Kingcome River	Recreational	The mouth of the Kingcome River shoreward of a line from a fishing boundary signs on Petley Point to a fishing boundary sign on a point on the opposite shore of Kingcome Inlet	Finfish closure to protect chinook.	All year
Wakeman River	Recreational	The mouth of the Wakeman River north of a line connecting two fishing boundary signs on opposite shores approx. 6 km from the head of Wakeman Sound	Finfish closure to protect chinook.	All year
Parson Bay (Sub area 12-20)	Seine, Gillnet, Recreational	Parson Bay bounded inside a line from Red Point on Harbledown Island to a marker on the most northwest point of Parson Island, from there following the northern shore to the most easterly point and from there true east to Harbledown Island	Finfish closure to protect juvenile chinook.	June 15 to October 13
Nimpkish River (sn/gn/rec)	Seine, Gillnet, Recreational	The mouth of Nimpkish River inside a line from a fishing boundary sign at a point on the shore of Vancouver Island approximately 1.5 km east of Broad Point, then to a navigational aid in the middle of Haddington Passage, then to a fishing boundary sign at a point approximately 1 km east of Willow Creek, then to the tidal water boundary signs about 100 m upstream of the Highway 19 bridge	Finfish closure to protect all returning stocks.	June 1 to November 30.
Scott Cove Creek	Recreational	The mouth of Scott Cove Creek and Viner Sound shoreward of a line between fishing boundary signs located at King Point and on the point 1 km south from the mouth of Scott Cove Creek	Finfish closure to protect chum and coho.	August 15 to September 30
Hardy Bay (Subarea 12-16)	Recreational	The waters of Hardy Bay shoreward of a line from a boundary sign on the Keltic Seafoods wharf to a boundary sign on the opposite shore non-retention of all salmon is in effect from August 15 to September 30, and only one single-pointed hook that measures no more than 15 mm between the point and shank may be used	non-retention of all salmon. Reviewed annually – stock dependent (enhanced)	August 15 to September 30.
Keogh River	Recreational	The mouth of the Keogh River within a 400 m radius of the shore only one single-pointed hook that measures no more than 15 mm between the point and shank may be used	Salmon closure to protect off year pinks.	August 1 to October 15.
Broughton Strait (Sub-area 12-19)	Recreational	Sub-area 12-19: Broughton Strait southerly of a line from Ledge Pt. to the light on the southern end of Haddington Island, then to the light on Yellow Bluff on Cormorant Island, then following the southerly shoreline to a marker on Gordon Bluff, then to Lewis Pt. on Vancouver Island	Non-retention of chinook	August 1 to October 31
Cluxewe River	Recreational	Those waters inside of a line that starts at a boundary sign approximately 1.9 km northwest of the Cluxewe river mouth, thence 35° true for 400 m to a position of 50° 37.57'N and 127°12.21'W, thence 108° true for approximately 3.3 km to a position of 50°36.98'N and 127°09.53'W, thence 200° true for approximately 400 m to the boundary sign on the shore. Only one single-pointed hook may be used during this period.	Non-retention of pink salmon during odd year cycles (ie: 2003, 2005).	July 14 to September 15
Loughborough Inlet	Recreational	The waters in Loughborough Inlet from Cosby Point to head of inlet	Finfish closure to protect chinook and coho.	All year

Closure	Applies to	Description	Reason for Closure	Length of Closure
Deepwater Bay	Seine, Gillnet, Recreational	Deepwater Bay inside a line from a fishing boundary sign at Separation Head to a fishing boundary sign at the northerly entrance of Deepwater Bay	Rockfish Conservation Area	All year
Phillips Arm (Sub-area 13-24)	Recreational	Phillips Arm northerly of a line from Picton Point true east to the opposite shore.	Finfish closure to protect chinook. Open on even years for pink salmon only.	All year
Bute Inlet	Seine, Gillnet, Recreational	The waters in Bute Inlet from Alpha Bluff to the head of the inlet	Finfish closure to protect chinook and coho.	All year
Village Bay	Recreational	The waters of Village Bay inside a line from a fishing boundary sign at the north entrance of Village Bay, Quadra Island, to a boundary sign at the south entrance of Village Bay	Finfish closure to protect sockeye and coho.	June 30 to October 31
Discovery Passage	Recreational	In those waters of Discovery Passage and the Campbell River, inside a line true east of the fishing boundary sign at Orange Point to the middle of the channel, then southeasterly down the middle of the channel to the intersection of a line running from a boundary sign on the southern end of Hidden Harbour breakwater, then true east to Quadra Island, , except for the Campbell River Discovery Pier	Finfish closure to protect coho.	October 1 to October 31
Salmon Bay	Recreational	The waters of Salmon Bay, bounded on the north by a line from Graveyard Point to the ferry landing on the opposite shore, and on the south by the downstream side of the first bridge upstream on the Salmon River	Finfish closure to protect all salmon species.	June 1 to December 1
Cape Mudge	Recreational	Those waters inside a line from the float at Yaculta Indian Village on Quadra Island true west one nautical mile, thence southeast 160° true to the intersection with a line drawn from the fishing boundary sign on Willow Point to the Wilby Shoal light buoy, thence to the Cape Mudge light on Quadra Island	Finfish closure to protect LGS chinook.	July 15 to August 31

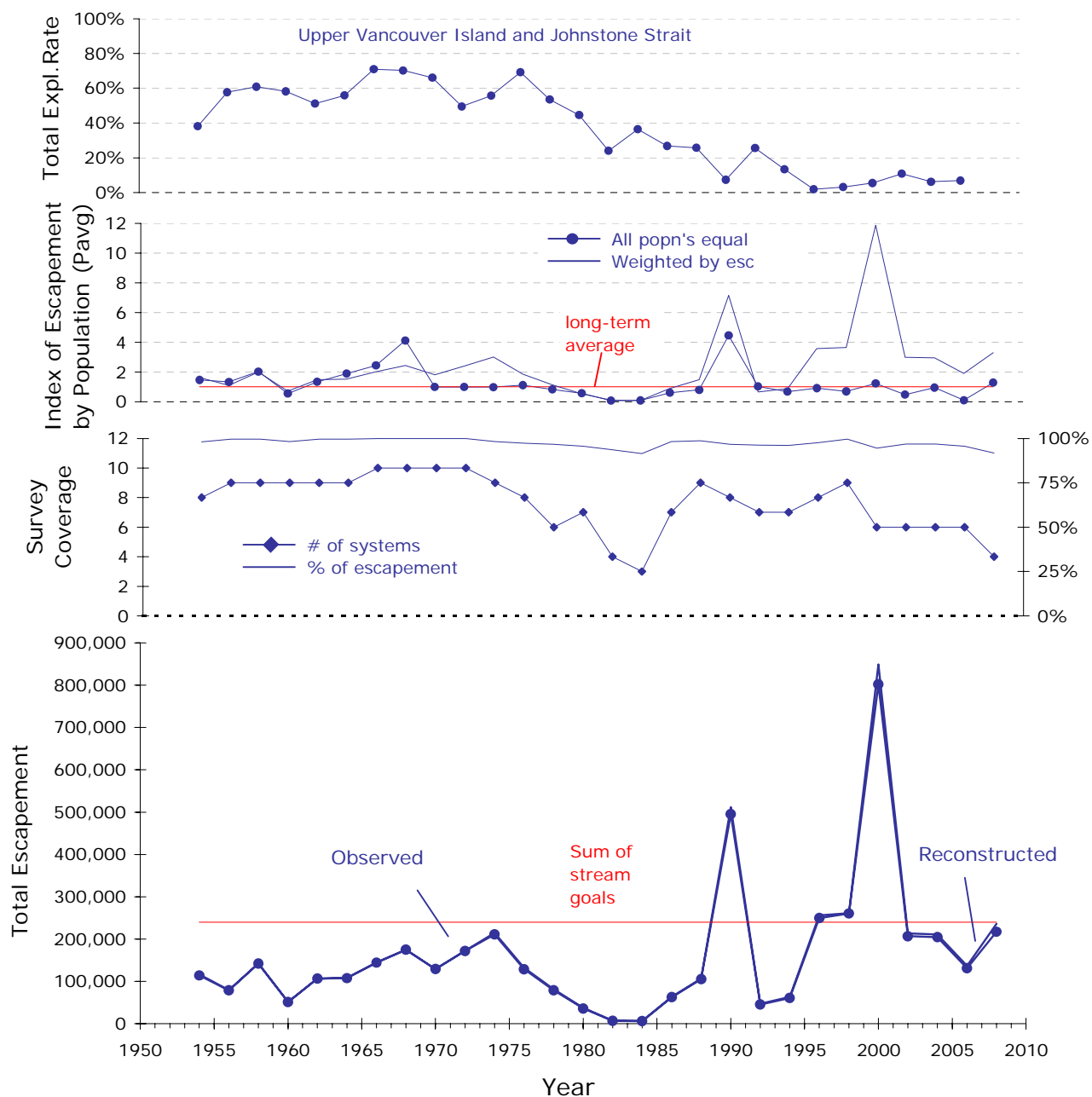
## FIGURES



**Figure 1. Aggregate escapement and exploitation rate trends for Inner South Coast pink salmon** Observed escapements are the sum of escapement estimates for all streams surveyed in a given year. The Average Index Escapement corrects for year-to-year differences in survey coverage and high variability in abundance across systems. Assumptions underlying the exploitation rate estimates are described in Section [4.3.1](#).

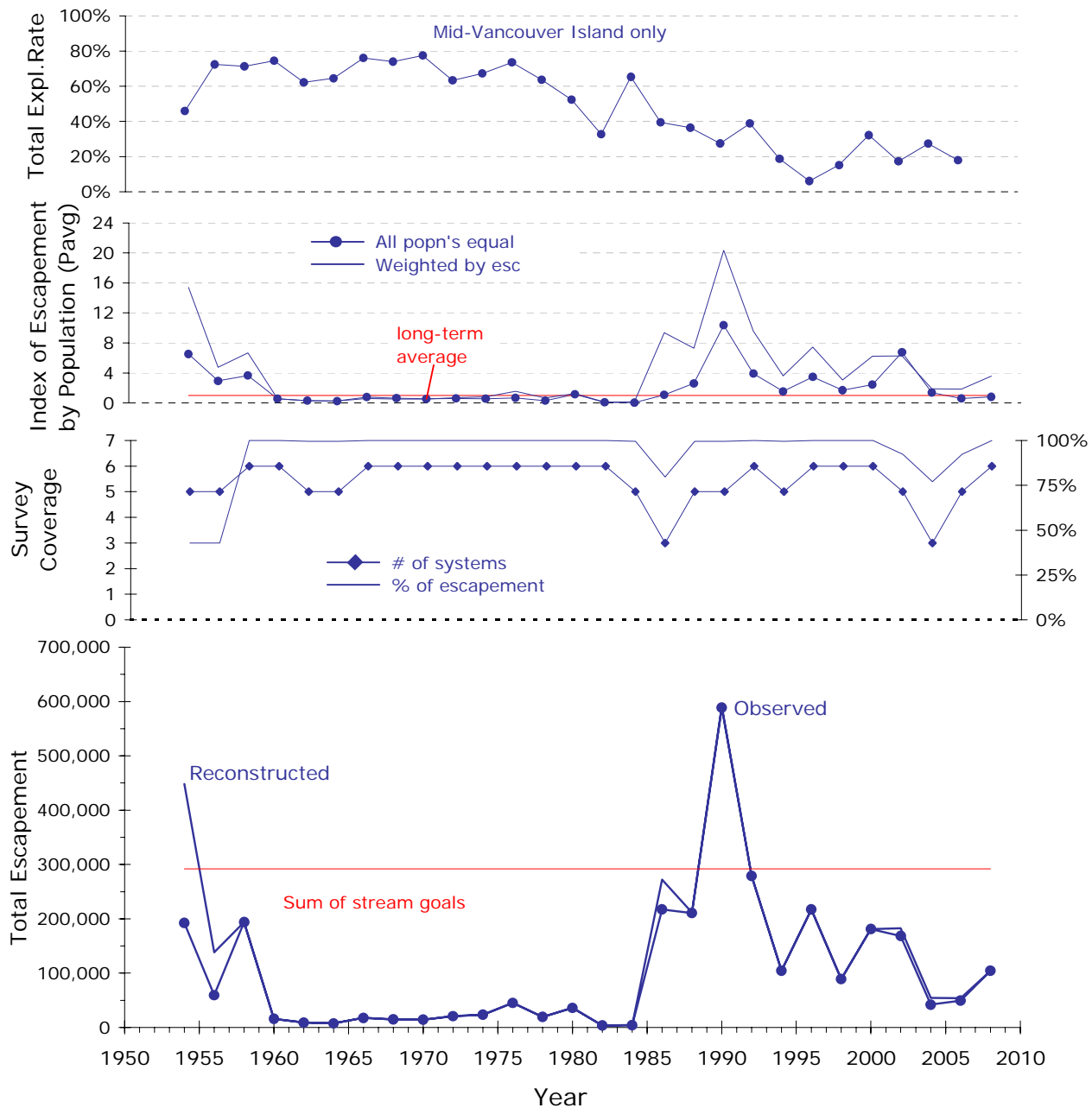


**Figure 2. Trend summary for Inner South Coast chum salmon – Upper Vancouver Island Even**  
Data sources and assumptions for each of the time series are summarized in Section 4.3.3.

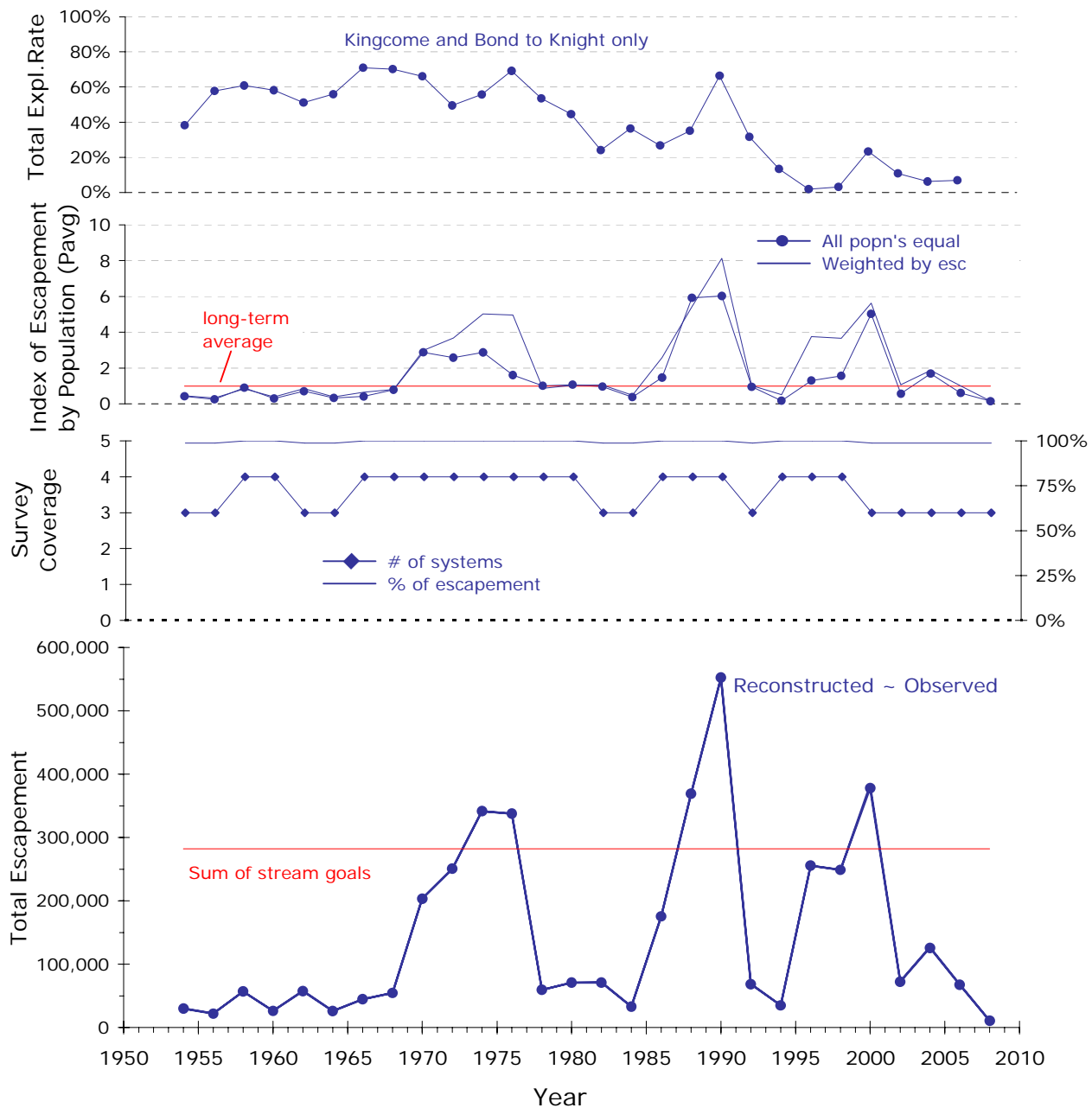


**Figure 3. Trend summary for Inner South Coast chum salmon – Johnstone Strait Even**  
Data sources and assumptions for each of the time series are summarized in Section 4.3.3.

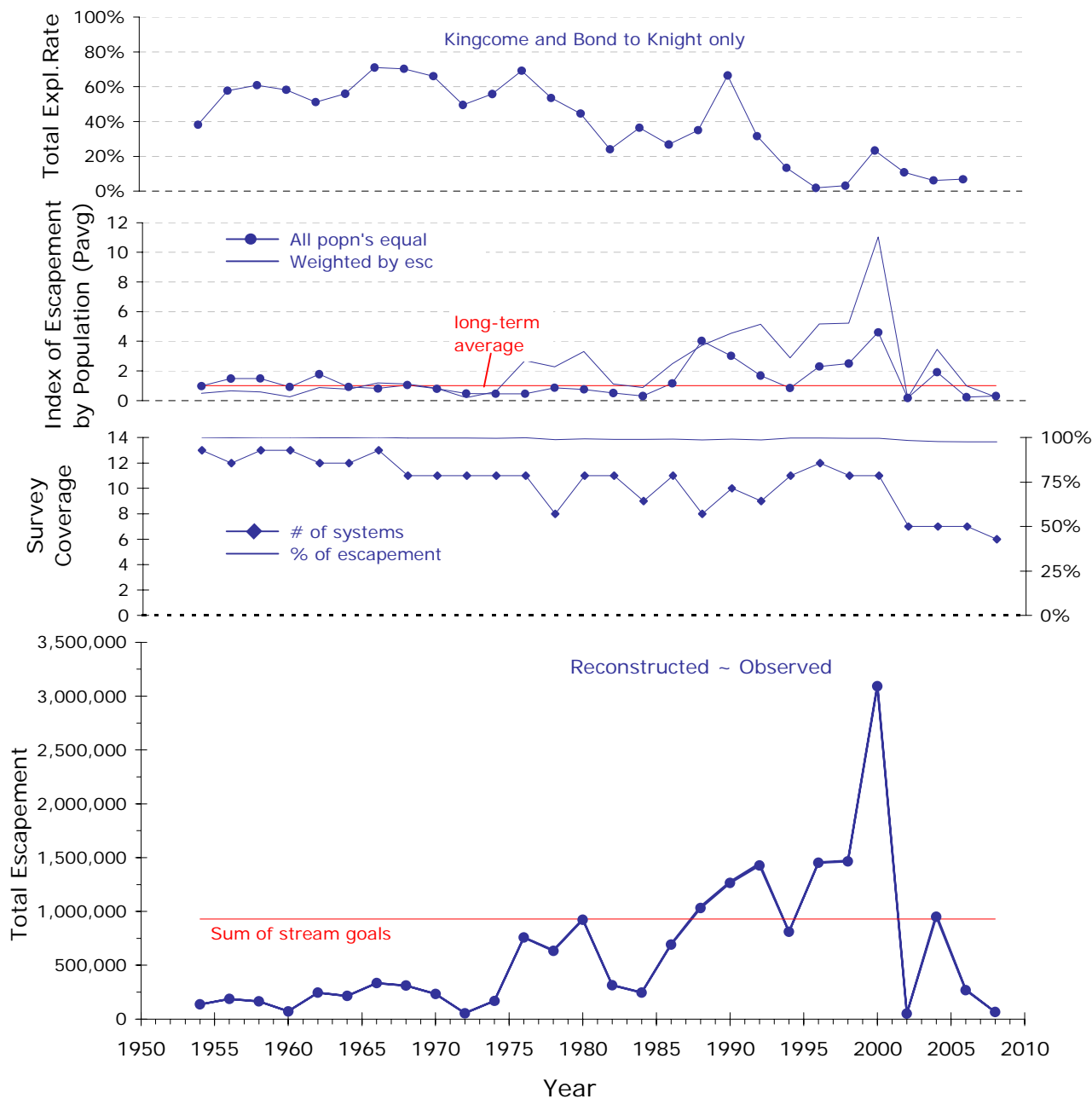




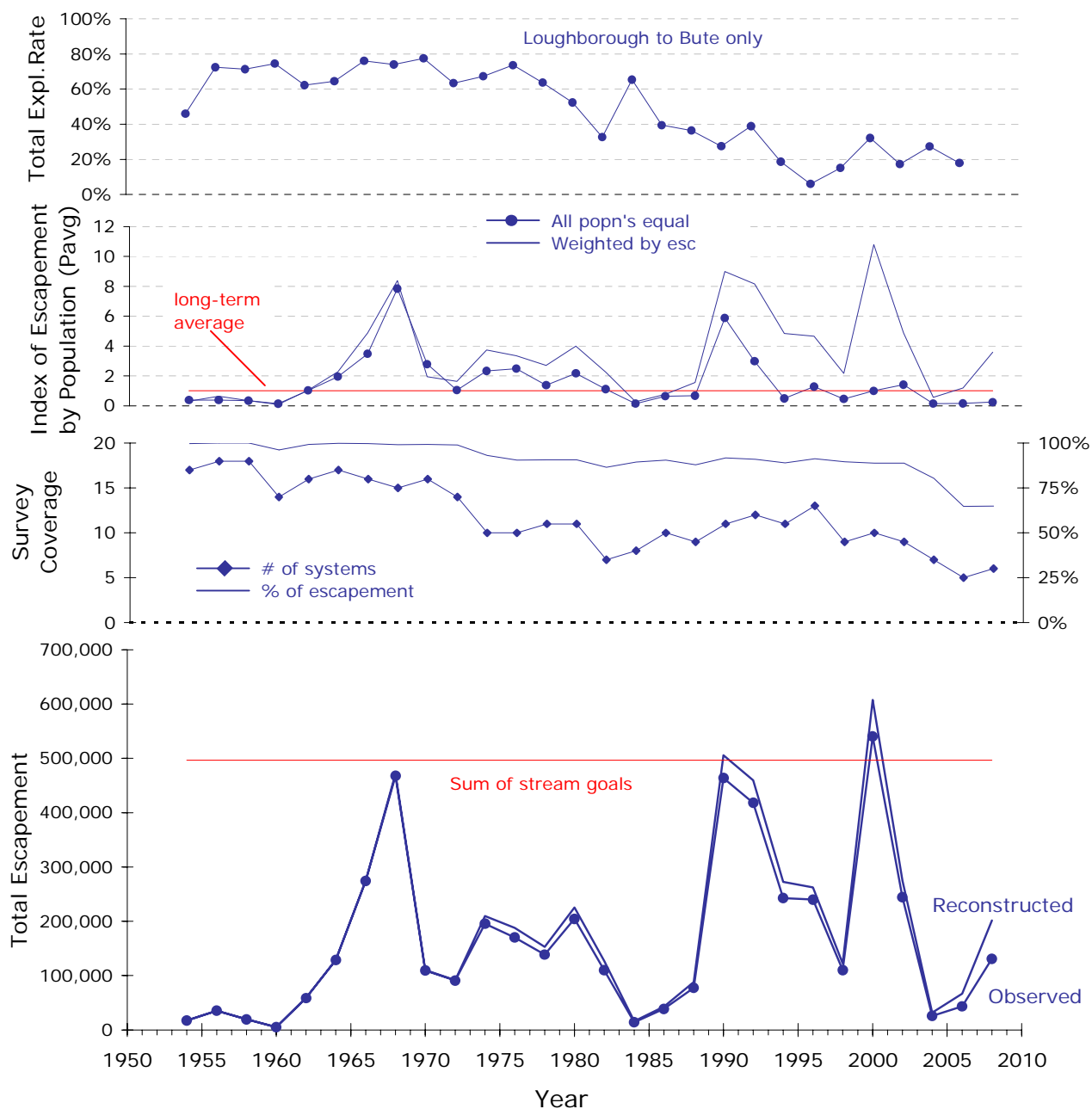
**Figure 4. Trend summary for Inner South Coast chum salmon – Mid Vancouver Even**  
Data sources and assumptions for each of the time series are summarized in Section 4.3.3.



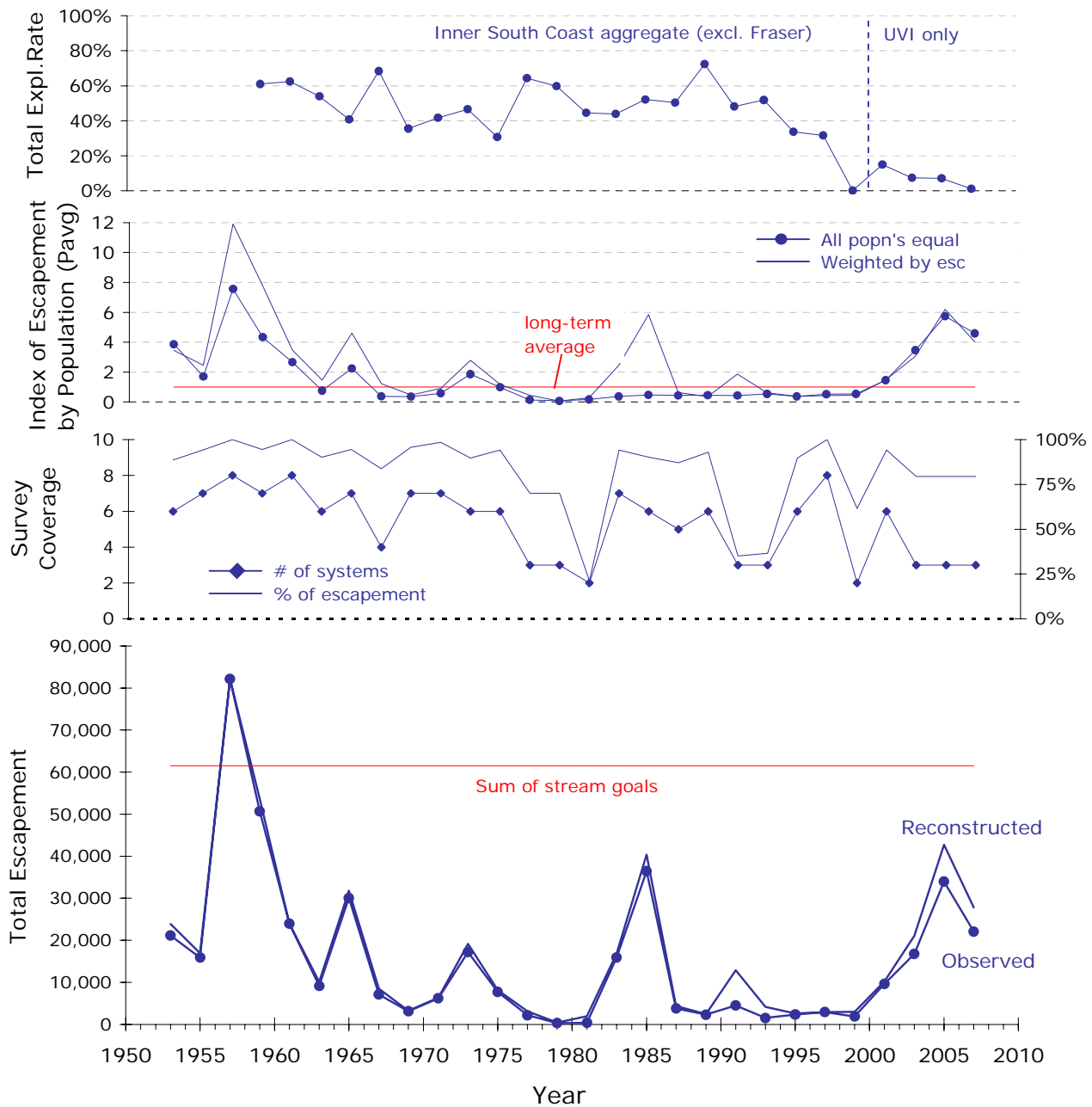
**Figure 5. Trend summary for Inner South Coast chum salmon – Kingcome Even**  
Data sources and assumptions for each of the time series are summarized in Section 4.3.3.



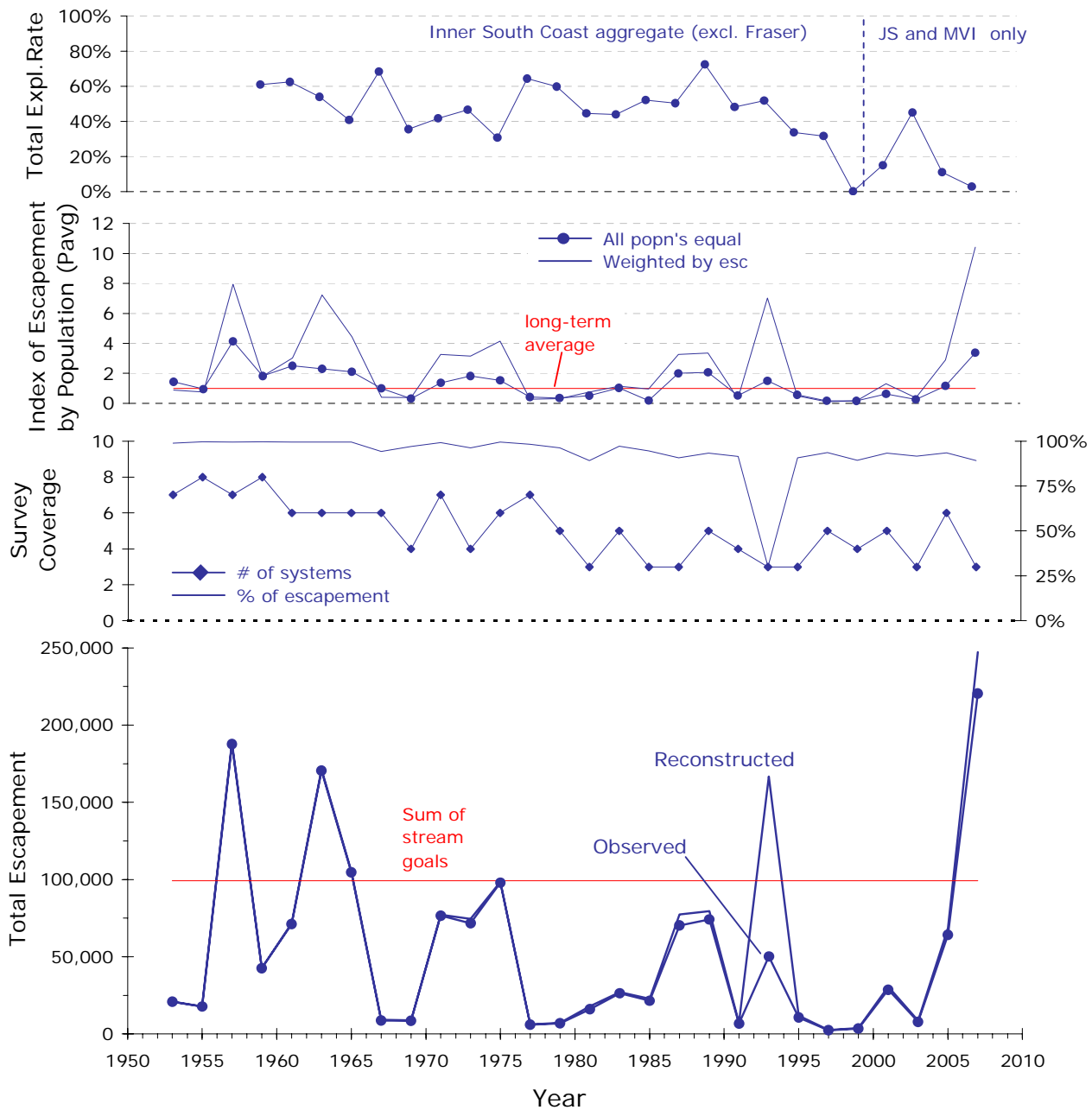
**Figure 6. Trend summary for Inner South Coast chum salmon – Bond to Knight Even**  
Data sources and assumptions for each of the time series are summarized in Section 4.3.3.



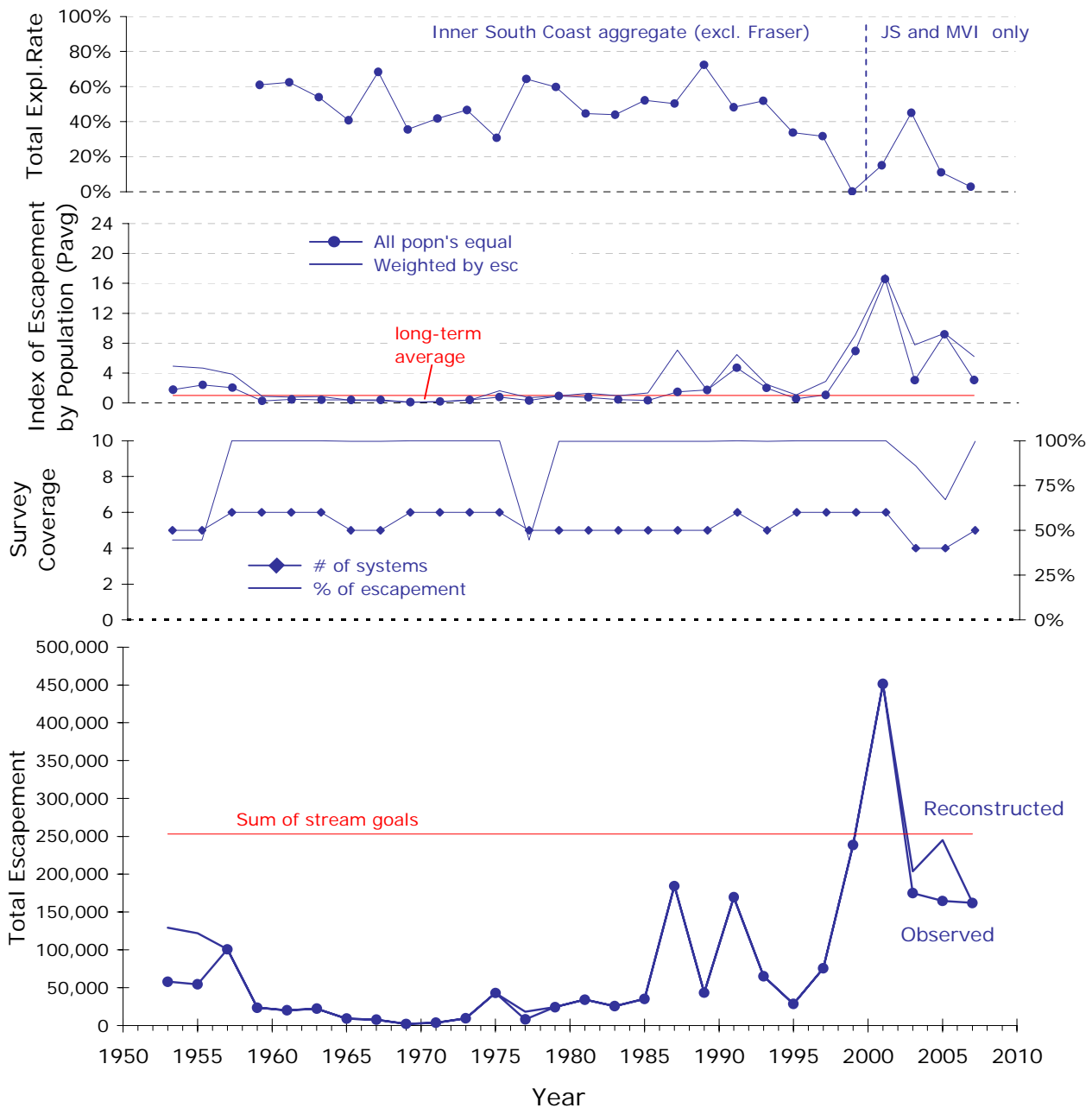
**Figure 7. Trend summary for Inner South Coast chum salmon – Loughborough to Bute Even**  
Data sources and assumptions for each of the time series are summarized in Section 4.3.3.



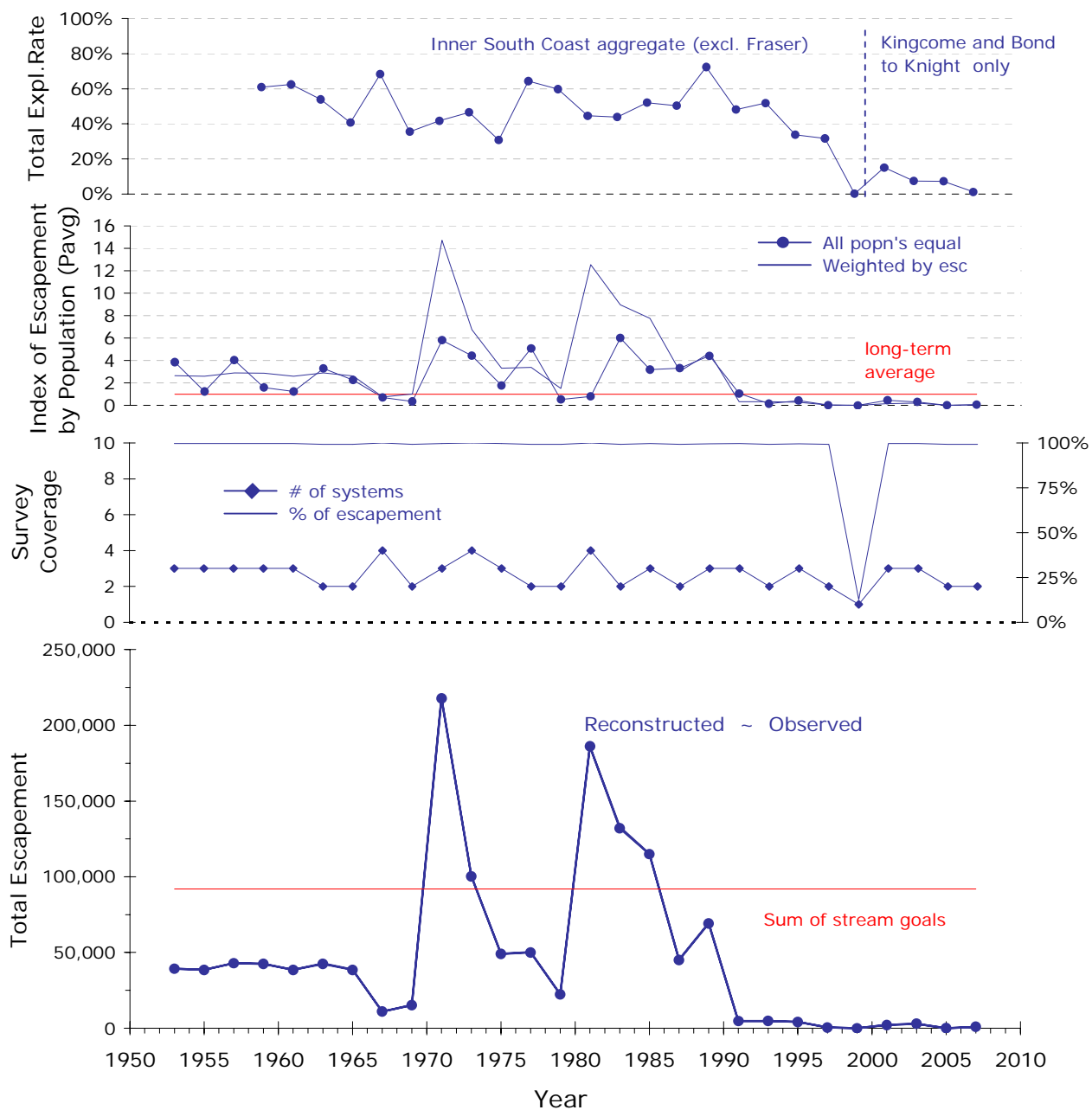
**Figure 8. Trend summary for Inner South Coast chum salmon – Upper Vancouver Island Odd**  
Data sources and assumptions for each of the time series are summarized in Section 4.3.3.



**Figure 9. Trend summary for Inner South Coast chum salmon – Johnstone Odd**  
Data sources and assumptions for each of the time series are summarized in Section 4.3.3.

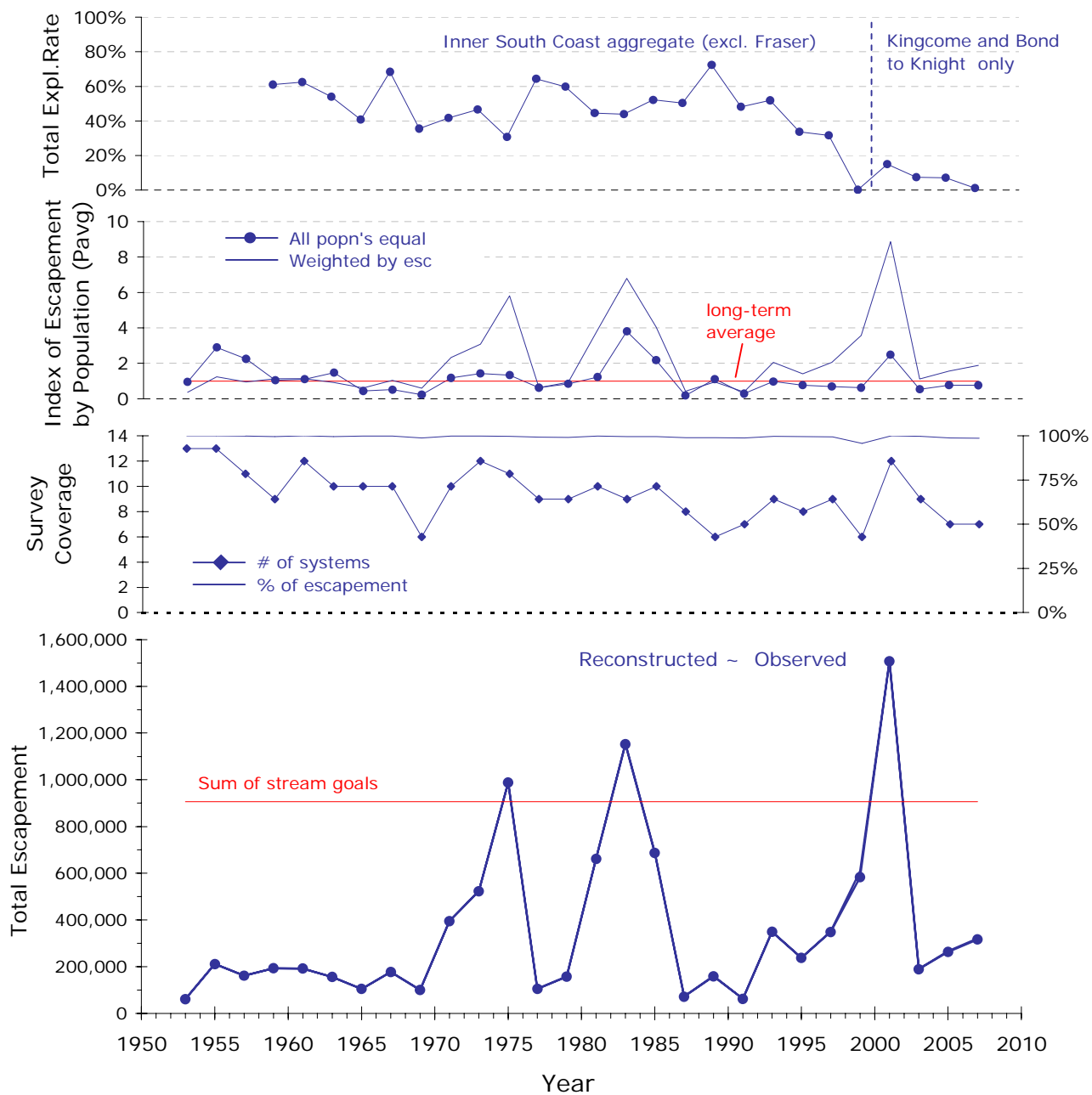


**Figure 10. Trend summary for Inner South Coast chum salmon – Mid Vancouver Island Odd**  
Data sources and assumptions for each of the time series are summarized in Section 4.3.3.

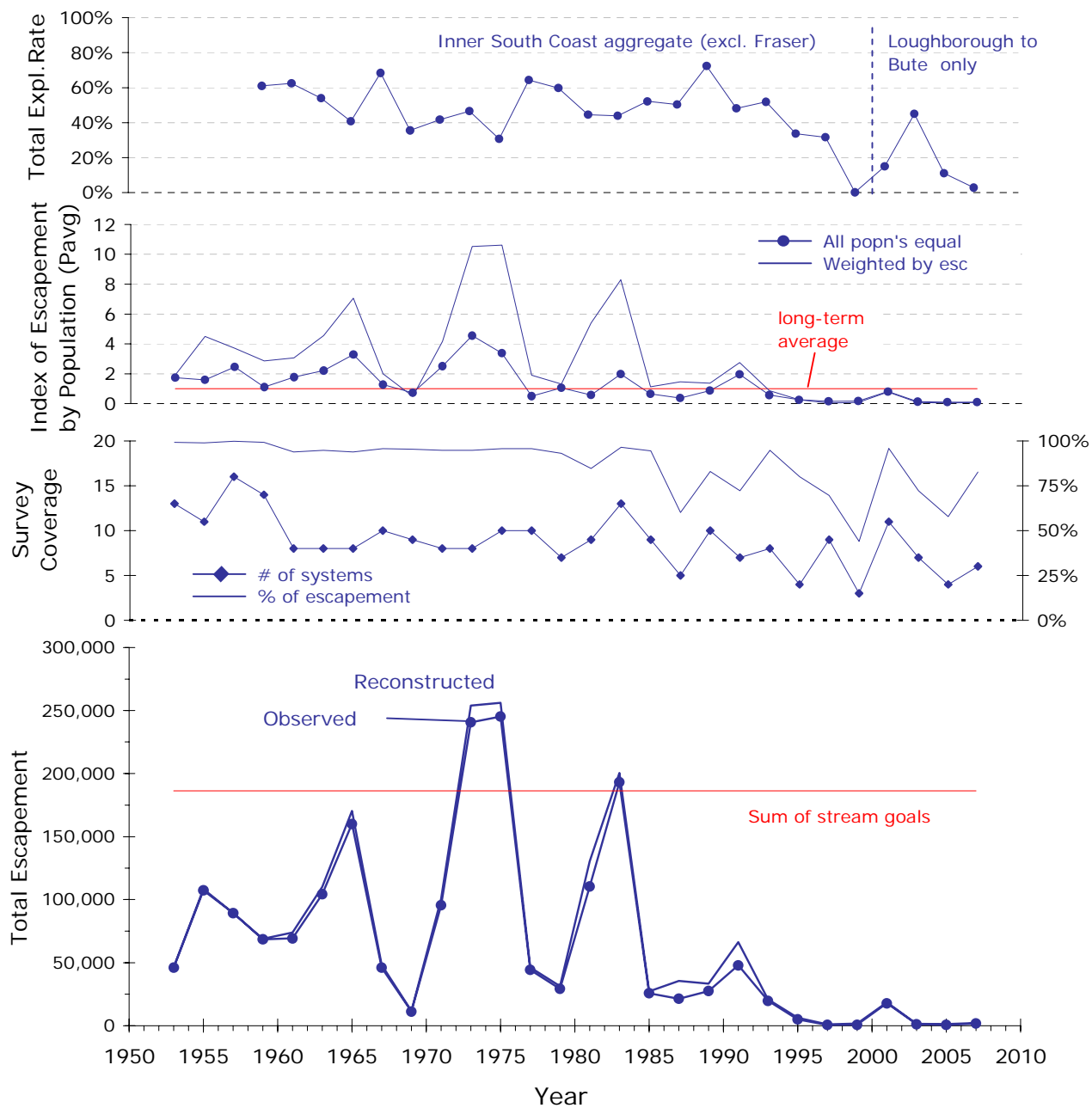


**Figure 11. Trend summary for Inner South Coast chum salmon – Kingcome Odd**  
Data sources and assumptions for each of the time series are summarized in Section 4.3.3.

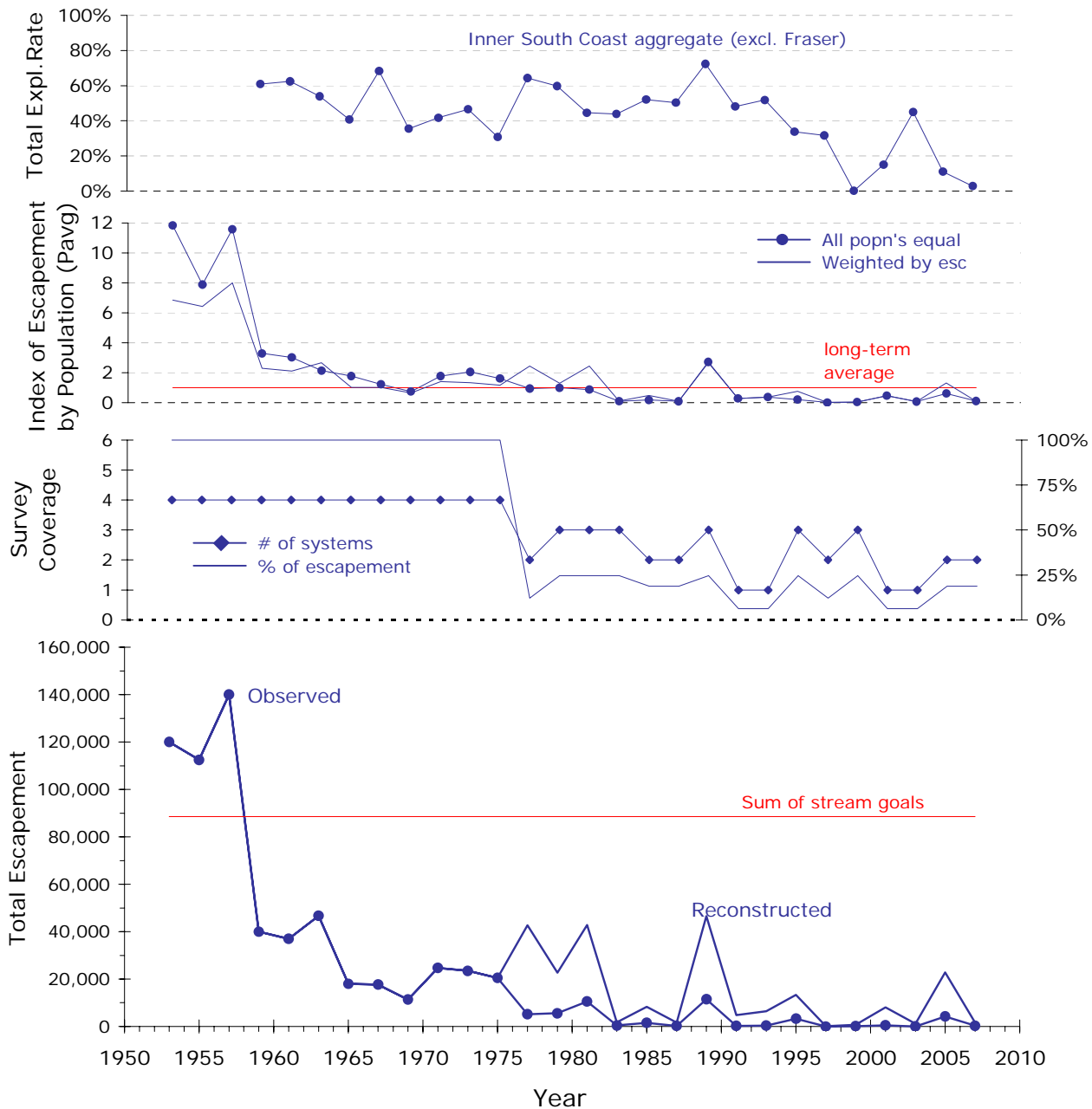




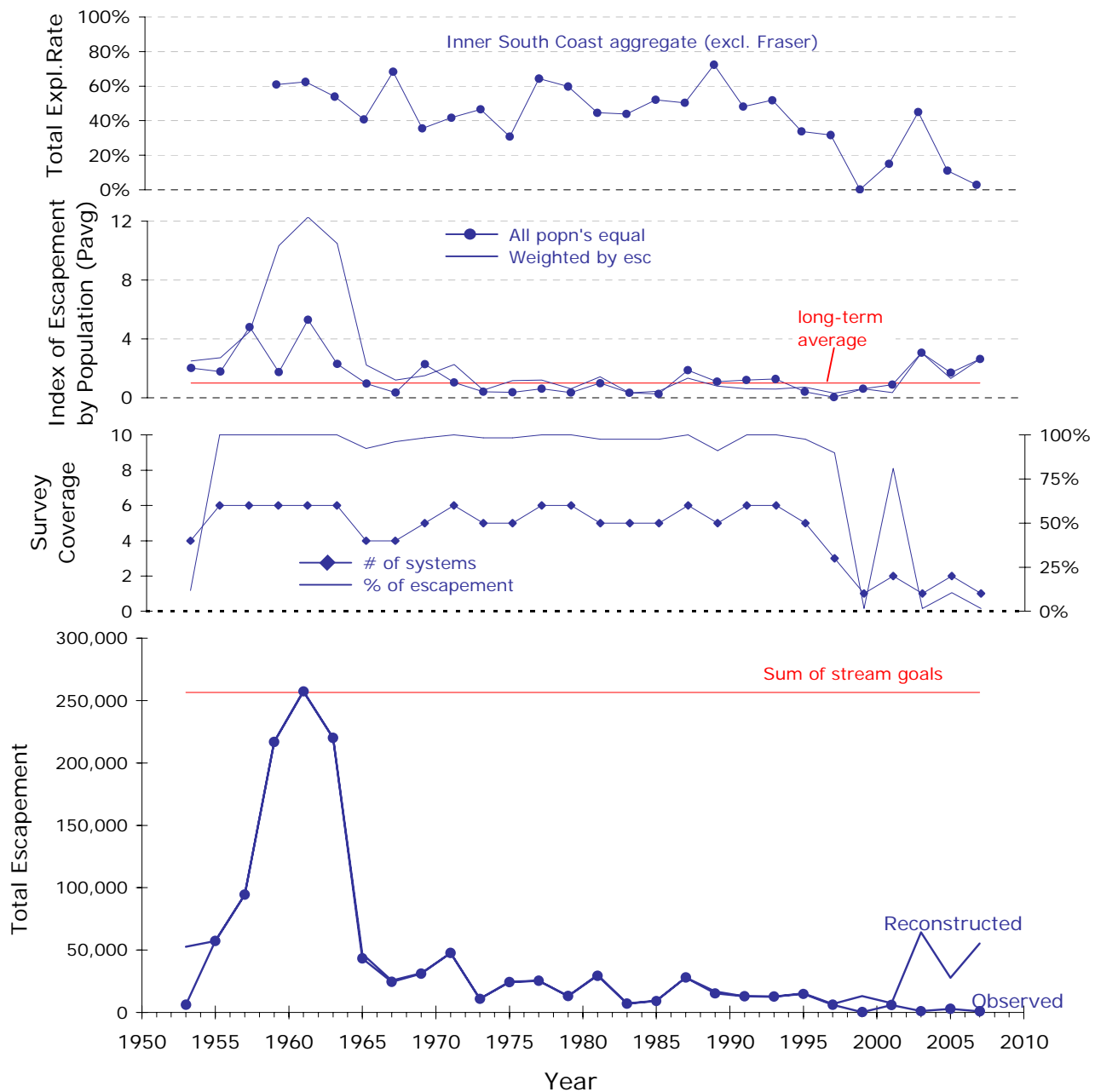
**Figure 12. Trend summary for Inner South Coast chum salmon – Bond to Knight Odd**  
Data sources and assumptions for each of the time series are summarized in Section 4.3.3.



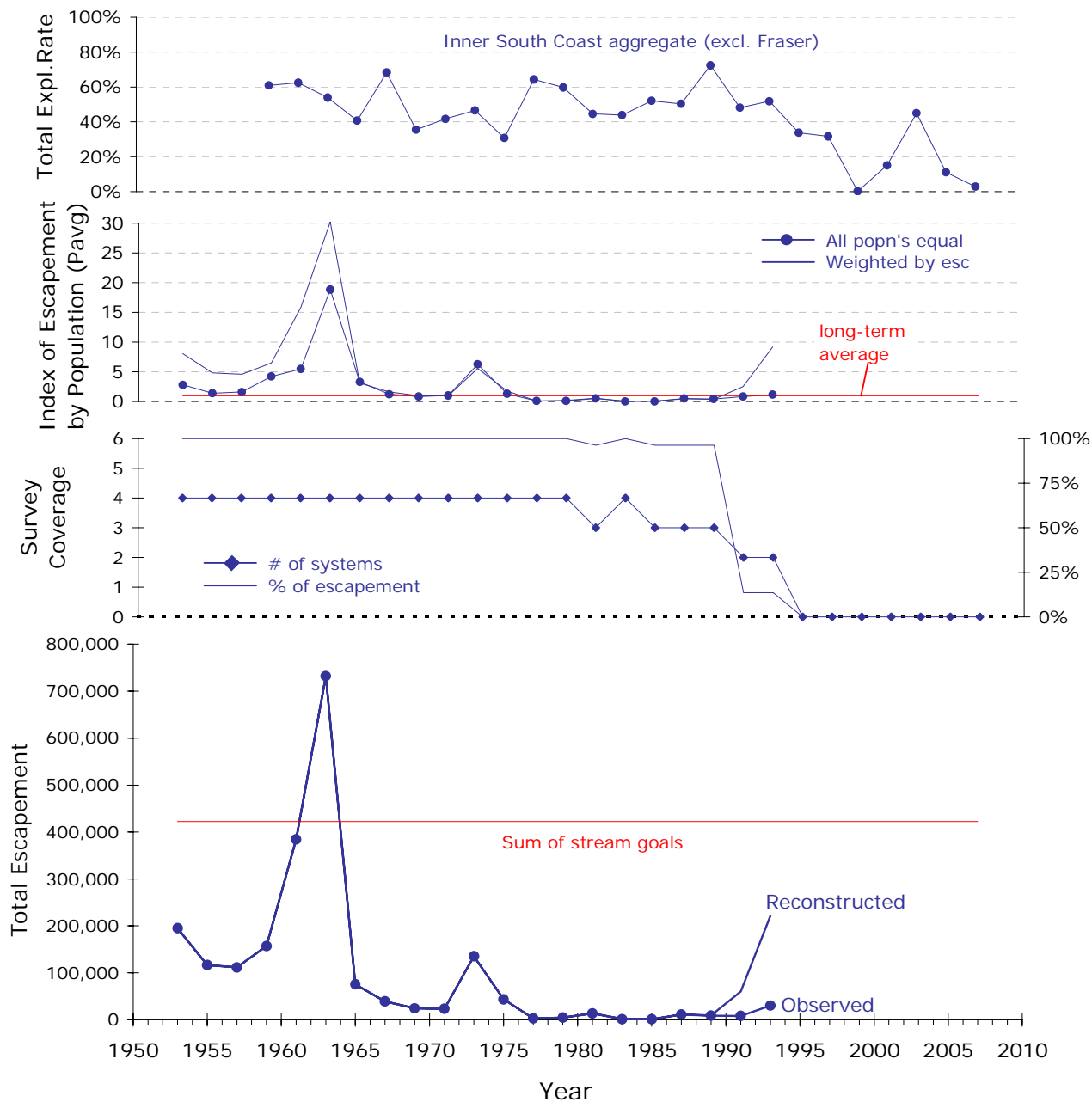
**Figure 13. Trend summary for Inner South Coast chum salmon – Loughborough to Bute Odd**  
Data sources and assumptions for each of the time series are summarized in Section 4.3.3.



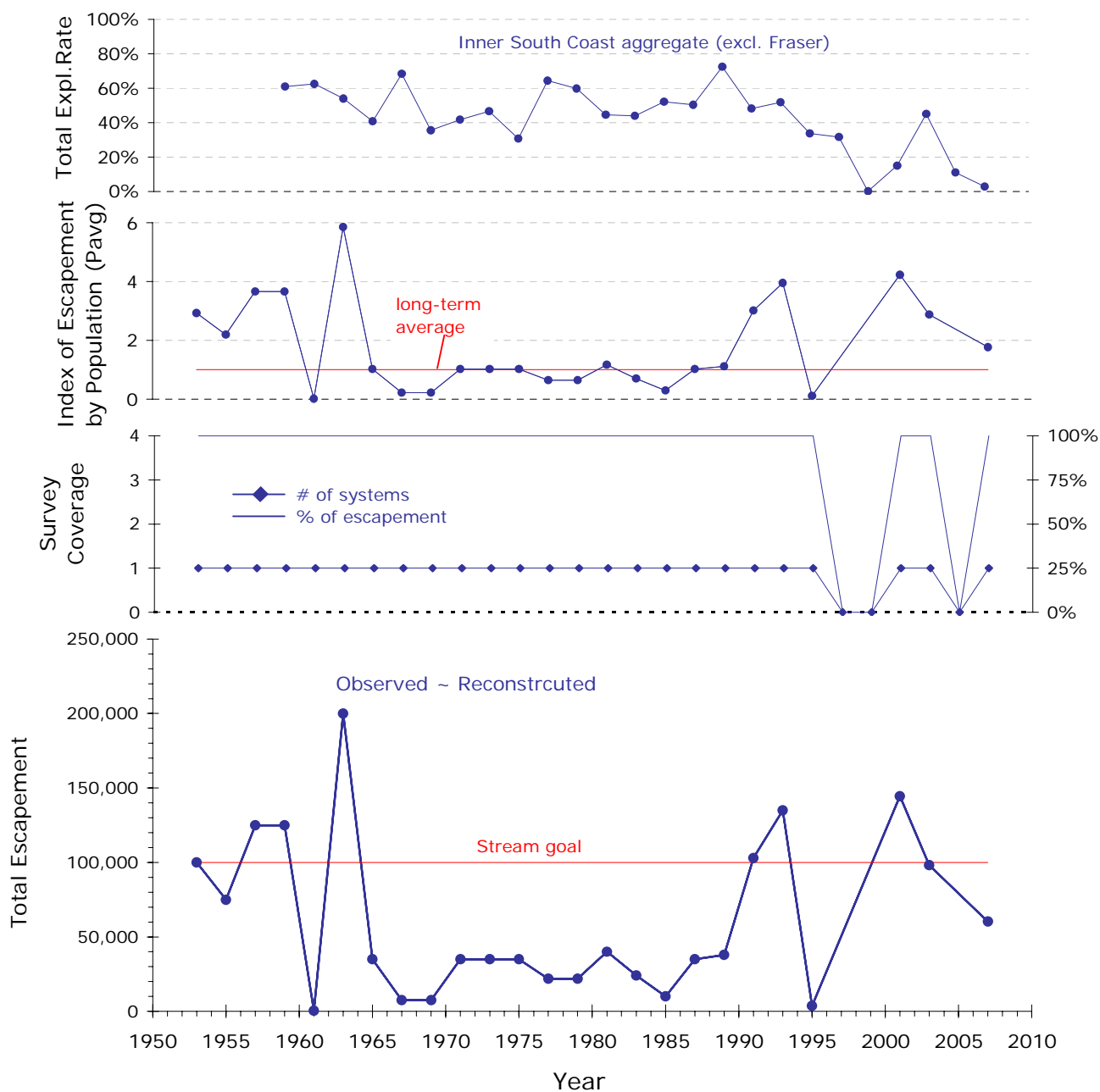
**Figure 14. Trend summary for Inner South Coast chum salmon – Toba Inlet Odd**  
Data sources and assumptions for each of the time series are summarized in Section 4.3.3.



**Figure 15. Trend summary for Inner South Coast chum salmon – Jervis Inlet Odd**  
Data sources and assumptions for each of the time series are summarized in Section 4.3.3.



**Figure 16. Trend summary for Inner South Coast chum salmon – Howe Sound Odd**  
Data sources and assumptions for each of the time series are summarized in Section 4.3.3.



**Figure 17. Trend summary for Inner South Coast chum salmon – Burrard Inlet Odd**  
Data sources and assumptions for each of the time series are summarized in Section 4.3.3.