PACIFIC SALMON COMMISSION

ESTABLISHED BY TREATY BETWEEN CANADA
AND THE UNITED STATES OF AMERICA
MARCH 18, 1985

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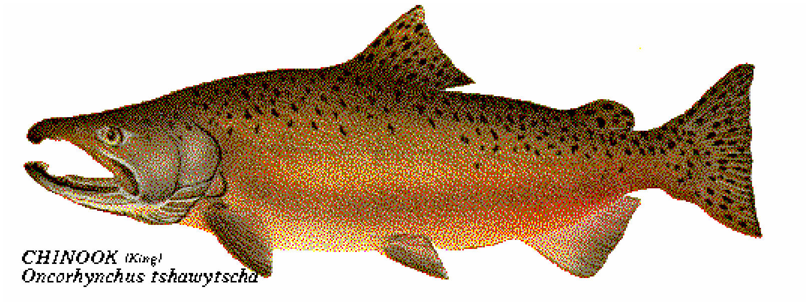
To: All Concerned Parties

From: Frank L. Cassidy, Chair, Chinook Interface Group
Gerry Kristianson, Vice-Chair, Chinook Interface Group

Date: August 2, 2006

Re: TCCHINOOK (06)-1 – Conduct of Canadian AABM Fisheries

The attached working group report on the October 19, 2005 assignment given to the Chinook Technical Committee by the Pacific Salmon Commission regarding the conduct of Canadian AABM fisheries has been received by the Commission's Chinook Interface Group (CIG). The report will be presented to the Commission for consideration at its Executive Meeting scheduled for October 17-19.



PSC Chinook Technical Committee

TO: Pacific Salmon Commission

FROM: Rick McNicol, Scott McPherson, and Dell Simmons, Co-Chairs, Chinook Technical Committee

DATE: July 28, 2006

SUBJECT: Final Report on the October 19, 2005 Assignment Re: Conduct of Canadian AABM Fisheries

The attached report addresses the ten tasks assigned to the CTC by the Pacific Salmon Commission on October 19, 2005 at the request of the Chinook Interface Group. The report was produced by a subgroup of the Chinook Technical Committee appointed by the Co-Chairs. Included in the report are the data and analyses associated with these tasks, as well as specific recommendations to the Commission based on the results and findings in the report.

Pacific Salmon Commission Joint
Chinook Technical Committee Report

Report of the Joint Chinook Technical Committee Workgroup on the October 19, 2005 Assignment Given to the Chinook Technical Committee by the Pacific Salmon Commission Regarding the Conduct of Canadian AABM Fisheries

Report TCCHINOOK (06)-1

July 28, 2006

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MEMBERSHIP OF THE CHINOOK TECHNICAL COMMITTEE WORKGROUP

Canadian Members
Dr. Rick McNicol, Co-Chair, CDFO
Dr. Gayle Brown, CDFO
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United States Members
Mr. C. Dell Simmons, Co-Chair, NMFS
Mr. Scott McPherson, Co-Chair, ADF&G
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EXECUTIVE SUMMARY

On October 19, 2005 the Pacific Salmon Commission, at the request of the Chinook Interface Group (CIG), asked the Chinook Technical Committee (CTC) to investigate the effects of changes made to the conduct and monitoring of the West Coast Vancouver Island (WCVI) and Northern British Columbia (NBC) troll fisheries in recent years. The request consisted of ten assignments. The results are summarized below.

Assignment 1. At the discretion of the co-chairs, assign a workgroup to have primary responsibility for completion of these tasks;

A workgroup was formed during a scheduled full CTC meeting October 24-28, 2005 to address the assignments from the CIG (referred to as the Workgroup in this report).

Assignment 2. View the presentation of "Chinook and Coho Salmon Genetic Stock Identification" as catalogued on the PSC website (from June 2004), and other related presentations by DFO staff (e.g., Wilf Luedke to the Southern Panel, February 2005; Rick McNicol to the Northwest Power and Conservation Council, July 2005);

The members of the Workgroup have completed this assignment. During the course of this review errors were found in the approach used to estimate stock composition for the WCVI troll fishery. The errors were corrected to the extent possible given the available data for the 2004 accounting year, and corrected stock composition estimates for the WCVI fishery are provided. No such problems were found in the approach used in the NBC troll and QCI sport fisheries.

Assignment 3. Review management plans and supporting information and provide a synopsis of management objectives and actions with respect to specific stock concerns for the NBC and WCVI Aggregate Abundance Based Management (AABM) fisheries from 1995 through 2004. Provide an assessment of the degree to which those objectives were achieved and do so in terms of harvests and of exploitation rates on the stocks of concern;

The Workgroup collated and summarized the management objectives and regulatory measures implemented for the WCVI and NBC AABM fisheries. NBC AABM fishery management objectives for WCVI Chinook were attained for all years with the exception of 2003. For the WCVI AABM fishery, management objectives were achieved for WCVI Chinook and Thompson Coho in all years. However, impacts on Lower Georgia Strait Chinook were not reduced. Changes in WCVI troll impacts on Fraser Early Chinook could not be assessed.

Assignment 4. For the years 1979-1998, and 1999-2004 provide effort and catch data by month (or other appropriate time period) by management area (or sub-area as appropriate) for the NBC and WCVI AABM fisheries;

Catch and effort data are summarized by month in Tables 4-1 through 4-8. The Workgroup concluded that the temporal pattern of fishing in the NBC troll fishery has not changed as much as the pattern observed in the WCVI troll fishery. In the WCVI troll fishery, from 1999 through 2004, over 90% of the catch in the WCVI troll fishery was taken from September through May of the following year. From 1985 through 1995, almost 90% of the catch was taken in June through August of the same calendar year. During the 1979-1982 PSC Chinook model base period approximately 60% of the WCVI troll catch occurred during June through August.

The temporal distribution of the catch within calendar years for three different time periods is presented for WCVI troll and NBC troll below.

Table Exec. 1. Temporal distribution of the Chinook catch in the WCVI and NBC troll fisheries.

Fishery	Years	March-May	June-August	September-December[8]
NBC Troll	1979-1982	12.6%	71.6%	15.8%
	1985-1995	0.4%	89.4%	10.3%
	1999-2004	20.5%	65.2%	14.3%
WCVI Troll	1979-1982	28.2%	57.6%	14.3%
	1985-1995	2.4%	89.0%	8.6%
	1999-2004	58.3%	8.6%	33.1%

* Includes catch from January and February; see Table 4-1 to 4-4 for details.

Assignment 5. To the extent possible, compare stock composition data available from coded wire tag recoveries and from the CTC Chinook model for the years 2000-2004 to the GSI data assembled by Canada to facilitate recent management of the NBC and WCVI fisheries.

The Workgroup concluded that a useful comparison of stock composition estimates based on Coded Wire Tag (CWT) recoveries, the CTC Model, and Genetic Stock Identification (GSI) data could not be made. The available GSI data and PSC model estimates of stock composition for both AABM fisheries are presented in sections 5 and 8, respectively, of the main body of the report. Due to the general lack of representation of wild stocks, and in many cases, the lack of complete representation of hatchery stocks, in the CWT database, stock composition in these fisheries cannot be estimated using CWT recovery data alone.

Assignment 6. Specify the sampling levels and procedures employed in each fishery and time period for CWT and GSI data for the years 1985-2004;

CWT—Both the WCVI and NBC troll fisheries have met or exceeded a sampling level of 20% of the annual Chinook landed catch in all but one year from 1985-2004 (Figures 6-1 and 6-2). However, there were sampling periods within a year when less than 20% of the catch was sampled. Sport expansions for both fisheries are based on awareness factors that are derived from creel observations, voluntary head returns, and estimated catches; at times these awareness factors are based on data gathered outside the specific fishery of interest. The Workgroup notes that direct sampling of the heads in Canadian sport fisheries would likely increase the accuracy and precision of CWT recovery data.

GSI—The NBC troll fishery was sampled in a representative manner from 2002-2005 to estimate: 1) the stock composition of Chinook in landed catch when fisheries were open and 2) the stock composition of available Chinook when fisheries were not open (samples obtained by test fishing). The sampling design provides annual estimates of stock composition of landed catch and temporal estimates of stock composition throughout the year. Sample sizes were sufficient to estimate contributions of stocks or stock groups that comprised 5% or more of the annual catch, with reasonable precision (see Tables 5-1A and 5-1B). The NBC AABM sport fishery was sampled in a representative manner from 2003-2005. The overall precision of the estimates is slightly less than that for the troll fishery. Estimates by month are less precise, and likely represent trends for major contributing stocks only.

The WCVI troll fishery GSI sampling was only applied to unclipped fish (2004 and 2005 accounting years). Upon detailed examination of the 2004 year, the Workgroup concluded that this approach, in conjunction with other errors, led to an incorrect estimation of the stock composition of the total catch that year. The Workgroup recommends that if future GSI work in WCVI fisheries is undertaken, that representative GSI sampling be done without regard to clip status. For both fisheries sample sizes taken would not be expected to provide reliable estimates of the contribution of stocks that comprise a small proportion of the catch.

Assignment 7. For those stocks for which analysis is available, update through 2003, with the addition of 2004 when data becomes available, the tables listed in Appendix G of CTC (2004). For all stocks compare average figures for appropriate prior years to average figures for those years (e.g., 1999-2004) for which specific stock concerns influenced the conduct of the NBC and/or WCVI fisheries;

The Workgroup updated the Appendix G tables through 2004.The WCVI AABM fisheries impacts are summarized below:

Table Exec 2. Summary of estimated changes of impacts of the WCVI AABM fisheries (troll and sport) on Chinook exploitation rate indicator stocks from 1979 to 2004.

Stock Complex	Summary Comments
Alaskan	Not significantly impacted.
North Central BC (Kitsumkalum)	Not significantly impacted.
WCVI (Robertson Creek)	The proportion of the total run accounted for by the WCVI AABM fisheries in 2002-2004 (2.7%) is less than 40% of the 1979-1982 average of 7%. The proportion of the total run taken by the WCVI troll fishery from 1979-1982 of 6.5% decreased to 0.2% from 2002-2004, about 3% of the base level.
Upper Georgia Strait (Quinsam Fall)	Historic impacts average less than 1%. No impacts observed in recent years.
Lower Georgia Strait (Puntledge, Cowichan, Big Qualicum)	Impacts observed in 2002-2004 were about the same as those in 1979-1982, for Puntledge and Big Qualicum stocks. Impacts on the Cowichan fall stock has tripled in 2002-2004, compared to 1985-1995.
Fraser Early (none)	No information

Fraser Late (Chilliwack)	No base period information is available. Impacts in 2002-2004 average 57% of the rates seen from 1985-1995.
Puget Sound Spring Chinook (Nooksack Fingerling, Nooksack Yearling, Skagit Fingerling, Skagit Yearling, White River Yearling)	Base period data are not available for these stocks and a complete time series in recent years is not available for Nooksack Yearlings and White Yearlings. The average proportion of the total run accounted for by reported catch in 2002-2004 exceeds the levels observed in prior years in 5 of 6 cases for Nooksack Fingerlings, 5 of 5 cases for Skagit Fingerlings, and 11 of 11 cases for Skagit Yearlings.
North Puget Sound Fall (Skagit Summer, Stillaguamish Fingerling, Nisqually Fingerling, Samish Fingerling)	Base period data are not available for this stock group. For most stocks, the proportion of the run taken by the fishery has not changed since the mid 1980s.
South Puget Sound Fall (SPS Fall Fingerlings, SPS Fall Yearling)	This stock group shows little change in the proportion of the run taken in 2002-2004 compared to the base period or other time periods.
Hood Canal (George Adams)	This stock group shows little change in the proportion of the run taken in 2002/03 compared to the base period or other time periods.
Washington Coastal Fall (Hoko, Sooes, Queets)	Historically, the reported catch by this fishery accounted for approximately 10% of the run. Impacts have been substantially reduced since 1999. In this stock complex, base period data are only available for the Queets. The proportion of the Queets run accounted for by the WCVI AABM fishery has been reduced from about 12% in the base period to about 1% in 2002-2004.
Willamette Spring	The reported catch by this fishery accounted for approximately 4% of the run during the base period. Impacts observed in 2002-2004 are about 3%. Impacts from 1985-1998 were about 2%.
Columbia River Summer	The reported catch by this fishery during the base period accounted for about 17% of the run. Impacts observed since 2001 have been substantially higher than levels observed from 1994-2000. In 2002-2004, the 14% of the run accounted for by the WCVI AABM fisheries was about 85% of the 1979-1982 base period levels.
Columbia River Tule (Cowlitz, Spring Creek, Lower River Hatchery)	The reported catch by this fishery accounted for approximately 16%-25% for these three stock groups prior to 1985. Impacts were reduced in response to PST regimes from the mid-1980s to late 1990s. Impacts observed in 2002-2004 were above the levels observed since 1985 and range from 59% to 95% of 1979-1982 base period averages, for these three stocks.
Lewis River Fall	The reported catch by this fishery accounted for about 8% of the run during the base period. Average impacts since then have been similar, about 7% from 1985-1995 and about 8% from 2002-2004. Impacts were estimated at 0% from 1996-2000.
Columbia River Bright	The reported catch by this fishery accounted for about 7% of the run in 1979-1982 but increased to an average of about 9% from 1985-1995. Impacts have been substantially reduced under the PST since the mid 1990s and were estimated to average about 2% in 2002-2004.
Snake River Fall	CWT data for this stock are very limited. Average impacts of 2.8% in 2003-2004 were about one-fifth of those observed from 1988-1994.
Salmon River Fall (Oregon Coast)	The reported catch by this fishery accounted for about 6% of the run during the base period and the average remained relatively unchanged for the period of 1985-1995. Average impacts were reduced to less than 1% since 1995 with no year since exceeding 2%.

The NBC impacts are summarized below:

Table Exec. 3. Summary of estimated changes of impacts of the NBC AABM troll fishery on Chinook exploitation rate indicator stocks from 1979 to 2004.

Stock Complex	Summary Comments
Alaskan	No base period data is available. Historic impacts average less than 1%.
North Central BC (Kitsumkalum)	No base period data is available. Impacts averaged about 8% of the run from 1985-1995 and impacts in 2002-2004 averaged about 3%.
WCVI (Robertson Creek)	The proportion of the run accounted for in recent years (1.8%) is less than one-sixth of that observed during the base period (about 11%).
Upper Georgia Strait (Quinsam Fall)	This fishery accounted for over 10% of the impacts to this stock in the base period. Impacts since 1999 have averaged less than 1%.
Lower Georgia Strait (Puntledge, Cowichan, Big Qualicum)	Impacts have decreased since the base period, and remain relatively small (about 2% or less).
Fraser Early (none)	No information
Fraser Late (Chilliwack)	No base period information is available. Impacts have consistently been < 1% since 1985.

Puget Sound Spring Chinook (Nooksack Fingerling, Nooksack Yearling, Skagit Fingerling, Skagit Yearling, White River Yearling)	The proportion of the run accounted for by reported catch in this fishery has remained unchanged under PST management. The impact on these stocks is very small (<1%).
North Puget Sound Fall (Skagit Summer, Stillaguamish Fingerling, Nisqually Fingerling, Samish Fingerling)	The impact of the fishery on these stocks is small, but has increased slightly since 1999 for the Skagit Summers, averaging about 2% of the run from 2002-2004.
South Puget Sound Fall (SPS Fall Fingerlings, SPS Fall Yearling)	Impacts on this stock group have increased in 2002-2004 compared to the base period and the pre 2002 periods, but remain very small (<1%)
Hood Canal (George Adams)	Impacts remain very small (<1%)
Washington Coastal Fall (Hoko, Sooes, Queets)	The reported catch by this fishery accounted for about 18% of the Queets run in the base period and about 12% from 1985-1998, but decreased to about 6% from 1999-2004.
Willamette Spring	The reported catch by this fishery accounted for approximately 10% of the run during the base period. Impacts have been substantially reduced since 1985 under the PST, and averaged < 1% of the run in 2002-2004.
Columbia River Summer	The reported catch by this fishery accounted for 8% of the run during 1979-1982, then about 3% of the run from 1985-1998. Impacts observed for 2002-2004 indicate that the reported catch for this fishery represented about 9% of the run, slightly higher than during the base period and 3 times the 1985-1998 impacts.
Columbia River Tule (Cowlitz, Spring Creek, Lower River Hatchery)	The reported catch by this fishery accounted for a small proportion of the run during 1979-1982. Impacts observed for 2002-2004 indicate that the proportion of the run accounted for by this fishery has not changed significantly under the PST.
Lewis River Fall	This fishery has had a light impact on this stock throughout the time series, averaging about 3% of the run from 1981-1998, and then averaging less than 2% since 1999.
Columbia River Bright	The reported catch by this fishery accounted for approximately 6% of the run in 1979-1982. Impacts observed in 2002-2004 averaged about 3% of the run, about one-half the level observed during the base period.
Snake River Fall	Impacts in 2003-2004 averaged about 1% of the run, and were less than one-quarter (25%) of the average impact observed from 1988-1994.
Salmon River Fall (Oregon Coast)	The reported catch by this fishery accounted for about 21% of the run during the base period, then dropped to average of about 12% from 1985-1995, and subsequently dropped again to an average level of about 5% from 2002-2004.

Assignment 8. Provide annual stock compositions through 2004 for the WCVI and NBC fisheries as in Appendix I of TCCHINOOK (04)-4, again with average figures calculated for appropriate prior years compared with average figures for those years for which specific stock concerns influenced the conduct of the NBC and WCVI fisheries;

The PSC Chinook model estimates of stock composition are provided in Tables 8-1 through 8-10. Since the PSC Chinook model does not include representation for all stocks that may be encountered in a fishery, stock composition estimates generated from the model are not directly comparable to those estimated through other means. In addition, the model, as currently constructed, cannot currently account for temporal changes in the conduct of these fisheries. Therefore, model estimates of stock composition provided do not reflect changes in the temporal conduct of the fisheries.

Assignment 9. For the NBC and WCVI fisheries, provide the CTC's assessment of the GSI data that supports the presentations referenced in 2 above and the

stock-specific management plans, and detail how that data may be utilized in advancing our understanding of stock composition in those fisheries;

The Workgroup concluded: 1) small sample sizes result in considerable uncertainty regarding contributions of stocks that comprise a small portion of the catch, 2) GSI sampling in the WCVI fishery was not representative, and 3) there are questions regarding the potential for bias resulting from an unbalanced representation of stocks included in the baseline.

The utility of GSI estimates could be improved by using standardized genetic baselines and standardized procedures for generating and reporting stock compositions. Genetic methods could provide information for fishery management that cannot be readily obtained from CWT experiments. For example, they could detect the presence of major stocks that are not adequately represented by CWTs. Genetic methods are well suited to estimating the catch of major stocks at reasonable cost. However, these methods are not capable of providing estimates of contributions of stocks that comprise small proportions of the catch with a high degree of reliability unless very large sample sizes are taken.

Assignment 10. After the tasks listed above have been completed, outline, in a separate document if necessary, technical difficulties for implementation of the agreed AABM fishery regimes that may be created by fishery patterns that change (possibly in-season) in order to alter the exploitation rates on specific stocks. Include any recommendations for monitoring programs and for analytical methods to estimate stock-specific impacts (across the range of stocks in an AABM fishery) that may result from such alteration in the conduct of a fishery.

The Workgroup noticed that the fishery index (harvest rate index) for the WCVI troll fishery derived from the CWT exploitation rate analyses has consistently deviated from the fishery index estimated by the PSC Chinook Model (Figure 1 below) since 2000. Prior to 2000, the two indices track relatively closely. Since then, however, the values have diverged, with the CWT-based index being consistently higher than the Model index. This suggests that the ability of the Model to accurately reflect impacts of the WCVI troll fishery has deteriorated. The Workgroup developed methods to improve the ability of the Model to estimate the impacts of changing catch patterns for this fishery.

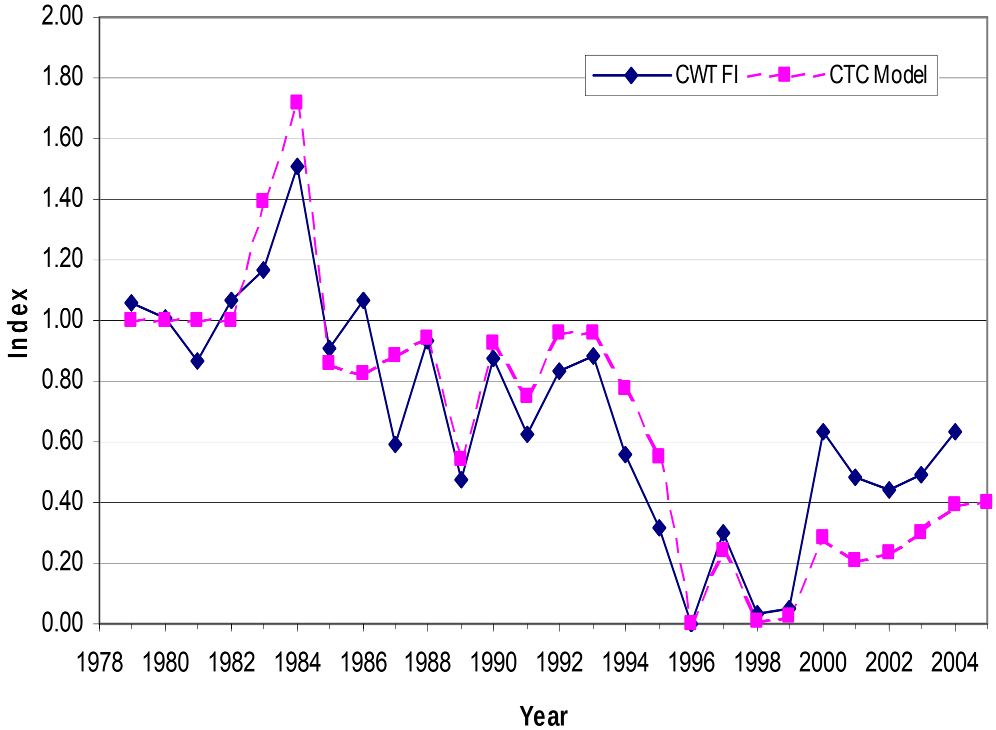


Figure 1. Estimated CWT (through 2004) and PSC Chinook model (through 2005) landed catch fishery indices the WCVI troll fishery, from the 2006 PSC Chinook model calibration.

Two additional analyses were investigated by the Workgroup. The results of these analyses are presented in Section 10 of the report. The first analysis decomposes the annual stock-age specific exploitation rates employed by the PSC Chinook model into monthly stock-age specific exploitation rates. Using this procedure, the stock composition of monthly catches can be estimated. Table 10-1 and Figure 10-1 illustrate how stock composition in the WCVI troll fishery would be expected to change by month. At base period stock abundance levels, Columbia River stocks comprise a larger proportion of the catch earlier in the season (March through June), while Puget Sound stocks comprise a larger proportion of the catch later (September through November). The proportion of Fraser stocks in the catch is predicted to be largest in July and August.

The effect of changes in timing of catch can be represented in the PSC Chinook model by two means: (1) Annual stock-age exploitation rates could be developed by weighting monthly stock-age-fishery exploitation rates by the magnitude of the monthly catch; or (2) annual scalar values could be estimated and used to modify the base period exploitation rates. By combining these adjustments to annual base period exploitation rates with other regulatory measures such as minimum size limits, changes in fishing patterns and regulations could be evaluated. The Workgroup examined the stock composition during three periods with different fishing regimes (1987 to 1995, 1999-2001, and 2002-2004), assuming base period levels of stock abundances.

The methods described above provide a means to modify the PSC Chinook model to reflect the effect of changes in fishery regulations and timing. For fishery planning purposes, the main technical questions relate to the degree to which the fishery timing can be predicted. Unanticipated changes in fishing patterns increase uncertainty in the ability to accomplish stock-specific management objectives. Fishing patterns can change for any number of reasons, either preseason or inseason. Without additional information from managers regarding preseason fishery planning, assumptions regarding fishing patterns must be made. Common assumptions in these cases include the same pattern as observed last year, or a pattern similar to a recent year average. The CTC currently uses these types of assumptions when doing preseason modeling of the SEAK troll fishery. The policy question, simply put, but more difficult to answer is: “How much of a temporal change is too much?” The answer is rooted in policy issues relating to the degree to which deviations from expectations can be tolerated and accommodated by the management system.

The second analysis involved the development of a ‘concentration index’ to help isolate the effects of fishing pattern changes as reflected in CWT recovery patterns. The concentration index standardizes CWT recoveries by accounting for observed changes in brood year survival, CWT release levels, and fishery catch. By accounting for changes in these factors, any changes in the CWT concentration index can be attributed to one or more of the following confounded factors:

1) Changes in the temporal and spatial conduct of a fishery.

2) Changes in fishery regulations, such as size limits.

3) Changes in stock distribution.

4) Changes in stock survival and abundance relative to other stocks.

The results of this analysis are presented in detail in Section 10.

Workgroup Recommendations

The results of this report have led the Workgroup to five specific recommendations. Some of these recommendations will require policy direction from the PSC. Our recommendations are highlighted in bold font; specific requests for PSC guidance are also highlighted in bold font, and bulleted.

Several analyses conducted by the Workgroup suggest that temporal changes in the conduct of the WCVI troll fishery have led to both positive and negative changes in impact on individual stocks of conservation concern. Currently, the PSC Chinook model cannot account for such temporal changes. In this report, a simple means by which such changes could be accounted for in the model is reported. Such changes would be relatively straight forward to implement and would result in a more accurate prediction of both the Abundance Index and model estimates of stock impacts in a fishery. In the Appendix to Annex IV, Chapter 3, assignment 5 instructs the CTC to ‘…continue to review and improve the accuracy and precision of the CTC model, including among other things, determining the pre-season forecasts of the aggregate Chinook abundance available to the fisheries.' The proposed model modification would therefore fall under this assignment.

1) **The Workgroup recommends that the CTC implement the model changes described in section 10 of this report for the WCVI, NBC, and WA/OR troll fisheries; other fisheries could also be considered**. However, such changes will likely alter the relationship between abundance and allowable harvest as embodied in Table 1 of the Agreement, as well as the predicted AI for all AABM fisheries. The magnitude of the changes is not known at this time. A similar modeling procedure called the Stratified Proportional Fishery Index (SPFI) has been in place for the Alaskan (SEAK) troll fishery for a number of years, which accounts for both spatial and temporal changes in its conduct, and therefore no changes in the model would be required for this fishery. However, the changes to the predicted AI for other fisheries resulting from the proposed model changes, will indirectly change the predicted AIs for SEAK fishery as well, though such changes should be small.

    - **Does the PSC wish the CTC to modify the PSC Chinook model inputs to be able to account for variations in the temporal distribution of catch during an accounting year in PST Chinook fisheries? If so, for which fisheries and years?**

2) **The Workgroup recommends that after the changes described in section 10 are completed, a SPFI type analysis be developed for at least the WCVI, NBC, and WA/OR troll fisheries**. A SPFI approach would enable the PSC Chinook model to account for both temporal and spatial changes in a fishery. This approach would take longer to develop than the methods described in section 10.

    - **Does the PSC wish the CTC to modify the PSC Chinook model inputs to be able to account for temporal <u>and</u>, to the extent possible, spatial changes in PST Chinook fisheries? Such a modification would be similar to the SPFI approach currently used for the SEAK AABM fishery (TCCHINOOK 05-3). If so, for which fisheries and years?**

3) **The Workgroup recommends that preseason management plans for PST fisheries should be as accurate as possible and provided to other jurisdictions in a timely manner, so that they can plan fisheries in their jurisdiction appropriately.** Any changes to such plans should be conveyed to the appropriate parties as soon as possible.

4) The Workgroup recommends improvements in CWT sampling and release tagging strategies as follows:

- Direct sampling of all major sport fisheries for CWTs should be implemented if it results in improved estimates for that fishery.
- All hatchery releases should be associated with a CWT release group. Every release of mass marked Chinook should be associated with a CWT group.
- A review of marking and sampling rates for PST Chinook stocks and fisheries is needed. The Workgroup notes that the PSC CWT Workgroup is currently undertaking this task.

5) The Workgroup recommends that the following points be considered when designing DNA sampling and analysis programs:

- Sampling sizes need to be appropriate for the level of application, and results should be reported accordingly. Precise estimates of individual stock composition for stocks comprising less than 5% of catch requires considerably higher sample sizes than are generally being applied in most fisheries.
- Using CWTs to estimate stock composition of the adipose-clipped portion of catch is not appropriate due to the high number of adipose-clipped hatchery fish currently being released that are not associated with any CWT release group. Consequently, GSI sampling of catch for stock composition purposes should be representative of both clipped and unclipped fish encountered in that fishery.
- The baseline used for GSI analyses of mixed stock fisheries should be the one most representative of the stocks being intercepted. Specifically, in fisheries where Canadian and U.S. stock composition estimates are equally important, it is recommended that the GAPS baseline be used.
- Presentations of GSI analyses should clearly articulate the objectives of the work, any shortcomings/limitations, the sample sizes employed, the baseline used, and report the results at the appropriate level of stock resolution for the sample sizes used.

INTRODUCTION

The October 19, 2005 memo to the Pacific Salmon Commission (PSC) from Jev Shelton and Jerry Kristianson assigns the Chinook Technical Committee (CTC) with ten tasks. The overall objective for these assignments is *"to assemble data that is relevant for determining the factual context surrounding the conduct of Canada's AABM fisheries".*

In October of 2005, at a previously scheduled session of the full CTC, a workgroup was formed and assignments were made to the individual workgroup members. This report is a product of that workgroup and fulfills the assignments given to the CTC.

What follows is a report comprised of the data compilations and completed analyses, aimed at addressing the assignments. These data compilations and most analyses were presented to the Chinook Interface Group (CIG) in a draft report in February 2006. The draft report, including several additional analyses and recommendations, was again presented to the CIG in July of 2006.

Two appendices are also included. Appendix 1 is an excerpt from the recent expert panel report on the coastwide CWT program wherein the panel discusses potential impacts of inseason management of AABM and ISBM fisheries on stocks of conservation concern. Appendix 2 represents a compilation of information requested from the CDFO genetics lab at the Pacific Biological Station by the CTC regarding methodology used in DNA-based stock composition analyses for the WCVI and NBC troll fishery. This appendix contains much of the information needed by the CTC to assess the validity of the GSI-based method of catch stock composition that formed the basis of several PowerPoint presentations on stock composition of NBC and WCVI Chinook catch.

ASSIGNMENTS

1. At the discretion of the co-chairs, assign a workgroup to have primary responsibility for completion of these tasks;

A workgroup (henceforth referred to as the Workgroup) was formed during a scheduled full CTC meeting in October 2005. Workgroup members include:

U.S. Members	Canadian Members
Scott McPherson	Rick McNicol
John Carlile	Gayle Brown
John Clark	Ivan Winther
Dell Simmons	
Gary Morishima	
Rishi Sharma	
Marianne McClure	

2. View the presentation of "Chinook and Coho Salmon Genetic Stock Identification" as catalogued on the PSC website (from June 2004), and other related presentations by DFO staff (e.g., Wilf Luedke to the Southern Panel, February 2005; Rick McNicol to the Northwest Power and Conservation Council, July 2005);

It does not appear that any action is required of the CTC other than review of the presentations and clarification of the basis for the information presented. All of the Workgroup members have seen the presentations referred to. During the course of this review errors were found in the approach used to estimate stock composition for the WCVI troll fishery. The errors were corrected to the extent possible given the available data for the 2004 accounting year, and corrected stock composition estimates for the WCVI fishery are provided in this report. No such problems were found in the approach used in the NBC troll and QCI sport fisheries.

3. Review management plans and supporting information and provide a synopsis of management objectives and actions with respect to specific stock concerns for the NBC and WCVI AABM fisheries from 1995 through 2004. Provide an assessment of the degree to which those objectives were achieved and do so in terms of harvests and of exploitation rates on the stocks of concern;

NBC AABM Fisheries Management

Canadian management objectives for the NBC troll fishery are identified in Table 3-1, along with domestic allocations between gear types. The AABM regime for NBC includes both NBC troll and Queen Charlotte Islands (QCI) sport. The sport fishery receives priority access to Chinook over the troll fishery; therefore all of the management actions to protect WCVI Chinook have been undertaken by the troll fishery. The exception was in 1996 when both fisheries were closed for the summer (Table 3-1). NBC troll fishery openings and management details from 1992 to 2005 are provided in Table 3-2. From 1957 to 1982 fishery openings varied somewhat but typically began April 15th and ended September 30th. Prior to 1957, there were no closed seasons in the troll fishery.

We have included harvest limits and management information from 1982 through 2005 to provide the complete context for the 1995 to 2004 data that were requested. Canada has had concerns for WCVI Chinook stocks since 1995. The NBC troll fishery from 1995 to 2001 was managed to annual total allowable catches and common practice was to reduce total NBC troll allocations to reduce exploitation on WCVI Chinook. From 2002 to 2005 management practices were changed to include specific catch limits for WCVI Chinook, with stock compositions from in-season DNA samples being used to shape NBC troll fisheries (Table 3-1). Canada also had concerns for upper Skeena River and upper Thompson River coho stocks from 1998 to 2000. Time and area closures were used to limit troll impacts on these stocks (Table 3-2).

Troll management harvest limits and actual catches for 2002 to 2005 are presented in Table 3-3. The catch limit of WCVI Chinook was expressed as an exploitation rate of 1.5% in 2002. In 2003, the limit was expressed in pieces (6,811 Chinook) without the related exploitation rate estimate. The 2003 management plan was to catch fewer WCVI Chinook than the 2002 fishery. In 2004 and 2005, the management plan was to achieve exploitation rates that were less than the rate observed in the 2002 troll fishery. The catch limits were also expressed as a NBC troll harvest rate on the return of WCVI Chinook to Canadian waters.

Table 3-1. Landed catch of Chinook salmon by the NBC troll and QCI sport fisheries with Canadian management objectives and PST allocations, 1993 to 2005.

Year	PST[1] Preseason AABM Ceiling	Total[2] PST Catch (1000's)	Canadian Domestic Troll Ceiling	Ceiling Objective	Post Season NBC Troll AABM TAC	Actual NBC Troll Catch (Areas 1-5)[3]	QCI Sport Catch
1993	*	257	186,000	263,000 NCBC Chinook catch		161,775	25,297
1994	*	251	160,000	263,000 NCBC Chinook catch		164,493	28,973
1995	*	119	60,000	Conservation of WCVI Chinook.		56,863	22,531
1996	*	27	0	Maximum protection of WCVI Chinook.		0	670
1997	*	167	85,000 before September.	Reduced ER on WCVI Chinook		86,813	27,738
1998	*	180	110,000 before September.	Reduce pre-1995 Canadian ER on WCVI Chinook by 50%. Protect Skeena & Thompson coho.		116,407	34,130
1999	145,600	75	50,000 before September.	Reduce pre-1995 Canadian ER on WCVI Chinook by 50%	115,373	48,094	30,227
2000	130,000	32	0 before September.	Protect WCVI Chinook. Determine Chinook stock composition in September	107,900	9,948	22,100
2001	132,600	43	0 before September.	<5% ER on WCVI Chinook in Canada	102,200	13,099	30,400
2002	192,700	151	3,052 WCVI Chinook[4]	<10% ER on WCVI Chinook in Canada, <1.5% ER on WCVI Chinook by NBC troll	145,600	103,038	47,100
2003	197,100	192	6,811 WCVI Chinook[4]	10 to 15% ER on WCVI Chinook in Canada, < number of WCVI Chinook caught in 2002	142,767	136,437	54,300
2004	243,600	241	7,800 WCVI Chinook[4]	<15% ER on WCVI Chinook in Canada <3.3% ER on WCVI Chinook by NBC troll	169,640	167,463	74,000
2005	246,600	244	11,600 WCVI Chinook[4]	<10% ER on WCVI Chinook in Canada <3.3% ER on WCVI Chinook by NBC troll	177,800	172,877	68,800

[1] From 1985-1992, the PST agreed catch ceiling for all north and central coast fisheries combined was 263,000. Increments were added in 1990 and 1991. From 1993-1998, no formal agreement on catch limits was in place. In 1993 and 1994, Canada chose to fish to the pre-1993 ceiling; conservation concerns from 1995-1998 kept Canada's harvest well below this ceiling. Since 1999, catch allowance were developed annually through an abundance based management approach. ER=exploitation rate.

[2] Up until 1998, catch included all north and central coast landings from Areas 1 to 10. Since 1999, catch reported includes only NBC troll landings in Areas 1 to 5 and QCI sport landings in Areas 1 and 2.

[3] Area 1 to 5 troll data from fish slips up to 2000 then from combined hails & slips thereafter. Troll catch from 1993-1998 is by calendar year and by troll accounting year (Sept-Oct) for 1999-2005, from Table 4-1.

[4] Ceiling calculated based on forecasted return and expected Alaskan harvest.

Table 3-2. NBC troll directed fishing times, Area 1 to 5 catch and management details 1982 to 2005.

Year	TROLL SEASON	Chinook season	Catch [1]	Chinook Management Details
1982	April 15 to October 31	same	174,146	
1983	April 15 to June 15 July 1 to September 30	same	163,056	
1984	May 23 to June 3 July 1 to September 30	same	179,664	
1985	May 9 to 20 July 1 to September 30	same	186,724	
1986	June 20 to September 5	same	152,999	
1987	July 1 to September 8?	same	177,457	
1988	July 1 to August 4?	same	152,368	
1989	July 1 to September 5	same	207,681	
1990	June 28 to September 30	June 28 to August 18	154,115	
1991	July 1 to September 30	July 1 to September 3	194,014	
1992	July 1 to September 15	July 1 to August 15	142,335	
1993	July 1 to August 15 August 19 to September 12	July 1 to August 5 August 19 to September 12	161,775	redline closed August 19-27 and September 8-12 (Figure 3-1)
1994	July 1 to September 14	July 1 to September 5	164,493	redline closed to all trolling September 5-14
1995	July 1 to September 10	July 1 to July 15	56,863	WC QCI Chinook non-retention. Chinook red line area closed to all trolling.
1996	July 8 to September 23	Closed	0	Chinook nonretention all year. Chinook red line area closed to all trolling.
1997	July 1 to October 15	July 1 to October 15	86,417	WCQCI and red line area closed most of the year to protect WCVI Chinook.
1998[2]	July 8 to October 6	July 8 to August 24 September 5 to October 6	116,407	Area closures in Dixon Entrance and south of QCI to protect upper Skeena and Thompson coho.
1999	August 1 to August 15	August 1 to 15	48,094	No fishing in Areas 1,3,4 & 5 to protect upper Skeena coho.
2000	August 8 to 22 September 2 to 24	September 2 to 24	9,948	Fall Chinook fishery only. Observers mandatory. Fishery to provide information on September stock composition.
2001[2]	June 4 to 15 July 2 to 18 August 26 to September 30	June 4 to 15 and July 6 to 18. September 8 to 30	13,099	Portions of Area 4 only open in June & July. Allocation 2000, catch 2300. September Area 2W test fishery.
2002	October 4, 2001 to June 8, 2002 August 1 to September 30	Oct. 4, 2001 to June 8, 2002 September 8 to 30	103,038	Troll fisheries based on historic cwt timing for Robertson Creek (WCVI). WCVI component monitored through DNA.
2003	October 1, 2002 to May 12, 2003 June 19 to July 5 July 25 to August 31 September 4 to 9	October 1, 2002 to May 12, 2003 June 19 to July 5 September 4 to 9	136,437	Summer opening based on pre-fishery DNA sampling. In-season monitoring via DNA.
2004	October 1, 2003 to April 15, 2004 June 15 to July 1 July 15 to September 30	Oct. 1, 2003 to April 15, 2004 June 15 to July 1 July 18 to July 22	167,463	June 15 opening based on DNA sampling. In-season monitoring via DNA.
2005	October 1, 2004 to March 31, 2005 June 3 to September 30, 2005	Same	172,877	Fishery opening and monitoring based on DNA. IVQ fishery June 3 to September 30 with a limit of 161,000 Chinook Derby portion June 16 to July 17 with a limit of 7,000 Chinook

[1] Prior to 1998, catch is the annual total and from 1999-2005 catch is by troll accounting year, i.e., from the previous October to September of the current year, from Table 4-1.

[2] Prior to 1998 and in 2001 trollers were also allowed to fish during net fishing open times. However, trollers did not participate in most net fishery openings. IVQ=Individual Vessel Quota. WC = West Coast.

Figure 3-1. Pacific Fishery Management Area map of Northern British Columbia. The heavy line off the QCI indicates the approximate location of the commercial troll redline area.

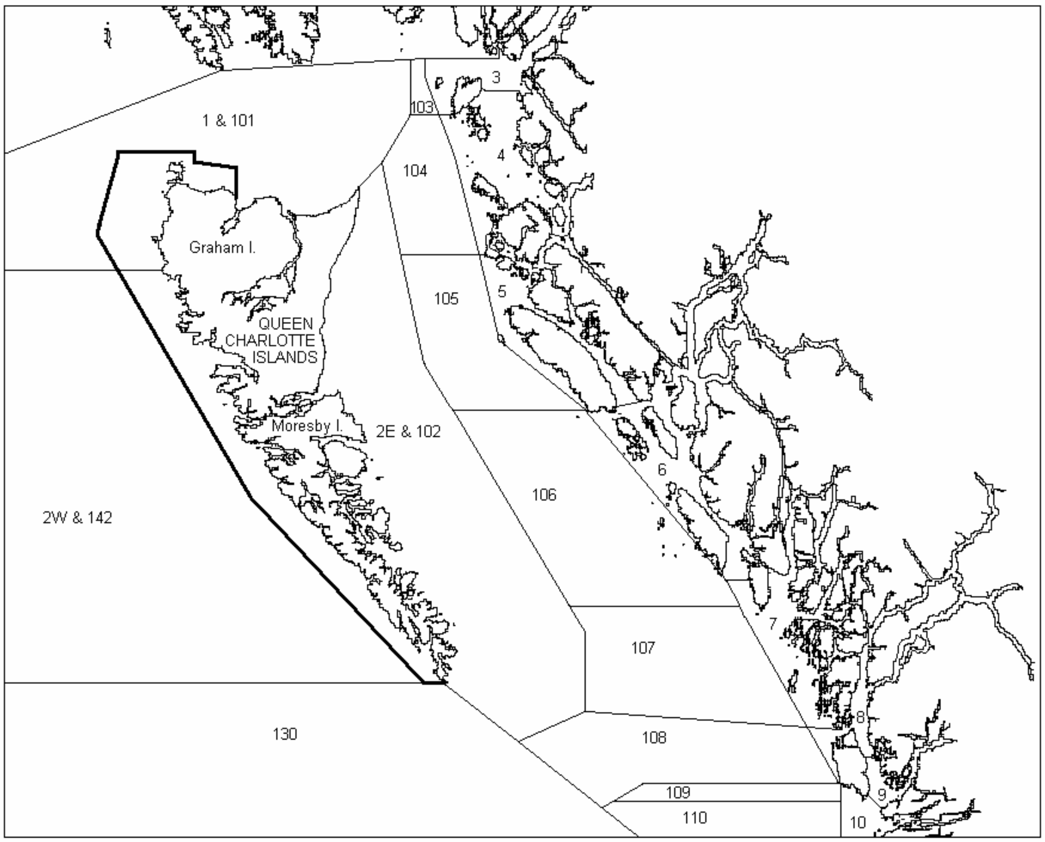


Table 3-3. Management harvest limits and actual catches for NBC troll fisheries from 2002 to 2005. In-season management to a harvest limit of WCVI Chinook stocks began in 2002.

Year	AABM Preseason Ceiling	QCI Sport Catch	Pre Season NBC Troll Allocation	Post Season NBC Troll Allocation	Actual NBC Troll Catch
2002	192,700	47,100	162,000	145,600	103,038
2003	197,067	54,300	152,000*	142,767	136,437
2004	243,640	74,000	183,640	169,640	167,463
2005	246,600	68,800	170,000	177,800	172,877

* Revised in-season to 142,000

Year	WCVI Stock Pre-season Troll Limit (pieces)[2]	Actual WCVI Catch (pieces)	Pre-season HR Limit on WCVI Returns to Canada	Estimated Troll HR on WCVI Return to Canada	Pre-season NBC Troll ER Limit on WCVI[3]	Estimated Post-season WCVI ER from DNA & CWT's[1]
2002	3,052	6,811	1.6%	3.6%	1.5%	3.3%
2003	6,811	7,637		3.2%		2.7%
2004	7,800	10,065	3.7%	3.4%	3.3%	3.0%
2005	11,600	8,125	3.7%	4.2%**	3.3%	Pending

** From preliminary Robertson Creek Hatchery (RCH) 2005 forecast (unpublished data).
[1] Note that CWT exploitation rate (ER) estimates for QCI sport are based on awareness factors from other areas. Consequently, their accuracy is unknown.
[2] Pre-season limit based on the pre-season forecasted return and the anticipated harvest by Alaska.
[3] ER = exploitation rate approximated by NBC troll Catch / (Total Catch in all fisheries + Escapement)

WCVI AABM Fisheries Management

The PST states that catch from the troll and sport fishery off the WCVI be accounted for and managed as an AABM fishery. Active management of the WCVI AABM fishery generally involves the troll fishery only, although sport catch is considered when determining the troll fishery pre-season allocation and any opportunities for a late season fishery to take remaining harvestable surplus. Hook and line harvest by First Nations is assumed to be 5,000 fish, and is included in the AABM troll and sport fishery catch.

The sport catch portion of the WCVI AABM fishery typically ranges from 25,000-40,000 fish annually, with no clear increasing or decreasing trend since 1999. Currently, as part of the pre-season management planning process, managers assume that the outside sport fishery will harvest approximately 50,000 fish, which represents the most recent catch level.

The total allowable catch by WCVI AABM fisheries is based on the abundance index generated from the PSC Chinook model calibration. The commercial catch limits are set with consideration given to the harvest of the recreational fishery and the First Nations fishery. Domestic concerns are then taken into consideration and influence troll openings throughout the year. In September, managers receive outside sport harvest estimates and after taking into account the cumulative troll harvest to that point, fishery managers may allow a September troll opening to harvest the remaining yearly allowable catch.

Management from 1995-1998

For most of this period, WCVI troll fisheries were severely restricted due to concerns for Thompson coho and WCVI Chinook. The total AABM harvest during this period was generally well below allowable limits. In fact, in 1996, there was no troll fishery for Chinook off the WCVI. Interior Fraser coho and WCVI Chinook were both limited to an exploitation rate of <1% in WCVI troll. This resulted in significant disruptions to the WCVI troll fishery through broad area/time closures in 1995-1998. Restrictions were also in place on the sport fishery including area/time closures from 1996-1998 for Chinook and in 1998 on coho. In 1998 the WCVI troll fishery entered into a 3-year pilot study to examine the feasibility of fishing opportunities outside the traditional summer troll season.

Management from 1999-2004

In 1998, policy reform initiatives were undertaken within the Department of Fisheries and Oceans. The 1998 New Directions document (CDFO 1998) describes key aspects of conservation-based salmon fisheries management, including three key components: conservation, sustainable use, and improved decision-making. Within this new policy framework, the Department emphasized conservation of domestic stocks. Implications to the WCVI troll fishery were significant, and are reflected in the management approaches outlined below.

Since the signing of the 1999 Agreement, the WCVI AABM fishery has been managed under the following general approach. The troll season is divided into fall, winter, summer and spring periods. These fishery components were created by management to provide Area G trollers opportunities to harvest Chinook, while attempting to minimize impacts on certain salmon stocks of concern. The fall and winter fishery allocation is based on the two-year-out forecast from the PSC Chinook model calibration in the spring of that year. Once the official pre-season allowable catch is determined through the model calibration the following spring, allowable troll catch for the remainder of the season is determined by subtracting the expected First Nations plus outside sport catch from the total pre-season allowable AABM catch. The size of the September troll fishery is determined after troll and outside sport catch up to that point is determined: any unrealized AABM catch is allocated to a September troll fishery. Note that fisheries in all periods but winter are shaped around stocks of concern through time and area closures (detailed below). In 1998, the minimum size limit for the WCVI commercial troll fishery was reduced from 67 cm to 48 cm (tip of snout to fork of tail). Since 1999, the minimum size limit has been 55 cm.

From 2000-2004 the WCVI Area G troll fishery has been managed to harvest Chinook in four main seasonal fisheries (spring, summer, fall and winter). Domestically the seasonal Area G troll fisheries have been managed around the following stocks of concern from 2000-2004:

Fishery	Stocks of Concern
Spring troll fishery (April-June)	Fraser Early Chinook Lower Georgia Strait Chinook Thompson River coho
Summer troll fishery (July-August)	Thompson River coho WCVI Chinook
Fall troll fishery (September-October)	Thompson River coho WCVI Chinook
Winter troll fishery (November-March)	Minimal impacts on any of the stocks listed above.

<u>Spring troll fishery</u>

From 1998-2000, fisheries were conducted as controlled assessment fisheries, i.e. catch limits were set well below allowable levels for the purpose of evaluating opportunities to avoid stocks of concern. The first year in which full fleet fishing opportunities were provided was 2001, though catch limits were set well below allowable levels. From 2002 on, the fishery was managed to achieve a harvest closer to the full allowable limits.

In 2000, Area G trollers conducted a small test fishery during the March-May period, and harvested approximately 5,300 Chinook. This fishery was closed in May when coho began recruiting to the fishery, thus minimizing impacts on Thompson coho. In 2001, Area G spring troll fisheries increased their harvest to ~32,000 Chinook; the fishery opening was delayed until April 25, to minimize impacts on Fraser Early Chinook stocks. This fishery was then closed May 28, to minimize impacts on Thompson coho. In 2002, Area G spring troll fisheries increased their harvest to ~119,000 Chinook; the fishery did not open until April 14, to minimize impacts on Fraser Early Chinook stocks. The fishery remained open much longer than usual (closed June 20), as coho encounters (i.e. Thompson coho) did not become frequent until then. In 2003, Area G spring troll fisheries increased their harvest to ~134,000 Chinook; the fishery opening was delayed until April 17, to minimize impacts on Fraser Early Chinook stocks. This fishery then closed June 5 to minimize impacts on Thompson coho. In 2004, CWT analysis from the 2003 spring fishery indicated the Fraser Early, as well as Lower Georgia Strait Chinook (which became a concern in 2004) were most vulnerable in area 123 during April. As a result, the spring troll fisheries were closed in area 123 in April, while they began April 1 in Areas 124-127. This spring fishery operated until May 16, and landed 103,000 Chinook. This left some TAC available for a troll fishery in September, the final amount being determined once the cumulative troll and outside sport catch was known.

Currently the spring troll fishery is managed around concerns for Fraser Early Chinook, Lower Georgia Strait Chinook (2003-present), and Thompson River coho. To protect the Fraser Early Chinook stocks, Area 123 (where this stock is known to be present from CWT and DNA analysis) is closed from mid-March until at least mid-April. The Swiftsure Bank (121), known to be a rearing and nursery area for juvenile salmon, remains closed to reduce impacts on immature fish.
Other area and timing closures may be implemented from time to time to minimize impacts on Lower Georgia Strait, and Fraser Early chinook.

Summer troll fishery

The summer troll fishery is currently closed due to the high encounter rates typically experienced by this fishery on Thompson coho and WCVI Chinook.

Fall troll fishery

The fall troll fishery is managed primarily around concerns for Thompson coho and WCVI Chinook. To reduce the impacts of this troll fishery on these two stocks of concern, Area G fisheries management implements two restrictions. First, the troll opening is delayed until mid-September, when Thompson coho are assumed to no longer be prevalent in the mixed stock area. Second, all the nearshore areas one nautical mile from the surfline in Areas 123-127 are closed to protect returning WCVI Chinook. In recent years Area 123 remained closed throughout September and Areas 124-127 opened 2-5 miles seaward of the surfline in an effort to continue to protect any migrating WCVI Chinook stocks from exploitation. CWT and otolith information indicates that the nearshore areas along the WCVI are the areas where most WCVI Chinook are intercepted; therefore these areas remain closed when these two stocks are most vulnerable to exploitation from the troll fishery.

Winter troll fishery

Due to the low harvest during the November-March period, it is assumed that impacts are minimal on WCVI and Lower Georgia Strait Chinook stocks.

Managing Around Domestic Stocks of Concern

Coho

From 2000-2004 the most prominent stock of concern that managers have had to address in the Area G (Areas 21-27, 121 and 123-127) troll fisheries is the Thompson River coho stock. During this time period Thompson River coho were managed to a total Canadian coastwide exploitation of 3%, and over the last four years the exploitation rate from the WCVI Area G troll fishery has been 0.3% or less. Exploitation rate estimates are calculated pre-season using CWT information and modelling techniques, and evaluated post-season. Post-season estimates differed very little (<0.1%) from pre-season estimates (Table 3-4).

Table 3-4. Estimates of pre-season expected exploitation (ER) rates, and post-season ER rates for Thompson River coho, 2000-2004.

Year	Total Expected CDN ER Rate Estimates on Thompson Coho	Pre-season Expected WCVI Troll ER Rates on Thompson Coho	Post-season Estimates of WCVI Troll ER Rates on Thompson Coho
2000	NA	NA	NA
2001	0.9%	NA	0.17%
2002	2.0%	0.21%	0.29%
2003	1.1%	0.07%	0.07%
2004	2.5%	0.14%	0.07%

Chinook

From 2000-2004, fishery managers have also structured the Area G troll fishery to accommodate domestic concerns for WCVI Chinook. During the 2000-2004 period, WCVI Chinook have been managed to a total Canadian coastwide exploitation rate of 15%, and over the last four years the exploitation rate limit for the WCVI Area G troll fishery has been 0.3% or less. Pre-season expected impacts are estimated via CWT analysis and post-season exploitation rates are determined through CWT analysis.

Table 3-5. Estimated exploitation rates for WCVI Chinook stocks based on RBT in WCVI AABM fisheries, 2000-2004.

Preseason Allocation/Expected Impact				Postseason Exploitation - CWT/cohort analysis	
Year	WCVI Troll	WCVI Sport	Total Canadian ER	WCVI Troll	WCVI Sport
2000[1]			5.0%	0.0%	0.0%
2001	0.4%	2.5%	5.0%	0.0%	1.9%
2002	0.5%	4.5%	10.0%	0.4%	2.0%
2003	0.4%	6.0%	15.0%	0.0%	4.4%
2004	0.5%	6.0%	15.0%	0.1%	1.2%

[1] No specific exploitation limits were set that year.

Two other Chinook stocks of concern that are managed within the WCVI Area G troll fishery are Fraser Early Chinook and Lower Georgia Strait Chinook. Neither stock is managed to a harvest rate or an exploitation rate limit. Rather, CWT and DNA analysis are conducted post-season to provide fisheries managers with information on where and when the largest fishery impacts occur. This information is used in the pre-season planning of the Area G troll fishery, and the openings are structured to avoid the areas with the largest potential impacts on these two stocks of concern. For reference, pre-season allowable catch, pre-season sector allocation, as well as post-season catch are provided from 1999-2004 (Table 3-6).

Table 3-6. The 1999-2004 AABM Chinook allocation and achieved harvest by WCVI AABM fisheries. Catch is from Section 4.

Year	AABM Pre-season Ceiling	Post-Season AABM Ceiling	Pre-season Assumed First Nations Catch	Assumed WCVI Sport Catch	Pre-season Area G Troll Allocation	Assumed Post-season First Nations Catch[1]	Actual WCVI Sport Catch	Post-Season Area G Troll Allocation	Actual Area G Troll Catch[2]	Total Catch
1999	128,300	107,000	5,000	30,000	-	5,000	31,106	77,000	5,511	36,617
2000	115,500	86,200	5,000	30,000	47,500	5,000	38,038	56,200	61,229	99,267
2001	141,200	145,500	5,000	30,000	106,200	5,000	40,179	115,500	75,564	115,743
2002	203,200	196,800	5,000	30,000	168,200	5,000	32,115	166,800	132,928	165,043
2003	181,825	268,900	5,000	30,000	146,825	5,000	23,995	238,900	151,557	175,552
2004	192,521	209,600	5,000	30,000	157,521	5,000	42,038	179,600	168,944	210,982

[1] First Nations catch is not monitored, and is assumed to amount to 5,000 fish annually.
[2] Troll catch reported includes First Nations catch and is the total AABM troll catch by accounting year.

4. For the years 1979-1998, and 1999-2004 provide effort and catch data by month (or other appropriate time period) by management area (or sub-area as appropriate) for the NBC and WCVI AABM fisheries;

Landed Catch

Landed catch is provided for both WCVI and NC AABM fisheries, by sector, for the years 1979-2004. Monthly breakouts are further provided for the troll fisheries. However, monthly breakouts are not provided for the sport fisheries. Such breakouts were not deemed to be informative, as both the WCVI outside sport fishery, and QCI sport fishery are summer-only fisheries (June-August), with catch and effort occurring in a fairly consistent manner across the summer months from year to year. However, the WCVI sport catch was broken out by catch region, i.e. Southwest Vancouver Island (SWVI; Areas 21-24) versus Northwest Vancouver Island (NWVI; Areas 25-27). Since CWT recoveries are expanded based on catch sampling within a catch region, such a breakout would capture any large geographic shift in sport catch within the WCVI sport sector across years.

Troll

Both the NBC and WCVI troll fisheries have exhibited similar changes over time. During the base period (1979-1982), NBC troll catch occurred in all months from April to October, with the majority of catch occurring in the summer months (Table 4-1). Starting in the late 1980's, catch occurred primarily in the summer months, including September, with much smaller amounts landed in the spring. However, by the early 2000's, fishing once again occurred in the spring months, in addition to the summer, though the August fishery was essentially shut down due to conservation concerns for WCVI Chinook. Similarly, WCVI troll catch during the base period occurred from spring through early fall, with the majority of catch occurring in the summer months (Table 4-4). By the late 1980's, the WCVI troll fishery catch occurred almost exclusively during the summer months. By the late 1990's, most catch was landed in the spring and fall. However, unlike the NBC fishery, very little catch now occurs in the summer. Note that during the base period, ~81% of total catch occurred in SWVI. However, in subsequent years, the proportion of catch from this catch region declined significantly, though still accounting for the majority of WCVI troll catch (Table 4-2, 4-3).

Table 4-1. NBC troll Chinook catch by month and year, 1979-2004 (from RMIS database[1]). Note that the PSC accounting year is from October to the following September.

Year	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Annual	PSC Year
1979	648	4,657	25,748	41,269	38,656	21,552	14,846	1,321	27		148,724	
1980	654	2,156	17,041	51,437	47,982	19,254	22,048	2,989	1		163,562	
1981		1,731	12,468	38,780	38,813	33,920	23,961	2,059			151,732	
1982		1,851	13,280	22,998	69,531	32,892	29,027	4,567			174,146	
1983		3,960	14,937	29,946	39,211	41,056	30,444	3,502			163,056	
1984			2,866	11,425	57,514	68,908	36,985	1,966			179,664	
1985			6,372		50,053	59,286	59,252	11,761			186,724	
1986				10,371	55,636	70,276	16,716				152,999	
1987					72,632	100,567	4,258				177,457	
1988					97,954	29,426	24,988				152,368	
1989				104	119,002	88,470	105				207,681	
1990				2,091	128,766	23,207	51				154,115	
1991				454	120,507	64,963	8,090				194,014	
1992					115,690	26,645					142,335	
1993					108,724	28,813	24,238				161,775	
1994					85,092	49,991	29,410				164,493	
1995				161	42,078	13,606	1,018				56,863	
1996											0	
1997					53,071	25,819	7,527	396			86,813	
1998					36,819	62,153	14,241	3,194			116,407	
1999						44,900					44,900	48,094
2000							9,948				9,948	9,948
2001	51	1,098	1,050	1,000	1,300		8,600	253		77	13,429	13,099
2002	69	5,646	55,036	16,841	917	815	23,384				102,708	103,038
2003	774	13,713	11,253	57,056	29,306	300	24,035			691	137,128	136,437
2004	2,488	6,021	400	67,765	89,683	215	200			680	167,452	167,463
Averages												
1979-1982	326	2,599	17,134	38,621	48,746	26,905	22,471	2,734	7	0	159,541	158,465
1983-1995	0	305	1,860	4,196	84,066	51,170	18,120	1,325	0	0	161,042	161,393
1996-1998	0	0	0	0	29,963	29,324	7,256	1,197	0	0	67,740	66,675
1999-2004	564	4,413	11,290	23,777	20,201	7,705	11,028	42	0	241	79,261	79,680
2002-2004	1,110	8,460	22,230	47,221	39,969	443	15,873	0	0	457	135,763	135,646

[1] Some data inconsistencies were noted between RMIS catch and catch data compiled by area DFO staff from 2001-2004, that could not be resolved prior to the compilation of this report. Consequently, area staff data were used for these years. Note that Dec catch reported in RMIS actually represents the sum of catch from Jan, Feb and Dec of that calendar year. Also, for CWT expansion purposes, some catch may have been considered landed in a different month than reported (e.g. freezer troll catch). Consequently, the PSC accounting year totals based on the above data may not equal those actually used for PSC Treaty accounting purposes. They are provided here to illustrate the degree to which annual and catch accounting year totals can differ.

Table 4-2. NWVI troll Chinook catch by month and year, 1979-2004. Data are from the RMIS database[1]. Note that the PSC accounting year is from October to the following September.

Year	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual	PSC Troll Accounting Year Total	% Annual Total as NWVI
1979		2,413	5,487	18,658	18,280	23,414	7,414	3,984		3	79,653		16.6%
1980		4,516	13,017	19,780	16,796	25,008	14,313	1,943	263		95,636		19.6%
1981		3,507	6,312	7,507	18,016	30,542	14,761	1,108			81,753		20.5%
1982		6,345	11,359	15,999	34,698	23,998	12,330	1,597			106,326		19.5%
1983		10,765	10,752	12,258	19,480	24,545	16,518	1,454			95,772		24.8%
1984		4,747	12,124	10,917	44,104	46,801	13,510				132,203		28.7%
1985			14,987		33,252	17,285	7,292	1,482			74,298		21.0%
1986				7,821	42,920	30,218					80,959		23.6%
1987				0	87,067	26,077					113,144		29.9%
1988				0	116,574	54,348	394				171,316		41.9%
1989				411	50,403	18,969	1,684				71,467		35.1%
1990				1,918	57,679	33,376	21,864				114,837		38.5%
1991			974	1,370	32,026	24,662	15,793				74,825		36.9%
1992		758	1,372	838	77,664	61,784	71,243	2,877			216,536		62.4%
1993				0	66,982	66,632	32,300	1,935			167,849		61.1%
1994				0	33,767	30,955	6,233				70,955		48.6%
1995				126	28,768	38					28,932		35.6%
1996						4					4		100.0%
1997				524	24,916			1,008			26,448		49.5%
1998			785						1,055	201	2,041		30.6%
1999								21,289			21,289	1,256	38.0%
2000		608	1,620					21,082			23,310	23,517	70.2%
2001	876	562	878				210	2,998		333	5,857	23,608	11.1%
2002		14,865	17,202	4,478	20		3,326	868		8	40,767	43,222	28.5%
2003	712	31,455	23,284	1,935				3,039	93	56	60,574	58,262	37.5%
2004	5,633	30,387	13,973			155	31,234	9,629	130	869	92,010	84,570	55.2%
Averages													
1979-1982	0	4,195	9,044	15,486	21,948	25,741	12,205	2,158	66	1	90,842	92,446	19.1%
1983-1995	0	1,252	3,093	2,743	53,130	33,515	14,372	596	0	0	108,699	108,822	37.6%
1996-1998	0	0	262	175	8,305	1	0	336	352	67	9,498	9,079	60.0%
1999-2004	1,204	12,980	9,493	1,069	3	26	5,795	9,818	37	211	40,635	39,073	40.1%
2002-2004	2,115	25,569	18,153	2,138	7	52	11,520	4,512	74	311	64,450	62,018	40.4%

[1] Note that Dec catch reported in RMIS actually represents the sum of catch from Jan, Feb and Dec of that calendar year. Also, for CWT expansion purposes, some catch may have been considered landed in a different month than reported (e.g. freezer troll catch). Consequently, the PSC accounting year totals based on these RMIS data may not equal those actually used for PSC Treaty accounting purposes. They are provided here to illustrate the degree to which annual and catch accounting year totals can differ.

Table 4-3. SWVI troll Chinook catch by month and year, 1979-2004. Data are from the RMIS database[1]. Note that the PSC accounting year is from October to the following September.

Year	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual	PSC Troll Accounting Year Total	% Annual Total as SWVI
1979	3,822	52,825	83,520	79,947	55,225	64,593	42,451	15,768	320	2,648	401,119		83.4%
1980	4,974	40,669	78,351	81,942	79,715	58,375	24,995	15,035	763	8,167	392,986		80.4%
1981	7,498	27,036	59,481	57,051	75,733	48,432	31,933	1,910		7,310	316,384		79.5%
1982	4	43,584	83,448	84,690	111,431	50,812	56,255	7,441			437,665		80.5%
1983		37,846	60,413	38,857	68,273	46,787	32,016	5,609			289,801		75.2%
1984		24,054	63,252	26,136	109,869	78,623	26,194				328,128		71.3%
1985			44,712		139,491	55,997	38,030	1,587			279,817		79.0%
1986				72,748	142,465	46,215					261,428		76.4%
1987				19	234,491	31,273	32				265,815		70.1%
1988				611	127,699	108,318	724	27	41		237,420		58.1%
1989			613	366	98,025	31,565	1,681				132,250		64.9%
1990		153	330	4,318	137,635	31,490	9,210				183,136		61.5%
1991			3,270	2,315	93,065	21,451	7,991				128,092		63.1%
1992		5,372	1,384	754	69,830	34,267	18,449	150			130,206		37.6%
1993					68,371	21,034	17,047	447			106,899		38.9%
1994					58,051	13,907	3,016				74,974		51.4%
1995				253	52,018	54					52,325		64.4%
1996											0		0.0%
1997				1,018	25,920	8		2			26,948		50.5%
1998		236	140		7			2,309	1,946		4,638		69.4%
1999								34,686			34,686	4,255	62.0%
2000		818	2,208					6,073	50	751	9,900	37,712	29.8%
2001	593	11,034	19,477				13,978	440		1,591	47,113	51,956	88.9%
2002		15,083	50,605	16,727	15	5,032	213	11,362	331	2,780	102,148	89,706	71.5%
2003	1,391	5,794	47,567	24,064			6	16,094	1,634	4,540	101,090	93,295	62.5%
2004	1,991	38,366	20,803			135	811	1,627	7,584	3,220	74,537	84,374	44.8%
Averages													
1979-1982	4,075	41,029	76,200	75,908	80,526	55,553	38,909	10,039	271	4,531	387,039	389,550	80.9%
1983-1995	0	5,187	13,383	11,260	107,637	40,075	11,876	602	3	0	190,022	190,595	62.4%
1996-1998	0	79	47	339	8,642	3	0	770	649	0	10,529	9,110	40.0%
1999-2004	663	11,849	23,443	6,799	3	861	2,501	11,714	1,600	2,147	61,579	60,216	59.9%
2002-2004	1,127	19,748	39,658	13,597	5	1,722	343	9,694	3,183	3,513	92,592	89,125	59.6%

[1] Note that Dec catch reported in RMIS actually represents the sum of catch from Jan, Feb and Dec of that calendar year. Also, for CWT expansion purposes, some catch may have been considered landed in a different month than reported (e.g. freezer troll catch). Consequently, the PSC accounting year totals based on these RMIS data may not equal those actually used for PSC Treaty accounting purposes. They are provided here to illustrate the degree to which annual and catch accounting year totals can differ.

Table 4-4. Total WCVI troll Chinook catch by month and year, 1979-2004. Data are from the RMIS database[1]. Note that the PSC accounting year is from October to the following September.

Year	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual	PSC Troll Accounting Year Total
1979	3,822	55,238	89,007	98,605	73,505	88,007	49,865	19,752	320	2,651	480,772	483,547
1980	4,974	45,185	91,368	101,722	96,511	83,383	39,308	16,978	1,026	8,167	488,622	485,174
1981	7,498	30,543	65,793	64,558	93,749	78,974	46,694	3,018		7,310	398,137	413,980
1982	4	49,929	94,807	100,689	146,129	74,810	68,585	9,038			543,991	545,281
1983		48,611	71,165	51,115	87,753	71,332	48,534	7,063			385,573	387,548
1984		28,801	75,376	37,053	153,973	125,424	39,704				460,331	467,394
1985			59,699		172,743	73,282	45,322	3,069			354,115	351,046
1986				80,569	185,385	76,433					342,387	345,456
1987				19	321,558	57,350	32				378,959	378,959
1988				611	244,273	162,666	1,118	27	41		408,736	408,668
1989			613	777	148,428	50,534	3,365				203,717	203,785
1990		153	330	6,236	195,314	64,866	31,074				297,973	297,973
1991		0	4,244	3,685	125,091	46,113	23,784				202,917	202,917
1992		6,130	2,756	1,592	147,494	96,051	89,692	3,027			346,742	343,715
1993				0	135,353	87,666	49347	2,382			274,748	275,393
1994				0	91,818	44,862	9,249				145,929	148,311
1995				379	80,786	92					81,257	81,257
1996						4					4	4
1997				1,542	50,836	8		1,010			53,396	52,386
1998		236	925		7			2,309	3,001	201	6,679	2,178
1999								55,975			55,975	5,511
2000		1,426	3,828					27,155	50	751	33,210	61,229
2001	1,469	11,596	20,355				14,188	3,438		1,924	52,970	75,564
2002		29,948	67,807	21,205	35	5,032	3,539	12,230	331	2,788	142,915	132,928
2003	2,103	37,249	70,851	25,999			6	19,133	1,727	4,596	161,664	151,557
2004	7,624	68,753	34,776			290	32,045	11,256	7,714	4,089	166,547	168,944
Averages												
1979-1982	4,075	45,224	85,244	91,394	102,474	81,294	51,113	12,197	337	4,532	477,881	481,996
1983-1995	0	6,438	16,476	14,003	160,767	73,590	26,248	1,198	3	0	298,722	299,417
1996-1998	0	79	308	514	16,948	4	0	1,106	1,000	67	20,026	18,189
1999-2004	1,866	24,829	32,936	7,867	6	887	8,296	21,531	1,637	2,358	102,214	99,289
2002-2004	3,242	45,317	57,811	15,735	12	1,774	11,863	14,206	3,257	3,824	157,042	151,143

[1] Note that Dec catch reported in RMIS actually represents the sum of catch from Jan, Feb and Dec of that calendar year. Also, for CWT expansion purposes, some catch may have been considered landed in a different month than reported (e.g. freezer troll catch). Consequently, the PSC accounting year totals based on these RMIS data may not equal those actually used for PSC Treaty accounting purposes. They are provided here to illustrate the degree to which annual and catch accounting year totals can differ.

Sport

The QCI sport fishery essentially did not exist during the base period. It wasn't until the late 1980's that this fishery began to expand significantly, as lodges were built in this area. The proportion of AABM catch harvested by this sector has been growing significantly over the past three years (Table 4-5).

Table 4-5. QCI sport Chinook catch, 1985-2005.

Year	QCI Sport (stat areas 1, 2)
1985	600
1986	1,153
1987	2,644
1988	7,059
1989	20,652
1990	16,827
1991	15,047
1992	21,358
1993	25,297
1994	28,973
1995	22,531
1996	670
1997	27,738
1998	34,130
1999	30,227
2000	22,100
2001	30,400
2002	47,100
2003	54,300
2004	74,000
2005	68,800

While fishing in time and areas associated with the WCVI outside sport fishery has been occurring since the base period, it hasn't been until 1992 that efforts were made to keep separate catch records of inside versus outside sport catch. This fishery tends to be limited in capacity, with no strong trend in catch over the past 13 years (Table 4-6). More recently, the fishery typically lands between 25,000 and 40,000 Chinook. The large majority of catch by this sector occurs in the SWVI. There has not been any trend in redistribution of catch between these two catch regions since 1995 (Table 4-6).

Table 4-6. Annual WCVI outside sport catch of Chinook salmon by catch region, 1995-2005.

Year	SWVI	NWVI	Total Outside Sport
1995	13,485	471	13,956
1996	9,837	392	10,229
1997	6,275	125	6,400
1998	3,991	186	4,177
1999	30,389	717	31,106
2000	36,583	1,455	38,038
2001	3,321	3,212	40,179
2002	30,773	1,342	32,115
2003	22,826	1,169	23,995
2004	40,291	1,747	42,038
2005	52,900	2,893	55,793

Troll Effort Data

While effort information for both Canadian AABM troll fisheries is reported routinely, such effort data is not species specific, since troll openings may allow harvest of multiple species. Consequently, inferences regarding changes in effort directed at Chinook, specifically, cannot generally be derived from these data. While such multi-species troll openings have been much less common in recent years, historically they were common. In addition, use of these data for making inferences regarding spatial changes in effort is also not advised. Frequently, a total amount of effort (e.g. number of boat days) is reported across several statistical areas. Since effort is reported by gear and statistical area, a ‘guess’ is made by sampling personnel as to how much of the effort is spent in one statistical area versus the others. In such instances, effort may be assumed to be equal for all statistical areas, which may or may not be an accurate representation on where effort was actually expended. In addition, catch reported in the RMIS database has been adjusted to account for when freezer troll catch was assumed to have been caught, as opposed to when it was landed. Effort in the CDFO sales slip database, where effort information is housed, has not been adjusted in a similar manner. Consequently, effort and catch data in the tables presented here will not be properly matched. Because of the above, troll effort data is presented here merely for illustration, and should not be used for any analytical purposes without prior consultation with CDFO personnel.

Table 4-7. Effort in the Northern troll fishery for all salmon species in boat-days by month and year, 1979-2004. Data are from the CDFO sales slip database. Note that totals for December actually represent the sum of effort for January, February and December of that calendar year.

Year	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1979	42	515	2,738	5,064	7,832	4,893	2,884	708	13	0	24,689
1980	89	505	3,526	8,487	13,844	9,623	6,497	2,576	79	0	45,226
1981	0	504	3,122	7,513	10,261	8,051	6,440	1,647	0	0	37,538
1982	0	385	2,891	5,372	12,117	5,308	6,562	1,922	0	0	34,557
1983	0	753	3,658	7,063	10,728	7,346	8,518	1,795	0	0	39,861
1984	0	0	686	2,193	10,764	11,066	9,179	121	0	0	34,009
1985	0	0	2,051	0	10,589	9,248	7,264	2,557	0	0	31,709
1986	0	0	0	1,369	12,968	7,526	4,428	0	0	0	26,291
1987	0	0	0	0	14,346	12,564	3,645	0	0	0	30,555
1988	0	0	0	0	10,185	9,308	3,834	0	0	0	23,327
1989	0	0	0	12	11,852	8,702	1,108	0	0	0	21,674
1990	0	0	0	105	14,919	6,596	3,483	329	0	0	25,432
1991	0	0	0	58	14,352	8,928	6,062	405	0	0	29,805
1992	0	0	0	0	9,774	8,054	3,748	46	0	0	21,622
1993	0	0	0	0	9,407	7,153	3,442	37	0	0	20,039
1994	0	0	0	0	9,788	8,873	5,985	17	0	0	24,663
1995	0	0	0	33	9,234	7,393	2,688	91	0	0	19,439
1996	0	0	0	0	1,565	2,266	1,079	267	0	0	5,177
1997	0	0	0	0	4,761	3,793	1,936	278	0	0	10,768
1998	0	0	0	0	1,243	3,074	849	631	0	0	5,797
1999	31	20	16	3	110	1,800	170	0	18	10	2,178
2000	0	0	0	54	61	210	296	433	0	0	1,054
2001	13	0	0	201	572	354	719	44	0	4	1,907
2002	28	649	1,005	415	181	916	789	25	0	1	4,009
2003	193	690	503	872	783	1,304	477	13	0	32	4,867
2004	197	297	10	1,354	1,151	1,571	315	0	0	66	4,961
Averages											
1979-1982	33	477	3,069	6,609	11,014	6,969	5,596	1,713	23	0	35,503
1983-1995	0	58	492	833	11,454	8,674	4,876	415	0	0	26,802
1996-1998	0	0	0	0	2,523	3,044	1,288	392	0	0	7,247
1999-2004	77	276	256	483	476	1,026	461	86	3	19	3,163
2002-2004	139	545	506	880	705	1,264	527	38	1	33	4,639

Table 4-8. Effort in the WCVI troll fishery for all salmon species in boat-days by month and year, 1979-2004. Data are from the CDFO sales slip database. Note that totals for December actually represent the sum of effort for January, February and December of that calendar year.

Year	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1979	433	3,562	7,238	12,749	22,747	23,062	10,095	5,407	70	272	85,635
1980	625	3,848	9,362	13,786	24,564	19,065	11,379	10,147	586	690	94,052
1981	695	3,370	7,885	10,304	20,215	20,493	13,473	3,308	31	917	80,691
1982	3	3,201	8,180	12,872	25,953	21,368	13,272	4,255	0	0	89,104
1983	0	3,818	7,685	9,628	22,913	17,987	13,400	3,377	0	0	78,808
1984	0	2,802	8,609	6,815	20,273	18,109	12,500	63	0	0	69,171
1985	0	0	8,298	0	21,143	20,047	12,232	1,365	0	0	63,085
1986	0	0	0	3,413	22,420	27,514	0	0	0	0	53,347
1987	0	0	0	1	17,637	17,555	7	0	0	0	35,200
1988	0	0	0	14	19,316	21,871	5,742	5	15	0	46,963
1989	0	0	26	91	19,946	16,658	2,407	0	0	0	39,128
1990	0	21	24	342	21,151	18,163	6,833	24	0	0	46,558
1991	0	0	86	215	19,050	17,742	8,671	0	0	0	45,764
1992	0	864	69	46	16,684	15,357	13,656	1,502	0	0	48,178
1993	0	0	0	0	13,323	13,319	8,637	979	0	0	36,258
1994	0	0	0	0	13,154	9,369	2,697	29	0	0	25,249
1995	0	0	0	58	13,577	5,838	1,967	60	0	0	21,500
1996	0	0	0	0	536	2,308	1,101	787	0	0	4,732
1997	0	0	0	23	1,645	241	92	35	0	0	2,036
1998	0	10	81	6	117	0	0	26	59	3	302
1999	0	41	121	88	366	119	79	797	75	0	1,686
2000	0	207	387	188	93	89	69	712	32	44	1,821
2001	82	438	798	105	608	181	227	120	5	272	2,836
2002	131	787	1,661	752	1,290	48	163	186	31	183	5,232
2003	399	1,271	1,497	222	0	5	26	224	15	353	4,012
2004	833	1,520	503	0	2	42	348	182	85	422	3,937
Averages											
1979-1982	439	3,495	8,166	12,428	23,370	20,997	12,055	5,779	172	470	87,371
1983-1995	0	577	1,907	1,586	18,507	16,887	6,827	570	1	0	46,862
1996-1998	0	3	27	10	766	850	398	283	20	1	2,357
1999-2004	241	711	828	226	393	81	152	370	41	212	3,254
2002-2004	454	1,193	1,220	325	430	32	179	197	44	319	4,393

5. To the extent possible, compare stock composition data available from coded wire tag recoveries and from the CTC Chinook model for the years 2000-2004 to the GSI data assembled by Canada to facilitate recent management of the NBC and WCVI fisheries.

After some discussion, the Workgroup concluded that this assignment amounted to an exercise of comparing 'apples to oranges'. Therefore, no such comparison has been made. Rather, GSI- based stock composition estimates are provided for some fisheries and years, where available. Model estimates of stock composition are provided under assignment 8.

CWT data alone cannot be used to estimate the stock composition in a fishery of interest because only a portion of the catch (typically 30-50%) can be assigned to a stock group. All hatchery and wild stocks present that have no CWT data associated with them will not be detected. Only GSI-derived (which may incorporate CWT information) and model stock composition estimates attempt to assign the entire catch to stock groups. However, these two approaches are designed with different objectives: GSI will theoretically detect all stocks present, while the PSC Chinook model will only estimate stocks included in the model base period. For example, while GSI can estimate the number of California Chinook in any catch (assuming that adequate baseline information on component stocks is available), the Chinook model cannot, since California CWT recovery information from the base period was not incorporated into the model. For the WCVI fishery, GSI-based stock compositions were estimated only for fish with intact adipose fins. Therefore, these estimates would not report the total contributions of hatchery and wild fish. Consequently GSI and PSC Chinook model-based estimates are not comparable. While comparing a GSI-based stock composition estimate to a model estimate may have some utility, such comparisons are only valid for the North Coast troll and QCI sport fisheries. These fisheries were the only ones sampled in an unbiased and representative manner using DNA technology for the period covered by this report.

NBC AABM Fishery Catch Stock Composition

The NBC information provided consists of GSI data from the NBC troll fishery and the Queen Charlotte Islands (QCI) Sport fishery (Winther et. al. 2006). The CTC Chinook model generates stock composition data for the annual time step from October 1 through September 30 of the following calendar year. The GSI information from the NBC AABM fisheries has been assembled to provide annual stock specific catch estimates for the troll and QCI sport fisheries in the same time steps (e.g., the 2003 CTC year begins Oct. 1, 2002 and ends Sept. 30, 2003). Stock compositions are presented in number of fish for the NBC troll fishery from 2002 to 2005 in Table 5-1A and for the QCI sport fishery from 2003 to 2005 in Table 5-2A. The stock composition estimates for catch by these fisheries are presented as percentages in Tables 5-1B and 5-2B for troll and sport fisheries respectively. The baseline used for sample allocations as well as a key to the acronyms used to represent production regions are provided in Tables 5-3 and 5-4.

Virtually all of the troll catches from 2002 to 2004 were assigned to stock groups using GSI information. .However, small amounts of catch in each of the years could not.. For example, test catches from Hecate Strait were not analyzed in 2002 and small catches in October of 2002 and 2003 were not sampled. Similarly, small portions of the annual QCI sport catches were not included in the GSI analysis (i.e., small catches from the east side of QCI). These small amounts of catch would have minimal effect on the stock composition estimates over the entire annual catch.

DNA samples were collected from 10,800 of the 13,100 Chinook caught in the 2001 troll fishery. The Area 4 catch of 2,300 Chinook was not DNA sampled. Only 381 Chinook in the 2000 catch of 9,948 were sampled for DNA analysis. Because this fishery was so restricted those years (less than 10% of the preseason NBC AABM allowance was harvested), comparisons to model estimates of stock composition would not likely be valid for 2000 or 2001.

Table 5-1A. Estimated Chinook catch by stock group for NBC troll fisheries from 2002 to 2005, based on DNA analysis. Baseline stocks appear in Table 5-3; abbreviations are described in Table 5-4, and standard deviations (STD) appear in brackets.

Year	2002		2003		2004		2005		
NBC AABM Troll Catch	103,038		136,437		167,463		172,877		
Catch assigned to DNA	101,305		137,117		167,436		174,806		
DNA analyzed (Σ N)	934		1,775		1,911		2,496		
DNA baseline size	182/233		233		240		240		
Stock Group 2002 & 2003	**Catch**	**STD**	**Catch**	**STD**	**Catch**	**STD**	**Catch**	**STD**	**Stock Group 2004 & 2005**
Alaska	236	(352)	286	(409)	1268	(784)	0	(81)	Alaska
					21	(84)	167	(224)	Alsek
Taku	58	(171)	635	(281)	578	(534)	8	(79)	Taku
Stikine	1533	(783)	4610	(1267)	527	(470)	943	(500)	Stikine
QCI	0	0	81	(78)	323	(324)	2	(29)	QCI
Nass	2100	(647)	2491	(772)	419	(344)	430	(373)	NASS
Skeena	4608	(1093)	5792	(1552)	4302	(1286)	6219	(1197)	Skeena
NOMN	6159	(1249)	4042	(959)	7974	(1671)	7902	(1351)	NOMN
WCVI	6775	(1097)	7637	(1471)	10065	(1204)	8125	(1027)	WCVI
ECVI	1087	(660)	2315	(893)	1357	(686)	3677	(876)	ECVI
SOMN	2189	(637)	980	(506)	1438	(766)	326	(365)	SOMN
UPFR	1769	(605)	1295	(676)	680	(548)	813	(500)	UPFR
MUFR	2064	(650)	3525	(1110)	3251	(1104)	1465	(655)	MUFR
NOTH	2525	(653)	2675	(769)	7592	(1583)	4193	(1032)	NOTH
SOTH	21388	(1880)	14573	(2198)	38729	(2895)	39439	(2234)	SOTH
LWTH	6364	(1563)	10160	(2212)	55	(120)	633	(423)	LWTH
LWFR	1237	(695)	1481	(774)	88	(204)	464	(296)	LWFR-Sp
					2892	(1120)	1245	(572)	LWFR-F
Puget Sound	649	(568)	2228	(754)	2600	(866)	498	(386)	Puget Sound
Juan de Fuca	521	(205)	708	(269)	71	(68)	127	(208)	Juan de Fuca
Coastal Wash	10344	(1404)	7704	(1540)	9670	(1858)	7309	(1170)	Coastal Wash
Up Col-Su/F	11449	(1234)	20084	(1917)	30303	(2692)	40805	(2270)	Up Col-Su/F
Snake-Sp/S	65	(82)	412	(234)	146	(245)	0	(149)	Snake-Sp/Su
Snake-F	905	(698)	2080	(1140)	2724	(1205)	831	(750)	Snake-F
Mid/Up Col-Sp	0	(69)	537	(429)	177	(290)	0	(89)	Mid Col-Sp
					253	(196)	0	(172)	Up Col-Sp
Low Col/Will	2329	(807)	11194	(1798)	3452	(1158)	4451	(981)	Low Col
					2,281	(646)	639	(376)	Up Willamette
Oregon	14712	(1338)	29275	(2099)	32827	(2823)	44059	(2236)	Oregon coastal
					411	(417)	33	(115)	S.Oregon/Cal coast
California	241	(237)	318	(430)	32	(101)	0	(58)	Up Klam/Trinity
					1	(5)			Sacramento
					27	(106)	0	(82)	Cent Val-Sp
					896	(575)	0	(111)	Cent Val-F

Table 5-1B. Estimated Chinook catch by stock group for NBC troll fisheries expressed as percent of catch, from 2002 to 2005, based on DNA analysis. Baseline stocks appear in Table 5-3, abbreviations are described in Table 5-4 and standard deviations (STD) appear in brackets.

Year	**2002**		**2003**		**2004**		**2005**		
NBC AABM Troll Catch	103,038		136,437		167,463		172,877		
Catch assigned to DNA	101,305		137,117		167,436		174,806		
DNA analyzed (Σ N)	934		1,775		1,911		2,496		
DNA baseline size	182/233		233		240		240		
Stock Group 2002 & 2003	**Catch**	**STD**	**Catch**	**STD**	**Catch**	**STD**	**Catch**	**STD**	**Stock Group 2004 & 2005**
Alaska	0.2	(0.3)	0.2	(0.3)	0.8	(0.5)	0.0	0.0	Alaska
					0.0	(0.1)	0.1	(0.1)	Alsek
Taku	0.1	(0.2)	0.5	(0.2)	0.3	(0.3)	0.0	0.0	Taku
Stikine	1.5	(0.8)	3.4	(0.9)	0.3	(0.3)	0.5	(0.3)	Stikine
QCI	0.0	0.0	0.1	(0.1)	0.2	(0.2)	0.0	0.0	QCI
Nass	2.1	(0.6)	1.8	(0.6)	0.3	(0.2)	0.2	(0.2)	NASS
Skeena	4.5	(1.1)	4.2	(1.1)	2.6	(0.8)	3.6	(0.7)	Skeena
NOMN	6.1	(1.2)	2.9	(0.7)	4.8	(1.0)	4.5	(0.8)	NOMN
WCVI	6.7	(1.1)	5.6	(1.1)	6.0	(0.7)	4.6	(0.6)	WCVI
ECVI	1.1	(0.7)	1.7	(0.7)	0.8	(0.4)	2.1	(0.5)	ECVI
SOMN	2.2	(0.6)	0.7	(0.4)	0.9	(0.5)	0.2	(0.2)	SOMN
UPFR	1.7	(0.6)	0.9	(0.5)	0.4	(0.3)	0.5	(0.3)	UPFR
MUFR	2.0	(0.6)	2.6	(0.8)	1.9	(0.7)	0.8	(0.4)	MUFR
NOTH	2.5	(0.6)	2.0	(0.6)	4.5	(0.9)	2.4	(0.6)	NOTH
SOTH	21.1	(1.9)	10.6	(1.6)	23.1	(1.7)	22.6	(1.3)	SOTH
LWTH	6.3	(1.5)	7.4	(1.6)	0.0	(0.1)	0.4	(0.2)	LWTH
LWFR	1.2	(0.7)	1.1	(0.6)	0.1	(0.1)	0.3	(0.2)	LWFR-Sp
					1.7	(0.7)	0.7	(0.3)	LWFR-F
Puget Sound	0.6	(0.6)	1.6	(0.5)	1.6	(0.5)	0.3	(0.2)	Puget Sound
Juan de Fuca	0.5	(0.2)	0.5	(0.2)	0.0	0.0	0.1	(0.1)	Juan de Fuca
Coastal Wash	10.2	(1.4)	5.6	(1.1)	5.8	(1.1)	4.2	(0.7)	Coastal Wash
Up Col-Su/F	11.3	(1.2)	14.6	(1.4)	18.1	(1.6)	23.3	(1.3)	Up Col-Su/F
Snake-Sp/S	0.1	(0.1)	0.3	(0.2)	0.1	(0.1)	0.0	(0.1)	Snake-Sp/Su
Snake-F	0.9	(0.7)	1.5	(0.8)	1.6	(0.7)	0.5	(0.4)	Snake-F
Mid/Up Col-Sp	0.0	(0.1)	0.4	(0.3)	0.1	(0.2)	0.0	(0.1)	Mid Col-Sp
					0.2	(0.1)	0.0	(0.1)	Up Col-Sp
Low Col/Will	2.3	(0.8)	8.2	(1.3)	2.1	(0.7)	2.5	(0.6)	Low Col
					1.4	(0.4)	0.4	(0.2)	Up Willamette
Oregon	14.5	(1.3)	21.4	(1.5)	19.6	(1.7)	25.2	(1.3)	Oregon coastal
					0.2	(0.2)	0.0	(0.1)	S.Oregon/Cal coast
California	0.2	(0.2)	0.2	(0.3)	0.0	(0.1)	0.0	0.0	Up Klam/Trinity
					0.0	0.0			Sacramento
					0.0	(0.1)	0.0	0.0	Cent Val-Sp
					0.5	(0.3)	0.0	(0.1)	Cent Val-F

Table 5-2A. Estimated Chinook catch by stock group for QCI sport fisheries 2003 to 2005, based on DNA analysis.

Baseline stocks appear in Table 5-3, abbreviations are described in Table 5-4 and standard deviations (STD) appear in brackets. Mixture analyses were performed with a 240 stock baseline for all years.

Year	**2003**		**2004**		**2005**	
QCI Sport AABM Catch	54,300		74,000		68,800	
Catch assigned to DNA	54,000		74,000		67,800	
DNA analyzed (Σ N)	358		597		684	
DNA baseline size	240		240		240	
Stock Group	**Catch**	**STD**	**Catch**	**STD**	**Catch**	**STD**
Alaska	5	(25)	5	(22)	0	(42)
Alsek	2	(14)	2	(28)	0	(32)
Taku	262	(304)	9	(50)	0	(34)
Stikine	763	(501)	2105	(828)	0	(185)
QCI (Yakoun)	103	(144)	889	(437)	535	(284)
Nass	232	(260)	990	(577)	692	(447)
Skeena	2583	(779)	2410	(1011)	3227	(870)
NOMN (N. Mainland)	1769	(741)	3119	(1008)	5181	(950)
WCVI	8124	(1047)	13871	(1539)	13347	(1072)
ECVI	717	(374)	592	(199)	187	(218)
SOMN (S. Mainland)	128	(202)	18	(80)	455	(394)
UPFR (Upper Fraser)	43	(94)	235	(147)	371	(328)
MUFR (Mid-upper Fraser)	36	(92)	407	(351)	1010	(456)
NOTH (N. Thompson)	883	(459)	1073	(650)	136	(383)
SOTH (S. Thompson)	10071	(1209)	7584	(1261)	10230	(1042)
LWTH (Lower Thompson)	11	(44)	84	(93)	0	(57)
LWFR-Spr (Lower Fraser)	2	(19)	195	(281)	0	(37)
LWFR-Fall (Lower Fraser)	1064	(457)	380	(323)	0	(57)
Puget Sound	145	(174)	236	(198)	0	(261)
Juan de Fuca	131	(152)	269	(81)	0	(33)
Coastal Wash	4145	(1024)	9954	(1664)	4790	(875)
Upper Col-Sp	5	(30)	7	(32)	0	(81)
Upper Col-Sum/Fall	7048	(1158)	10820	(1382)	11939	(1063)
Snake-Sp/Sum	19	(58)	15	(74)	0	(80)
Snake-Fall	2782	(861)	123	(927)	219	(364)
Mid Col-Spr	5	(23)	0	(23)	0	(32)
Upper Willamette Spr	19	(66)	2	(22)	58	(103)
Low Columbia Fall	2326	(677)	1048	(305)	511	(325)
Oregon coastal	9979	(1305)	16734	(1738)	14826	(1276)
S.Oregon/Cal coast	13	(62)	127	(484)	0	(60)
Upper Klamath/Trinity	3	(31)	0	(7)	0	(32)
CA Cent Val-Spr	11	(44)	5	(53)	0	(69)
CA Cent Val-Fall	563	(358)	688	(542)	86	(162)

Table 5-2B. Estimated Chinook catch by stock group for QCI sport fisheries expressed as percent of catch for 2003 to 2005, based on DNA analysis.

Baseline stocks appear in Table 5-3, abbreviations are described in Table 5-4 and standard deviations (STD) appear in brackets. Mixture analyses were performed with a 240 stock baseline for all years

Year	**2003**		**2004**		**2005**	
QCI Sport AABM Catch	54,300		74,000		68,800	
Catch assigned to DNA	54,000		74,000		67,800	
DNA analyzed (Σ N)	358		597		684	
DNA baseline size	240		240		240	
Stock Group	**Catch**	**STD**	**Catch**	**STD**	**Catch**	**STD**
Alaska	0.0	0.0	0.0	0.0	0.0	(0.1)
Alsek	0.0	0.0	0.0	0.0	0.0	0.0
Taku	0.5	(0.6)	0.0	(0.1)	0.0	0.0
Stikine	1.4	(0.9)	2.8	(1.1)	0.0	(0.3)
QCI (Yakoun)	0.2	(0.3)	1.2	(0.6)	0.8	(0.4)
Nass	0.4	(0.5)	1.3	(0.8)	1.0	(0.7)
Skeena	4.8	(1.4)	3.3	(1.4)	4.8	(1.3)
NOMN (N. Mainland)	3.3	(1.4)	4.2	(1.4)	7.6	(1.4)
WCVI	15.0	(1.9)	18.7	(2.1)	19.7	(1.6)
ECVI	1.3	(0.7)	0.8	(0.3)	0.3	(0.3)
SOMN (S. Mainland)	0.2	(0.4)	0.0	(0.1)	0.7	(0.6)
UPFR (Upper Fraser)	0.1	(0.2)	0.3	(0.2)	0.5	(0.5)
MUFR (Mid-upper Fraser)	0.1	(0.2)	0.6	(0.5)	1.5	(0.7)
NOTH (N. Thompson)	1.6	(0.8)	1.4	(0.9)	0.2	(0.6)
SOTH (S. Thompson)	18.7	(2.2)	10.2	(1.7)	15.1	(1.5)
LWTH (Lower Thompson)	0.0	(0.1)	0.1	(0.1)	0.0	(0.1)
LWFR-Spr (Lower Fraser)	0.0	0.0	0.3	(0.4)	0.0	(0.1)
LWFR-Fall (Lower Fraser)	2.0	(0.8)	0.5	(0.4)	0.0	(0.1)
Puget Sound	0.3	(0.3)	0.3	(0.3)	0.0	(0.4)
Juan de Fuca	0.2	(0.3)	0.4	(0.1)	0.0	0.0
Coastal Wash	7.7	(1.9)	13.5	(2.2)	7.1	(1.3)
Upper Col-Sp	0.0	(0.1)	0.0	0.0	0.0	(0.1)
Upper Col-Sum/Fall	13.1	(2.1)	14.6	(1.9)	17.6	(1.6)
Snake-Sp/Sum	0.0	(0.1)	0.0	(0.1)	0.0	(0.1)
Snake-Fall	5.2	(1.6)	0.2	(1.3)	0.3	(0.5)
Mid Col-Spr	0.0	0.0	0.0	0.0	0.0	0.0
Upper Willamette Spr	0.0	(0.1)	0.0	0.0	0.1	(0.2)
Low Columbia Fall	4.3	(1.3)	1.4	(0.4)	0.8	(0.5)
Oregon coastal	18.5	(2.4)	22.6	(2.3)	21.9	(1.9)
S.Oregon/Cal coast	0.0	(0.1)	0.2	(0.7)	0.0	(0.1)
Upper Klamath/Trinity	0.0	(0.1)	0.0	0.0	0.0	0.0
CA Cent Val-Spr	0.0	(0.1)	0.0	(0.1)	0.0	(0.1)
CA Cent Val-Fall	1.0	(0.7)	0.9	(0.7)	0.1	(0.2)

Table 5-3. Baseline stocks (245) available for use in the mixture analyses from 2002 to 2005 for the NBC stock composition analyses.

#	Stock Group	Population	Code[1]	n
1	UPFR	Bowron__	XYZ	176
1	UPFR	Dome____	XYZ	385
1	UPFR	Fontoniko	XYZ	63
1	UPFR	Goat____	XYZ	77
1	UPFR	Holmes___	XYZ	216
1	UPFR	Horsey___	XYZ	41
1	UPFR	Indianpoint	XYZ	47
1	UPFR	James	YZ	57
1	UPFR	Kenneth_Cr	YZ	78
1	UPFR	MacGregor	XYZ	126
1	UPFR	Morkill_River	XYZ	208
1	UPFR	R_Chehalis	YZ	127
1	UPFR	R_Chilliwack	YZ	163
1	UPFR	Salmon@PG	XYZ	263
1	UPFR	Slim_____	XYZ	204
1	UPFR	Swift____	XYZ	411
1	UPFR	Tete_Jaune	XYZ	488
1	UPFR	Torpy_River	YZ	170
1	UPFR	Walker__	XYZ	42
1	UPFR	Willow___	XYZ	85
2	MUFR	Baezeako	YZ	82
2	MUFR	Bridge__	XYZ	425
2	MUFR	Chilako_	XYZ	45
2	MUFR	Chilcotin_mix	XYZ	47
2	MUFR	Chilko__	XYZ	270
2	MUFR	Cottonwood	XYZ	53
2	MUFR	Elkin____	XYZ	235
2	MUFR	Endako__	XYZ	87
2	MUFR	Horsefly	XYZ	58
2	MUFR	L._Cariboo	XYZ	33
2	MUFR	L._Chilcoti	XYZ	232
2	MUFR	Nazko	YZ	194
2	MUFR	Nechako_	XYZ	577
2	MUFR	Portage_	XYZ	201
2	MUFR	Quesnel_	XYZ	565
2	MUFR	Stuart__	XYZ	555
2	MUFR	Taseko__	XYZ	200
2	MUFR	U._Cariboo	XYZ	171
2	MUFR	U._Chilcotin	XYZ	277
2	MUFR	Westroad	XYZ	39
3	LWFR-F	Chilliwac@Stave	XYZ	377
3	LWFR-F	Harrison	XYZ	603
3	LWFR-F	W_Chilliwack	XYZ	481
4	NOTH	Barriere	XYZ	55
4	NOTH	Blue_River	XYZ	52
4	NOTH	Clearwater	XYZ	262
4	NOTH	Finn____	XYZ	171
4	NOTH	Lemieux_Creek	XYZ	98
4	NOTH	N._Thom@Main	XYZ	115
4	NOTH	Raft____	XYZ	248
5	SOTH	Bessette	XYZ	59
5	SOTH	Duteau_Cr	XYZ	46
5	SOTH	Eagle___	XYZ	42
5	SOTH	L._Adams_	XYZ	208
5	SOTH	L._Shuswap	XYZ	356
5	SOTH	L._Thompson	XYZ	173
5	SOTH	L_Shus@U_Adams	XYZ	45
5	SOTH	Little__	XYZ	158
5	SOTH	M._Shuswap	XYZ	376
5	SOTH	Salmon@SA	XYZ	214
5	SOTH	South_Thom	XYZ	267
6	LWTH	Bonaparte	XYZ	308
6	LWTH	Coldwater	XYZ	279
6	LWTH	Deadman__	XYZ	299
6	LWTH	Louis___	XYZ	577
6	LWTH	Nicola__	XYZ	468
6	LWTH	Spius___	XYZ	136
6	LWTH	U._Coldwat_SP	XYZ	141
6	LWTH	U._Spius_SP	XYZ	131
7	ECVI	Big_Qualicum	XYZ	374
7	ECVI	BigQul@Lang	YZ	293
7	ECVI	Chemainus	XYZ	261
7	ECVI	Cowichan	XYZ	684
7	ECVI	L._Qualicum	XYZ	209
7	ECVI	Nanaimo,Upper	Y	118
7	ECVI	Nanaimo_F	XYZ	546
7	ECVI	Nanaimo_SP	YZ	99
7	ECVI	Nanaimo_SU	XYZ	278
7	ECVI	Nimpkish	XYZ	57
7	ECVI	Puntled_SU	XYZ	899
7	ECVI	Puntledge_F	XYZ	576
7	ECVI	Quatse___	XYZ	38
7	ECVI	Quinsam_	XYZ	457
7	ECVI	Woss_Lake	YZ	31
8	WCVI	Burman__	XYZ	273
8	WCVI	Colonial_Cay	YZ	40
8	WCVI	Conuma__	XYZ	456
8	WCVI	Gold_R	YZ	93
8	WCVI	Kennedy_	XYZ	49
8	WCVI	Marble@NVI	XYZ	507
8	WCVI	Nahmint__	XYZ	258
8	WCVI	Nitinat_	XYZ	346
8	WCVI	Rob@Gold	YZ	225
8	WCVI	Rob@Muchalat_	YZ	33
8	WCVI	Robertson	XYZ	386
8	WCVI	San_Juan	YZ	196
8	WCVI	Sarita__	XYZ	415
8	WCVI	Stamp___	XYZ	303
8	WCVI	Tahsis	YZ	310
8	WCVI	Thornton_	XYZ	518
8	WCVI	Tlupana	Y	66
8	WCVI	Toquart_River	YZ	87
8	WCVI	Tranquille	XYZ	342
9	SOMN	Bute____	XYZ	72
9	SOMN	Capilano	YZ	126
9	SOMN	Devereux	XYZ	329
9	SOMN	Homathko	XYZ	52
9	SOMN	Klinaklini	XYZ	448
9	SOMN	Porteau_Cove	XYZ	357
9	SOMN	Squamish	XYZ	157
9	SOMN	Mamquam_	X	20
9	SOMN	Phillips	X	26
10	NOMN	Ashlulm__	XYZ	64
10	NOMN	Atnarko_	XYZ	275
10	NOMN	Chuckwalla	XYZ	279
10	NOMN	Dean_River	Y	38
10	NOMN	Docee__	YZ	50
10	NOMN	Hirsch__	XYZ	474
10	NOMN	Kilbella	XYZ	161
10	NOMN	Kildala_	XYZ	441
10	NOMN	Kitimat_	XYZ	482
10	NOMN	Kloiya_River	XYZ	46
10	NOMN	Kwinamass	XYZ	275
10	NOMN	Neechanze	XY	57
10	NOMN	Nusatsum	XYZ	43
10	NOMN	Saloompt	XYZ	96

#	Stock Group	Population	Code[1]	n
10	NOMN	U._Atnarko	XYZ	155
10	NOMN	U._Dean	XY	51
10	NOMN	Wannock_	XYZ	510
11	NASS	Cranberry	XYZ	164
11	NASS	Damdochax	XYZ	257
11	NASS	Kincolith	XYZ	287
11	NASS	Kwinageese	XYZ	299
11	NASS	Meziadin	XYZ	195
11	NASS	Owegee__	XYZ	219
11	NASS	Seaskinnish	XYZ	99
11	NASS	Snowbank_	XYZ	54
11	NASS	Teigen__	X	30
11	NASS	Tseax___	XYZ	180
12	LWFR-Sp	Big_Silver	XYZ	111
12	LWFR-Sp	Birkenhead	XYZ	255
12	LWFR-Sp	Upper_Pitt	XY	88
13	LWFR-Su	Maria_Slough	XYZ	302
14	QCI	Yakoun__	XYZ	201
15	Alaska	Chickamin	XYZ	116
15	Alaska	King_Salmon	XYZ	57
15	Alaska	Unuk____	XYZ	193
17	Taku	Little_Tatsam.	XYZ	204
17	Taku	Little_Trapper	XYZ	131
17	Taku	Nahlin__	X	22
18	Stikine	Andrew_Creek	XYZ	144
18	Stikine	Christina	XYZ	238
18	Stikine	Craig_River	YZ	114
18	Stikine	Little_Tahltan	XYZ	413
18	Stikine	Shakes_Creek	YZ	159
18	Stikine	Verrett	XYZ	467
19	Skeena Upper	Bear____	XYZ	177
19	Skeena Upper	Sustut__	XYZ	416
20	Skeena Babine	Babine__	XYZ	266
21	Skeena Bulkley	Bulkley	XYZ	585
21	Skeena Bulkley	Morice__	XYZ	228
22	Skeena Mid	Kispiox_	XYZ	105
22	Skeena Mid	Kitwanga	XYZ	288
23	Skeena Lower	Cedar___	XYZ	116
23	Skeena Lower	Ecstall_	XYZ	293
23	Skeena Lower	Gitnadoix	XY	42
23	Skeena Lower	L._Kalum	XYZ	457
23	Skeena Lower	L._Kalum@AC	XYZ	190
23	Skeena Lower	Moonlit_Creek	XYZ	83
24	Alsek	Blanchard	YZ	376
24	Alsek	Klukshu_	YZ	432
24	Alsek	Takhanne	YZ	188
50	Puget Sound	Kendall_Green_F	XYZ	50
50	Puget Sound	Kendall_Nook_SP	XYZ	100
50	Puget Sound	Little Campbell	YZ	90
50	Puget Sound	Serpentine	YZ	46
50	Puget Sound	Skagit_SU	XYZ	282
50	Puget Sound	Skykomish_SU	XYZ	75
50	Puget Sound	Soos_Green_F	XYZ	100
50	Puget Sound	Stillaguamish	XYZ	87
50	Puget Sound	White_F_	XYZ	100
51	Juan de Fuca	Elwha_F_	XYZ	99
52	Coastal Wash	Hoh_River_SP_SU	XYZ	59
52	Coastal Wash	Queets__	XYZ	57
52	Coastal Wash	Quinault_F	XYZ	64
52	Coastal Wash	Solduc_F	XYZ	98
53	Low Col	Abernathy_F	XYZ	100
53	Low Col	Coweeman_	XYZ	77
53	Low Col	Sandy___	YZ	89
54	Up Col-Sp	Chewuch_SP	XYZ	100
54	Up Col-Sp	Chiwawa_SP	XYZ	100
54	Up Col-Sp	Entiat__	YZ	64
54	Up Col-Sp	Twisp_SP	YZ	100

#	Stock Group	Population	Code[1]	n
55	Up Col-Su/F	Deschutes-F	YZ	100
55	Up Col-Su/F	Hanford_Reach	XYZ	98
55	Up Col-Su/F	Silmilkameen_SU	XYZ	100
55	Up Col-Su/F	Wenatchee_SU	XYZ	100
56	Snake-Sp/Su	Frenchman-SP	YZ	61
56	Snake-Sp/Su	Imnaha__	XYZ	99
56	Snake-Sp/Su	Marsh_Creek	XYZ	220
56	Snake-Sp/Su	McCall_Hat	XYZ	41
56	Snake-Sp/Su	McCall_River	XYZ	32
56	Snake-Sp/Su	Rapid_Sp	XYZ	80
56	Snake-Sp/Su	Salmon_E.Fork	YZ	53
56	Snake-Sp/Su	Tucannon_SP	XYZ	100
56	Snake-Sp/Su	Up_Salmon-SP	YZ	165
56	Snake-Sp/Su	Upper_Valley	XYZ	77
56	Snake-Sp/Su	Valley_Creek	XYZ	43
56	Snake-Sp/Su	Wenaha__	XYZ	43
57	Snake-F	Lyon's_Ferry_F	XYZ	123
57	Snake-F	Snake___	XYZ	62
58	Oregon coastal	Cole_River	YZ	49
58	Oregon coastal	Elk_River	YZ	70
58	Oregon coastal	Euchre_Creek	YZ	57
58	Oregon coastal	Hunter_Creek	YZ	96
58	Oregon coastal	Lobster_Creek	YZ	49
58	Oregon coastal	Nehalem__	YZ	53
58	Oregon coastal	Pistol_River	YZ	95
58	Oregon coastal	Siuslaw__	YZ	37
58	Oregon coastal	Trask_hat_SP	XYZ	48
58	Oregon coastal	Trsk_hat_F	XYZ	98
58	Oregon coastal	Umpqua_Smith	YZ	93
59	S.Oregon/Cal coast	Blue_Creek	YZ	94
59	S.Oregon/Cal coast	Winchuk__	YZ	80
61	Up Klam/Trinity	Trinity_F	XYZ	100
61	Up Klam/Trinity	Trinity_SP	XYZ	100
62	Mid Col-Sp	John_Day_main	YZ	36
62	Mid Col-Sp	John_Day_middle	YZ	40
62	Mid Col-Sp	John_Day_north	YZ	40
62	Mid Col-Sp	Naches_Sp	X	30
63	Up Willamette	Clackamas_North	YZ	79
63	Up Willamette	North_Santiam	XYZ	97
64	Cent Val-F	American_River	YZ	69
64	Cent Val-F	Battle_Creek	YZ	40
64	Cent Val-F	Butte_F	YZ	49
64	Cent Val-F	Feather_F	YZ	128
64	Cent Val-F	Merced__	YZ	200
64	Cent Val-F	Mokelumne	XYZ	94
64	Cent Val-F	Sacr_F___	XYZ	136
64	Cent Val-F	Sacr_LF__	XYZ	96
64	Cent Val-F	Toulume__	YZ	34
64	Cent Val-F	Yuba____	YZ	50
65	Cent Val-Sp	Butte_Sp	YZ	43
65	Cent Val-Sp	Feather_Sp	YZ	82
65	Cent Val-Sp	Yuba_Sp__	YZ	32

[1]X = stocks used in the 182 stock baseline.
Y = stocks used in 240 stock baseline.
Z = stocks used in 233 stock baseline.

Table 5-4. Abbreviations used to describe production regions.

#	Abbreviation	Stock Group
1	UPFR	Upper Fraser River
2	MUFR	Middle Fraser River
3	LWFR-F	Lower Fraser River Fall
4	NOTH	North Thompson River
5	SOTH	South Thompson River
6	LWTH	Lower Thompson River
7	ECVI	East Coast of Vancouver Island
8	WCVI	West Coast of Vancouver Island
9	SOMN	Southern Mainland BC
10	NOMN	Northern Mainland BC
11	NASS	Nass River
12	LWFR-Sp	Lower Fraser River Spring
13	LWFR-Su	Lower Fraser River Summer
14	QCI	Yakoun River
15	Alaska	Alaska
17	Taku	Taku River
18	Stikine	Stikine River
19	Skeena Upper	Skeena Upper
20	Skeena Babine	Skeena Babine
21	Skeena Bulkley	Skeena Bulkley
22	Skeena Mid	Skeena Mid
23	Skeena Lower	Skeena Lower
24	Alsek	Alsek
50	Puget Sound	Puget Sound
51	Juan de Fuca	Juan de Fuca Strait
52	Coastal Wash	Coastal Washington
53	Low Col	Lower Columbia
54	Up Col-Sp	Upper Columbia Spring
55	Up Col-Su/F	Upper Columbia Summer & Fall
56	Snake-Sp/Su	Snake River Spring & Summer
57	Snake-F	Snake River Fall
58	Oregon coastal	Oregon coastal
59	S.Oregon/Cal coast	Southern Oregon Coastal and California Coastal
61	Up Klam/Trinity	Upper Klamath & Trinity
62	Mid Col-Sp	Middle Columbia Spring
63	Up Willamette	Upper Willamette
64	Cent Val-F	Central Valley Fall
65	Cent Val-Sp	Central Valley Spring
19-23	Skeena	Skeena River and tributaries
58 & 59	Oregon	Oregon coastal
61, 64 & 65	California	California

WCVI AABM Fishery Catch Stock Composition

In the WCVI troll fishery, CDFO attempted to use data collected from CWT and DNA sampling to generate stock composition estimates for marked (adipose-clipped fish) and unmarked fish separately. These estimates were combined in various past PowerPoint presentations (e.g. Northwest Power and Conservation Council meeting, July 2005). Specifically, DNA samples were taken from unclipped fish only, while CWT recoveries were expanded to account for associated production with CWT releases, in an attempt to account for the stock composition of adipose-clipped fish. However, upon closer examination of the 2003/2004 WCVI troll stock composition data, the Workgroup determined that the approach used was flawed. There were four major sources of error:

1) During the course of transferring release data from the RMIS database to the Canadian equivalent (Mark Recovery Program Database), a 'translation' error occurred. This resulted in some release data having their mark status incorrectly identified. The net effect of this error was that expansions of some CWT recoveries for southern U.S. stocks were incorrectly calculated.
2) Some incorrect weights were applied to the monthly stock composition estimates.
3) When attempting to account for all hatchery releases, it was incorrectly assumed that all adipose-clipped fish encountered in the WCVI troll fishery had CWTs associated with them. In fact, from 30-45% of recent adipose-clipped Chinook releases from the southern U.S. are not associated with any CWTs. This is primarily the result of mass marking. Based on the observed clip rate in the 2003/2004 WCVI troll catch versus the calculated number of clipped fish encountered in the catch that could be accounted for by CWTs, it is estimated that approximately 50% of clipped encounters were from unassociated releases. This meant that ~12% (monthly range, 4-25%) of the total WCVI troll catch for that period was not accounted for, i.e. was not represented by either CWTs, or DNA sampling. Efforts to try to link unassociated releases with CWT marked releases generally failed, as such releases could not be reliably associated with CWT marked fish of similar stock origin, life history type, or run-timing. The only conclusion that could be drawn on the origin of this unassociated, clipped catch is that it is almost exclusively comprised of southern U.S. hatchery origin Chinook.
4) Another source of confusion resulted from inconsistencies in the stocks included in the groupings used for CWT and DNA analysis. In particular, the stock group labelled mid-Columbia Springs actually represented lower Columbia spring stocks originating below John Day Dam, or in the Yakima basin. This inconsistency has now been eliminated and stock groups properly labelled.

The net result was that even when errors #1 and 2 were corrected, there was no reliable way to account for 12% of the landed catch for the 2003/2004 accounting year (error #3). Therefore, the stock composition estimates previously presented as representing the <u>total</u> WCVI troll catch for this catch year were incorrect. Nevertheless, since the 2003/2004 WCVI troll stock composition estimates have been widely circulated, the Workgroup felt that corrected results, as far as they could go, should be provided in this report. No additional stock composition estimates are provided for the WCVI troll fishery, since it has only been since the fall of 2005 that the sampling protocol was changed so that both clipped and unclipped fish are sampled for DNA. Such sampling should provide unbiased, representative estimates of stock composition in the future (see Appendix 2 for a complete description of the GSI methodology employed by CDFO, including the stocks included in the CDFO microsatellite baseline).

A graphical comparison is provided between the stock composition estimates for the WCVI troll (2003/2004) presented at the Columbia River Power and Conservation Council (Figure 5-1), and the corrected and revised estimates (Figure 5-2). A tabular comparison is shown below. Monthly estimates of stock composition are also provided in Table 5-5 (see Assignment 9 for an assessment of the methodology used).

Stock Group	Previously Presented (July 2005) Stock Composition	Corrected Stock Composition
Alaska	0.0%	0.0%
Canada	12.1%	13.2%
Puget Sound Spring/Summer/Fall	19.4%	17.7%
Washington Coastal	1.3%	1.2%
Lower Columbia R Fall	43.5%	27.8%
Upper Columbia R Spring	0.1%	0.0%
Upper Columbia R Summer/Fall	4.3%	9.3%
Lower Columbia R Spring	5.3%	7.0%
Upper Willamette Spring	4.0%	4.6%
Snake R Spring/Summer	0.1%	0.2%
Snake R Fall	1.5%	1.6%
Oregon Coastal	1.6%	1.9%
California	5.9%	3.7%
Unassociated adipose fin clipped	NA	11.9%

Some changes associated with correcting errors 1-4 are worth noting. The proportion of Lower Columbia River fall Chinook was originally overestimated, while that of the Upper Columbia River spring/summer group was underestimated. Changes among the other stock groups were relatively small. Note that when the unaccounted for adipose-clipped portion is included in the breakouts, the proportions of all of the identified stock groups decrease, though some of these stock groups would also be represented within the unassociated group to an unknown degree. Table 5-6 provides a tabular presentation of the percent stock compositions for both figures.

It is important to note that these point estimates have measures of variability associated with them. Consequently, caution should be exercised when using any such point estimates to estimate how many fish of any stock group were harvested.

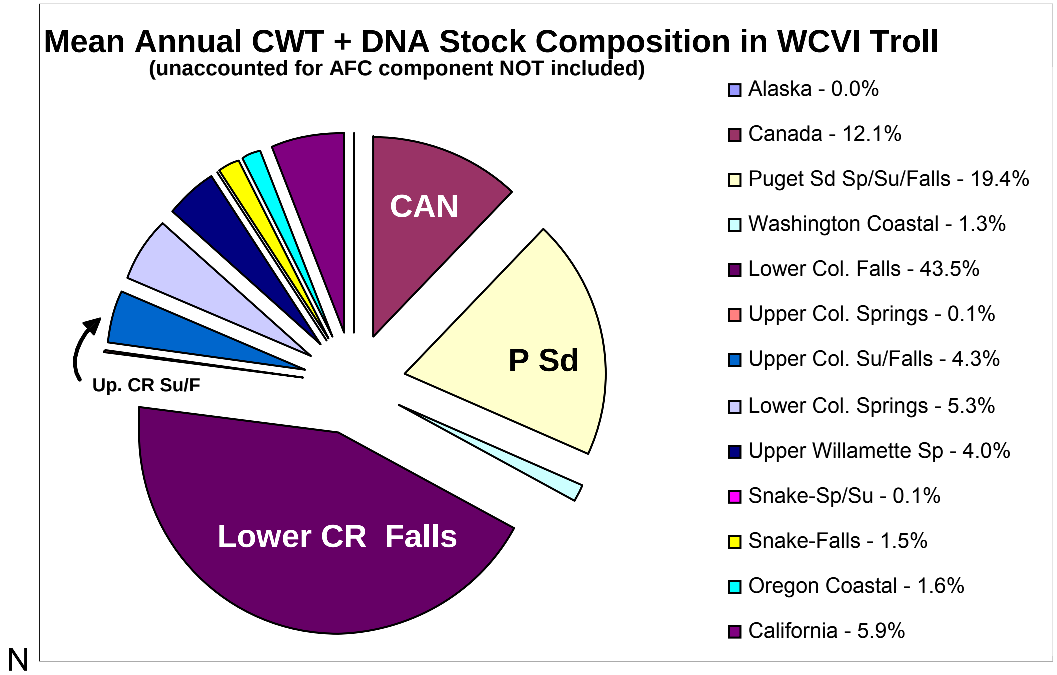


Figure 5-1. Estimated stock composition of the WCVI Chinook troll catch (Oct. 2003 – Sept. 2004) based on combined DNA and CWT data as presented at the Northwest Power and Conservation Council meeting, July 2005. CWT and DNA used to construct this chart were assumed to represent 100% of the catch. However, a number of errors were later discovered in the assemblage of the CWT data. In addition, it was discovered that the stock composition data actually represented only 88% of the catch. Note that Alaska stocks are represented at the 12:00 position; the other stock groups follow in the order given in the legend in a clockwise direction. The acronym 'AFC' refers to 'adipose fin clip'.

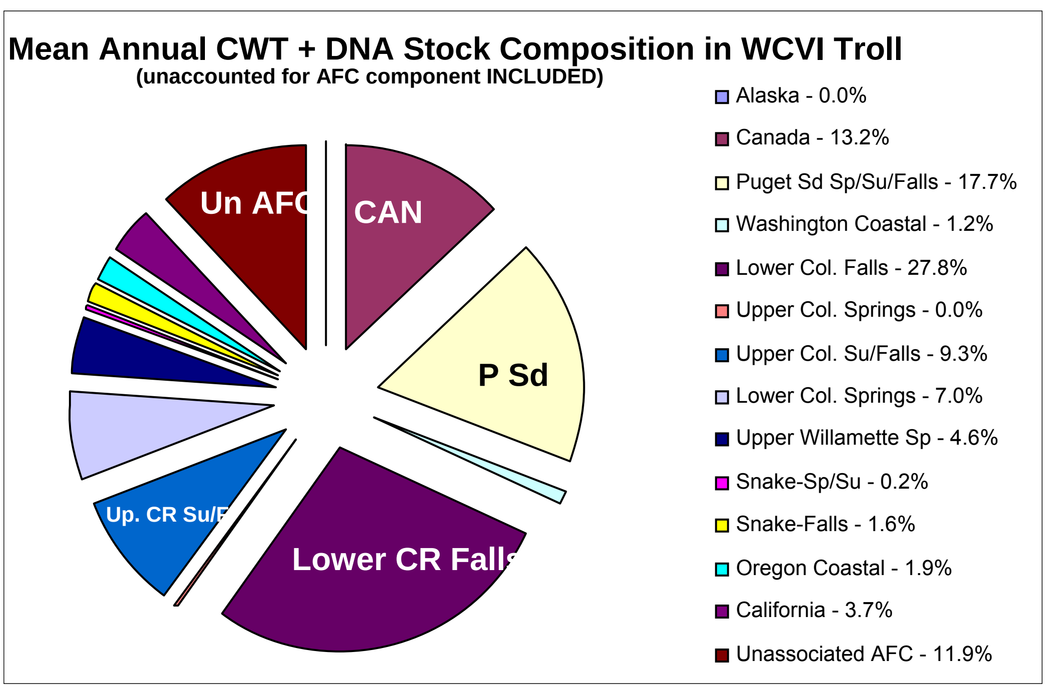


Figure 5-2. Estimated stock composition of the WCVI Chinook troll catch (Oct. 2003 – Sept. 2004) based on combined DNA and corrected CWT data. This is similar to Figure 5-1 except that the estimated percentage of the catch not represented by either CWT or DNA sampling has been included, labelled "Unassociated AFC". The stock-specific percentages have been adjusted (i.e., reduced) so that their total plus the unrepresented AFC (adipose fin clip) component now represents 100% of the catch.

Table 5-5. Monthly estimated stock composition estimates (both uncorrected and corrected) of the WCVI troll catch based on combined CWT and DNA data during the period Oct. 2003 – Sept. 2004. Figure 5-1 represents the data in the column with the heading 'Mean – Original Uncorrected'. Figure 5-2 represents the data in the column with the heading 'Mean – Corrected'. See the text for an explanation of how the original data were corrected.

Aggregated Stock Grouping	Oct 2003	Nov 2003	Dec 2003	Jan 2004	Feb 2004	Mar 2004	Apr 2004	May 2004	Sept 2004	Mean – Corrected	Mean -Original Uncorrected
Alaska	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	**0.0%**	**0.0%**
Canada	25.6%	15.1%	0.9%	5.0%	14.2%	10.8%	12.2%	15.1%	14.9%	**13.2%**	**12.1%**
Puget Sound Sp/Su/Falls	34.3%	16.3%	51.7%	83.0%	50.2%	26.8%	14.9%	18.1%	17.0%	**17.7%**	**19.4%**
Washington Coastal	2.2%	0.4%	0.0%	0.3%	1.2%	0.9%	0.5%	0.0%	4.5%	**1.2%**	**1.3%**
Lower Col. Falls	27.3%	50.0%	36.8%	9.5%	30.2%	40.5%	36.5%	26.2%	31.9%	**27.8%**	**43.5%**
Upper Col. Springs	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	**0.0%**	**0.1%**
Upper Col. Su/Falls	0.6%	1.6%	0.1%	0.1%	0.4%	9.5%	15.0%	13.0%	7.3%	**9.3%**	**4.3%**
Lower Col. Springs	2.5%	1.7%	0.4%	0.2%	0.0%	0.7%	1.0%	11.1%	20.5%	**7.0%**	**5.3%**
Upper Willamette Sp	0.8%	0.5%	1.8%	1.4%	3.2%	8.1%	9.3%	5.5%	0.4%	**4.6%**	**4.0%**
Snake-Sp/Su	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	0.2%	0.1%	0.3%	**0.2%**	**0.1%**
Snake-Falls	0.4%	1.7%	0.4%	0.3%	0.0%	0.1%	1.3%	3.1%	2.0%	**1.6%**	**1.5%**
Oregon Coastal	2.6%	2.7%	0.1%	0.0%	0.0%	0.0%	4.4%	1.2%	0.7%	**1.9%**	**1.6%**
California	3.7%	10.0%	7.9%	0.0%	0.3%	2.6%	4.6%	6.4%	0.5%	**3.7%**	**5.9%**
Unassociated AFC	22.0%	21.8%	18.5%	16.9%	24.5%	17.8%	14.7%	4.4%	10.4%	**11.9%**	
Total	100.0%	100.0%	100.1%	100.0%	99.9%	100.0%	100.0%	100.0%	100.0%	100.0%	

Table 5-6. Monthly estimates of the percentage contribution of the four components of the 2003-2004 WCVI troll catch, and how they were sampled for stock composition. Three of the components are represented by either CWT recoveries or DNA samples. The fourth was not sampled for either. The acronym 'AFC' refers to 'adipose fin clipped' and 'non-AFC' refers to 'non-adipose fin clipped'.

AFC or non-AFC Component of Catch	Sampled for Stock Composition?	Oct 2003	Nov 2003	Dec 2003	Jan 2004	Feb 2004	Mar 2004	Apr 2004	May 2004	Sept 2004	Mean - Unweighted	Mean - Weighted by Catch
AFC fish associated with a CWT release group	Yes, via CWT	10.0%	11.0%	13.0%	20.4%	9.2%	12.0%	11.6%	18.1%	3.8%	12.1%	**12.0%**
Non-AFC fish with CWTs (e.g. DIT)	Yes, via CWT	1.6%	2.3%	1.3%	8.1%	4.7%	2.0%	1.0%	0.7%	0.3%	2.4%	**1.0%**
Non-AFC fish NOT associated with CWTs (primarily wild)	Yes, via DNA	66.4%	64.9%	67.2%	54.7%	61.6%	68.3%	72.7%	76.9%	85.5%	68.7%	**75.1%**
AFC fish NOT associated with a CWT release group	No[1]	22.0%	21.8%	18.5%	16.9%	24.5%	17.8%	14.7%	4.4%	10.4%	16.8%	**11.9%**
Landed Catch (Monthly and Total)		17,905	2,803	815	1,390	1,812	8,043	51,181	51,486	31,234		**166,669**

[1] While the stock composition of this component could only be accounted for via DNA, no tissue samples were taken from this component of the catch.

6. Specify the sampling levels and procedures employed in each fishery and time period for CWT and GSI data for the years 1985-2004;

<u>Mark Recovery Program (CWT sampling)</u>

<u>Troll Fisheries</u>

CDFO has required that all commercial troll catch be sampled at a minimum rate of 20% of landed catch. Sampling is to represent the distribution of catch across statistical areas within a catch region, such that any CWT recoveries can be expanded by each statistical week in which catch occurred for each catch region. Such sampling is meant to provide unbiased and accurate expansion factors for all CWT recoveries. For north coast troll, the catch region NTR is comprised of statistical areas 1-5, corresponding to the statistical areas encompassed by the North Coast AABM troll fishery. While every effort is made to ensure that catch sampling is representative of catch in all statistical areas, CWT expansion factors are based on catch sample rates across all statistical areas comprising the NTR catch region.

For the WCVI area, there are two catch regions: SWVI, encompassing statistical areas 21, 23, 24, 121 and 123-124; and the NWVI, encompassing statistical areas 25-27 and 125-127. Together, these two catch regions comprise the statistical areas that correspond to the WCVI AABM troll fishery. As with the NBC troll fishery, efforts are made to representatively sample catch in all statistical areas within each catch region. However, WCVI CWT expansions are based on catch sample rates for NWVI and SWVI separately. For both NBC troll and WCVI troll fisheries, expansion factors do not take into account the particular statistical area location where the fleet fished. .

Up until 2003, all commercial catch sampling was carried out by J.O. Thomas and Associates (JOT), a Vancouver-based consultant. Starting in 2003, catch in southern B.C. fisheries was for the most part, sampled by CDFO staff using the same operational guidelines as those used by JOT, while north coast catch continued to be sampled by JOT.

For NBC troll, representative sampling is complicated by landings from the freezer fleet, which can comprise up to ~60% of troll catch some years. Since freezer boats might fish for weeks before landing, their catch often occurs across statistical weeks and catch region boundaries, making it difficult to determine the proper catch sample expansions. Furthermore, prior to 2004, many CWTs dissected from heads collected from the freezer fleet could not be considered random, due to concerns regarding bias. Consequently, more effort was directed at sampling the ice boat fleet during this time. However, tag expansions were based on both ice boat and freezer troll landings, under the assumption that both fleets were fishing in similar areas and times. Recent analyses by CDFO personnel have demonstrated that the stock composition of catch for these two troll fleets is similar. Since 2004, catch sampling of the freezer fleets has been much more representative.

For most years, the 20% catch sample rate was achieved on an annual scale (Fig. 6-1 and 6-2), though monthly rates could vary considerably (Tables 6-1 and 6-2). Only in 2003 for the NBC troll fishery, was the annual sample rate significantly below 20% (Fig. 6-2). The achieved rate of 13% was due primarily to a problem with expanding CWT recoveries in the freezer troll fleet due to incomplete catch information that led to questions of possible bias in CWT collection. As a result, CWT recoveries for much of this catch had to be considered as 'select'. Consequently, while ~26% of the landed catch was sampled for CWTs, only half of the sampled catch (i.e. 13% of all landed catch) could be used for CWT expansions.

Figure 6-1. Annual Catch Sample Rate for WCVI Troll, 1985-2004

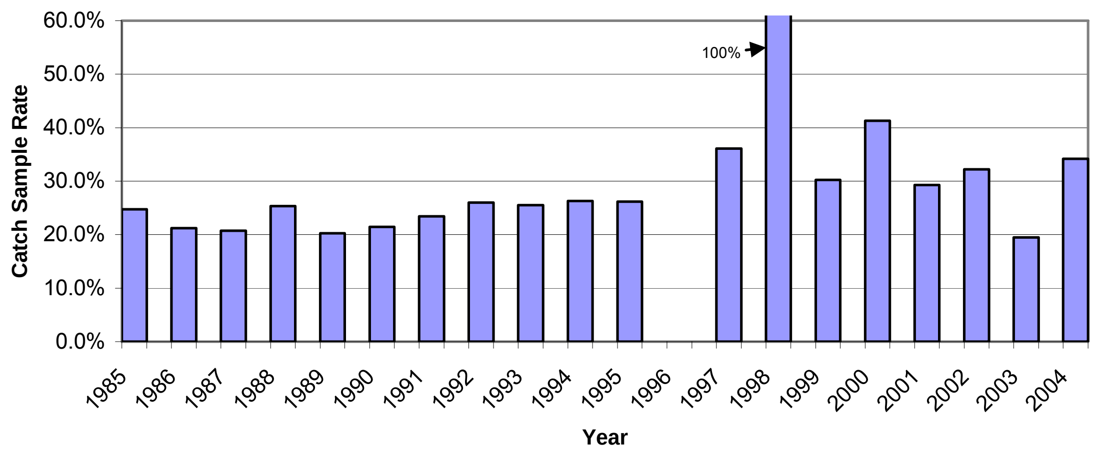


Figure 6-2. Annual catch sample rate for Northern BC troll, 1985-2004.

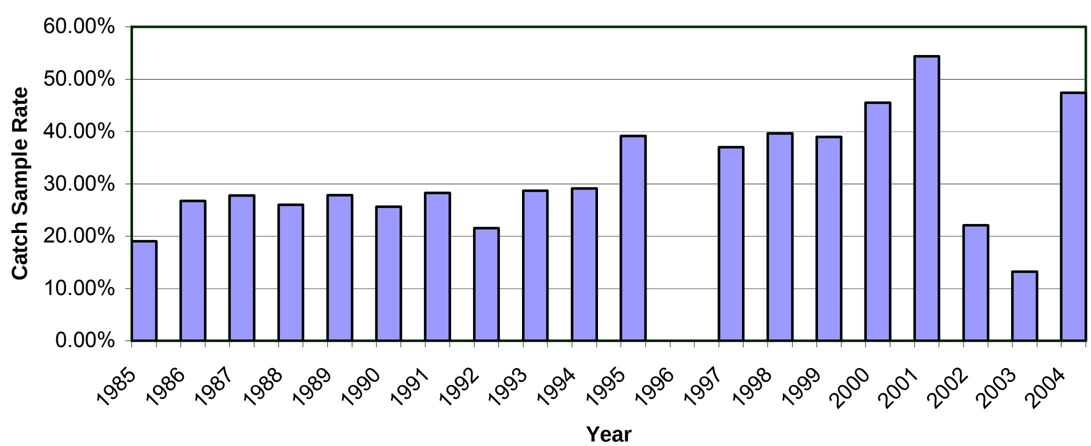


Table 6-1. Monthly and yearly Chinook catch sample rate and landed catch for WCVI troll fishery, in total, and by the NWVI and SWVI catch regions, 1985-2004. Note that while the small amount of catch caught from vessels that crossed the NWVI and SWVI border is included in landed catch totals, none of the CWTs sampled from such catch can be used. That is because tag expansions are done separately by these two catch regions, and there is no reliable way to apportion tags recovered from such catch by catch region. Catch sample data from RMIS database.

PANEL A—All areas of the WCVI troll fishery

		Month										
Year		Mar	Apr	May	Jun	July	Aug	Sept	Oct	Nov	Dec	Annual Catch Sample Rate
1985	Catch sample			29.7%		23.2%	21.3%	28.9%	36.2%			24.8%
	Landed Catch	0	0	59,699	0	172,743	73,275	45,281	3,069	0	0	
1986	Catch sample				23.7%	22.5%	15.4%					21.2%
	Landed Catch	0	0	0	80,357	185,296	76,410	0	0	0	0	
1987	Catch sample				0.0%	20.4%	22.4%	84.6%				20.7%
	Landed Catch	0	0	0	19	321,554	57,331	26	0	0	0	
1988	Catch sample				0.0%	23.8%	27.4%	67.6%	0.0%	0.0%		25.3%
	Landed Catch	0	0	0	611	244,273	162,653	1,118	27	41	0	
1989	Catch sample			0.0%	22.1%	21.3%	17.0%	25.7%				20.2%
	Landed Catch	0	0	613	777	148,428	50,530	3,347	0	0	0	
1990	Catch sample		0.0%	0.0%	17.5%	21.4%	17.4%	31.6%				21.5%
	Landed Catch	0	153	330	6,236	195,314	64,866	31,074	0	0	0	
1991	Catch sample			0.0%	54.7%	24.7%	20.2%	21.9%				23.4%
	Landed Catch	0	0	4,244	3,685	125,091	46,113	23,784	0	0	0	
1992	Catch sample		27.7%	0.0%	0.0%	24.4%	31.3%	24.1%	28.6%			26.0%
	Landed Catch	0	6,130	2,756	1,592	147,494	96,051	89,692	3,027	0	0	
1993	Catch sample					24.1%	28.4%	24.0%	33.7%			25.5%
	Landed Catch	0	0	0	0	135,353	87,666	49,347	2,382	0	0	
1994	Catch sample					25.1%	26.2%	38.8%				26.3%
	Landed Catch	0	0	0	0	91,818	44,862	9,249	0	0	0	
1995	Catch sample				19.5%	26.2%	22.8%	.				26.2%
	Landed Catch	0	0	0	379	80,786	92	0	0	0	0	
1996	Catch sample						175.0%					
	Landed Catch	0	0	0	0	0	4	0	0	0	0	
1997	Catch sample				0.0%	37.9%	0.0%		0.0%			36.1%
	Landed Catch	0	0	0	1,542	50,836	8	0	1,010	0	0	
1998	Catch sample		635.2%	100.0%		0.0%			105.2%	37.8%	0.0%	100.0%
	Landed Catch	0	236	925	0	7	0	0	2,309	3,001	201	
1999	Catch sample								30.2%			30.3%
	Landed Catch	0	0	0	0	0	0	0	55,975	0	0	
2000	Catch sample		54.5%	96.6%					34.0%	0.0%	0.0%	41.3%
	Landed Catch	0	1,426	3,828	0	0	0	0	27,155	50	751	
2001	Catch sample	24.6%	18.2%	47.8%				18.4%	4.7%		28.7%	29.3%
	Landed Catch	1,469	11,596	20,355	0	0	0	14,188	3,438	0	1,924	
2002	Catch sample		19.8%	33.6%	46.8%	0.0%	59.1%	12.4%	28.5%	54.1%	11.7%	32.2%
	Landed Catch	0	29,948	67,807	21205	35	5,032	3,539	12,230	331	2,788	
2003	Catch sample	44.4%	12.3%	15.4%	21.0%			0.0%	39.4%	0.0%	45.6%	19.5%
	Landed Catch	2,103	37,249	70,851	25,999	0	0	6	19,133	1,727	4,596	
2004	Catch sample	23.0%	22.6%	60.4%			0.0%	27.0%	59.2%	20.7%	42.5%	34.2%
	Landed Catch	7,624	68,753	34,776	0	0	29	32,04	11,256	7,714	4,089	

[1] A calculated catch sample rate >100% is not uncommon in fisheries with small amounts of landed catch.

Table 6-1: PANEL B—SWVI troll fishery

Year		Mar	Apr	May	Jun	July	Aug	Sept	Oct	Nov	Dec	Annual Catch Sample Rate
		Month										
1985	Catch sample			29.8%		25.7%	21.0%	27.5%	27.9%			25.7%
	Landed Catch	0	0	44,712	0	139,491	55,990	37,989	1,587	0	0	
1986	Catch sample				22.0%	22.3%	15.1%					20.9%
	Landed Catch	0	0	0	72,536	142,376	46,192	0	0	0	0	
1987	Catch sample				0.0%	19.3%	20.7%	84.6%				19.5%
	Landed Catch	0	0	0	19	234,487	31,254	26	0	0	0	
1988	Catch sample				0.0%	23.5%	22.0%	15.1%	0.0%	0.0%		22.8%
	Landed Catch	0	0	0	611	127,699	108,305	724	27	41	0	
1989	Catch sample			0.0%	0.5%	18.2%	17.0%	17.1%				17.8%
	Landed Catch	0	0	613	366	98,025	31,561	1,663	0	0	0	
1990	Catch sample		0.0%	0.0%	19.5%	20.3%	11.6%	16.2%				18.5%
	Landed Catch	0	153	330	4,318	137,635	31,490	9,210	0	0	0	
1991	Catch sample			0.0%	47.0%	22.7%	16.5%	14.3%				21.0%
	Landed Catch	0	0	3,270	2,315	93,065	21,451	7,991	0	0	0	
1992	Catch sample		26.4%	0.0%	0.0%	24.8%	25.3%	29.8%	54.7%			25.3%
	Landed Catch	0	5,372	1,384	754	69,830	34,267	18,449	150	0	0	
1993	Catch sample					21.0%	23.1%	16.3%	4.3%			20.6%
	Landed Catch	0	0	0	0	68,371	21,034	17,047	447	0	0	
1994	Catch sample					20.9%	27.8%	38.2%				22.9%
	Landed Catch	0	0	0	0	58,051	13,907	3,016	0	0	0	
1995	Catch sample				17.0%	20.9%	1.9%					20.9%
	Landed Catch	0	0	0	253	52,018	54	0	0	0	0	
1996	Catch sample											
	Landed Catch	0	0	0	0	0	0	0	0	0	0	
1997	Catch sample				0.0%	37.3%	0.0%		0.0%			35.9%
	Landed Catch	0	0	0	1,018	25,920	8	0	2	0	0	
1998	Catch sample		431.8% [1]	721.4% [1]		0.0%			105.2% [1]	42.5%		114.0%[1]
	Landed Catch	0	236	140	0	7	0	0	2,309	1,946	0	
1999	Catch sample								31.6%			31.7%
	Landed Catch	0	0	0	0	0	0	0	34,686	0	0	
2000	Catch sample		35.2%	97.7%					32.5%	0.0%	0.0%	44.6%
	Landed Catch	0	818	2,208	0	0	0	0	6,073	50	751	
2001	Catch sample	61.0%	19.1%	49.9%				18.7%	0.0%		34.8%	32.6%
	Landed Catch	593	11,034	19,477	0	0	0	13,978	440	0	1,591	
2002	Catch sample		34.3%	39.5%	48.8%	0.0%	59.1%	0.0%	28.5%	54.1%	11.8%	39.2%
	Landed Catch	0	15,083	50,605	16,727	15	5,032	213	11,362	331	2,780	
2003	Catch sample	67.1%	12.3%	17.2%	20.8%			0.0%	44.0%	0.0%	46.1%	23.7%
	Landed Catch	1,391	5,794	47,567	24,064	0	0	6	16,094	1,634	4,540	
2004	Catch sample	51.4%	19.8%	63.6%			0.0%	55.5%	17.6%	21.1%	54.0%	34.8%
	Landed Catch	1,991	38,366	20,803	0	0	135	811	1,627	7,927	3,220	

[1] A calculated catch sample rate >100% is not uncommon in fisheries with small amounts of landed catch.

Table 6-1: PANEL C—NWVI troll fishery

Year		Month										Annual Catch Sample Rate
		Mar	**Apr**	**May**	**Jun**	**July**	**Aug**	**Sept**	**Oct**	**Nov**	**Dec**	
1985	Catch sample			29.7%		12.9%	22.2%	36.4%	45.0%			21.4%
	Landed Catch	0	0	14,987	0	33,252	17,285	7,292	1,482	0	0	
1986	Catch sample				39.2%	23.4%	15.8%					22.1%
	Landed Catch	0	0	0	7,821	42,920	30,218	0	0	0	0	
1987	Catch sample					23.5%	24.6%					23.7%
	Landed Catch	0	0	0	0	87,067	26,077	0	0	0	0	
1988	Catch sample					24.0%	38.2%	164.2% [1]				28.8%
	Landed Catch	0	0	0	0	116,574	54,348	394	0	0	0	
1989	Catch sample				41.4%	27.2%	17.0%	34.2%				24.7%
	Landed Catch	0	0	0	411	50,403	18,969	1,684	0	0	0	
1990	Catch sample				12.9%	24.1%	22.9%	38.0%				26.2%
	Landed Catch	0	0	0	1,918	57,679	33,376	21,864	0	0	0	
1991	Catch sample			0.0%	67.8%	30.8%	23.4%	25.8%				27.6%
	Landed Catch	0	0	974	1,370	32,026	24,662	15,793	0	0	0	
1992	Catch sample		36.4%	0.0%	0.0%	24.0%	34.7%	22.6%	27.3%			26.4%
	Landed Catch	0	758	1,372	838	77,664	61,784	71,243	2,877	0	0	
1993	Catch sample					27.2%	30.1%	28.0%	40.5%			28.7%
	Landed Catch	0	0	0	0	66,982	66,632	32,300	1,935	0	0	
1994	Catch sample					32.3%	25.5%	39.1%				29.9%
	Landed Catch	0	0	0	0	33,767	30,955	6,233	0	0	0	
1995	Catch sample				24.6%	35.8%	52.6%					35.8%
	Landed Catch	0	0	0	126	28,768	38	0	0	0	0	
1996	Catch sample						25.0%					25.0%
	Landed Catch	0	0	0	0	0	4	0	0	0	0	
1997	Catch sample				0.0%	38.5%			0.0%			36.3%
	Landed Catch	0	0	0	524	24,916	0	0	1,008	0	0	
1998	Catch sample			106.9% [1]						29.2%	0.0%	79.7%
	Landed Catch	0	0	785	0	0	0	0	0	1,055	201	
1999	Catch sample								27.9%			27.9%
	Landed Catch	0	0	0	0	0	0	0	21,289	0	0	
2000	Catch sample		80.4%	95.0%					34.5%			39.9%
	Landed Catch	0	608	1,620	0	0	0	0	21,082	0	0	
2001	Catch sample	0.0%	0.0%	0.0%				0.0%	5.4%		0.0%	2.7%
	Landed Catch	876	562	878	0	0	0	210	2,998	0	333	
2002	Catch sample		5.2%	16.4%	39.3%	0.0%		13.2%	28.6%		0.0%	14.8%
	Landed Catch	0	14,865	17,202	4,478	20	0	3,326	868	0	8	
2003	Catch sample	0.0%	12.3%	11.7%	24.0%				15.1%	0.0%	0.0%	12.4%
	Landed Catch	712	31,455	23,284	1,935	0	0	0	3,039	93	56	
2004	Catch sample	12.9%	26.0%	55.7%			0.0%	26.3%	66.2%	0.0%	0.0%	33.7%
	Landed Catch	5,633	30,387	13,973	0	0	155	31,234	9,629	130	869	

[1] A calculated catch sample rate >100% is not uncommon in fisheries with small amounts of landed catch.

Table 6-2. Monthly Chinook catch sample rate and landed catch, with overall yearly catch sample rate for NBC troll fishery, 1985-2004. Catch sample data from the RMIS database.

Year		Month										Annual Catch Sample Rate
		Mar	Apr	May	Jun	July	Aug	Sept	Oct	Nov	Dec	
1985	Sample Rate			36.7%		17.9%	14.2%	22.5%	20.7%			19.03%
	Landed Catch	0	0	6,372	0	50,053	59,286	59,252	11,761	0	0	
1986	Sample Rate				21.5%	28.1%	26.5%	26.4%				26.72%
	Landed Catch	0	0	0	10,371	55,636	70,276	16,716	0	0	0	
1987	Sample Rate					22.7%	31.0%	39.6%				27.79%
	Landed Catch	0	0	0	0	72,632	100,567	4,258	0	0	0	
1988	Sample Rate					25.3%	32.1%	21.3%				25.97%
	Landed Catch	0	0	0	0	97,954	2,426	24,988	0	0	0	
1989	Sample Rate				0.0%	27.6%	28.2%	16.2%				27.82%
	Landed Catch	0	0	0	104	119,002	88,470	105	0	0	0	
1990	Sample Rate				22.2%	24.2%	33.6%	11.8%				25.60%
	Landed Catch	0	0	0	2,091	128,766	23,207	51	0	0	0	
1991	Sample Rate				0.0%	28.2%	28.7%	27.3%				28.25%
	Landed Catch	0	0	0	454	120,507	64,963	8,090	0	0	0	
1992	Sample Rate					18.9%	32.7%					21.51%
	Landed Catch	0	0	0	0	115,690	26,645	0	0	0	0	
1993	Sample Rate					28.1%	35.0%	23.8%				28.68%
	Landed Catch	0	0	0	0	108,724	28,813	24238	0	0	0	
1994	Sample Rate					31.6%	27.2%	25.2%				29.14%
	Landed Catch	0	0	0	0	85,092	49,991	29,410	0	0	0	
1995	Sample Rate				0.0%	41.4%	33.7%	23.6%				39.12%
	Landed Catch	0	0	0	161	42,078	13,606	1,018	0	0	0	
1996	Sample Rate											0.00%
	Landed Catch	0	0	0	0	0	0	0	0	0	0	
1997	Sample Rate					32.8%	41.5%	36.2%	100.0%			37.03%
	Landed Catch	0	0	0	0	53,071	25,819	7,527	396	0	0	
1998	Sample Rate					39.3%	40.6%	31.3%	62.9%			39.63%
	Landed Catch	0	0	0	0	36,819	62,153	14,241	3,194	0	0	
1999	Sample Rate						38.9%					38.93%
	Landed Catch	0	0	0	0	0	44,900	0	0	0	0	
2000	Sample Rate											45.48%
	Landed Catch	0	0	0	0	0	0	9948	0	0	0	
2001	Sample Rate				56.2%	5.2%	0.0%	29.5%	100.0%			54.34%
	Landed Catch	0	0	0	907	899	7	7,567	360	0	0	
2002	Sample Rate	100%	28.1%	14.4%	50.7%	132.0%	100.0%	9.3%	62.3%		0.00%	22.07%
	Landed Catch	69	5,646	55,035	16,841	787	782	22,914	467	0	77	
2003	Sample Rate	0.0%	4.9%	19.6%	8.1%	23.5%	1.0%	15.3%			0.0%	13.21%
	Landed Catch	774	13,713	11,253	57,056	29,306	300	24,035	0	0	691	
2004	Sample Rate	9.9%	20.0%	49.3%	11.9%	81.2%	1.2%		56.7%	0.0%	0.0%	47.39%
	Landed Catch	2,282	5,611	404	68,260	79,722	258	0	1,375	31	613	

Sport Fisheries

The QCI sport fishery portion of the NBC AABM fishery is located off the Queen Charlotte Islands in statistical areas 1 and 2. The WCVI outside sport fishery is included in the WCVI AABM fishery, occurring in parts of statistical areas 21, 23-27, 121 and 123-127. However, the exact portion of these statistical areas that comprise this fishery is seasonally dependent (see the 1999 Agreement for the exact definition).

Since 2002, there has been little direct sampling for CWTs in any Canadian sport fishery. The CDFO has relied on a voluntary head recovery program to obtain CWT samples from its sport fisheries, whereby sport fishers are encouraged to deposit the heads from adipose-clipped Chinook in specially designated depots. Based on adipose-clip rates observed during creel surveys, an ‘awareness factor’ is calculated that represents the fraction of the estimated number of adipose-clipped Chinook encountered in a sport fishery from which heads were voluntarily submitted for CWT extraction. The inverse of this factor is used to expand each CWT caught in the particular area and time stratum that the expansion factor represents. These awareness factors are analogous to catch sample rates in the commercial fishery. Because creel surveys are not conducted for each sport fishery, awareness factors for any one fishery and time stratum may be based on the calculated factor from the nearest geographical location. In some cases where creel estimates are not available, a default awareness factor of 0.25 was used, leading to an expansion factor of 4 (i.e.1/0.25) for that particular time and area stratum.

While a creel survey has been conducted on the QCI sport fishery since 1997, the awareness factors currently used to expand CWT recoveries in this fishery are based on data from other areas, and are not derived from the QCI sport fishery. Consequently, while CWT recoveries from this area are representative of the stocks encountered in this fishery, the awareness factors used to expand these recoveries are not based on data from this fishery. However, QCI-specific awareness factors (and the corresponding corrected expansions for CWT recoveries since then) will soon be incorporated into the RMIS database. Comprehensive creel surveys have been conducted off the WCVI since 1996. Awareness factors used to expand CWT recoveries in WCVI sport fisheries are based on all heads submitted from WCVI sport fisheries, i.e., both the inside and outside sport fishery combined.

From 1985-2004, average awareness factors for the WCVI sport fishery ranged from 3.6-26.6%, while those for QCI sport ranged from 7.5-32.0% (Table 6-3 and 6-4).

Table 6-3. Awareness factors used to expand CWT recoveries in the QCI Chinook sport fishery. Expansion factor used to calculate awareness factors from RMIS database.

	Month												
Year	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sept	Oct	Nov	Dec	Annual Catch Sample Rate
1985	.	.	.	27.6%	.	24.1%	32.6%	30.5%	23.8%	.	27.6%	27.6%	27.7%
1986	.	26.3%	26.3%	26.3%	22.3%	27.8%	22.8%	24.6%	.	.	.	26.3%	25.3%
1987	20.3%	20.3%	.	20.3%	14.5%	32.3%	20.7%	21.0%	19.8%	.	.	.	21.2%
1988	.	.	.	.	.	19.4%	16.0%	20.2%	20.0%	.	.	15.6%	18.2%
1989	15.2%	15.2%	15.2%	15.2%	15.3%	13.5%	13.9%	15.8%	18.3%	15.2%	.	.	15.3%
1990	.	.	19.6%	19.6%	22.3%	15.3%	22.3%	22.0%	18.2%	19.6%	19.6%	.	19.8%
1991	.	23.0%	23.0%	23.0%	34.5%	28.4%	19.6%	22.0%	16.1%	.	.	.	23.7%
1992	25.6%	25.6%	25.6%	25.6%	25.3%	28.8%	24.2%	24.5%	26.1%	.	.	.	25.7%
1993	26.7%	.	26.7%	26.7%	22.8%	25.1%	35.3%	21.8%	32.7%	.	.	26.7%	27.2%
1994	.	.	21.8%	18.7%	20.0%	43.5%	21.1%	20.0%	16.8%	.	.	.	23.1%
1995	32.1%	.	.	.	34.6%	46.9%	23.3%	37.3%	27.6%	.	.	32.1%	33.4%
1996	29.3%	.	29.3%	29.3%	19.2%	36.9%	23.0%	38.8%	.	.	.	.	29.4%
1997	.	.	.	.	22.6%	44.6%	25.4%	18.3%	.	.	22.0%	22.0%	25.8%
1998	.	.	.	.	40.3%	32.1%	24.6%	21.4%	19.6%	.	.	.	27.6%
1999	25.8%	.	.	25.8%	50.0%	12.0%	40.8%	26.8%	35.6%	.	.	.	31.0%
2000	.	.	.	20.7%	47.8%	14.9%	13.5%	23.0%	27.7%	.	.	20.7%	24.0%
2001	13.8%	13.8%	13.8%	13.8%	33.1%	10.8%	13.6%	19.4%	8.7%	.	.	.	15.6%
2002	.	.	.	.	18.3%	14.1%	13.0%	15.8%	23.1%	.	16.2%	.	16.8%
2003	7.5%	.	.	7.5%	17.8%	3.4%	7.6%	9.0%	14.1%	.	7.5%	7.5%	9.1%
2004	.	.	.	10.9%	30.4%	7.0%	8.3%	12.2%	11.8%	.	10.9%	.	13.1%

Note: a cell containing a dot indicates a time stratum when no CWTs were recovered. Averages represent simple averages across those months for which awareness factors were calculated.

Table 6-4. Awareness factors used to expand CWT recoveries in the outside WCVI Chinook sport fishery. Expansion factors used to calculate awareness factors from RMIS database.

	Month												
Year	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sept	Oct	Nov	Dec	Annual Catch Sample Rate
1985	.	.	.	.	.	25.0%	25.0%	23.4%	25.0%	.	.	.	24.6%
1986	25.0%	.	.	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	.	.	.	25.0%
1987	12.2%	12.2%	12.2%	12.2%	12.2%	11.2%	12.2%	30.4%	7.7%	12.2%	.	12.2%	12.1%
1988	6.6%	.	6.6%	6.6%	6.6%	6.6%	6.6%	4.6%	12.2%	.	.	.	7.4%
1989	.	.	7.2%	7.2%	7.2%	7.2%	3.8%	12.1%	13.4%	7.2%	.	.	7.2%
1990	.	.	5.8%	5.8%	5.8%	5.8%	2.7%	20.0%	9.9%	5.8%	.	.	5.7%
1991	.	18.2%	18.2%	18.2%	18.2%	18.2%	17.7%	16.2%	21.2%	18.2%	.	.	18.2%
1992	.	17.9%	17.9%	17.9%	17.9%	17.9%	16.2%	15.7%	22.8%	.	.	.	17.8%
1993	.	.	11.5%	11.5%	11.5%	11.5%	7.8%	12.9%	17.6%	11.5%	.	.	11.5%
1994	.	.	12.6%	12.6%	12.6%	12.6%	27.1%	18.0%	6.8%	12.6%	12.6%	.	12.6%
1995	22.9%	22.9%	22.9%	22.9%	22.9%	22.9%	13.4%	37.6%	33.3%	.	22.9%	.	22.9%
1996	25.0%	25.0%	25.0%	.	25.0%	25.0%	31.3%	25.0%	.	.	.	25.0%	26.8%
1997	.	25.0%	25.0%	25.0%	25.0%	94.3%	67.6%	21.5%	12.6%	.	.	25.0%	26.4%
1998	25.0%	25.0%	25.0%	25.0%	25.0%	49.5%	73.0%	38.0%	13.2%	.	.	25.0%	29.9%
1999	16.8%	16.8%	16.8%	16.8%	16.8%	9.8%	30.8%	22.2%	16.8%	16.8%	.	.	16.8%
2000	13.4%	.	13.4%	.	12.9%	11.6%	8.6%	44.6%	13.4%	13.4%	.	.	13.3%
2001	.	3.6%	3.6%	3.6%	3.6%	12.9%	12.3%	14.0%	1.1%	.	.	.	3.6%
2002	.	.	16.7%	16.7%	16.7%	14.3%	16.2%	15.6%	22.0%	.	.	.	16.6%
2003	.	4.4%	4.4%	4.4%	4.4%	2.4%	6.0%	5.6%	6.4%	.	.	.	4.4%
2004	11.4%	.	11.4%	11.4%	11.0%	17.9%	10.9%	9.6%	9.8%	11.4%	11.4%	.	11.6%

Note: a cell containing a dot indicates a time stratum when no CWTs were recovered. Averages represent simple averages across those months for which awareness factors were calculated.

GSI Catch Sampling

Since at least 1998, microsatellite DNA has been used for Chinook stock identification in B. C. fisheries. Originally, such sampling was meant to establish presence or absence of certain stocks of concern. It wasn't until 2002 that attempts were made to use this technology to estimate stock composition of a full season's catch in any Canadian AABM fishery. Most such work was directed at troll fisheries, since they account for the majority of catch in Canadian AABM fisheries and would be the first fishery required to make a management adjustment under the current allocation policy. However, some DNA sampling has recently been conducted on both the QCI and WCVI outside sport fisheries. Sampling approaches, protocols, etc. are described below for each fishery and sector.

NBC AABM Fisheries

GSI samples were first collected from the NBC troll fishery in 2000 and from the QCI sport fishery in 2002 (Winther, 2005 and Winther et. al., 2006). First collections were preliminary or exploratory in nature with the objectives of testing GSI and sample collection techniques.

A common paper punch was used to collect tissue samples from the operculum of the Chinook salmon sampled. One tissue sample was collected from each Chinook. Tissues were preserved in a solution of 95% non-denatured ethanol.
Chinook salmon collections were compared against genetic baselines from Chinook salmon populations from SEAK through Canada and the northwest U.S. A baseline of 182 populations was used early in 2002 then revised to 233 populations in 2003, and to 240 populations in 2004 (Table 5-3). Samples were analyzed for 13 microsatellite loci using methods of DNA extraction, PCR reaction, electrophoresis, and allele scoring described by Candy et al. (2002) and Nelson et al. (2000).

The Molecular Genetics Laboratory provided the sample analysis. A new version of the computer program as outlined by Pella and Masuda (2001) was developed and used for the analyses presented here. This program called "c-BAYES" is available upon request from the Fisheries & Oceans Canada, Molecular Genetics Laboratory at the Pacific Biological Station in Nanaimo. The model output presented includes the Bayesian probability estimates for the five most probable populations for each sample (J. R. Candy, Fisheries & Oceans Canada, pers. comm.).

1) NBC Troll

Some GSI samples were collected from the NBC troll fishery in 2000 (Table 6-5), though only a small sample was analysed (n=88). A more extensive program was undertaken in 2001 with almost 20% of the Area 1 and 2W troll fisheries sampled for DNA (2,067 individuals sampled). NBC troll fisheries in 2001 were held with a limited number of participants and sampling of Chinook landings was mandatory. Collections were made as "batch" samples where tissues were only matched to the area fished and the week of landing. Samples from multiple vessels were pooled in the same vial for the same week and area fished. Tissue samples were collected in conjunction with the existing CWT Mark Recovery Program (MRP) contract. The MRP contract objectives are random samples of 20% of vessel offloads by landing week and Pacific Fishery Management Area, Area G in this case.

Samples collected from the 2002 commercial fishery and the 2004 spring fishery were also stored with multiple fish samples per vial (“batch” samples). All other tissue samples were kept in individual vials. Data on the geographic location, date, sampler and other biological data were collected with each sample. Samples were forwarded to the Fisheries & Oceans Canada, Molecular Genetics Laboratory at the Pacific Biological Station in Nanaimo.

A test fishery was conducted in 2002 to collect biological data from major Chinook troll fishing locations in the North and Central Coast. The design was to sample 10 locations during four periods of 15 days each in July and August of 2002. Catch and sampling targets were set at 100 legal sized Chinook and up to 100 sublegal Chinook encountered while fishing for legal Chinook. Only 2,211 of the 4,000 legal sized Chinook proposed for the test samples were taken. Analyses were completed for 788 of the Chinook from the West Coast of QCI. Hecate Strait and Dixon Entrance samples were not submitted for analyses.

The 2003 GSI sampling protocol was to sample test-vessel catch in a manner that would represent 1% of the NBC troll catch. In 2003, all Chinook GSI samples were collected by test vessels at sea. Monthly samples were collected from two locations during closed times. The 2,600 Chinook tissues collected were sub-sampled to 1,775 to best represent the troll catch by time and area.

The sampling objective for the 2004 commercial fishery was to analyze 1,000 Chinook samples representative of the catch. Collections of 1,580 Chinook from the commercial fishery were sub-sampled and 1,143 were analyzed. The test fishery sample objectives were met with 800 Chinook sampled and GSI analyses completed for 768.

Catch was sampled from the 2005 Individual Transferable Quota (ITQ) demonstration fishery and the regular derby style fishery. The objective was to collect tissue samples from 1.5% of the catch (2,400 Chinook) and have the DNA analyses completed for approximately 1% of the catch (1,600 Chinook). Fishery sampling objectives were met with a total of 2,648 Chinook sampled, 2,198 and 450 Chinook sampled from the ITQ and derby fisheries respectively. Analyses were completed for 1,069 of the tissues collected from fishery landings. Requests for analyses were reduced as many of the test samples occurred in the same time and area as the fishery samples.

The 2005 test fishing program was designed to collect 16 samples over 8 time periods and 2 locations between May 1 and September 15, 2005. The tests began in early May to sample 100 Chinook from each of 2 sites: Area 101 between Langara and Frederick Island and Area 2/142 around Buck Point. Samples were collected near the beginning and middle of each month such that stock composition data could be supplied to the managers and reported near the 1st and 15th of each month. No test vessel sampling occurred during the period from June 15 to July 1 because managers expected commercial opportunity to provide fish for direct sampling of the fishery. Complete samples were collected by the test fisheries except in September. Only 56 and 33 Chinook were collected in the September sample in areas 1/101 and 2W/142, respectively, due to bad weather. The total test catch was 1,489 Chinook and DNA analyses were completed for 1,427 of the Chinook landed by test fisheries.

Commercial fishery samples from 2002 to 2004 were collected from the first fish encountered by the samplers. In 2005, the procedure to sample commercial fishery landings was modified to sample every 5th or 10th fish from a load depending on the size of the load. Typically, 25 or 50 Chinook were sampled from a randomly selected vessel offload. Test fishing vessels sampled the first fish encountered in all years. Note that only samples from legal-sized fish were used for catch stock composition estimates.

2) QCI Sport

The first collections of Chinook tissue for DNA analysis in QCI were sponsored by the Sport Fishing Institute of British Columbia in 2002 (Table 6-6). The proposed sampling strategy was to sample two fish per day from 10 lodges. These voluntary samples were largely a failure as few lodges participated and only samples from a single lodge, representing only part of the fishing season, were suitable for analysis.

Subsequent samples were coordinated by CDFO and collected by Haida Creel Survey staff and volunteer lodges. A voluntary sample was collected from Area 2W in 2003 that consisted of Chinook tissues collected at random from lodge catches at Kano Inlet. In all other collections, the protocol was stratified to sample to five Chinook per day with a maximum of 25 per week from the end of May to early September, essentially covering the duration of the fishery. Collections were made from lodge catches at Langara Island to represent Area 1 & 101 and from Englefield Bay to represent Area 2W & 142. Similar collections were made in 2003 and 2004 from Naden Harbour, but were not submitted due to budget constraints in 2003 and sampling bias in 2004. In 2003 and 2004, the Langara Island collections were sub-sampled to meet budget requirements. Tissue collections from Chinook salmon from the QCI sport fishery for the purposes of GSI are detailed in Table 6-6.

Table 6-5. GSI samples collected from Chinook catches in the NBC troll fishery, 2000 to 2005.

Year	Month	Area	n	Format	GSI	Catch applied to DNA	Catch without samples	Catch for Time/Area	Comment
2000	Sep	101	186	Batch	88	0	0	381	
2000	Sep	2W	0			0	9,567	9,567	
2001	Mar-May	101	316	Batch	316	850		850	
2001	Mar-May	2W	720	Batch	720	1,350		1,350	
2001	Jun-Jul	4	0				2,300	2,300	
2001	Sep	101	85	Batch	85	600		600	
2001	Sep	2W	946	Batch	946	8,000		8,000	
2001	Oct	2W	102	Batch	102	253		253	
2002	Mar	101	28	Batch	28	687		687	
2002	Apr	2W	100	Batch	96	3,981		3,981	
2002	May	101	147	Batch	147	33,454		33,454	
2002	May	2W	137	Batch	137	19,094		19,094	
2002	Jun	101	130	Batch	130	13,638		13,638	
2002	Jun	2W	146	Batch	146	6,814		6,814	
2002	Jul-Aug	MIX	1390	Test	0	0	1,402	1,402	Not Submitted
2002	Jul	101	200	Test	194	201		201	
2002	Jul	2W	202	Test	196	203		203	
2002	Aug	101	200	Test	199	202		202	
2002	Aug	2W	203	Test	199	203		203	
2002	Sep	101	53	Batch	53	5,142		5,142	
2002	Sep	2W	100	Batch	95	18,242		18,242	
2002	Oct	2W	0				240	240	
2003	Apr	2W	100	Test	92	11,904		11,904	
2003	May	101	400	Test	195	14,527		14,527	
2003	May	2W	200	Test	0				Not Submitted
2003	May	MIX	100	Test	0				Not Submitted
2003	Jun	101	500	Test	374	57,933		57,933	
2003	Jun	2W	600	Test	569	28,329		28,329	
2003	Jul	101	100	Test	0				Not Submitted
2003	Aug	101	200	Test	189	200		200	
2003	Aug	2W	200	Test	190	200		200	
2003	Sep	101	100	Test	70	14,081		14,081	
2003	Sep	2W	100	Test	96	9,943		9,943	
2003	Oct	MIX	0				72	72	
2004	Apr	101	107	Batch	107	4,054		4,054	
2004	Apr	2W	173	Batch	173	5,135		5,135	
2004	May	101	100	Test	96	100		100	
2004	May	2W	100	Test	96	100		100	
2004	Jun	101	700	Test & Troll	526	78,537		78,537	150 not submitted
2004	Jun	2W	350	Test & Troll	337	30,267		30,267	
2004	Jul	101	250	Troll	96	33,516		33,516	150 not submitted
2004	Jul	2W	200	Troll	96	15,327		15,327	100 not submitted
2004	Aug	101	100	Test	96	100		100	
2004	Aug	2W	100	Test	96	100		100	
2004	Sep	101	100	Test	96	100		100	
2004	Sep	2W	100	Test	96	100		100	
2004	Oct	101	100	Volunteer	98	1,870		1,870	DNA & scales only
2005	Mar	2W	93	Volunteer	91	3,173		3,173	DNA & scales only
2005	May	101	200	Test	191	200		200	
2005	May	2W	200	Test	192	200		200	
2005	Jun	101	230	Troll	0	0			Not Submitted
2005	Jun	101	630	Test & Troll	605	82,209		82,209	100 test, 530 IVQ
2005	Jun	2W	100	Test	96	100		100	
2005	Jun	MIX	98	Troll	0	0			Not Submitted
2005	Jul	101	450	Batch	0	0			Not Submitted - Derby
2005	Aug	101	300	Troll	0	0			Not Submitted
2005	Jul	101	500	Test & Troll	472	70,604		70,604	200 test, 200 IVQ, 100 Derby
2005	Jul	2W	200	Test	191	200		200	
2005	Jul	MIX	100	Troll	0	0			Not Submitted
2005	Aug	101	300	Troll	0	0			Not Submitted
2005	Aug	101	200	Test	191	11,827		11,827	
2005	Aug	2W	200	Test	191	200		200	

Table 6-5 (Page 2 of 2).

Year	Month	Area	n	Format	GSI	Catch applied to DNA	Catch without samples	Catch for Time/Area	Comment
2005	Aug	MIX	200	Troll	0	0			Not Submitted
2005	Sep	101	103	Test & Troll	103	2,379		2,379	70 IVQ, 33 test
2005	Sep	2W	76	Test & Troll	76	1,844		1,844	56 test, 20 IVQ
2005	Sep	MIX	70	Troll	0	0			Not Submitted

n = number of samples collected
GSI = analysis completed for this number of samples.
Batch = Samples from multiple vessel landings were pooled in the same vial for the same week and area fished.
Test = Samples collected at sea by test fishing vessels in individual vials with associated biological data.
Troll = Samples collected from NBC troll fishery landings in individual vials with associated biological data. A maximum of 50 fish were sampled per vessel. Consecutive samples were collected starting from the first fish encountered, except in 2005, when every 5th or 10th fish was sampled, depending on load size.
IVQ = individual vessel quota

Table 6-6. GSI samples collected from the QCI sport fishery catches of Chinook salmon, 2002 to 2005. n = number of samples collected; numbers in 'GSI' column represent the number of samples analysed.

Year	Sample dates	Area	Description	n	Format	GSI	Catch applied to DNA	Catch without related DNA samples	Annual catch for Area	Comment
2002	July 8 - Sep 11	1	Langara	86	SFI 2 per day per lodge	83	not applied		31,200	Langara Fishing Lodge
2002		2E		0				300	300	
2002		2W						15,600	15,600	
2002	July to Sep	1&2W	QCI	139	SFI 10 lodges @ 2 per day - insufficient data	0				other lodges
2003	Jun 2-Aug 8	2W	Kano Inlet	135	Voluntary - opportunistic	133	19,650		19,650	Salmon Seeker
2003	Jun 11 - Sep 7	1	Langara	342	25 per week – subsampled to 225	225	34,350		34,350	Haida Creel
2003	Jun 11 - Aug 28	1	Naden Harbour	300	25 per week	0	not submitted			Haida Creel – samples archived
2003		2E		0				300	300	
2004	May 31 - Sep 6	2W	Englefield Bay	307	Max 25 per week, 5 per day	306	21,750		21,750	West Coast Resorts
2004	Jun 3 - Sep 13	1	Langara	375	Max 25 per week, 5 per day. Subsampled to 20/week for analyses	291	52,000		52,000	Haida Creel
2004	Jun 1 - Aug 30	1	Naden Harbour	325	Discarded, Sampling biased to adipose clipped fish only. Max 25 per week, 5 per day	0	not submitted			Haida Creel – Sample discarded – biased to adipose fin clipped Chinook.
2004		2E		0				250	250	
2005	Jun 1 - Sep 10	1	Langara	358	Max 25 per week, 5 per day	339	44,800		44,800	Haida Creel
2005	May 30 - Sep10	2W	Englefield Bay	361	Max 25 per week, 5 per day	345	23,000		23,000	West Coast Resorts
2005		2E		0				1,000	1,000	

WCVI AABM

1) WCVI Troll

GSI sampling of this fishery started in 1998, and was initiated in an attempt to determine the presence/absence of WCVI Chinook by time and area strata. This information was used to determine when and where the troll fishery was encountering WCVI Chinook. At this time, there was no intent to estimate stock composition of the full troll catch. As there is a large body of stock composition-related information from CWT recoveries for months when troll fisheries traditionally have taken place, DNA sampling initially tended to occur in months for which little CWT-derived stock composition data existed, i.e., October-April.

It wasn't until the 2003/2004 troll season (October 2003-September 2004) that attempts were made to provide an unbiased estimate of stock composition of troll catch across the full season. The approach used CWT recoveries to represent the adipose-clipped portion of catch, and DNA to estimate the stock composition of the unclipped portion of the catch. Consequently, DNA sampling, in most instances, was done on unclipped fish only. Unfortunately, this approach did not account for the clipped portion of catch that was not accounted for by CWTs (i.e., mass-marked fish not associated with a CWT release group). Thus, in 2003/2004, this meant that stock composition estimates could be estimated for only ~88% of the landed catch (Table 5-6). More details on this and other sampling issues associated with this fishery are provided in the response to question 5. Table 6-7 provides details on when and where tissue samples were collected in this fishery from 1998-2004.

Table 6-7. Details on GSI sampling of the WCVI troll fishery from 1998-2004.

Year	Month	Catch Region	Stat Area	Sampling Protocol	No. DNA Samples Collected	No. DNA Samples Processed For Stock Composition Analysis	Catch In Area Sampled	Total Catch in Catch Region
1998	Apr	SWVI	123, 124	5	703	76		1,188
1998	Apr	NWVI	125, 126	5	448	35		362
1998	May	SWVI	123, 124	5	841	48		1,977
1998	May	NWVI	125, 126	5	660	75		1,065
1998	Oct	SWVI		1,4	491	63		3,990
1998	Oct	NWVI		1,4	587	126		935
1998	Nov	SWVI						910
1998	Nov	NWVI						1,071
1999	Oct	SWVI	123, 124	5	939	200		34,686
1999	Oct	NWVI	125, 126	5	583	200		21,289
2000	Mar	SWVI						119
2000	Mar	NWVI						76
2000	Apr	SWVI						605
2000	Apr	NWVI		5	24	0		493
2000	May	SWVI		5	1,863	0		3,235
2000	May	NWVI		5	1,360	0		1,471
2000	Sept	SWVI						809
2000	Sept	NWVI						1,433
2000	Oct	SWVI		5	254	0		5,270
2000	Oct	NWVI		5	567	0		19,968
2000	Nov	SWVI		4	113	0		147
2000	Nov	NWVI						Closed
2000	Dec	SWVI		4	448	0		649
2000	Dec	NWVI						Closed
2001	Jan	SWVI	23/123, 24/124	4	761	198		1,069
2001	Jan	NWVI						50
2001	Feb	SWVI	23/123, 24/124	4	534	182		674
2001	Feb	NWVI		2	254	0		350
2001	Mar	SWVI		2	563	0		464
2001	Mar	NWVI		2	423	0		873
2001	Apr	SWVI		2, 5	817	0		5,465
2001	Apr	NWVI		2	320	0		440
2001	May	SWVI						23,622
2001	May	NWVI						982
2001	Sept	SWVI						18,417
2001	Sept	NWVI						Closed
2001	Oct	SWVI		5	53	0		407
2001	Oct	NWVI		5	190	0		2,828
2001	Nov	SWVI						49
2001	Dec	SWVI						848
2002	Jan	SWVI		6	50	0		2,339
2002	Apr	SWVI		4,6	809	83		11,979
2002	Apr	NWVI		4,6	524	83		12,874
2002	May	SWVI		4,6	1,268	51		52,739

Table 6-7 (Page 2 of 3).

Year	Month	Catch Region	Stat Area	Sampling Protocol	No. DNA Samples Collected	No. DNA Samples Processed For Stock Composition Analysis	Catch In Area Sampled	Total Catch in Catch Region
2002	May	NWVI		4,6	408	44		18,631
2002	June	SWVI		4,6	218	24		17,697
2002	June	NWVI		4,6	453	55		5,040
2002	Aug	SWVI		4,6	883	41		5,032
2002	Aug	NWVI						Closed
2002	Sept	SWVI		4,6	102	0		218
2002	Sept	NWVI		4,6	162	50		3,627
2002	Oct	SWVI	123	4	106	80		11,357
2002	Oct	NWVI						567
2002	Nov	SWVI						331
2002	Dec	SWVI						441
2002	Dec	NWVI						8
2003	Jan	SWVI						1,887
2003	Feb	SWVI						1,477
2003	Mar	SWVI						1,752
2003	Mar	NWVI						758
2003	Apr	SWVI	123	4/7	144/40	100/0		3,280
2003	Apr	NWVI	126	4/7	469/235	100/0		25,646
2003	May	SWVI	123	4	1,190	300		48,543
2003	May	SWVI	124	4	123	0		440
2003	May	SWVI	123/124	4	28	0		
2003	May	SWVI/NWVI	123/126	4	35	0		
2003	May	NWVI	126	4	786	197		21,014
2003	May	NWVI	127	4	13	3		5,604
2003	June	SWVI	123	4	700	400		23,750
2003	June	NWVI	126	4	64	64		1,140
2003	June	NWVI	127	4	36	36		658
2003	Oct	SWVI	123	2,1	172	100	14,882	14,925
2003	Oct	NWVI	126	3	65	65	2,962	2,980
2003	Nov	SWVI	123	4,2,1	151	121	2,738	2,803
2003	Dec	SWVI	123	2	96	72	646	646
2004	Jan	SWVI	23	2,1	402	100	1,004	1,390
2004	Feb	SWVI	123	2,1	227	100	916	1,870
2004	Mar	SWVI	123/23/24	2,1	393	100	1,313	2,069
2004	Mar	NWVI	126	2,1	198	100	4,279	5,974
2004	Apr	SWVI	123/124	2,1	461	100	23,531	23,685
2004	Apr	NWVI	126/127	2,1	585	200	25,049	27,315
2004	May 1-3	SWVI	123	2,1	503	100	26,747	35,232
2004	May 15-16	SWVI	124	2,1	248	100		
2004	May 15-16	NWVI	126	2,1	261	100	8,813	16,254
2004 [1]	May 1-3	SWVI	123	5,1	1467	848	.	.
2004 [1]	May 1-3	NWVI	126	2,1	863	140	.	.
2004	Sep-21	NWVI	125/126	2,1	194	100	28,894	31,234

Table 6-7 (Page 3 of 3).

Year	Month	Catch Region	Stat Area	Sampling Protocol	No. DNA Samples Collected	No. DNA Samples Processed For Stock Composition Analysis	Catch In Area Sampled	Total Catch in Catch Region
2004	Oct	SWVI	123	2	75	75	1,417	1,627
2004	Oct	NWVI	125	2	50	23	2,787	9,629
2004	Oct	NWVI	125&126	2	168	77	.	.
2004	Oct	NWVI	126	2/7	247/40	0/0	6,055	.
2004	Nov	SWVI	23/123	2	0/103	0/103	7,550	
2004	Nov	NWVI	.	.	0	0	.	130
2004	Dec	SWVI	.	.	0	0	.	134
2004	Dec	NWVI	.	.	0	0	.	0
2005	Jan	SWVI	23/123	2	222/32	100/0	1,078/301	1,379
2005	Jan	NWVI	126	2	31	0	208	483
2005	Feb	SWVI	23	2	29	18	639	831
2005	Feb	SWVI	123	2	69	43	172	.
2005	Feb	SWVI	23&123	2	60	39	.	.
2005	Feb	NWVI	125	2,1	20	9	687	4,819
2005	Feb	NWVI	126	2,1	218	76	3,875	.
2005	Feb	NWVI	125&126	2	42	13	.	.
2005	Mar	SWVI	23	2	33	0	393	393
2005	Mar	NWVI	125	2,1	50	18	3,385	15,854
2005	Mar	NWVI	126	2,1	261	60	12,007	.
2005	Mar	NWVI	125&126	2	92	22	.	.
2005	Apr	SWVI			0	0	.	6,274
2005	Apr	NWVI	125	2,1	34	14	8,076	50,789
2005	Apr	NWVI	126	2,1	419	65	39,920	.
2005	Apr	NWVI	125&126	2	69	12	.	.
2005	Apr	NWVI	127	2,1	70	9	2,707	.
2005	May	SWVI	123	2	308	0	12,419	12,791
2005	May	NWVI	125	2	32	0	4,714	13,864
2005	May	NWVI	126	2	207	0	8,884	.
2005	May	NWVI	127	2	40	0	255	.
2005	May	NWVI	125&126	2	10	0	.	.
2005	May	NWVI&SWVI	123,124,125&126	2	91	0	.	.

Notes

1. DNA samples chosen for processing, out of all samples collected, were selected based on a weighting by total observed landed catch in each sampled troll zone for that month.

2. Only unclipped fish sampled, in a quasi-representative manner, i.e. a sampler might be told to collect 10-20 plugs per boat. However, depending on the situation, sampling may be done at the boat (unsorted catch) or at the processing plant (sorted catch); DITs were screened out using wands, and thus not included in DNA samples.

3. Same as 2., but no electronic pre-screening for DITs, and thus DITs may have been included in sample.

4. First 25 unclipped fish landed each day sampled.

5. Clipped and unclipped fish sampled. Samplers told to collect every xth fish, regardless of clip status (X could vary among samplers). In general, sampling was probably representative of the catch sampled. This sampling was part of an intensive sampling program that was separate from the ongoing GSI sampling program. These samples were not used in annual stock composition estimates

6. Unknown mark status

7. Clipped only fish sampled

2) WCVI Outside Sport

No attempts have been made to provide a representative GSI-based estimate of stock composition of annual catch from the WCVI outside sport fishery. However, some sampling was done in 2002 and 2003 to investigate temporal variability in stock composition in this fishery, though sampling was not representative of the fishery as a whole (Table 6-8). For the most part, such sampling was carried out by creel surveyors, who collected DNA samples primarily from unclipped Chinook.

Table 6-8. Details on GSI sampling of Chinook salmon in the WCVI outside sport fishery from 2002-2003.

Year	Month	Catch Region	Stat Area	No. DNA Samples Collected	No. DNA Samples Processed For Stock Composition Analysis
2002	June 1-23	SWVI	123	46	46
2002	July 1-27	SWVI	123	60	60
2002	August 3-10	SWVI	123	25	25
2003	July	SWVI	123	99	99
2003	August	SWVI	123	93	93

7. For those stocks for which analysis is available, update through 2004, the tables listed in Appendix G of CTC (2004). For all stocks compare average figures for appropriate prior years to average figures for those years (e.g., 1999-2004) for which specific stock concerns influenced the conduct of the NBC and/or WCVI fisheries;

Stock distributions for both reported catch and total mortality are generated as part of the CTC's annual CWT Exploitation Rate Analysis. This section contains data output from the 2006 Exploitation Rate Analysis, with data available through 2004. Only information on distribution of reported catch is presented as changes in distribution patterns for both reported catch and total mortality are similar. Tables 7-2 to 7-5 summarize the distribution of landed catch mortality (expressed in terms of adult equivalents) separately for the WCVI AABM fishery, the WCVI troll fishery alone, the WCVI sport fishery alone, and the NBC troll fishery for stocks that have a non-zero value in any year. Note that WCVI sport includes both outside (AABM) and inside (ISBM) recoveries. This is because for many recoveries, the recovery location information is not specific enough to reliably separate them into inside and outside. Note also that recoveries from the QCI sport fishery are currently rolled up with the rest of the north/central BC sport fisheries. Consequently, recovery information specific to the QCI sport fishery cannot currently be provided. Averages are provided for the following periods:

- 1979-1982: the PST base period.
- 1985-1995: ceiling management regime, total mortality base period, and prior to Canadian actions directed at conservation concerns for WCVI Chinook and coho stocks.
- 1999-2004: management under 1999 Agreement.
- 2002-2004: years when Canadian AABM catch approached allowable limits and temporal distribution of catch changed significantly in the WCVI troll fishery.

For the indicator stocks that represent natural stocks of Canadian domestic conservation concern, the full Appendix G tables are also presented to provide a time series of estimates for the distribution of mortalities among fisheries and escapement (Table 7-6 to 7-8). The natural stocks of Canadian conservation concern are WCVI, Lower Georgia Strait and Fraser Early. The Robertson Creek hatchery stock is the exploitation rate indicator stock for WCVI. The Cowichan and Big Qualicum are exploitation rate indicator stocks for Lower Georgia Strait stocks. No CWT indicator stock is available to represent the Fraser Early stock.

Stocks with zero reported CWT impacts in the NBC or WCVI AABM fisheries or that have chronically poor escapement data are not included. In addition Nisqually FF escapement data may be bad before 1992 and George Adams FF escapement data may be bad before 1993.

Workgroup observations on changes in impacts by stock group are summarized in Table 7-1. It is important to note that the distribution of reported catch data presented is computed as

$$Percent\ of\ Total\ Run = \frac{Fishery\ Catch\ in\ AEQs}{Total\ Catch\ all\ Fisheries\ in\ AEQs + Escapement}$$

and therefore can be influenced by a number of factors unrelated to changes in fishing patterns, including changes in the total fishery catch, changes in the catch of other fisheries, the abundance of the stock in question relative to other stocks intercepted in this fishery, and changes in escapement counting.

Table 7-1. Summary of observed changes of impacts of Canadian AABM fisheries on exploitation rate indicator stocks from 1979 to 2004.

Stock Complex	WCVI AABM (Troll + Outside Sport[1])	NBC AABM (Troll Only)
Alaskan	Not significantly impacted.	No base period data is available. Historic impacts average less than 1%.
North Central BC (Kitsumkalum)	Not significantly impacted.	No base period data is available. Impacts averaged about 8% of the run from 1985-1995 and impacts in 2002-2004 averaged about 3%.
WCVI (Robertson Creek)	The proportion of the total run accounted for by the WCVI AABM fisheries in 2002-2004 (2.7%) is less than 40% of the 1979-1982 average of 7%. The proportion of the total run taken by the WCVI troll fishery from 1979-1982 of 6.5% decreased to 0.2% from 2002-2004, about 3% of the base level.	The proportion of the run accounted for in recent years (1.8%) is less than one-sixth of that observed during the base period (about 11%).
Upper Georgia Strait (Quinsam Fall)	Historic impacts average less than 1%. No impacts observed in recent years.	This fishery accounted for over 10% of the impacts to this stock in the base period. Impacts since 1999 have averaged less than 1%.
Lower Georgia Strait (Puntledge, Cowichan, Big Qualicum)	Impacts observed in 2002-2004 were about the same as those in 1979-1982, for Puntledge and Big Qualicum stocks. Impacts on the Cowichan fall stock has tripled in 2002-2004, compared to 1985-1995.	Impacts have decreased since the base period, and remain relatively small (about 2% or less).
Fraser Early (none)	No information	No information
Fraser Late (Chilliwack)	No base period information is available. Impacts in 2002-2004 average 57% of the rates seen from 1985-1995.	No base period information is available. Impacts have consistently been < 1% since 1985.
Puget Sound Spring Chinook (Nooksack Fingerling, Nooksack Yearling, Skagit Fingerling, Skagit Yearling, White River Yearling)	Base period data are not available for these stocks and a complete time series in recent years is not available for Nooksack Yearlings and White Yearlings. The average proportion of the total run accounted for by reported catch in 2002-2004 exceeds the levels observed in prior years in 5 of 6 cases for Nooksack Fingerlings, 5 of 5 cases for Skagit Fingerlings, and 11 of 11 cases for Skagit Yearlings.	The proportion of the run accounted for by reported catch in this fishery has remained unchanged under PST management. The impact on these stocks is very small (<1%).
North Puget Sound Fall (Skagit Summer, Stillaguamish Fingerling, Nisqually Fingerling, Samish Fingerling)	Base period data are not available for this stock group. For most stocks, the proportion of the run taken by the fishery has not changed since the mid 1980s.	The impact of the fishery on these stocks is small, but has increased slightly since 1999 for the Skagit Summers, averaging about 2% of the run from 2002-2004.
South Puget Sound Fall (SPS Fall Fingerlings, SPS Fall Yearling)	This stock group shows little change in the proportion of the run taken in 2002-2004 compared to the base period or other time periods.	Impacts on this stock group have increased in 2002-2004 compared to the base period and the pre 2002 periods, but remain very small (<1%)
Hood Canal (George Adams)	This stock group shows little change in the proportion of the run taken in 2002/03 compared to the base period or other time periods.	Impacts remain very small (<1%)

Table 7.1 Continued.

Stock Complex	WCVI AABM (Troll + Outside Sport)	NBC AABM (Troll Only)
Washington Coastal Fall (Hoko, Sooes, Queets)	Historically, the reported catch by this fishery accounted for approximately 10% of the run. Impacts have been substantially reduced since 1999. In this stock complex, base period data are only available for the Queets. The proportion of the Queets run accounted for by the WCVI AABM fishery has been reduced from about 12% in the base period to about 1% in 2002-2004.	The reported catch by this fishery accounted for about 18% of the Queets run in the base period and about 12% from 1985-1998, but decreased to about 6% from 1999-2004.
Willamette Spring	The reported catch by this fishery accounted for approximately 4% of the run during the base period. Impacts observed in 2002-2004 are about 3%. Impacts from 1985-1998 were about 2%.	The reported catch by this fishery accounted for approximately 10% of the run during the base period. Impacts have been substantially reduced since 1985 under the PST, and averaged < 1% of the run in 2002-2004.
Columbia River Summer	The reported catch by this fishery during the base period accounted for about 17% of the run. Impacts observed since 2001 have been substantially higher than levels observed from 1994-2000. In 2002-2004, the 14% of the run accounted for by the WCVI AABM fisheries was about 85% of the 1979-1982 base period levels.	The reported catch by this fishery accounted for 8% of the run during 1979-1982, then about 3% of the run from 1985-1998. Impacts observed for 2002-2004 indicate that the reported catch for this fishery represented about 9% of the run, slightly higher than during the base period and 3 times the 1985-1998 impacts.
Columbia River Tule(Cowlitz, Spring Creek, Lower River Hatchery)	The reported catch by this fishery accounted for approximately 16%-25% for these three stock groups prior to 1985. Impacts were reduced in response to PST regimes from the mid-1980s to late 1990s. Impacts observed in 2002-2004 were above the levels observed since 1985 and range from 59% to 95% of 1979-1982 base period averages, for these three stocks.	The reported catch by this fishery accounted for a small proportion of the run during 1979-1982. Impacts observed for 2002-2004 indicate that the proportion of the run accounted for by this fishery has not changed significantly under the PST.
Lewis River Fall	The reported catch by this fishery accounted for about 8% of the run during the base period. Average impacts since then have been similar, about 7% from 1985-1995 and about 8% from 2002-2004. Impacts were estimated at 0% from 1996-2000.	This fishery has had a light impact on this stock throughout the time series, averaging about 3% of the run from 1981-1998, and then averaging less than 2% since 1999.
Columbia River Bright	The reported catch by this fishery accounted for about 7% of the run in 1979-1982 but increased to an average of about 9% from 1985-1995. Impacts have been substantially reduced under the PST since the mid 1990s and were estimated to average about 2% in 2002-2004.	The reported catch by this fishery accounted for approximately 6% of the run in 1979-1982. Impacts observed in 2002-2004 averaged about 3% of the run, about one-half the level observed during the base period.
Snake River Fall	CWT data for this stock are very limited. Average impacts of 2.8% in 2003-2004 were about one-fifth of those observed from 1988-1994.	Impacts in 2003-2004 averaged about 1% of the run, and were less than one-quarter (25%) of the average impact observed from 1988-1994.
Salmon River (Oregon Coast) Fall	The reported catch by this fishery accounted for about 6% of the run during the base period and the average remained relatively unchanged for the period of 1985-1995. Average impacts were reduced to less than 1% since 1995 with no year since exceeding 2%.	The reported catch by this fishery accounted for about 21% of the run during the base period, then dropped to average of about 12% from 1985-1995, and subsequently dropped again to an average level of about 5% from 2002-2004.

[1] In many cases, CWT recoveries from the WCVI sport fishery cannot easily be identified as 'outside' (AABM) or 'inside' (ISBM), due to uncertainly in the recovery location. Consequently, the percentages reported here for the WCVI AABM fishery reflect CWTs recovered in all WCVI sport fisheries (the exception is Robertson Cr. sport recoveries, which do not include recoveries from Alberni Canal, i.e. terminal recoveries). Most recoveries of non-local stocks would occur in the outside sport fishery.

Table 7-2. Percent of total run (reported catch and escapement, measured in terms of adult equivalents) for PST Chinook CWT indicator stocks taken in the WCVI AABM (sport and troll sectors combined[1]) fishery. Bold font depicts values for indicators associated with stocks of Canadian domestic conservation concern. Blank cells indicate a gap in tagging.

	WCVI	UGS	**Lower GS**			Fraser Late	Puget Sound Spring					North Puget Sound Summer/Fall			
Catch Year	**Robertson Creek Fall**	Quinsam Fall	Puntledge Summer	**Big Qualicum Fall**	**Cowichan Fall**	Chilliwack Fall	Nooksack Spring Fingerling	Nooksack Spring Yearling	Skagit Spring Fingerling	Skagit Spring Yearling	White Spring Yearling	Skagit Summer Fingerling	Stillaguamish Fall Fingerling	Nisqually Fall Fingerling	Samish Fall Fingerling
1979	**8.1%**	0.0%	0.9%	**2.3%**											
1980	**7.4%**	0.0%	4.9%	**4.2%**											
1981	**6.0%**	0.7%	0.0%	**1.9%**											
1982	**6.2%**	0.4%	1.6%	**4.3%**							0.0%				
1983	**5.3%**	0.7%	2.4%	**1.1%**							4.3%			16.4%	
1984	**6.7%**	0.8%	2.3%	**1.4%**							4.5%		0.0%	28.8%	
1985	**2.0%**	0.1%	0.0%	**1.4%**		34.5%				6.7%	2.2%		9.3%	33.3%	
1986	**5.3%**	0.0%	2.8%	**1.4%**		19.5%		0.0%		11.9%	0.6%		0.0%	15.7%	
1987	**2.3%**	0.8%	4.7%	**4.2%**		16.7%				3.7%	0.0%			10.7%	
1988	**8.8%**	1.6%	0.0%	**4.8%**		17.9%				11.4%	1.0%			5.4%	
1989	**3.3%**	0.3%	0.0%	**4.8%**		19.5%		0.0%		5.2%	1.2%			10.7%	8.7%
1990	**8.3%**	1.4%	0.0%	**3.0%**	**1.3%**	11.8%		0.0%		13.6%	1.9%		27.7%	28.3%	20.5%
1991	**5.5%**	1.3%	0.0%	**1.9%**	**3.9%**	19.0%		9.1%			2.1%		7.6%	10.3%	16.7%
1992	**20.9%**	0.3%	0.0%	**3.4%**	**11.0%**	18.1%		19.7%			3.2%		21.2%	11.8%	12.3%
1993	**16.3%**	1.2%	0.0%	**1.7%**	**9.4%**	12.3%		12.0%			0.0%		20.4%	14.2%	20.8%
1994	**9.6%**	0.0%	0.0%	**2.8%**	**5.0%**	9.0%		5.1%			0.0%		11.9%	5.0%	17.2%
1995	**4.7%**	0.0%	0.0%	**0.0%**	**4.6%**	9.3%		0.0%			0.0%		12.2%	8.5%	9.2%
1996	**0.0%**	0.0%	0.0%	**0.0%**	**1.1%**	0.5%	4.2%	3.2%			0.0%		7.2%	1.1%	0.7%
1997	**2.2%**	5.7%	0.0%	**4.5%**	**3.9%**	12.0%	4.5%	5.3%	5.4%	12.2%	0.0%		12.0%	6.9%	3.8%
1998	**3.3%**	0.0%	0.0%	**0.0%**	**2.0%**	0.5%	4.0%	6.2%	3.0%	8.5%	0.0%	4.0%	3.1%	1.2%	3.4%
1999	**3.4%**	0.0%	0.0%	**3.8%**	**4.1%**	2.2%	6.6%	3.9%	6.3%	5.7%	2.4%	20.2%	8.7%	3.1%	11.8%
2000	**0.0%**	0.0%	0.0%	**0.0%**	**6.6%**	7.0%	24.1%		11.8%	10.0%	4.7%	11.1%	9.2%	19.0%	20.9%
2001	**1.9%**	0.0%	1.5%	**0.6%**	**11.3%**	5.1%	16.3%		10.8%	6.0%		15.0%	10.0%	6.9%	11.5%
2002	**2.4%**	0.0%	7.6%	**4.1%**	**4.8%**	11.4%	19.0%		7.8%	11.0%		7.5%		9.2%	13.0%
2003	**4.4%**	0.0%	0.0%	**3.4%**	**20.2%**	11.1%	18.5%		23.6%	35.8%		17.7%		11.1%	18.5%
2004	**1.3%**	0.0%	2.3%	**0.9%**	**31.0%**	6.9%	33.9%		13.4%	16.5%		12.0%		7.0%	14.4%
Averages															
1979-1982	**6.9%**	0.3%	1.9%	**3.2%**	**NA**	NA	NA	NA	NA	NA	0.0%	NA	NA	NA	NA
1985-1995	**7.9%**	0.6%	0.7%	**2.7%**	**5.9%**	17.1%	NA	5.7%	NA	8.8%	1.1%	NA	13.8%	14.0%	15.1%
1985-1998	**6.6%**	0.9%	0.5%	**2.4%**	**4.7%**	14.3%	4.2%	5.5%	4.2%	9.2%	0.9%	4.0%	12.1%	11.7%	11.3%
1999-2004	**2.2%**	0.0%	1.9%	**2.4%**	**13.0%**	7.3%	19.7%	3.9%	12.3%	14.2%	3.6%	13.9%	9.3%	9.4%	15.1%
2002-2004	**2.7%**	0.0%	3.3%	**3.8%**	**18.7%**	9.8%	23.8%	NA	14.9%	21.1%	NA	12.4%	NA	9.1%	15.4%

Table 7-2. Percent taken in the WCVI sport and troll fishery (Page 2 of 2).

	South PS Fall		Hood C.	Wa Coast/Juan de Fuca			Columbia River								Oregon	Fishery Statistics		
Catch Year	SPS Fall Fingerling	SPS Fall Yearling	G. Adams Fall Fingerling	Hoko Fall Fingerling	Sooes Fall Fingerling	Queets Fall Fingerling	Willamette Spring	Columbia Summer	Cowlitz Tule Fall	Spring Crk Tule Fall	CR LRH Tule Fall	Lewis River Fall	Snake River Fall	CR Upriver Bright Fall	Salmon River Fall	WCVI AABM Harvest[2]	WCVI AABM TAC	WCVI Percent Of TAC
1979								16.3%		24.1%				11.8%		480,772		
1980							4.7%	16.7%		25.5%	17.3%			7.3%		488,622		
1981						11.6%	2.7%		16.1%	21.1%	30.9%	6.0%		4.0%	4.4%	398,137		
1982	23.1%	2.8%	20.8%			12.2%	4.1%		15.4%	22.0%	26.5%	10.7%		4.6%	7.0%	543,991		
1983	17.6%	5.8%	16.2%			7.6%	1.9%		17.8%	30.3%	35.4%			3.7%	10.4%	385,573		
1984	20.8%	7.3%	18.1%			7.7%	1.9%		24.5%	27.9%	50.2%			7.4%	3.4%	460,331		
1985	19.5%					2.0%	0.5%		11.4%	14.9%	28.9%			8.0%	1.5%	354,115		
1986	18.4%					7.0%	6.1%		12.6%	23.1%	11.8%	9.3%		6.4%	2.1%	342,387		
1987	12.7%					0.7%	2.2%	0.0%	10.7%	7.9%	29.4%	9.3%		8.1%	2.4%	378,959		
1988	9.7%					5.1%	3.1%	20.1%	15.9%	25.4%	31.2%	8.9%	18.6%	11.2%	3.9%	408,736		
1989	9.9%		10.2%	10.8%	10.1%	7.6%	1.9%	17.2%	6.6%	17.7%	15.4%	5.6%	16.9%	7.7%	3.9%	203,717		
1990	27.0%	0.3%	24.3%	17.0%	17.7%	6.6%	2.8%	19.5%	14.2%	22.1%	19.8%	12.9%	16.1%	8.1%	7.8%	297,973		
1991	17.7%	5.6%	22.9%	7.4%	5.2%	4.8%	0.6%	6.4%	8.8%	14.4%	12.2%	5.9%	8.8%	8.9%	5.8%	202,917		
1992	19.4%	5.8%	15.6%	11.9%	21.0%	17.5%	2.9%	14.8%	17.7%	14.4%	18.2%	6.2%	13.7%	12.5%	15.4%	365,260		
1993	20.3%	1.4%	41.7%	14.9%	16.0%	12.1%	1.6%	16.2%	6.7%	21.9%	22.9%	7.6%	10.3%	17.0%	17.8%	298,060		
1994	10.2%	1.5%	0.0%	13.5%	8.0%	5.1%	0.6%	0.0%	1.9%	22.5%	27.6%	3.2%	7.1%	7.6%	4.6%	156,242		
1995	4.8%	8.4%	11.8%	2.9%	9.8%	1.1%	0.4%	5.1%	4.2%	9.4%	0.0%	5.3%		5.3%	1.1%	95,213		
1996	1.8%	1.3%	4.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	3.1%	0.0%	0.0%		0.0%	0.0%	10,233		
1997	6.7%	1.9%	5.6%	1.5%	2.8%	0.2%	0.0%	1.6%	4.9%	14.6%	20.3%	0.0%		0.6%	0.2%	59,796		
1998	1.3%	0.0%	1.3%	0.3%	0.0%	0.0%	0.1%	0.6%	0.0%	0.8%	6.1%	0.0%		0.1%	0.0%	10,856		
1999	4.7%	0.0%	9.8%	1.4%	0.0%	0.0%	0.6%	5.6%	3.8%	4.1%	11.4%	0.0%		0.3%	0.0%	36,617	107,000	34.2%
2000	13.2%	8.9%	29.5%	0.2%	10.7%	0.0%	0.6%	9.5%	19.6%	9.9%	32.3%	0.0%		3.6%	0.0%	99,267	86,200	115.2%
2001	12.0%	4.5%	14.4%	0.0%	2.0%	0.0%	0.5%	16.7%	4.2%	5.3%	11.6%	10.9%		1.1%	0.5%	115,743	145,500	79.5%
2002	13.5%	0.0%	18.4%	1.5%	0.6%	0.0%	0.7%	16.3%	9.1%	10.0%	12.4%	12.3%		1.7%	0.1%	165,043	196,800	83.9%
2003	25.2%		15.0%	1.8%	0.0%	1.2%	2.9%	12.8%	16.3%	16.8%	28.3%	8.3%	1.2%	2.3%	0.4%	175,552	268,900	65.3%
2004	22.1%		18.3%	1.6%	0.8%	1.6%	5.9%	13.0%	6.4%	14.6%	30.5%	2.2%	4.4%	2.8%	1.2%	210,982	209,142	100.9%
Averages																		
1979-1982	23.1%	2.8%	20.8%	NA	NA	11.9%	3.8%	16.5%	15.8%	23.2%	24.9%	8.4%		6.9%	5.7%	477,881		
1985-1995	15.4%	3.8%	18.1%	11.2%	12.5%	6.3%	2.1%	11.0%	10.1%	17.6%	19.8%	7.4%	13.1%	9.2%	6.0%	282,144		
1985-1998	12.8%	2.9%	13.8%	8.0%	9.1%	5.0%	1.6%	8.5%	8.3%	15.2%	17.4%	5.7%	13.1%	7.3%	4.8%	227,462		
1999-2004	15.1%	3.4%	17.6%	1.1%	2.4%	0.5%	1.9%	12.3%	9.9%	10.1%	21.1%	5.6%	2.8%	2.0%	0.4%	133,867	168,924	79.8%
2002-2004	20.3%	0.0%	17.2%	1.6%	0.5%	0.9%	3.2%	14.0%	10.6%	13.8%	23.7%	7.6%	2.8%	2.3%	0.6%	183,859	224,947	83.3%

[1] In many cases, CWT recoveries from the WCVI sport fishery cannot easily be identified as 'outside' (AABM) or 'inside' (ISBM), due to uncertainly in the recovery location. Consequently, the percentages reported here for the WCVI AABM fishery reflect CWTs recovered in all WCVI sport fisheries (the exception is Robertson Cr. sport recoveries, which do not include recoveries from Alberni Canal, i.e. terminal recoveries). Most recoveries of non-local stocks would occur in the outside sport fishery.

[2] Troll catch is by calendar year from 1979-1998 and troll accounting year from 1999-2005. Also, note that sport harvest data not available prior to 1992 and harvest for 1979-1991 is troll only.

Table 7-3. Percent of total run (reported catch and escapement, measured in terms of adult equivalents) for PST Chinook CWT indicator stocks taken in the WCVI troll fishery. Bold font depicts values for indicators associated with stocks of Canadian domestic conservation concern. Blank cells indicate a gap in tagging.

	WCVI	UGS	**Lower GS**			Fraser Late	Puget Sound Spring					North Puget Sound Summer/Fall			
Catch Year	**Robertson Creek Fall**	Quinsam Fall	Puntledge Summer	**Big Qualicum Fall**	**Cowichan Fall**	Chilliwack Fall	Nooksack Spring Fingerling	Nooksack Spring Yearling	Skagit Spring Fingerling	Skagit Spring Yearling	White Spring Yearling	Skagit Summer Fingerling	Stillaguamish Fall Fingerling	Nisqually Fall Fingerling	Samish Fall Fingerling
1979	**8.0%**	0.0%	0.9%	**2.2%**											
1980	**7.0%**	0.0%	4.9%	**4.2%**											
1981	**5.3%**	0.7%	0.0%	**1.6%**											
1982	**5.8%**	0.4%	1.6%	**4.3%**							0.0%				
1983	**5.3%**	0.7%	2.4%	**1.1%**							4.3%			16.4%	
1984	**6.7%**	0.8%	2.3%	**1.4%**							4.5%			28.8%	
1985	**2.0%**	0.1%	0.0%	**1.4%**		34.5%				6.7%	0.0%			30.3%	
1986	**4.4%**	0.0%	2.8%	**1.4%**		19.5%		0.0%		6.2%	0.6%			15.7%	
1987	**2.2%**	0.4%	0.0%	**4.2%**		16.2%				3.7%	0.0%			10.7%	
1988	**4.1%**	0.7%	0.0%	**2.8%**		17.9%				1.8%	0.2%			5.4%	
1989	**1.6%**	0.3%	0.0%	**4.8%**		19.5%		0.0%		3.4%	1.2%			4.4%	6.8%
1990	**6.3%**	1.4%	0.0%	**3.0%**	**1.3%**	9.4%		0.0%		4.9%	1.9%		21.2%	22.5%	18.5%
1991	**4.4%**	0.5%	0.0%	**1.9%**	**3.2%**	18.3%		2.1%			0.8%		5.3%	8.2%	13.5%
1992	**18.8%**	0.3%	0.0%	**3.4%**	**9.6%**	18.0%		17.4%			2.4%		17.2%	7.6%	11.4%
1993	**13.7%**	1.2%	0.0%	**1.7%**	**7.8%**	11.9%		4.4%			0.0%		11.1%	12.4%	12.3%
1994	**5.3%**	0.0%	0.0%	**2.8%**	**4.1%**	6.5%		5.1%			0.0%		6.6%	4.5%	11.8%
1995	**1.5%**	0.0%	0.0%	**0.0%**	**4.0%**	8.8%		0.0%			0.0%		2.4%	5.4%	5.8%
1996	**0.0%**	0.0%	0.0%	**0.0%**	**0.0%**	0.0%	0.0%	0.0%			0.0%		0.0%	0.0%	0.0%
1997	**0.1%**	0.7%	0.0%	**0.0%**	**2.8%**	10.0%	1.6%	0.0%	1.4%	2.0%	0.0%		7.0%	2.4%	2.0%
1998	**0.0%**	0.0%	0.0%	**0.0%**	**0.5%**	0.2%	1.7%	0.0%	0.0%	1.3%	0.0%	1.7%	1.0%	0.5%	1.7%
1999	**0.0%**	0.0%	0.0%	**0.0%**	**0.0%**	0.3%	1.1%	2.8%	0.5%	1.2%	2.4%	0.0%	1.1%	0.4%	1.6%
2000	**0.0%**	0.0%	0.0%	**0.0%**	**1.3%**	5.0%	19.5%		5.5%	6.4%	4.7%	2.2%	7.5%	13.4%	11.4%
2001	**0.0%**	0.0%	1.5%	**0.6%**	**11.3%**	3.5%	8.9%		4.8%	3.2%		6.7%	5.2%	3.1%	4.7%
2002	**0.4%**	0.0%	0.0%	**2.4%**	**4.1%**	8.5%	17.5%		4.7%	0.8%		6.4%		7.0%	8.9%
2003	**0.0%**	0.0%	0.0%	**3.4%**	**9.0%**	5.3%	14.1%		21.3%	22.7%		10.9%		5.8%	14.2%
2004	**0.1%**	0.0%	2.3%	**0.9%**	**16.6%**	4.7%	27.5%		10.4%	12.4%		10.4%		5.7%	7.1%
Averages															
1979-1982	**6.5%**	0.3%	1.9%	**3.1%**	**NA**	NA	NA	NA	NA	NA	0.0%	NA	NA	NA	NA
1985-1995	**5.8%**	0.4%	0.3%	**2.5%**	**5.0%**	16.4%	NA	3.6%	NA	4.5%	0.6%	NA	10.6%	11.6%	11.4%
1985-1998	**4.6%**	0.4%	0.2%	**2.0%**	**3.7%**	13.6%	1.1%	2.6%	0.7%	3.8%	0.5%	1.7%	8.0%	9.3%	8.4%
1999-2004	**0.1%**	0.0%	0.6%	**1.2%**	**7.1%**	4.6%	14.8%	2.8%	7.9%	7.8%	3.6%	6.1%	4.6%	5.9%	8.0%
2002-2004	**0.2%**	0.0%	0.8%	**2.2%**	**9.9%**	6.2%	19.7%	NA	12.1%	12.0%	NA	9.2%	NA	6.2%	10.1%

Table 7-3. Percent taken in the WCVI troll fishery (Page 2 of 2).

	South PS Fall		Hood C.	Wa Coast/Juan de Fuca			Columbia River								Oregon	Fishery Statistics		
Catch Year	SPS Fall Fingerling	SPS Fall Yearling	G. Adams Fall Fingerling	Hoko Fall Fingerl.	Sooes Fall Fingerling	Queets Fall Fingerling	Willamette Spring	Columbia Summer	Cowlitz Tule Fall	Spring Crk Tule Fall	CR LRH Tule Fall	Lewis River Fall	Snake River Fall	CR Upriver Bright Fall	Salmon River Fall	WCVI Troll Harvest [1]	WCVI Troll TAC[1]	WCVI T Percent Of TAC
1979								16.3%		24.0%				11.8%		480,772		
1980							4.7%	16.7%		25.4%	16.0%			7.3%		488,622		
1981						11.6%	2.7%		16.1%	21.0%	30.6%	6.0%		3.8%	3.7%	398,137		
1982	23.0%	2.8%	20.8%			12.2%	4.1%		14.5%	22.0%	26.0%	10.7%		4.6%	7.0%	543,991		
1983	17.3%	5.8%	15.7%			7.6%	1.9%		17.8%	29.8%	35.0%			3.7%	10.4%	385,573		
1984	20.5%	7.3%	18.1%			7.7%	1.9%		24.5%	27.5%	49.9%			7.2%	3.4%	460,331		
1985	18.7%					2.0%	0.5%		11.4%	14.2%	28.2%			7.9%	1.5%	354,115		
1986	18.4%					7.0%	5.5%		12.6%	20.6%	9.1%	6.8%		6.3%	2.1%	342,387		
1987	12.7%					0.7%	0.9%	0.0%	9.7%	7.9%	26.9%	8.4%		7.8%	2.4%	378,959		
1988	5.5%					4.0%	3.1%	15.9%	15.9%	23.2%	28.8%	8.9%	18.6%	11.2%	3.9%	408,736		
1989	7.4%		8.5%	10.8%	1.9%	7.6%	1.4%	14.8%	6.6%	14.4%	15.4%	5.1%	16.0%	7.7%	3.9%	203,717		
1990	22.7%	0.3%	19.3%	17.0%	17.7%	6.6%	2.1%	19.5%	14.2%	17.6%	19.8%	12.1%	16.1%	8.1%	7.8%	297,973		
1991	15.1%	5.6%	18.4%	6.9%	5.2%	4.8%	0.4%	5.7%	5.6%	13.1%	10.2%	5.9%	8.8%	8.9%	5.8%	202,917		
1992	17.2%	4.6%	15.6%	9.8%	19.3%	17.5%	2.7%	14.8%	17.7%	11.9%	16.3%	6.2%	10.7%	11.5%	15.4%	346,742		
1993	15.7%	1.4%	33.9%	14.9%	16.0%	12.1%	1.4%	14.3%	6.7%	17.7%	18.4%	7.6%	10.3%	17.0%	17.8%	274,748		
1994	8.9%	0.8%	0.0%	11.4%	8.0%	4.1%	0.6%	0.0%	1.9%	18.6%	27.6%	3.2%	7.1%	6.9%	4.6%	145,929		
1995	3.7%	6.4%	7.9%	2.9%	9.8%	0.7%	0.3%	5.1%	1.8%	6.7%	0.0%	5.3%		5.3%	0.9%	81,257		
1996	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		0.0%	0.0%	4		
1997	5.2%	1.5%	4.2%	0.9%	0.0%	0.2%	0.0%	1.6%	4.9%	11.9%	16.4%	0.0%		0.5%	0.2%	53,396		
1998	0.5%	0.0%	0.2%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%	0.3%	1.0%	0.0%		0.1%	0.0%	6,679		
1999	0.7%	0.0%	0.8%	0.0%	0.0%	0.0%	0.0%	0.6%	3.8%	0.3%	2.3%	0.0%		0.0%	0.0%	5,511	75,894	7.3%
2000	9.1%	0.0%	18.9%	0.2%	0.0%	0.0%	0.3%	4.5%	7.2%	3.7%	15.9%	0.0%		0.9%	0.0%	61,229	48,162	127.1%
2001	7.5%	4.5%	11.7%	0.0%	0.0%	0.0%	0.4%	12.3%	1.3%	4.2%	8.2%	8.6%		0.7%	0.3%	75,564	105,321	71.7%
2002	11.5%	0.0%	11.4%	1.5%	0.6%	0.0%	0.7%	15.5%	7.2%	9.3%	10.6%	6.0%		1.4%	0.1%	132,928	164,685	80.7%
2003	13.2%		11.6%	0.0%	0.0%	0.0%	2.3%	12.0%	9.6%	9.8%	14.9%	4.9%	1.2%	1.0%	0.0%	151,557	244,905	61.9%
2004	17.2%	2.1%	14.8%	0.6%	0.8%	1.6%	5.9%	11.6%	6.4%	11.5%	20.9%	2.2%	2.5%	2.4%	1.2%	168,944	167,104	101.1%
Averages																		
1979-1982	23.0%	2.8%	20.8%	NA	NA	11.9%	3.8%	16.5%	15.3%	23.1%	24.2%	8.4%		6.9%	5.4%	477,881		
1985-1995	13.3%	3.2%	14.8%	10.5%	11.1%	6.1%	1.7%	10.0%	9.5%	15.1%	18.2%	7.0%	12.5%	9.0%	6.0%	276,135		
1985-1998	10.8%	2.3%	10.8%	7.5%	7.8%	4.8%	1.4%	7.6%	7.8%	12.7%	15.6%	5.3%	12.5%	7.1%	4.7%	221,254		
1999-2004	9.9%	1.3%	11.5%	0.4%	0.2%	0.3%	1.6%	9.4%	5.9%	6.5%	12.1%	3.6%	1.9%	1.1%	0.3%	99,289	134,345	75.0%
2002-2004	14.0%	1.1%	12.6%	0.7%	0.5%	0.5%	3.0%	13.0%	7.7%	10.2%	15.5%	4.4%	1.9%	1.6%	0.4%	151,143	192,231	81.2%

[1] Troll catch is by calendar year from 1979-1998 and troll accounting year (previous October to September of the current year) from 1999-2005.

[2] Amount based on post-season allowable catch, i.e. total post-season allowable AABM catch less outside sport catch.

Table 7-4. Percent of total run (reported catch and escapement, measured in terms of adult equivalents) of PST Chinook CWT indicator stocks taken in the WCVI sport[1] fishery. Bold font depicts values for indicators associated with stocks of Canadian domestic conservation concern. Blank cells indicate a gap in tagging.

	WCVI	UGS	**Lower GS**			Fraser Late	Puget Sound Spring					North Puget Sound Summer/Fall			
Catch Year	**Robertson Creek Fall**	Quinsam Fall	Puntledge Summer	**Big Qualicum Fall**	**Cowichan Fall**	Chilliwack Fall	Nooksack Spring Fingerling	Nooksack Spring Yearling	Skagit Spring Fingerling	Skagit Spring Yearling	White Spring Yearling	Skagit Summer Fingerl.	Stillaguamish Fall Fingerling	Nisqually Fall Fingerling	Samish Fall Fingerling
1979	**0.1%**	0.0%	0.0%	**0.1%**											
1980	**0.4%**	0.0%	0.0%	**0.0%**											
1981	**0.7%**	0.0%	0.0%	**0.3%**											
1982	**0.4%**	0.0%	0.0%	**0.0%**							0.0%				
1983	**0.0%**	0.0%	0.0%	**0.0%**							0.0%			0.0%	
1984	**0.0%**	0.0%	0.0%	**0.0%**							0.0%		0.0%	0.0%	
1985	**0.0%**	0.0%	0.0%	**0.0%**		0.0%				0.0%	2.2%		9.3%	3.0%	
1986	**0.9%**	0.0%	0.0%	**0.0%**		0.0%		0.0%		5.7%	0.0%		0.0%	0.0%	
1987	**0.1%**	0.4%	4.7%	**0.0%**		0.5%				0.0%	0.0%			0.0%	
1988	**4.7%**	0.9%	0.0%	**2.0%**		0.0%				9.6%	0.8%			0.0%	
1989	**1.7%**	0.0%	0.0%	**0.0%**		0.0%		0.0%		1.8%	0.0%			6.3%	1.9%
1990	**2.0%**	0.0%	0.0%	**0.0%**	0.0%	2.4%		0.0%		8.7%	0.0%		6.5%	5.8%	2.0%
1991	**1.1%**	0.8%	0.0%	**0.0%**	0.7%	0.7%		7.0%			1.3%		2.3%	2.1%	3.2%
1992	**2.1%**	0.0%	0.0%	**0.0%**	1.4%	0.1%		2.3%			0.8%		4.0%	4.2%	0.9%
1993	**2.6%**	0.0%	0.0%	**0.0%**	1.6%	0.4%		7.6%			0.0%		9.3%	1.8%	8.5%
1994	**4.3%**	0.0%	0.0%	**0.0%**	0.9%	2.5%		0.0%			0.0%		5.3%	0.5%	5.4%
1995	**3.2%**	0.0%	0.0%	**0.0%**	0.6%	0.5%		0.0%			0.0%		9.8%	3.1%	3.4%
1996	**0.0%**	0.0%	0.0%	**0.0%**	1.1%	0.5%	4.2%	3.2%			0.0%		7.2%	1.1%	0.7%
1997	**2.1%**	5.0%	0.0%	**4.5%**	1.1%	2.0%	2.9%	5.3%	4.0%	10.2%	0.0%		5.0%	4.5%	1.8%
1998	**3.3%**	0.0%	0.0%	**0.0%**	1.5%	0.3%	2.3%	6.2%	3.0%	7.2%	0.0%	2.3%	2.1%	0.7%	1.7%
1999	**3.4%**	0.0%	0.0%	**3.8%**	4.1%	1.9%	5.5%	1.1%	5.8%	4.5%	0.0%	20.2%	7.6%	2.7%	10.2%
2000	**0.0%**	0.0%	0.0%	**0.0%**	5.3%	2.0%	4.6%		6.3%	3.6%	0.0%	8.9%	1.7%	5.6%	9.5%
2001	**1.9%**	0.0%	0.0%	**0.0%**	0.0%	1.6%	7.4%		6.0%	2.8%		8.3%	4.8%	3.8%	6.8%
2002	**2.0%**	0.0%	7.6%	**1.7%**	0.7%	2.9%	1.5%		3.1%	10.2%		1.1%		2.2%	4.2%
2003	**4.4%**	0.0%	0.0%	**0.0%**	11.2%	5.8%	4.4%		2.3%	13.1%		6.8%		5.3%	4.4%
2004	**2.1%**	0.0%	0.0%	**0.0%**	14.4%	2.2%	6.4%		3.0%	4.1%		1.6%		1.3%	7.3%
Averages															
1979-1982	**0.4%**	0.0%	0.0%	**0.1%**	NA	NA	NA	NA	NA	NA	0.0%	NA	NA	NA	NA
1985-1995	**2.1%**	0.2%	0.4%	**0.2%**	0.9%	0.6%	NA	2.1%	NA	4.3%	0.5%	NA	5.8%	2.4%	3.6%
1985-1998	**2.0%**	0.5%	0.3%	**0.5%**	1.0%	0.7%	3.1%	2.9%	3.5%	5.4%	0.4%	2.3%	5.5%	2.4%	3.0%
1999-2004	**2.2%**	0.0%	1.5%	**1.1%**	6.0%	2.7%	5.0%	1.1%	4.4%	6.4%	0.0%	7.8%	4.7%	3.5%	7.1%
2002-2004	**2.5%**	0.0%	3.8%	**0.9%**	8.8%	3.6%	4.1%	NA	2.8%	9.1%	NA	3.2%	NA	2.9%	5.3%

Table 7-4. Percent taken in the WCVI sport fishery (Page 2 of 2). Catch is correct

	South PS Fall		Hood C.	Wa Coast/Juan de Fuca			Columbia River								Oregon	Fishery Statistics		
Catch Year	SPS Fall Fingerling	SPS Fall Yearling	G. Adams Fall Fingerling	Hoko Fall Fingerling	Sooes Fall Fingerling	Queets Fall Fingerling	Willamette Spring	Columbia Summer	Cowlitz Tule Fall	Spring Crk Tule Fall	CR LRH Tule Fall	Lewis River Fall	Snake River Fall	CR Upriver Bright Fall	Salmon River Fall	WCVI O. Sport Harvest	WCVI O. Sport TAC[2]	O. Sport Percent Of TAC
1979								0.0%		0.1%				0.0%				
1980							0.0%	0.0%		0.1%	1.3%			0.0%				
1981						0.0%	0.0%		0.0%	0.1%	0.3%	0.0%		0.2%	0.7%			
1982	0.1%	0.0%	0.0%			0.0%	0.0%		0.9%	0.0%	0.5%	0.0%		0.0%	0.0%			
1983	0.3%	0.0%	0.5%			0.0%	0.0%		0.0%	0.5%	0.4%			0.0%	0.0%			
1984	0.3%	0.0%	0.0%			0.0%	0.0%		0.0%	0.4%	0.3%			0.2%	0.0%			
1985	0.8%					0.0%	0.0%		0.0%	0.7%	0.7%			0.1%	0.0%			
1986	0.0%					0.0%	0.6%		0.0%	2.5%	2.7%	2.5%		0.1%	0.0%			
1987	0.0%					0.0%	1.3%	0.0%	1.0%	0.0%	2.5%	0.9%		0.3%	0.0%			
1988	4.2%					1.1%	0.0%	4.2%	0.0%	2.2%	2.4%	0.0%	0.0%	0.0%	0.0%			
1989	2.5%		1.7%	0.0%	8.2%	0.0%	0.5%	2.4%	0.0%	3.3%	0.0%	0.5%	0.9%	0.0%	0.0%			
1990	4.3%	0.0%	5.0%	0.0%	0.0%	0.0%	0.7%	0.0%	0.0%	4.5%	0.0%	0.8%	0.0%	0.0%	0.0%			
1991	2.6%	0.0%	4.5%	0.5%	0.0%	0.0%	0.2%	0.7%	3.2%	1.3%	2.0%	0.0%	0.0%	0.0%	0.0%			
1992	2.2%	1.2%	0.0%	2.1%	1.7%	0.0%	0.2%	0.0%	0.0%	2.5%	1.9%	0.0%	3.0%	1.0%	0.0%	18,518		
1993	4.6%	0.0%	7.8%	0.0%	0.0%	0.0%	0.2%	1.9%	0.0%	4.2%	4.5%	0.0%	0.0%	0.0%	0.0%	23,312		
1994	1.3%	0.7%	0.0%	2.1%	0.0%	1.0%	0.0%	0.0%	0.0%	3.9%	0.0%	0.0%	0.0%	0.7%	0.0%	10,313		
1995	1.1%	2.0%	3.9%	0.0%	0.0%	0.4%	0.1%	0.0%	2.4%	2.7%	0.0%	0.0%		0.0%	0.2%	13,956		
1996	1.8%	1.3%	4.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	3.1%	0.0%	0.0%		0.0%	0.0%	10,229		
1997	1.5%	0.4%	1.4%	0.6%	2.8%	0.0%	0.0%	0.0%	0.0%	2.7%	3.9%	0.0%		0.1%	0.0%	6,400		
1998	0.8%	0.0%	1.1%	0.3%	0.0%	0.0%	0.0%	0.6%	0.0%	0.5%	5.1%	0.0%		0.0%	0.0%	4,177		
1999	4.0%	0.0%	9.0%	1.4%	0.0%	0.0%	0.6%	5.0%	0.0%	3.8%	9.1%	0.0%		0.3%	0.0%	31,106	31,106	100.0%
2000	4.1%	8.9%	10.6%	0.0%	10.7%	0.0%	0.3%	5.0%	12.4%	6.2%	16.4%	0.0%		2.7%	0.0%	38,038	38,038	100.0%
2001	4.5%	0.0%	2.7%	0.0%	2.0%	0.0%	0.1%	4.4%	2.9%	1.1%	3.4%	2.3%		0.4%	0.2%	40,179	40,179	100.0%
2002	2.1%	0.0%	7.0%	0.0%	0.0%	0.0%	0.0%	0.8%	1.9%	0.7%	1.8%	6.3%		0.3%	0.0%	32,115	32,115	100.0%
2003	12.0%		3.4%	1.8%	0.0%	1.2%	0.6%	0.8%	6.7%	7.0%	13.4%	3.4%	0.0%	1.3%	0.4%	23,995	23,995	100.0%
2004	4.9%	0.0%	3.5%	1.0%	0.0%	0.0%	0.0%	1.4%	0.0%	3.1%	9.6%	0.0%	1.9%	0.4%	0.0%	42,038	42,038	100.0%
Averages																		
1979-1982	0.1%	0.0%	0.0%	NA	NA	0.0%	0.0%	0.0%	0.5%	0.1%	0.7%	0.0%		0.1%	0.4%			
1985-1995	2.1%	0.7%	3.3%	0.7%	1.4%	0.2%	0.3%	1.0%	0.6%	2.5%	1.5%	0.5%	0.6%	0.2%	0.0%	16,525		
1985-1998	2.0%	0.6%	3.0%	0.6%	1.3%	0.2%	0.3%	0.8%	0.5%	2.4%	1.8%	0.4%	0.6%	0.2%	0.0%	12,415		
1999-2004	5.3%	1.8%	6.0%	0.7%	2.1%	0.2%	0.3%	2.9%	4.0%	3.7%	9.0%	2.0%	1.0%	0.9%	0.1%	34,579	34,579	100.0%
2002-2004	6.3%	0.0%	4.6%	0.9%	0.0%	0.4%	0.2%	1.0%	2.9%	3.6%	8.3%	3.2%	1.0%	0.7%	0.1%	32,716	32,716	100.0%

[1] In many cases, CWT recoveries from the WCVI sport fishery cannot easily be identified as ‘outside’ (AABM) or ‘inside’ (ISBM), due to uncertainly in the recovery location. Consequently, the percentages reported here for the WCVI AABM fishery reflect CWTs recovered in all WCVI sport fisheries (the exception is Robertson Cr. sport recoveries, which do not include recoveries from Alberni Canal, i.e. terminal recoveries). Most recoveries of non-local stocks would occur in the outside sport fishery.

[2] Sport catch is generally not managed to a target, and therefore is always considered to have achieved its full allocation.

Table 7-5. Percent of total run (reported catch and escapement, measured in terms of adult equivalents) of PST Chinook CWT indicator stocks taken in the NBC troll fishery. Blank cells indicate a gap in tagging.

	Alaska	NCBC	WCVI	UGS	Lower GS			Fraser Late	North Puget Sound Spring			North Puget Sound Summer/Fall			SPS Fall
Catch Year	Alaska SSE	Kitsumkalum Summer	Robertson Creek Fall	Quinsam Fall	Puntledge Summer	Big Qualicum Fall	Cowichan Fall	Chilliwack Fall	Nooksack Spring Fingerling	Skagit Spring Fingerling	Skagit Spring Yearling	Skagit Summer Fingerlin.	Stillaguamish Fall Fingerling	Nisqually Fall Fingerling	SPS Fall Fingerling
1979			11.6%	7.3%	3.2%	1.7%									
1980			8.1%	10.9%	2.0%	4.3%									
1981			12.2%	15.4%	5.4%	1.3%									
1982			13.5%	8.1%	2.2%	4.5%									0.1%
1983	1.7%		10.4%	15.4%	7.5%	4.9%								2.5%	0.7%
1984	0.9%		14.7%	5.9%	2.0%	1.4%								0.0%	0.7%
1985	1.0%	7.1%	17.7%	5.1%	6.2%	1.7%		0.3%			0.0%			0.0%	0.0%
1986	0.6%	13.9%	8.1%	6.6%	2.8%	0.8%		0.8%			0.0%			0.0%	0.0%
1987	0.4%	8.9%	6.1%	6.3%	12.1%	4.0%		0.7%			4.6%			0.0%	0.0%
1988	1.1%	3.1%	6.6%	6.6%	0.0%	2.3%		0.2%			0.0%			0.7%	0.2%
1989	0.6%	5.0%	7.8%	3.9%	0.0%	3.2%		0.0%			0.0%			0.3%	0.2%
1990	1.7%	6.5%	7.3%	6.7%	0.0%	6.0%	0.0%	0.0%			0.0%		0.9%	0.0%	0.3%
1991	0.6%	8.8%	9.1%	5.7%	0.0%	2.1%	0.2%	0.4%					0.0%	2.1%	0.0%
1992	0.4%	7.0%	7.2%	10.1%	0.0%	5.4%	0.4%	0.1%					0.4%	0.0%	0.0%
1993	0.1%	10.0%	7.1%	5.8%	0.0%	1.5%	0.1%	0.0%					0.6%	0.0%	0.0%
1994	0.4%	5.6%	9.5%	9.3%	0.0%	1.6%	0.4%	0.7%					0.7%	0.0%	0.5%
1995	0.3%	7.1%	3.1%	9.2%	0.0%	1.5%	0.0%	0.0%					0.0%	0.0%	0.1%
1996	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%				0.0%	0.0%	0.0%
1997	0.0%	0.0%	4.5%	4.1%	9.8%	5.0%	0.0%	0.1%	0.2%	0.4%	0.0%		0.5%	0.0%	0.3%
1998	0.0%	0.0%	6.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.0%	0.0%	0.9%
1999	0.0%	0.0%	3.3%	1.3%	0.0%	2.1%	0.0%	0.1%	0.0%	0.2%	0.0%	0.0%	0.0%	0.0%	0.1%
2000	0.0%	0.0%	0.0%	0.3%	1.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
2001	0.2%	0.4%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%
2002	0.7%	1.4%	3.0%	0.4%	0.6%	2.8%	0.0%	0.0%	0.8%	0.2%	0.0%	0.9%		0.0%	0.5%
2003	0.7%	5.6%	0.6%	0.0%	0.0%	0.0%	2.2%	0.0%	0.0%	1.1%	0.7%	3.4%		0.0%	0.7%
2004	0.4%	1.4%	1.9%	0.3%	3.0%	3.5%	0.6%	0.1%	0.4%	0.4%	0.0%	2.5%		0.0%	0.6%
Averages															
1979-1982	NA	NA	11.4%	10.4%	3.2%	3.0%	NA	NA	NA	NA	NA	NA	NA	NA	0.1%
1985-1995	0.7%	7.5%	8.1%	6.8%	1.9%	2.7%	0.2%	0.3%	NA	NA	0.8%	NA	0.4%	0.3%	0.1%
1985-1998	0.5%	5.9%	7.2%	5.7%	2.2%	2.5%	0.1%	0.2%	0.1%	0.2%	0.6%	0.0%	0.5%	0.2%	0.2%
1999-2004	0.3%	1.5%	1.5%	0.4%	0.9%	1.4%	0.5%	0.0%	0.2%	0.4%	0.1%	1.1%	0.0%	0.0%	0.3%
2002-2004	0.6%	2.8%	1.8%	0.2%	1.2%	2.1%	0.9%	0.0%	0.4%	0.6%	0.2%	2.3%		0.0%	0.6%

Table 7-5. Percent taken in the NBC troll fishery (Page 2 of 2).

	Hood Canal	Wa Coast/Juan de Fuca			Columbia River								Oregon	Fishery Statistics		
Catch Year	G. Adams Fall Fingerling	Hoko Fall Fingerling	Sooes Fall Fingerling	Queets Fall Fingerling	Willamette Spring	Columbia Summer	Cowlitz Tule Fall	Spring Crk Tule Fall	CR LRH Tule Fall	Lewis River Wild	Snake River Fall	CR Upriver Bright Fall	Salmon River Fall	NBC Troll Harvest	NBC Troll TAC[1]	NBC T Percent Of TAC
1979						7.2%		0.1%				7.6%		148,724		
1980					11.0%	8.8%		0.1%	0.0%			6.5%		163,562		
1981				13.7%	12.0%		2.4%	0.1%	0.0%	3.3%		5.6%	28.2%	151,732		
1982	0.0%			22.9%	6.6%		1.4%	0.0%	0.3%	3.0%		3.5%	14.4%	174,146		
1983	0.0%			6.8%	12.0%		6.7%	0.0%	0.0%			10.7%	21.5%	163,056		
1984	0.5%			19.6%	2.1%		7.2%	0.0%	0.0%			8.6%	16.9%	179,664		
1985				31.6%	0.5%		4.0%	0.0%	0.0%			8.8%	19.1%	186,724		
1986				11.6%	6.6%		0.2%	0.0%	0.0%	1.6%		7.9%	9.0%	152,999		
1987				11.7%	13.3%	5.6%	3.9%	0.0%	0.2%	4.7%		12.4%	15.3%	177,457		
1988				7.8%	6.2%	7.6%	1.9%	0.5%	0.3%	2.9%	3.3%	7.4%	6.4%	152,368		
1989	0.0%	7.6%	0.0%	9.1%	1.8%	5.1%	4.5%	0.2%	0.0%	4.5%	6.3%	14.9%	11.4%	207,681		
1990	0.4%	8.0%	14.2%	5.5%	1.4%	6.6%	1.8%	0.2%	0.0%	1.7%	3.5%	9.9%	10.6%	154,115		
1991	0.0%	5.0%	9.9%	9.7%	1.7%	2.2%	3.2%	0.0%	0.0%	3.8%	4.9%	5.9%	15.2%	194,014		
1992	0.0%	4.4%	9.5%	7.7%	1.7%	3.4%	0.0%	0.0%	0.0%	3.8%	3.6%	3.0%	6.6%	142,335		
1993	0.0%	6.6%	7.6%	14.1%	1.3%	1.4%	2.5%	0.0%	0.0%	4.9%	4.7%	6.7%	15.3%	161,775		
1994	0.0%	14.8%	10.5%	21.7%	0.7%	0.0%	1.9%	0.0%	0.0%	3.2%	6.0%	8.0%	14.8%	164,493		
1995	0.0%	6.2%	4.6%	6.1%	1.0%	0.0%	1.8%	0.0%	0.0%	3.2%		2.0%	4.6%	56,863		
1996	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		0.0%	0.0%	0		
1997	0.0%	1.7%	5.5%	6.0%	0.5%	0.2%	3.0%	0.0%	0.0%	3.1%		4.5%	3.3%	86,813		
1998	0.0%	5.9%	17.5%	19.1%	0.0%	0.5%	7.4%	0.0%	0.0%	3.0%		2.6%	11.1%	116,407		
1999	0.0%	4.3%	4.1%	1.9%	0.0%	0.4%	0.0%	0.0%	0.0%	5.9%		3.8%	2.7%	48,094	95,873	58.9%
2000	0.2%	0.0%	0.0%	10.7%	0.1%	0.4%	0.0%	0.0%	0.0%	0.0%		0.0%	2.6%	9,948	101,400	9.7%
2001	0.0%	0.0%	0.0%	3.6%	0.1%	0.5%	0.0%	0.0%	0.0%	0.0%		0.0%	2.7%	13,099	128,500	10.2%
2002	1.0%	3.7%	1.7%	1.8%	0.6%	10.5%	0.8%	0.0%	0.0%	0.0%		0.8%	2.9%	103,038	190,700	54.0%
2003	0.0%	3.0%	4.5%	9.9%	0.4%	10.7%	1.3%	0.0%	0.0%	1.5%	0.0%	4.3%	5.7%	136,437	222,900	61.6%
2004	0.0%	8.5%	14.5%	9.8%	0.6%	4.9%	1.0%	0.0%	0.3%	2.7%	2.1%	2.6%	7.2%	167,463	193,000	86.8%
Averages																
1979-1982	0.0%	NA	NA	18.3%	9.9%	8.0%	1.9%	0.1%	0.1%	3.2%		5.8%	21.3%	158,465		
1985-1995	0.1%	7.5%	8.0%	12.4%	3.3%	3.5%	2.3%	0.1%	0.0%	3.4%	4.6%	7.9%	11.7%	161,393		
1985-1998	0.0%	6.0%	7.9%	11.6%	2.6%	2.7%	2.6%	0.1%	0.0%	3.1%	4.6%	6.7%	10.2%	66,675		
1999-2004	0.2%	3.3%	4.1%	6.3%	0.3%	4.6%	0.5%	0.0%	0.1%	1.7%	1.1%	1.9%	4.0%	79,680	155,396	46.9%
2002-2004	0.3%	5.1%	6.9%	7.2%	0.5%	8.7%	1.0%	0.0%	0.1%	1.4%	1.1%	2.6%	5.3%	135,646	202,200	67.5%

[1] Amount based on post-season allowable catch, i.e. total post-season allowable AABM catch less outside sport catch. Troll catch is from TCCHINOOK (05)-2.

Table 7-6. Distribution of Robertson Creek Fall Chinook (WCVI) reported catch (percentage of reported catch + escapement, measured in terms of adult equivalents), 1979-2004.

Catch Year	Alaska Troll	Alaska Net	Alaska Sport	North Troll	Central Troll	N/CBC Net	N/CBC Sport	WCVI Troll	WCVI Non-terminal Sport	GeoSt Tr&Sp	Other Fisheries: Canada Net	Other Fisheries: Canada Sport	Other Fisheries: U.S. Troll	Other Fisheries: U.S. Net	Other Fisheries: U.S. Sport	Percent Escapement	WCVI Naturals Escapement
1979	18.4%	0.8%	0.6%	11.6%	10.8%	7.7%	0.3%	8.0%	0.1%	1.7%	2.2%	5.1%	0.0%	0.1%	0.0%	32.3%	2,048
1980	26.9%	7.0%	0.9%	8.1%	8.3%	4.5%	0.1%	7.0%	0.4%	0.1%	11.2%	3.0%	0.0%	0.2%	0.0%	22.5%	5,974
1981	29.7%	1.6%	0.8%	12.2%	8.2%	4.9%	0.5%	5.3%	0.7%	0.6%	13.5%	5.0%	0.0%	0.4%	0.0%	16.5%	5,050
1982	25.0%	3.4%	1.5%	13.5%	7.5%	5.0%	0.1%	5.8%	0.4%	0.9%	14.8%	6.0%	0.1%	0.5%	0.2%	15.3%	6,812
1983	36.0%	3.3%	0.6%	10.4%	8.0%	2.4%	0.3%	5.3%	0.0%	0.3%	18.2%	4.6%	0.0%	0.2%	0.0%	10.4%	2,700
1984	26.6%	4.0%	0.2%	14.7%	3.0%	2.7%	0.0%	6.7%	0.0%	0.8%	17.7%	15.9%	0.0%	0.2%	0.0%	7.6%	3,862
1985	14.1%	5.8%	0.0%	17.7%	0.5%	4.5%	0.0%	2.0%	0.0%	0.8%	3.6%	17.7%	0.0%	2.0%	0.0%	31.3%	3,700
1986	13.9%	4.6%	0.0%	8.1%	1.1%	3.1%	0.7%	4.4%	0.9%	0.0%	1.5%	25.7%	0.0%	0.0%	1.1%	35.0%	2,760
1987	6.5%	1.5%	0.6%	6.1%	2.9%	2.4%	0.5%	2.2%	0.1%	0.5%	1.1%	20.8%	0.0%	0.3%	0.1%	54.3%	2,570
1988	9.9%	2.1%	0.9%	6.6%	1.2%	2.0%	1.1%	4.1%	4.7%	0.6%	8.1%	13.9%	0.0%	0.3%	0.2%	44.4%	4,560
1989	8.0%	2.5%	0.4%	7.8%	0.8%	1.1%	1.0%	1.6%	1.7%	0.8%	20.5%	16.8%	0.0%	0.1%	0.1%	36.9%	6,220
1990	15.8%	1.1%	1.3%	7.3%	2.0%	1.7%	0.9%	6.3%	2.0%	0.3%	10.4%	8.8%	0.0%	0.0%	0.1%	41.9%	3,660
1991	16.9%	1.1%	3.1%	9.1%	2.7%	0.6%	0.8%	4.4%	1.1%	0.3%	14.9%	12.5%	0.0%	0.0%	0.1%	32.3%	5,060
1992	13.7%	3.0%	1.7%	7.2%	3.0%	0.9%	1.5%	18.8%	2.1%	0.1%	0.8%	5.9%	0.0%	0.1%	0.1%	41.1%	4,830
1993	13.9%	1.0%	2.5%	7.1%	2.0%	0.4%	1.4%	13.7%	2.6%	0.5%	8.4%	13.1%	0.0%	0.0%	0.1%	33.2%	4,530
1994	15.8%	2.2%	3.7%	9.5%	1.1%	1.1%	1.1%	5.3%	4.3%	0.4%	12.8%	17.0%	0.0%	0.0%	0.1%	25.6%	4,080
1995	15.3%	0.0%	4.0%	3.1%	0.3%	0.3%	0.9%	1.5%	3.2%	1.4%	7.3%	9.3%	0.0%	0.2%	0.0%	53.2%	3,710
1996	5.6%	0.1%	1.9%	0.0%	0.7%	0.0%	2.8%	0.0%	0.0%	1.5%	0.0%	0.0%	0.0%	0.0%	0.0%	87.4%	6,026
1997	10.7%	3.2%	3.9%	4.5%	1.8%	0.4%	2.8%	0.1%	2.1%	0.5%	6.5%	17.9%	0.1%	0.0%	0.0%	45.1%	7,197
1998	16.5%	1.2%	5.1%	6.2%	0.0%	0.0%	2.0%	0.0%	3.3%	0.6%	4.2%	15.8%	0.1%	0.0%	0.0%	45.1%	11,643
1999	12.2%	0.4%	7.9%	3.3%	0.2%	0.0%	2.9%	0.0%	3.4%	0.8%	7.0%	18.9%	0.0%	0.0%	0.0%	42.9%	10,186
2000	5.6%	0.0%	0.0%	0.0%	0.0%	0.0%	3.4%	0.0%	0.0%	2.6%	0.0%	0.0%	0.0%	0.0%	0.0%	88.4%	4,675
2001	3.2%	0.0%	2.2%	0.0%	0.0%	0.0%	0.4%	0.0%	1.9%	2.0%	0.0%	1.3%	0.0%	0.0%	0.0%	88.9%	2,737
2002	12.4%	0.3%	1.7%	3.0%	0.2%	0.0%	4.2%	0.4%	2.0%	0.7%	8.6%	6.6%	0.0%	0.0%	0.0%	59.6%	4,036
2003	11.4%	1.7%	2.7%	6.0%	0.0%	0.0%	8.7%	0.0%	4.4%	0.4%	2.7%	18.0%	0.0%	0.0%	0.0%	49.1%	4,456
2004	10.1%	6.4%	2.3%	1.9%	0.0%	0.0%	4.2%	0.1%	1.2%	1.1%	10.6%	11.5%	0.0%	0.0%	0.1%	50.4%	8,491
Averages																	
1979-1982	25.0%	3.2%	1.0%	11.4%	8.7%	5.5%	0.3%	6.5%	0.4%	0.8%	10.4%	4.8%	0.0%	0.3%	0.1%	21.7%	4,971
1985-1995	13.1%	2.3%	1.7%	8.1%	1.6%	1.6%	0.9%	5.8%	2.1%	0.5%	8.1%	14.7%	0.0%	0.3%	0.2%	39.0%	4,153
1985-1998	12.6%	2.1%	2.1%	7.2%	1.4%	1.3%	1.3%	4.6%	2.0%	0.6%	7.2%	13.9%	0.0%	0.2%	0.1%	43.3%	5,039
1999-2004	9.2%	1.5%	2.8%	2.4%	0.1%	0.0%	4.0%	0.1%	2.4%	1.3%	4.8%	9.2%	0.0%	0.0%	0.0%	63.2%	5,764
2002-2004	11.3%	2.8%	2.2%	3.6%	0.1%	0.0%	5.7%	0.2%	2.9%	0.7%	7.3%	11.6%	0.0%	0.0%	0.0%	53.0%	5,661

Table 7-7. Distribution of Big Qualicum River Fall Chinook (Lower Georgia Strait) reported catch (percentage of reported catch + escapement, measured in terms of adult equivalents), 1979-2004.

											Other Fisheries						LGS[1]
Catch Year	Alaska Troll	Alaska Net	Alaska Sport	North Troll	Central Troll	N/CBC Net	N/CBC Sport	WCVI Troll	WCVI Sport[2]	GeoSt Tr&Sp	Canada Net	Canada Sport	U.S. Troll	U.S. Net	U.S. Sport	Percent Escapement	Naturals Escapement
1979	3.4%	0.9%	0.3%	1.7%	9.4%	4.1%	0.4%	2.2%	0.1%	39.3%	8.0%	0.0%	0.0%	0.3%	0.1%	29.8%	10,686
1980	1.4%	1.6%	0.4%	4.3%	6.6%	3.4%	1.3%	4.2%	0.0%	39.2%	9.4%	0.0%	0.1%	0.3%	0.2%	27.6%	8,819
1981	1.9%	0.3%	0.4%	1.3%	11.5%	4.5%	0.8%	1.6%	0.3%	54.7%	9.7%	0.0%	0.0%	0.1%	0.6%	12.3%	6,007
1982	4.5%	0.4%	1.2%	4.5%	5.8%	8.5%	0.4%	4.3%	0.0%	25.6%	12.1%	0.0%	0.0%	1.1%	0.7%	30.9%	6,186
1983	5.4%	0.3%	0.3%	4.9%	6.8%	4.5%	1.0%	1.1%	0.0%	36.6%	14.6%	0.0%	0.0%	0.0%	0.6%	23.7%	6,582
1984	1.4%	0.4%	0.0%	1.4%	6.6%	3.6%	5.8%	1.4%	0.0%	52.3%	6.2%	0.0%	0.0%	0.0%	0.0%	20.7%	8,456
1985	3.9%	0.3%	0.6%	1.7%	3.7%	6.8%	1.7%	1.4%	0.0%	35.6%	12.4%	0.0%	0.0%	2.6%	0.0%	29.3%	4,589
1986	1.9%	0.3%	0.0%	0.8%	12.8%	8.3%	2.9%	1.4%	0.0%	45.4%	7.5%	0.0%	0.0%	0.0%	0.0%	18.8%	3,105
1987	8.8%	0.0%	1.0%	4.0%	2.5%	2.6%	2.7%	4.2%	0.0%	31.7%	5.2%	0.0%	0.8%	0.7%	0.0%	35.8%	3,276
1988	2.8%	0.5%	0.0%	2.3%	1.3%	10.2%	1.3%	2.8%	2.0%	32.1%	4.8%	0.0%	0.0%	1.0%	0.0%	38.9%	7,957
1989	4.2%	1.6%	0.6%	3.2%	0.6%	1.0%	1.8%	4.8%	0.0%	39.0%	8.2%	0.0%	0.2%	0.0%	1.0%	34.0%	7,087
1990	4.8%	1.9%	0.0%	6.0%	1.6%	6.7%	2.4%	3.0%	0.0%	22.7%	11.3%	0.0%	0.2%	0.0%	1.9%	37.5%	7,023
1991	2.4%	1.3%	0.0%	2.1%	1.1%	2.9%	1.9%	1.9%	0.0%	44.7%	5.6%	0.0%	0.5%	0.5%	0.0%	35.0%	8,343
1992	2.3%	0.0%	2.5%	5.4%	5.9%	1.6%	7.7%	3.4%	0.0%	41.3%	3.9%	0.0%	0.0%	0.4%	0.0%	25.5%	11,377
1993	1.2%	1.2%	0.0%	1.5%	3.9%	2.9%	3.2%	1.7%	0.0%	45.0%	6.8%	0.0%	0.0%	0.0%	1.0%	31.5%	8,418
1994	4.5%	0.0%	0.0%	1.6%	1.6%	3.7%	2.0%	2.8%	0.0%	34.6%	2.4%	0.0%	0.0%	2.8%	0.0%	43.9%	7,463
1995	7.0%	0.0%	0.0%	1.5%	0.0%	7.0%	2.5%	0.0%	0.0%	21.0%	0.5%	0.0%	0.0%	0.0%	0.0%	60.5%	18,732
1996	2.9%	0.0%	0.0%	0.0%	0.0%	0.7%	1.1%	0.0%	0.0%	46.8%	0.0%	0.0%	0.0%	0.0%	1.1%	47.5%	16,465
1997	3.0%	0.0%	0.0%	5.0%	1.5%	1.5%	2.0%	0.0%	4.5%	30.5%	0.5%	0.0%	0.0%	0.0%	0.0%	51.5%	11,742
1998	7.6%	0.6%	0.0%	0.0%	0.0%	0.0%	6.5%	0.0%	0.0%	21.2%	0.0%	0.0%	0.0%	0.0%	0.0%	64.1%	8,246
1999	6.0%	2.6%	0.0%	2.1%	2.6%	0.0%	2.1%	0.0%	3.8%	12.3%	0.0%	0.0%	0.0%	0.9%	0.0%	67.7%	8,481
2000	14.2%	0.9%	0.0%	0.0%	0.0%	0.5%	3.2%	0.0%	0.0%	11.5%	0.0%	0.0%	0.0%	3.2%	0.0%	66.5%	7,933
2001	4.0%	6.8%	0.0%	0.0%	0.0%	0.0%	5.1%	0.6%	0.0%	10.2%	0.0%	0.0%	0.0%	1.7%	0.0%	71.5%	5,315
2002	10.4%	0.0%	3.1%	2.8%	0.0%	0.0%	7.6%	2.4%	1.7%	9.7%	0.3%	0.0%	0.0%	2.1%	1.0%	58.7%	3,840
2003	8.1%	0.4%	1.7%	0.0%	0.0%	0.0%	20.8%	3.4%	0.0%	7.2%	0.0%	0.0%	0.0%	0.0%	0.0%	58.5%	3,310
2004	6.1%	0.0%	0.2%	3.5%	0.0%	0.0%	4.5%	0.9%	0.0%	6.8%	0.0%	0.0%	0.5%	1.2%	0.0%	76.2%	2,602
Averages																	
1979-1982	2.8%	0.8%	0.6%	3.0%	8.3%	5.1%	0.7%	3.1%	0.1%	39.7%	9.8%	0.0%	0.0%	0.5%	0.4%	25.2%	7,925
1985-1995	4.0%	0.6%	0.4%	2.7%	3.2%	4.9%	2.7%	2.5%	0.2%	35.7%	6.2%	0.0%	0.2%	0.7%	0.4%	35.5%	7,943
1985-1998	4.1%	0.6%	0.3%	2.5%	2.6%	4.0%	2.8%	2.0%	0.5%	35.1%	4.9%	0.0%	0.1%	0.6%	0.4%	39.6%	8,845
1999-2004	8.1%	1.8%	0.8%	1.4%	0.4%	0.1%	7.2%	1.2%	0.9%	9.6%	0.1%	0.0%	0.1%	1.5%	0.2%	66.5%	5,247
2002-2004	8.2%	0.1%	1.7%	2.1%	0.0%	0.0%	11.0%	2.2%	0.6%	7.9%	0.1%	0.0%	0.2%	1.1%	0.3%	64.5%	3,251

[1] Represents the sum of escapement of Nanaimo and Cowichan fall Chinook.
[2] Represents both inside and outside sport.

Table 7-8. Distribution of Cowichan River Fall Chinook (Lower Georgia Strait) reported catch (percentage of reported catch + escapement, measured in terms of adult equivalents), 1990-2004.

											Other Fisheries						
Catch Year	Alaska Troll	Alaska Net	Alaska Sport	North Troll	Central Troll	N/CBC Net	N/CBC Sport	WCVI Troll	WCVI Sport[1]	GeoSt Tr&Sp	Canada Net	Canada Sport	U.S. Troll	U.S. Net	U.S. Sport	Percent Escapement	Cowichan Escapement
1990	0.0%	0.0%	0.0%	0.0%	1.4%	4.6%	0.3%	1.3%	0.0%	52.1%	12.9%	0.0%	0.7%	3.0%	2.2%	21.6%	5,300
1991	0.1%	0.0%	0.0%	0.2%	0.2%	0.6%	1.5%	3.2%	0.7%	57.3%	4.8%	0.0%	0.9%	3.6%	0.8%	26.0%	6,000
1992	0.1%	0.0%	0.0%	0.4%	1.1%	1.2%	0.9%	9.6%	1.4%	63.1%	4.3%	0.0%	0.3%	1.3%	1.3%	15.1%	8,500
1993	0.2%	0.0%	0.0%	0.1%	0.5%	0.6%	1.5%	7.8%	1.6%	59.6%	3.4%	0.0%	0.6%	0.9%	0.5%	22.8%	5,058
1994	0.6%	0.0%	0.0%	0.4%	0.2%	2.3%	0.0%	4.1%	0.9%	37.9%	6.3%	0.0%	0.4%	3.7%	0.5%	42.7%	5,050
1995	0.3%	0.0%	0.0%	0.0%	0.0%	1.2%	0.0%	4.0%	0.6%	33.2%	0.5%	0.0%	0.0%	2.2%	0.8%	57.3%	14,300
1996	0.3%	0.0%	0.0%	0.0%	0.0%	0.5%	0.0%	0.0%	1.1%	42.6%	0.4%	0.0%	0.0%	0.9%	3.7%	50.6%	12,980
1997	0.9%	0.0%	0.0%	0.0%	0.0%	0.5%	0.6%	2.8%	1.1%	25.3%	0.2%	0.0%	0.0%	3.5%	2.9%	62.2%	9,845
1998	3.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.8%	0.5%	1.5%	26.7%	0.3%	0.0%	0.0%	2.8%	0.0%	63.7%	4,371
1999	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.0%	0.0%	4.1%	38.7%	1.2%	0.0%	1.0%	6.8%	0.7%	46.5%	4,500
2000	1.2%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	1.3%	5.3%	19.8%	0.0%	0.0%	0.0%	4.2%	1.3%	66.8%	5,109
2001	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.6%	11.3%	0.0%	23.4%	0.3%	0.0%	0.2%	14.9%	0.9%	48.0%	3,282
2002	1.1%	0.0%	0.0%	0.0%	0.0%	0.0%	2.7%	4.1%	0.7%	27.7%	0.1%	0.0%	0.7%	3.0%	3.6%	56.2%	2,505
2003	2.0%	0.3%	0.0%	2.2%	3.1%	0.0%	6.7%	9.0%	11.2%	25.8%	0.0%	0.0%	0.6%	5.6%	2.5%	30.9%	2,494
2004	0.0%	0.3%	0.0%	0.6%	0.0%	0.0%	4.5%	16.6%	14.4%	21.4%	2.6%	0.0%	2.6%	6.4%	1.9%	28.8%	2,226
Averages																	
1979-1982																	
1990-1995	0.2%	0.0%	0.0%	0.2%	0.6%	1.8%	0.7%	5.0%	0.9%	50.5%	5.4%	0.0%	0.5%	2.5%	1.0%	30.9%	7,368
1990-1998	0.7%	0.0%	0.0%	0.1%	0.4%	1.3%	0.6%	3.7%	1.0%	44.2%	3.7%	0.0%	0.3%	2.4%	1.4%	40.2%	7,934
1999-2004	0.8%	0.1%	0.0%	0.5%	0.5%	0.0%	2.6%	7.1%	6.0%	26.1%	0.7%	0.0%	0.9%	6.8%	1.8%	46.2%	3,353
2002-2004	1.0%	0.2%	0.0%	0.9%	1.0%	0.0%	4.6%	9.9%	8.8%	25.0%	0.9%	0.0%	1.3%	5.0%	2.7%	38.6%	2,408

[21]Represents both inside and outside sport.

8. Provide annual stock compositions through 2004 for the WCVI and NBC fisheries as in Appendix I of TCCHINOOK(04)-4, again with average figures calculated for appropriate prior years compared with average figures for those years for which specific stock concerns influenced the conduct of the NBC and WCVI fisheries;

The PSC Chinook Model serves as the data source for Appendix I; however, because the model operates under base period exploitation patterns and stock distribution, model-generated estimates of stock composition would not be expected to be representative of those resulting from the different fishing patterns observed in recent years.

Table 8-1 contains estimates of stock composition generated by the 2005 calibration (#0506) of the PSC Chinook Model for the WCVI AABM fishery complex. Tables 8-2 and 8-3 show the estimated stock composition for the WCVI troll and sport fisheries separately. The five stocks with the largest stock composition estimates in the base period from 1979-1982 for the WCVI AABM fishery complex were: 1) Fraser Late at 24.3%, 2) Spring Creek Hatchery at 14.0%, 3) Nooksack Fall at 9.3%, 4) Bonneville Hatchery at 10.5% and 5) Cowlitz Fall at 8.5%. Considerable variation in stock compositions is evident, reflecting interannual variability in relative stock and cohort strengths.

Table 8-4 contains estimates of stock composition generated by the 2005 calibration (#0506) of the PSC Chinook Model for the NBC AABM fishery complex. Table 8-5 shows the estimated stock composition for the NBC troll fishery separately. No separate table is shown for the sport fishery as no base period data exists for the QCI fishery alone. Rather, the base period used by the model for this fishery consists of all north and central BC sport fisheries data; this introduces some bias into the stock composition estimates shown in Table 8-4 for the NBC AABM fishery as a whole, regardless of any changes in fishing patterns. Consequently, only the troll fishery should be used to assess changes in stock impacts using model data. The eight stocks with the largest stock composition estimates in the base period from 1979-1982 for the NBC troll fishery were: 1) Oregon Coast Fall at 26.3%, 2) CR URBs at 8.4%, 3) NCBC at 8.2%, 4) WCVI Hatchery at 6.8%, 5) Willamette Hatchery at 6.1%, 6) WA Coastal wild at 6.0%, 7) Fraser Early at 5.7% and 8) Upper Georgia Strait at 5.6%. Considerable variation in stock compositions is evident, reflecting interannual variability in relative stock and cohort strengths.

Tables 8-6, 8-7 and 8-8 provide model estimates of the percent of total run (in catch + escapement) of stocks accounted for by the WCVI AABM fishery complex. Tables 8-9 and 8-10 provide the same estimates for the NBC AABM fishery complex and the NBC troll fishery, respectively. These tables were provided for the potential comparison of the percents from the coded-wire tag analysis data, e.g., Appendix G data from CTC (2004).

Table 8-1. Stock Composition of the WCVI AABM fishery (Troll and Sport) as estimated from the PSC Chinook Model (CLB-0506) for calendar years 1979-2004.

Panel A PSC Model Stocks 1-15															
Year	Alaska SSE	NCBC	WCVI hatchery	WCVI wild	Upper GS	Lower GS wild	Lower GS hatchery	Fraser Early	Fraser Late	Nooksack Spring	Nooksack Fall	Skagit Sum/Fall	Stillaguamish Sum/Fall	Snohomish Sum/Fall	PS hatch Fingerling
1979	0.0%	0.1%	1.2%	1.6%	0.1%	0.6%	0.6%	0.7%	25.1%	0.2%	7.5%	1.8%	0.1%	0.9%	4.0%
1980	0.0%	0.2%	1.7%	2.4%	0.1%	0.6%	0.7%	0.6%	22.1%	0.2%	9.4%	1.8%	0.1%	0.9%	4.9%
1981	0.0%	0.2%	2.0%	2.7%	0.1%	0.4%	0.7%	0.5%	26.4%	0.1%	9.6%	1.7%	0.1%	0.8%	5.0%
1982	0.0%	0.2%	4.0%	3.0%	0.1%	0.3%	0.5%	0.5%	26.0%	0.1%	9.3%	1.2%	0.1%	0.7%	4.7%
1983	0.0%	0.2%	5.1%	1.9%	0.1%	0.3%	0.4%	0.5%	25.7%	0.1%	10.7%	1.2%	0.1%	0.7%	6.1%
1984	0.0%	0.2%	3.5%	1.3%	0.0%	0.4%	0.9%	0.5%	27.4%	0.1%	11.6%	1.8%	0.1%	0.6%	5.7%
1985	0.0%	0.2%	2.5%	0.9%	0.1%	0.2%	0.7%	0.7%	30.5%	0.0%	10.2%	1.4%	0.1%	0.5%	5.1%
1986	0.0%	0.3%	1.4%	0.5%	0.1%	0.1%	0.4%	0.8%	22.0%	0.0%	8.3%	0.9%	0.1%	0.5%	5.4%
1987	0.0%	0.2%	1.9%	0.6%	0.1%	0.1%	0.2%	0.8%	9.9%	0.0%	5.3%	0.8%	0.1%	0.4%	5.2%
1988	0.0%	0.3%	3.7%	1.0%	0.1%	0.1%	0.1%	0.8%	6.6%	0.0%	4.9%	0.8%	0.1%	0.4%	6.3%
1989	0.0%	0.3%	5.7%	1.2%	0.1%	0.2%	0.3%	0.8%	18.5%	0.0%	6.8%	1.0%	0.1%	0.4%	7.7%
1990	0.0%	0.4%	9.0%	1.7%	0.1%	0.2%	0.3%	0.9%	23.9%	0.0%	8.2%	0.9%	0.1%	0.4%	7.8%
1991	0.0%	0.5%	11.0%	2.4%	0.1%	0.3%	0.4%	1.1%	22.0%	0.0%	6.1%	0.8%	0.1%	0.4%	6.9%
1992	0.0%	0.3%	30.2%	7.4%	0.1%	0.2%	0.2%	0.7%	19.8%	0.0%	2.9%	0.4%	0.1%	0.3%	4.1%
1993	0.0%	0.4%	21.8%	5.5%	0.1%	0.2%	0.3%	1.0%	21.3%	0.0%	3.8%	0.5%	0.1%	0.4%	5.6%
1994	0.0%	0.6%	8.7%	2.1%	0.1%	0.3%	0.3%	1.6%	18.6%	0.1%	4.4%	0.9%	0.1%	0.5%	10.8%
1995	0.0%	0.7%	2.7%	0.7%	0.1%	0.7%	0.5%	2.0%	11.9%	0.1%	4.7%	1.1%	0.2%	0.6%	16.1%
1996	0.0%	0.6%	0.0%	0.0%	0.1%	0.6%	0.6%	1.8%	15.9%	0.1%	4.2%	1.2%	0.2%	0.5%	12.2%
1997	0.0%	0.5%	6.6%	1.7%	0.1%	0.3%	0.5%	2.1%	29.0%	0.1%	3.7%	1.0%	0.1%	0.5%	9.6%
1998	0.0%	0.6%	3.0%	0.7%	0.1%	0.3%	0.6%	1.6%	30.8%	0.1%	3.7%	0.8%	0.2%	0.6%	11.0%
1999	0.0%	0.7%	0.6%	0.1%	0.1%	0.3%	0.7%	1.4%	25.6%	0.1%	4.4%	1.4%	0.2%	0.6%	12.9%
2000	0.0%	0.6%	1.1%	0.2%	0.1%	0.2%	0.7%	1.3%	22.4%	0.1%	4.1%	1.6%	0.2%	0.6%	12.6%
2001	0.0%	0.4%	2.6%	0.3%	0.1%	0.1%	0.5%	0.9%	14.0%	0.1%	2.8%	1.0%	0.1%	0.4%	8.1%
2002	0.0%	0.2%	3.8%	0.4%	0.1%	0.1%	0.3%	0.8%	18.1%	0.1%	2.0%	0.6%	0.1%	0.3%	5.2%
2003	0.0%	0.3%	4.5%	0.3%	0.1%	0.1%	0.3%	0.9%	19.5%	0.1%	1.6%	1.0%	0.1%	0.5%	5.9%
2004	0.0%	0.3%	6.0%	0.4%	0.1%	0.1%	0.4%	0.9%	13.2%	0.1%	1.3%	1.0%	0.1%	0.6%	6.9%
Averages															
1979-1982	0.0%	0.2%	2.2%	2.5%	0.1%	0.4%	0.6%	0.6%	24.9%	0.1%	9.0%	1.6%	0.1%	0.8%	4.6%
1985-1995	0.0%	0.4%	9.0%	2.2%	0.1%	0.2%	0.3%	1.0%	18.6%	0.0%	6.0%	0.9%	0.1%	0.4%	7.4%
1985-1998	0.0%	0.4%	7.7%	1.9%	0.1%	0.3%	0.4%	1.2%	20.1%	0.0%	5.5%	0.9%	0.1%	0.5%	8.1%
1999-2004	0.0%	0.4%	3.1%	0.3%	0.1%	0.1%	0.5%	1.0%	18.8%	0.1%	2.7%	1.1%	0.1%	0.5%	8.6%
2002-2004	0.0%	0.3%	4.8%	0.4%	0.1%	0.1%	0.3%	0.8%	16.9%	0.1%	1.6%	0.8%	0.1%	0.4%	6.0%

Table 8-1.- continued

Year	PS Natural	PS Yearling	WACO wild	WACO hatchery	CR Summer	CR URBS	CR Mid-Brights	Snake Fall	Lewis wild	Spring Crk. hatchery	L. Bonneville hatchery	Fall Cowlitz hatchery	Spring Cowlitz hatchery	Willamette Hatchery	ORC North Migrating
	Panel B PSC Model Stocks 16-30														
1979	2.5%	2.2%	1.1%	0.8%	2.0%	5.0%	0.0%	0.2%	1.2%	15.0%	12.1%	7.6%	1.1%	1.0%	3.8%
1980	2.2%	2.6%	1.3%	0.9%	2.1%	4.1%	0.2%	0.2%	1.5%	13.9%	10.3%	8.6%	1.6%	1.3%	3.6%
1981	1.8%	2.7%	1.4%	0.8%	1.8%	3.1%	0.4%	0.3%	1.1%	12.6%	9.3%	8.0%	1.5%	1.6%	3.6%
1982	2.0%	2.0%	1.2%	0.6%	1.4%	2.8%	0.6%	0.2%	0.6%	12.5%	9.9%	8.6%	1.2%	1.8%	4.2%
1983	2.9%	1.6%	1.4%	0.7%	1.6%	6.1%	0.8%	0.2%	0.7%	4.4%	9.3%	8.2%	1.2%	1.9%	6.5%
1984	2.6%	1.6%	1.4%	0.7%	1.6%	7.2%	0.4%	0.1%	0.5%	5.7%	8.3%	6.7%	0.8%	1.6%	6.9%
1985	2.5%	1.3%	1.6%	0.8%	1.3%	10.2%	0.5%	0.1%	0.6%	3.6%	8.3%	7.2%	0.7%	1.5%	6.6%
1986	3.0%	1.0%	2.0%	1.2%	1.5%	15.0%	1.6%	0.2%	1.1%	1.6%	12.9%	8.5%	1.0%	1.9%	6.7%
1987	3.2%	0.7%	2.0%	1.4%	1.5%	15.1%	3.1%	0.2%	1.5%	0.9%	20.6%	14.9%	1.1%	2.3%	6.1%
1988	4.1%	0.9%	2.3%	1.8%	1.5%	12.7%	3.8%	0.2%	1.6%	2.3%	11.0%	24.0%	0.9%	2.4%	5.8%
1989	5.2%	1.2%	2.6%	1.9%	1.5%	9.1%	3.2%	0.2%	1.0%	3.7%	4.8%	12.9%	0.9%	3.0%	5.6%
1990	5.9%	1.0%	2.5%	1.9%	1.5%	6.7%	2.3%	0.1%	0.8%	4.2%	2.8%	6.3%	0.9%	3.0%	6.2%
1991	5.2%	0.7%	2.5%	2.4%	1.3%	4.7%	1.9%	0.2%	0.7%	7.2%	5.9%	5.0%	1.1%	2.6%	6.6%
1992	2.7%	0.4%	1.6%	1.7%	0.9%	4.3%	1.4%	0.1%	0.6%	3.7%	5.2%	4.5%	0.7%	1.3%	4.4%
1993	3.1%	0.5%	2.0%	2.1%	1.4%	7.8%	2.1%	0.2%	0.6%	2.6%	3.8%	4.8%	0.6%	1.5%	6.3%
1994	5.1%	0.8%	3.0%	2.8%	1.9%	10.0%	2.8%	0.2%	1.5%	3.1%	3.4%	4.5%	0.4%	1.9%	9.5%
1995	7.1%	1.1%	3.6%	3.2%	2.0%	9.3%	3.4%	0.3%	1.2%	5.6%	3.7%	6.3%	0.4%	1.8%	9.0%
1996	5.2%	0.7%	3.2%	2.4%	1.8%	13.0%	5.3%	0.3%	0.9%	6.6%	5.2%	8.0%	0.4%	2.0%	7.3%
1997	3.7%	0.5%	2.3%	1.4%	2.1%	9.0%	4.3%	0.2%	0.6%	3.6%	3.4%	5.4%	0.2%	1.7%	5.9%
1998	3.7%	0.5%	2.0%	1.1%	2.2%	12.0%	4.0%	0.3%	0.3%	4.7%	3.3%	3.2%	0.3%	2.3%	6.1%
1999	3.7%	0.8%	1.7%	1.1%	3.0%	12.9%	3.6%	0.4%	0.5%	8.1%	2.8%	4.1%	0.5%	2.8%	5.1%
2000	2.9%	0.7%	1.8%	1.3%	5.0%	11.9%	3.8%	0.9%	1.0%	6.0%	4.5%	3.6%	0.5%	2.9%	7.4%
2001	1.8%	0.5%	1.3%	0.9%	4.9%	12.4%	5.0%	0.8%	0.9%	15.9%	10.1%	4.8%	0.5%	2.8%	6.2%
2002	1.3%	0.4%	1.0%	0.7%	4.0%	12.0%	5.5%	0.6%	0.8%	19.3%	7.5%	6.1%	0.7%	2.3%	6.1%
2003	1.6%	0.4%	1.2%	0.8%	4.1%	11.4%	4.7%	0.7%	0.7%	15.9%	5.4%	7.9%	1.0%	2.3%	7.0%
2004	1.9%	0.5%	1.2%	0.9%	4.0%	14.1%	4.3%	1.0%	0.7%	21.6%	2.5%	6.6%	0.9%	2.5%	6.1%
Averages															
1979-1982	2.1%	2.4%	1.2%	0.8%	1.8%	3.7%	0.3%	0.2%	1.1%	13.5%	10.4%	8.2%	1.3%	1.4%	3.8%
1985-1995	4.3%	0.9%	2.3%	1.9%	1.5%	9.5%	2.4%	0.2%	1.0%	3.5%	7.5%	9.0%	0.8%	2.1%	6.6%
1985-1998	4.3%	0.8%	2.4%	1.9%	1.6%	9.9%	2.8%	0.2%	0.9%	3.8%	6.7%	8.2%	0.7%	2.1%	6.6%
1999-2004	2.2%	0.5%	1.3%	1.0%	4.2%	12.4%	4.5%	0.7%	0.8%	14.5%	5.5%	5.5%	0.7%	2.6%	6.3%
2002-2004	1.6%	0.4%	1.1%	0.8%	4.0%	12.5%	4.8%	0.8%	0.7%	18.9%	5.1%	6.9%	0.9%	2.4%	6.4%

Table 8-2. Stock Composition of the WCVI AABM fishery (troll only) as estimated from the PSC Chinook Model (CLB-0506) for calendar years 1979-2004.

Panel A PSC Model Stocks 1-15															
Year	Alaska SSE	NCBC	WCVI hatchery	WCVI wild	Upper GS	Lower GS wild	Lower GS hatchery	Fraser Early	Fraser Late	Nooksack Spring	Nooksack Fall	Skagit Sum/Fall	Stillaguamish Sum/Fall	Snohomish Sum/Fall	PS hatch Fingerling
1979	0.0%	0.1%	1.2%	1.7%	0.1%	0.6%	0.6%	0.7%	25.1%	0.2%	7.5%	1.8%	0.1%	0.9%	4.0%
1980	0.0%	0.2%	1.8%	2.5%	0.1%	0.6%	0.7%	0.6%	22.1%	0.2%	9.4%	1.8%	0.1%	0.9%	4.9%
1981	0.0%	0.2%	2.1%	2.8%	0.1%	0.4%	0.7%	0.5%	26.3%	0.1%	9.6%	1.7%	0.1%	0.8%	5.0%
1982	0.0%	0.2%	4.0%	3.1%	0.1%	0.3%	0.5%	0.5%	26.0%	0.1%	9.3%	1.2%	0.1%	0.7%	4.7%
1983	0.0%	0.2%	5.1%	2.0%	0.1%	0.3%	0.4%	0.5%	25.7%	0.1%	10.7%	1.2%	0.1%	0.7%	6.1%
1984	0.0%	0.2%	3.5%	1.3%	0.0%	0.4%	0.9%	0.5%	27.4%	0.1%	11.5%	1.8%	0.1%	0.6%	5.7%
1985	0.0%	0.2%	2.6%	0.9%	0.1%	0.2%	0.7%	0.7%	30.5%	0.0%	10.2%	1.4%	0.1%	0.5%	5.1%
1986	0.0%	0.3%	1.5%	0.5%	0.1%	0.1%	0.4%	0.8%	22.0%	0.0%	8.3%	0.9%	0.1%	0.5%	5.4%
1987	0.0%	0.2%	2.0%	0.6%	0.1%	0.1%	0.2%	0.8%	9.9%	0.0%	5.3%	0.8%	0.1%	0.4%	5.3%
1988	0.0%	0.3%	3.7%	1.0%	0.1%	0.1%	0.1%	0.8%	6.6%	0.0%	4.9%	0.8%	0.1%	0.4%	6.3%
1989	0.0%	0.3%	6.3%	1.3%	0.1%	0.2%	0.3%	0.9%	18.1%	0.0%	6.8%	1.0%	0.1%	0.4%	7.6%
1990	0.0%	0.4%	9.6%	1.9%	0.1%	0.2%	0.3%	0.9%	23.8%	0.0%	8.2%	0.8%	0.1%	0.4%	7.8%
1991	0.0%	0.4%	12.2%	2.6%	0.1%	0.3%	0.4%	1.1%	21.5%	0.0%	6.1%	0.8%	0.1%	0.4%	6.8%
1992	0.0%	0.3%	31.5%	7.7%	0.1%	0.2%	0.2%	0.7%	19.3%	0.0%	2.8%	0.4%	0.1%	0.3%	4.0%
1993	0.0%	0.3%	23.0%	5.8%	0.1%	0.2%	0.3%	0.9%	20.8%	0.0%	3.7%	0.5%	0.1%	0.4%	5.5%
1994	0.0%	0.5%	9.5%	2.3%	0.1%	0.3%	0.3%	1.6%	18.4%	0.1%	4.3%	0.9%	0.1%	0.5%	10.6%
1995	0.0%	0.7%	3.0%	0.8%	0.1%	0.7%	0.5%	2.1%	11.8%	0.1%	4.7%	1.1%	0.2%	0.6%	16.2%
1996	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1997	0.0%	0.5%	7.0%	1.8%	0.1%	0.3%	0.5%	2.1%	28.6%	0.1%	3.7%	0.9%	0.1%	0.5%	9.6%
1998	0.0%	0.6%	6.0%	1.3%	0.1%	0.3%	0.6%	1.4%	28.4%	0.1%	3.5%	0.8%	0.2%	0.6%	10.6%
1999	0.0%	0.6%	2.4%	0.4%	0.1%	0.3%	0.7%	1.2%	27.0%	0.1%	4.1%	1.4%	0.2%	0.6%	12.1%
2000	0.0%	0.6%	1.4%	0.2%	0.1%	0.2%	0.7%	1.2%	22.3%	0.1%	4.1%	1.6%	0.2%	0.6%	12.4%
2001	0.0%	0.3%	3.4%	0.4%	0.1%	0.1%	0.5%	0.9%	13.9%	0.1%	2.8%	0.9%	0.1%	0.4%	7.9%
2002	0.0%	0.2%	4.3%	0.4%	0.1%	0.1%	0.3%	0.7%	18.1%	0.1%	1.9%	0.6%	0.1%	0.3%	5.1%
2003	0.0%	0.3%	4.9%	0.3%	0.1%	0.1%	0.3%	0.9%	19.4%	0.1%	1.6%	1.0%	0.1%	0.5%	5.8%
2004	0.0%	0.3%	6.8%	0.5%	0.1%	0.1%	0.4%	0.8%	13.1%	0.1%	1.3%	1.0%	0.1%	0.6%	6.8%
Averages															
1979-1982	0.0%	0.2%	2.3%	2.5%	0.1%	0.4%	0.6%	0.6%	24.9%	0.1%	9.0%	1.6%	0.1%	0.8%	4.6%
1985-1995	0.0%	0.4%	9.5%	2.3%	0.1%	0.2%	0.3%	1.0%	18.4%	0.0%	5.9%	0.9%	0.1%	0.4%	7.3%
1985-1998	0.0%	0.4%	8.4%	2.0%	0.1%	0.2%	0.3%	1.1%	25.7%	0.0%	5.2%	0.8%	0.1%	0.4%	7.2%
1999-2004	0.0%	0.4%	3.9%	0.4%	0.1%	0.1%	0.5%	0.9%	19.0%	0.1%	2.6%	1.1%	0.1%	0.5%	8.3%
2002-2004	0.0%	0.3%	5.3%	0.4%	0.1%	0.1%	0.3%	0.8%	16.8%	0.1%	1.6%	0.8%	0.1%	0.4%	5.9%

Table 8-2.- continued

Panel B PSC Model Stocks 16-30

Year	PS Natural	PS Yearling	WACO wild	WACO hatchery	CR Summer	CR URBS	CR Mid-Brights	Snake Fall	Lewis wild	Spring Crk. hatchery	L. Bonneville hatchery	Fall Cowlitz hatchery	Spring Cowlitz hatchery	Willamette Hatchery	ORC North Migrating
1979	2.5%	2.2%	1.1%	0.8%	2.0%	5.0%	0.0%	0.2%	1.2%	14.9%	12.1%	7.6%	1.1%	1.0%	3.8%
1980	2.2%	2.6%	1.3%	0.9%	2.1%	4.1%	0.2%	0.2%	1.5%	13.9%	10.3%	8.6%	1.6%	1.3%	3.6%
1981	1.8%	2.7%	1.4%	0.8%	1.8%	3.1%	0.4%	0.3%	1.1%	12.6%	9.2%	8.0%	1.5%	1.6%	3.6%
1982	2.0%	2.0%	1.2%	0.6%	1.4%	2.8%	0.6%	0.2%	0.6%	12.5%	9.9%	8.6%	1.2%	1.8%	4.2%
1983	2.9%	1.6%	1.4%	0.7%	1.6%	6.0%	0.8%	0.2%	0.7%	4.4%	9.3%	8.2%	1.2%	1.9%	6.5%
1984	2.6%	1.6%	1.4%	0.7%	1.6%	7.2%	0.4%	0.1%	0.5%	5.7%	8.3%	6.7%	0.8%	1.5%	6.9%
1985	2.5%	1.3%	1.6%	0.8%	1.3%	10.2%	0.5%	0.1%	0.6%	3.6%	8.3%	7.2%	0.7%	1.5%	6.6%
1986	3.0%	1.0%	2.0%	1.2%	1.5%	15.0%	1.6%	0.2%	1.1%	1.6%	12.9%	8.5%	1.0%	1.9%	6.7%
1987	3.2%	0.8%	2.0%	1.4%	1.5%	15.1%	3.1%	0.2%	1.5%	0.9%	20.4%	14.9%	1.1%	2.3%	6.1%
1988	4.1%	0.9%	2.3%	1.8%	1.5%	12.6%	3.8%	0.2%	1.6%	2.3%	11.0%	24.0%	0.9%	2.4%	5.8%
1989	5.2%	1.2%	2.6%	1.9%	1.5%	9.1%	3.2%	0.2%	1.0%	3.7%	4.8%	13.0%	0.8%	2.9%	5.6%
1990	5.9%	1.0%	2.5%	1.9%	1.5%	6.7%	2.3%	0.1%	0.8%	4.2%	2.8%	6.3%	0.8%	2.9%	6.2%
1991	5.2%	0.7%	2.5%	2.3%	1.3%	4.7%	1.9%	0.2%	0.7%	7.0%	5.7%	4.9%	1.1%	2.5%	6.5%
1992	2.6%	0.4%	1.6%	1.7%	0.9%	4.2%	1.3%	0.1%	0.6%	3.6%	5.0%	4.4%	0.7%	1.2%	4.3%
1993	3.0%	0.5%	2.0%	2.0%	1.4%	7.6%	2.0%	0.2%	0.5%	2.6%	3.7%	4.7%	0.6%	1.4%	6.1%
1994	5.1%	0.8%	2.9%	2.8%	1.9%	10.0%	2.8%	0.2%	1.5%	3.0%	3.3%	4.5%	0.4%	1.8%	9.4%
1995	7.1%	1.1%	3.5%	3.2%	2.1%	9.3%	3.4%	0.3%	1.2%	5.5%	3.7%	6.3%	0.4%	1.8%	9.0%
1996	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1997	3.7%	0.5%	2.3%	1.4%	2.1%	9.0%	4.3%	0.2%	0.6%	3.6%	3.4%	5.4%	0.2%	1.7%	5.9%
1998	3.5%	0.5%	2.0%	1.1%	2.0%	12.3%	3.9%	0.3%	0.3%	4.9%	3.3%	3.1%	0.3%	2.2%	5.9%
1999	3.4%	0.7%	1.7%	1.1%	2.8%	12.2%	3.3%	0.4%	0.5%	8.6%	2.9%	3.9%	0.4%	2.3%	4.7%
2000	2.9%	0.7%	1.8%	1.3%	5.0%	11.9%	3.8%	0.9%	1.0%	6.1%	4.6%	3.6%	0.5%	2.8%	7.5%
2001	1.7%	0.5%	1.3%	0.9%	4.7%	12.4%	5.0%	0.8%	0.9%	16.1%	10.2%	4.8%	0.4%	2.5%	6.1%
2002	1.2%	0.4%	1.0%	0.7%	3.9%	11.9%	5.5%	0.6%	0.7%	19.4%	7.6%	6.0%	0.7%	2.3%	6.0%
2003	1.6%	0.4%	1.2%	0.8%	4.0%	11.3%	4.6%	0.7%	0.7%	15.9%	5.4%	7.8%	1.0%	2.3%	7.0%
2004	1.8%	0.5%	1.1%	0.8%	3.9%	14.0%	4.3%	1.0%	0.7%	21.7%	2.5%	6.5%	0.9%	2.4%	6.0%
Averages															
1979-1982	2.1%	2.4%	1.2%	0.8%	1.8%	3.7%	0.3%	0.2%	1.1%	13.5%	10.4%	8.2%	1.3%	1.4%	3.8%
1985-1995	4.3%	0.9%	2.3%	1.9%	1.5%	9.5%	2.4%	0.2%	1.0%	3.4%	7.4%	9.0%	0.8%	2.1%	6.6%
1985-1998	3.9%	0.7%	2.1%	1.7%	1.5%	9.0%	2.4%	0.2%	0.8%	3.3%	6.3%	7.7%	0.6%	1.9%	6.0%
1999-2004	2.1%	0.5%	1.3%	1.0%	4.0%	12.3%	4.4%	0.7%	0.7%	14.6%	5.5%	5.4%	0.6%	2.4%	6.2%
2002-2004	1.6%	0.4%	1.1%	0.8%	3.9%	12.4%	4.8%	0.8%	0.7%	19.0%	5.1%	6.8%	0.9%	2.3%	6.4%

Table 8-3. Stock Composition of the WCVI AABM fishery (outside Sport only) as estimated from the PSC Chinook Model (CLB-0506) for calendar years 1979-2004.

Panel A PSC Model Stocks 1-15															
Year	Alaska SSE	NCBC	WCVI hatchery	WCVI wild	Upper GS	Lower GS wild	Lower GS hatchery	Fraser Early	Fraser Late	Nooksack Spring	Nooksack Fall	Skagit Sum/Fall	Stillaguamish Sum/Fall	Snohomish Sum/Fall	PS hatch Fingerling
1979	0.0%	0.2%	0.0%	0.0%	0.1%	0.7%	0.7%	0.6%	25.7%	0.2%	7.3%	1.9%	0.1%	1.0%	3.9%
1980	0.0%	0.2%	0.0%	0.0%	0.1%	0.7%	0.9%	0.5%	23.3%	0.2%	9.3%	1.9%	0.1%	0.9%	4.9%
1981	0.0%	0.2%	0.0%	0.0%	0.1%	0.4%	0.8%	0.5%	28.7%	0.1%	9.3%	1.8%	0.1%	0.8%	4.8%
1982	0.0%	0.2%	0.0%	0.0%	0.1%	0.3%	0.6%	0.4%	27.7%	0.1%	9.2%	1.3%	0.1%	0.8%	4.8%
1983	0.0%	0.3%	0.0%	0.0%	0.1%	0.3%	0.4%	0.5%	27.3%	0.1%	11.3%	1.4%	0.1%	0.8%	6.5%
1984	0.0%	0.3%	0.0%	0.0%	0.1%	0.4%	0.9%	0.6%	28.5%	0.1%	12.0%	1.9%	0.1%	0.7%	6.0%
1985	0.0%	0.3%	0.0%	0.0%	0.1%	0.2%	0.7%	0.7%	31.3%	0.1%	10.5%	1.5%	0.1%	0.6%	5.3%
1986	0.0%	0.3%	0.0%	0.0%	0.1%	0.1%	0.4%	0.8%	22.2%	0.0%	8.4%	1.0%	0.1%	0.5%	5.5%
1987	0.0%	0.3%	0.0%	0.0%	0.1%	0.2%	0.2%	0.6%	9.8%	0.0%	4.8%	0.8%	0.1%	0.4%	5.0%
1988	0.0%	0.3%	0.0%	0.0%	0.1%	0.1%	0.2%	0.7%	6.9%	0.0%	5.1%	0.9%	0.1%	0.4%	6.7%
1989	0.0%	0.4%	0.0%	0.0%	0.1%	0.2%	0.3%	0.8%	22.5%	0.0%	7.1%	1.1%	0.1%	0.5%	7.9%
1990	0.0%	0.5%	0.0%	0.0%	0.1%	0.2%	0.3%	1.0%	26.0%	0.0%	8.9%	1.0%	0.1%	0.5%	8.6%
1991	0.0%	0.5%	0.0%	0.0%	0.1%	0.4%	0.5%	1.0%	26.9%	0.1%	6.3%	0.9%	0.1%	0.5%	7.3%
1992	0.0%	0.5%	0.0%	0.0%	0.1%	0.3%	0.4%	0.9%	31.4%	0.1%	4.4%	0.7%	0.1%	0.5%	6.2%
1993	0.0%	0.5%	0.0%	0.0%	0.1%	0.3%	0.4%	1.1%	30.1%	0.1%	4.8%	0.8%	0.1%	0.5%	7.6%
1994	0.0%	0.7%	0.0%	0.0%	0.0%	0.4%	0.4%	1.6%	19.7%	0.1%	4.8%	1.2%	0.2%	0.6%	12.4%
1995	0.0%	0.8%	0.0%	0.0%	0.1%	0.8%	0.6%	1.8%	13.4%	0.1%	4.6%	1.2%	0.2%	0.6%	15.8%
1996	0.0%	0.6%	0.0%	0.0%	0.1%	0.6%	0.6%	1.8%	15.9%	0.1%	4.2%	1.2%	0.2%	0.5%	12.2%
1997	0.0%	0.6%	0.0%	0.0%	0.1%	0.3%	0.6%	1.9%	34.9%	0.1%	3.8%	1.1%	0.1%	0.5%	9.9%
1998	0.0%	0.7%	0.0%	0.0%	0.1%	0.3%	0.6%	1.8%	33.3%	0.1%	3.8%	0.9%	0.2%	0.6%	11.4%
1999	0.0%	0.7%	0.0%	0.0%	0.1%	0.3%	0.7%	1.5%	25.2%	0.1%	4.5%	1.4%	0.2%	0.6%	13.2%
2000	0.0%	0.7%	0.0%	0.0%	0.1%	0.2%	0.7%	1.4%	22.8%	0.1%	4.3%	1.7%	0.2%	0.7%	13.1%
2001	0.0%	0.4%	0.0%	0.0%	0.1%	0.1%	0.5%	1.1%	14.2%	0.1%	3.1%	1.0%	0.1%	0.5%	8.8%
2002	0.0%	0.3%	0.0%	0.0%	0.1%	0.1%	0.3%	1.0%	18.2%	0.1%	2.3%	0.7%	0.1%	0.3%	6.0%
2003	0.0%	0.3%	0.0%	0.0%	0.1%	0.1%	0.3%	1.0%	20.6%	0.1%	1.8%	1.0%	0.1%	0.5%	6.2%
2004	0.0%	0.4%	0.0%	0.0%	0.1%	0.1%	0.4%	1.1%	14.1%	0.1%	1.5%	1.1%	0.1%	0.6%	7.8%
Averages															
1979-1982	0.0%	0.2%	0.0%	0.0%	0.1%	0.5%	0.7%	0.5%	26.3%	0.2%	8.8%	1.7%	0.1%	0.9%	4.6%
1985-1995	0.0%	0.5%	0.0%	0.0%	0.1%	0.3%	0.4%	1.0%	21.8%	0.1%	6.3%	1.0%	0.1%	0.5%	8.0%
1985-1998	0.0%	0.5%	0.0%	0.0%	0.1%	0.3%	0.4%	1.2%	23.2%	0.1%	5.8%	1.0%	0.1%	0.5%	8.7%
1999-2004	0.0%	0.5%	0.0%	0.0%	0.1%	0.1%	0.5%	1.2%	19.2%	0.1%	2.9%	1.1%	0.1%	0.5%	9.2%
2002-2004	0.0%	0.3%	0.0%	0.0%	0.1%	0.1%	0.3%	1.0%	17.6%	0.1%	1.9%	0.9%	0.1%	0.5%	6.7%

Table 8-3.- continued

Panel B PSC Model Stocks 16-30															
Year	PS Natural	PS Yearling	WACO wild	WACO hatchery	CR Summer	CR URBS	CR Mid-Brights	Snake Fall	Lewis wild	Spring Crk. hatchery	L. Bonneville hatchery	Fall Cowlitz hatchery	Spring Cowlitz hatchery	Willamette Hatchery	ORC North Migrating
1979	2.4%	2.1%	1.2%	0.9%	1.8%	4.7%	0.0%	0.2%	1.2%	16.8%	13.1%	7.3%	1.2%	1.2%	3.7%
1980	2.2%	2.6%	1.5%	1.0%	2.0%	4.1%	0.3%	0.2%	1.4%	15.4%	11.1%	8.3%	1.8%	1.6%	3.7%
1981	1.7%	2.6%	1.4%	0.8%	1.7%	3.0%	0.4%	0.3%	1.0%	14.4%	10.4%	7.7%	1.7%	1.8%	3.6%
1982	2.1%	2.0%	1.3%	0.7%	1.3%	3.2%	0.7%	0.3%	0.6%	14.6%	11.3%	8.6%	1.4%	2.1%	4.5%
1983	3.1%	1.7%	1.5%	0.8%	1.7%	6.4%	0.8%	0.2%	0.7%	4.7%	9.9%	8.7%	1.5%	2.4%	7.0%
1984	2.8%	1.7%	1.5%	0.8%	1.6%	7.5%	0.4%	0.1%	0.6%	5.9%	8.6%	6.9%	1.0%	1.9%	7.3%
1985	2.6%	1.3%	1.6%	0.8%	1.4%	10.5%	0.5%	0.1%	0.7%	3.7%	8.5%	7.4%	0.8%	1.9%	6.8%
1986	3.0%	1.1%	2.0%	1.2%	1.5%	15.1%	1.6%	0.2%	1.2%	1.6%	13.0%	8.6%	1.3%	2.4%	6.9%
1987	3.1%	0.7%	2.0%	1.5%	1.3%	14.8%	3.2%	0.2%	1.4%	1.0%	23.3%	15.5%	1.2%	2.6%	5.9%
1988	4.3%	0.9%	2.7%	2.1%	1.5%	12.9%	4.0%	0.2%	1.6%	3.0%	11.8%	23.4%	1.1%	3.0%	6.1%
1989	5.4%	1.1%	2.9%	2.1%	1.5%	9.4%	3.3%	0.2%	1.0%	4.4%	5.5%	11.9%	1.0%	3.5%	5.9%
1990	6.5%	1.0%	3.0%	2.3%	1.6%	7.1%	2.6%	0.1%	0.9%	5.5%	3.5%	6.6%	1.1%	4.0%	6.9%
1991	5.5%	0.7%	2.9%	2.8%	1.4%	5.2%	2.1%	0.2%	0.8%	9.2%	7.6%	5.4%	1.4%	3.3%	7.2%
1992	4.1%	0.5%	2.6%	2.8%	1.3%	7.2%	2.2%	0.2%	0.9%	6.6%	9.3%	6.5%	1.3%	2.2%	6.7%
1993	4.1%	0.6%	2.9%	2.9%	1.8%	10.6%	2.8%	0.2%	0.8%	3.8%	5.5%	5.9%	0.9%	2.3%	8.7%
1994	5.8%	0.9%	3.6%	3.4%	2.0%	10.7%	3.1%	0.2%	1.6%	4.1%	4.5%	4.9%	0.5%	2.4%	10.1%
1995	6.9%	1.0%	3.8%	3.4%	1.9%	9.5%	3.5%	0.2%	1.2%	6.4%	4.0%	6.4%	0.4%	2.1%	9.4%
1996	5.2%	0.7%	3.2%	2.4%	1.8%	13.0%	5.3%	0.3%	0.9%	6.6%	5.2%	8.0%	0.4%	2.0%	7.3%
1997	3.8%	0.5%	2.5%	1.5%	2.1%	9.0%	4.3%	0.2%	0.6%	4.1%	3.9%	5.0%	0.3%	2.1%	6.2%
1998	3.9%	0.6%	2.0%	1.1%	2.3%	11.8%	4.0%	0.3%	0.3%	4.6%	3.2%	3.3%	0.4%	2.4%	6.3%
1999	3.8%	0.8%	1.7%	1.1%	3.0%	13.1%	3.6%	0.5%	0.5%	7.9%	2.8%	4.2%	0.5%	2.9%	5.2%
2000	3.1%	0.7%	1.7%	1.3%	5.3%	11.7%	3.7%	0.9%	1.1%	5.8%	4.1%	3.8%	0.5%	3.3%	7.2%
2001	1.9%	0.5%	1.3%	0.9%	5.4%	12.5%	4.9%	0.8%	1.0%	15.3%	9.5%	4.8%	0.6%	3.7%	6.6%
2002	1.4%	0.4%	1.0%	0.7%	4.7%	12.5%	5.8%	0.7%	0.9%	18.7%	7.5%	6.5%	0.9%	2.7%	6.4%
2003	1.7%	0.5%	1.1%	0.8%	4.5%	12.1%	5.1%	0.8%	0.8%	15.2%	5.2%	8.7%	1.2%	3.0%	7.4%
2004	2.1%	0.6%	1.2%	0.9%	4.7%	14.7%	4.6%	1.1%	0.8%	21.2%	2.6%	7.7%	1.1%	2.7%	6.9%
Averages															
1979-1982	2.1%	2.3%	1.3%	0.8%	1.7%	3.7%	0.3%	0.2%	1.1%	15.3%	11.5%	8.0%	1.5%	1.7%	3.9%
1985-1995	4.7%	0.9%	2.7%	2.3%	1.6%	10.3%	2.6%	0.2%	1.1%	4.5%	8.8%	9.3%	1.0%	2.7%	7.3%
1985-1998	4.6%	0.8%	2.7%	2.2%	1.7%	10.5%	3.0%	0.2%	1.0%	4.6%	7.8%	8.5%	0.9%	2.6%	7.2%
1999-2004	2.3%	0.6%	1.3%	0.9%	4.6%	12.8%	4.6%	0.8%	0.8%	14.0%	5.3%	5.9%	0.8%	3.1%	6.6%
2002-2004	1.7%	0.5%	1.1%	0.8%	4.7%	13.1%	5.2%	0.8%	0.8%	18.3%	5.1%	7.6%	1.0%	2.8%	6.9%

Table 8-4. Stock Composition of the NBC AABM fishery (troll and sport) as estimated from the PSC Chinook Model (CLB-0506) for calendar years 1979-2004[1].

Panel A PSC Model Stocks 1-15

Year	Alaska SSE	NCBC	WCVI hatchery	WCVI wild	Upper GS	Lower GS wild	Lower GS hatchery	Fraser Early	Fraser Late	Nooksack Spring	Nooksack Fall	Skagit Sum/Fall	Stillaguamish Sum/Fall	Snohomish Sum/Fall	PS hatch Fingerling
1979	0.1%	14.8%	3.8%	5.3%	6.0%	3.5%	3.6%	4.0%	13.9%	0.8%	1.7%	1.7%	0.1%	0.9%	0.4%
1980	0.1%	16.1%	5.3%	7.4%	6.2%	3.3%	4.2%	3.5%	11.6%	0.0%	2.0%	1.8%	0.1%	0.8%	0.5%
1981	0.1%	17.0%	6.1%	8.2%	6.4%	2.1%	3.7%	3.0%	14.3%	0.0%	2.0%	1.5%	0.1%	0.7%	0.5%
1982	0.1%	17.7%	11.5%	9.1%	5.0%	1.5%	2.7%	2.6%	12.9%	0.0%	2.0%	1.1%	0.0%	0.6%	0.4%
1983	0.2%	17.6%	12.9%	5.5%	3.7%	1.2%	2.0%	2.2%	11.5%	0.0%	1.8%	0.9%	0.0%	0.5%	0.4%
1984	0.2%	16.8%	8.9%	3.2%	3.9%	1.5%	3.4%	2.6%	8.3%	0.0%	1.5%	1.1%	0.1%	0.4%	0.4%
1985	0.2%	17.8%	6.2%	2.2%	5.0%	0.7%	2.3%	3.8%	6.2%	0.0%	1.1%	0.9%	0.1%	0.3%	0.3%
1986	0.2%	20.1%	3.7%	1.3%	5.1%	0.6%	2.0%	3.7%	7.4%	0.0%	1.2%	0.7%	0.1%	0.4%	0.4%
1987	0.1%	19.4%	5.2%	1.5%	4.8%	0.7%	1.2%	3.8%	4.2%	0.0%	0.9%	0.6%	0.0%	0.3%	0.4%
1988	0.1%	25.5%	6.7%	1.7%	3.9%	0.4%	0.6%	3.1%	1.9%	0.0%	0.8%	0.5%	0.0%	0.2%	0.4%
1989	0.1%	34.2%	8.8%	1.9%	4.5%	0.5%	0.7%	3.0%	2.0%	0.0%	0.7%	0.4%	0.0%	0.2%	0.3%
1990	0.1%	36.9%	12.6%	2.5%	3.4%	0.6%	0.8%	2.9%	3.0%	0.0%	0.6%	0.4%	0.1%	0.2%	0.3%
1991	0.1%	34.9%	16.1%	3.4%	3.6%	0.7%	0.9%	3.2%	2.7%	0.0%	0.4%	0.3%	0.0%	0.2%	0.2%
1992	0.1%	40.4%	15.6%	3.8%	2.8%	0.8%	0.9%	2.8%	4.5%	0.0%	0.5%	0.3%	0.0%	0.2%	0.2%
1993	0.1%	40.6%	14.0%	3.5%	2.3%	0.6%	0.8%	3.0%	2.4%	0.0%	0.4%	0.3%	0.0%	0.2%	0.2%
1994	0.1%	43.3%	10.7%	2.6%	1.6%	0.8%	0.7%	3.7%	1.5%	0.0%	0.3%	0.3%	0.0%	0.2%	0.3%
1995	0.1%	60.9%	3.2%	0.8%	2.4%	1.2%	1.0%	3.4%	0.9%	0.0%	0.4%	0.4%	0.1%	0.2%	0.4%
1996	0.0%	88.3%	0.4%	0.1%	2.8%	1.2%	1.4%	0.0%	1.8%	0.0%	0.5%	0.3%	0.1%	0.2%	0.3%
1997	0.1%	59.8%	5.0%	1.3%	2.9%	0.7%	1.1%	3.6%	1.9%	0.0%	0.4%	0.3%	0.0%	0.2%	0.3%
1998	0.1%	58.7%	6.0%	1.4%	3.6%	0.5%	1.1%	4.3%	1.4%	0.0%	0.3%	0.3%	0.0%	0.2%	0.3%
1999	0.1%	68.7%	2.2%	0.4%	4.1%	0.4%	1.3%	2.7%	0.8%	0.0%	0.3%	0.3%	0.0%	0.2%	0.3%
2000	0.0%	80.9%	0.4%	0.1%	5.2%	0.4%	1.3%	0.8%	1.0%	0.0%	0.6%	0.5%	0.1%	0.2%	0.3%
2001	0.0%	78.3%	0.8%	0.1%	5.8%	0.3%	1.4%	0.7%	1.4%	0.0%	0.5%	0.4%	0.1%	0.2%	0.3%
2002	0.1%	57.2%	3.5%	0.4%	5.3%	0.3%	1.0%	2.4%	0.8%	0.0%	0.2%	0.3%	0.0%	0.2%	0.2%
2003	0.1%	55.3%	3.9%	0.3%	5.9%	0.2%	0.9%	2.3%	0.9%	0.0%	0.2%	0.4%	0.0%	0.2%	0.2%
2004	0.1%	58.6%	4.5%	0.3%	7.0%	0.2%	0.9%	2.1%	0.6%	0.0%	0.2%	0.4%	0.1%	0.2%	0.2%
Averages															
1979-1982	0.1%	16.4%	6.7%	7.5%	5.9%	2.6%	3.5%	3.3%	13.2%	0.2%	1.9%	1.5%	0.1%	0.8%	0.5%
1985-1995	0.1%	34.0%	9.3%	2.3%	3.6%	0.7%	1.1%	3.3%	3.3%	0.0%	0.7%	0.4%	0.0%	0.2%	0.3%
1985-1998	0.1%	41.5%	8.1%	2.0%	3.5%	0.7%	1.1%	3.2%	3.0%	0.0%	0.6%	0.4%	0.0%	0.2%	0.3%
1999-2004	0.0%	66.5%	2.5%	0.3%	5.5%	0.3%	1.1%	1.8%	0.9%	0.0%	0.3%	0.4%	0.0%	0.2%	0.3%
2002-2004	0.1%	57.0%	3.9%	0.3%	6.1%	0.2%	0.9%	2.3%	0.8%	0.0%	0.2%	0.4%	0.0%	0.2%	0.2%

Table 8-4. continued

Panel B PSC Model Stocks 16-30															
Year	PS Natural	PS Yearling	WACO wild	WACO hatchery	CR Summer	CR URBS	CR Mid-Brights	Snake Fall	Lewis wild	Spring Crk. hatchery	L. Bonneville hatchery	Fall Cowlitz hatchery	Spring Cowlitz hatchery	Willamette Hatchery	ORC North Migrating
1979	0.3%	0.6%	3.4%	2.6%	2.6%	7.7%	0.0%	0.1%	0.8%	0.5%	1.9%	1.1%	0.5%	2.6%	14.7%
1980	0.2%	0.7%	3.9%	2.8%	2.5%	5.7%	0.1%	0.1%	1.0%	0.6%	2.1%	1.3%	0.6%	3.2%	12.6%
1981	0.2%	0.7%	4.0%	2.5%	2.2%	4.4%	0.5%	0.1%	0.9%	0.4%	1.1%	1.1%	0.7%	3.7%	11.9%
1982	0.2%	0.5%	3.4%	1.9%	1.8%	2.9%	0.6%	0.1%	0.4%	0.4%	1.2%	1.2%	0.5%	4.0%	13.5%
1983	0.2%	0.3%	3.1%	1.7%	1.7%	4.7%	0.8%	0.1%	0.4%	0.1%	0.6%	1.1%	0.6%	4.7%	19.5%
1984	0.2%	0.3%	3.5%	1.8%	1.4%	7.6%	0.6%	0.0%	0.3%	0.1%	0.2%	0.9%	0.5%	4.8%	25.8%
1985	0.1%	0.2%	4.2%	2.2%	1.4%	10.2%	0.5%	0.0%	0.3%	0.1%	0.2%	1.1%	0.3%	4.8%	27.4%
1986	0.2%	0.2%	4.5%	2.5%	1.6%	13.7%	1.2%	0.1%	0.5%	0.0%	0.5%	1.0%	0.4%	4.8%	22.1%
1987	0.3%	0.2%	4.7%	3.1%	1.6%	16.3%	2.8%	0.1%	0.8%	0.0%	0.9%	1.5%	0.5%	4.7%	19.5%
1988	0.2%	0.2%	4.7%	3.5%	1.3%	13.6%	3.8%	0.0%	0.9%	0.0%	1.3%	3.7%	0.3%	4.7%	16.2%
1989	0.2%	0.1%	4.9%	3.7%	1.1%	8.1%	2.9%	0.0%	0.6%	0.0%	0.1%	1.0%	0.3%	5.0%	14.8%
1990	0.2%	0.1%	4.3%	3.2%	1.0%	5.8%	1.9%	0.0%	0.3%	0.0%	0.1%	0.5%	0.3%	4.6%	13.5%
1991	0.2%	0.1%	4.2%	3.5%	0.8%	3.4%	1.3%	0.0%	0.3%	0.0%	0.0%	0.4%	0.3%	3.9%	14.8%
1992	0.2%	0.1%	3.3%	3.4%	0.9%	3.1%	1.2%	0.0%	0.3%	0.1%	0.2%	0.6%	0.3%	2.3%	11.4%
1993	0.1%	0.1%	3.3%	3.4%	0.9%	5.3%	1.4%	0.0%	0.2%	0.0%	0.1%	0.4%	0.2%	2.2%	13.8%
1994	0.1%	0.1%	3.6%	3.5%	0.9%	6.4%	1.6%	0.0%	0.4%	0.0%	0.0%	0.3%	0.1%	2.1%	14.7%
1995	0.2%	0.1%	2.9%	2.7%	0.9%	3.4%	1.1%	0.0%	0.3%	0.0%	0.1%	0.3%	0.1%	1.4%	11.3%
1996	0.1%	0.1%	0.0%	0.0%	0.8%	0.6%	0.3%	0.0%	0.1%	0.0%	0.0%	0.6%	0.1%	0.0%	0.0%
1997	0.1%	0.1%	2.4%	1.6%	1.1%	4.6%	2.3%	0.0%	0.2%	0.0%	0.1%	0.5%	0.1%	1.6%	8.1%
1998	0.1%	0.1%	2.4%	1.4%	1.2%	3.6%	1.7%	0.0%	0.1%	0.0%	0.0%	0.2%	0.1%	2.1%	9.1%
1999	0.1%	0.1%	1.4%	0.8%	1.4%	5.0%	1.5%	0.0%	0.1%	0.0%	0.0%	0.3%	0.1%	1.8%	5.7%
2000	0.1%	0.1%	0.4%	0.3%	2.0%	1.5%	0.5%	0.0%	0.1%	0.0%	0.0%	0.3%	0.1%	0.7%	2.3%
2001	0.1%	0.1%	0.3%	0.2%	3.0%	1.9%	0.6%	0.0%	0.1%	0.0%	0.0%	0.2%	0.2%	0.8%	2.3%
2002	0.1%	0.1%	1.1%	0.8%	3.5%	5.7%	2.8%	0.1%	0.3%	0.0%	0.0%	0.8%	0.3%	3.0%	9.7%
2003	0.1%	0.1%	1.1%	0.8%	3.0%	6.8%	3.1%	0.1%	0.3%	0.0%	0.0%	1.1%	0.3%	2.4%	10.5%
2004	0.1%	0.1%	1.0%	0.7%	3.0%	5.0%	1.9%	0.1%	0.2%	0.0%	0.0%	0.7%	0.3%	2.3%	9.2%
Averages															
1979-1982	0.2%	0.6%	3.7%	2.5%	2.3%	5.2%	0.3%	0.1%	0.8%	0.4%	1.6%	1.2%	0.6%	3.4%	13.2%
1985-1995	0.2%	0.1%	4.0%	3.2%	1.1%	8.1%	1.8%	0.0%	0.4%	0.0%	0.3%	1.0%	0.3%	3.7%	16.3%
1985-1998	0.2%	0.1%	3.5%	2.7%	1.1%	7.0%	1.7%	0.0%	0.4%	0.0%	0.3%	0.9%	0.2%	3.2%	14.0%
1999-2004	0.1%	0.1%	0.9%	0.6%	2.7%	4.3%	1.7%	0.1%	0.2%	0.0%	0.0%	0.5%	0.2%	1.9%	6.6%
2002-2004	0.1%	0.1%	1.0%	0.8%	3.2%	5.8%	2.6%	0.1%	0.2%	0.0%	0.0%	0.8%	0.3%	2.6%	9.8%

[1] Note that sport includes all northern and central B.C. sport, not just QCI.

Table 8-5. Stock Composition of the NBC AABM fishery (troll only) as estimated from the PSC Chinook Model (CLB-0506) for calendar years 1979-2004.

Panel A PSC Model Stocks 1-15

Year	Alaska SSE	NCBC	WCVI hatchery	WCVI wild	Upper GS	Lower GS wild	Lower GS hatchery	Fraser Early	Fraser Late	Nooksack Spring	Nooksack Fall	Skagit Sum/Fall	Stillaguamish Sum/Fall	Snohomish Sum/Fall	PS hatch Fingerling
1979	0.2%	8.0%	3.7%	5.1%	5.8%	1.9%	1.9%	6.5%	1.5%	1.5%	0.5%	1.1%	0.0%	0.6%	0.2%
1980	0.2%	8.8%	5.5%	7.8%	5.6%	1.9%	2.3%	5.8%	1.4%	0.0%	0.6%	1.2%	0.0%	0.6%	0.2%
1981	0.3%	9.6%	6.2%	8.5%	6.4%	1.3%	2.1%	5.0%	1.7%	0.0%	0.6%	1.0%	0.0%	0.5%	0.3%
1982	0.3%	9.3%	11.6%	10.0%	4.6%	0.9%	1.6%	4.3%	1.4%	0.0%	0.6%	0.8%	0.0%	0.4%	0.2%
1983	0.3%	8.0%	12.8%	5.7%	3.2%	0.7%	1.1%	3.3%	1.3%	0.0%	0.7%	0.6%	0.0%	0.4%	0.2%
1984	0.2%	8.2%	9.3%	3.3%	3.8%	1.0%	2.3%	3.5%	1.4%	0.0%	0.6%	0.8%	0.0%	0.3%	0.2%
1985	0.3%	9.3%	6.6%	2.3%	5.0%	0.5%	1.8%	4.6%	1.4%	0.0%	0.6%	0.7%	0.0%	0.3%	0.2%
1986	0.3%	9.2%	3.5%	1.2%	3.9%	0.3%	1.2%	4.9%	0.8%	0.0%	0.4%	0.4%	0.0%	0.2%	0.2%
1987	0.2%	8.9%	4.1%	1.2%	3.9%	0.3%	0.7%	4.9%	0.4%	0.0%	0.2%	0.3%	0.0%	0.2%	0.2%
1988	0.2%	8.6%	6.8%	1.8%	3.0%	0.2%	0.3%	4.4%	0.3%	0.0%	0.2%	0.3%	0.0%	0.2%	0.2%
1989	0.1%	10.2%	11.6%	2.5%	3.8%	0.3%	0.5%	4.7%	0.7%	0.0%	0.3%	0.3%	0.0%	0.2%	0.2%
1990	0.1%	10.7%	16.6%	3.2%	3.0%	0.3%	0.5%	4.8%	0.6%	0.0%	0.2%	0.3%	0.0%	0.2%	0.2%
1991	0.1%	11.6%	21.1%	4.4%	3.4%	0.5%	0.7%	5.0%	0.7%	0.0%	0.2%	0.2%	0.0%	0.1%	0.2%
1992	0.1%	12.2%	21.9%	5.2%	2.3%	0.5%	0.5%	5.2%	0.8%	0.0%	0.1%	0.2%	0.0%	0.1%	0.1%
1993	0.1%	11.4%	20.2%	5.1%	1.8%	0.4%	0.6%	5.2%	0.6%	0.0%	0.1%	0.2%	0.0%	0.1%	0.1%
1994	0.1%	12.6%	15.8%	3.9%	1.5%	0.5%	0.5%	6.4%	0.3%	0.0%	0.1%	0.2%	0.0%	0.1%	0.2%
1995	0.2%	15.1%	7.5%	1.9%	2.2%	1.0%	0.9%	8.7%	0.4%	0.0%	0.1%	0.3%	0.0%	0.2%	0.3%
1996	0.0%	15.4%	7.7%	0.0%	0.0%	0.0%	0.0%	7.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1997	0.1%	14.5%	10.6%	2.8%	2.8%	0.6%	0.9%	9.7%	0.9%	0.0%	0.1%	0.3%	0.0%	0.2%	0.2%
1998	0.2%	15.7%	13.4%	3.2%	3.7%	0.5%	1.0%	10.2%	0.8%	0.0%	0.1%	0.3%	0.0%	0.2%	0.3%
1999	0.2%	17.2%	7.1%	1.4%	4.7%	0.5%	1.5%	9.1%	0.7%	0.0%	0.1%	0.3%	0.0%	0.2%	0.4%
2000	0.3%	17.6%	3.0%	0.4%	5.8%	0.4%	1.5%	8.8%	0.6%	0.0%	0.1%	0.6%	0.0%	0.2%	0.3%
2001	0.2%	14.1%	4.9%	0.6%	5.2%	0.3%	1.5%	7.6%	0.6%	0.0%	0.1%	0.4%	0.0%	0.2%	0.3%
2002	0.1%	10.2%	8.5%	0.9%	4.3%	0.2%	0.9%	6.7%	0.6%	0.0%	0.1%	0.3%	0.0%	0.1%	0.2%
2003	0.1%	8.9%	9.5%	0.8%	4.2%	0.2%	0.6%	6.2%	0.5%	0.0%	0.1%	0.3%	0.0%	0.2%	0.2%
2004	0.2%	9.3%	11.8%	0.8%	5.8%	0.2%	0.7%	6.4%	0.4%	0.0%	0.1%	0.4%	0.0%	0.2%	0.2%
Averages															
1979-1982	0.2%	8.9%	6.7%	7.8%	5.6%	1.5%	2.0%	5.4%	1.5%	0.4%	0.6%	1.0%	0.0%	0.5%	0.2%
1985-1995	0.2%	10.9%	12.3%	3.0%	3.1%	0.5%	0.7%	5.3%	0.6%	0.0%	0.2%	0.3%	0.0%	0.2%	0.2%
1985-1998	0.2%	11.8%	11.9%	2.8%	2.9%	0.4%	0.7%	6.2%	0.6%	0.0%	0.2%	0.3%	0.0%	0.2%	0.2%
1999-2004	0.2%	12.9%	7.4%	0.8%	5.0%	0.3%	1.1%	7.5%	0.6%	0.0%	0.1%	0.4%	0.0%	0.2%	0.3%
2002-2004	0.2%	9.5%	9.9%	0.8%	4.8%	0.2%	0.7%	6.4%	0.5%	0.0%	0.1%	0.3%	0.0%	0.2%	0.2%

Table 8-5. continued

Panel B PSC Model Stocks 16-30															
Year	PS Natural	PS Yearling	WACO wild	WACO hatchery	CR Summer	CR URBS	CR Mid-Brights	Snake Fall	Lewis wild	Spring Crk. hatchery	L. Bonneville hatchery	Fall Cowlitz hatchery	Spring Cowlitz hatchery	Willamette Hatchery	ORC North Migrating
1979	0.1%	0.4%	5.3%	4.1%	2.2%	11.4%	0.0%	0.1%	1.2%	0.1%	0.0%	1.8%	0.6%	5.2%	28.9%
1980	0.1%	0.4%	6.1%	4.3%	2.1%	8.8%	0.2%	0.1%	1.5%	0.2%	0.0%	2.2%	0.8%	6.4%	25.0%
1981	0.1%	0.4%	6.4%	4.0%	2.0%	7.0%	0.7%	0.1%	1.2%	0.1%	0.0%	1.9%	1.0%	7.6%	24.1%
1982	0.1%	0.3%	5.5%	3.0%	1.8%	4.3%	0.9%	0.1%	0.5%	0.1%	0.0%	2.0%	0.7%	8.1%	26.8%
1983	0.1%	0.2%	4.7%	2.5%	1.4%	6.1%	1.1%	0.1%	0.5%	0.0%	0.0%	1.6%	0.7%	8.4%	34.4%
1984	0.1%	0.2%	4.6%	2.4%	1.2%	9.4%	0.7%	0.1%	0.3%	0.0%	0.0%	1.2%	0.6%	7.1%	37.4%
1985	0.1%	0.2%	5.3%	2.7%	1.3%	12.2%	0.6%	0.0%	0.4%	0.0%	0.0%	1.3%	0.4%	6.3%	35.9%
1986	0.1%	0.1%	6.1%	3.5%	1.3%	16.6%	1.5%	0.1%	0.6%	0.0%	0.0%	1.3%	0.4%	7.6%	34.4%
1987	0.1%	0.1%	5.9%	3.9%	1.1%	19.2%	3.2%	0.1%	0.9%	0.0%	0.0%	2.0%	0.5%	7.4%	30.3%
1988	0.1%	0.1%	6.4%	4.8%	1.0%	17.8%	4.9%	0.1%	1.1%	0.0%	0.0%	4.4%	0.4%	7.3%	25.4%
1989	0.1%	0.1%	7.5%	5.6%	1.0%	11.9%	4.3%	0.1%	0.7%	0.0%	0.0%	1.1%	0.3%	8.1%	23.8%
1990	0.2%	0.1%	7.0%	5.2%	0.9%	9.1%	3.0%	0.0%	0.4%	0.0%	0.0%	0.6%	0.3%	8.3%	24.2%
1991	0.1%	0.1%	6.4%	5.4%	0.9%	5.1%	2.0%	0.0%	0.3%	0.0%	0.0%	0.5%	0.3%	6.5%	24.4%
1992	0.1%	0.0%	6.1%	6.1%	0.9%	5.1%	2.0%	0.1%	0.5%	0.0%	0.0%	0.8%	0.4%	4.8%	23.7%
1993	0.1%	0.0%	5.7%	5.9%	0.8%	8.4%	2.3%	0.1%	0.3%	0.0%	0.0%	0.5%	0.3%	4.1%	25.6%
1994	0.1%	0.1%	6.0%	5.9%	0.9%	10.2%	2.6%	0.1%	0.6%	0.0%	0.0%	0.4%	0.2%	3.9%	26.9%
1995	0.1%	0.1%	7.4%	6.8%	1.2%	8.0%	2.7%	0.1%	0.5%	0.0%	0.0%	0.5%	0.1%	3.8%	30.0%
1996	0.0%	0.0%	7.7%	7.7%	0.0%	7.7%	7.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	7.7%	30.8%
1997	0.1%	0.0%	6.3%	4.2%	1.2%	10.6%	5.3%	0.1%	0.4%	0.0%	0.0%	0.7%	0.1%	4.5%	22.9%
1998	0.1%	0.1%	5.6%	3.2%	1.7%	8.2%	3.9%	0.1%	0.2%	0.0%	0.0%	0.3%	0.1%	5.1%	21.9%
1999	0.1%	0.1%	4.6%	2.7%	2.7%	14.7%	4.3%	0.1%	0.2%	0.0%	0.0%	0.6%	0.1%	6.2%	20.0%
2000	0.1%	0.1%	4.3%	2.9%	4.2%	11.7%	3.7%	0.2%	0.4%	0.0%	0.0%	0.5%	0.2%	7.4%	24.7%
2001	0.1%	0.1%	3.7%	2.6%	4.2%	12.0%	4.4%	0.3%	0.6%	0.0%	0.0%	0.6%	0.1%	9.0%	26.3%
2002	0.0%	0.1%	3.0%	2.2%	3.5%	13.5%	6.7%	0.3%	0.6%	0.1%	0.0%	1.0%	0.2%	8.3%	27.2%
2003	0.0%	0.0%	2.8%	2.0%	3.2%	15.5%	7.1%	0.3%	0.5%	0.1%	0.0%	1.3%	0.3%	6.5%	28.5%
2004	0.1%	0.1%	3.0%	2.2%	3.4%	13.3%	5.0%	0.3%	0.4%	0.1%	0.0%	0.8%	0.4%	6.9%	27.9%
Averages															
1979-1982	0.1%	0.4%	5.8%	3.9%	2.0%	7.9%	0.5%	0.1%	1.1%	0.1%	0.0%	2.0%	0.8%	6.8%	26.2%
1985-1995	0.1%	0.1%	6.3%	5.1%	1.0%	11.2%	2.6%	0.1%	0.6%	0.0%	0.0%	1.2%	0.3%	6.2%	27.7%
1985-1998	0.1%	0.1%	6.4%	5.1%	1.0%	10.7%	3.3%	0.1%	0.5%	0.0%	0.0%	1.0%	0.3%	6.1%	27.2%
1999-2004	0.1%	0.1%	3.6%	2.4%	3.5%	13.5%	5.2%	0.2%	0.4%	0.1%	0.0%	0.8%	0.2%	7.4%	25.8%
2002-2004	0.0%	0.0%	3.0%	2.1%	3.4%	14.1%	6.3%	0.3%	0.5%	0.1%	0.0%	1.0%	0.3%	7.3%	27.9%

Table 8-6.- Percent stock (catch and escapement) taken in the WCVI AABM fishery (troll and sport reported catch) as estimated by the PSC Chinook Model (CLB-0506) for calendar years 1979-2004. (Analogous to CTC (2004) Appendix G Tables which are based on CWT recovery data).

Panel A PSC Model Stocks 1-15

Year	Alaska SSE	NCBC	WCVI hatchery	WCVI wild	Upper GS	Lower GS wild	Lower GS hatchery	Fraser Early	Fraser Late	Nooksack Spring	Nooksack Fall	Skagit Sum/Fall	Stillaguamish Sum/Fall	Snohomish Sum/Fall	PS hatch Fingerling
1979	0.0%	0.3%	5.9%	5.9%	0.5%	1.3%	1.2%	1.9%	13.6%	0.5%	12.6%	9.9%	8.5%	9.7%	14.1%
1980	0.0%	0.3%	5.0%	5.0%	0.4%	1.4%	1.3%	1.8%	12.3%	3.0%	12.9%	9.1%	8.2%	9.3%	14.3%
1981	0.0%	0.3%	6.4%	6.5%	0.5%	1.4%	1.4%	1.8%	12.9%	4.8%	12.7%	9.8%	8.8%	9.4%	14.3%
1982	0.0%	0.3%	6.4%	6.0%	0.5%	1.3%	1.4%	1.7%	13.5%	4.1%	12.6%	9.2%	8.2%	9.7%	13.6%
1983	0.0%	0.4%	9.5%	7.6%	0.7%	2.3%	2.0%	2.2%	20.0%	8.8%	19.0%	15.0%	14.1%	15.4%	21.5%
1984	0.0%	0.6%	9.0%	9.2%	0.7%	3.4%	3.2%	2.9%	26.1%	12.6%	24.1%	21.8%	21.3%	18.9%	27.0%
1985	0.0%	0.3%	4.8%	4.8%	0.4%	1.8%	1.8%	1.5%	17.2%	5.7%	12.6%	9.1%	10.4%	9.8%	13.8%
1986	0.0%	0.3%	4.4%	4.3%	0.4%	1.4%	1.8%	1.5%	13.8%	4.8%	11.9%	8.3%	9.3%	9.1%	12.9%
1987	0.0%	0.3%	4.9%	4.8%	0.6%	1.6%	1.6%	1.7%	12.5%	4.4%	12.7%	10.3%	8.4%	9.4%	14.0%
1988	0.0%	0.3%	6.7%	6.5%	0.5%	1.7%	1.7%	1.9%	10.8%	5.2%	13.7%	10.3%	9.3%	10.7%	15.7%
1989	0.0%	0.2%	3.7%	3.5%	0.4%	1.2%	1.1%	1.1%	11.7%	3.4%	8.6%	7.1%	6.0%	6.8%	9.8%
1990	0.0%	0.3%	6.4%	6.4%	0.5%	1.7%	1.7%	1.8%	15.3%	5.0%	14.2%	9.3%	10.5%	10.1%	15.3%
1991	0.0%	0.2%	4.4%	4.6%	0.5%	1.7%	1.4%	1.5%	13.4%	4.1%	11.7%	9.0%	7.8%	8.6%	13.0%
1992	0.0%	0.2%	19.8%	20.4%	0.6%	1.8%	1.6%	1.7%	13.9%	4.7%	12.5%	9.3%	8.5%	9.9%	14.0%
1993	0.0%	0.2%	12.2%	12.2%	0.7%	1.7%	1.7%	1.7%	14.8%	5.0%	13.7%	10.6%	9.4%	10.1%	14.8%
1994	0.0%	0.2%	4.1%	4.1%	0.4%	1.5%	1.5%	1.6%	12.9%	4.9%	12.2%	9.8%	8.2%	8.8%	13.5%
1995	0.0%	0.2%	1.8%	1.9%	0.4%	1.3%	1.1%	1.0%	8.3%	3.0%	8.4%	6.2%	6.1%	6.6%	9.4%
1996	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.1%	0.1%	0.4%	0.2%	0.5%	0.4%	0.4%	0.4%	0.5%
1997	0.0%	0.1%	1.7%	1.6%	0.1%	0.6%	0.5%	0.5%	5.6%	1.4%	4.0%	3.0%	2.7%	3.1%	4.4%
1998	0.0%	0.0%	0.1%	0.1%	0.0%	0.1%	0.1%	0.0%	0.3%	0.2%	0.4%	0.2%	0.3%	0.3%	0.4%
1999	0.0%	0.0%	0.1%	0.1%	0.1%	0.3%	0.3%	0.2%	1.8%	0.9%	1.7%	2.1%	1.4%	1.5%	2.0%
2000	0.0%	0.1%	1.6%	1.6%	0.2%	1.1%	1.3%	0.6%	7.8%	3.4%	6.4%	5.5%	5.5%	5.7%	7.3%
2001	0.0%	0.1%	2.0%	2.0%	0.2%	0.8%	0.7%	0.4%	5.2%	3.0%	4.8%	3.9%	4.2%	4.2%	5.2%
2002	0.0%	0.1%	2.3%	2.1%	0.1%	0.8%	0.9%	0.5%	8.7%	3.4%	4.5%	4.0%	3.7%	4.1%	5.1%
2003	0.0%	0.1%	2.4%	2.0%	0.2%	1.0%	0.9%	0.6%	6.2%	3.8%	5.3%	5.8%	5.2%	5.7%	6.5%
2004	0.0%	0.1%	3.3%	3.4%	0.2%	1.2%	1.3%	0.7%	7.9%	4.3%	6.8%	5.7%	6.7%	6.6%	8.3%
Averages															
1979-1982	0.0%	0.3%	5.9%	5.8%	0.5%	1.3%	1.3%	1.8%	13.1%	3.1%	12.7%	9.5%	8.4%	9.5%	14.1%
1985-1995	0.0%	0.2%	6.6%	6.7%	0.5%	1.6%	1.5%	1.5%	13.2%	4.6%	12.0%	9.0%	8.5%	9.1%	13.3%
1985-1998	0.0%	0.2%	5.3%	5.4%	0.4%	1.3%	1.3%	1.3%	10.8%	3.7%	9.8%	7.3%	7.0%	7.4%	10.8%
1999-2004	0.0%	0.1%	1.9%	1.8%	0.2%	0.9%	0.9%	0.5%	6.3%	3.1%	4.9%	4.5%	4.5%	4.6%	5.7%
2002-2004	0.0%	0.1%	2.7%	2.5%	0.2%	1.0%	1.0%	0.6%	7.6%	3.8%	5.5%	5.2%	5.2%	5.5%	6.6%

Table 8-6. continued

Year	PS Natural	PS Yearling	WACO wild	WACO hatchery	CR Summer	CR URBS	CR Mid-Brights	Snake Fall	Lewis wild	Spring Crk. hatchery	L. Bonneville hatchery	Fall Cowlitz hatchery	Spring Cowlitz hatchery	Willamette Hatchery	ORC North Migrating
							Panel B PSC Model Stocks 16-30								
1979	15.0%	9.2%	6.2%	5.8%	14.1%	10.5%	6.4%	25.4%	8.3%	20.3%	25.8%	18.2%	7.7%	4.5%	5.5%
1980	15.2%	9.3%	6.1%	5.6%	15.5%	9.9%	12.8%	25.8%	7.9%	17.9%	24.6%	17.9%	7.8%	4.3%	5.7%
1981	13.8%	10.3%	5.9%	5.4%	16.2%	9.4%	9.3%	28.8%	6.6%	17.6%	23.8%	18.8%	6.7%	5.0%	6.0%
1982	13.1%	10.5%	5.9%	5.4%	16.2%	8.2%	10.0%	27.3%	6.9%	15.9%	21.7%	17.3%	7.0%	4.5%	7.4%
1983	21.6%	13.8%	9.6%	9.1%	24.1%	19.1%	13.2%	33.6%	11.4%	32.5%	35.0%	26.7%	12.0%	8.6%	12.4%
1984	27.1%	19.8%	12.3%	11.6%	28.3%	18.7%	13.0%	40.3%	15.7%	41.4%	48.1%	38.5%	14.1%	7.3%	11.8%
1985	13.7%	9.8%	6.6%	6.2%	15.0%	8.7%	9.2%	20.2%	8.1%	22.4%	24.5%	18.2%	7.6%	4.2%	6.9%
1986	12.8%	9.1%	6.4%	6.3%	14.2%	8.7%	11.2%	22.6%	9.2%	15.7%	21.5%	12.9%	8.5%	5.4%	6.6%
1987	14.1%	10.0%	6.1%	6.1%	16.5%	8.9%	10.7%	24.3%	8.4%	15.7%	22.2%	16.4%	7.1%	5.0%	6.3%
1988	15.8%	11.7%	6.6%	6.4%	20.0%	8.1%	9.5%	25.0%	10.0%	19.1%	24.1%	19.6%	6.5%	4.6%	6.3%
1989	9.8%	7.9%	3.9%	3.6%	10.5%	5.4%	5.0%	15.9%	2.8%	11.4%	13.5%	15.2%	4.4%	3.0%	4.7%
1990	15.4%	12.8%	5.7%	5.4%	16.0%	7.7%	7.7%	22.2%	6.0%	16.0%	20.9%	19.6%	6.7%	4.6%	6.8%
1991	13.3%	9.9%	4.8%	4.9%	16.8%	6.2%	6.7%	22.8%	5.0%	13.8%	16.8%	17.5%	7.0%	2.5%	5.3%
1992	14.4%	10.1%	5.6%	5.6%	14.2%	10.4%	8.8%	23.1%	8.2%	17.7%	19.5%	19.6%	6.3%	3.4%	6.0%
1993	15.1%	11.1%	6.0%	5.6%	20.5%	11.8%	9.1%	23.8%	6.1%	17.9%	19.8%	18.1%	5.9%	3.8%	7.3%
1994	13.7%	10.4%	5.3%	4.8%	12.0%	7.5%	7.3%	25.2%	10.8%	15.4%	20.2%	16.5%	4.7%	3.4%	5.5%
1995	9.6%	7.5%	3.8%	3.5%	8.5%	4.9%	5.5%	19.1%	3.2%	10.5%	14.3%	11.8%	4.7%	2.0%	2.8%
1996	0.5%	0.4%	0.2%	0.2%	0.6%	0.3%	0.4%	1.1%	0.3%	0.7%	0.9%	0.5%	0.3%	0.2%	0.3%
1997	4.5%	3.5%	1.6%	1.3%	5.8%	2.2%	2.3%	7.8%	1.6%	5.2%	6.1%	5.7%	1.9%	1.3%	1.6%
1998	0.4%	0.3%	0.1%	0.1%	0.4%	0.3%	0.2%	0.7%	0.1%	0.6%	0.7%	0.5%	0.2%	0.1%	0.2%
1999	2.0%	1.6%	0.7%	0.7%	2.1%	1.1%	1.1%	3.6%	1.4%	2.3%	3.0%	1.9%	1.3%	0.7%	0.7%
2000	7.2%	5.6%	3.2%	3.2%	8.6%	5.1%	4.2%	14.4%	5.5%	11.6%	15.6%	8.5%	3.8%	2.9%	3.3%
2001	5.3%	4.2%	2.5%	2.4%	5.6%	3.8%	4.5%	10.8%	3.8%	8.1%	10.4%	5.0%	3.6%	1.7%	2.3%
2002	5.2%	4.2%	2.4%	2.3%	5.4%	4.2%	3.8%	8.0%	2.8%	8.5%	9.7%	6.0%	3.2%	1.9%	2.8%
2003	6.7%	5.0%	2.9%	2.7%	6.9%	3.9%	3.0%	12.6%	2.4%	10.0%	11.1%	7.1%	3.5%	1.7%	2.8%
2004	8.1%	6.2%	3.5%	3.3%	10.4%	6.3%	4.2%	15.0%	3.7%	13.1%	12.6%	9.4%	3.9%	2.4%	2.9%
Averages															
1979-1982	14.3%	9.8%	6.0%	5.5%	15.5%	9.5%	9.6%	26.8%	7.4%	17.9%	23.9%	18.1%	7.3%	4.6%	6.1%
1985-1995	13.4%	10.0%	5.5%	5.3%	14.9%	8.0%	8.2%	22.2%	7.1%	16.0%	19.7%	16.8%	6.3%	3.8%	5.9%
1985-1998	10.9%	8.2%	4.5%	4.3%	12.2%	6.5%	6.7%	18.1%	5.7%	13.0%	16.1%	13.7%	5.1%	3.1%	4.7%
1999-2004	5.8%	4.5%	2.5%	2.4%	6.5%	4.1%	3.5%	10.7%	3.2%	8.9%	10.4%	6.3%	3.2%	1.9%	2.5%
2002-2004	6.7%	5.1%	2.9%	2.7%	7.5%	4.8%	3.7%	11.9%	2.9%	10.5%	11.1%	7.5%	3.5%	2.0%	2.8%

Table 8-7. Percent stock (catch and escapement) taken in the WCVI AABM fishery (troll reported catch) as estimated by the PSC Chinook Model (CLB-0506) for calendar years 1979-2004. (Analogous to CTC (2004) Appendix G Tables, which are based on CWT recovery data).

Panel A PSC Model Stocks 1-15

Year	Alaska SSE	NCBC	WCVI hatchery	WCVI wild	Upper GS	Lower GS wild	Lower GS hatchery	Fraser Early	Fraser Late	Nooksack Spring	Nooksack Fall	Skagit Sum/Fall	Stillaguamish Sum/Fall	Snohomish Sum/Fall	PS hatch Fingerling
1979	0.0%	0.3%	5.9%	5.9%	0.5%	1.2%	1.1%	1.9%	13.3%	0.5%	12.3%	9.7%	8.3%	9.5%	13.9%
1980	0.0%	0.3%	5.0%	5.0%	0.4%	1.4%	1.3%	1.8%	12.0%	3.0%	12.6%	8.9%	8.0%	9.1%	14.0%
1981	0.0%	0.3%	6.4%	6.5%	0.5%	1.3%	1.4%	1.8%	12.6%	4.6%	12.5%	9.6%	8.6%	9.2%	14.0%
1982	0.0%	0.3%	6.4%	6.0%	0.5%	1.3%	1.4%	1.7%	13.2%	4.0%	12.3%	9.0%	8.0%	9.5%	13.4%
1983	0.0%	0.4%	9.5%	7.6%	0.7%	2.3%	2.0%	2.2%	19.7%	8.7%	18.7%	14.8%	13.9%	15.2%	21.2%
1984	0.0%	0.6%	9.0%	9.2%	0.6%	3.3%	3.2%	2.8%	25.9%	12.5%	23.8%	21.5%	21.1%	18.7%	26.7%
1985	0.0%	0.3%	4.8%	4.8%	0.4%	1.7%	1.8%	1.5%	16.6%	5.6%	12.2%	8.8%	10.0%	9.5%	13.3%
1986	0.0%	0.3%	4.4%	4.3%	0.4%	1.4%	1.7%	1.4%	13.5%	4.7%	11.6%	8.0%	9.1%	8.8%	12.5%
1987	0.0%	0.3%	4.9%	4.8%	0.5%	1.5%	1.5%	1.6%	12.0%	4.2%	12.1%	9.8%	8.0%	8.9%	13.4%
1988	0.0%	0.3%	6.7%	6.5%	0.5%	1.7%	1.6%	1.8%	10.6%	5.1%	13.5%	10.1%	9.1%	10.5%	15.4%
1989	0.0%	0.2%	3.7%	3.5%	0.4%	1.1%	1.0%	1.0%	10.3%	3.0%	7.8%	6.3%	5.4%	6.1%	8.9%
1990	0.0%	0.3%	6.4%	6.4%	0.5%	1.6%	1.6%	1.7%	14.3%	4.6%	13.3%	8.6%	9.7%	9.3%	14.3%
1991	0.0%	0.2%	4.4%	4.6%	0.5%	1.5%	1.3%	1.4%	11.9%	3.6%	10.5%	8.1%	6.9%	7.7%	11.7%
1992	0.0%	0.2%	19.8%	20.4%	0.6%	1.7%	1.5%	1.6%	13.1%	4.3%	11.7%	8.7%	8.0%	9.3%	13.1%
1993	0.0%	0.2%	12.2%	12.2%	0.6%	1.5%	1.5%	1.6%	13.7%	4.6%	12.7%	9.7%	8.7%	9.4%	13.8%
1994	0.0%	0.2%	4.1%	4.1%	0.4%	1.3%	1.3%	1.4%	11.7%	4.3%	11.0%	8.7%	7.3%	7.9%	12.2%
1995	0.0%	0.2%	1.8%	1.9%	0.3%	1.2%	1.0%	1.0%	7.5%	2.7%	7.7%	5.7%	5.5%	6.1%	8.7%
1996	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1997	0.0%	0.1%	1.7%	1.6%	0.1%	0.5%	0.5%	0.5%	5.1%	1.3%	3.7%	2.8%	2.5%	2.9%	4.2%
1998	0.0%	0.0%	0.1%	0.1%	0.0%	0.0%	0.0%	0.0%	0.2%	0.1%	0.2%	0.1%	0.2%	0.1%	0.2%
1999	0.0%	0.0%	0.1%	0.1%	0.0%	0.1%	0.1%	0.0%	0.4%	0.2%	0.4%	0.5%	0.4%	0.4%	0.4%
2000	0.0%	0.1%	1.6%	1.6%	0.2%	0.8%	1.0%	0.5%	5.8%	2.7%	4.7%	4.1%	4.2%	4.2%	5.4%
2001	0.0%	0.1%	2.0%	2.0%	0.1%	0.7%	0.5%	0.3%	4.0%	2.4%	3.6%	3.0%	3.3%	3.3%	4.0%
2002	0.0%	0.1%	2.3%	2.1%	0.1%	0.7%	0.8%	0.4%	7.7%	3.1%	3.9%	3.5%	3.3%	3.6%	4.5%
2003	0.0%	0.1%	2.4%	2.0%	0.2%	0.9%	0.8%	0.5%	5.7%	3.5%	4.8%	5.3%	4.8%	5.3%	5.9%
2004	0.0%	0.1%	3.3%	3.4%	0.2%	1.1%	1.2%	0.6%	6.9%	3.8%	5.9%	4.9%	6.0%	5.8%	7.2%
Averages															
1979-1982	0.0%	0.3%	5.9%	5.8%	0.5%	1.3%	1.3%	1.8%	12.8%	3.0%	12.4%	9.3%	8.2%	9.3%	13.8%
1985-1995	0.0%	0.2%	6.6%	6.7%	0.5%	1.5%	1.4%	1.5%	12.3%	4.2%	11.3%	8.4%	8.0%	8.5%	12.5%
1985-1998	0.0%	0.2%	5.3%	5.4%	0.4%	1.2%	1.2%	1.2%	10.0%	3.4%	9.1%	6.8%	6.5%	6.9%	10.1%
1999-2004	0.0%	0.1%	1.9%	1.8%	0.1%	0.7%	0.7%	0.4%	5.1%	2.6%	3.9%	3.6%	3.7%	3.7%	4.6%
2002-2004	0.0%	0.1%	2.7%	2.5%	0.1%	0.9%	0.9%	0.5%	6.8%	3.5%	4.9%	4.6%	4.7%	4.9%	5.9%

Table 8-7. continued

Year	PS Natural	PS Yearling	WACO wild	WACO hatchery	CR Summer	CR URBS	CR Mid-Brights	Snake Fall	Lewis wild	Spring Crk. hatchery	L. Bonneville hatchery	Fall Cowlitz hatchery	Spring Cowlitz hatchery	Willamette Hatchery	ORC North Migrating
	Panel B PSC Model Stocks 16-30														
1979	14.7%	9.0%	6.0%	5.7%	13.8%	10.3%	6.2%	24.9%	8.1%	19.8%	25.2%	17.9%	7.5%	4.4%	5.4%
1980	14.9%	9.1%	6.0%	5.5%	15.2%	9.7%	12.5%	25.4%	7.8%	17.5%	24.1%	17.6%	7.7%	4.2%	5.6%
1981	13.5%	10.1%	5.8%	5.3%	15.9%	9.3%	9.1%	28.2%	6.5%	17.2%	23.2%	18.4%	6.5%	4.9%	5.8%
1982	12.9%	10.3%	5.8%	5.3%	15.9%	8.0%	9.8%	26.8%	6.7%	15.6%	21.2%	17.0%	6.9%	4.4%	7.2%
1983	21.3%	13.6%	9.5%	9.0%	23.8%	18.9%	13.0%	33.2%	11.3%	32.1%	34.6%	26.3%	11.8%	8.4%	12.3%
1984	26.9%	19.6%	12.1%	11.5%	28.0%	18.6%	12.9%	39.9%	15.6%	40.9%	47.7%	38.1%	13.9%	7.2%	11.7%
1985	13.2%	9.4%	6.4%	6.0%	14.5%	8.4%	8.9%	19.5%	7.8%	21.6%	23.6%	17.5%	7.2%	4.0%	6.6%
1986	12.4%	8.9%	6.2%	6.2%	13.8%	8.5%	10.9%	22.0%	9.0%	15.2%	20.9%	12.6%	8.2%	5.3%	6.4%
1987	13.4%	9.6%	5.8%	5.8%	15.8%	8.5%	10.1%	23.2%	8.1%	14.9%	21.0%	15.6%	6.8%	4.7%	6.0%
1988	15.5%	11.5%	6.4%	6.3%	19.7%	7.9%	9.3%	24.6%	9.8%	18.7%	23.7%	19.3%	6.4%	4.5%	6.2%
1989	8.9%	7.2%	3.5%	3.2%	9.5%	4.9%	4.5%	14.4%	2.6%	10.1%	12.1%	13.9%	3.9%	2.7%	4.3%
1990	14.4%	12.0%	5.3%	5.0%	15.0%	7.2%	7.2%	20.8%	5.6%	14.7%	19.3%	18.4%	6.1%	4.3%	6.3%
1991	12.0%	9.0%	4.3%	4.4%	15.2%	5.6%	6.0%	20.4%	4.4%	12.1%	14.8%	15.7%	6.1%	2.2%	4.8%
1992	13.5%	9.5%	5.2%	5.2%	13.4%	9.7%	8.2%	21.7%	7.7%	16.4%	18.1%	18.5%	5.9%	3.2%	5.7%
1993	14.1%	10.4%	5.5%	5.1%	19.2%	10.9%	8.5%	22.1%	5.6%	16.5%	18.2%	16.9%	5.4%	3.4%	6.8%
1994	12.4%	9.4%	4.7%	4.3%	10.9%	6.9%	6.6%	22.9%	9.8%	13.7%	17.8%	15.0%	4.2%	3.0%	5.0%
1995	8.8%	6.9%	3.4%	3.2%	7.8%	4.5%	5.0%	17.5%	2.9%	9.4%	13.0%	10.8%	4.2%	1.8%	2.6%
1996	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1997	4.2%	3.3%	1.5%	1.2%	5.4%	2.1%	2.1%	7.3%	1.5%	4.9%	5.6%	5.4%	1.8%	1.2%	1.5%
1998	0.2%	0.1%	0.1%	0.1%	0.2%	0.2%	0.1%	0.3%	0.1%	0.3%	0.3%	0.2%	0.1%	0.1%	0.1%
1999	0.4%	0.3%	0.2%	0.2%	0.5%	0.3%	0.2%	0.9%	0.3%	0.6%	0.7%	0.4%	0.3%	0.1%	0.2%
2000	5.3%	4.1%	2.5%	2.5%	6.4%	3.8%	3.2%	10.8%	4.0%	8.9%	12.0%	6.3%	2.9%	2.1%	2.5%
2001	4.0%	3.2%	2.0%	1.8%	4.2%	3.0%	3.5%	8.2%	2.9%	6.4%	8.3%	3.9%	2.5%	1.3%	1.7%
2002	4.5%	3.6%	2.1%	2.0%	4.6%	3.7%	3.3%	6.9%	2.4%	7.6%	8.6%	5.3%	2.8%	1.6%	2.5%
2003	6.2%	4.6%	2.7%	2.5%	6.3%	3.5%	2.7%	11.5%	2.2%	9.2%	10.3%	6.5%	3.2%	1.6%	2.5%
2004	7.0%	5.4%	3.0%	2.9%	8.9%	5.5%	3.7%	13.0%	3.2%	11.6%	11.1%	8.1%	3.4%	2.1%	2.5%
Averages															
1979-1982	14.0%	9.6%	5.9%	5.4%	15.2%	9.3%	9.4%	26.3%	7.3%	17.5%	23.4%	17.7%	7.1%	4.5%	6.0%
1985-1995	12.6%	9.4%	5.2%	5.0%	14.1%	7.5%	7.8%	20.8%	6.7%	14.9%	18.4%	15.8%	5.9%	3.6%	5.5%
1985-1998	10.2%	7.6%	4.2%	4.0%	11.5%	6.1%	6.3%	16.9%	5.3%	12.0%	14.9%	12.8%	4.7%	2.9%	4.4%
1999-2004	4.6%	3.5%	2.1%	2.0%	5.1%	3.3%	2.8%	8.6%	2.5%	7.4%	8.5%	5.1%	2.5%	1.5%	2.0%
2002-2004	5.9%	4.5%	2.6%	2.5%	6.6%	4.2%	3.3%	10.5%	2.6%	9.5%	10.0%	6.6%	3.1%	1.8%	2.5%

Table 8-8. Percent stock (catch and escapement) taken in the WCVI AABM fishery (outside sport reported catch) as estimated by the PSC Chinook Model (CLB-0506) for calendar years 1979-2004. (Analogous to CTC (2004) Appendix G Tables, which are based on CWT recovery data).

Panel A PSC Model Stocks 1-15

Year	Alaska SSE	NCBC	WCVI hatchery	WCVI wild	Upper GS	Lower GS wild	Lower GS hatchery	Fraser Early	Fraser Late	Nooksack Spring	Nooksack Fall	Skagit Sum/Fall	Stillaguamish Sum/Fall	Snohomish Sum/Fall	PS hatch Fingerling
1979	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%	0.0%	0.2%	0.2%	0.2%	0.2%	0.3%
1980	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%	0.1%	0.2%	0.2%	0.2%	0.2%	0.3%
1981	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%	0.1%	0.2%	0.2%	0.2%	0.2%	0.3%
1982	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%	0.1%	0.2%	0.2%	0.2%	0.2%	0.3%
1983	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%	0.1%	0.2%	0.2%	0.2%	0.2%	0.3%
1984	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%	0.1%	0.2%	0.2%	0.2%	0.2%	0.3%
1985	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.1%	0.1%	0.6%	0.2%	0.5%	0.3%	0.4%	0.4%	0.5%
1986	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.4%	0.1%	0.3%	0.2%	0.3%	0.3%	0.4%
1987	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.1%	0.1%	0.6%	0.3%	0.6%	0.5%	0.4%	0.5%	0.6%
1988	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%	0.1%	0.2%	0.2%	0.2%	0.2%	0.3%
1989	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.1%	0.1%	1.3%	0.4%	0.8%	0.7%	0.7%	0.7%	0.9%
1990	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.1%	0.1%	1.0%	0.4%	0.9%	0.6%	0.8%	0.7%	1.0%
1991	0.0%	0.0%	0.0%	0.0%	0.1%	0.2%	0.2%	0.1%	1.6%	0.5%	1.2%	1.0%	0.9%	0.9%	1.3%
1992	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.1%	0.1%	0.9%	0.4%	0.7%	0.6%	0.6%	0.6%	0.8%
1993	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.1%	0.1%	1.1%	0.4%	0.9%	0.8%	0.7%	0.8%	1.1%
1994	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%	0.2%	0.1%	1.2%	0.6%	1.1%	1.0%	0.9%	0.9%	1.3%
1995	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.1%	0.1%	0.8%	0.3%	0.7%	0.5%	0.6%	0.6%	0.8%
1996	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.1%	0.1%	0.4%	0.2%	0.5%	0.4%	0.4%	0.4%	0.5%
1997	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.4%	0.1%	0.3%	0.2%	0.2%	0.2%	0.3%
1998	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%	0.1%	0.2%	0.1%	0.2%	0.1%	0.2%
1999	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%	0.2%	0.2%	1.3%	0.7%	1.4%	1.6%	1.1%	1.1%	1.6%
2000	0.0%	0.0%	0.0%	0.0%	0.1%	0.3%	0.3%	0.2%	2.0%	0.7%	1.7%	1.4%	1.3%	1.4%	1.9%
2001	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%	0.2%	0.1%	1.2%	0.6%	1.2%	0.9%	0.9%	1.0%	1.3%
2002	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.1%	0.1%	1.0%	0.4%	0.6%	0.5%	0.4%	0.5%	0.7%
2003	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.1%	0.1%	0.5%	0.3%	0.5%	0.5%	0.4%	0.5%	0.6%
2004	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%	0.2%	0.1%	1.0%	0.5%	0.9%	0.7%	0.8%	0.8%	1.1%
Averages															
1979-1982	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%	0.1%	0.2%	0.2%	0.2%	0.2%	0.3%
1985-1995	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.1%	0.1%	0.9%	0.3%	0.7%	0.6%	0.6%	0.6%	0.8%
1985-1998	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.1%	0.1%	0.8%	0.3%	0.6%	0.5%	0.5%	0.5%	0.7%
1999-2004	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%	0.2%	0.1%	1.2%	0.5%	1.0%	0.9%	0.8%	0.9%	1.2%
2002-2004	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.1%	0.1%	0.8%	0.4%	0.7%	0.6%	0.5%	0.6%	0.8%

Table 8-8. continued

Year	PS Natural	PS Yearling	WACO wild	WACO hatchery	CR Summer	CR URBS	CR Mid-Brights	Snake Fall	Lewis wild	Spring Crk. hatchery	L. Bonneville hatchery	Fall Cowlitz hatchery	Spring Cowlitz hatchery	Willamette Hatchery	ORC North Migrating
Panel B PSC Model Stocks 16-30															
1979	0.3%	0.2%	0.1%	0.1%	0.3%	0.2%	0.2%	0.5%	0.2%	0.5%	0.6%	0.3%	0.2%	0.1%	0.1%
1980	0.3%	0.2%	0.1%	0.1%	0.3%	0.2%	0.3%	0.5%	0.2%	0.4%	0.5%	0.3%	0.2%	0.1%	0.1%
1981	0.3%	0.2%	0.1%	0.1%	0.3%	0.2%	0.2%	0.6%	0.1%	0.4%	0.5%	0.4%	0.2%	0.1%	0.1%
1982	0.3%	0.2%	0.1%	0.1%	0.3%	0.2%	0.2%	0.5%	0.1%	0.4%	0.5%	0.3%	0.2%	0.1%	0.2%
1983	0.3%	0.2%	0.1%	0.1%	0.3%	0.2%	0.2%	0.4%	0.2%	0.4%	0.4%	0.3%	0.2%	0.1%	0.2%
1984	0.3%	0.2%	0.1%	0.1%	0.3%	0.2%	0.1%	0.4%	0.2%	0.4%	0.5%	0.4%	0.2%	0.1%	0.1%
1985	0.5%	0.4%	0.2%	0.2%	0.5%	0.3%	0.3%	0.7%	0.3%	0.8%	0.9%	0.6%	0.3%	0.2%	0.2%
1986	0.3%	0.2%	0.2%	0.2%	0.4%	0.2%	0.3%	0.6%	0.3%	0.4%	0.6%	0.4%	0.3%	0.2%	0.2%
1987	0.6%	0.4%	0.3%	0.3%	0.7%	0.4%	0.5%	1.1%	0.4%	0.9%	1.2%	0.8%	0.4%	0.3%	0.3%
1988	0.3%	0.2%	0.1%	0.1%	0.3%	0.1%	0.2%	0.4%	0.2%	0.4%	0.4%	0.3%	0.1%	0.1%	0.1%
1989	1.0%	0.7%	0.4%	0.4%	1.0%	0.5%	0.5%	1.5%	0.3%	1.3%	1.4%	1.3%	0.5%	0.3%	0.5%
1990	1.0%	0.8%	0.4%	0.4%	1.0%	0.5%	0.5%	1.5%	0.4%	1.2%	1.6%	1.2%	0.5%	0.4%	0.5%
1991	1.3%	1.0%	0.5%	0.6%	1.7%	0.7%	0.7%	2.4%	0.5%	1.7%	2.1%	1.8%	0.8%	0.3%	0.6%
1992	0.8%	0.6%	0.4%	0.4%	0.8%	0.7%	0.5%	1.4%	0.5%	1.2%	1.4%	1.1%	0.5%	0.2%	0.4%
1993	1.1%	0.8%	0.5%	0.4%	1.4%	0.9%	0.7%	1.7%	0.5%	1.4%	1.5%	1.2%	0.5%	0.3%	0.5%
1994	1.3%	1.0%	0.5%	0.5%	1.1%	0.7%	0.7%	2.4%	1.0%	1.7%	2.3%	1.5%	0.5%	0.4%	0.5%
1995	0.8%	0.6%	0.3%	0.3%	0.7%	0.4%	0.5%	1.6%	0.3%	1.0%	1.3%	1.0%	0.4%	0.2%	0.3%
1996	0.5%	0.4%	0.2%	0.2%	0.6%	0.3%	0.4%	1.1%	0.3%	0.7%	0.9%	0.5%	0.3%	0.2%	0.3%
1997	0.3%	0.2%	0.1%	0.1%	0.4%	0.1%	0.1%	0.5%	0.1%	0.4%	0.4%	0.3%	0.1%	0.1%	0.1%
1998	0.2%	0.2%	0.1%	0.1%	0.2%	0.2%	0.1%	0.4%	0.1%	0.3%	0.3%	0.2%	0.1%	0.1%	0.1%
1999	1.5%	1.3%	0.6%	0.6%	1.6%	0.9%	0.8%	2.7%	1.0%	1.7%	2.3%	1.5%	1.0%	0.6%	0.5%
2000	1.9%	1.5%	0.8%	0.8%	2.3%	1.2%	1.0%	3.6%	1.4%	2.7%	3.5%	2.2%	1.0%	0.8%	0.8%
2001	1.3%	1.1%	0.6%	0.5%	1.4%	0.9%	1.0%	2.6%	0.9%	1.7%	2.2%	1.1%	1.1%	0.5%	0.5%
2002	0.7%	0.6%	0.3%	0.3%	0.7%	0.5%	0.5%	1.1%	0.4%	0.9%	1.1%	0.8%	0.5%	0.2%	0.4%
2003	0.6%	0.4%	0.2%	0.2%	0.6%	0.3%	0.3%	1.1%	0.2%	0.8%	0.9%	0.6%	0.3%	0.2%	0.2%
2004	1.1%	0.9%	0.4%	0.4%	1.5%	0.8%	0.5%	2.0%	0.5%	1.5%	1.6%	1.3%	0.5%	0.3%	0.4%
Averages															
1979-1982	0.3%	0.2%	0.1%	0.1%	0.3%	0.2%	0.2%	0.5%	0.1%	0.4%	0.5%	0.3%	0.2%	0.1%	0.1%
1985-1995	0.8%	0.6%	0.4%	0.3%	0.9%	0.5%	0.5%	1.4%	0.4%	1.1%	1.3%	1.0%	0.4%	0.3%	0.4%
1985-1998	0.7%	0.5%	0.3%	0.3%	0.8%	0.4%	0.4%	1.2%	0.4%	1.0%	1.2%	0.9%	0.4%	0.2%	0.3%
1999-2004	1.2%	0.9%	0.5%	0.5%	1.3%	0.8%	0.7%	2.2%	0.7%	1.6%	1.9%	1.2%	0.7%	0.4%	0.5%
2002-2004	0.8%	0.6%	0.3%	0.3%	0.9%	0.5%	0.4%	1.4%	0.4%	1.1%	1.2%	0.9%	0.4%	0.2%	0.3%

Table 8-9. Percent stock (catch and escapement, measured in terms of adult equivalents) taken in the NBC AABM fishery (troll and sport[1] reported catch) as estimated by the PSC Chinook Model (CLB-0506) for calendar years 1979-2004. (Analogous to CTC (2004) Appendix G Tables, which are based on CWT recovery data).

Panel A PSC Model Stocks 1-15															
Year	Alaska SSE	NCBC	WCVI hatchery	WCVI wild	Upper GS	Lower GS wild	Lower GS hatchery	Fraser Early	Fraser Late	Nooksack Spring	Nooksack Fall	Skagit Sum/Fall	Stillaguamish Sum/Fall	Snohomish Sum/Fall	PS hatch Fingerling
1979	1.0%	19.2%	14.4%	14.4%	23.6%	5.8%	5.4%	8.2%	5.5%	2.0%	2.0%	7.2%	5.6%	7.2%	1.2%
1980	1.2%	19.0%	12.6%	12.6%	24.0%	6.4%	5.9%	8.5%	5.1%	0.6%	2.1%	7.3%	5.3%	7.1%	1.2%
1981	1.2%	18.9%	16.3%	16.2%	23.9%	6.4%	6.3%	8.2%	5.7%	1.1%	2.0%	6.9%	6.0%	6.9%	1.3%
1982	1.3%	20.4%	15.6%	15.2%	24.4%	6.3%	6.7%	7.9%	5.5%	1.1%	2.1%	7.1%	5.0%	7.1%	1.1%
1983	1.5%	22.0%	16.8%	14.9%	24.6%	7.7%	6.8%	7.1%	6.0%	1.2%	2.1%	7.8%	7.5%	8.1%	1.1%
1984	1.6%	22.8%	14.1%	14.1%	32.3%	7.9%	7.7%	8.2%	4.6%	1.1%	1.7%	7.9%	9.2%	7.3%	1.1%
1985	1.4%	14.4%	9.1%	9.1%	20.6%	4.8%	4.8%	5.7%	2.6%	0.8%	0.9%	4.5%	4.3%	4.4%	0.5%
1986	1.2%	14.6%	8.9%	8.7%	17.1%	5.3%	6.4%	5.2%	3.6%	1.0%	1.3%	4.6%	5.2%	5.1%	0.7%
1987	1.1%	15.9%	10.6%	10.5%	21.7%	6.2%	7.1%	6.5%	4.2%	1.0%	1.7%	5.7%	4.3%	5.8%	1.0%
1988	0.7%	16.5%	7.9%	7.8%	16.5%	4.2%	4.3%	4.8%	1.8%	0.6%	1.2%	4.3%	2.9%	4.1%	0.6%
1989	1.1%	25.2%	9.5%	9.4%	21.6%	5.4%	5.0%	6.6%	2.0%	0.7%	1.2%	5.0%	4.1%	5.1%	0.7%
1990	0.8%	22.6%	9.0%	8.9%	18.4%	4.8%	4.8%	5.2%	1.8%	0.8%	0.9%	4.4%	4.7%	4.5%	0.7%
1991	1.3%	24.4%	10.5%	10.5%	20.8%	5.9%	5.4%	7.1%	2.5%	0.9%	1.1%	4.9%	3.7%	5.2%	0.8%
1992	1.2%	26.0%	9.7%	9.8%	21.9%	6.8%	6.2%	6.0%	2.8%	0.9%	1.6%	5.9%	4.7%	6.0%	0.8%
1993	1.1%	27.0%	9.3%	9.3%	23.4%	6.0%	5.8%	6.1%	1.9%	0.7%	1.3%	5.7%	4.9%	5.7%	0.7%
1994	1.2%	31.4%	10.8%	10.8%	26.2%	6.5%	6.2%	7.2%	2.1%	0.9%	1.5%	6.3%	4.7%	6.0%	0.8%
1995	0.6%	23.7%	4.1%	4.1%	16.0%	4.1%	4.1%	3.1%	1.1%	0.5%	1.0%	3.7%	3.5%	3.5%	0.5%
1996	0.0%	7.8%	0.1%	0.1%	4.2%	0.9%	0.8%	0.0%	0.2%	0.0%	0.3%	0.8%	0.8%	0.8%	0.1%
1997	0.7%	29.8%	6.0%	5.9%	22.4%	6.0%	5.1%	4.0%	1.7%	0.6%	1.3%	5.0%	4.4%	5.2%	0.6%
1998	1.3%	33.5%	7.1%	7.1%	24.1%	6.5%	7.0%	6.0%	0.9%	0.7%	1.4%	5.4%	4.1%	5.5%	0.6%
1999	0.5%	29.6%	4.0%	3.9%	18.4%	4.5%	4.3%	3.3%	0.5%	0.5%	1.0%	4.2%	3.3%	3.8%	0.5%
2000	0.1%	19.0%	0.9%	0.9%	11.0%	2.9%	3.4%	0.6%	0.4%	0.1%	0.9%	2.5%	2.3%	2.3%	0.3%
2001	0.1%	24.2%	1.1%	1.1%	14.0%	3.5%	3.1%	0.5%	0.7%	0.1%	1.0%	2.8%	3.3%	3.0%	0.3%
2002	0.5%	30.8%	4.3%	4.2%	19.7%	4.9%	4.8%	2.8%	0.7%	0.2%	0.8%	4.3%	3.3%	4.4%	0.5%
2003	0.8%	38.6%	5.5%	5.4%	25.7%	6.5%	6.5%	3.7%	0.6%	0.5%	1.0%	5.6%	5.1%	5.8%	0.6%
2004	0.9%	45.9%	6.9%	6.9%	32.9%	8.7%	8.6%	4.7%	0.9%	0.6%	2.1%	7.2%	7.7%	7.4%	0.8%
Averages															
1979-1982	1.2%	19.4%	14.7%	14.6%	24.0%	6.2%	6.1%	8.2%	5.4%	1.2%	2.1%	7.1%	5.5%	7.1%	1.2%
1985-1995	1.1%	22.0%	9.0%	9.0%	20.4%	5.5%	5.5%	5.8%	2.4%	0.8%	1.2%	5.0%	4.3%	5.0%	0.7%
1985-1998	1.0%	22.3%	8.0%	8.0%	19.6%	5.2%	5.2%	5.3%	2.1%	0.7%	1.2%	4.7%	4.0%	4.8%	0.6%
1999-2004	0.5%	31.4%	3.8%	3.7%	20.3%	5.2%	5.1%	2.6%	0.6%	0.3%	1.1%	4.4%	4.2%	4.5%	0.5%
2002-2004	0.7%	38.4%	5.6%	5.5%	26.1%	6.7%	6.6%	3.7%	0.7%	0.4%	1.3%	5.7%	5.3%	5.9%	0.6%

Table 8-9. continued

Panel B PSC Model Stocks 16-30															
Year	PS Natural	PS Yearling	WACO wild	WACO hatchery	CR Summer	CR URBS	CR Mid-Brights	Snake Fall	Lewis wild	Spring Crk. hatchery	L. Bonneville hatchery	Fall Cowlitz hatchery	Spring Cowlitz hatchery	Willamette Hatchery	ORC North Migrating
1979	1.3%	2.0%	15.0%	14.4%	13.4%	12.8%	4.1%	7.6%	4.4%	0.5%	3.5%	2.0%	2.8%	8.9%	16.4%
1980	1.3%	2.0%	15.0%	14.6%	14.6%	11.6%	7.4%	7.7%	4.8%	0.6%	4.4%	2.3%	2.8%	8.8%	16.5%
1981	1.1%	2.2%	15.3%	14.7%	16.0%	11.5%	10.0%	8.5%	4.6%	0.4%	2.5%	2.2%	2.9%	10.1%	16.7%
1982	0.9%	2.3%	15.4%	14.7%	17.0%	7.4%	8.9%	7.9%	4.3%	0.4%	2.4%	2.1%	2.7%	9.3%	20.3%
1983	1.2%	2.0%	15.8%	14.9%	16.7%	10.7%	10.1%	7.3%	4.6%	0.6%	1.8%	2.5%	4.3%	15.5%	25.7%
1984	1.0%	2.0%	18.6%	17.8%	14.2%	12.3%	11.0%	8.2%	5.8%	0.4%	0.9%	3.3%	5.2%	14.3%	26.6%
1985	0.5%	1.2%	13.8%	13.0%	10.7%	6.9%	6.9%	5.1%	3.3%	0.2%	0.5%	2.1%	3.1%	10.7%	21.6%
1986	0.7%	1.4%	11.6%	11.0%	11.3%	6.5%	7.0%	5.6%	3.4%	0.3%	0.8%	1.2%	2.9%	11.2%	17.0%
1987	1.0%	1.9%	12.4%	11.3%	13.5%	8.1%	8.1%	6.0%	3.9%	0.2%	0.8%	1.4%	2.7%	8.8%	16.5%
1988	0.6%	1.3%	9.2%	8.7%	10.6%	5.8%	6.4%	4.3%	3.9%	0.2%	2.0%	2.0%	1.8%	6.1%	11.6%
1989	0.6%	1.6%	12.7%	11.8%	11.7%	8.3%	7.9%	5.9%	3.0%	0.1%	0.5%	1.8%	2.6%	8.9%	21.3%
1990	0.6%	1.5%	10.1%	9.3%	9.8%	6.7%	6.4%	4.5%	2.9%	0.1%	0.8%	1.5%	2.0%	7.3%	14.8%
1991	0.7%	1.7%	13.3%	12.4%	16.5%	7.5%	7.9%	6.4%	3.2%	0.1%	0.2%	2.4%	2.8%	6.4%	19.6%
1992	0.8%	1.8%	11.5%	10.9%	12.5%	7.4%	7.5%	4.9%	4.3%	0.2%	0.6%	2.4%	2.6%	6.2%	14.9%
1993	0.7%	1.8%	11.8%	11.2%	15.2%	9.8%	7.7%	5.2%	3.0%	0.2%	0.8%	1.9%	2.6%	6.9%	19.2%
1994	0.8%	2.0%	14.1%	13.3%	11.7%	10.5%	9.2%	7.8%	7.0%	0.2%	0.4%	2.3%	2.7%	8.7%	18.3%
1995	0.4%	1.1%	6.2%	5.9%	6.9%	3.6%	3.8%	3.8%	1.7%	0.1%	0.4%	1.2%	1.6%	3.3%	7.0%
1996	0.1%	0.2%	0.0%	0.0%	1.7%	0.1%	0.2%	0.0%	0.2%	0.0%	0.0%	0.3%	0.3%	0.0%	0.0%
1997	0.6%	1.5%	8.1%	7.6%	13.3%	5.5%	5.8%	4.2%	2.7%	0.1%	0.5%	2.4%	2.2%	5.8%	10.6%
1998	0.6%	1.8%	11.0%	10.3%	13.1%	6.9%	6.3%	6.0%	2.1%	0.1%	0.1%	1.5%	2.8%	7.4%	15.3%
1999	0.4%	1.2%	6.1%	5.7%	9.2%	4.5%	4.6%	2.7%	1.8%	0.0%	0.1%	1.5%	2.1%	4.6%	7.8%
2000	0.2%	0.7%	1.1%	1.0%	5.0%	1.0%	0.9%	0.5%	0.8%	0.0%	0.0%	0.9%	0.8%	1.0%	1.5%
2001	0.3%	1.1%	1.1%	1.1%	6.0%	1.1%	1.1%	0.6%	1.1%	0.0%	0.0%	0.5%	1.9%	0.9%	1.5%
2002	0.4%	1.3%	5.7%	5.3%	9.3%	4.2%	4.1%	2.7%	2.5%	0.0%	0.0%	1.6%	2.3%	4.8%	9.3%
2003	0.5%	1.7%	7.1%	6.6%	12.9%	6.1%	5.4%	4.1%	2.4%	0.1%	0.0%	2.5%	2.5%	4.6%	10.7%
2004	0.8%	2.4%	8.6%	8.0%	21.2%	6.6%	5.4%	4.4%	2.4%	0.0%	0.0%	2.7%	2.8%	6.0%	12.1%
Averages															
1979-1982	1.1%	2.1%	15.2%	14.6%	15.3%	10.8%	7.6%	7.9%	4.5%	0.5%	3.2%	2.2%	2.8%	9.3%	17.5%
1985-1995	0.7%	1.5%	11.5%	10.8%	11.9%	7.4%	7.2%	5.4%	3.6%	0.2%	0.7%	1.9%	2.5%	7.7%	16.5%
1985-1998	0.6%	1.5%	10.4%	9.8%	11.3%	6.7%	6.5%	5.0%	3.2%	0.2%	0.6%	1.8%	2.3%	7.0%	14.8%
1999-2004	0.4%	1.4%	5.0%	4.6%	10.6%	3.9%	3.6%	2.5%	1.9%	0.0%	0.0%	1.6%	2.1%	3.7%	7.2%
2002-2004	0.6%	1.8%	7.1%	6.7%	14.5%	5.6%	5.0%	3.7%	2.5%	0.0%	0.0%	2.3%	2.6%	5.2%	10.7%

[1] Note that sport includes all northern and central B.C. sport, not just QCI.

Table 8-10. Percent stock (catch and escapement, measured in terms of adult equivalents) taken in the NBC AABM fishery (troll reported catch) as estimated by the PSC Chinook Model (CLB-0506) for calendar years 1979-2004. (Analogous to CTC (2004) Appendix G Tables, which are based on CWT recovery data).

Panel A PSC Model Stocks 1-15															
Year	Alaska SSE	NCBC	WCVI hatchery	WCVI wild	Upper GS	Lower GS wild	Lower GS hatchery	Fraser Early	Fraser Late	Nooksack Spring	Nooksack Fall	Skagit Sum/Fall	Stillaguamish Sum/Fall	Snohomish Sum/Fall	PS hatch Fingerling
1979	1.0%	5.9%	6.9%	6.9%	11.0%	1.6%	1.5%	6.4%	0.3%	1.9%	0.3%	2.3%	1.1%	2.4%	0.3%
1980	1.2%	5.9%	6.5%	6.5%	10.6%	1.8%	1.6%	6.7%	0.3%	0.2%	0.3%	2.5%	1.0%	2.4%	0.3%
1981	1.2%	5.9%	7.9%	8.1%	11.0%	1.8%	1.7%	6.5%	0.3%	0.4%	0.3%	2.2%	1.2%	2.3%	0.3%
1982	1.3%	6.1%	7.7%	8.0%	10.6%	1.8%	1.9%	6.3%	0.3%	0.4%	0.3%	2.4%	1.0%	2.3%	0.2%
1983	1.5%	6.4%	9.1%	8.6%	11.5%	2.4%	2.1%	5.6%	0.4%	0.2%	0.4%	2.8%	1.7%	2.8%	0.3%
1984	1.6%	8.7%	10.1%	10.1%	21.6%	3.7%	3.5%	7.2%	0.5%	0.3%	0.5%	3.8%	3.3%	3.6%	0.4%
1985	1.4%	6.6%	7.3%	7.3%	15.4%	2.8%	2.8%	5.3%	0.4%	0.5%	0.4%	2.8%	2.0%	2.7%	0.3%
1986	1.2%	4.9%	5.3%	5.2%	8.1%	1.8%	2.3%	4.2%	0.2%	0.5%	0.2%	1.8%	1.3%	2.0%	0.2%
1987	1.0%	5.3%	5.2%	5.3%	10.6%	1.9%	2.6%	5.2%	0.2%	0.5%	0.2%	1.9%	0.9%	2.0%	0.2%
1988	0.7%	4.3%	5.1%	5.1%	8.1%	1.5%	1.5%	4.2%	0.2%	0.4%	0.2%	1.8%	0.7%	1.7%	0.2%
1989	1.1%	5.8%	7.8%	7.8%	11.4%	2.5%	2.4%	6.3%	0.4%	0.6%	0.3%	2.4%	1.2%	2.5%	0.3%
1990	0.8%	4.5%	6.6%	6.5%	9.4%	1.7%	1.8%	4.7%	0.2%	0.6%	0.2%	1.9%	1.1%	1.9%	0.2%
1991	1.3%	6.0%	8.3%	8.3%	11.5%	2.7%	2.5%	6.6%	0.4%	0.7%	0.3%	2.3%	1.1%	2.5%	0.3%
1992	1.2%	4.7%	6.5%	6.5%	8.7%	2.1%	1.9%	5.3%	0.2%	0.6%	0.3%	2.1%	0.9%	2.0%	0.2%
1993	1.1%	5.1%	7.2%	7.1%	9.8%	2.2%	2.3%	5.6%	0.3%	0.5%	0.3%	2.3%	1.1%	2.3%	0.3%
1994	1.2%	6.2%	8.7%	8.7%	13.6%	2.3%	2.3%	6.7%	0.2%	0.6%	0.3%	2.7%	1.2%	2.7%	0.3%
1995	0.6%	2.8%	3.6%	3.6%	5.8%	1.3%	1.4%	2.9%	0.2%	0.4%	0.2%	1.3%	0.7%	1.2%	0.2%
1996	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1997	0.7%	3.3%	4.5%	4.4%	8.0%	2.0%	1.6%	3.7%	0.3%	0.5%	0.2%	1.6%	0.7%	1.7%	0.2%
1998	1.3%	4.7%	6.5%	6.5%	11.1%	2.8%	2.8%	5.9%	0.2%	0.7%	0.3%	2.5%	1.0%	2.5%	0.3%
1999	0.5%	2.7%	3.6%	3.7%	6.6%	1.6%	1.6%	3.2%	0.1%	0.4%	0.2%	1.4%	0.6%	1.3%	0.2%
2000	0.1%	0.5%	0.6%	0.6%	1.2%	0.3%	0.4%	0.5%	0.0%	0.1%	0.0%	0.3%	0.1%	0.3%	0.0%
2001	0.1%	0.5%	0.6%	0.6%	1.2%	0.3%	0.3%	0.5%	0.0%	0.1%	0.0%	0.2%	0.1%	0.3%	0.0%
2002	0.5%	2.6%	3.7%	3.7%	6.2%	1.4%	1.7%	2.8%	0.2%	0.2%	0.1%	1.3%	0.5%	1.4%	0.2%
2003	0.8%	2.9%	5.0%	5.0%	7.6%	1.9%	1.8%	3.7%	0.2%	0.5%	0.2%	1.7%	0.8%	1.7%	0.2%
2004	0.9%	3.1%	6.0%	6.1%	9.5%	2.2%	2.4%	4.7%	0.2%	0.6%	0.2%	1.9%	1.0%	2.0%	0.2%
Averages															
1979-1982	1.2%	6.0%	7.2%	7.4%	10.8%	1.8%	1.7%	6.5%	0.3%	0.7%	0.3%	2.3%	1.1%	2.3%	0.3%
1985-1995	1.0%	5.1%	6.5%	6.5%	10.2%	2.1%	2.2%	5.2%	0.3%	0.5%	0.3%	2.1%	1.1%	2.1%	0.2%
1985-1998	1.0%	4.6%	5.9%	5.9%	9.4%	2.0%	2.0%	4.8%	0.2%	0.5%	0.2%	2.0%	1.0%	2.0%	0.2%
1999-2004	0.5%	2.1%	3.3%	3.3%	5.4%	1.3%	1.4%	2.6%	0.1%	0.3%	0.1%	1.1%	0.5%	1.1%	0.1%
2002-2004	0.7%	2.9%	4.9%	4.9%	7.8%	1.9%	2.0%	3.7%	0.2%	0.4%	0.2%	1.6%	0.7%	1.7%	0.2%

Table 8-10. continued

Panel B PSC Model Stocks 16-30															
Year	PS Natural	PS Yearling	WACO wild	WACO hatchery	CR Summer	CR URBS	CR Mid-Brights	Snake Fall	Lewis wild	Spring Crk. hatchery	L. Bonneville hatchery	Fall Cowlitz hatchery	Spring Cowlitz hatchery	Willamette Hatchery	ORC North Migrating
1979	0.3%	0.5%	11.2%	10.8%	5.2%	9.2%	2.9%	5.3%	3.0%	0.1%	0.0%	1.6%	1.8%	8.7%	15.7%
1980	0.3%	0.6%	11.3%	10.9%	5.6%	8.7%	4.9%	5.3%	3.3%	0.1%	0.0%	1.8%	1.8%	8.6%	15.8%
1981	0.2%	0.6%	11.4%	10.9%	6.4%	8.5%	7.0%	5.8%	2.9%	0.1%	0.0%	1.7%	2.0%	9.8%	16.0%
1982	0.2%	0.6%	11.6%	11.1%	7.2%	5.2%	6.3%	5.7%	2.6%	0.1%	0.0%	1.7%	1.8%	9.0%	19.4%
1983	0.3%	0.6%	12.7%	12.0%	7.2%	7.5%	7.3%	5.4%	3.3%	0.1%	0.0%	1.9%	3.0%	15.1%	24.5%
1984	0.4%	0.9%	16.6%	15.8%	7.8%	10.2%	9.4%	6.8%	4.6%	0.1%	0.0%	2.8%	4.3%	14.2%	26.0%
1985	0.2%	0.6%	12.9%	12.1%	7.4%	6.2%	6.2%	4.4%	2.8%	0.1%	0.0%	1.9%	2.6%	10.6%	21.3%
1986	0.2%	0.5%	9.7%	9.3%	5.3%	4.9%	5.1%	3.8%	2.6%	0.1%	0.0%	1.0%	2.0%	11.0%	16.4%
1987	0.2%	0.5%	9.5%	8.8%	5.5%	5.9%	5.7%	4.3%	2.7%	0.0%	0.0%	1.1%	1.8%	8.6%	15.9%
1988	0.2%	0.4%	7.8%	7.3%	5.1%	4.8%	5.1%	3.6%	2.8%	0.0%	0.0%	1.5%	1.3%	6.0%	11.4%
1989	0.3%	0.7%	12.0%	11.1%	6.6%	7.5%	7.2%	5.5%	2.3%	0.1%	0.0%	1.3%	1.9%	8.8%	21.1%
1990	0.2%	0.6%	9.0%	8.4%	4.7%	5.8%	5.5%	4.0%	2.0%	0.0%	0.0%	1.0%	1.4%	7.2%	14.6%
1991	0.3%	0.8%	12.3%	11.4%	9.7%	6.8%	7.1%	5.6%	2.5%	0.0%	0.0%	1.8%	2.0%	6.4%	19.3%
1992	0.2%	0.5%	9.8%	9.2%	5.4%	5.8%	5.9%	3.9%	2.9%	0.1%	0.0%	1.5%	1.6%	6.1%	14.6%
1993	0.2%	0.6%	10.8%	10.2%	6.6%	8.3%	6.5%	4.7%	2.1%	0.1%	0.0%	1.2%	1.8%	6.8%	18.9%
1994	0.3%	0.8%	12.8%	12.1%	5.9%	9.1%	7.9%	7.0%	5.5%	0.1%	0.0%	1.6%	2.1%	8.5%	18.0%
1995	0.1%	0.4%	5.8%	5.5%	3.1%	3.2%	3.3%	3.5%	1.2%	0.0%	0.0%	0.7%	0.9%	3.2%	6.9%
1996	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
1997	0.2%	0.5%	7.5%	7.1%	5.0%	4.4%	4.7%	3.9%	1.8%	0.1%	0.0%	1.2%	1.2%	5.7%	10.4%
1998	0.3%	0.7%	10.8%	10.1%	7.3%	6.4%	5.9%	5.8%	1.7%	0.1%	0.0%	1.0%	1.8%	7.3%	15.2%
1999	0.2%	0.4%	6.0%	5.5%	4.5%	3.8%	3.8%	2.6%	1.4%	0.0%	0.0%	0.8%	0.9%	4.6%	7.8%
2000	0.0%	0.1%	1.1%	1.0%	0.8%	0.7%	0.6%	0.5%	0.3%	0.0%	0.0%	0.2%	0.2%	1.0%	1.5%
2001	0.0%	0.1%	1.1%	1.0%	0.6%	0.6%	0.6%	0.6%	0.4%	0.0%	0.0%	0.1%	0.2%	0.8%	1.5%
2002	0.1%	0.4%	5.7%	5.3%	3.1%	3.6%	3.5%	2.6%	1.7%	0.0%	0.0%	0.8%	0.9%	4.7%	9.3%
2003	0.2%	0.5%	7.0%	6.6%	4.7%	5.2%	4.5%	4.1%	1.7%	0.1%	0.0%	1.1%	1.1%	4.5%	10.7%
2004	0.2%	0.6%	8.6%	8.0%	7.2%	5.7%	4.8%	4.3%	1.7%	0.0%	0.0%	1.1%	1.4%	5.9%	12.1%
Averages															
1979-1982	0.2%	0.6%	11.4%	10.9%	6.1%	7.9%	5.3%	5.5%	2.9%	0.1%	0.0%	1.7%	1.8%	9.0%	16.7%
1985-1995	0.2%	0.6%	10.2%	9.6%	5.9%	6.2%	6.0%	4.6%	2.7%	0.0%	0.0%	1.3%	1.7%	7.6%	16.2%
1985-1998	0.2%	0.5%	9.3%	8.8%	5.5%	5.6%	5.4%	4.3%	2.3%	0.0%	0.0%	1.2%	1.6%	6.9%	14.6%
1999-2004	0.1%	0.3%	4.9%	4.6%	3.5%	3.3%	3.0%	2.5%	1.2%	0.0%	0.0%	0.7%	0.8%	3.6%	7.1%
2002-2004	0.2%	0.5%	7.1%	6.7%	5.0%	4.8%	4.3%	3.7%	1.7%	0.0%	0.0%	1.0%	1.1%	5.0%	10.7%

9. For the NBC and WCVI fisheries, provide the CTC's assessment of the GSI data that supports the presentations referenced in assignment 2 above and the stock-specific management plans, and detail how that data may be utilized in advancing our understanding of stock composition in those fisheries;

John Candy from the Molecular Genetics Laboratory at the Pacific Biological Station of the Department of Fisheries and Oceans met with the Workgroup on November 16, 2005, to review the data and methodology used to generate GSI estimates. DFO provided extensive documentation to the Workgroup (Appendix 2).

Our evaluation will be divided into the following categories:

1) description of the baseline, 2) power and accuracy of the baseline, 3) mixture estimations, 4) comments on PowerPoint presentations, and 5) conclusion and recommendations

Many of the comparisons will be to the standardized microsatellite baseline recently developed by the *Genetic Analysis of Pacific Salmon* (GAPS) group using funding received from the Pacific Salmon Commission U.S. Letter of Agreement and administered by the U.S. PSC commissioners.

1. Description of DFO baseline

DFO submitted a baseline that was likely representative of the baseline actually used, but was not identical. The baseline used in any particular mixed stock analysis varied depending on the year when the analysis occurred as well as the particular analysis. Likewise the regions reported also differed depending on the analysis. The DFO baseline was built on a set of 13 microsatellite loci (see Appendix 2). The number of alleles per locus varied from 12 to 54 and averaged 30 alleles per locus with a total of 386 alleles across all loci. The amount and distribution of variation is typical of Pacific salmon microsatellite databases and, given appropriate baseline and mixture sample sizes, should provide adequate resolution for a broad range of questions. By comparison, the GAPS baseline also includes 13 loci with an average of 37 alleles per locus.

The baseline was composed of populations ranging from Central California (Sacramento River) through Southeast Alaska (Alsek drainage) and included 240 populations divided into 33 (or 34 in some analyses) regional groups. Most of these populations were collected in multiple years dating from the early 1990's through early 2000's. Results from the 33 (or 34) regional groups were pooled into 14 larger reporting regions for the pie diagrams in the PowerPoint presentations. The baseline was uneven both in terms of number of individuals and number of populations in the reporting groups. Across the regions, the number of individuals varied considerably from a high of 4,861 from WCVI to a low of 99 from Juan de Fuca (Figure 9-1). Of the 240 populations, 36 (13%) had sample sizes below 50. Individual population sample sizes varied considerably from a high of 899 (Puntledge) to a low of 22 (Goldstream). Small sample sizes will result in a reduction in the accuracy and precision of estimates of allele frequencies as well as the ability to detect the presence/absence of all alleles, so estimates based on small baseline sample sizes should be interpreted with caution.

A single Canadian laboratory developed the baseline, and both the number of individual fish and populations were heavily weighted towards Canada. Individual fish from Canadian stocks composed over 80% of the baseline with 35,400 individuals followed by U.S. (including Alaska) with approximately 6,000 (13%), and Transboundary individuals totalling approximately 2,700 (7%). Some of the U.S. regions that had the largest sample sizes include the Central Valley Fall of California and Snake River Spring and Summer, regions that are not likely to contribute heavily to WCVI fisheries. The Lower Columbia region, estimated to contribute between 40-60% of the fish in many time periods, was represented by only 266 fish. Puget Sound stocks, also large contributors in some strata, were better represented with 960 individuals from nine populations in the baseline. Given the overall under representation of U.S. stocks in the baseline, there may be a systematic bias in the estimates. The magnitude and direction of the bias will likely depend on the composition of the mixture and the allele frequency differences among the contributors to the mixture (Wood et al. 1987).

By contrast, the GAPS Version 1.0 of the baseline includes higher representation of U. S. both in number of populations and sample sizes. Of the 16,000 individuals, 34% originated from Canadian populations, 7% from Transboundary populations, and 59% from U.S. populations.

Sample sizes of many of the populations included in the baseline are below the target sample sizes of 144 set by the GAPS group. Both empirical and theoretical data were used to set the target. The GAPS baseline Version 1.0 had 4% of populations below 50.

2. Power and accuracy of the baseline

DFO submitted an analysis of CWT fish as a test of the accuracy of the baseline. The analysis used a Bayesian method for stock estimation. With this method, some uncertainty in baseline allele frequencies can be accounted for in the estimation process. The evaluation was based on 306 CWT Chinook salmon that were sampled from fisheries in British Columbia during 1997 (Appendix 2, Figure 9-1) and from 297 fish sampled from a troll fishery off the southwest coast of Vancouver Island in 2001 (Appendix 2, Figure 2). The evaluation used a somewhat different baseline from that used in the 2003/2004 estimates provided. The evaluation baseline included 52,000 fish from 325 populations distributed from throughout the range of Chinook salmon including Russia and Northwest Alaska and estimated 45 reporting groups. It is likely the majority of new individuals originated from the additional coverage, but this could not be determined from the information provided. Reporting groups for the Southeast Alaska to California regions were condensed somewhat with only a single Lower Fraser group and pooling of the Lower Columbia and Willamette groups into a single group.

This resulted in 31 instead of 33(34) groups. Despite inconsistencies between the baseline actually used and that submitted for evaluation purposes, some trends are apparent.

Figure 1 in Appendix 2 represents a complex mixture of Southeast Alaska, British Columbia, and southern US stocks. Canadian regions that were well represented in the baseline (Northern BC Mainland N > 3,500, Skeena N > 3,100, Lower Fraser N > 1,500) are overestimated as is Puget Sound (N > 930). Regions with smaller sample sizes that were underestimated include Southeast Alaska (N > 350) and Central Valley Spring (N > 150). Two regions, Oregon Coastal (N > 740) and Middle Fraser (N > 4,350) were also underestimated despite having what appear to be large sample sizes. In the case of the Oregon Coastal region, additional diversity may exist that is not adequately represented by the included populations. For Middle Fraser, the baseline may not sufficiently differentiate it from other regions (e.g., Lower Fraser was overestimated).

Figure 2 in Appendix 2 represents a much simpler mixture with both the true and estimated proportions nearly 60% Puget Sound individuals. The Lower Columbia/Willamette and Upper Columbia Su/F were overestimated while the Snake Fall group was underestimated.

3. Fishery Mixture Samples

The Workgroup was provided with estimates for the following fisheries:

	Area	Date	N screened
Periodic Sampling			
		2003	
	Area123-10	Nov	72
	Area123-10	Dec	72
		2004	
	Area23	January	100
	Area123/23	February	99
	Area23	March	100
	Area126	March	100
	Area123	April	100
	Area126	April	100
	Area126/127	April	99
	Area123	May 1-3	99
	Area124	May 15-16	96
	Area125-127	May 15-16	101
	Area126	Sep-21	100
Intensive Sampling			
		2004	
	A123-13	May	328
	A123-12/13	May	330
	A123-12(few 13)	May	190
	A126	May	140

Stock proportions and standard deviations were estimated using a Bayesian analysis. Estimates were provided for 33 regions for the periodic sampling and 34 regions for the intensive sampling. A Sacramento group was included in the intensive sampling in addition to the two Central Valley groups. It was not possible to determine how the populations were assigned to the 34 groups relative to the assignments in the 33-group analysis. Sample sizes were small for the periodic sampling ranging from 72 to 101 individuals. Sample sizes were considerably larger for the intensive sampling ranging from 140 to 330 individuals.

The small sample sizes of the periodic sampling greatly decrease the precision of the estimates relative to the intensive sampling estimates. This can be seen in the relatively large standard deviations for the periodic sampling. The resulting confidence intervals are large, so only major trends can be extrapolated from the periodic sampling. In many cases, the confidence intervals included zero, so even the presence or absence of a stock could not be reliably determined. A much higher level of confidence can be attributed to the intensive sampling estimates.

Decisions on sample sizes should be based on the desired level of accuracy and precision balanced against limitations of sample availability and funding. Marlowe and Busack (1995) conducted a bootstrap power analysis using the 25 stock Coastal troll Chinook fishery in Washington State. Their study suggested a minimum mixture sample size of 200 would be necessary to detect stocks contributing at rates of 5% or higher, using the electrophoretic baseline in use at the time. Increasing the mixture sample size improves both the detectability of smaller contributions and the reliability of contribution estimates.

Caution is required if GSI estimates are to be used in expansions to estimate the number of individual populations in the catch, particularly if the stock of interest represents a small proportion of catch. Further discussions on this issue are included in the Report of the Expert Panel on the Future of the Coded Wire Tag Recovery Program for Pacific Salmon. For the GAPS baseline, a power analysis is currently being conducted using LOA funds secured in FY06. As part of that analysis, the Panel recommended that methods be developed to determine the appropriate sample sizes for various mixtures and as a function of the desired accuracy and precision of the statistic of interest.

4. Comments on PowerPoint Presentations

The numerous pie diagrams presented within the various PowerPoint presentations are useful to visualize variability in stock composition estimated from small sample sizes taken from highly mixed stock fisheries. The Workgroup evaluated only the 2003/2004 fishery samples, so the majority of the analyses depicted in the pie diagrams could not be evaluated. The reporting regions varied considerably, sometimes at the same fine-scale level as the 33 regions evaluated here; at other times the estimates were pooled into larger regional groups. For example, “Puget Sound” and “Washington Coast” were shown both independently but also pooled into “Washington.” As a general comment, the compositional estimates for larger reporting regions will likely have improved precision and accuracy for a given sample over estimates of the proportion of the catch comprised of an individual stock. However, no indication or depiction of the precision of any of the estimates was given. To an audience unfamiliar with GSI studies, this can lead to a misleading sense of the precision of the estimates, of particular concern with smaller mixture sample sizes such as those used in the 2003/2004 periodic samples.

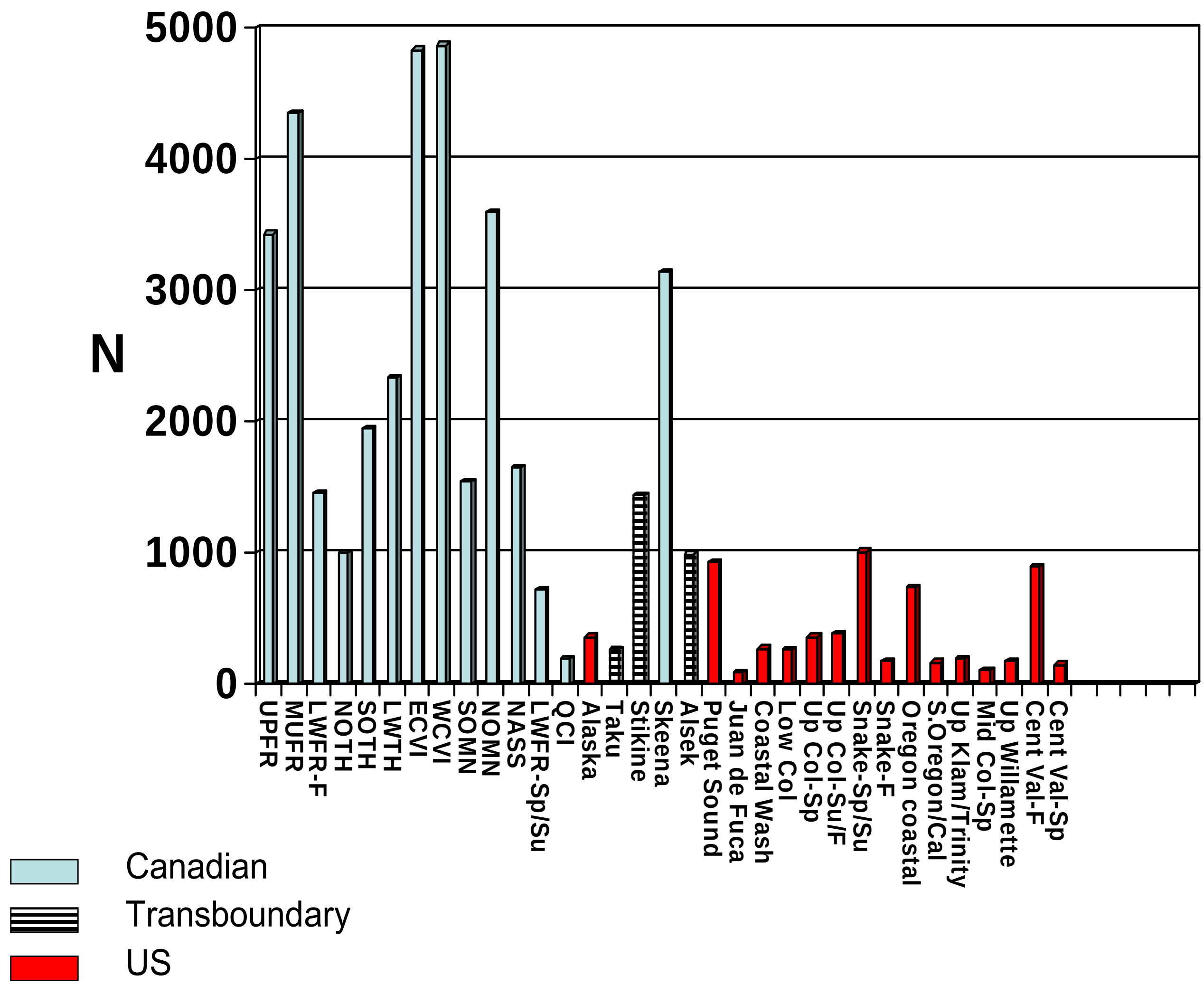
5. Conclusions and Recommendations

The Workgroup evaluated the 2003/2004 baseline estimates for its coverage both in terms of number of populations and individuals. The baseline, although cumulatively composed of a large number of individuals, was skewed towards Canada both in the number of individuals and populations. Within the US populations, there was an uneven distribution among populations and regions. Thus, there may be a bias in the estimates. The magnitude and direction of any bias would depend on the composition of the mixture under investigation.

The Workgroup evaluated estimates from periodic and intensive sampling of the WCVI fishery for 2003/2004. The sample sizes for the periodic estimates were small, averaging less than 100 individuals. This resulted in large confidence intervals around all the estimates. The estimates are best used as indicators of trends or relative contribution. They shouldn't be used to extrapolate to numbers of individuals harvested without a great deal of caution. The intensive sampling in May of 2004 had larger sample sizes and a considerably higher level of precision and would be more appropriate for a variety of analyses.

The Workgroup through the LOA funds has invested heavily in developing a standardized DNA database by the GAPS (including DFO) group. The GAPS baseline has representation of all the major U.S. and Canadian lineages from the PSC area of interest and is continuing to grow. As such, it is more balanced than the DFO baseline, and more appropriate for PSC applications. The GAPS group has also been funded to conduct comprehensive power analyses and develop mixture and sampling guidelines. The use of GAPS baseline and sampling guidelines would reduce controversy over interpretation of results in studies reporting GSI-based estimates of stock composition for the PSC.

Figure 9-1. Number of individuals in each of 33 regions in the DFO GSI baseline for Chinook salmon.



10. After the tasks listed above have been completed, outline, in a separate document if necessary, technical difficulties for implementation of the agreed AABM fishery regimes that may be created by fishery patterns that change (possibly in-season) in order to alter the exploitation rates on specific stocks. Include any recommendations for monitoring programs and for analytical methods to estimate stock-specific impacts (across the range of stocks in an AABM fishery) that may result from such alteration in the conduct of a fishery.

The requested recommendations in Assignment 10 could only be addressed after the other tasks had been completed, and scrutinized by the Workgroup. Additional analyses were completed since the previous draft of this report in an attempt to address this assignment. These are presented below. Note that the expert panel has previously commented on the above topic as well (see Appendix 1).

Fishery Indices

The Workgroup compared fishery indices (reflecting relative changes in fishery harvest rates) for the WCVI and NBC troll fisheries derived from the CWT exploitation rate analyses with the index estimated by the PSC Chinook Model. For the WCVI troll fishery, a different picture emerged. Prior to 2000, the two indices were closely correlated. Since then, however, the indices have diverged. The Model-based fishery indices since 1999 indicate that the relative harvest rate has been below the target level anticipated under the 1999 Chinook agreement. In contrast, the CWT-based estimates are well above the target level since 2000 (Fig 10-1), while for the NBC troll fishery, the model indices have been higher than the CWT indices since 2002 (Fig 10-2).

The change in timing of the catch by the WCVI troll fishery has been a source of concern for the CTC and Southern U.S. fishery managers. The deviation of the CWT and fishery indices reinforces this concern. The Workgroup has proposed a method to improve the capacity of the PSC Chinook model to account for temporal changes in the conduct of the WCVI troll fishery.

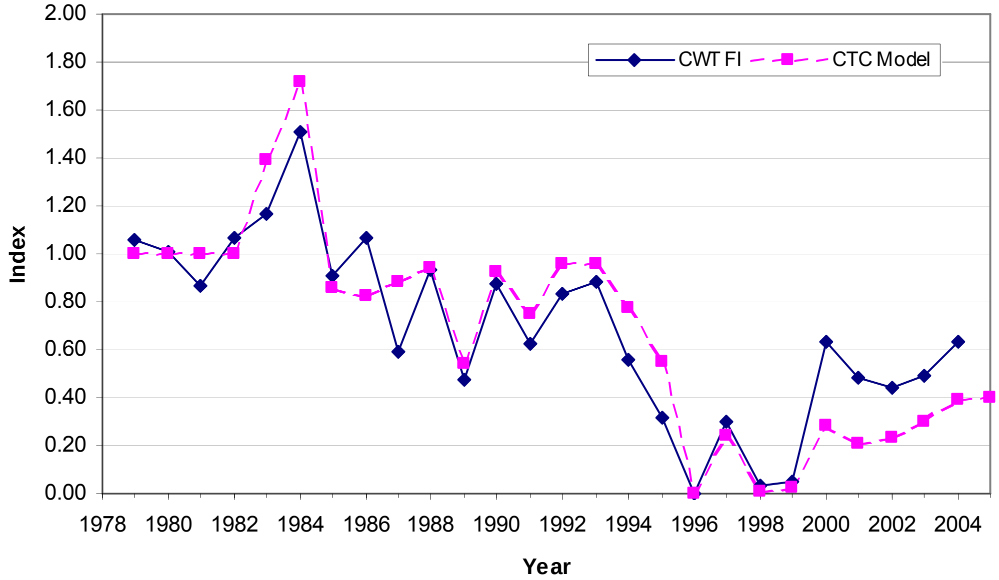


Figure 10-1. Estimated CWT (through 2004) and PSC Chinook model (through 2005) landed catch fishery indices the WCVI troll fishery, from the 2006 PSC Chinook model calibration.

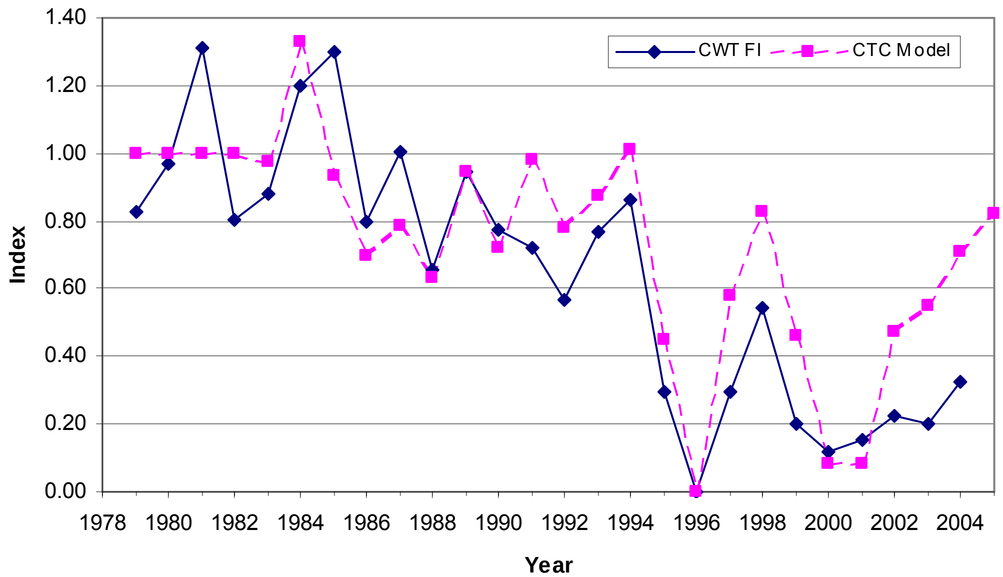


Figure 10-2. Estimated CWT (through 2004) and model landed catch fishery indices (through 2005) for the NBC troll fishery, from the 2006 PSC Chinook model calibration.

To address part of Assignment 10, the Workgroup investigated the utility of two additional analyses to attempt to address the question of whether changes in the conduct of the WCVI and NBC troll fisheries have differentially impacted some stocks more than others. The Workgroup concluded that significant changes have not occurred in the NBC troll fishery and limited further work to the WCVI troll fishery. Analysis 1 examines how model stock composition can be affected by changes in temporal fishing patterns and regulations (see Section 10 below). Analysis 2 involves the development of a standardized index to reflect changes in the concentration of recoveries of selected CWT-marked stocks in two time periods, pre-1999, and 1999-2004.

Analysis 1: A model-based method to analyze effects of changes in the timing of catch on stock composition.

<u>Introduction</u>

This analysis illustrates how stock composition can be affected by fishing patterns and regulations. Two types of analyses are presented. The first provides insight into how stock compositions can vary by month. The second show four examples of how annual stock compositions can change depending on the timing of the catch and minimum size limits. We performed the analysis only for the WCVI troll fishery, as the fishing patterns for the NBC troll fishery were comparatively stable.

<u>Method</u>

The method utilizes the annual stock-age-specific base period exploitation rates employed by the PSC Chinook Model. These annual exploitation rates are apportioned in accordance with the percentage of the total recoveries taken in a given month.

For each fishery, individual CWT recovery records were stratified by month and ocean age for the same CWT release groups that are used to generate the base period exploitation rates. The percent base period CWT recoveries by month were computed by stock and age[1]:

$$\frac{CWT_{s,a,f,m}}{\sum_m CWT_{s,a,f,m}}. \qquad (1)$$

The percent recoveries were then used to apportion the base period annual exploitation rate (BPER) by month to derive monthly base period exploitation rates:

$$BPER_{s,a,f,m} = \frac{CWT_{s,a,f,m}}{\sum_m CWT_{s,a,f,m}} * BPER_{s,a,f} \qquad (2)$$

The monthly base period exploitation rates were divided by base period reported catch to obtain the exploitation rate on a per fish basis:

$$\frac{BPER_{s,a,f,m}}{BPCatch_{f,m}} \qquad (3)$$

[1] For some model stocks, the exact CWT release groups used to generate the BPERs could not be determined. Except for Snohomish summer/fall stock, the CWTs listed in the 1991 CTC Model documentation were used. For Snohomish stock, recoveries from the 1971 through 1976 brood year fingerling releases of progeny of local broodstock were used.

For a given year (or combination of years) *y*, the percent catch for each month was estimated:

$$\frac{Catch_{y,m}}{\sum_{m} Catch_{y,m}} \tag{4}$$

The BPER per fish (Eq. 3) and the percent catch by month (Eq. 4) were multiplied by the base period catch in each fishery to estimate the monthly exploitation rates that would have been observed for base period catches under the fishing pattern in year(s) *y* and base period stock distribution:

$$NewBPER_{s,a,f,m} = \frac{BPER_{s,a,f,m}}{BPCatch_{f,m}} * \frac{Catch_{y,m}}{\sum_{m} Catch_{y,m}} * BCatch_{f} \tag{5}$$

The effect of changes in the timing of the catch and size limits on stock compositions is evaluated using equations (6) and (7). Equation 6 computes the catch that would have occurred for CTC model stocks under the fishing pattern for month *m*:

$$NCatch_{f,m} = \sum_{s} \sum_{f} NewBPER_{s,a,f,m} * N_{s,a} * PV_{a,f} \tag{6}$$

Where $N_{s,a}$ = the base period cohort size for stock *s* and age *a* and $PV_{a,f}$ is the proportion of a cohort of age *a* that is above the minimum size limit for fishery *f*.

Equations (7) and (8) simply compute the composition of the catch that is comprised of fish from a given stock group. This method does not reflect potential implications of changes in stock distribution.

The percent contribution of a stock or stock group is estimated as follows for stocks *s* in group *g* for month *m*:

$$StkComp_{g,m} = \frac{\sum_{s \in g} \sum_{a} NewBPER_{s,a,f,m} * N_{s,a} * PV_{a,f}}{NCatch_{f,m}} \tag{7}$$

These monthly stock compositions are shown in Figure 10-3. Annual percent stock or stock group is also estimated for year(s) *y*:

$$StkComp_{g,y} = \frac{\sum_{s \in g} \sum_{a} \left(\sum_{m} NewBPER_{s,a,f,m} \right) * N_{s,a} * PV_{a,f}}{\sum_{m} NCatch_{f,m}} \tag{8}$$

These stock composition estimates for individual stocks over a range of years with similar regulations are shown in Figure 10-4 through Figure 10-7 and can be directly compared with those from the CTC Model.

<u>Results</u>

The analysis outlined above can be used in a number of ways to examine the potential effects of changing temporal fishing changes in catch patterns and minimum size limits. Since these analyses are based on model base period abundances, it should reflect seasonal availability of stock groups to the fishery, independent of fluctuations in stock size. It is important to remember that these data are based primarily on CWT sampling during the 1979 – 1982 base period.

Caveats, cautions, and assumptions:

1) If catch during a particular month in the base period was small, or not adequately sampled for CWTs (as could have occurred in March or Nov/Dec of the base catch years), results will not be as reliable as those from months with larger catch or more intensive sampling. In addition, for some stocks, CWT recovery data used to generate base period exploitation rates were collected during years in which fishing may not have occurred in some months. For example, if CWTs for a stock were collected during a period when fishing only occurred during the summer, there would be no recoveries during other months. This can lead to anomalous results. For example, the data in Table 10-1 show that in March, October, and November, only Columbia River and Puget Sound stocks are present in the WCVI fishery, which is extremely unlikely. A more reasonable interpretation of the information might be that those stocks represent the majority of the catch, with other stock groups making lesser contributions. Nonetheless, the error introduced by "out of base" stocks in the model is not believed to be substantial; variability in monthly stock compositions are likely true reflections of relative differences in the availability of individual stocks.
2) The data in this analysis are from the PSC Chinook model only and are restricted to CWT recovery data used to generate stock-age-fishery specific exploitation rates, generally for the period from the 1979 – 1982 base period. As such, the results are not directly comparable, stock by stock, to the CWT data presented in Section 7 of this report.
3) Only stocks included in the PSC Chinook model are included in this analysis. Absence of a stock or stock group from this analysis does not necessarily demonstrate lack of impact on that stock. It may only mean that the stock is not included in the model. A complete list of stocks included in the model is provided in Table 10-2.
4) The distribution of stocks is assumed to remain constant in this analysis, i.e., recent stock movement and migration patterns are assumed to be the same as those observed in the 1979-1982 base period.
5) Recent relative stock abundances are also assumed to be the same as those observed during the base period; this allowed us to isolate the effect of changes in temporal distribution of catch and minimum size limits on stock-specific exploitation rates.

Table 10-1 and Figure 10-3 illustrate how monthly stock compositions can be expected to change during the base period. For example, Figure 10-3 shows that Columbia River stocks should on average contribute heavily to the WCVI troll catch early in the season, from March to June, then at a relatively steady rate, 20 – 40 % of the total catch, for the remainder of the year. Puget Sound stocks, on the other hand, comprised less than 25 % of the catch from March through August, and then increased in September. The Fraser River stocks show a strong pattern of increased contribution to the WCVI catch from March to a maximum in July of 55 percent; contribution then decreased as the season progressed.

Table 10-1. Monthly stock composition of the WCVI troll fishery under base period stock abundances, temporal fishing patterns and size limits.

Stock	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
Fraser Early & Late (FR)	0%	4%	15%	14%	55%	37%	20%	0%	0%
WCVI Fall (WCVI)	0%	1%	1%	4%	2%	8%	6%	1%	0%
Georgia Strait (GS)	0%	7%	1%	0%	0%	1%	0%	0%	0%
Puget Sound (PS)	9%	26%	28%	28%	16%	15%	27%	71%	63%
Wash. Coastal (WC)	0%	0%	1%	3%	2%	5%	2%	0%	0%
Columbia River (CR)	91%	57%	53%	49%	24%	28%	33%	28%	37%
Oregon Coastal (OR)	0%	4%	0%	2%	1%	5%	12%	0%	0%

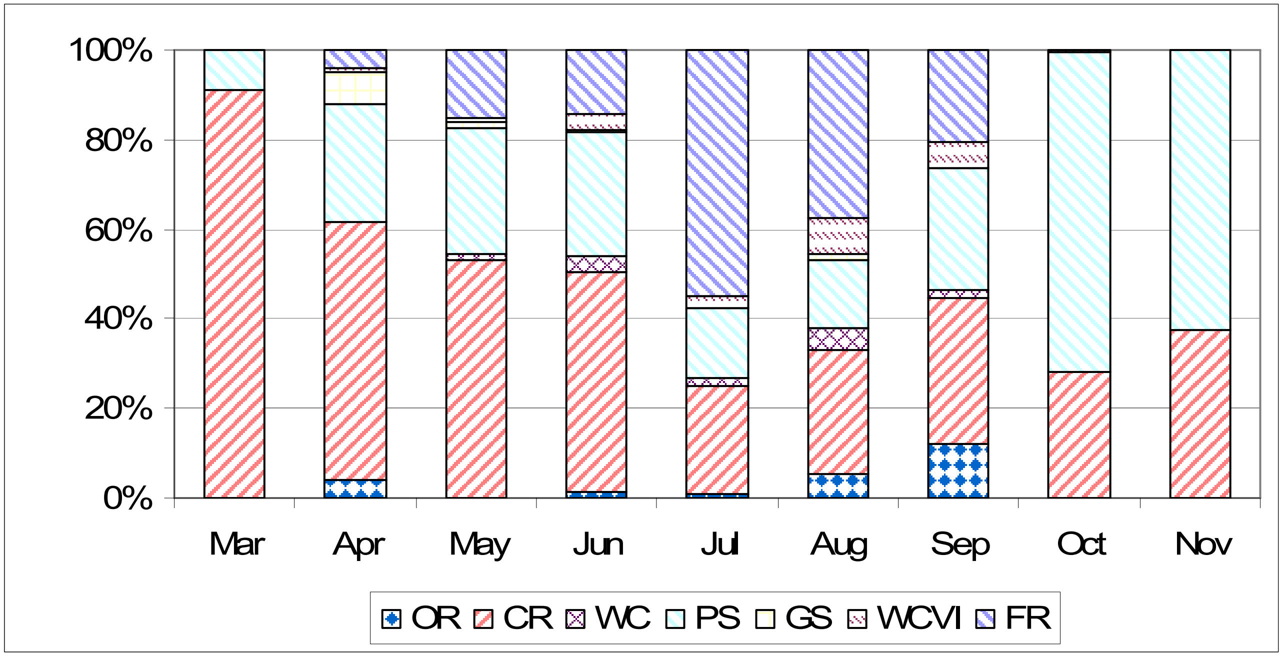


Figure 10-3. Average monthly stock composition of the WCVI troll fishery under base period stock abundances, temporal fishing patterns and size limits (1979-1982).

Table 10-3 and Figure 10-4 show how the model base period catch stock composition of the major stock groups in the WCVI troll fishery would have changed across several time periods since 1982, representing differing temporal distribution of catch, magnitude of catch, minimum size limits, or a combination of these factors. The distribution of catch by month during each period is shown in Table 4-4. During the 1979-1982 base period, fishing generally occurred from March to December, with catches averaging over 400,000 annually. The size limit during the base period was 66 cm. The 1987-1995 fishing period was characterized by declining catches, ranging from approximately 400,000 in 1987 and 1988 to under 100,000 in 1995. Fishing generally occurred from May to September, with a size limit of 67 cm. From 1999 -2001, catches averaged about 50,000 fish per year, with fishing occurring March – May and September – December. During this period, no fishing occurred in June, July, or August and very little occurred in September. The size limit was 55 cm. In 2002-2004, the average catches increased from the previous period to approximately 150,000. While fishing continued to occur primarily during the spring and fall months, significant fishing also occurred in June and September. The size limit remained at 55 cm.

In considering the results of this analysis, it is important to remember that the stock compositions presented are not observed stock compositions, but are those that would have been generated by the model if all four periods fished on the same stock abundances (base period abundances assumed in all cases). Actual stock composition of a fishery catch is influenced by many factors, including relative stock abundance, which will vary annually.

The proportion of Fraser stocks in the WCVI troll fishery in the last two time periods, when most fishing occurred in the spring and fall, is much less than the earlier periods when most catch occurred during the summer months. This result is consistent with the data in Table 10-1, which shows that Fraser stocks would contribute most to fisheries occurring during the summer. Similarly, the WCVI fall stock impacts under fishing periods when fishing occurred primarily in the spring and fall are estimated to be about half of the impacts that would occur with summer fisheries. Puget Sound stocks show a somewhat variable response to temporal variation in fishing. Under the pattern seen in 1999-2001, impacts are predicted to be more than double those observed during the base period. However, the proportion of Puget Sound stocks that would be caught under most recent fishing patterns (2002-2004) is near observed base period levels. The proportion of Columbia River stocks decreases when fisheries occur primarily during the summer months, as occurred from 1985-1997, and increases when the fishery is concentrated in the spring and fall months. Figure 10-5 shows the relative change from the base for the major stock groups for each of the fishing periods.

Table 10-2. List of PSC Chinook Model stocks and stock groups.

Model Stock	Stock Group
Alaska South SE	AKS
North/Central BC	NCBC
Fraser Early	FR
Fraser Late (Harrison)	FR
WCVI Hatchery	WCVI
WCVI Natural	WCVI
Georgia St. Upper	GS
Georgia St. Lower Natural	GS
Georgia St. Lower Hatchery	GS
Nooksack Fall	PS
Puget Sound Fingerling	PS
Puget Sound Natural Fingerling	PS
Puget Sound Yearling	PS
Nooksack Spring	PS
Skagit Wild	PS
Stillaguamish Wild	PS
Snohomish Wild	PS
WA Coastal Hatchery	WC
WA Coastal Wild	WC
Upriver Brights	CR
Mid Col R Brights	CR
Spring Creek Hatchery	CR
Lower Bonneville Hatchery	CR
Fall Cowlitz Hatchery	CR
Lewis R Wild	CR
Willamette R	CR
Spring Cowlitz Hatchery	CR
Columbia R Summer	CR
Lyons Ferry	CR
Oregon Coast	ORC

Table 10-3. Expected WCVI troll stock composition during fishing periods with differing temporal catch distribution, assuming base period stock abundances and distributions.

Stock	79-82	87-95	99-01	02-04
Fraser Early & Late (FR)	31%	47%	8%	13%
WCVI Fall (WCVI)	4%	4%	1%	2%
Georgia Strait (GS)	1%	0%	1%	3%
Puget Sound (PS)	22%	17%	48%	24%
Wash. Coastal (WC)	2%	2%	0%	1%
Columbia River (CR)	37%	26%	40%	55%
Oregon Coastal (OR)	3%	3%	2%	2%

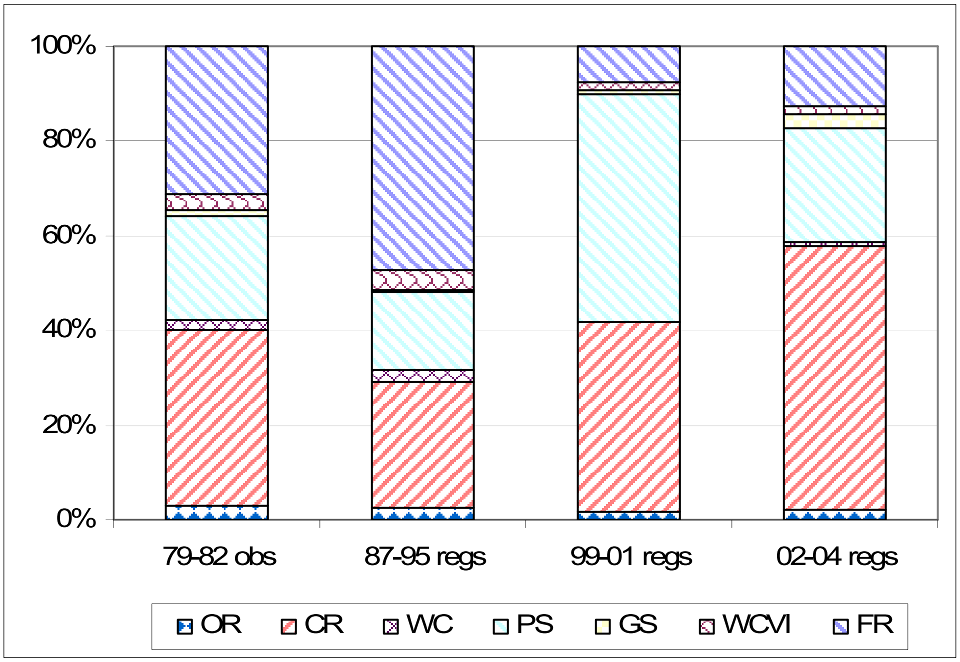


Figure 10-4. Expected WCVI troll stock composition during fishing periods with differing temporal catch distribution, assuming base period stock abundances and distributions.

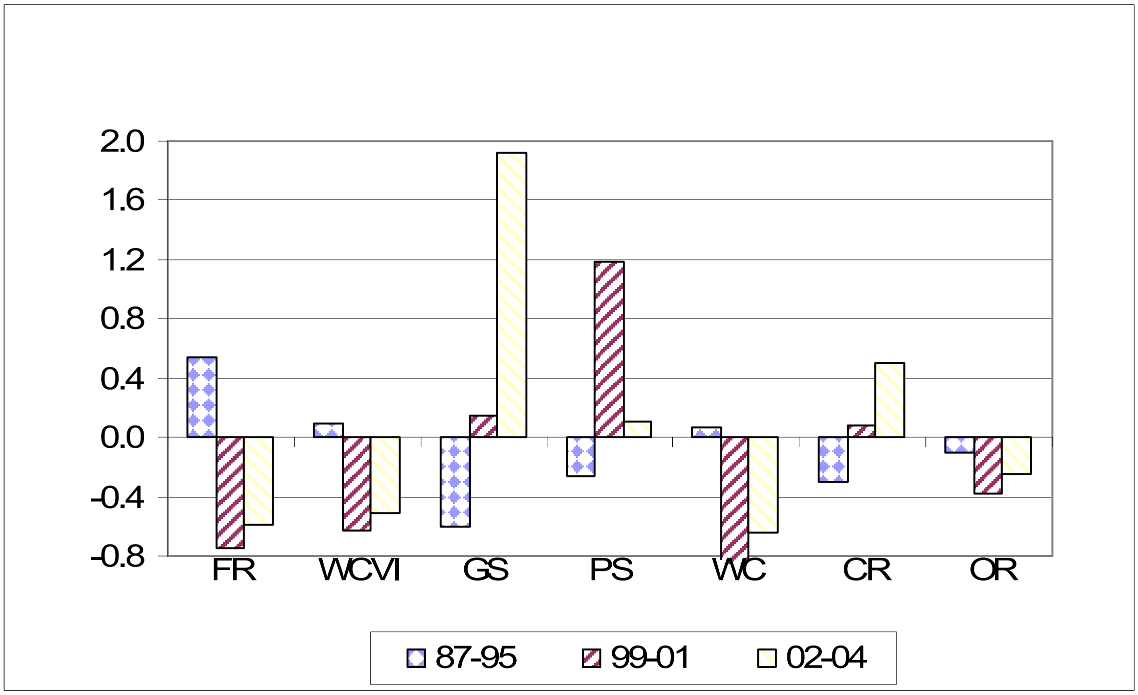


Figure 10-5. Expected relative change in estimated stock composition in the WCVI troll fishery during fishing periods with differing temporal catch distribution, assuming base period stock abundances and distributions.

Table 10-4 and Figure 10-6 show how the model base period catch stock composition of Columbia River stocks would have changed under the different temporal fishing patterns. Fishing patterns like those observed in 2002 – 2004, with the largest catches occurring in April and May, are predicted to have much less impact on Upriver Bright and Snake River Wild stocks compared to fishing periods in which fishing occurred primarily during the summer and fall months.

Table 10-4. Expected WCVI troll composition of Columbia River stocks during fishing periods with differing temporal catch distribution, assuming base period stock abundances and distributions.

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Stock	79-82	87-95	99-01	02-04
Upriver Brights (URB+MCB)	9%	13%	16%	5%
Spring Creek Hatchery (SPR)	39%	33%	49%	48%
Lower River Hatch. (BON+CWF)	36%	36%	26%	37%
Lewis River Wild (LRW)	3%	3%	1%	2%
Willamette Spring (WSH)	1%	1%	2%	1%
Cowlitz Spring (CWS)	4%	5%	3%	3%
Upper Columbia Summer (SUM)	6%	6%	2%	4%
Snake River Wild (SRW)	1%	3%	2%	<1%

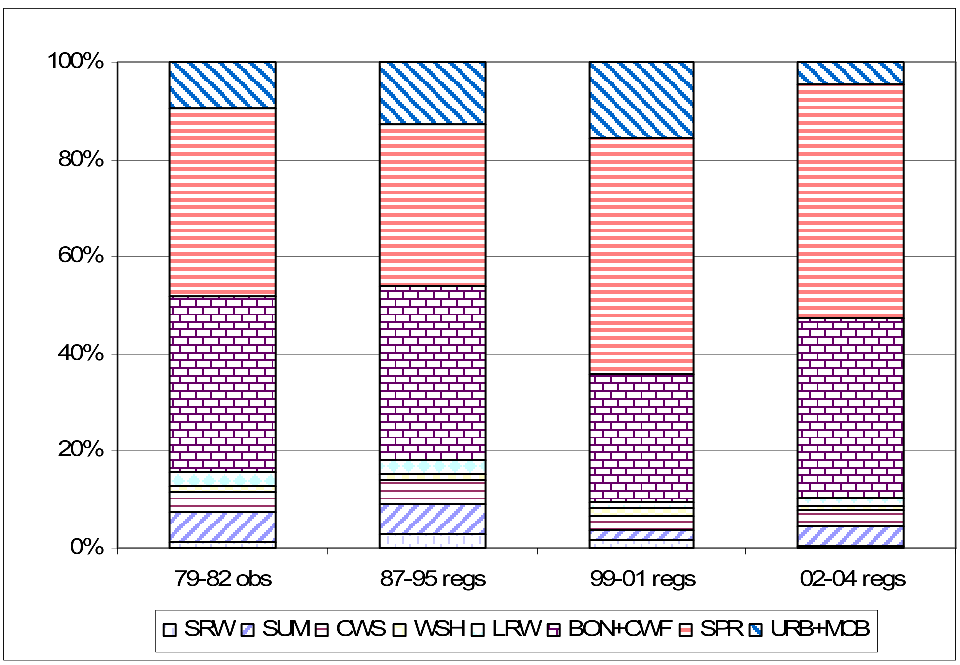

Figure 10-6. Expected WCVI troll composition of Columbia River stocks during fishing periods with differing temporal catch distribution, assuming base period stock abundances and distributions.

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Table 10-5 and Figure 10-7 show how the model base period catch stock composition of only the stocks originating in Puget Sound would have changed under the different temporal fishing patterns. Within this stock group, the relative impacts on individual stocks do not seem to change substantially as fishing patterns change for most stocks. The exception is the Snohomish stock, which shows much greater impacts under a fishing period like that observed in 1999-2001 compared to the other fishing periods.

Table 10-5. Expected WCVI troll composition of Puget Sound stocks during fishing periods with differing temporal catch distribution, assuming base period stock abundances and distributions.

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Stock	79-82	87-95	99-01	02-04
Nooksack Falls (NKF)	42%	42%	35%	41%
Puget Sound. Fing. (PSF)	21%	23%	21%	20%
Puget Sound. Natural (PSN)	14%	15%	14%	14%
Puget Sound. Yearling (PSY)	12%	9%	9%	13%
Nooksack Spring (NKS)	1%	1%	0%	1%
Skagit Summer/Fall (SKG)	6%	6%	8%	6%
Stillaguamish Summer/Fall (STL)	0%	0%	0%	0%
Snohomish (SNO)	4%	3%	12%	5%

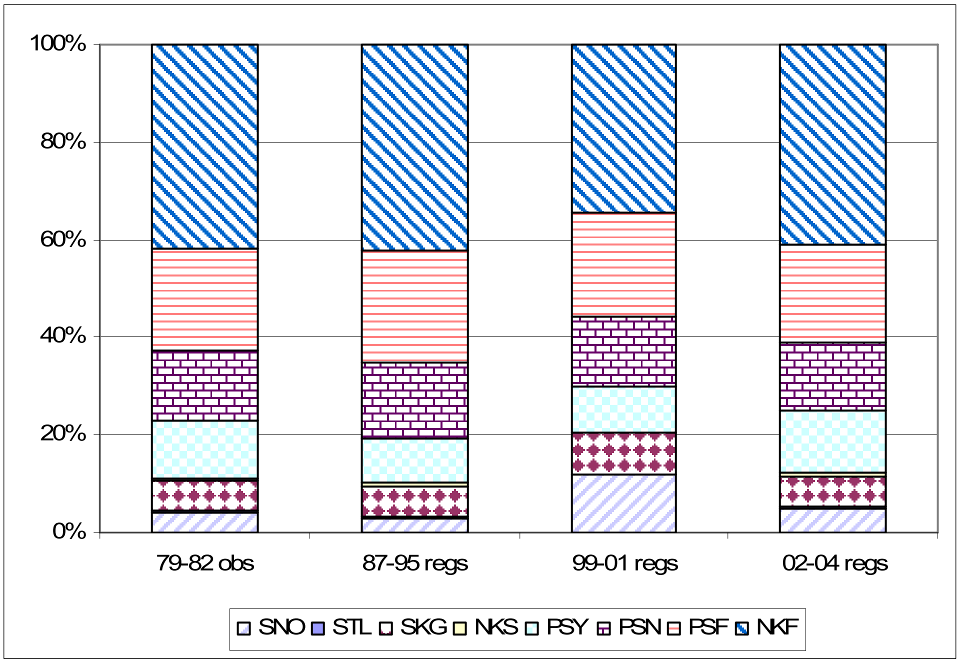

Figure 10-7. Expected WCVI troll composition of Puget Sound stocks during fishing periods with differing temporal catch distribution, assuming base period stock abundances and distributions.

Modification of PSC Chinook model inputs to account for temporal changes in fishing patterns.

A result of the analysis presented above is a straightforward method of adjusting the model stock specific exploitation rates to account for changes in temporal fishing patterns through the use of stock specific FPs.

From above, a new annual exploitation rate by stock and age based on an observed temporal fishing pattern is estimated in equations 5 and 6:

$$NewBPER_{s,a,f,y} = \sum_m \left(\frac{BPER_{s,a,f,m}}{BPCatch_{f,m}} * \frac{Catch_{y,m}}{\sum_m Catch_{y,m}} * BCatch_f \right) \quad (1)$$

The general equation used in the PSC Chinook model to estimate catch is

$$Catch_{s,a,f,y} = Cohort_{s,a,f,y} * PV_{a,f,y} * BPExpRate_{s,a,f,y} * FP_{s,a,f,y} \quad (2)$$

Where
a = age
$BPExpRate_{s,a,f,y}$ = Model base period observed Exploitation Rate on the vulnerable cohort
$Catch_{s,a,f,y}$ = model predicted catch
$Cohort_{s,a,f,y}$ = stock cohort size
f = fishery
$FP_{s,a,f,y}$ = A scalar that can be used to adjust the BPExpRates on a stock and age specific basis
$PV_{f,y}$ = Proportion of the cohort at age that is above the minimum size limit
y = year

If the FP in the above equation is defined as

$$FP_{s,a,f,y} = \frac{NewBPER_{s,a,f,y}}{BPExpRate_{s,a,f,y}} \quad (3)$$

then equation (3) can be substituted into equation (2) and we get

$$Catch_{s,a,f,y} = Cohort_{s,a,f,y} * PV_{f,y} * NewBPER_{s,a,f,y} \quad (4)$$

which reflects the stock catches that would occur under the new temporal fishing pattern.

The CTC intends to explore the potential use this modification of the FPs next year to more accurately model the WCVI troll fishery. This modification should result in more accurate abundance index predictions and more accurate stock specific impact predictions and will be useful in both PSC and domestic management. In future years, the CTC should develop stock specific FPs for the WCVI troll (and other fisheries) using observed CWT recovery data similar to the SPFI in current use for the SEAK troll fishery.

Analysis 2: Changes in Coded Wire Tag Concentration Indices for Stocks in Five Ocean Fisheries for 1979-2004.

Introduction

The Workgroup developed an index that reflects relative changes in encounter rates for individual stocks that were present in the NBC and WCVI troll fishery catches. Raw recoveries alone do not necessarily provide an accurate representation of whether a stock is being encountered more or less frequently in fishery catch. The number of stock-specific CWTs encountered in a fishery will vary with brood year survival and release numbers, as well as the total number of fish landed, all else being equal. The concentration statistic (equation 1), used in development of the index, represents an attempt to adjust recoveries to account for these variables and allow more meaningful inter-annual comparisons of individual stocks that contribute to a fishery catch. By accounting for release numbers, brood year survival, and catch levels, any changes in the concentration index can then be attributed to one or more of the following confounded factors:

1. Changes in the temporal and spatial conduct of the fishery.

2. Changes in fishery regulations, such as size limits.

3. Changes in stock distribution.

4. Changes in survival and abundance relative to other stocks.

It is impossible, however, to determine which confounded factor, or combination of factors, has caused the change in the index.

Tests were conducted to determine if there were statistically significant differences in average values of these indices between two time periods, 1979-1998 and 1999-2004. The latter period roughly represents the years during which some significant changes occurred in the conduct of Canadian AABM troll fisheries, in response to conservation concerns for some domestic stocks, as well as to provide better economic opportunity for fishers. The former period was used to represent a ‘base’ period. It was thought that these indices would provide quantitative measures of how stock encounters have changed in these fisheries between these two periods. We also examined several fisheries other than the WCVI and NBC troll, including the SEAK troll, Georgia St. sport and Washington/Oregon (WA/OR) troll. These other fisheries were thought to be more stable over time than the two Canadian troll fisheries, while intercepting stock groups similar to one or the other Canadian AABM fishery, and therefore might provide insights into the underlying causes of any observed changes in index values.

Methods

The Workgroup analyzed coded wire tag-recovery data from adipose-clipped Chinook caught from the years 1979 to 2004 (the data used for the 2005 Exploitation Rate Analysis).

A concentration statistic (*p*) representing stock contribution to a fishery was computed as follows:

$$p_{s,t} = \sum_{a=3}^{a=5} \frac{E_{s,t,a}}{S_{s,t-a} R_{s,t-a} C_t} \qquad (1)$$

where t is the current year of recovery (from 1979 to 2003, and for some stocks, to 2004), $E_{s,t,a}$ is the estimated number of recoveries by stock (s), age (a) and time (t) (i.e., the observed tag recoveries adjusted for sampling rate) in a fishery, $S_{(t-a)}$ is the associated brood year survival index (from CWT analysis) for stock (s) and age (a), $R_{s,t-a}$ is the number of releases for brood year (t-a) and stock (s), and C_t is the catch associated with that fishery in year (t).

The annual concentration index (I) is the concentration statistic scaled to the average value of the concentration index for a stock from 1979-1999, and is calculated as:

$$I_{s,t} = \frac{p_{s,t}}{\frac{\sum_{yr=1979}^{1998} p_{s,t}}{n}} \qquad (2)$$

where n is equal to the number of valid years where data is available from 1979-1998.

Data Selection Criteria Used in Calculating the Concentration Statistic

Only ages 3, 4 and 5 were used as very few other ages were recovered in these fisheries. In some years all three ages were recovered, while in other years recoveries were observed for only 2 of the age classes.

In addition, only recovery data for a stock from a given brood year were used if there were more than 10 estimated tag recoveries over all ages (3-5) in that fishery. This restriction was implemented to help reduce the occurrence of extreme index values related to small numbers of recoveries alone. However, for Robertson Creek Hatchery and Salmon River Hatchery, estimated tag recoveries were used for 1999 on, regardless of the number of recoveries, in the WCVI troll fishery only. This 10 tag restriction was relaxed for Robertson Creek because the WCVI troll fishery was deliberately shaped to avoid encounters of this stock in recent years, and thus low recoveries were more likely related to the shaping of the fishery rather than a change in stock abundance or distribution. Salmon River Hatchery fish have historically been encountered in large numbers in this fishery; and since post-1999 recoveries in other fisheries continued to remain strong, it was assumed that low numbers of recoveries of this stock in the WCVI troll fishery were a true effect and could possibly be explained by a change in fishery structure or a change in stock distribution.

Years in which the catch in a fishery was less than 10% of the average catch from 1979 to 2003 were excluded from the analysis of that fishery. This occurred in 1996 and 1998 for WCVI troll, and 1996 for NBC troll. In addition, the year 1999 was excluded from the WCVI analysis because catch for that year occurred exclusively in October, and thus was not thought to be representative of typical fishing patterns after 1998. Initially, only returns from completed brood years were included in the analyses. However, this resulted in the exclusion of a considerable amount of data from the post-1998 period, making it difficult to obtain sufficient data for comparison to the pre-1999 period. As a means of including these data, recoveries from incomplete broods (typically BYs 1997-2000) were assumed to have experienced the average survival rate of all completed broods for that stock, i.e. an average brood year survival index value of 1. This effectively removes the effects of brood year survival from the concentration statistic for recovery years 1999-2003. Consequently, concentration indices post-1998 could be biased high or low for many stocks, depending on whether actual brood year survival was higher or lower, respectively, than average.

Statistical Tests

Changes in the concentration index were evaluated by comparing the 1979-1998 period, except years with insufficient recoveries, to years after 1998 (1999 for the WCVI troll fishery).

Variance for p (Equation 1) is

$$\mathrm{var}(p) = \left(\frac{1}{n-1}\right)\sum_{l=1}^{n}\left(p_{s,t,f} - \overline{p}\right)^2 \qquad (3)$$

A t-test was used to assess statistical significance of differences in the average pre-1999 and post-1998 concentration indices for each stock:

$$t_{df,alpha=0.05(2)} = \frac{\hat{p}_{pre} - \hat{p}_{post}}{\sqrt{\left(SE(\hat{p}_{pre})\right)^2 + \left(SE(\hat{p}_{post})\right)^2}} \qquad (4)$$

Results

To make this statistic more comparable between stocks, each concentration statistic value was standardized to the average value for that stock for the pre-1999 period (equation 2), represented as the ‘base’ in Table 10-6 and ‘Pre-1999’ in Tables 10-7 to10-11. This meant that the resulting concentration index values for a stock would always average 1 for the pre-1999 period. Values greater than1 for the post-1999 period would indicate a higher encounter rate of a stock in a fishery, while a value less than 1 would indicate a lower encounter rate, relative to this ‘base’ period.

Table 10-6 illustrates how brood year releases, survival and catch affect the concentration statistic. It further illustrates that when these variables co-vary, the statistic does not necessarily change. By accounting for release numbers, brood year survival, and catch levels, any changes in the concentration index can then be attributed to one or more of the following confounded factors:

1. Changes in the temporal and spatial conduct of the fishery.

2. Changes in fishery regulations, such as size limits.

3. Changes in stock distribution.

4. Changes in survival and abundance relative to other stocks.

Table 10-6: Hypothetical example of factors effecting the concentration statistic and index.

Brood year	**Release**	**Survival**	**Estimated Recoveries**	**Total Catch**	**Concentration Statistic**	**Concentration Index**
Base	200,000	0.1	200	200,000	5.0E-08	1
Yr1	400,000	0.1	800	400,000	5.0E-08	1
Yr2	50,000	0.2	100	400,000	2.5E-08	0.5
Yr3	50,000	0.2	100	200,000	5.0E-08	1

There are a number of caveats that need to be considered when attempting to assess the significance of the results presented here for any particular stock:

- It was assumed that the effects of catch, brood year survival and brood release size were linear in nature. However, this may not be true, particularly for release sizes. For example, doubling release numbers may not double the number of subsequent recoveries; limits in carrying capacity of critical rearing habitat could reduce the effectiveness of increased release numbers. Thus, recoveries may be improperly adjusted for release size for some stocks.
- It is important to recognize that for the pre-1999 period, fishery conduct may have changed significantly on several occasions. For example, there have been several temporal changes in the conduct of the WCVI troll fishery from 1979-

1998 (see Assignment #3 for details). In addition, size limits changed in 1985 and 1999 in this fishery. Both temporal and size-limit changes would be expected to affect the numbers of recoveries of some stocks in landed catch. Since the years included pre-1999 varied among stocks due to the minimum tag recovery requirement, any changes in the index specific to fishery changes would be expected to vary among stocks, depending on the years included in the analysis. Consequently, comparing changes in the index among stocks should be done with caution. While dividing the pre-1999 period into several sub-periods was considered, doing so reduced sample sizes significantly, thus reducing the power of the statistical test used. Consequently, for this analysis, the pre-1999 period was not subdivided.

- As previously stated, changes in the concentration indices may have multiple causes (the confounded factors referred to above) whose individual influences cannot be quantified.

Figures 10-8 to10-16 illustrate the annual variability in CWT recoveries as well as the concentration indices for some stocks in the WCVI troll fishery. In some instances, as recoveries went up or down, so did the indices (e.g. Figures 10-10 and 10-16). However, for other stocks, increases or decreases in CWT recoveries did not result in a concomitant increase or decrease in the index values. This is because catches, brood year survivals or brood year releases may have concurrently changed. For example, for URBs (Figure 10-14), the index appears to be correlated with changes in CWT recoveries up to 1988. However, between 1989 and 1995, the concentration index continued to increase, even though total CWT recoveries declined. This can be explained by the fact that during these latter years, survival of contributing broods was significantly below average, while release numbers and catch levels were also low. Referring to equation 1, it can be seen how a combination of all three factors would serve to increase the concentration statistic, even if recoveries remained at the same level. This illustrates how increases or decreases in CWT recoveries alone do not necessarily reflect relative increases or decreases in encounter rates for a stock.

The fishery that exhibited the greatest changes in concentration indices amongst the stocks examined was the WCVI troll fishery (Figure 10-17), where the indices showed an increase for 16 of the 21 stocks with sufficient data (Table 10-7). The percentage change across these stocks averaged 137%. However, only four stocks showed a statistically significant increase (SKS, LRH, SPR, WSH; Figures 10-10, 10-11, 10-13. and 10-15), while two showed a significant decrease (URB, SRH; Figures 10-14 and 10-16). Of particular note was the >800% increase observed for Skagit Springs. However, it is worth noting that even such a large average increase was only significant at p=0.04 (Table 10-7). In fact, while the index increased for all Puget Sound stocks in this fishery, no other change in the index within this group was statistically significant. This is due at least in part to the generally high degree of variability among yearly index values (see CV values in Table 10-7) and the relatively few years of data available post-1999. Such variability was the norm rather than the exception for most stocks in all fisheries. For example, the Lyons Ferry stock showed a decrease in the index post-

1999, though this decrease was not statistically significant (Figure 10-12). Indices declined for the Robertson Cr. hatchery stock post-1999, though the decline was not statistically significant (Figure 10-9). This decline may reflect the management actions taken to reduce impacts of this fishery on WCVI stocks.

Sixteen stocks could be examined for the Georgia St. sport fishery, with all but three showing an increase in average index values (Table 10-8; Figure 10-18). Only one stock (GRN) showed a statistically significant increase. The percentage change across these stocks averaged 81% in this fishery. An equal number of the 16 stocks in the WA/OR troll fishery showed increases and decreases in the index (Table 10-9; Figure 10-19), with two stocks (NIS, SUM) showing statistically significant changes (decrease and increase, respectively). Interestingly, all but one Puget Sound stock showed a decrease in the index in this fishery. In the WA/OR troll fishery, the percentage change across the 16 stocks examined averaged 52%.

In the two northern fisheries examined, the SEAK troll fishery showed the greatest number of significant changes among the 20 stocks with sufficient data (Table 10-11; Figure 10-20). Four stocks showed a statistically significant increase (QUE, SOO, LRW, and SRH), while two showed a significant decrease (ACI and RBT). The percentage change across these stocks averaged 47%. By comparison, there were fewer significant changes observed among the 15 stocks examined for the NBC troll (Table 10-10; Figure 10-21), where indices for only two stocks (QUE, SUM) showed statistically significant changes. The percentage change across these stocks averaged 66% across the 15 stocks examined.

Considering the average absolute percentage change among all stocks, the SEAK, WA/OR and NBC troll fisheries experienced the least amount of change in indices, while the WCVI troll and GS sport fisheries experienced the most. The average absolute percentage change amongst all stocks examined was 47%, 55%, 66%, 81% and 137% for the SEAK troll, WA/OR troll, GS sport and WCVI troll fisheries respectively. Looking at the same statistic for only stocks with significant changes, the SEAK (68%), WA/OR (78%), and GS sport fisheries (76%) showed the least amount of change, while the WCVI (207%) and NBC troll (107%) fisheries showed the most. Considering the proportion of stocks in each fishery with significant differences, the SEAK and WCVI fisheries showed the largest (30% and 29% respectively, with NBC troll, GS sport, and WA/OR troll showing the least (13%, 13%, and 6%, respectively).

Comparisons across fisheries reveal some interesting trends. Increases in the concentration index were observed among Puget Sound stocks in both the WCVI troll and Georgia St. sport fisheries (Table 10-12). Conversely, indices for this stock group tended to decrease in the WA/OR troll. The indices for Upper Columbia River summers (SUM) increased in all five fisheries, significantly so in the NBC and WA/OR troll fisheries. Conversely, Lyons Ferry indices decreased in all but one fishery (NBC troll), though none of the changes were statistically significant.

Summary/Conclusions

Bearing in mind the previously mentioned cautions and caveats regarding interpretation of the concentration index data presented, some general conclusions can be drawn from this analysis. Statistically significant changes in the concentration index were observed for some stocks in ‘stable’ fisheries, such as the SEAK troll fishery and the Georgia St. sport fishery, suggesting that there have been significant fluctuations in stock distribution and/or relative abundances of stocks through the years. This suggests that stock dynamics can significantly change standardized encounter rates in a fishery from year to year, whether concurrent changes in fishery conduct occurred or not.

The degree of observed changes in concentration indices across a broad range of stocks intercepted in the WCVI troll fishery, suggests that changes in the conduct of this fishery have led to changes in impact on some stocks. This may be particularly true for Puget Sound stocks. However, quantifying these impacts using CWT recovery data is problematic for all of the reasons previously discussed. It is also noteworthy that impacts of this fishery on other stocks of concern, such as Snake River falls, may have decreased, as corroborated by the exploitation rate analysis data presented in Section 7.

Over all the stocks examined, the NBC troll fishery experienced a similar degree of change in indices among stocks as the SEAK troll fishery. While the more ‘stable’ SEAK troll fishery showed the least overall changes among all stocks examined, proportionally more stocks showed significant changes in this fishery compared to the NBC troll fishery. As mentioned above, stock dynamics may be at least partially responsible for the observed changes in concentration indices in the NBC troll fishery. However, due to the emerging nature of this analysis, these results should be viewed with caution.

Table 10-7. Concentration indices and statistics for stocks intercepted in the WCVI troll fishery. The t-test was performed on the difference between the average pre-1999 and post-1999 index values. CV=coefficient of variation. Statistically significant differences at p<0.05 are indicted in bold font. See CTC (2004) for more stock specific details.

	Stock			Index				No. of Years		Statistics		% change
Region	Stock Acronym	Stock Name	Run Type	Average Pre - 1999	CV	Post-1999	CV	79-98	99-04	t-statistic	p-value	Pre-98 to Post-99
Alaska	ACI	Central Inside	SPR					0	0			
Alaska	ALP	Little Port Walter	SPR					0	0			
Alaska	ASI	South East Inside	SPR					0	0			
NBC	KLM	Kitsumkalum	SUM					0	0			
Georgia St	QUI	Quinsam	FALL		0.45			2	0			
Georgia St	PPS	Puntledge	FALL		0.68			4	0			
Georgia St	BQR	Big Qualicum River	FALL		0.83			12	0			
Georgia St	COW	Cowichan	FALL	1.00	0.75	3.14	1.04	8	5	-1.4392915	0.22	214%
Fraser	CHI	Chilliwack	FALL	1.00	0.63	0.87	0.34	13	5	0.61470277	0.55	-13%
WCVI	RBT	Robertson Creek	FALL	1.00	0.72	0.44	2.21	17	5	1.20465605	0.28	-56%
Olympic	ELW	Elwah	FALL		0.96			8	0			
Olympic	HOK	Hoko	FALL		0.38			8	1			
Olympic	QUE	Queets	FALL		0.51			12	1			
PS/HC	GAD	George Adams	FALL	1.00	0.90	2.57	0.67	14	5	-1.9363732	0.11	157%
PS/HC	GRN	Green	FALL	1.00	0.58	1.41	0.70	15	5	-0.8787233	0.42	41%
PS/HC	GRO	Grovers	FALL	1.00	0.50	1.97	0.51	13	5	-2.0616353	0.09	97%
PS/HC	ISS	Issaquah	FALL		0.76			9	0			
PS/HC	NIS	Nisqually	FALL	1.00	0.43	2.09	1.25	14	4	-0.8324122	0.47	109%
PS/HC	NKS	Nooksack Spring Yearling	SPR		0.83			5	0			
PS/HC	NSF	Nooksack Spring Fingerling	SPR	1.00	0.80	2.52	0.60	4	5	-1.928372	0.10	152%
PS/HC	SAM	Samish	FALL	1.00	0.64	3.10	0.97	14	5	-1.5535214	0.20	210%
PS/HC	SKF	Skagit Spring Fingerling	SPR	1.00	0.36	1.52	0.28	2	3	-1.4838178	0.23	52%
PS/HC	**SKS**	**Skagit Spring Yearling**	**SPR**	**1.00**	**0.76**	**9.69**	**0.33**	**6**	**3**	**-4.6601656**	**0.04**	**869%**
PS/HC	SOO	Sooes	FALL		0.92			6	0			
PS/HC	SPY	South Puget Sound Yearling	FALL		0.78			6	0			
PS/HC	SQP	Squaxin Pen	FALL		0.90			5	0			
PS/HC	SSF	Skagit Summer Fingerling	SUM				0.77	0	5			
PS/HC	STL	Stillaguamish	FALL		0.40			11	0			
PS/HC	UWA	University of Washington	FALL		0.42			7	0			
PS/HC	WRY	White River	SPR		0.95			2	0			
Columbia	CWF	Cowlitz	FALL	1.00	0.32	1.15	0.57	13	3	-0.3960471	0.73	15%
Columbia	HAN	Hanford	FALL	1.00	0.49	1.68	0.13	6	2	-2.6622618	0.06	68%
Columbia	**LRH**	**Lower River Hatchery**	**FALL**	**1.00**	**0.78**	**2.04**	**0.19**	**16**	**5**	**-3.9905651**	**0.00**	**104%**
Columbia	LRW	Lewis River Wild	FALL	1.00	0.65	1.86	0.62	14	4	-1.4264399	0.23	86%
Columbia	LYF	Lyons Ferry	FALL	1.00	0.62	0.50	0.59	9	3	1.89274106	0.10	-50%
Columbia	**SPR**	**Spring Creek**	**FALL**	**1.00**	**0.65**	**1.84**	**0.36**	**18**	**5**	**-2.5418664**	**0.04**	**84%**
Columbia	SUM	Upper Columbia Summer	SUM	1.00	0.39	3.49	0.70	10	5	-2.2654355	0.09	249%
Columbia	**URB**	**Upriver Bright Columbia**	**FALL**	**1.00**	**0.59**	**0.36**	**0.73**	**17**	**4**	**3.27090934**	**0.01**	**-64%**
Columbia	**WSH**	**Willamette**	**SPR**	**1.00**	**0.55**	**2.06**	**0.40**	**15**	**5**	**-2.6828146**	**0.04**	**106%**
Oregon Coast	**SRH**	**Salmon River Hatchery**	**FALL**	**1.00**	**0.87**	**0.29**	**1.30**	**16**	**5**	**2.59683887**	**0.02**	**-71%**

Table 10-8 Concentration indices and statistics for stocks intercepted in the Georgia St. sport fishery. The t-test was performed on the difference between the average pre-1999 and post-1999 index values. CV=coefficient of variation. Statistically significant differences at p<0.05 are indicted in bold font. See CTC (2004) for more stock specific details.

	Stock			Index				No. of years		Statistics		% change
Region	**Acronym**	**Name**	**Run Type**	**Average Pre -1999**	**CV**	**Average Post-1998**	**CV**	**79-98**	**99-04**	**t-statistic**	**p-value**	**Pre-99 to Post-98**
Alaska	ACI	Central Inside	SPR					0	0			
Alaska	ALP	Little Port Walter	SPR					0	0			
Alaska	ASI	South East Inside	SPR					0	0			
NBC	KLM	Kitsumkalum	SUM					0	0			
Georgia St	QUI	Quinsam	FALL	1.00	0.99	0.82	0.74	20	4	0.4747095	0.64	-18%
Georgia St	PPS	Puntledge	FALL	1.00	1.05	1.08	0.92	17	5	0.1489763	0.88	8%
Georgia St	BQR	Big Qualicum River	FALL	1.00	0.72	0.73	0.80	20	5	0.8717518	0.39	-27%
Georgia St	COW	Cowichan	FALL	1.00	0.59		0.93	12	6	0.4055031	0.69	20%
Fraser	CHI	Chilliwack	FALL	1.00	0.41	1.36	0.86	16	6	0.7468224	0.46	36%
WCVI	RBT	Robertson Creek	FALL	1.00	0.95	5.27	1.20	15	4	1.3461273	0.20	427%
Olympic	ELW	Elwah	FALL		0.72			4	0			
Olympic	HOK	Hoko	FALL				0.50	0	3			
Olympic	QUE	Queets	FALL					0	0			
PS/HC	GAD	George Adams	FALL	1.00	1.07		0.84	14	5	1.5800356	0.13	163%
PS/HC	**GRN**	**Green**	**FALL**	**1.00**	**0.89**	**1.76**	**0.36**	**18**	**5**	**2.1663076**	**0.04**	**76%**
PS/HC	GRO	Grovers	FALL	1.00	0.72		0.54	14	6	1.2579167	0.22	48%
PS/HC	ISS	Issaquah	FALL		0.84			9	0			
PS/HC	NIS	Nisqually	FALL	1.00	0.68		0.53	13	3	0.9734971	0.35	-28%
PS/HC	NKS	Nooksack Spring Yearling	SPR		0.69			13	0			
PS/HC	NSF	Nooksack Spring Fingerling	SPR	1.00	0.67	1.93	1.24	7	5	0.8437606	0.42	93%
PS/HC	SAM	Samish	FALL		0.84	2.12	0.62	16	5	1.7949727	0.09	112%
PS/HC	SKF	Skagit Spring Fingerling	SPR		0.99	1.21	0.80	4	4	0.2989196	0.78	21%
PS/HC	SKS	Skagit Spring Yearling	SPR		0.74		0.91	13	6	1.4553601	0.16	127%
PS/HC	SOO	Sooes	FALL					1	0			
PS/HC	SPY	South Puget Sound Yearling	FALL		0.51			3	0			
PS/HC	SQP	Squaxin Pen	FALL		0.74			3	0			
PS/HC	SSF	Skagit Summer Fingerling	SUM				0.51	0	5			
PS/HC	STL	Stillaguamish	FALL		0.34			13	0			
PS/HC	UWA	University of Washington	FALL		0.28			6	0			
PS/HC	WRY	White River	SPR		1.28			4	0			
Columbia	CWF	Cowlitz	FALL					0	0			
Columbia	HAN	Hanford	FALL					0	0			
Columbia	LRH	Lower River Hatchery	FALL		0.88			9	0			
Columbia	LRW	Lewis River Wild	FALL					0	0			
Columbia	LYF	Lyons Ferry	FALL					0	0			
Columbia	SPR	Spring Creek	FALL	1.00	0.59		0.52	7	2	0.9823217	0.36	63%
Columbia	SUM	Upper Columbia Summer	SUM	1.00	0.45	1.32	1.41	2	3	0.2833752	0.80	32%
Columbia	URB	Upriver Bright Columbia	FALL					1	0			
Columbia	WSH	Willamette	SPR		1.41			2	0			
Oregon Coast	SRH	Salmon River Hatchery	FALL					0	0			

Table 10-9. Concentration indices and statistics for stocks intercepted in the WA/OR troll fishery. The t-test was performed on the difference between the average pre-1999 and post-1999 index values. CV=coefficient of variation. Statistically significant differences at $p<0.05$ are indicted in bold font. See CTC (2004) for more stock specific details.

	Stock			Index				No. of years		Statistics		% change
Region	**Acronym**	**Name**	**Run Type**	**Average Pre -1999**	**CV**	**Average Post-1998**	**CV**	**79-98**	**99-04**	**t-statistic**	**p-value**	**Pre-99 to Post-98**
Alaska	ACI	Central Inside	SPR					0	0			
Alaska	ALP	Little Port Walter	SPR					0	0			
Alaska	ASI	South East Inside	SPR					0	0			
NBC	KLM	Kitsumkalum	SUM					0	0			
Georgia St	QUI	Quinsam	FALL					0	0			
Georgia St	PPS	Puntledge	FALL					0	0			
Georgia St	BQR	Big Qualicum River	FALL					0	0			
Georgia St	COW	Cowichan	FALL		0.67			4	0			
Fraser	CHI	Chilliwack	FALL	1.00	0.72	1.54	0.58	14	6	1.3059007	0.21	54%
WCVI	RBT	Robertson Creek	FALL					0	0			
Olympic	ELW	Elwah	FALL		1.28			3	0			
Olympic	HOK	Hoko	FALL					0	0			
Olympic	QUE	Queets	FALL					0	0			
PS/HC	GAD	George Adams	FALL	1.00	0.86		0.57	10	6	0.6129718	0.55	-20%
PS/HC	GRN	Green	FALL	1.00	0.66	1.14	1.09	14	5	0.2399328	0.81	14%
PS/HC	GRO	Grovers	FALL	1.00	0.50		0.65	11	5	1.5048658	0.15	-36%
PS/HC	ISS	a	FALL		0.68			7	0			
PS/HC	**NIS**	**Nisqually**	**FALL**	**1.00**	**0.65**		**0.48**	**9**	**4**	**2.3595497**	**0.04**	**-56%**
PS/HC	NKS	Nooksack Spring Yearling	SPR					0	0			
PS/HC	NSF	Nooksack Spring Fingerling	SPR	1.00	0.48	0.59	0.09	2	2	1.2013968	0.35	-41%
PS/HC	SAM	Samish	FALL	1.00	0.96	0.50	0.89	12	3	1.3339882	0.21	-50%
PS/HC	SKF	Skagit Spring Fingerling	SPR					0	0			
PS/HC	SKS	Skagit Spring Yearling	SPR		0.52			5	1			
PS/HC	SOO	Sooes	FALL					0	0			
PS/HC	SPY	South Puget Sound Yearling	FALL		0.71			3	0			
PS/HC	SQP	Squaxin Pen	FALL		0.64			5	0			
PS/HC	SSF	Skagit Summer Fingerling	SUM					0	0			
PS/HC	STL	Stillaguamish	FALL		0.57			5	0			
PS/HC	UWA	University of Washington	FALL		0.68			6	0			
PS/HC	WRY	White River	SPR		0.45			6	0			
Columbia	CWF	Cowlitz	FALL	1.00	0.77	2.14	0.68	15	6	1.8177262	0.08	114%
Columbia	HAN	Hanford	FALL			0.44		1	1			
Columbia	LRH	Lower River Hatchery	FALL	1.00	0.43		0.47	16	5	1.1064969	0.28	33%
Columbia	LRW	Lewis River Wild	FALL	1.00	0.33	2.61	0.54	11	3	1.9604932	0.07	161%
Columbia	LYF	Lyons Ferry	FALL	1.00	0.67	0.66	0.45	8	4	1.2065672	0.26	-34%
Columbia	SPR	Spring Creek	FALL	1.00	0.46		0.49	18	6	1.7161521	0.10	57%
Columbia	SUM	Upper Columbia Summer	SUM	1.00	0.36	2.00	0.45	8	6	2.5581322	0.03	100%
Columbia	URB	Upriver Bright Columbia	FALL	1.00	0.45	1.38	0.90	8	4	0.5962505	0.5643	38%
Columbia	WSH	Willamette	SPR	1.00	0.70	0.63	0.77	13	5	1.2508719	0.229	-37%
Oregon Coast	SRH	Salmon River Hatchery	FALL	1.00	1.19	0.61	0.74	9	4	0.8528703	0.4119	-39%

Table 10-10. Concentration indices and statistics for stocks intercepted in the NBC troll fishery. The t-test was performed on the difference between the average pre-1999 and post-1999 index values. CV=coefficient of variation. Statistically significant differences at p<0.05 are indicted in bold font. See CTC (2004) for more stock specific details.

	Stock			Index				No. of years		Statistics		% change
Region	Acronym	Name	Run type	Average Pre -1999	CV	Average Post-1998	CV	79-98	99-04	t-statistic	p-value	Pre-99 to Post-98
Alaska	ACI	Central Inside	SPR					0	0			
Alaska	ALP	Little Port Walter	SPR		1.03			4	1			
Alaska	ASI	South East Inside	SPR	1.00	0.74	1.80	0.83	12	2	0.74630006	0.47	80%
NBC	KLM	Kitsumkalum	SUM	1.00	0.59	1.24	0.58	10	3	0.53487639	0.60	24%
Georgia St	QUI	Quinsam	FALL		0.65			18	1			
Georgia St	PPS	Puntledge	FALL	1.00	0.63			7	0			
Georgia St	BQR	Big Qualicum River	FALL	1.00	0.64	1.07	1.25	14	2	0.06843873	0.95	7%
Georgia St	COW	Cowichan	FALL					1	1			
Fraser	CHI	Chilliwack	FALL		0.59			4	1			
WCVI	RBT	Robertson Creek	FALL	1.00	0.34	0.67	0.85	19	4	1.12944717	0.27	-33%
Olympic	ELW	Elwah	FALL	1.00	0.19			5	0			
Olympic	HOK	Hoko	FALL	1.00	0.69	1.73	0.37	9	4	1.84372352	0.09	73%
Olympic	**QUE**	**Queets**	**FALL**	**1.00**	**0.66**	**1.68**	**0.32**	**16**	**4**	**2.15953517**	**0.04**	**68%**
PS/HC	GAD	George Adams	FALL					0	1			
PS/HC	GRN	Green	FALL	1.00	0.37	1.05	0.77	2	2	0.07901927	0.94	5%
PS/HC	GRO	Grovers	FALL				0.61	1	3			
PS/HC	ISS	Issaquah	FALL					1	0			
PS/HC	NIS	Nisqually	FALL					0	0			
PS/HC	NKS	Nooksack Spring Yearling	SPR					0	0			
PS/HC	NSF	Nooksack Spring Fingerling	SPR				0.16	1	2			
PS/HC	SAM	Samish	FALL		0.60			3	1			
PS/HC	SKF	Skagit Spring Fingerling	SPR			1.00		0	0			
PS/HC	SKS	Skagit Spring Yearling	SPR					0	1			
PS/HC	SOO	Sooes	FALL	1.00	0.78	1.88	0.51	7	3	1.41083069	0.20	88%
PS/HC	SPY	South Puget Sound Yearling	FALL					0	0			
PS/HC	SQP	Squaxin Pen	FALL					0	0			
PS/HC	SSF	Skagit Summer Fingerling	SUM			1.00	0.76	0	3			
PS/HC	STL	Stillaguamish	FALL					1	0			
PS/HC	UWA	University of Washington	FALL					1	0			
PS/HC	WRY	White River	SPR					0	0			
Columbia	CWF	Cowlitz	FALL		0.49			6	1			
Columbia	HAN	Hanford	FALL	1.00	0.42	3.07	0.83	8	4	1.60393742	0.14	207%
Columbia	LRH	Lower River Hatchery	FALL					1	0			
Columbia	LRW	Lewis River Wild	FALL	1.00	0.67	1.45	0.80	15	2	0.54180896	0.60	45%
Columbia	LYF	Lyons Ferry	FALL	1.00	0.54	1.66	0.86	8	3	0.78301795	0.45	66%
Columbia	SPR	Spring Creek	FALL					0	0			
Columbia	**SUM**	**Upper Columbia Summer**	**SUM**	**1.00**	**0.55**	**2.46**	**0.48**	**7**	**4**	**2.32943745**	**0.04**	**146%**
Columbia	URB	Upriver Bright Columbia	FALL	1.00	0.35	0.67	0.90	19	4	1.06786437	0.30	-33%
Columbia	WSH	Willamette	SPR	1.00	0.92	0.50	0.78	18	3	1.59007649	0.13	-50%
Oregon Coast	SRH	Salmon River Hatchery	FALL	1.00	0.36	1.66	0.65	18	5	1.34603314	0.19	66%

Table 10-11. Concentration indices and statistics for stocks intercepted in the SEAK troll fishery. The t-test was performed on the difference between the average pre-1999 and post-1999 index values. CV=coefficient of variation. Statistically significant differences at p<0.05 are indicted in bold font. See CTC (2004) for more stock specific details.

	Stock			Index				No. of years		Statistics		% change
Region	Acronym	Name	Run Type	Average Pre -1999	CV	Average Post-1998	CV	79-98	99-04	t-statistic	p-value	Pre-99 to Post-98
Alaska	**ACI**	**Central Inside**	**SPR**	**1.00**	**0.53**	**0.40**	**0.69**	**16**	**6**	**3.4265873**	**0.00**	**-60%**
Alaska	ALP	Little Port Walter	SPR	1.00	0.59	0.75	0.79	17	6	0.88584207	0.39	-25%
Alaska	ASI	South East Inside	SPR	1.00	0.62	0.79	0.56	17	6	0.87169308	0.39	-21%
NBC	KLM	Kitsumkalum	SUM	1.00	0.68	1.09	0.21	15	6	0.45922874	0.65	9%
Georgia St	QUI	Quinsam	FALL	1.00	0.45	0.87	0.76	20	6	0.44385106	0.66	-13%
Georgia St	PPS	Puntledge	FALL	1.00	1.22	0.42	1.12	4	3	0.86669924	0.43	-58%
Georgia St	BQR	Big Qualicum River	FALL	1.00	0.64	1.88	0.89	17	6	1.26088823	0.22	88%
Georgia St	COW	Cowichan	FALL		1.05			2	0			
Fraser	CHI	Chilliwack	FALL		0.44			4	1			
WCVI	**RBT**	**Robertson Creek**	**FALL**	**1.00**	**1.00**	**0.41**	**0.53**	**20**	**6**	**2.46198824**	**0.02**	**-59%**
Olympic	ELW	Elwah	FALL		0.44			4	0			
Olympic	HOK	Hoko	FALL	1.00	0.53	1.09	0.18	10	6	0.51200912	0.62	9%
Olympic	**QUE**	**Queets**	**FALL**	**1.00**	**0.47**	**1.35**	**0.24**	**18**	**6**	**2.03305958**	**0.05**	**35%**
PS/HC	GAD	George Adams	FALL					0	1			
PS/HC	GRN	Green	FALL					1	1			
PS/HC	GRO	Grovers	FALL					0	0			
PS/HC	ISS	Issaquah	FALL					0	0			
PS/HC	NIS	Nisqually	FALL					0	0			
PS/HC	NKS	Nooksack Spring Yearling	SPR					0	0			
PS/HC	NSF	Nooksack Spring Fingerling	SPR	1.00	0.23	0.47	1.07	3	5	2.01177472	0.09	-53%
PS/HC	SAM	Samish	FALL		0.91			3	1			
PS/HC	SKF	Skagit Spring Fingerling	SPR				0.81	1	3			
PS/HC	SKS	Skagit Spring Yearling	SPR					1	0			
PS/HC	**SOO**	**Sooes**	**FALL**	**1.00**	**0.46**	**2.28**	**0.24**	**10**	**5**	**4.4282951**	**0.00**	**128%**
PS/HC	SPY	South Puget Sound Yearling	FALL					0	0			
PS/HC	SQP	Squaxin Pen	FALL					0	0			
PS/HC	SSF	Skagit Summer Fingerling	SUM				0.92	1	6			
PS/HC	STL	Stillaguamish	FALL	1.00	0.38	1.15		4	1			
PS/HC	UWA	University of Washington	FALL					0	0			
PS/HC	WRY	White River	SPR					0	0			
Columbia	CWF	Cowlitz	FALL	1.00	0.59	0.97	0.02	11	2	0.18015751	0.86	-3%
Columbia	HAN	Hanford	FALL	1.00	0.48	1.32	0.32	9	6	1.3751721	0.19	32%
Columbia	LRH	Lower River Hatchery	FALL					0	0			
Columbia	**LRW**	**Lewis River Wild**	**FALL**	**1.00**	**0.57**	**1.64**	**0.29**	**15**	**4**	**2.3086037**	**0.03**	**64%**
Columbia	LYF	Lyons Ferry	FALL	1.00	0.94	0.72	1.07	7	4	0.54544974	0.60	-28%
Columbia	SPR	Spring Creek	FALL					0	0			
Columbia	SUM	Upper Columbia Summer	SUM	1.00	1.53	2.20	0.73	12	6	1.51243521	0.15	120%
Columbia	URB	Upriver Bright Columbia	FALL	1.00	0.46	1.50	1.23	20	6	0.65141893	0.52	50%
Columbia	WSH	Willamette	SPR	1.00	0.61	0.75	0.49	20	6	1.21440877	0.24	-25%
Oregon Coast	**SRH**	**Salmon River Hatchery**	**FALL**	**1.00**	**0.45**	**1.67**	**0.31**	**19**	**6**	**2.85464051**	**0.01**	**67%**

Table 10-12. Relative differences in average pre-1999 and post-1998 concentration indices ((post-pre)/pre) for the five fisheries examined.

Region	Stock	Name	SEAK Troll	NTR Troll	WCVI Troll	GS Sport	WAOR Troll
Alaska	ACI	Central Inside	**-60%**				
Alaska	ALP	Little Port Walter	-25%				
Alaska	ASI	South East Inside	-21%	80%			
NBC	KLM	Kitsumkalum	9%	24%			
Georgia St	QUI	Quinsam	-13%			-18%	
Georgia St	PPS	Puntledge	-58%			8%	
Georgia St	BQR	Big Qualicum River	88%	7%		-27%	
Georgia St	COW	Cowichan			214%	20%	
Fraser	CHI	Chilliwack			-13%	36%	54%
WCVI	RBT*	Robertson Creek	**-59%**	-33%	-56%	427%	
Olympic	ELW	Elwah					
Olympic	HOK	Hoko	9%	73%			
Olympic	QUE	Queets	**35%**	**68%**			
PS/HC	GAD	George Adams			157%	163%	-20%
PS/HC	GRN	Green		5%	41%	**76%**	14%
PS/HC	GRO	Grovers			97%	48%	-36%
PS/HC	ISS	Issaquah					
PS/HC	NIS	Nisqually			109%	-28%	**-56%**
PS/HC	NKS	Nooksack Spring Yearling					
PS/HC	NSF	Nooksack Spring Fingerling	-53%		152%	93%	-41%
PS/HC	SAM	Samish			210%	112%	-50%
PS/HC	SKF	Skagit Spring Fingerling			52%	21%	
PS/HC	SKS	Skagit Spring Yearling			**869%**	127%	
PS/HC	SOO	Sooes	**128%**	88%			
PS/HC	SPY	South Puget Sound Yearling					
PS/HC	SQP	Squaxin Pen					
PS/HC	SSF	Skagit Summer Fingerling					
PS/HC	STL	Stillaguamish					
PS/HC	UWA	University of Washington					
PS/HC	WRY	White River					
Columbia	CWF	Cowlitz	-3%		15%		114%
Columbia	HAN	Hanford	32%	207%	69%		
Columbia	LRH	Lower River Hatchery			**105%**		33%
Columbia	LRW	Lewis River Wild	**64%**	45%	87%		161%
Columbia	LYF	Lyons Ferry	-28%	66%	-50%		-34%
Columbia	SPR	Spring Creek			**84%**	63%	57%
Columbia	SUM	Upper Columbia Summer	120%	**146%**	249%	32%	**100%**
Columbia	URB	Upriver Bright Columbia	50%	-33%	**-64%**		38%
Columbia	WSH	Willamette	-25%	-50%	**106%**		-37%
Oregon Coast	SRH*	Salmon River Hatchery	**67%**	66%	**-71%**		-39%

(grey)	=increase in concentration index relative to pre-1999 period; bold font indicates difference is statistically dif P<0.05.
(cyan)	=decline in concentration Index relative to pre-1999 period; bold font indicates difference is statistically diffe p<0.05.

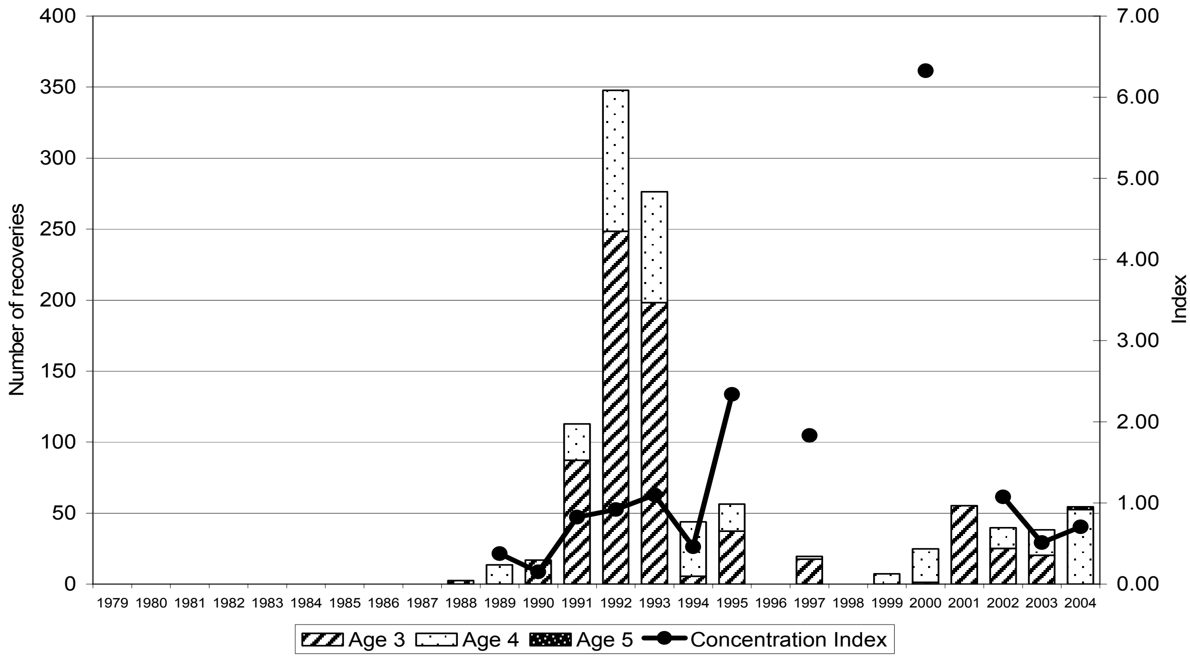

Table 10-8. Relationship between annual estimated CWT recoveries by age and concentration indices for Cowichan fall Chinook in the WCVI troll
fishery.

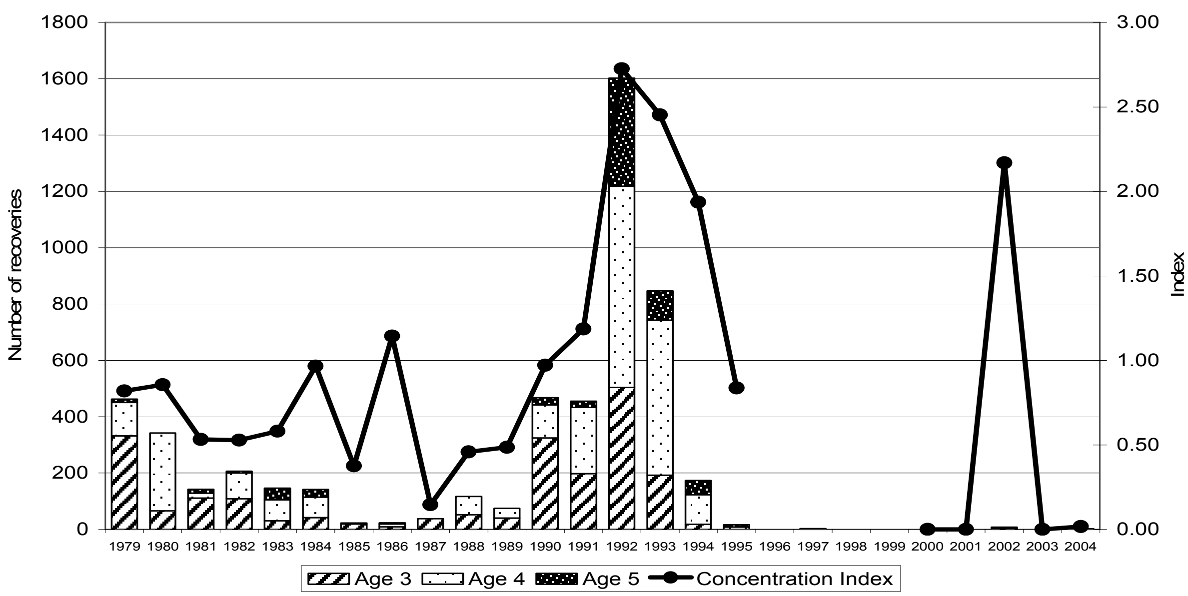

Figure 10-9. Relationship between annual estimated CWT recoveries by age and concentration indices for Robertson Creek Hatchery fall Chinook in the WCVI troll fishery.

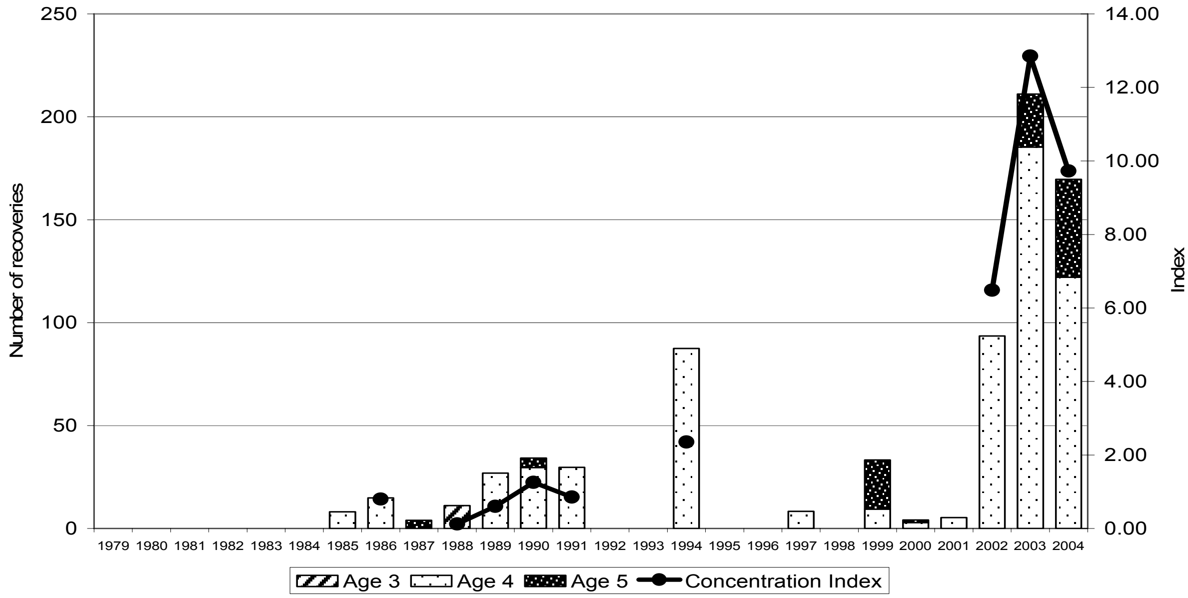

Figure 10-10. Relationship between annual estimated CWT recoveries by age, and concentration indices for Skagit Spring Yearling Chinook in the WCVI troll fishery.

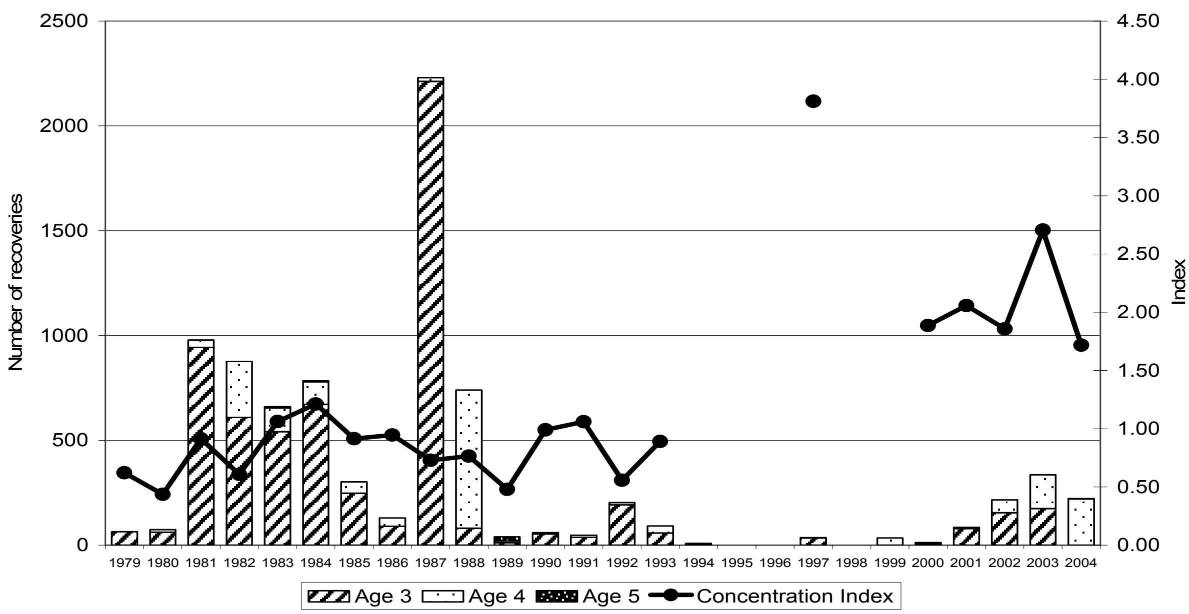

Figure 10-11. Relationship between annual estimated CWT recoveries by age and concentration indices for Columbia River Lower River Hatchery fall Chinook in the WCVI troll fishery.

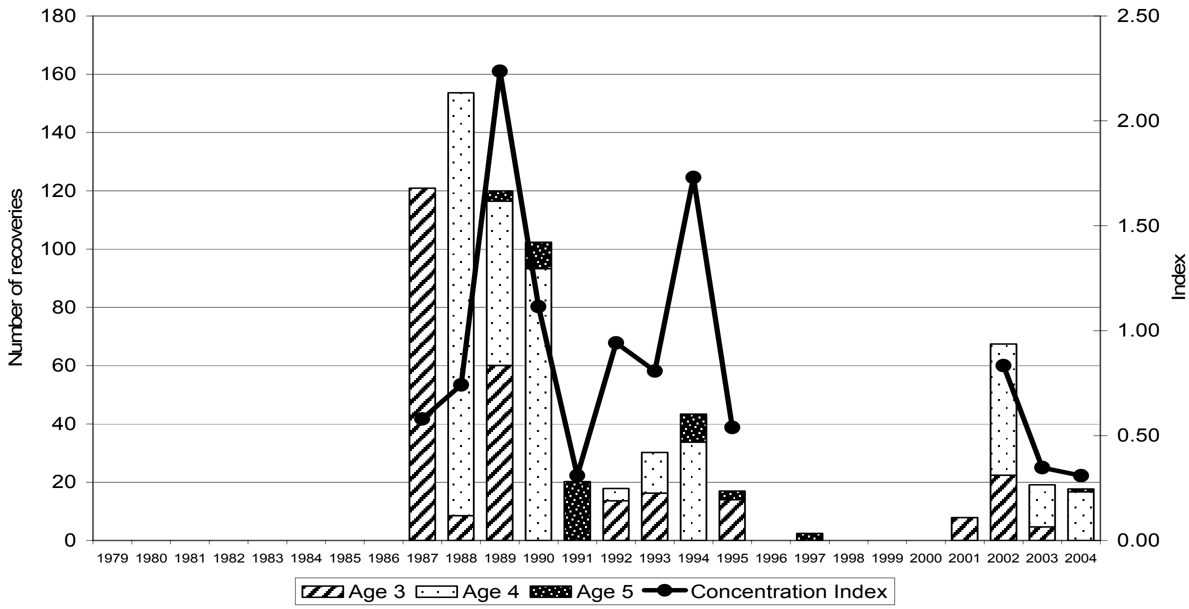

Figure 10-12. Relationship between annual estimated CWT recoveries by age and concentration indices for Lyons Ferry fall Chinook in the WCVI troll fishery.

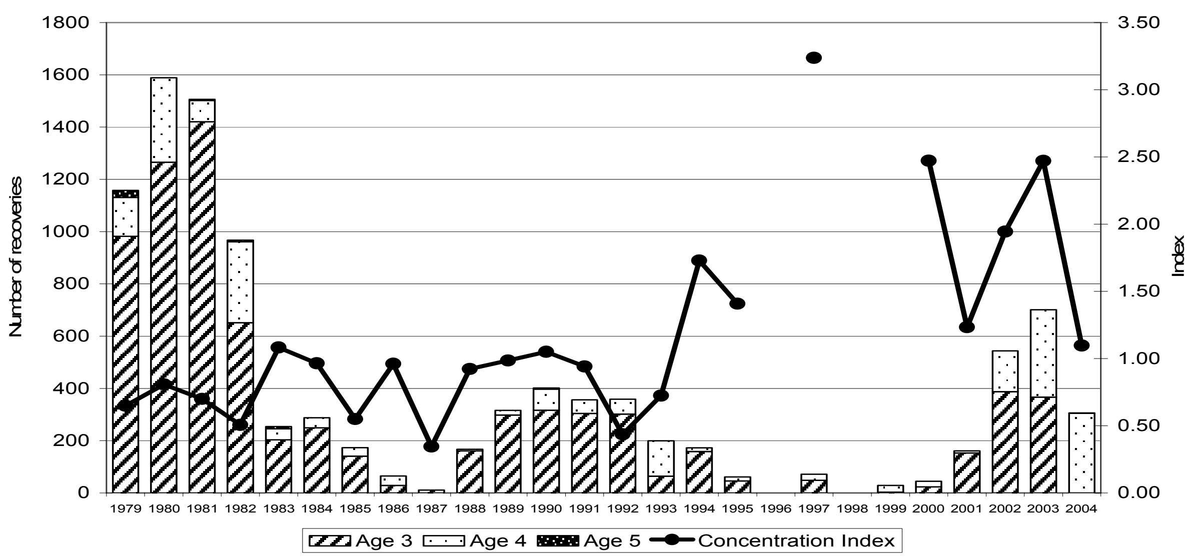

Figure 10-13. Relationship between annual estimated CWT recoveries by age and concentration indices for Spring Creek Hatchery fall Chinook in the WCVI fishery.

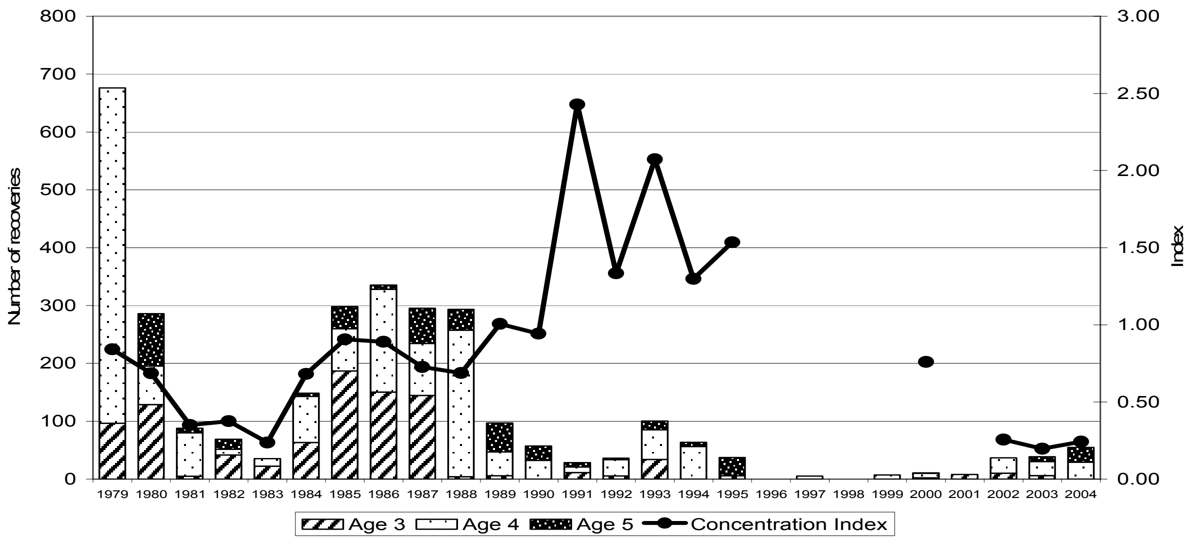

Figure 10-14. Relationship between annual estimated CWT recoveries by age and concentration indices for Columbia Upriver Brights Fall Chinook in the WCVI troll fishery.

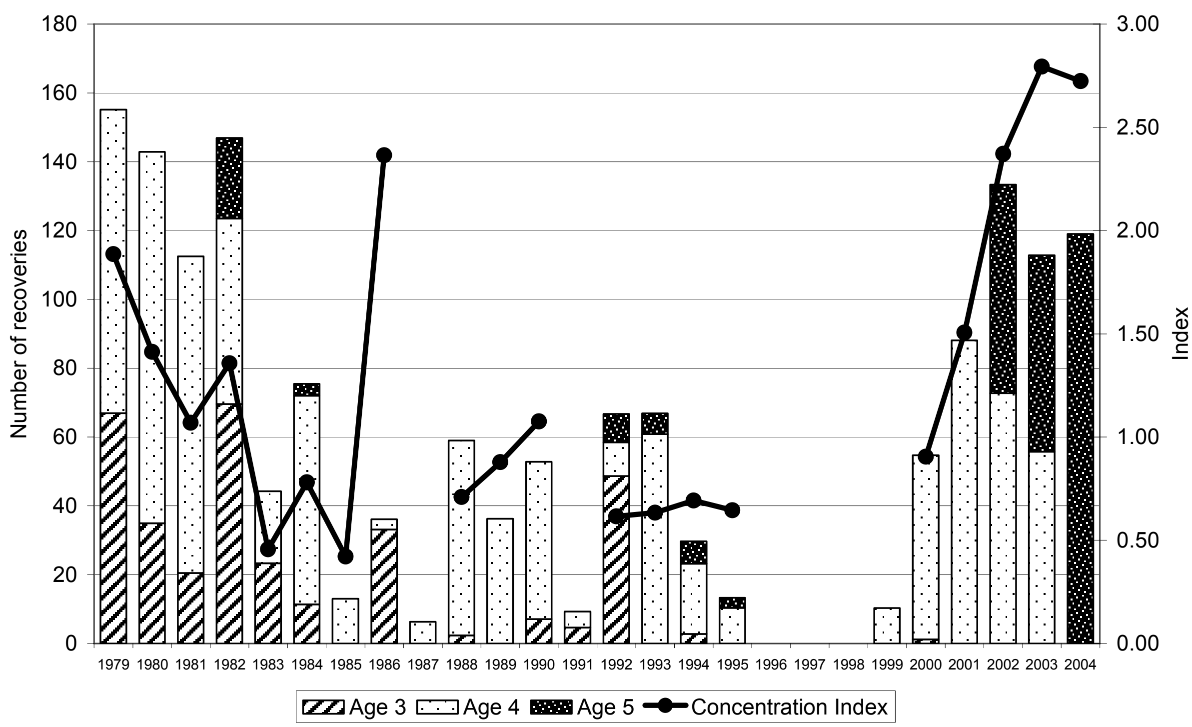

Figure 10-15. Relationship between annual estimated CWT recoveries by age and concentration indices for Willamette Spring Chinook in the WCVI troll fishery.

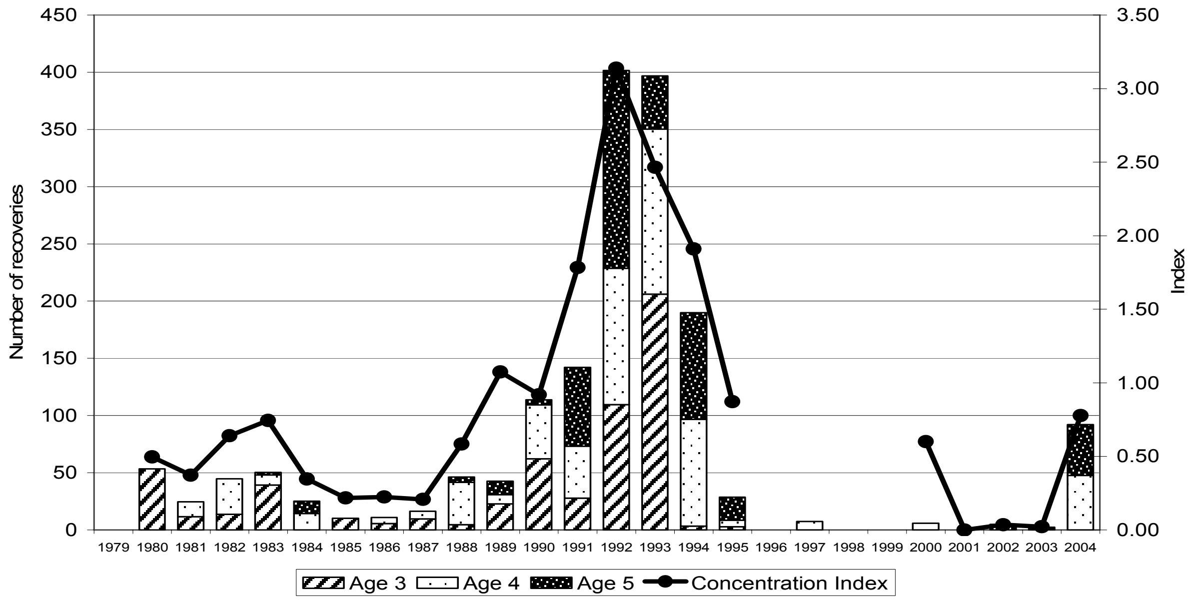

Figure 10-16. Relationship between annual estimated CWT recoveries by age and concentration indices for Salmon River hatchery fall Chinook in the WCVI troll fishery.

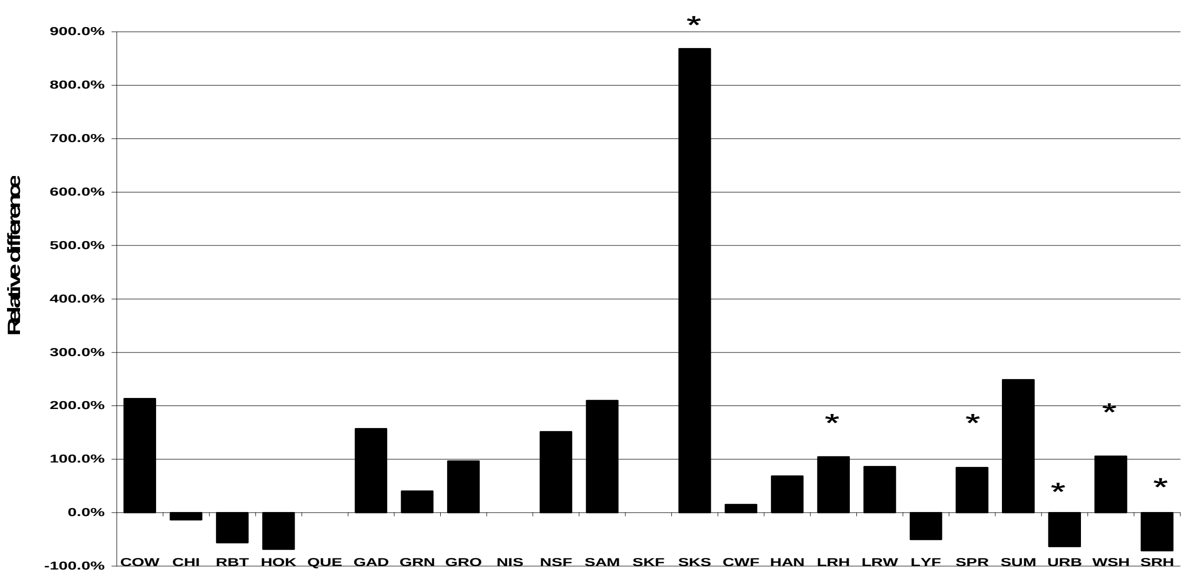

Figure 10-17. Relative differences between pre-1999 and post-1999 concentration indices by stock in the WCVI troll fishery. An asterisk indicates that differences were significant at p<0.05.

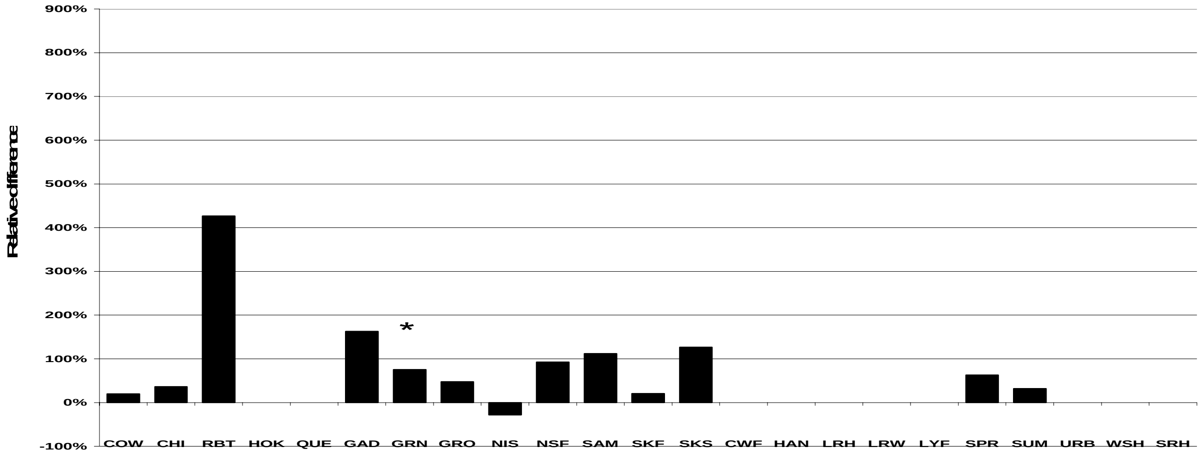

Figure 10-18. Relative differences between pre-1999 and post-1998 concentration indices by stock in the GST sport fishery. An asterisk indicates that differences were significant at p<0.05.

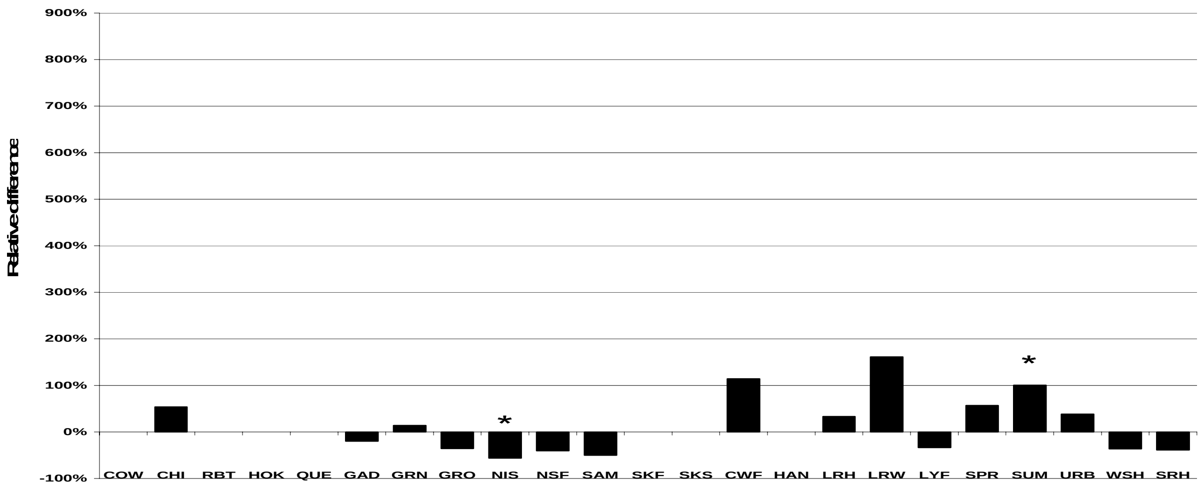

Figure 10-19. Relative differences between pre-1999 and post-1998 concentration indices by stock in the WA/OR troll fishery. An asterisk indicates that differences were significant at p<0.05.

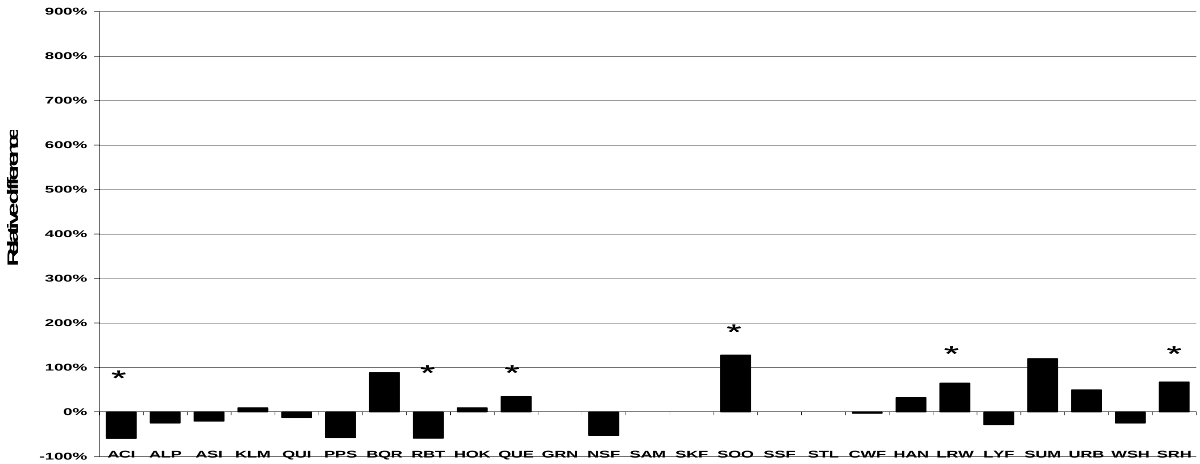

Figure 10-20. Relative differences between pre-1999 and post-1998 concentration indices by stock in the SEAK troll fishery. An asterisk indicates that differences were significant at p<0.05.

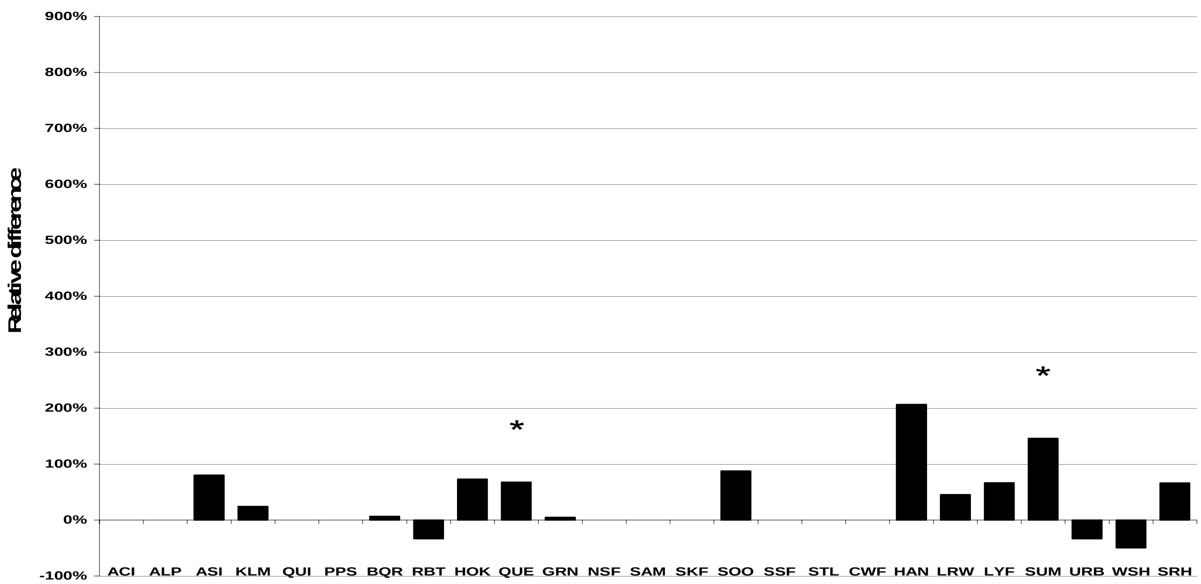

Figure 10-21. Relative differences between pre-1999 and post-1998 concentration indices by stock in the NBC troll fishery. An asterisk indicates that differences were significant at p<0.05.

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APPENDICES TO REPORT

Appendix 1. Excerpts from the CWT Panel Report.

"PSC Fishery Regimes

The 1999 PSC Chinook agreement establishes two general types of fishery regimes: (1) Aggregate Abundance Based Management (AABM); and (2) Individual Stock-Based Management (ISBM).

AABM Regimes

Major mixed stock fisheries off Southeast Alaska (all gear), Northern British Columbia (troll and sport), and West Coast Vancouver Island (WCVI troll and sport) operate under AABM regimes. These regimes are intended to: (a) adjust fishery harvest rates in response to estimated abundance of all stocks combined; and (b) reduce uncertainty for fishery management planning to meet stock-specific conservation objectives.

For AABM fisheries, abundance is indexed to stock-age population sizes through the use of an index estimated by the Chinook Technical Committee's Model. The index is derived by applying annual fishery exploitation rates for the troll component of the AABM fishery complex during a specified historical base period to two estimates of stock-age specific abundance: (a) forecasts for the coming season; and (b) observed levels during the model base period. The abundance index thus reflects the relative abundance for the coming year to that observed during the model base period when fishing patterns are consistent with those observed under the base period. The allowable fishery impact (initially landed catch, eventually changing to total mortality) is derived from a negotiated relationship between the abundance index and the allowable fishery harvest rate.

In recent years, fishing patterns in Canadian AABM fisheries have been altered in-season in response to information obtained from GSI samples in an attempt to constrain mortalities of stocks of conservation concern to Canada. Times and areas of fishing and important regulatory measures such as size limits have changed drastically from those in place during the base period. For example, during the base period, the predominant impacts from WCVI fisheries occurred in the entire area during the summer months. Recently, fishery managers have focused on reducing impacts to Chinook from WCVI and southern Strait of Georgia rivers, and interior Fraser coho. Now; the Chinook fishery predominantly operates offshore (to minimize impacts on

WCVI and Strait of Georgia Chinook)[2] *during the October-June time period (to minimize impacts on interior Fraser coho) under reduced minimum size limit restrictions (to provide targeted marketing opportunities and reflect the smaller size of fish available during the winter-spring time frame).*

While in-season management actions based on well-designed GSI methods could be usefully employed to address conservation concerns for some stocks, such measures could be fundamentally incompatible with the objectives of the 1999 PSC Chinook agreement. Unless sample sizes for GSI analysis are very large, the methods are unlikely to provide useful estimates of contributions of stocks that comprise a small proportion of the catch. These smaller stocks are often of greatest conservation concern.

Management actions in AABM fisheries which are taken in-season to reduce impacts on selected stocks raises three major concerns. First, the abundance index would no longer be appropriate to establish the allowable level of fishery impacts. For example, in the WCVI troll fishery, the stock-age specific fishery exploitation rates during the base period were estimated from coded wire tags that were predominantly collected during the summer time period that is no longer being fished. In addition, stocks that are intentionally being avoided by in-season management historically comprised a significant portion of the WCVI harvest (4%-8%) during the base period and thus affect the values of the abundance index. The technical basis for deriving the abundance index, which establishes allowable AABM fishery impacts with the objective of constraining fishery harvest rates, is undermined. Second, since fishing patterns can vary markedly from year to year, a primary purpose of the AABM regimes, to reduce uncertainty for stock-specific management planning, would be rendered meaningless. Further, instability in fishing patterns diminishes the capacity to incorporate information from catch sampling during more recent years (compared to the 1979-1982 base period) into usable estimates of exploitation rates if AABM regimes are to continue in effect in the future. Third, maintaining the same level of impact (in terms of allowable catch or mortality) while avoiding selected stocks, increases impacts on other stocks. This raises issues of "fairness" of the negotiated fishing agreements by undermining the relationship between aggregate abundance and the general objective of constraining fishery impacts on the total stock complex being exploited by the AABM fishery.

ISMB (*sic*) Regimes

The 1999 PSC Chinook agreement requires that fisheries that are not conducted under AABM regimes are managed to constrain total mortality, adult-equivalent harvest rates on individual natural stocks that do not meet agreed to spawning escapement goals. The 1999 Agreement calls for reductions in a harvest rate index in relation to levels observed during a specified base period. The ISBM obligation applies to the aggregate impact of all non-AABM fisheries within the individual jurisdictions of Canada and the United States on individual stocks. ISBM regimes commonly operate under domestic

[2] In the latest available calibration of the CTC Model (#0506), WCVI and lower Strait of Georgia stocks are estimated to comprise from 4% to 8% of the WCVI troll catch during the 1979-1982 base period.

management agreements that are designed to achieve spawning escapement and harvest allocation objectives throughout the migratory range of the stocks.

In certain circumstances (e.g., terminal area fishery management), in-season GSI information could be usefully employed in ISBM fisheries to help reduce or constrain fishery impacts on selected stocks that are not projected to meet established escapement goals. However, the difficulty of planning and conducting ISBM fisheries to meet management objectives and constraints can also be profoundly affected by substantial year-to-year variations in AABM fishing patterns that respond to in-season information. ISBM fisheries bear the brunt of uncertainty associated with the conduct of AABM fisheries since they frequently operate on maturing fish. Since spawning escapement levels are ultimately determined by the cumulative impact of AABM and ISBM fisheries, an additional burden can be placed on ISBM fishery managers to compensate for increased uncertainty in the conduct of AABM fisheries. This increased uncertainty was not anticipated when the 1999 Agreement was reached and undoubtedly will affect perceptions, which in turn are likely to increase the difficulty of negotiating agreements on future fishing regimes. Greater uncertainty in AABM fishery impacts can disrupt the capacity to successfully negotiate and prosecute management agreements that affect conservation and allocation objectives.

Further, if the ultimate result of instability in fishing patterns is increased uncertainty and the failure to attain spawning escapement goals, paragraph 9 of the 1999 PSC Chinook agreement contains provisions for adjusting both AABM and ISBM fisheries with the potential end result of an almost endless reshaping of both AABM and ISBM fisheries."

Appendix 2. CTC request for genetic data from MGL-DFO under the multi-lab sample sharing agreement

a) Request to CDFO for information concerning the DNA estimates of stock composition in the WCVI and NBC AABM fisheries in 2003-2004.

In 2004, genetics staff of the: (1) Alaska Department of Fish and Game, (2) Canada Department of Fisheries and Oceans, (3) National Marine Fisheries Service, and (4) Washington Department of Fish and Wildlife agreed to the following language and list of information for peer review and evaluation of genetic based estimates of stock composition for salmon fisheries.

Estimation of stock composition of samples taken from salmon fisheries is frequently conducted by management agencies in the Pacific Northwest and Alaska. The key outputs from the stock composition analysis are the estimated proportions of either specific populations or stocks (regional groups of populations) of interest (accuracy), and a measure of the variance associated with the estimated proportions (precision). When estimated stock compositions are produced by one agency, it is often necessary for other agencies to independently evaluate the quality of the estimated stock compositions for fisheries samples. The following list of data will allow for an independent assessment of the quality of estimated stock compositions.

1. *A list of all populations included in the baseline;*
2. *A listing of the number of individuals screened from each population by locus;*
3. *The observed allele frequencies at each locus in each baseline population;*
4. *The sample sizes for each mixture-sample analyzed;*
5. *A summary of Hardy-Weinberg equilibrium test results for each locus to identify any loci that are significantly out of equilibrium;*
6. *A summary of pair-wise tests of gametic disequilibrium to identify any locus pairs that don't appear to be independent;*
7. *The name and version of the computer program used to generate the mixed-stock analysis (MSA) estimates, as well as a listing of the program settings that were used when the MSA estimates were generated;*
8. *To the extent that alleles listed in point 3 are binned prior to the analysis, details on the binning procedures employed;*
9. *Information, if available, on population structure of the baseline populations;*
10. *Levels of accuracy and precision of estimates of stock composition for simulated mixtures as well as any known-origin mixtures analyzed, and;*
11. *Multi-locus genotypes of each individual fish analyzed from the mixed-stock sample provided in an electronic format.*

The Chinook Technical Committee (CTC) requests that the Canadian Department of Fisheries (CDFO) provide the information as described above to the CTC on or before

November 14, 2005 for the CDFO Chinook baseline used to make stock allocation estimates for the British Columbia Chinook AABM fisheries. The CTC also requests information concerning the sampling levels and procedures employed in each fishery AABM fishery by sampling time period for genetic stock composition estimates generated for the years 1985-2004.

b) Response by CDFO to CTC request for genetic data from MGL-DFO under the multi-lab sample sharing agreement, Nov 23/05.

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PREFACE

This is a response to a request to provide information concerning the DNA estimates of stock composition in the Chinook AABM fisheries 2003-04. The following complies with the II points set out in the inter-lab sample sharing agreement for the exchange of information, peer review and evaluation of genetic based estimates of stock composition in salmon fisheries.

01. LIST OF POPULATIONS IN THE DFO BASELINE

The list below represents the populations, and associated sample sizes, that comprised the baseline that was used for mixed stock analysis for 2003/2004 WCVI troll samples. This baseline has been evolving as more stocks and samples are added. Consequently, the baseline used in any particular mixed stock analysis may differ slightly, depending on the year when the analysis occurred. This baseline includes populations from Southeast Alaska and to California.

Stocks Included, Grouped by Major Drainage or Region[1]	Year DNA Samples Collected	No. of Samples Collected by Year	Total Sample Size
Transboundary (Taku, Stikine, Alsek)			
Taku (Little_Tatsam.)	1999	-	204
Taku (Little_Trapper)	1999	-	70
Stikine (Andrew_Creek0	2000	-	144
Stikine (Christina)	2000 2001 2002	-	238
Stikine (Craig_River)	2001	-	114
Stikine (Little_Tahltan)	1999 2001	-	415
Stikine (Shakes_Creek)	2000 2001 2002	-	159
Stikine (Verrett)	2000 2002	-	367
Alsek (Blanchard)	2000 2001 2002 2003	-	376
Alsek (Klukshu)_	1987 2000 2001	-	432
Alsek (Takhanne)	2000 2001 2002 2003	-	188
Alaska (SEAK)			
Unuk River	1999	192	192
King Salmon River	1999	57	57
Chickamin River	1999	116	116
Queen Charlotte Islands (QCI)			
Yakoun River	1987, 1989, 1996, 2001	27, 59, 80, 35	201
Nass River			
Kwinageese River	1991, 1995, 1996, 1997	14, 35, 87, 163	299
Damdochax Lake	1995, 1996, 1997	64, 98, 86	248
Meziadin Lake	1995, 1996, 1997	50, 111, 34	195
Owegee River	1995, 1996, 1997	53, 128, 39	220
Seaskinnish River	1995, 1996, 1997	40, 53, 6	99
Tseax River	1995, 1996, 2002	33, 54, 93	180
Cranberry River	1995, 1996, 1997	3, 103, 58	164
Snowbank River	1996	54	54
Kincolith River	1996, 1999	239, 48	287
Skeena River-upper drainage (Skeena)			

Bear River	1991, 1995, 1996	99, 25, 53	177
Sustut River	1995, 1996, 1999, 2001, 2002	38, 41, 90, 200, 47	416
Skeena River – Babine River drainage (Skeena)			
Babine River	1994, 1995, 1996	27, 47, 192	266
Skeena River- Bulkley River drainage (Skeena)			
Bulkley River	1991, 1996, 1998, 1999	112, 112, 213, 148	585
Morice River	1991, 1995, 1996	100, 50, 77	227
Skeena River – mid drainage (Skeena)			
Kitwanga River	1991, 1996, 2002, 2003	99, 19, 71, 99	288
Kispiox River	1979, 1985, 1989, 1991, 1995, 2004	31, 24, 21, 25, 62	163
Skeena River – lower drainage (Skeena)			
Ecstall River	1995, 2000, 2001, 2002, 2003	17, 43, 66, 61, 106	293
Lower Kitsumkalum River	1991, 1995, 1996, 1998, 2001	111, 25, 42, 83	457
Lower Kitsumkalum (above canyon)	1991, 1998, 2001	70, 95, 25	190
Cedar River	1996	116	116
Gitnadoix River	2002, 2003	22, 20	42
North/Central BC Mainland Coast (NOMN)			
Kitimat River	1996, 1997, 1998	260, 147, 75	482
Wannock River	1991, 1996, 1997, 2000	51, 216, 69, 171	507
. Atnarko River	1991, 1996	56, 219	275
. Upper Atnarko River	1996	155	155
. Kilbella River	1996, 1998, 2000, 2001	49, 22, 40, 46	157
. Chuckwalla River	1996, 1998, 1999, 2000, 2001	94, 45, 83, 8, 49	279
. Kildala River	1996, 1997, 1998, 1999, 2000	112, 90, 59, 86, 94	441
. Nusatsum River	1996	43	43
. Saloompt River	1996	96	96
. Hirsch River	1998, 1999, 2000	136, 157, 181	474
. Neechanze River	2000, 2002, 2003	28, 13, 16	57
. Ashlulm River	2000, 2002, 2003	27, 18, 19	64
. Kwinamass River	2000, 2001, 2002	3, 135, 137	275
. Kloiya River	2001	46	46
. Upper Dean River	2001, 2002, 2003, 2004	31, 9, 11, 31	82
. Dean River	2002, 2003	13, 25	38
. Docee River	2002	49	49
. Takia River	2002, 2003	9, 21	320
Southern BC Mainland Coast (SOMN)			
. Squamish River	1990, 1996, 1997	54, 18, 85	157
. Porteau Cove	1996, 2003	158, 199	357
. Bute River	1990, 1991	5, 67	72
. Klinaklini River	1997, 1998, 2002	213, 42, 147	402
. Devereux River	1997, 1998, 2000	214, 89, 26	329
. Homathko River	1997, 1998	20, 32	52
. Capilano River	1999	126	126
East Coast Vancouver Island (ECVI)			
. Little Qualicum River	1996, 1998	166, 143	209
. Big Qualicum River	1988, 1992, 1996, 1997	49, 41, 149, 135	374
. Big Qualicum/Lang	1998, 2000	138, 155	293
. Quinsam River	1988, 1992, 1996, 1997, 1998	96, 42, 152, 102, 65	457
. Nanaimo River (spring)	1998	99	99

. Nanaimo River (summer)	1988, 1990, 1996, 2002	54, 2, 137, 88	281
. Nanaimo River (fall)	1996, 1997, 1998, 1999, 2002	150, 71, 146, 99, 80	546
. Nanaimo, upper	2003, 2004	24, 94	118
. Cowichan River	1988, 1996, 1999, 2000	40, 147, 349, 148	684
. Nimpkish River	1996	57	57
. Puntledge River (summer)	1988, 1996, 1997, 1998, 2000	131, 196, 209, 164, 201	901
. Puntledge River (fall)	1996, 1997, 2000, 2001	60, 127, 194, 195	576
. Quatse River	1996, 2000	27, 11	38
Goldstream	1998	22	22
. Woss Lake	2001	31	31
West Coast Vancouver Island (WCVI)			
. Robertson Creek	1988, 1996, 2003	48, 155, 183	386
. Stamp River	1973, 1996	155, 148	303
. Conuma River	1988, 1996, 1997, 1998	46, 215, 143, 52	456
. Nitinat River	1989, 1996, 2003	53, 153, 140	346
. Kennedy River	1992	49	49
. Thornton Creek	1992, 1999, 2000, 2001	37, 147, 150, 184	518
. Marble River	1994, 1996, 1999, 2000	58, 98, 149, 192	497
. Sarita River	1996, 1997, 2001	113, 157, 145	415
. Nahmint River	1996, 2001, 2002, 2003, 2004	27, 56, 51, 124, 40	298
. Tranquille River	1996, 1999	209, 133	342
. San Juan River	2001, 2002	80, 116	196
. Burman River	1985, 1989, 1990, 1991, 1992, 2000, 2002, 2003	20, 35, 19, 56, 35, 34, 51, 13	263
. Toquart River	1999, 2000	71, 16	87
. Robertson/Muchalat	2002	33	33
. Robertson/Gold	1987, 1992, 1999, 2002	58, 82, 44, 42	226
. Gold River	1983, 1985, 1986	6, 13, 71	90
. Colonial/Cay	1999, 2004	40, 19	59
. Tahsis River	1996, 1999, 2002, 2003	72, 87, 104, 47	310
. Tlupana River	2002, 2003	34, 32	66
Fraser River (upper portion of drainage, UPFR)			
. James	1984, 1988	48, 9	57
. Dome	1991, 1994, 1995, 1996, 2000	34, 51, 94, 148, 25	352
. Salmon@PG	1996, 1997	109, 131	240
. Tete Jaune	1993, 1994, 1995, 2001	66, 94, 88, 205	453
. Chilliwack_red	1994, 1999	30, 133	163
. Chehalis_red	1994, 1999	42, 84	126
. Bowron	1995, 1997, 1998, 2001	57, 39, 78, 2	176
. Horsey	1995, 1997, 2000, 2001, 2002	13, 11, 3, 3, 5	35
. Goat	1995, 1997, 2000, 2001, 2002	12, 12, 3, 35, 8	70
. Holmes	1995, 1996, 1999, 2000, 2001, 2002	43, 54, 14, 20, 8, 65	204
. Swift	1995, 1996, 2000, 2001	63, 164, 38, 113	378
. Slim	1995, 1996, 1998, 2001	65, 6, 40, 86	197
. Indianpoint	1995	472	472
. Willow	1995, 1996, 1997, 2000, 2002	62, 9, 11, 1, 2	85
. Fontoniko	1996	57	57
. MacGregor	1997	119	119
. Kenneth	2001, 2002	17, 61	78
. Walker	2000, 2001	3, 39	42
. Morkill River	2001	208	208
. Torpy River	2001	170	170
Fraser River (middle portion of drainage, MUFR)			
. Nazko	1983, 1984, 1985	120, 24, 50	194

. Baezeako	1984, 1985	45, 37	82
. Quesnel River	1990, 1994, 1995, 1996, 1997	20, 77, 100, 276, 95	568
. Stuart River	1991, 1992, 1994, 1995, 1996	95, 67, 109, 108, 175	554
. Nechako River	1991, 1992, 1994, 1995, 1996	81, 120, 84, 101,198	584
. Chilko River	1994, 1995, 1996, 1999, 2001, 2002	43, 78, 80, 14, 35, 50	300
. Bridge River	1994, 1995, 1996	23, 35, 326	384
. Cottonwood	1995	53	53
. Elkin	1995, 1996	19, 216	235
. Upper Chilcotin	1995, 1996, 1997, 1998, 2001	10, 12, 5, 19, 230	276
. Chilcotin (mixed)	1997	47	47
. Portage Creek	1995, 1996, 2001, 2002	4, 27, 14, 176	221
. Horsefly	1996, 1997	14, 15	29
. Lower Cariboo	1996, 1998	12, 10	22
. Upper Cariboo	2001	171	171
. Lower Chilcotin	1996, 2000, 2001	74, 34, 102	210
. Westroad	1996, 1997	2, 31	33
. Endako	1996, 1997, 1998, 2000	4, 25, 32, 24	85
. Taseko	1997, 1998, 2001, 2002	37, 27, 18, 97	179
. Chilako	1998	45	45
Fraser River (lower portion of drainage, LWFR-Sp/Su)			
. Big Silver Creek	1996, 2002, 2003	16, 71, 26	113
. Birkenhead River	1993, 1994, 1996, 1997, 1998, 1999, 2000, 2001, 2002, 2003	43, 3, 31, 22, 27, 19, 31, 28, 20, 27	251
. Harrison	1988, 1992, 1994, 1999	134, 99, 100, 215	548
. Upper Pitt River	2002, 2003	30, 58, 16	104
. Maria Slough	1999, 2000, 2001, 2002	31, 28, 154, 89	302
. Chilliwack (fall)	1994, 1995, 1998, 1999, 2002	83, 89, 132, 139, 9	452
. Stave/Chilliwack	1999, 2000, 2001, 2002	48, 23, 184, 124	379
North Thompson River (NOTH)			
. Raft River	1995, 1996, 2002	14, 115, 62	191
. Finn	1996, 1998, 2002	101, 35, 24	160
. Clearwater	1997, 1998	257, 5	262
. Barriere	2000, 2001, 2002	18, 25, 12	55
. Blue River	2000, 2001, 2002	8, 6, 38	52
. Lemieux Creek	2000, 2001, 2002	2, 32, 61	95
. North Thompson mainstem	2001	115	115
South Thompson River (SOTH)			
. Lower Shuswap	1994, 1995, 1996, 1997	130, 73, 90, 42	335
. Middle Shuswap	1994, 1995, 1997, 2001	109, 86, 118, 53	366
. Eagle	1995, 2001	36, 3	39
. Salmon(Salmon Arm)	1995, 1996, 1997, 1998, 1999	9, 72, 56, 49, 35	221
. Lower Adams	1996, 2001, 2002	103, 39, 42	184
. South Thompson	1996, 2000, 2001	201, 21, 44	266
. Little River	1996, 2001	53, 72	125
. Bessette	1998, 2001, 2002	17, 22, 18	57
. Lower Shuswap/Upper Adams	1993, 1997	24, 21	45
. Lower Thompson	2001	176	176
. Duteau Creek	2001, 2002	42, 6	46
Lower Thompson River (LWTH)			
. Nicola	1992, 1994, 1995, 1997, 1998, 1999	54, 73, 75, 49, 77, 92	420
. Coldwater	1994, 1995, 1996, 1997, 1998, 1999	27, 31, 75, 43, 26, 32	234
. Spius	1996, 1998, 1999	58, 42, 34	134

. Deadman	1996, 1997, 1998, 1999	132, 61, 53, 45	291
. Bonaparte	1996	306	306
. Louis Creek	1996, 1997, 1999, 2000, 2001	32, 107, 183, 31, 200	553
. Upper Coldwater (spring)	2001	141	141
. Upper Spius (spring)	2001, 2002	116, 15	131
Puget Sound			
. Little Campbell River (Canada)	**2002**	**91**	**91**
. Serpentine River (Canada)	2002	46	46
. Skagit River (summer)	1994, 1995, 1996	90, 92, 100	282
. White (Fall)_fall	1994	100	100
. Kendall_Nooksack (Spring)	1998	100	100
. Soos_Green (Fall)	1998	100	100
. Kendall_Green (Fall)	1998	50	50
. Skykomish River (summer)	1996	75	75
. Stillaguamish River (Summer)	**1996**	**88**	**88**
Strait of Juan de Fuca			
. Elwha River (fall)	1996	100	100
Coastal Washington			
. Solduc River (fall)	1995	98	98
. Quinault River (fall)	1995, 1997	47, 17	64
. Hoh River (spring)	1995, 1996, 1997	18, 30, 11	59
. Queets River	1997	59	59
Lower Columbia River (Low Col)			
. Abernathy River (fall)	1995	100	100
. Coweeman River	1996	77	77
. Sandy River	1997	92	92
Upper Willamette River			
. North Santiam River	1997	99	99
. Clackamas River (North)	1997	80	80
Mid Columbia Springs (Mid Col-Sp)			
. John Day River (Middle fork)	2000	40	40
. John Day River (North fork)	2000	40	40
. John Day River (Mainstem)	2000	36	36
Upper Columbia Springs (Up Col-Sp)			
. Chewuch River	1993	100	100
. Twisp River	1995	100	100
. Chiwawa River	1993	100	100
. Entiat River	2002	64	64
Upper Columbia Summer/Fall (Up Col-Su/F)			
. Silmilkameen River	1993	100	100
. Wenatchee River	1993	100	100
. Hanford Reach	1998	100	100
. Deschutes River	1998	100	100
Snake River Spring/Summer			
. Tucannon River	1995	100	100
. McCall Hatchery	1989	41	41
. Valley Creek	1989	43	43
. Imnaha River	1999	99	99
. Rapid River	1997	80	80

. Upper Valley River	1998	78	78
. Wenaha River	1998	43	43
. Marsh Creek	1989, 1991, 1998, 1999	59, 39, 52, 70	220
. McCall River	1997	32	32
. Upper Salmon River	1989, 1992, 1993	50, 60, 55	165
. Salmon River (east fork)	1999	53	53
. Frenchman River	1991, 1992	1, 60	61
Snake River Fall			
. Snake River - unknown	1993	51	51
. Lyon's Ferry	1993, 1998	91, 20	111
Oregon coastal			
. Trask River hatchery (spring)	**1997**	**48**	**48**
. Trask River hatchery (fall)	1997	100	100
. Euchre Creek	1996	57	57
. Hunter Creek	1995	96	96
. Umpqua/Smith	1997, 1998	23, 70	93
. Cole River	1995	49	49
. Pistol River	1995	95	95
. Elk River	1995	70	70
. Lobster Creek	1998	48	48
. Nehalem River	1996	53	53
. Siuslaw River	1995	37	37
Southern Oregon/ California coastal			
. Blue Creek	1999	94	94
. Winchuk River	1995	80	80
Upper Klamath/Trinity			
. Trinity River (Spring)	1998	100	100
. Trinity River (Fall)	1998	100	100
California Central Valley Spring			
. Butte River (Spring)	2000	434	434
. Feather River (Spring)	1999, 2000	30, 52	82
. Yuba River (Spring)	2000	32	32
California Central Valley Fall			
. Sacramento River (Fall)	1993, 1995	40, 96	136
. Sacramento River (Late Fall)	**1995**	**96**	**96**
. Mokelumne River	1995	96	96
. Toulumne River	1998	35	35
. Merced River	1998, 1999	120, 80	200
. Yuba River	2000	51	51
. Stanislaus River	1998	25	25
. American River	1999	69	69
. Battle Creek	1999	40	40
. Butte River	2000	49	49

[1] The stock group names used for the DNA mixture analysis, to which these major drainage groupings map are indicated in parentheses.

02. LISTING OF NUMBER OF INDIVIDUALS SCREENED FROM EACH POPULATION BY LOCI

See attached Excel file that contains the allele frequencies by stock and microsatellite locus.

03. OBSERVED ALLELE FREQUENCIES AT EACH LOCUS IN EACH BASELINE POPULATION

See attached Excel file that contains the allele frequencies by stock and microsatellite locus. Also see Spam format baseline file Chinookcoastwide.bse

04. SAMPLE SIZES FOR EACH MIXTURE ANALYSIS

Sample sizes vary with each study. For the 2003/2004 WCVI troll sampling project, a total of 1400 samples were analysed spanning the period Oct/03-Sept/04. See multi-locus genotypes of each fish within this sample group (item #11).

05. SUMMARY OF HARDY-WEINBERG EQUILIBRIUM

Table 1 summarizes the results of Hardy-Weinberg equilibrium tests of the 13 microsatellite loci used for stock differentiation. This test was performed using a representative sample of 52 Chinook salmon spawning populations in the Fraser River drainage.

Table 1. Number of alleles, expected heterozygosity (H_e), observed heterozygosity (H_o), percent significant Hardy-Weinberg equilibrium tests (HWE, N=106 tests), and F_{ST} among 52 Chinook salmon spawning locations (standard deviation in parentheses) for 13 microsatellite loci.

Locus	Alleles	H_e	H_o	HWE	F_{ST}
Ogo2	18	0.71	0.70	1.9	0.077 (0.011)
Ogo4	20	0.80	0.80	3.7	0.076 (0.014)
Oke4	14	0.66	0.63	1.9	0.074 (0.014)
Oki100	39	0.92	0.92	7.4	0.026 (0.003)
Omy325	31	0.77	0.75	8.4	0.081 (0.012)
Ots2	18	0.71	0.71	6.5	0.042 (0.009)
Ots9	12	0.58	0.58	0.0	0.051 (0.009)
Ots100	34	0.91	0.87	10.3	0.022 (0.002)

Ots101	33	0.91	0.86	13.1	0.016 (0.003)
Ots102	54	0.89	0.61	57.0	0.036 (0.003)
Ots104	33	0.92	0.89	8.4	0.022 (0.003)
Ots107	47	0.90	0.86	13.1	0.036 (0.004)
Ssa197	33	0.92	0.90	4.7	0.024 (0.003)
All loci					0.039 (0.006)

From:
Beacham, T.D., K.J. Supernault, M. Wetklo, B. Deagle, K. Labaree, J.R. Irvine, J.R. Candy, K.M. Miller, R.J. Nelson and R.E. Withler. 2003. The geographic basis for population structure in Fraser River Chinook salmon, *Oncorhynchus tshawytscha.* Fishery Bulletin 101: 229-242

06. PAIR WISE TEST OF GAMETIC DISEQUILIBRUIM

Results
There was no evidence of linkage between any of the microsatellite loci used in this study, but four of the 52 samples surveyed in the study exhibited significant linkage disequilibrium in more than 10% of the pairwise comparisons between loci (Table 1). These sample locations were Harrison River, Tete Jaune, Fontoniko, and Bessette Creek.

Discussion
Significant linkage disequilibrium was detected in samples from four populations: Harrison River, Tete Jaune (main stem Fraser River), Fontoniko Creek, and Bessette Creek. Linkage disequilibrium may reflect sample admixture (Waples and Smouse, 1990) in the Harrison River and Tete Jaune samples. The Harrison River samples were obtained from broodstock collections at a hatchery on the Chehalis River, a tributary of the Harrison River. Initial broodstock for the hatchery was derived from Chinook salmon collected from the Harrison River, and over time broodstock has been developed from fish returning to the hatchery. Chinook salmon returning to the Chehalis hatchery were also used to found the Chilliwack River population that is maintained by production in the Chilliwack hatchery and spawning in the Chilliwack River. During the 1990s, Chinook salmon were transplanted back from the Chilliwack hatchery to the Chehalis hatchery. Thus, the samples examined in our study, collected between 1988 and 1994, may reflect some mixing of genetically related but heterogeneous groups of fish from the Harrison, Chehalis, and Chilliwack rivers in the Chehalis hatchery broodstock. The Tete Jaune samples were obtained at Tete Jaune Cache in the extreme headwaters of the Fraser River. As the samples were collected from the mainstem Fraser River, there is potential for admixture of populations, although it is thought that there are few Chinook salmon spawning sites upstream from this location. Significant linkage disequilibrium was detected in single-year samples from Fontoniko Creek (a tributary of the McGregor River) and Bessette Creek (a tributary of the Shuswap River). Population admixtures would not typically be expected in such terminal locations, and the cause of

the disequilibrium is unknown. The disequilibrium observed in the Bessette Creek sample may simply reflect small sample size (17 fish).

From:

Beacham, T.D., K.J. Supernault, M. Wetklo, B. Deagle, K. Labaree, J.R. Irvine, J.R. Candy, K.M. Miller, R.J. Nelson and R.E. Withler. 2003. The geographic basis for population structure in Fraser River Chinook salmon, *Oncorhynchus tshawytscha.* Fishery Bulletin 101: 229-242.

07. NAME AND VERSION OF COMPUTER PROGRAM.

The program used for stock allocation is based on a Bayesian approach to mixture analysis developed by Pella and Masuda (2001). The algorithms were rewritten in Cplus in a program referred to as Cbayes (Neaves et al. 2005)

Neaves, P. I., C. G. Wallace, J. R. Candy, and T. D. Beacham. 2005. CBayes: Computer program for mixed stock analysis of allelic data. Version 2.2.1. Free program distributed by the authors over the internet from http://www.pac.dfo-mpo.gc.ca/sci/mgl/data_e.htm

Pella, J., and M. Masuda. 2001. Bayesian methods for analysis of stock mixtures from genetic characters. Fishery Bulletin 99: 151-167. Free program distributed by the authors over the internet from ftp://wwwabl.afsc.noaa.gov/sida/mixture-analysis/Bayes/

Below are typical settings from the Cbayes control file used for the analysis of this data.

CBAYES2.1

Title = coastwide
Species = Chinook
BaseDesc = Chinookcoastwide

NumberOfChains = 8
ThinIse = 1
ThinSta = 1
StartStock = 065
PreExtend = True
NumberToKeep = 1000
Quantile = 0.975
Accuracy = 0.02
Probability = 0.95
RanGen = MT19937
Timer = 1000
Debug = False

SaveEvery = 200

! file section:
BaselineFile = bayes.bse
MixtureFile = bayes.mix
OutputFolder = output

! options section:
PrintMixture = f
PrintBaseline = f

! control parameters section:
NumberOfStocks = 239
NumberOfChars = 13
NumberOfReps = 20000
Seed1 = -718805
Seed2 = 99733654
MaxMissingLoci = 8

08. ALLELE BIN LIMITS

See attached file coast-wide table of allele frequencies.

No additional binning prior to analysis.

09. INFORMATION ON POPULATION STRUCTURE.

See the attached PDF file that illustrates the relatedness of populations coastwide via a dendrogram using Cavalli-Sforza distances and neigbour joining tree generated in Phylip.

Free download:
http://evolution.genetics.washington.edu/phylip.html

10. LEVEL OF ACCURACY AND PRECISION OF ESTIMATES.

Below is a test of the accuracy of stock allocations using the DFO 13 loci baseline on samples of known origin (via CWTs) collected in Canadian fisheries (Figure 1 and 2).

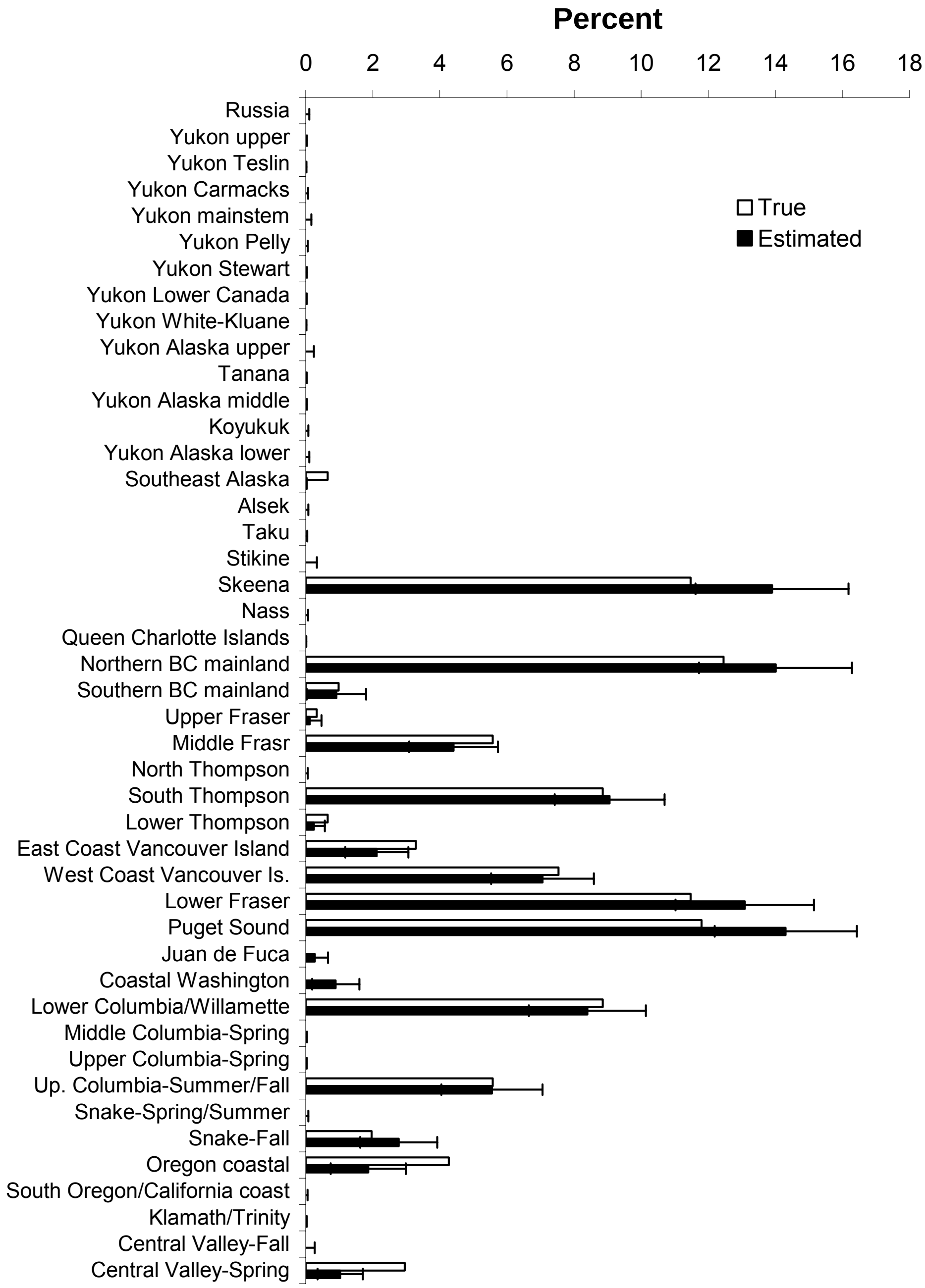

Figure 1. Estimated percentage stock compositions of a sample of 306 Chinook salmon marked with coded wire tags and sampled from fisheries in British Columbia during 1997. The baseline used for the stock composition analysis consisted of approximately 52,000 Chinook salmon surveyed for variation at 13 microsatellite loci from 325 populations across the Pacific Rim distribution of the species. Actual percentages are in white, and estimated percentages, with standard deviations, are in black. (From Beacham et al. 2006 in review).

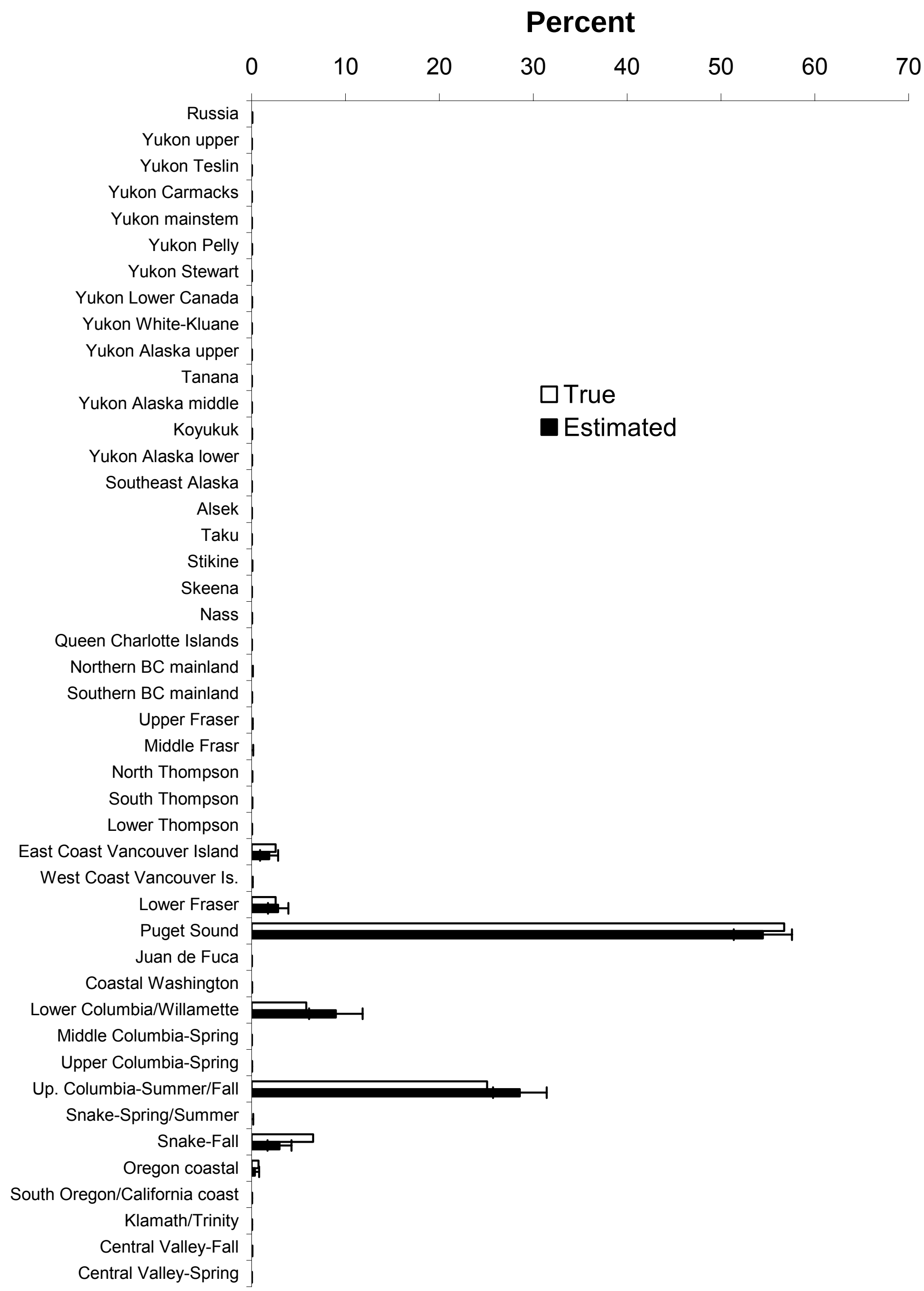

Figure 2. Estimated percentage stock compositions of a sample of 297 Chinook salmon marked with coded wire tags and sampled from a troll fishery off the southwest coast of Vancouver Island during 2001 (From Beacham et al. 2006 in review).

11. MULTI-LOCUS GENOTYPES FOR EACH FISH ANALYZED IN MIXTURE.

The multi-locus genotypes for mixed stock fisheries samples in genepop format for Chinook caught in the WCVI troll fishery from October 2003-September 2004 are available upon request.