North and Central Coast Salmon Escapement, Catch, Run Size and Exploitation Rate Estimates for each Salmon Conservation Unit for 1954-2014

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EXECUTIVE SUMMARY

A large amount of time and resources are expended each year by Fisheries and Oceans Canada (DFO), Pacific Salmon Commission (PSC), First Nations, stewardship groups, Pacific Salmon Foundation (PSF) and other NGOs to obtain the catch and escapement data needed to monitor trends for BC salmon stocks and Conservation Units (CUs). Some of these data are combined in regional or coast-wide models to derive estimates of run size and exploitation rates for specific salmon indicator stocks (e.g., Northern Boundary Sockeye Run Reconstruction Model, Skeena Sockeye In-river Model, Area 3-5 Pink and Chum Models, coast-wide CWT analysis models for NCC Chinook and Coho exploitation rate indicator stocks). In most instances prior to 2009, the results from these substantial data collection and analysis efforts have not been applied to the challenge of tracking trends in catch and escapement by CU.

This project builds on a previous work supported by Indian and Northern Affairs Canada (INAC), the State of the Salmon Program (SOS), DFO and PSF to produce the 1980-2010 estimates of escapement, catch and run size for each BC Salmon CU (English et al. 2004a; 2006a;b; 2010; 2012) and the extension of the time series for Skeena Salmon CU to cover the years from 1954-2010 prepared for PSF (English et al. 2013). LGL Limited was contracted by the PSF in January 2015 to work with DFO stock assessment biologists to update the core datasets, database systems and analysis tools needed to produce annual abundance estimates for all NCC salmon stocks using the best available information from 1954-2014.

The analytical procedures used to compute the abundance estimates for each NCC Statistical Area (SA) and CU range from the relatively simple summation of annual catch and escapement estimates for a SA to complex run reconstruction techniques using all the available run-timing data for specific sockeye CUs (English et al. 2015). The foundation for the escapement estimates presented in this report is the nuSEDS database and list of indicator streams identified by NCC biologist as the most reliable set of escapement data available for each CU. The DFO regional biologists have identified 681 indicator streams for even years and 630 indicator streams for odd years where escapement survey data was of sufficient quality and quantity to be used as an indicator of annual escapement trends for NCC salmon CUs. The majority of these indicator streams (76%) were assigned survey quality ratings of fair (2) or good (3). The streams with the highest quality survey data (ratings of 4 and 5) accounted for 6% of the indicator streams and 18% of the indicator streams were assigned a poor quality rating of 1. The number of indicator streams rated poor was higher than previous analyses because of the desire to produce escapement, catch, and run size estimates for as many CUs as possible.

This report provides details on the methods used to convert the escapement estimates for indicator stream into total escapement estimates for each SA and CU as well as a description of the methods used to estimate the exploitation rates needed to compute annual harvest and total run size estimates for each salmon CU for 1954-2014. Results from these analyses have been loaded into an application that allows anyone with access to the internet to obtain the historical time-series of escapement, catch, Canadian ERs and Total ERs for each salmon species by SA or CU and the associated histogram showing the survey quality ratings for the annual escapement estimates (http://shiny.lglsidney.com/ncc-salmon/).The appendices to this report provide further details on the methods, data sources, and assumptions used to derive the annual estimates of escapement, catch and exploitation rates for each salmon CU.

INTRODUCTION

The primary purpose for this project was to streamline the process used to do annual updates of the best available estimates for escapement, catch, and exploitation rates for each NCC Statistical Area (SA) and Conservation Unit (CU) to track trends in these salmon stocks and facilitate further analysis by regional scientists to define fisheries management benchmarks for each CU.

A large amount of time and resources are expended each year by Fisheries and Oceans Canada (DFO), Pacific Salmon Commission (PSC), First Nations, stewardship groups, Pacific Salmon Foundation (PSF) and other NGOs to obtain the catch and escapement data needed to monitor trends for BC salmon stocks and Conservation Units (CUs). Some of these data are combined in regional or coast-wide models to derive estimates of run size and exploitation rates for specific salmon indicator stocks (e.g., Northern Boundary Sockeye model, Skeena Sockeye In-river Model, Area 3-5 Pink and Chum Models, coast-wide CWT analysis models for NCC Chinook and Coho exploitation rate indicator stocks). In most instances prior to 2009, the results from these substantial data collection and analysis efforts have not been applied to the challenge of tracking trends in catch and escapement by CU.

This project builds on a previous work supported by Indian and Northern Affairs Canada (INAC), the State of the Salmon Program (SOS), DFO, and PSF to produce the 1980-2010 estimates of escapement, catch and run size for BC Salmon. The initial projects for INAC computed escapement, catch and total annual run size estimates for each salmon species by Statistical Area for 1980-2003 (English et al. 2004a; 2006a;b). In 2005-06, a comprehensive review of the North and Central Coast (NCC) salmon stock assessment programs was conducted and the indicator streams were identified for each salmon species (English et al. 2006). In 2008-09 the State of the Salmon Program (SOS), DFO and PSF to supported additional efforts to compute these estimates for each BC Salmon CU (English et al. 2010). In 2011-12, the PSF supported projects to update the NCC Database and Analysis System and the various models used to compute annual exploitation rates for NCC salmon (English et al. 2012) and the extension of the time series for Skeena Salmon CU to cover the years from 1954-2010 (English et al. 2013). LGL Limited was contracted by the PSF in January 2015 to work with DFO stock assessment biologists to update the core datasets, database systems and analysis tools needed to track stock status and trends for NCC salmon stocks using the best available information from 1954-2014.

METHODS

General Analytical Approach

The analytical procedures used to compute escapement, catch, and run size (ECR) estimates for each SA and CU range from the relatively simple summation of annual catch and escapement estimates to complex run reconstruction techniques. A summary of the major components of the data compilation and analytical sequence is provided below:

a. Identify the streams with reliable and consistent time-series of escapement data for a specific species and run timing group (indicator streams);

b. Record information about the escapement survey methods and relative quality of the escapement estimates for each indicator stream using a 5 point scale along with other meta data related to these escapement estimates;

c. Obtain the latest version of the nuSEDS database to extract the escapement data for each indicator stream and all the non-indicator streams that have been monitored;

d. Link the nuSEDS database, Blair Holtby's October 2011 version of his "CU decoder ring" database and our new set of indicator streams using the unique nuSEDS POPID code which is common to each of these separate databases;

e. Evaluate alternate methods used to account for missing escapement estimates in the available time series for a specific SA or CU;

f. Obtain the best estimates of catch by species, week, gear type and SA;

g. Obtain the most recent version of the available run reconstruction analyses for intensively monitored and assessed stocks (e.g., Nass and Skeena Sockeye and Chinook stocks);

h. Estimate Canadian and total exploitation rates for Pink and Chum salmon returning to Area 3, 4 and 5 using Effort-Harvest Rate (EHR) relationships and/or adjustments to Sockeye harvest rates to account for species-stock specific run-timing differences;

i. Obtain total fishing mortality or exploitation rate (ER) estimates for each Chinook and Coho indicator stocks and link these estimates to the appropriate SA and CU for each species;

j. Upload all of the above information into an MS Access database; and

k. Run the analyses using procedures similar to those described in North and Central Coast Core Stock Assessment Report (English et al. 2006a) and Appendix A of this report to produce annual estimates of total escapement, Canadian harvest, total harvest, run size, and exploitation rates for each SA and CU.

The foundation for the escapement estimates presented in this report is the nuSEDS database and list of indicator streams identified by NCC biologist as the most reliable set of escapement data available for each CU. All of our analyses are linked directly to a downloaded copy of the nuSEDS database so these analyses can be readily updated as new information is loaded into the database. Two different approaches have been used to covert escapement estimates for a specific CU into a time series of comparable estimates. One approach uses the estimates for the most reliably monitored streams (indicator streams) to determine the trends in the escapement data, corrects for missing estimates for these indicator streams using an algorithm similar to that described in (Little and Rubin 1987) and expands the total for indicator streams to the represent all streams in a specific SA or CU (English et al. 2006; Appendix A). The other approach proposed in Holtby (2011) uses criteria related to the number of annual estimates in a specified period to determine the escapement data that should be used to determine trends and employs a relatively complex algorithm (Brown 1974) to fill in the missing values for each stream based on the available data for the other streams in a SA or CU. Prior to selecting the best approach for this project, we compared the methods used to correct for missing estimates and determined that the results were essentially identical when the same set of streams were selected. Therefore, we employed the approach initially described by Little and Rubin (1987) because it was easier to implement and more readily understood of the two methods.

The critical step in the escapement estimation process was identifying the streams with the most reliable escapement records. We used the set of indicator streams previously identified by NCC biologists (English et al. 2004a; 2006; 2009; 2012) as the starting point for this project. In 2012, nuSEDS data for all NCC streams were linked to our initial set of indicator streams and we worked with DFO biologist to review the escapement time series for every NCC stream for each CU. Together, we determine which indicator streams should be removed and which of the other streams that should be added to the indicator stream list. The results provided in this report are based on the set of indicator streams developed for the 2012 analyses (English et al. 2012), except for Coho salmon where 40 indicator streams were added in Area 4 and 5. The quality of the escapement data for each indicator stream was assessed on a 5 point scale (see below).

In addition to the above change in the indicator streams for Coho salmon, we made the following modifications to the methods used to expand observed escapements to indicator streams to a total escapement estimate for a specific species-SA or CU:

a. For the Expansion Factor 1, previous analyses used decade averages for each indicator stream to determine the expansion factor to account for indicator streams that were not surveyed in a given year. However, this process underestimated the total escapement to indicator streams for those decades where one or more indicator streams for a specific CU or Stat Area-species combination did not have any escapement estimates in that decade.

b. To address the above issue, we modified our analysis program to use the average stream specific escapements for the nearest decade with at least one escapement estimate for each indicator stream in a CU or Stat Area-species combination. There were very few instances (2 for Coho and 1 for Chinook) where there was no decade when each indicator stream had at least one escapement estimate in the nuSEDS database. For these cases, we used the average escapement estimates for 1980-1999 to compute Expansion Factor 1.

c. For Expansion Factor 2, previous analyses used decades or multiple decade periods (e.g., 0=decadal averages, 1=1980-89 average, 2=1990-99 average, 3=2000-09 average, 4=1980-99 average, 5=1980-2009 average) to expand the adjusted indicator stream escapement to total escapement for all streams in a SA or CU (see English et al. 2012, Appendix Tables A1 and A2).

d. For 1950's, 1960's and 1970's, we used the above rules to determine Expansion Factor 2 except for those decades or multiple decade period where one or more indicator streams did not have any escapement estimates. For these instances, we used the 1980-99 averages to expand the adjusted indicator stream escapement to total escapement for all streams in a SA or CU.

e. The expansion factor associated with observer efficiency (Expansion Factor 3) was adjusted from 5.0 to 3.0 for Area 2E Coho and the Haida Gwaii East Coho CU (CO_23) and from 3.0 to 1.0 for Smith Inlet Coho CU (CO_20) and Upper Nass Coho (CO_36) quality of the escapement estimates for the indicator streams in these areas. Deena and Pallant creeks are the two major indicator streams in Area 2E and both have more reliable escapement estimates that most Coho streams. The primary indicator stream for the Smith Inlet CU is the Docee Fence after 1990 and the Meziadin fishway is the primary source of the indicator stream escapement Upper Nass CU is Meziadin where the escapement estimates are derived from highly reliable fishway counts.

Appendix Table A3 provides a summary of the average values for expansion factors 1, 2, and 3 for each species by SA and Appendix Table A4 provides similar values for each CU.

Sockeye Salmon

No changes were made to the list of escapement indicator streams for NCC Sockeye salmon but the time series was extended back to 1954 and forward to 2014 for CUs within Area 1, 2 and 6-10. The time series of escapement and ER estimates starts in 1982 for Area 3 sockeye and 1960 for Area 4 and 5 sockeye. The new approach of adjusting for missing indicator stream data (Expansion Factor 1), using the nearest decade with at least one escapement estimate for each indicator stream, worked for all Sockeye CUs and SAs.

Exploitation rate estimates for the Nass and Skeena Sockeye stock aggregates are estimated annually using the Northern Boundary Sockeye Run Reconstruction (NBSRR) Model (English et al. 2004b; 2005; Alexander et al. 2010; in prep.). As in previous analyses, we used available data on the migration timing by CU to derive preliminary estimates of the marine ERs for each CU or group of CUs with the same migration timing. The average CU timing relative to the mean run timing for the Nass Sockeye aggregate was estimated using DNA stock composition data reported in Hall et al. (2010). The average CU timing relative to the mean run timing for the Skeena Sockeye aggregate was derived from Cox-Rogers et al. (2004). The timing distribution for each CU was defined by a normal curve with its peak defined by the relative timing (offset) parameter and duration determined by the standard deviation (SD) parameter (e.g., SD value of 2.0 = 14.0 d and a run duration of 84 d). Reviews of the run-timing parameters for Skeena sockeye resulted in the decision to reduce the run duration for each Skeena sub-stock group by 20% (e.g., 2.5 SD to 2.0 reduced the run duration from 105 d to 84 d). A summary of the current set of timing offsets and run duration parameters for Nass and Skeena Sockeye CUs is provided in Appendix B along with some examples of the shape of the aggregate run based on these parameters. The run timing parameters for the Skeena sockeye CUs are the same as those used in the updated version of the Skeena Sockeye In-River (SSIR) model (English et al. 2015). The SSIR model combines the best available estimates of weekly sockeye catches in Skeena River First Nation fisheries with daily escapement estimates derived by combining information from the Tyee Test fisheries with relative escapement estimates for each of the Skeena sockeye sub-stock groups. The in-river harvest rates computed by the SSIR model are combined with the marine harvest estimates from the NBSRR model to estimate the Canadian ER for each Skeena sockeye sub-stock group.

The methods and assumptions use to derive Canadian and Total ERs for stocks returning to each SA are summarized in Table 1. In the absence of any direct ER estimates for Area 1, 2E, and 2W the assumption of a constant 20% ER was used. The ERs for Area 5 Sockeye stocks were assumed to be equal to the ER estimates for Lakelse Sockeye which have similar run timing to those of Area 5 Sockeye stocks. ERs for Area 6-10 Sockeye stocks were derived by combining the escapement and catch estimates for each SA, as described below for Pink and Chum salmon returns to these areas.

The Canadian and Alaska ERs were combined with the escapement estimates for Sockeye salmon to produce the estimates of Canadian catch, Alaska catch, and total run size for each SA or CU. The relationship between the Sockeye salmon CUs and the ER estimates for Sockeye

returning to each SA is provided in Table 2 along with the total number of streams and the number of indicator streams by survey quality rating for each CU.

Pink Salmon

No changes were made to the list of indicator streams for NCC Pink salmon but the time series was extended back to 1954 and forward to 2014 for CUs and SA where at least one of the indictor streams was monitored in that year. The new approach of adjusting for missing indicator stream data (Expansion Factor 1), using the nearest decade with at least one escapement estimate for each indicator stream, worked for all Pink CUs and SAs.

A summary of the methods used to estimate the Canadian and Alaska ERs for NCC Pink salmon stocks is provided in Table 1. Canadian HRs for Area 1, 2E, 2W, and 6-10 were derived by combining the escapement and catch estimates for each SA as described in previous reports (English et al. 2004a; 2012). The methods used to estimate the Canadian HRs for Pink salmon stocks returning to Areas 3, 4, and 5 were similar to those described in English et al (2012) but some key data sources and analysis procedures were streamlined to facilitate future annual updates.

Canadian HRs for 1982-95 were derived from run reconstruction analyses conducted for northern boundary Pink salmon (Gazey and English 2000). Canadian HRs for 1954-81 and 1996-2014 were derived from Effort–HR relationships developed for Area 3 and Skeena Pink salmon using the 1982-95 HR and fishing effort estimates from the run reconstruction analysis.

Catch, effort and CPUE estimates for the Area 3 and 4 seine and gillnet fisheries were used to derive a time series of annual effort estimates that account for variability in weekly fishing effort for both seine and gillnet gear during the period when Pink salmon were harvested in these fisheries. This process included the following steps for Inside Area 3 Pink salmon stocks:

1) Weekly Pink CPUE estimates showed that Pink salmon were most abundant in Area 3 from mid-July to mid-August (Alaska weeks 29-36);
2) Pink catch and effort estimates for weeks 29-36 were used compute estimates of annual CPUE for gillnet gear for comparison with annual CPUE estimates for seine gear;
3) Annual ratios of gillnet CPUE to seine CPUE (mean 0.052, 95% bounds $\pm$0.01) were used to convert gillnet effort into seine effort; and
4) The total annual effort index for the Area 3 Pink salmon fishery was the sum of the seine effort in vessel-days and the gillnet effort after conversion to seine equivalents.

The 1982-95 estimates of seine equivalent fishing effort were combined with the Canadian HR estimates from the 1982-95 run reconstruction analyses to derive the relationship between annual HRs and fishing effort for Inside Area 3 Pink salmon stocks in Area 3 fisheries (Figure 1) and Skeena Pink salmon in Area 3 and 4 fisheries (Figure 2).

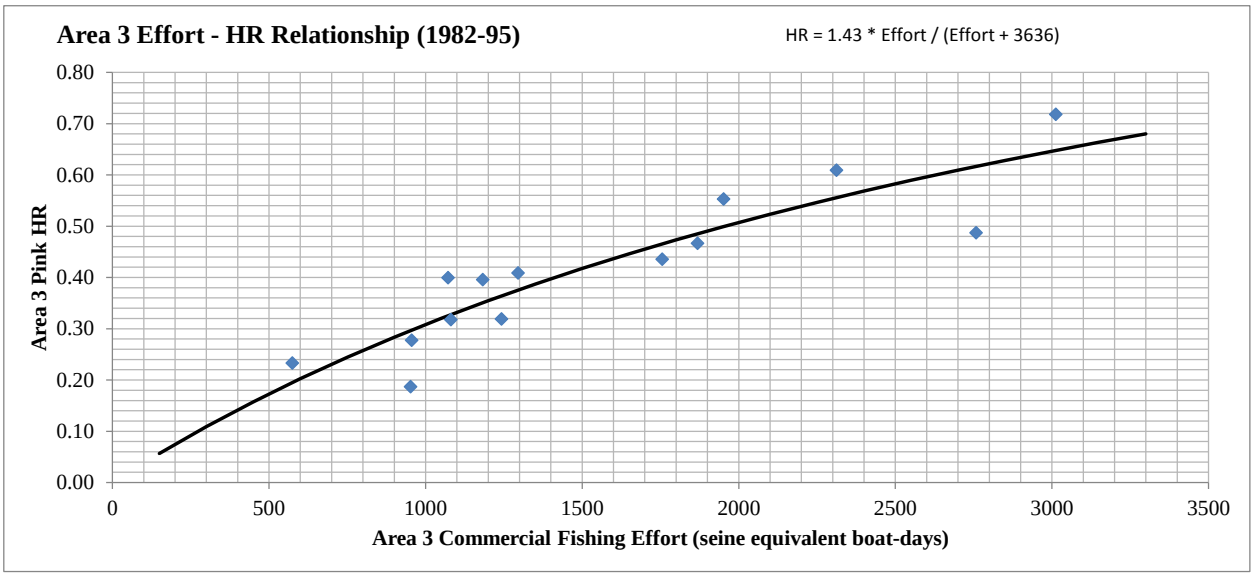

Figure 1. Relationship between the annual Area 3 fishing effort and the annual harvest rates estimated for Inside Area 3 stocks in Area 3 fisheries from 1982-95.

Weekly seine and gillnet fishing effort estimates for 1954-1981 were derived from DFO's historical data files and comparable estimates for 1982-2014 were derived from the NBSRR database which is updated each year for the PSC Northern Boundary Technical Committee (English et al. 2004; Alexander et al. in prep.).

The EHR relationships for the 1982-95 were combined with annual fishing effort for 1954-1981 and 1996-2014 to compute the HR estimates for each year. The annual HRs for Inside Area 3 Pink salmon in Area 3 fisheries were expanded to represent all Canadian fisheries by dividing these HRs by the average portion that Area 3 HRs were of the total Canadian HRs during the 1982-1995 period (90%).

Similarly, for Skeena Pink salmon, the annual HRs for Skeena Pink salmon in Area 3+4 fisheries derived from the EHR relationship (Figure 2) were expanded to represent all Canadian fisheries by dividing these HRs by the average portion that Area 3+4 HRs were of the total Canadian HRs during the 1982-1995 period (83%).

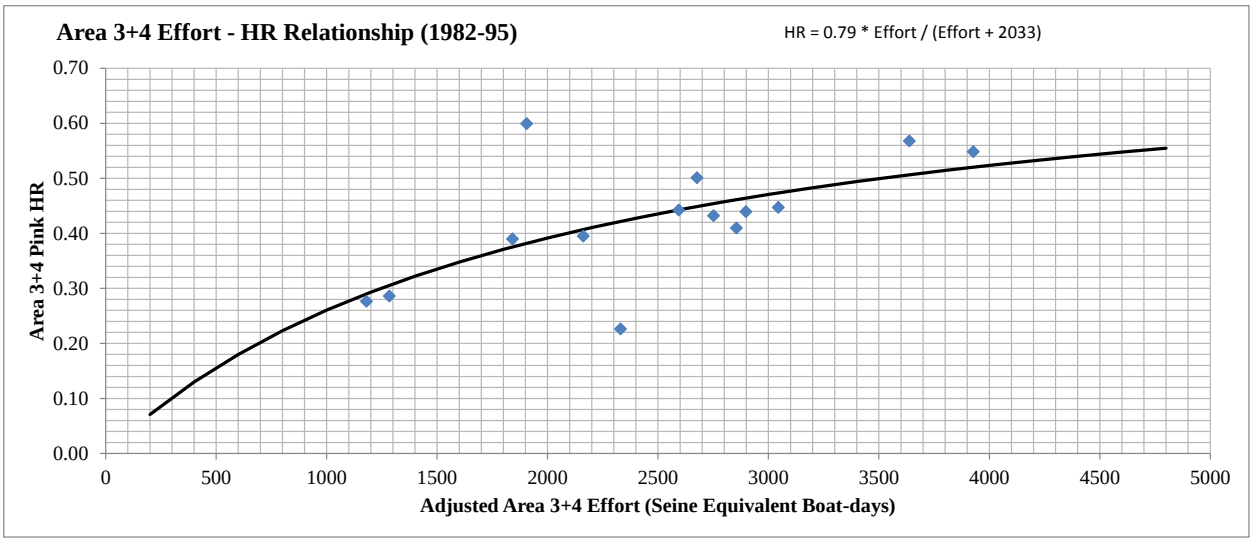

Figure 2. Relationship between the annual Area 3+4 fishing effort and the annual harvest rates estimated for Skeena Pink salmon stocks in Area 3+4 fisheries from 1982-95.

For Area 5 Pink salmon, Canadian HRs was estimated to be 50% of Canadian HRs for Skeena Pink salmon based on assumption that only 50% of Area 5 Pink salmon would migrate through the Area 3+4 fisheries. These annual HRs for Area 5 Pink salmon in Area 3+4 fisheries were expanded to represent all Canadian fisheries by dividing these HRs by the average portion that Area 3+4 HRs were of the total Canadian HRs for Skeena Pink salmon during the 1982-1995 period (87%).

Alaska ER for 1982-95 were derived from the 1982-95 Pink salmon run reconstruction analysis (Gazey and English 2000). These estimates were also used to define the Effort–Exploitation Rate (EER) relationships for Inside Area 3 and Skeena Pink salmon caught in Alaskan purse seine fisheries. These EER relationships were used to derive Alaska ER estimates for 1996-2014 using estimates of Alaskan purse seine fishing effort in District 101, 102 and 104. The 1954-81 Alaska ERs for Area 3 and Skeena pink salmon were assumed to be equal to the average of the 1982-95 ER estimates for these stocks. The Alaskan ERs for Area 5 Pink salmon were assumed to be equal to those estimated for Skeena Pink salmon. The Alaskan ERs for Area 1, 2E, 2W and Central Coast (Area 6-10) Pink salmon stocks were assumed to be zero (Dave Peacock, pers. comm.).

The resulting Canadian HR_i and Alaskan ER_i for stock "i" were combined in the following equation to compute the total ER_i for Canadian fisheries:

$$\text{Total Canadian } ER_i = \text{Canadian } HR_i * (1\text{-Alaska } ER_i)$$

The Canadian and Alaska ERs were combined with the escapement estimates for Pink salmon to produce the estimates of Canadian catch, Alaska catch, and total run size for each SA or CU. The relationship between the Pink salmon CUs and the ER estimates for Pink salmon returning to each SA is provided in Table 3 along with the total number of streams and the number of indicator streams by survey quality rating for each CU.

For Pink salmon CUs contained within a single SA, the ER estimates were set equal to those for that SA. For Pink salmon CUs that include streams from multiple SAs, the ER estimates were the average of those for the associated SAs. Previous analyses (English et al. 2012) used the same relationships between CUs and SA and the method used to compute the ERs for CUs that include streams from multiple SAs for Pink salmon.

Chum Salmon

No changes were made to the list of indicator streams for NCC Chum salmon but the time series was extended back to 1954 and forward to 2014 for CUs and SA where at least one of the indictor streams was monitored in that year. The new approach of adjusting for missing indicator stream data (Expansion Factor 1), using the nearest decade with at least one escapement estimate for each indicator stream, worked for all Chum CUs and SAs.

A summary of the methods used to estimate the Canadian and Alaska ERs for NCC Chum salmon stocks is provided in Table 1. Canadian HRs for Area 1, 2E, 2W, and 6-10 were derived by combining the escapement and catch estimates for each SA using methods similar to those described in English et al. (2004a; 2012).

Assessments of the Canadian HRs Area 3, 4 and 5 Chum stocks in the Area 3-5 seine and gillnet fisheries were complicated by the mixture of Chum stocks in these fisheries, lack of any direct measures of Chum harvest rates and the recent implementation of Chum non-retention regulation in specific weeks for some fisheries. Prior to 1982, we assumed that HRs for Area 3, 4 and 5 Chum stocks in Canadian fisheries were equal to the Canadian HRs estimates for Area 3, 4 and 5 Pink salmon stocks, respectively. From 1982-2014, we combined weekly sockeye HR estimates from the NBSRR model (English et al. 2005; Alexander et al. in prep.) with estimates of Chum run timing and the timing-location of chum non-retention fisheries into a Chum HR Model to estimate the Canadian HRs for Area 3, 4 and 5 Chum stocks.

The Chum HR Model for Area 3 stocks included the capability to apply adjustments for Chum non-retention by week and gear type for each of the Area 3 (3A, 3B, 3C, 3D, 3E) and Area 4 (4W, 4X) fisheries where Nass Sockeye are harvested. These weekly adjusted HRs were weighted by the portion of the Area 3 Chum migrating through these fisheries each week to compute the annual HRs for Area 3 Chum. The migration timing for Area 3 Chum was derived from the 1994-2009 daily Nass fishwheel Chum catch data adjusted for weekly variability in fishwheel catch efficiencies and annual variability in the duration of fishwheel operations (Will Duguid, LGL Limited, pers. comm.).

The Chum HR Model for Area 4 stocks was similar to the Area 3 Model but included all the Canadian fisheries that harvested significant numbers of Skeena Sockeye (Sub-area 3A, 3B, 3C, 4W, 4X, 4Y, 4Z, and Area 5). The Area 4 Chum run timing was derived from the Tyee Test Fishery data and is equivalent to the chum run timing used in the Skeena Model used to evaluate alternative fishing plans for Skeena sockeye (Dave Peacock, pers. comm.).

The Chum HR Model for Area 5 stocks used all the same Skeena Sockeye harvest rates and fisheries used for Area 4 stocks, along with an assumption that the run timing for Area 5 Chum is one week later than that for Area 4 Chum stocks.

The Alaska ERs for Area 1, 2E, 2W and Central Coast (Area 6-10) Chum stocks were assumed to be zero (Dave Peacock, pers. comm.). The Alaska ERs for Area 3 and 4 Chum salmon stocks were assumed to be equal to the Alaska ERs for Area 3 and 4 Pink salmon, respectively, as described above for 1954-2014. The Alaska ERs for Area 5 Chum salmon stocks were assumed to be equal to the Alaska ER estimates for Area 4 Pink salmon for 1954-2014.

As described for Pink salmon, the resulting Canadian HR_i and Alaskan ER_i for stock "i" were combined in the following equation to compute the total ER_i for Canadian fisheries:

$$\text{Total Canadian } ER_i = \text{Canadian } HR_i * (1\text{-Alaska } ER_i)$$

The Canadian and Alaska ERs were combined with the escapement estimates for Chum salmon to produce the estimates of Canadian catch, Alaska catch, and total run size for each SA and CU. The relationship between the Chum CUs and the ER estimates for Chum returning to each SA is provided in Table 4 along with the total number of streams and the number of indicator streams by survey quality rating for each CU.

For Chum salmon CUs contained within a single SA, the ER estimates were set equal to those for that SA. For Chum salmon CUs that include streams from multiple SAs, the ER estimates were the average of those for the associated SAs. Previous analyses (English et al. 2012) used the same relationships between CUs and SA and the method used to compute the ERs for CUs that include streams from multiple SAs for Chum salmon.

Coho Salmon

The extension of the time series for Coho escapement estimates resulted in a few changes to the escapement indicator streams and analysis procedures for Coho salmon:

a. Historical indicator streams (26 streams) were reinstated for Area 5 to provide better estimates for the earlier years in the time-series (1954-1979).
b. Zymoetz River Coho was removed from the list of indicator streams for Area 4 and Lower Skeena due to inconsistent monitoring that provided some very anomalous results for several years.
c. The new approach of adjusting for missing indicator stream data (Expansion Factor 1), using the nearest decade with at least one escapement estimate for each indicator stream, did not work for Area 4 and 5 Coho because there was no decade when each indicator stream had at least one escapement estimate in the nuSEDS database. For these cases, we used the average escapement estimates for 1980-1999 to compute Expansion Factor 1.
d. Annual escapement estimates for Babine River Coho were derived from Holby (1999) for 1954-1998. The estimates for 1999-2014 were derived by expanding the Babine River fence counts for the portion of the run migrating after the counting period.

The extension of the time series to provide 1954-2014 ER estimates for Coho resulted in fairly substantial changes in data sources and the analytical methods used to derive the ER estimates for both Canadian and Alaskan fisheries:

a. The ER estimates for NCC Coho were derived by CWT recovery information for several Coho ER indicator streams (Deena River, Tobaggan Creek and Zolzap Creek) with the historical time series of ER estimates for Babine River Coho 1954-88 (Holtby 1999).

b. Area 3 Coho ERs for 1992-2014 were derived by the Nisga'a Joint Technical Committee based CWT recovery data for Zolzap Creek Coho and escapement estimates for Coho streams in the Nass Area (Appendix Table C1, Richard Alexander, pers. comm.). The Area 3 Coho ER time series was extended back to 1954 by multiplying the ratio of the Area 3 to Area 4 ER estimates by the annual Babine/Area 4 ER estimates for 1954-1991.

c. The Babine/Area 4 ER estimates for 1989-2014 were derived by combining CWT recovery data for Tobaggan Creek Coho (Joel Sawada, DFO Nanaimo, pers. comm.) with the total escapement estimates for Area 4 Coho (Appendix Table C2). The Babine ER estimates for 1954-88 (Appendix Table C3) were derived from run reconstruction analyses for Babine River Coho (Holtby 1999) and Babine ER estimates for 1989-2014 were assumed to be equal to those estimates for Area 4 Coho.

d. Area 2E and 2W ERs for 1997-2014 were from the CWT recovery data for Deena River Coho with missing values for 1999, 2007, 2008, and 2012 filled in using the average of the ER estimates in adjacent years. The Canadian ERs for 1954-96 were set equal to those for Area 3 Coho as described above. The estimates for Alaska ER for Area 2E and 2W Coho for 1954-96 were derived using the ratio of the average Canadian ERs and average Alaska ER for 1997-2014 from the Deena River CWT recovery data (Appendix Table C4).

e. Area 6 Canadian ERs for 1997-2010 were from the NCC Coho Model (Dave Peacock, DFO Prince Rupert, pers. comm.). The Canadian ER estimates for 2011-2014 were set equal to those for Babine/Area 4 Coho, as described above. The Canadian ERs for 1954-96 were derived using the ratio of the average Canadian ERs for Babine/Area 4 Coho for 1980-96 to the baseline Canadian ER estimate of 25.6% for Area 5/6 Coho from the NCC Coho Model. The Alaska ERs for Area 6 Coho were set equal to those estimated for Area 4 Coho for all years (Appendix Table C5).

f. Area 6-8 Canadian ERs for 1997-2010 were from the NCC Coho Model (Dave Peacock, pers. comm.). The Canadian ER estimates for 2011-2014 were set to 60% of those for Babine/Area 4 Coho. The Canadian ERs for 1954-96 were derived using the ratio of the average Canadian ERs for Babine/Area 4 Coho for 1980-96 to the baseline Canadian ER estimate of 24.7% for Area 6-8 Coho from the NCC Coho Model. The Alaska ERs for Area 6-8 Coho were set to 60% of those estimated for Area 4 Coho for all years (Appendix Table C5).

g. Area 8 Canadian ERs for 1997-2010 were from the NCC Coho Model (Dave Peacock, pers. comm.). The Canadian ER estimates for 2011-2014 were set to 60% of those for Babine/Area 4 Coho. The Canadian ERs for 1954-96 were derived using the ratio of the average Canadian ERs for Babine/Area 4 Coho for 1980-96 to the baseline Canadian ER estimate of 25.5% for Area 8 Coho from the NCC Coho Model. The Alaska ERs for Area 8 Coho were set to 60% of those estimated for Area 4 Coho for all years (Appendix Table C5).

h. Area 4-9 Canadian ERs for 1997-2010 were from the NCC Coho Model (Dave Peacock, pers. comm.). The Canadian ER estimates for 2011-2014 were set to 40% of those for Babine/Area 4 Coho. The Canadian ERs for 1954-96 were derived using the ratio of the

average Canadian ERs for Babine/Area 4 Coho for 1980-96 to the baseline Canadian ER estimate of 25.5% for Area 4-9 Coho from the NCC Coho Model. The Alaska ERs for Area 4-9 Coho were set to 40% of those estimated for Area 4 Coho for all years (Appendix Table C6).

i. Area 9-10 Canadian ERs for 1997-2010 were from the NCC Coho Model (Dave Peacock, pers. comm.). The Canadian ER estimates for 2011-2014 were set to 20% of those for Babine/Area 4 Coho. The Canadian ERs for 1954-96 were derived using the ratio of the average Canadian ERs for Babine/Area 4 Coho for 1980-96 to the baseline Canadian ER estimate of 25.0% for Area 4-9 Coho from the NCC Coho Model. The Alaska ERs for Area 9-10 Coho were set to 20% of those estimated for Area 4 Coho for all years (Appendix Table C6).

The relationship between the Coho CUs and the ER estimates for Coho returning to each SA is provided in Table 5 along with the total number of streams and the number of indicator streams by survey quality rating for each CU.

Chinook Salmon

The results of the 1980-2010 analyses for Area 3 (Nass), Area 4 (Skeena), Areas 6, 8, 9, and 10 were reviewed and new information was added to these analyses. North and Central Coast Chinook run reconstruction analyses were conducted using MS Excel workbooks where the spreadsheets results for each SA were linked to a table that summarized the results in the standard output format used for all other species. These spreadsheet analysis results were uploaded into our MS Access database to facilitate further analyses of each Chinook CU. The relationship between the Chinook CUs and the ER estimates for Chinook returning to each SA is provided in Table 6.

The Area 3 analyses are updated annually by the Nisga'a Joint Technical Committee (NJTC) as required for implementation of the Nisga'a Treaty (Richard Alexander, LGL, pers. comm.). The revised version of the NJTC Nass Chinook tables provides estimates for 1986-2014 but it should be noted that the estimates for 1986-91 are less reliable than those after 1991 the higher degree of uncertainty associated with the escapement and catch estimates prior to the implementation of the Nisga'a Fisheries Program in 1992. The data sources and methods used to produce the estimates for Nass Chinook are identified in the footnotes for the Nass Chinook summary table (Appendix Table D1) and further documentation can be found in NJTC reports (e.g., Alexander et al. 2015).

Escapement estimates for Skeena Chinook are currently under review and revision based on reanalysis of the Kitsumkalum mark-recapture data and results from analysis of DNA samples from the Tyee Test Fishery (Ivan Winter, DFO Rupert, pers. comm.). However, the results from these analyses were not available for this update of the NCC Salmon Database. The estimates for Skeena Chinook included in this report are updates of previous analyses reported in Skeena Independent Science Review Panel process (Walters et al. 2008) and the 2012 update to the NCC Salmon Database (English et al. 2012). The Skeena Chinook time series started in 1984 with the initiation of a mark-recapture program for estimating the escapement for Kitsumkalum Chinook. These estimates were combined with those from the Babine fences, and visual surveys of the Bear, Kispiox, and Morice rivers to produce an annual index of the escapement. This index was

expanded to represent the entire Skeena using decadal averages of the portion that these indicator streams represented of the total for all Skeena Chinook spawning areas. Estimates of harvest for marine fisheries were derived from CTC tables with the Total Fisheries Mortality estimates for Kitsumkalum Chinook based on expanding CWT return data (Ivan Winter, pers. comm.). Estimates for Skeena River Chinook fisheries were derived from First Nation and recreational catch monitoring programs (Appendix Table D2).

Escapement estimates for the non-enhanced Chinook streams in Area 6 were based on recorded escapements for three indicator streams (Wahoo, Brim, and Khutze) which represent 25% of the average total escapement to the non-enhanced Chinook streams in Area 6. Harvest estimates for Area 6 Chinook were derived using the Canadian marine and total marine ERs for Area 8 Chinook (Appendix Table D3). Catch estimates for Area 6 Chinook reported in English et al. (2012) were derived from marine ERs for Area 4 Chinook, however, DFO advisors indicated that Area 8 ERs would be more appropriate for Area 6 Chinook (Ivan Winter, pers. comm.).

Escapement estimates for Area 8 Chinook were produced by summing the available estimates for the Bella Coola and Dean rivers, and filling a few missing values for the Dean River. These estimates were compared with the 1990-2013 escapement estimates for Atnarko River Chinook (Vélez-Espino et. al 2014). With the single exception of 1992, the nuSEDS records for Bella Coola Chinook were consistently larger than the Atnarko estimates but showed a similar pattern (Appendix Table D4). Estimates of harvest for marine fisheries were derived from CTC tables with the Total Fisheries Mortality estimates for Atnarko Chinook based on expanding CWT return data (Ivan Winter, pers. comm.). Harvest estimates for 1985-89 were derived using the average total ER for the 1990-94 period (43%) and the average distribution of the harvest between Canadian and Alaskan fisheries (Appendix Table D4).

Escapement and harvest estimates for Area 9 Summer and Area 9 Fall (Wannock) Chinook are provided in Appendix Tables D5 and D6, respectively. Annual exploitation rate estimates for Area 9 Chinook in Canadian and Alaskan fisheries were derived by combining the CWT recovery data for Wannock Chinook with annual estimates of the catch of Wannock Chinook in Central Coast (Area 7-9) recreational fisheries for 1988-2014. The contribution of Wannock Chinook to recreational fisheries in Area 7+8 and the Area 9 (Rivers Inlet) were assumed to be 10% and 20%, respectively, in average escapement years. These catch estimates were adjusted for variation in escapement levels by increasing the contribution of Wannock Chinook to these fisheries in higher than average escapement years and decreasing the contribution in lower than average escapement years. These analyses resulted in Canadian ERs that varied from 6-15% and Total ERs varying from 11-58%, with the highest ERs occurring in recent years. It is likely that the Canadian ERs for Area 9 Summer Chinook are higher than those for Wannock Chinook, however, the CWT recovery data for Area 9 Summer Chinook is very limited compared to that for Wannock Chinook. Consequently, we assumed that marine ERs were similar for both of these Area 9 Chinook stocks.

Escapement and harvest estimates for Area 10 Chinook are provided in Appendix Table D7. Harvest estimates for Area 10 Chinook in Canadian were derived using the following assumptions: 1) First Nations catch was 1% of the adjusted escapement estimate; 2) commercial catch was 2% of the Area 10 Troll Catch and 5% of the Area 10 gillnet catch; and 3) the harvest rate for Area 10 Chinook in the central coast recreational fishery was equal to the harvest rate for

Wannock Chinook in the Area 7-9 recreational fisheries. Harvest estimates for Area 10 Chinook in Alaskan fisheries were derived using the exploitation rates for Wannock Chinook in Alaskan fisheries.

Age Composition Data

Estimates of the average annual age composition for each salmon species returning to each SA and CU were derived from the Pacific Region Salmon Age Dataset (Brian Spilsted, pers. comm.). Additional data on the annual age composition of Sockeye returns to the Nass and Skeena watershed were provided by Richard Alexander and Steve Cox-Rogers, respectively.

RESULTS

The escapement trends for each CU and species-SA combination reflect the adjusted annual escapement estimates derived from 681 indicator streams for even years and 630 indicator streams for odd years (Table 7). The quality ratings for each indicator stream are the same as those resulting from previous reviews and these quality rating were based on the methods used to estimate escapement since 1980 (English et al. 2012). The extension of the time series of escapement estimates back to 1954 has certainly include estimates of different quality for individual stream, however, there were not sufficient time and resources to review and record annual quality ratings for each indicator stream. The majority of these indicator streams (76%) were assigned survey quality ratings of fair (2) or good (3). The streams with the highest quality survey data (ratings of 4 and 5) accounted for 6% of the indicator streams and 18% of the indicator streams were assigned a poor quality rating of 1. The number of indicator streams rated poor was higher than previous analyses because of the desire to produce escapement, catch, and run size estimates for as many CUs as possible. Most of the Pink and Chum streams with poor ratings could have been removed from the indicator stock list without affecting the estimates because they were associated with CUs that had many other streams with higher survey quality ratings. For Sockeye, Coho, and Chinook, there were several CUs for which all the indicator streams were assigned a poor rating for survey quality. For these CUs, escapement trends should be interpreted with caution since the available estimates are only slightly better than no data at all. Tables 2-6 provide the total number of streams, number of indicator streams and survey quality ratings for each CU with at least one indicator stream.

Tables 8-12 provide the annual Canadian and total ERs for each species and SA derived using the various analyses described above. Blanks in these tables indicate years when estimates of total run size could not be derived for a specific SA because escapement or ERs could not be estimated for that year. The time series for Area 3 and 4 Sockeye (Table 8) included those years (1982-2014) with completed run reconstructions using the NBSRR model. Pink salmon estimates for Area 1 and 2W were not available for odd numbered years (Table 9) because no indicator streams were identified for the odd-year returns of Pink salmon in these SAs. The time series of ER estimates for Area 3-5 Pink and Chum salmon have been extended back to 1954 using historical records of week fishing effort in Area 3 and 4 and the EHR relationships for Area 3 and 4 Pink salmon stocks was derived from the 1982-95 Pink run reconstruction results (Gazey and English 2000). Coho salmon ERs were estimated for each year from 1954-2014, as described above. The lack of ER estimates for Area 1 Coho is because no indicator streams were identified for Coho salmon in Area 1 (Table 11). The start of the time series of estimates for

Area 3, 4 and 8 Chinook salmon (Table 12) was determined by the first year when escapement estimates improved substantially for Nass, Kitsumkalum, and Bella Coola (Atnarko) Chinook, respectively. For Area 9 and 10 Chinook, the time series of ER estimates starts in 1980 because this is the first year in the time series of comparable catch estimates for the Area 7-9 recreational fisheries which is the critical time series used to derive the ER estimates for these Chinook stocks.

The results from the escapement and harvest rate analyses described above were organized into a series of workbooks that facilitated the preparation of two primary types of figures showing: 1) escapement, catch and harvest rate trends (Figures 3-7, upper graph); and 2) the relative data quality and completeness of the escapement monitoring efforts for the selected SA or CU (Figures 3-7, lower graph).

The relative survey rating scale presented in (Figures 3-7, lower graph) was comprised of three sub-ratings, which included: a) survey quality (Q1); b) survey execution (Q2); and c) survey coverage (Q3) for the indicator streams within each SA or CU. A five point scale was used for each of these three sub-ratings, where 1= a poor score and 5= an excellent score.

The ratings for survey quality (Q1) were:

1) **Poor quality** – An estimate of poor reliability due to few surveys, counting deficiencies, etc.
2) **Fair quality** – An estimate of moderate reliability based on two or more visual inspections (i.e., low quality AUC estimate);
3) **Good quality** – An estimate of good reliability based on three or more visual inspections (i.e., medium quality AUC estimate);
4) **Very good quality** – An estimate of high reliability based on MR data, almost complete fence counts, or high quality AUC estimates; and
5) **Excellent quality** – An estimate of very high reliability from an unbreached fence count.

The ratings for survey execution (Q2) is the degree to which the surveys of indicator streams were conducted and these were calculated based on Expansion Factor 1 used to account for indicator streams not surveyed in a given year. The portion that the surveyed streams represent of the average escapement to all indicator stream was converted to a 5 point scale using the following equation:

$$Q2 = 5.0 / \text{Expansion Factor 1}$$

Therefore, for those years when escapement estimates are available for each indicator stream in a SA or CU (Expansion Factor 1 = 1.0) and Q2 is 5.0.

The ratings for survey coverage (Q3) reflect the portion that indicator streams represent of all streams within a SA or CU (index portion). Expansion Factor 2 is used to convert the escapement estimate for the indicator streams to a total escapement estimate for all streams within a SA or CU. Therefore, the values for Q3 on a 5 point scale was calculated as follows:

Q3 = 5.0 / Expansion Factor 2

For those decades when the sum of the average escapement estimates for indicate represent half of the sum of the average escapement estimates for all streams in a SA or CU (Expansion Factor 2 = 2.0) and Q3 is 2.5.

The three sub-ratings are summed together to provide an overall rating of survey quality. A combined rating above 10 would be indicative of reliable escapement estimates. A score of 9-12 could occur when the average quality rating was fair-good, 80-100% of the escapement to indicator streams was monitored, and the index streams represented more than 60-80% of the total escapement for a species to all streams within a SA or CU. The survey execution and index portion components of the overall survey rating can vary by year or decade. The survey quality component was usually constant over all years unless there was a change in the survey method for one or more of the indicator streams for a specific SA/CU/Species combination.

The escapement, catch, and run size estimates for each species (Chinook, Coho, Sockeye, Pink odd, Pink even, and Chum) were organized into a single file to facilitate the preparation of summary tables and figures for any selected SA, CU, or Areas 1-10 combined. Figures 3-7 are samples of the stock abundance, harvest, and exploitation rate trends for selected CUs for each species within each region. These particular figures were selected to provide examples of the variability in survey quality, survey execution, abundance and exploitation rates observed among the species and CUs. While the quality and quantity of data used to generate these plots was often substantially different between CUs, these types of figures provide a quick means for examining trends in abundance, catch and exploitation over the past 29-35 years for Chinook, 33-61 years for Sockeye and the past 61 years for Pink, Chum and Coho salmon.

Nass Chinook provide an example of the result of substantial improvement to escapement estimation procedures (Figure 3). Previous summaries for Nass Chinook have included run size estimates back to 1980; however, the level of uncertainty in the pre-1992 estimates was so large that regional managers and stock assessment biologist agreed that the Nass Chinook time series should start in 1992. Prior to 1992, escapement estimates for Nass Chinook were derived from visual surveys of variable numbers of spawning areas. From 1992 to present, these estimates were derived from intensive mark-recapture programs (thus, the high survey quality rating for this period). Nass Chinook provides an example of relatively stable abundance (total run size usually in the 30,000-60,000 range) and total ERs averaging 52% since 1992. The difference between the total ERs and Canadian ERs indicates that a small portion of this stock (averaging <3%) was harvested in US fisheries.

Area 4 Coho (Figure 4) provide an example of a stock with lower quality survey ratings, generally good coverage and much higher variability in annual abundance than Nass Chinook. The substantial reduction in the Canadian ERs from 1996 to 1998 reflects the fishery closure resulting from the 1997 “Coho crisis”. The portion of the run harvested in Alaskan fisheries has remained fairly stable over the years and, with the decline in Canadian harvests, Alaskan fisheries have accounted for the majority of the catch of Skeena Coho since 1997.

Area 10 (Smith Inlet) Sockeye provide an example of a stock in which abundance levels declined dramatically over a short period and have not recovered despite the complete closure of the

fishery (Figure 5). Escapement estimates for this stock have been derived from a counting fence since 1982 and thus the survey quality is consistently high. All harvests of this stock occurred in Canadian waters (i.e., Canadian ER = Total ER).

Chum salmon escapement estimates for the Hecate Strait Lowland CU (Figure 6) were derived from visual surveys of up to 41 indicator streams. The average survey quality rating is only fair (rating=2), but the frequency of surveys and coverage has been sufficient to produce an annual survey rating close to 10 on the 15 point scale until recent years (Figure 6, lower graph).

The last North-Central Coast example is for Hecate Strait Fjords even-year Pink salmon returns (Figure 7). This figure shows the very large returns Pink salmon for this CU from 1986-92 (10-16 M), the substantial decline to less than 1 M in 2006-10 and signs of some recovery in 2014. As a result of the even-odd cycles for Pink salmon, there are fewer years on these graphs than those for other species, but there are two Pink salmon graphs (one for even-years and one for odd-years) for most SAs. In some SAs, consistently small returns or poor survey coverage limit the Pink salmon graphs to one of the two cycles (e.g., North and West Haida Gwaii CUs).

DISCUSSION

A large amount of time and resources are expended each year by DFO, PSC, First Nations, stewardship groups and NGOs to obtain the catch and escapement data needed to monitor trends for BC salmon stocks and CUs. Some of these data are combined in regional or coast-wide models to derive estimates of run size and exploitation rates for specific salmon indicator stocks (e.g., Northern Boundary Sockeye model; PSC Chinook and NCC Coho models). In most instances, the results from these substantial data collection and analysis efforts have not been fully applied to the challenge of tracking trends in catch and escapement by CU.

In this project, we have worked with region fisheries biologists to identify or compute the most reliable time series of escapement and exploitation rate estimates and to link these time series to the CUs for each species. While there have been substantial improvements to the DFO catch and escapement databases over the past 3 years, there are still several important issues that need to be addressed. The nuSEDS database is supposed to contain the most reliable escapement estimate for each monitored salmon spawning area. However, some of the escapement time series that are the foundation for the regional analysis models are not included in the nuSEDS database. For example: the nuSEDS database does not include the escapement estimates that are routinely used to assess the status and trends for several major stocks, including: Nass River Sockeye, Chinook, Coho, and Babine Sockeye. Similarly, a single source for the complete set of catch and fishing effort data for BC salmon fisheries does not exist. Alternative estimates of commercial catches for the same fishery can be found in the sale slip and FOS databases, and these estimates can be substantially different. Recreational catch estimates have been systematically organized for some fisheries and completely lacking for others. Harvests estimates are available for most First Nation fisheries, but most of these estimates are not contained in any database.

Reliable estimates of the annual age composition for return salmon is available for only a few NCC stocks (e.g., Nass and Babine Sockeye). Age composition data for Babine Sockeye was used to derive two estimates of recruits per spawner (R/S): 1) using the annual age composition data and 2) using the average age composition data for returns over the time series. This analysis

for Babine Sockeye revealed substantial difference between the best estimates of R/S based on annual age composition and those derived using the average age composition estimate (Figure 8).

Previous reports have provided a number of recommendations for streamlining the data management and analysis procedures for NCC salmon (English et al. 2009; 2012). Most of recommendations related to database updating and analysis process were addressed to produce the estimates in this report. A summary of these improvements is provided below:

1. Procedures for updating the NCC Salmon Database have been streamlined using program written in R that also created a record of the updating process for future reference.
2. The results from the NBSRR Model and Skeena Sockeye In-River Model have been linked using a MS Excel program to combine in-river harvest rates with marine harvest rates to compute Canadian and Total ERs for each Skeena Sockeye CU.
3. The Pink and Chum Models for Area 3-5 streamlined using a MS Excel program that combines the historical effort data with the EHR relationships and recent catch and effort data from the NBSRR Model to produce the time-series of Canadian and Total ERs for Area 3, 4 and 5 Pink and Chum salmon from 1954-2014. Future updates will just require loading the latest catch and effort estimates for Area 3 and 4 fisheries and SSE Alaskan purse seine fisheries into the appropriate input tables in the Pink and Chum Models.
4. Analyses were conducted to assess the sensitivity of sub-stocks exploitation rates to the assumptions regarding run timing parameters for Nass and Skeena Sockeye sub-stocks and CUs. These analysis resulted in the decision to reduce the run duration for each Skeena sockeye CUs by 20% (i.e., a reduction of 20 day for a CU that had a run duration of 100 days in previous analyses).
5. Results from these run reconstruction analyses have been loaded into an application that allows anyone with access to the internet to obtain the historical time-series of escapement, catch, Canadian ERs and Total ERs for each salmon species by SA or CU and the associated histogram showing the survey quality ratings for the annual escapement estimates (http://shiny.lglsidney.com/ncc-salmon/).

Streamlining the data compilation, analysis, and access for annual estimates of catch and escapement for each BC salmon CU has made it easier to update and maintain these time-series and ensure this important information is available to decision makers both inside and outside the management agencies in a timely manner.

RECOMMENDATIONS

While database organization and analysis procedures have been substantially improved over the past year, there are several important issues that need to be addressed within DFO's internal data management and updating processes:

1. The procedures for uploading escapement estimates into the nuSEDS database and completing the review of these data need to be streamlined. Data coordinators need to be identified for each region and assigned the responsibility of ensuring that escapement data are complete and uploaded into the nuSEDS database in a timely manner.
2. The most reliable annual escapement estimates for every indicator stream must be added to the nuSEDS database. This is important for ensuring consistency between the various analyses conducted using salmon escapement data (e.g., Babine fence counts, Nass River escapement estimates derived using mark-recapture techniques).
3. Procedures and responsibilities for updating databases must be clearly defined. One individual in Prince Rupert and one in Bella Coola, with the necessary skills, should be responsible for ensuring that catch and exploitation rate data are uploaded into the appropriate DFO database.
4. DFO's catch databases for commercial, recreational and First Nation fisheries harvest statistics need to be upgraded to industry standards and more accessible to DFO staff (i.e., single source, consistent format, accessible through the web via high speed servers).

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TABLES

Table 1. Summary of the sources for Canadian and Alaskan exploitation rates used for Sockeye, Pink, and Chum salmon stock originating from each NCC Statistical Area.

	Canadian Exploitation Rates (CDN ERs)					Alaska Exploitation Rates (AK ERs)				
	Area 1, 2E, 2W	**Area 3**	**Area 4**	**Area 5**	**Area 6-10**	**Area 1, 2E, 2W**	**Area 3**	**Area 4**	**Area 5**	**Area 6-10**
Sockeye Salmon										
1954-1959	20%				TCC&E	Zero				Zero
1960-1981	20%		Adj. Hist. Skeena	Adj. Hist. Lakelse	TCC&E	Zero		Adj. Hist. Skeena	Adj. Hist. Lakelse	Zero
1982-2008	20%	NBSRR Model	NBSRR+SSIR Model	NBSRR+SSIR Lakelse	TCC&E	Zero	NBSRR Model	NBSRR Model	NBSRR Lakelse	Zero
Pink Salmon										
1954-1981	TCC&E	A3-EHR Model	A3+4 EHR Model	A4 ERs * 50%	TCC&E	Zero	AK EER Model	AK EER Model	A4 ER	Zero
1982-1995	TCC&E	A3 Inside Pink-RR	Skeena Pink-RR	A4 ERs * 50%	TCC&E	Zero	A3 Inside Pink-RR	Skeena Pink-RR	A4 ER	Zero
1996-2014	TCC&E	A3-EHR Model	A3+4 EHR Model	A4 ERs * 50%	TCC&E	Zero	AK EER Model	AK EER Model	A4 ER	Zero
Chum Salmon										
1954-1981	TCC&E	A3 Pink CDN ERs	A4 Pink CDN ERs	A4 ERs * 50%	TCC&E	Zero	A3 Pink AK ERs	A4 Pink AK ERs	A4 ER	Zero
1982-2014	TCC&E	A3 Chum Model	A4 Chum Model	A5 Chum Model	TCC&E	Zero	A3 Pink AK ERs	A4 Pink AK ERs	A4 ER	Zero

All Species

TCC&E= CDN ERs derived from Total Canadian Catch (TCC) and escapement (E) estimates for that statistical area, where ER= TCC/(TCC+E).

A4 ERs *50% = CDN ERs were set equal to 50% of the Canadian exploitation rates for Area 4 (Skeena) Pink salmon.

A4 ER = AK ERs were set equal to the Alaskan exploitation rates for Area 4 (Skeena) Pink salmon.

Sockeye

NBSRR Model = Northern Boundary Sockeye Run Reconstruction model provided the 1982-2014 time series of CDN and AK ERs for Area 3 (Nass) Sockeye stocks (English et al. 2004b; 2005, Alexander et al. 2010; in prep.).

NBSRR+SSIR Model = NBSRR and Skeena Sockeye In-River (SSIR) models provided the 1982-2014 time series of CDN and AK ERs for Area 4 (Skeena) Sockeye stocks (English et al. 2004b; 2005, Alexander et al. 2010; in prep.).

NBSRR+SSIR Lakelse = NBSRR and Skeena Sockeye In-River (SSIR) models provided the 1982-2014 time series of CDN and AK ERs for Lakesle Sockeye which have similar run timing to Area 5 Sockeye stocks (English et al. 2004b; 2005, Alexander et al. 2010; in prep.).

Adj. Hist. Skeena = Adjusted historical CDN and AK exploitation rates from DFO (Les Jantz, pers.comm.) were used to estimate the 1960-81 ERs for Skeena Sockeye.

Adj. Hist. Lakelse = Adjusted historical CDN and AK exploitation rates from DFO (Les Jantz, pers.comm.) were used to estimate the 1960-81 ERs for Lakelse Sockeye.

Pink Salmon

A3 Inside Pink RR = CDN ERs derived from Area 3 Inside Pink salmon Run Reconstruction estimates (Gazey and English 2000).

Skeena Pink RR = CDN ERs derived from Skeena Pink salmon Run Reconstruction estimates (Gazey and English 2000).

A3-EHR Model = CDN ERs derived from Effort-Harvest Rate (EHR) relationship for Area 3 Inside Pink salmon harvested in Area 3 fisheries using harvest rates from 1982-95 Skeena Pink salmon run reconstruction estimates (Gazey and English 2000).

A3+4 EHR Model = CDN ERs derived from Effort-Harvest Rate (EHR) relationship for Skeena Pink salmon harvested in Area 3+4 fisheries using harvest rates from 1982-95 Skeena Pink salmon run reconstruction estimates (Gazey and English 2000).

AK EER Model = AK ERs derived from Effort-Harvest Rate (EHR) relationship for Area 3 Inside and Skeena pink salmon harvested in Alaskan fisheries using harvest rates from 1982-95 Skeena pink salmon run reconstruction estimates (Gazey and English 2000).

Chum Salmon

A3 Chum Model = CDN ERs derived using weekly harvest rates from the 1982-14 NBSRR model for Nass Sockeye and estimates of Chum migration timing for Area 3 stocks, with adjustment for periods of non-retention in Area 3 gillnet and seine fisheries.

A4 Chum Model = CDN ERs derived using weekly harvest rates from the 1982-14 NBSRR model for Skeena Sockeye and estimates of Chum migration timing for Area 4 stocks, with adjustment for periods of non-retention in Area 3+4 gillnet and seine fisheries.

A5 Chum Model = CDN ERs derived using weekly harvest rates from the 1982-14 NBSRR model for Skeena Sockeye and estimates of Chum migration timing for Area 5 stocks, with adjustment for periods of non-retention in Area 3+4 gillnet and seine fisheries.

Table 2. Sockeye salmon Conservation Units and associated Statistical Areas and source for exploitation rate estimates.

		Exploitation Rate Indicator		Total	Indicator	Survey Quality Ratings				
CU Code	Conservation Unit	Stock/Area Name	Stat. Area #	Streams	Streams	1	2	3	4	5
SX_L-15-01	Long	Area 10	10	3	2				2	
SX_L-15-02	Owikeno	Area 9	09	11	8		5	3		
SX_L-17-02	Awun	Area 1	01	1	1		1			
SX_L-17-05	Marian	Area 1	01	1	1		1			
SX_L-17-06	Mathers	Area 2E	02E	1	1		1			
SX_L-17-07	Mercer	Area 2W	02W	1	1			1		
SX_L-17-08	Skidegate	Area 2E	02E	1	1				1	
SX_L-17-09	Yakoun	Area 1	01	1	1			1		
SX_L-18-01	Backland	Area 6	06	1	1		1			
SX_L-18-02	Canoona	Area 6	06	1	1		1			
SX_L-18-04	Evelyn	Area 6	06	1	1			1		
SX_L-18-05	Kainet Creek	Area 7	07	1	1	1				
SX_L-18-08	Kitlope	Area 6	06	1	1		1			
SX_L-19-02	Bloomfield	Area 6	06	1	1		1			
SX_L-19-11	Curtis Inlet	Lakelse	05	1	1	1				
SX_L-19-14	Devon	Lakelse	05	1	1	1				
SX_L-19-20	Freeda	Lakelse	05	1	1	1				
SX_L-19-21	Hartley Bay	Area 6	06	1	1		1			
SX_L-19-24	Kadjusdis River	Area 7	07	1	1		1			
SX_L-19-26	Keecha	Lakelse	05	1	1	1				
SX_L-19-33	Koeye	Area 8	08	1	1	1				
SX_L-19-34	Kooryet	Lakelse	05	1	1		1			
SX_L-19-36	Kwakwa Creek	Area 6	06	1	1		1			
SX_L-19-39	Lowe/Simpson/Weir	Lakelse	05	1	1	1				
SX_L-19-40	Mary Cove Creek	Area 7	07	1	1	1				
SX_L-19-43	Mikado	Lakelse	05	1	1		1			
SX_L-19-45	Namu	Area 8	08	1	1		1			
SX_L-19-46	Port John	Area 8	08	1	1	1				
SX_L-19-49	Prudhomme	Lakelse	04	2	2		2			
SX_L-19-50	Roderick	Area 7	07	1	1	1				
SX_L-19-54	Shawatlan	Lakelse	04	1	1			1		
SX_L-19-60	Tankeeah River	Area 7	07	1	1			1		
SX_L-19-62	Tsimtack/Moore/Roger	Lakelse	05	1	1	1				
SX_L-19-70	Yeo	Area 7	07	1	1	1				
SX_L-20-01	Alastair	Alastair	04	3	2		2			
SX_L-20-05	Johnston	Johnston	04	2	1	1				
SX_L-20-06	Kitsumkalum	Kalum	04	7	2		1	1		
SX_L-20-07	Lakelse	Lakelse	04	9	3	1	1	1		
SX_L-20-08	Mcdonell	Zymoetz	04	1	1			1		
SX_L-21-02	Babine	Area 4	04	33	9		2	7		
SX_L-21-05	Kitwancool	Kitwanga	04	1	1					1
SX_L-21-07	Morice	Morice+	04	4	1		1			
SX_L-21-09	Stephens	Swan+	04	2	1		1			
SX_L-21-10	Swan	Swan+	04	6	3		1	2		
SX_L-21-11	Tahlo/Morrison	Babine WM	04	2	1		1			
SX_L-22-01	Asitika	Bear+	04	1	1		1			
SX_L-22-02	Azuklotz	Bear+	04	1	1		1			
SX_L-22-03	Bear	Bear+	04	3	2	1	1			
SX_L-22-04	Damshilgwit	Slamgeesh	04	1	1			1		
SX_L-22-08	Motase	Motase	04	1	1		1			
SX_L-24-02	Damdochax	Damdochax	03	1	1	1				
SX_L-24-03	Fred Wright	Kwinagees	03	1	1		1			
SX_L-24-05	Meziadin	Hanna-Tin, MezBeach	03	1	1					1
SX_R16	Northern Coastal Fjords	Area 6,7,8	06,07,08	73	4	3	1			
SX_R19	Skeena River-high interior	Swan+	04	1	1			1		
SX_R20	Lower Nass-Portland	Gingit+	03	15	1			1		
SX_R21	Upper Nass River	BrownBear	03	3	1			1		
Total		57		219	84	19	36	24	3	2

Table 3. Pink salmon Conservation Units and associated Statistical Areas and source for exploitation rate estimates.

		Exploitation Rate Indicator		Total	Indicator	Survey Quality Ratings				
CU Code	Pink Conservation Units (odd years)	Stock/Area Name	Stat. Area #	Streams	Streams	1	2	3	4	5
Pko-8	8_Homathko-Klinaklini-Smith-Rivers	Area 8-10	8,9,10	46	10	6	2	2		
Pko-9	9_East Haida Gwaii	Area 2E	2E	44	6		1	3	2	
Pko-11	11_West Haida Gwaii	Area 2W	2W	32						
Pko-12	12_Hecate Strait-Lowlands	Area 5-10 Average	5,6,7,8,9,10	169	35	2	22	11		
Pko-13	13_Hecate Strait-Fjords	Area 6-8 Average	6,7,8	100	52	2	29	20	1	
Pko-14	14_Nass-Skeena Estuary	Area 3	3	32	13	1	5	7		
Pko-15	15_Lower Skeena	Area 4	4	48	5	2	3			
Pko-16	16_Middle & Upper Skeena	Area 4	4	53	3		1	1	1	
Pko-17	17_Nass-Portland-Observatory	Area 3	3	58	16	1	7	7	1	
Total		9		582	140	14	70	51	5	0

		Exploitation Rate Indicator		Total	Indicator	Survey Quality Ratings				
CU Code	Pink Conservation Units (even years)	Stock/Area Name	Stat. Area #	Streams	Streams	1	2	3	4	5
Pke-5	5_Hecate Lowlands	Area 5-10 Average	5,6,7,8,9,10	185	39	4	24	11		
Pke-6	6_Hecate Strait-Fjords	Area 6-10 Average	6,7,8,9,10	146	70	9	35	25	1	
Pke-7	7_Nass-Skeena Estuary	Area 3	3	160	37	4	18	14	1	
Pke-8	8_Middle-Upper Skeena	Area 4	4	56	3		1	1	1	
Pke-9	9_North Haida Gwaii	Area 1 (Masset)	1	17	7			4	3	
Pke-10	10_East Haida Gwaii	Area 2E	2E	110	23		3	13	7	
Pke-11	11_West Haida Gwaii	Area 2W	2W	70	12		4	6	2	
Total		7		744	191	17	85	74	15	0

Table 4. Chum salmon Conservation Units and associated Statistical Areas and source for exploitation rate estimates.

		Exploitation Rate Indicator		Total	Indicator	Survey Quality Ratings				
CU Code	Chum Conservation Units	Stock/Area Name	Stat. Area #	Streams	Streams	1	2	3	4	5
CM-12	12_Smith Inlet	Area 9-10 Average	9,10	11	5		3	2		
CM-13	13_Rivers Inlet	Area 9	9	15	5	2	1	2		
CM-15	15_Spiller-Fitz-Hugh-Burke	Area 7-9 Average	7,8,9	69	28	4	17	6	1	
CM-16	16_Bella Colla-Dean Rivers	Area 8	8	22	7	1	2	4		
CM-17	17_Bella Coola River-Late	Area 8	8	9	7		1	5	1	
CM-18	18_Hecate Lowlands	Area 3-7 Average	3,4,5,6,7	142	41	7	30	4		
CM-19	19_Mussel-Kynock	Area 6-7 Average	6,7	14	12	3	7	2		
CM-20	20_Douglas-Gardner	Area 6	6	62	27		20	7		
CM-21	21_East Haida Gwaii	Area 2E	2E	95	32		10	14	8	
CM-22	22_Skidegate	Area 2E	2E	40	13			11	2	
CM-23	23_West Haida Gwaii	Area 2W	2W	61	31	5	16	10		
CM-24	24_North Haida Gwaii	Area 1	1	11	3		3			
CM-25	25_North Haida Gwaii-Stanley	Area 1	1	1	1			1		
CM-27	27_Lower Skeena	Area 4	4	32	6	3	2	1		
CM-28	28_Middle Skeena	Area 4	4	16	2	1	1			
CM-30	30_Portland Inlet	Area 3	3	19	5	1	2	2		
CM-31	31_Lower Nass	Area 3	3	20	1	1				
CM-32	32_Portland Canal-Observatory	Area 3	3	15	6	1	2	2	1	
Total		18		654	232	29	117	73	13	0

Table 5. Coho salmon Conservation Units and associated Statistical Areas and source for exploitation rate estimates.

		Exploitation Rate Indicator		Total	Indicator	Survey Quality Ratings				
CU Code	Coho Conservation Units	Stock/Area Name	Stat. Area #	Streams	Streams	1	2	3	4	5
CO-20	Smith Inlet	Area 9-10	10	12	2		1		1	
CO-21	Rivers Inlet	Area 9-10	9	24	2	2				
CO-22	Bella Coola - Dean Rivers	Area 8	8	30	11	4	6	1		
CO-23	Haida Gwaii|Hecate Strait - Q.C. Sound	Area 2E	2E	109	5			3	2	
CO-24	Haida Gwaii|Outer Graham Island	Area 2W	2W	62	3	1	2			
CO-25	Haida Gwaii-Graham Island Lowlands	Area 2WE		28	1			1		
CO-26	Mussel-Kynoch	Area 6-8	7	14	2	2				
CO-27	Hecate Strait Mainland	Area 4-9	5	176	36	26	8	2		
CO-28	Brim-Wahoo	Area 6	6	2	2		2			
CO-29	Douglas Channel-Kitimat Arm	Area 6	6	33	2	2				
CO-30	Northern Coastal Streams	Area 6-8		58	17	1	12	4		
CO-31	Skeena Estuary	Area 3	3	23	3		2	1		
CO-32	Lower Skeena	Area 4	4	84	20	2	11	6		
CO-33	Middle Skeena	Area 4	4	74	20	1	7	8		1
CO-34	Upper Skeena	Area 4	4	17	4	1	2		1	
CO-35	Lower Nass	Area 3	3	22	4		2	1	1	
CO-36	Upper Nass	Area 3	3	13	2			2		
CO-37	Portland Sound-Observatory Inlet-Portl	Area 3	3	26	2	1	1			
Total		18		807	138	43	56	29	5	1

Table 6. Chinook salmon Conservation Units and associated Statistical Areas and source for exploitation rate estimates.

		Exploitation Rate Indicator		Total	Indicator	Survey Quality Ratings				
CU Code	Chinook Conservation Units	Stock/Area Name	Stat. Area #	Streams	Streams	1	2	3	4	5
36	Docee	Area 10	10	1	1	1				
37	Rivers Inlet	A9 Summer	9	14	6	2	4			
38	Wannock	A9 Wannock	9	1	1	1				
39	Bella Coola-Bentinck	Area 8	8	5	1				1	
40	Dean River	Area 8	8	1	1		1			
41	NCC-late timing	Area 6	6	16	1	1				
42	NCC-early timing	Area 6	6	39	3	3				
46	Ecstall	Skeena	4	4	1		1			
47	Gitnadoix	Skeena	4							
48	Lower Skeena	Skeena	4	14	4	1	3			
49	Kalum-Early	10% of Skeena	4	2	1		1			
50	Kalum-Late	Skeena	4	7	1				1	
52	Middle Skeena	Skeena	4							
53	Middle Skeena-large lakes	Skeena	4	12	5	1	2	1	1	
54	Middle Skeena mainstem tributaries	Skeena	4	24	3		2	1		
55	Upper Bulkley River	10% of Skeena	4	4	1			1		
57	Portland Sound-Observatory Inlet-Lower Nass	Nass	3	14	3		1	2		
58	Upper Nass	Nass	3	17	3		1	2		
Total		18		175	36	10	16	7	3	0

Table 7. Summary of the number of CUs, total number of streams, and number of indicators by survey quality code by species for all NCC Statistical Areas.

Species	Number of CUs	Total Streams	Indicator Streams	Survey Quality Ratings				
				1	2	3	4	5
Sockeye salmon	57	219	84	19	36	24	3	2
Pink salmon (odd years)	9	582	140	14	70	51	5	0
Pink salmon (even years)	7	744	191	17	85	74	15	0
Chum salmon	18	654	232	29	117	73	13	0
Coho salmon	18	807	138	43	56	29	5	1
Chinook salmon	18	175	36	10	16	7	3	0
Total (odd years)	120	2437	630	115	295	184	29	3
Total (even years)	118	2599	681	118	310	207	39	3
Percentage				17.8%	46.2%	29.8%	5.2%	0.5%

Table 8. Canadian and total exploitation rates for Sockeye salmon stocks summarized by NCC Statistical Area, 1954-2014.

	Canadian Exploitation Rates										
Year	**01**	**02E**	**02W**	**03**	**04**	**05**	**06**	**07**	**08**	**09**	**10**
1954	20%	20%	20%				40%	34%	44%	55%	69%
1955	20%	20%	20%				60%	39%	26%	50%	75%
1956	20%	20%	20%				65%	43%	32%	61%	83%
1957	20%	20%	20%				36%	22%	10%	37%	74%
1958	20%	20%	20%				64%	43%	81%	55%	91%
1959	20%	20%	20%				38%	14%	25%	25%	69%
1960	20%	20%	20%		42%	13%	47%	47%	43%	62%	92%
1961	20%	20%	20%		50%	15%	33%	45%	53%	67%	90%
1962	20%	20%	20%		49%	15%	24%	45%	42%	46%	70%
1963	20%	20%	20%		26%	8%	9%	45%	48%	13%	72%
1964	20%	20%	20%		47%	14%	49%	50%	77%	39%	83%
1965	20%	20%	20%		34%	10%	56%	81%	64%	72%	96%
1966	20%	20%	20%		61%	19%	39%	37%	62%	51%	77%
1967	20%	20%	20%		60%	18%	31%	48%	68%	60%	86%
1968	20%	20%	20%		58%	18%	38%	62%	89%	62%	70%
1969	20%	20%	20%		46%	14%	73%	38%	27%	77%	61%
1970	20%	20%	20%		50%	15%	63%	74%	56%	7%	54%
1971	20%	20%	20%		54%	17%	36%	53%	35%	37%	52%
1972	20%	20%	20%		52%	16%	86%	78%	44%	45%	44%
1973	20%	20%	20%		60%	18%	47%	62%	46%	39%	63%
1974	20%	20%	20%		65%	20%	44%	85%	43%	7%	79%
1975	20%	20%	20%		42%	13%	33%	66%	61%	3%	46%
1976	20%	20%	20%		54%	16%	39%	83%	64%	45%	60%
1977	20%	20%	20%		53%	16%	35%	76%	46%	58%	30%
1978	20%	20%	20%		53%	16%	73%	69%	49%	40%	74%
1979	20%	20%	20%		52%	16%	75%	84%	69%	4%	37%
1980	20%	20%	20%		44%	13%	63%	88%	67%	0%	2%
1981	20%	20%	20%		53%	16%	80%	93%	58%	6%	42%
1982	20%	20%	20%	45%	60%	15%	53%	92%	35%	2%	58%
1983	20%	20%	20%	39%	35%	5%	60%	69%	62%	3%	40%
1984	20%	20%	20%	37%	45%	11%	17%	71%	23%	8%	20%
1985	20%	20%	20%	30%	48%	20%	48%	49%	50%	12%	60%
1986	20%	20%	20%	25%	41%	14%	46%	76%	66%	20%	66%
1987	20%	20%	20%	36%	36%	8%	46%	76%	70%	29%	49%
1988	20%	20%	20%	26%	50%	28%	64%	12%	63%	31%	60%
1989	20%	20%	20%	40%	40%	18%	7%	35%	42%	11%	32%
1990	20%	20%	20%	24%	44%	21%	63%	71%	69%	24%	30%
1991	20%	20%	20%	44%	47%	20%	27%	71%	41%	23%	69%
1992	20%	20%	20%	46%	50%	35%	28%	53%	48%	38%	77%
1993	20%	20%	20%	49%	51%	31%	10%	52%	57%	13%	56%
1994	20%	20%	20%	33%	38%	23%	26%	60%	76%	19%	56%
1995	20%	20%	20%	50%	56%	27%	19%	41%	30%	16%	32%
1996	20%	20%	20%	45%	66%	29%	21%	4%	17%	0%	14%
1997	20%	20%	20%	33%	56%	41%	14%	10%	35%	0%	0%
1998	20%	20%	20%	25%	24%	15%	34%	1%	20%	0%	0%
1999	20%	20%	20%	52%	15%	14%	18%	65%	7%	0%	0%
2000	20%	20%	20%	54%	64%	27%	33%	0%	5%	0%	0%
2001	20%	20%	20%	36%	56%	11%	36%	3%	3%	0%	0%
2002	20%	20%	20%	62%	50%	20%	30%	2%	4%	0%	0%
2003	20%	20%	20%	65%	30%	11%	52%	6%	24%	0%	0%
2004	20%	20%	20%	48%	28%	13%	10%	16%	6%	0%	0%
2005	20%	20%	20%	45%	16%	7%	45%	1%	5%	0%	0%
2006	20%	20%	20%	50%	51%	19%	2%	0%	4%	0%	0%
2007	20%	20%	20%	32%	30%	7%	26%	0%	8%	0%	0%
2008	20%	20%	20%	31%	55%	6%	1%	0%	5%	0%	0%
2009	20%	20%	20%	31%	17%	7%	36%	0%	6%	0%	0%
2010	20%	20%	20%	37%	24%	8%	4%	0%	4%	0%	0%
2011	20%	20%	20%	33%	41%	8%	25%	0%	2%	0%	24%
2012	20%	20%	20%	45%	42%	7%	0%	0%	2%	0%	0%
2013	20%	20%	20%	44%	8%	3%	9%	0%	9%	0%	0%
2014	20%	20%	20%	41%	37%	7%	35%	0%	2%	0%	2%

Table 8 (cont'd). Canadian and total exploitation rates for Sockeye salmon stocks summarized by NCC Statistical Area, 1954-2014.

	Total Exploitation Rates										
Year	**01**	**02E**	**02W**	**03**	**04**	**05**	**06**	**07**	**08**	**09**	**10**
1954	20%	20%	20%				40%	34%	44%	55%	69%
1955	20%	20%	20%				60%	39%	26%	50%	75%
1956	20%	20%	20%				65%	43%	32%	61%	83%
1957	20%	20%	20%				36%	22%	10%	37%	74%
1958	20%	20%	20%				64%	43%	81%	55%	91%
1959	20%	20%	20%				38%	14%	25%	25%	69%
1960	20%	20%	20%		55%	17%	47%	47%	43%	62%	92%
1961	20%	20%	20%		52%	16%	33%	45%	53%	67%	90%
1962	20%	20%	20%		56%	17%	24%	45%	42%	46%	70%
1963	20%	20%	20%		35%	11%	9%	45%	48%	13%	72%
1964	20%	20%	20%		55%	17%	49%	50%	77%	39%	83%
1965	20%	20%	20%		46%	14%	56%	81%	64%	72%	96%
1966	20%	20%	20%		64%	20%	39%	37%	62%	51%	77%
1967	20%	20%	20%		71%	22%	31%	48%	68%	60%	86%
1968	20%	20%	20%		63%	19%	38%	62%	89%	62%	70%
1969	20%	20%	20%		51%	16%	73%	38%	27%	77%	61%
1970	20%	20%	20%		52%	16%	63%	74%	56%	7%	54%
1971	20%	20%	20%		56%	17%	36%	53%	35%	37%	52%
1972	20%	20%	20%		58%	18%	86%	78%	44%	45%	44%
1973	20%	20%	20%		64%	20%	47%	62%	46%	39%	63%
1974	20%	20%	20%		69%	21%	44%	85%	43%	7%	79%
1975	20%	20%	20%		43%	13%	33%	66%	61%	3%	46%
1976	20%	20%	20%		59%	18%	39%	83%	64%	45%	60%
1977	20%	20%	20%		59%	18%	35%	76%	46%	58%	30%
1978	20%	20%	20%		62%	19%	73%	69%	49%	40%	74%
1979	20%	20%	20%		58%	18%	75%	84%	69%	4%	37%
1980	20%	20%	20%		61%	19%	63%	88%	67%	0%	2%
1981	20%	20%	20%		59%	18%	80%	93%	58%	6%	42%
1982	20%	20%	20%	62%	67%	16%	53%	92%	35%	2%	58%
1983	20%	20%	20%	66%	51%	7%	60%	69%	62%	3%	40%
1984	20%	20%	20%	63%	54%	13%	17%	71%	23%	8%	20%
1985	20%	20%	20%	52%	57%	21%	48%	49%	50%	12%	60%
1986	20%	20%	20%	68%	56%	17%	46%	76%	66%	20%	66%
1987	20%	20%	20%	63%	40%	9%	46%	76%	70%	29%	49%
1988	20%	20%	20%	61%	63%	31%	64%	12%	63%	31%	60%
1989	20%	20%	20%	78%	54%	21%	7%	35%	42%	11%	32%
1990	20%	20%	20%	61%	61%	24%	63%	71%	69%	24%	30%
1991	20%	20%	20%	68%	63%	21%	27%	71%	41%	23%	69%
1992	20%	20%	20%	66%	67%	37%	28%	53%	48%	38%	77%
1993	20%	20%	20%	75%	63%	32%	10%	52%	57%	13%	56%
1994	20%	20%	20%	63%	58%	24%	26%	60%	76%	19%	56%
1995	20%	20%	20%	77%	66%	28%	19%	41%	30%	16%	32%
1996	20%	20%	20%	79%	74%	31%	21%	4%	17%	0%	14%
1997	20%	20%	20%	75%	73%	43%	14%	10%	35%	0%	0%
1998	20%	20%	20%	63%	42%	16%	34%	1%	20%	0%	0%
1999	20%	20%	20%	75%	22%	17%	18%	65%	7%	0%	0%
2000	20%	20%	20%	67%	69%	27%	33%	0%	5%	0%	0%
2001	20%	20%	20%	71%	66%	12%	36%	3%	3%	0%	0%
2002	20%	20%	20%	71%	53%	23%	30%	2%	4%	0%	0%
2003	20%	20%	20%	78%	37%	13%	52%	6%	24%	0%	0%
2004	20%	20%	20%	78%	40%	14%	10%	16%	6%	0%	0%
2005	20%	20%	20%	66%	32%	11%	45%	1%	5%	0%	0%
2006	20%	20%	20%	68%	57%	19%	2%	0%	4%	0%	0%
2007	20%	20%	20%	73%	48%	9%	26%	0%	8%	0%	0%
2008	20%	20%	20%	43%	57%	7%	1%	0%	5%	0%	0%
2009	20%	20%	20%	57%	23%	7%	36%	0%	6%	0%	0%
2010	20%	20%	20%	48%	29%	9%	4%	0%	4%	0%	0%
2011	20%	20%	20%	50%	48%	9%	25%	0%	2%	0%	24%
2012	20%	20%	20%	57%	45%	9%	0%	0%	2%	0%	0%
2013	20%	20%	20%	59%	12%	3%	9%	0%	9%	0%	0%
2014	20%	20%	20%	53%	51%	8%	35%	0%	2%	0%	2%

Table 9. Canadian and total exploitation rates for Pink salmon stocks summarized by NCC Statistical Area, 1954-2014.

	Canadian Exploitation Rates										
Year	**01**	**02E**	**02W**	**03**	**04**	**05**	**06**	**07**	**08**	**09**	**10**
1954	19%	30%	60%	26%	38%	19%	72%	42%	67%	76%	55%
1955		34%		25%	32%	16%	66%	50%	24%	81%	39%
1956	17%	24%	23%	42%	38%	19%	74%	68%	47%	44%	32%
1957		52%		34%	37%	19%	70%	30%	28%	57%	51%
1958	47%	43%	38%	28%	33%	17%	71%	55%	64%	76%	91%
1959		2%		25%	29%	15%	25%	20%	34%	24%	34%
1960	24%	23%	48%	22%	27%	14%	52%	53%	38%	92%	84%
1961		12%		22%	32%	16%	45%	52%	48%	67%	77%
1962	35%	43%	0%	12%	25%	12%	46%	74%	67%	77%	73%
1963		0%		4%	21%	10%	32%	47%	64%	41%	34%
1964	27%	15%	1%	15%	27%	13%	44%	58%	71%	66%	96%
1965		0%		26%	27%	14%	59%	76%	63%	24%	71%
1966	44%	26%	31%	18%	30%	15%	67%	65%	60%	58%	79%
1967		2%		38%	39%	20%	40%	21%	30%	41%	97%
1968	29%	28%	44%	25%	31%	16%	67%	55%	64%	90%	88%
1969		6%		23%	28%	14%	15%	10%	17%	98%	91%
1970	28%	30%	41%	18%	24%	12%	79%	69%	66%	45%	74%
1971		1%		17%	29%	14%	27%	29%	9%	47%	37%
1972	26%	24%	53%	18%	28%	14%	81%	78%	35%	51%	79%
1973		0%		12%	27%	14%	49%	55%	20%	82%	54%
1974	20%	26%	51%	23%	35%	18%	54%	72%	57%	61%	70%
1975		9%		10%	25%	12%	7%	53%	29%	25%	71%
1976	1%	66%	16%	7%	17%	8%	26%	62%	48%	62%	58%
1977		11%		38%	39%	20%	63%	43%	17%	92%	42%
1978	5%	24%	48%	28%	27%	14%	69%	52%	33%	70%	40%
1979		0%		21%	30%	15%	46%	43%	29%	39%	22%
1980	20%	0%	23%	26%	26%	13%	70%	61%	30%	8%	43%
1981		1%		26%	37%	18%	67%	68%	56%	32%	34%
1982	3%	0%	8%	31%	22%	11%	48%	44%	10%	1%	23%
1983		0%		48%	33%	17%	81%	16%	23%	9%	20%
1984	27%	13%	52%	39%	42%	21%	35%	35%	9%	32%	46%
1985		12%		36%	40%	20%	46%	64%	19%	18%	32%
1986	41%	24%	19%	34%	38%	19%	66%	72%	36%	28%	49%
1987		0%		47%	46%	23%	48%	63%	37%	30%	44%
1988	18%	13%	20%	42%	51%	25%	76%	51%	68%	33%	69%
1989		3%		31%	25%	13%	5%	7%	14%	6%	21%
1990	39%	20%	49%	25%	35%	18%	62%	41%	48%	30%	72%
1991		0%		54%	41%	21%	38%	30%	3%	18%	32%
1992	23%	2%	42%	30%	53%	27%	41%	14%	30%	43%	96%
1993		0%		42%	43%	21%	2%	4%	11%	11%	45%
1994	7%	10%	21%	17%	35%	17%	24%	3%	46%	14%	78%
1995		0%		42%	49%	24%	3%	13%	17%	12%	4%
1996	10%	2%	0%	29%	41%	21%	24%	5%	11%	0%	5%
1997		2%		28%	35%	18%	21%	7%	14%	0%	0%
1998	6%	15%	56%	13%	13%	6%	38%	2%	31%	0%	0%
1999		0%		48%	39%	19%	2%	15%	7%	0%	
2000	0%	3%	51%	24%	40%	20%	35%	1%	3%	0%	0%
2001		0%		13%	27%	14%	38%	23%	18%	0%	
2002	0%	3%	5%	18%	25%	13%	34%	14%	25%	0%	0%
2003		0%		14%	19%	9%	59%	10%	27%	0%	0%
2004	0%	0%	29%	25%	27%	13%	5%	23%	22%	0%	
2005		0%		16%	15%	8%	64%	6%	28%	0%	0%
2006	0%	11%	0%	12%	39%	20%	2%	9%	12%	0%	0%
2007		0%		23%	26%	13%	41%	1%	15%	0%	0%
2008	0%	0%	0%	4%	18%	9%	1%	0%	1%	0%	0%
2009		0%		8%	9%	5%	60%	0%	6%	0%	0%
2010	10%	14%	2%	2%	2%	1%	5%	0%	0%	0%	
2011		0%		7%	14%	7%	44%	3%	0%	0%	
2012	0%	13%	0%	6%	11%	5%	0%	6%	2%	0%	
2013		0%		7%	7%	3%	56%	4%	23%	0%	
2014		0%	0%	7%	15%	8%	27%	17%	23%	0%	

Table 9 (cont'd). Canadian and total exploitation rates for Pink salmon stocks summarized by NCC Statistical Area, 1954-2014.

	Total Exploitation Rates										
Year	**01**	**02E**	**02W**	**03**	**04**	**05**	**06**	**07**	**08**	**09**	**10**
1954	19%	30%	60%	45%	57%	38%	72%	42%	67%	76%	55%
1955		34%		44%	50%	34%	66%	50%	24%	81%	39%
1956	17%	24%	23%	60%	56%	37%	74%	68%	47%	44%	32%
1957		52%		53%	55%	37%	70%	30%	28%	57%	51%
1958	47%	43%	38%	47%	51%	35%	71%	55%	64%	76%	91%
1959		2%		43%	48%	33%	25%	20%	34%	24%	34%
1960	24%	23%	48%	41%	45%	32%	52%	53%	38%	92%	84%
1961		12%		40%	50%	34%	45%	52%	48%	67%	77%
1962	35%	43%	0%	30%	43%	31%	46%	74%	67%	77%	73%
1963		0%		22%	39%	29%	32%	47%	64%	41%	34%
1964	27%	15%	1%	34%	45%	32%	44%	58%	71%	66%	96%
1965		0%		45%	46%	32%	59%	76%	63%	24%	71%
1966	44%	26%	31%	37%	48%	33%	67%	65%	60%	58%	79%
1967		2%		56%	58%	38%	40%	21%	30%	41%	97%
1968	29%	28%	44%	44%	49%	34%	67%	55%	64%	90%	88%
1969		6%		42%	46%	32%	15%	10%	17%	98%	91%
1970	28%	30%	41%	37%	42%	30%	79%	69%	66%	45%	74%
1971		1%		35%	47%	33%	27%	29%	9%	47%	37%
1972	26%	24%	53%	37%	47%	33%	81%	78%	35%	51%	79%
1973		0%		31%	45%	32%	49%	55%	20%	82%	54%
1974	20%	26%	51%	41%	54%	36%	54%	72%	57%	61%	70%
1975		9%		28%	43%	31%	7%	53%	29%	25%	71%
1976	1%	66%	16%	26%	35%	27%	26%	62%	48%	62%	58%
1977		11%		56%	57%	38%	63%	43%	17%	92%	42%
1978	5%	24%	48%	46%	46%	32%	69%	52%	33%	70%	40%
1979		0%		40%	49%	34%	46%	43%	29%	39%	22%
1980	20%	0%	23%	44%	45%	31%	70%	61%	30%	8%	43%
1981		1%		44%	55%	37%	67%	68%	56%	32%	34%
1982	3%	0%	8%	44%	32%	21%	48%	44%	10%	1%	23%
1983		0%		70%	60%	43%	81%	16%	23%	9%	20%
1984	27%	13%	52%	55%	62%	41%	35%	35%	9%	32%	46%
1985		12%		51%	55%	36%	46%	64%	19%	18%	32%
1986	41%	24%	19%	56%	58%	40%	66%	72%	36%	28%	49%
1987		0%		55%	54%	31%	48%	63%	37%	30%	44%
1988	18%	13%	20%	53%	64%	39%	76%	51%	68%	33%	69%
1989		3%		58%	49%	36%	5%	7%	14%	6%	21%
1990	39%	20%	49%	44%	51%	33%	62%	41%	48%	30%	72%
1991		0%		81%	72%	51%	38%	30%	3%	18%	32%
1992	23%	2%	42%	47%	70%	43%	41%	14%	30%	43%	96%
1993		0%		69%	63%	41%	2%	4%	11%	11%	45%
1994	7%	10%	21%	34%	57%	40%	24%	3%	46%	14%	78%
1995		0%		60%	65%	41%	3%	13%	17%	12%	4%
1996	10%	2%	0%	48%	60%	39%	24%	5%	11%	0%	5%
1997		2%		42%	48%	30%	21%	7%	14%	0%	0%
1998	6%	15%	56%	29%	27%	21%	38%	2%	31%	0%	0%
1999		0%		62%	52%	32%	2%	15%	7%	0%	
2000	0%	3%	51%	36%	51%	31%	35%	1%	3%	0%	0%
2001		0%		29%	42%	29%	38%	23%	18%	0%	
2002	0%	3%	5%	29%	36%	23%	34%	14%	25%	0%	0%
2003		0%		28%	32%	23%	59%	10%	27%	0%	0%
2004	0%	0%	29%	40%	40%	27%	5%	23%	22%	0%	
2005		0%		30%	28%	21%	64%	6%	28%	0%	0%
2006	0%	11%	0%	18%	45%	25%	2%	9%	12%	0%	0%
2007		0%		38%	39%	26%	41%	1%	15%	0%	0%
2008	0%	0%	0%	15%	28%	19%	1%	0%	1%	0%	0%
2009		0%		21%	22%	17%	60%	0%	6%	0%	0%
2010	10%	14%	2%	15%	14%	13%	5%	0%	0%	0%	
2011		0%		15%	21%	14%	44%	3%	0%	0%	
2012	0%	13%	0%	20%	24%	18%	0%	6%	2%	0%	
2013		0%		21%	19%	16%	56%	4%	23%	0%	
2014		0%	0%	23%	30%	22%	27%	17%	23%	0%	

Table 10. Canadian and total exploitation rates for Chum salmon stocks summarized by NCC Statistical Area, 1954-2014.

	Canadian Exploitation Rates										
Year	**01**	**02E**	**02W**	**03**	**04**	**05**	**06**	**07**	**08**	**09**	**10**
1954	15%	39%	38%	26%	38%	19%	53%	44%	37%	42%	44%
1955	8%	57%	40%	25%	32%	16%	29%	35%	57%	71%	78%
1956	37%	23%	56%	42%	38%	19%	57%	48%	40%	29%	40%
1957	20%	9%	2%	34%	37%	19%	51%	61%	57%	38%	62%
1958	20%	6%	6%	28%	33%	17%	53%	35%	47%	24%	14%
1959	6%	0%	19%	25%	29%	15%	42%	23%	34%	38%	33%
1960	8%	1%	1%	22%	27%	14%	37%	39%	46%	30%	44%
1961	2%	19%	2%	22%	32%	16%	51%	44%	50%	31%	47%
1962	12%	20%	1%	12%	25%	12%	37%	40%	61%	27%	40%
1963	21%	26%	0%	4%	21%	10%	42%	45%	42%	23%	44%
1964	9%	50%	35%	15%	27%	13%	37%	46%	48%	28%	56%
1965	4%	18%	52%	26%	27%	14%	47%	30%	67%	77%	64%
1966	13%	21%	19%	18%	30%	15%	32%	29%	46%	13%	85%
1967	34%	50%	17%	38%	39%	20%	14%	21%	38%	46%	24%
1968	30%	57%	26%	25%	31%	16%	31%	40%	38%	39%	80%
1969	34%	14%	29%	23%	28%	14%	37%	35%	39%	83%	80%
1970	44%	52%	59%	18%	24%	12%	68%	58%	45%	53%	74%
1971	32%	50%	35%	17%	29%	14%	38%	45%	32%	35%	31%
1972	77%	53%	48%	18%	28%	14%	55%	59%	37%	33%	27%
1973	44%	58%	42%	12%	27%	14%	27%	66%	34%	51%	26%
1974	24%	36%	55%	23%	35%	18%	31%	58%	44%	34%	21%
1975	11%	2%	52%	10%	25%	12%	11%	48%	47%	24%	26%
1976	3%	18%	6%	7%	17%	8%	12%	48%	59%	60%	19%
1977	6%	41%	17%	38%	39%	20%	31%	28%	26%	69%	13%
1978	6%	25%	18%	28%	27%	14%	40%	45%	71%	44%	35%
1979	11%	2%	12%	21%	30%	15%	41%	45%	55%	32%	42%
1980	35%	34%	30%	26%	26%	13%	59%	74%	62%	14%	18%
1981	30%	12%	10%	26%	37%	18%	43%	47%	69%	20%	9%
1982	10%	9%	31%	29%	22%	14%	40%	45%	49%	4%	15%
1983	5%	0%	12%	35%	24%	20%	54%	11%	56%	6%	7%
1984	7%	35%	52%	43%	22%	18%	16%	50%	25%	22%	18%
1985	36%	57%	41%	26%	28%	20%	32%	49%	58%	21%	36%
1986	45%	36%	19%	28%	27%	23%	32%	58%	76%	35%	24%
1987	8%	29%	21%	36%	31%	24%	40%	53%	68%	20%	22%
1988	15%	50%	8%	20%	35%	26%	53%	48%	70%	29%	14%
1989	16%	23%	35%	26%	21%	15%	4%	27%	52%	59%	22%
1990	54%	39%	39%	25%	30%	24%	31%	46%	58%	67%	8%
1991	61%	44%	31%	31%	26%	18%	26%	32%	61%	37%	30%
1992	49%	37%	19%	39%	40%	30%	29%	36%	44%	55%	49%
1993	24%	32%	31%	42%	28%	22%	8%	35%	44%	39%	34%
1994	22%	31%	19%	23%	20%	13%	24%	47%	54%	33%	45%
1995	44%	9%	16%	32%	27%	19%	8%	33%	66%	26%	11%
1996	9%	26%	2%	29%	24%	15%	16%	13%	42%	0%	3%
1997	49%	17%	7%	17%	14%	8%	10%	13%	41%	0%	0%
1998	5%	20%	11%	13%	2%	1%	37%	15%	53%	0%	0%
1999	2%	21%	14%	41%	2%	2%	23%	19%	36%	0%	0%
2000	1%	22%	20%	23%	16%	10%	18%	10%	11%	0%	0%
2001	0%	0%	0%	10%	10%	6%	33%	26%	42%	0%	0%
2002	0%	4%	1%	14%	12%	6%	37%	33%	42%	0%	0%
2003	0%	3%	0%	13%	6%	3%	55%	33%	43%	0%	0%
2004	0%	0%	6%	10%	9%	7%	44%	41%	56%	0%	0%
2005	0%	9%	36%	6%	0%	0%	71%	17%	44%	0%	0%
2006	3%	9%	16%	12%	15%	10%	20%	8%	46%	0%	0%
2007	0%	0%	0%	6%	7%	4%	19%	5%	42%	0%	0%
2008	0%	2%	0%	5%	9%	5%	10%	0%	7%	0%	0%
2009	0%	0%	0%	5%	1%	0%	25%	1%	21%	0%	0%
2010	0%	7%	0%	2%	1%	1%	4%	5%	5%	0%	0%
2011	0%	0%	0%	5%	9%	7%	6%	38%	8%	0%	0%
2012	0%	0%	0%	2%	1%	1%	5%	35%	40%	0%	0%
2013		0%	0%	3%	0%	0%	0%	35%	49%		0%
2014		0%	0%	2%	2%	1%	0%	39%	24%	0%	0%

Table 10 (cont'd). Canadian and total exploitation rates for Chum salmon stocks summarized by NCC Statistical Area, 1954-2014.

	Total Exploitation Rates										
Year	**01**	**02E**	**02W**	**03**	**04**	**05**	**06**	**07**	**08**	**09**	**10**
1954	15%	39%	38%	45%	57%	38%	53%	44%	37%	42%	44%
1955	8%	57%	40%	44%	50%	34%	29%	35%	57%	71%	78%
1956	37%	23%	56%	60%	56%	37%	57%	48%	40%	29%	40%
1957	20%	9%	2%	53%	55%	37%	51%	61%	57%	38%	62%
1958	20%	6%	6%	47%	51%	35%	53%	35%	47%	24%	14%
1959	6%	0%	19%	43%	48%	33%	42%	23%	34%	38%	33%
1960	8%	1%	1%	41%	45%	32%	37%	39%	46%	30%	44%
1961	2%	19%	2%	40%	50%	34%	51%	44%	50%	31%	47%
1962	12%	20%	1%	30%	43%	31%	37%	40%	61%	27%	40%
1963	21%	26%	0%	22%	39%	29%	42%	45%	42%	23%	44%
1964	9%	50%	35%	34%	45%	32%	37%	46%	48%	28%	56%
1965	4%	18%	52%	45%	46%	32%	47%	30%	67%	77%	64%
1966	13%	21%	19%	37%	48%	33%	32%	29%	46%	13%	85%
1967	34%	50%	17%	56%	58%	38%	14%	21%	38%	46%	24%
1968	30%	57%	26%	44%	49%	34%	31%	40%	38%	39%	80%
1969	34%	14%	29%	42%	46%	32%	37%	35%	39%	83%	80%
1970	44%	52%	59%	37%	42%	30%	68%	58%	45%	53%	74%
1971	32%	50%	35%	35%	47%	33%	38%	45%	32%	35%	31%
1972	77%	53%	48%	37%	47%	33%	55%	59%	37%	33%	27%
1973	44%	58%	42%	31%	45%	32%	27%	66%	34%	51%	26%
1974	24%	36%	55%	41%	54%	36%	31%	58%	44%	34%	21%
1975	11%	2%	52%	28%	43%	31%	11%	48%	47%	24%	26%
1976	3%	18%	6%	26%	35%	27%	12%	48%	59%	60%	19%
1977	6%	41%	17%	56%	57%	38%	31%	28%	26%	69%	13%
1978	6%	25%	18%	46%	46%	32%	40%	45%	71%	44%	35%
1979	11%	2%	12%	40%	49%	34%	41%	45%	55%	32%	42%
1980	35%	34%	30%	44%	45%	31%	59%	74%	62%	14%	18%
1981	30%	12%	10%	44%	55%	37%	43%	47%	69%	20%	9%
1982	10%	9%	31%	42%	32%	24%	40%	45%	49%	4%	15%
1983	5%	0%	12%	57%	51%	46%	54%	11%	56%	6%	7%
1984	7%	35%	52%	59%	42%	37%	16%	50%	25%	22%	18%
1985	36%	57%	41%	41%	44%	36%	32%	49%	58%	21%	36%
1986	45%	36%	19%	50%	48%	43%	32%	58%	76%	35%	24%
1987	8%	29%	21%	44%	39%	32%	40%	53%	68%	20%	22%
1988	15%	50%	8%	31%	49%	39%	53%	48%	70%	29%	14%
1989	16%	23%	35%	53%	44%	39%	4%	27%	52%	59%	22%
1990	54%	39%	39%	45%	46%	39%	31%	46%	58%	67%	8%
1991	61%	44%	31%	57%	56%	48%	26%	32%	61%	37%	30%
1992	49%	37%	19%	56%	56%	46%	29%	36%	44%	55%	49%
1993	24%	32%	31%	70%	48%	42%	8%	35%	44%	39%	34%
1994	22%	31%	19%	40%	42%	36%	24%	47%	54%	33%	45%
1995	44%	9%	16%	50%	43%	35%	8%	33%	66%	26%	11%
1996	9%	26%	2%	48%	42%	34%	16%	13%	42%	0%	3%
1997	49%	17%	7%	31%	27%	21%	10%	13%	41%	0%	0%
1998	5%	20%	11%	28%	17%	15%	37%	15%	53%	0%	0%
1999	2%	21%	14%	55%	15%	14%	23%	19%	36%	0%	0%
2000	1%	22%	20%	35%	27%	21%	18%	10%	11%	0%	0%
2001	0%	0%	0%	26%	25%	21%	33%	26%	42%	0%	0%
2002	0%	4%	1%	26%	22%	17%	37%	33%	42%	0%	0%
2003	0%	3%	0%	27%	19%	17%	55%	33%	43%	0%	0%
2004	0%	0%	6%	25%	22%	20%	44%	41%	56%	0%	0%
2005	0%	9%	36%	20%	13%	13%	71%	17%	44%	0%	0%
2006	3%	9%	16%	18%	20%	16%	20%	8%	46%	0%	0%
2007	0%	0%	0%	21%	20%	17%	19%	5%	42%	0%	0%
2008	0%	2%	0%	15%	19%	15%	10%	0%	7%	0%	0%
2009	0%	0%	0%	18%	13%	13%	25%	1%	21%	0%	0%
2010	0%	7%	0%	15%	13%	12%	4%	5%	5%	0%	0%
2011	0%	0%	0%	14%	16%	14%	6%	38%	8%	0%	0%
2012	0%	0%	0%	16%	14%	14%	5%	35%	40%	0%	0%
2013		0%	0%	17%	12%	12%	0%	35%	49%		0%
2014		0%	0%	17%	17%	16%	0%	39%	24%	0%	0%

Table 11. Canadian and total exploitation rates for Coho salmon stocks summarized by NCC Statistical Area, 1954-2014.

	Canadian Exploitation Rates										
Year	01	02E	02W	03	04	05	06	07	08	09	10
1954		21%	21%	21%	36%	23%	23%	22%	23%	22%	22%
1955		21%	21%	21%	36%	23%	23%	22%	23%	22%	22%
1956		21%	21%	21%	36%	23%	23%	22%	23%	22%	22%
1957		21%	21%	21%	36%	23%	23%	22%	23%	22%	22%
1958		21%	21%	21%	36%	23%	23%	22%	23%	22%	22%
1959		21%	21%	21%	36%	23%	23%	22%	23%	22%	22%
1960		21%	21%	21%	36%	23%	23%	22%	23%	22%	22%
1961		21%	21%	21%	36%	23%	23%	22%	23%	22%	22%
1962		21%	21%	21%	36%	23%	23%	22%	23%	22%	22%
1963		19%	19%	19%	33%	21%	21%	20%	21%	20%	20%
1964		24%	24%	24%	41%	26%	26%	25%	26%	25%	25%
1965		18%	18%	18%	31%	20%	20%	19%	20%	19%	19%
1966		23%	23%	23%	39%	24%	24%	23%	24%	24%	24%
1967		18%	18%	18%	31%	19%	19%	19%	19%	19%	19%
1968		23%	23%	23%	39%	24%	24%	23%	24%	24%	24%
1969		19%	19%	19%	33%	21%	21%	20%	21%	20%	20%
1970		22%	22%	22%	37%	23%	24%	23%	23%	23%	23%
1971		22%	22%	22%	37%	23%	24%	23%	23%	23%	23%
1972		25%	25%	25%	43%	27%	27%	26%	27%	27%	27%
1973		19%	19%	19%	33%	21%	21%	20%	21%	21%	21%
1974		21%	21%	21%	37%	23%	23%	22%	23%	23%	23%
1975		18%	18%	18%	30%	19%	19%	18%	19%	19%	19%
1976		18%	18%	18%	30%	19%	19%	18%	19%	19%	19%
1977		23%	23%	23%	39%	24%	24%	23%	24%	24%	24%
1978		26%	26%	26%	45%	28%	29%	27%	28%	28%	28%
1979		27%	27%	27%	46%	29%	29%	28%	29%	29%	29%
1980		28%	28%	28%	48%	30%	31%	29%	30%	30%	30%
1981		26%	26%	26%	44%	28%	28%	27%	28%	27%	27%
1982		22%	22%	22%	38%	24%	24%	23%	24%	23%	23%
1983		31%	31%	31%	53%	33%	33%	32%	33%	33%	33%
1984		27%	27%	27%	47%	30%	30%	29%	30%	29%	29%
1985		29%	29%	29%	49%	31%	31%	30%	31%	30%	30%
1986		32%	32%	32%	54%	34%	34%	33%	34%	33%	33%
1987		24%	24%	24%	42%	26%	26%	25%	26%	26%	26%
1988		24%	24%	24%	41%	26%	26%	25%	26%	25%	25%
1989		23%	23%	23%	40%	25%	25%	24%	25%	25%	25%
1990		27%	27%	27%	46%	29%	29%	28%	29%	28%	28%
1991		19%	19%	19%	33%	21%	21%	20%	21%	20%	20%
1992		17%	17%	17%	29%	18%	18%	18%	18%	18%	18%
1993		16%	16%	16%	29%	18%	18%	17%	18%	18%	18%
1994		19%	19%	19%	30%	19%	19%	18%	19%	18%	18%
1995		14%	14%	14%	20%	12%	12%	12%	12%	12%	12%
1996		23%	23%	23%	47%	30%	30%	29%	30%	29%	29%
1997		19%	19%	9%	13%	23%	18%	22%	23%	23%	23%
1998		0%	0%	2%	2%	5%	3%	5%	5%	5%	5%
1999		0%	0%	2%	3%	4%	3%	4%	4%	4%	4%
2000		0%	0%	12%	5%	4%	2%	3%	4%	4%	4%
2001		0%	0%	12%	5%	6%	4%	5%	6%	6%	6%
2002		0%	0%	6%	10%	7%	5%	6%	7%	6%	6%
2003		5%	5%	12%	9%	8%	6%	7%	8%	8%	8%
2004		55%	55%	14%	18%	13%	8%	12%	13%	13%	13%
2005		44%	44%	14%	6%	9%	12%	8%	9%	8%	8%
2006		17%	17%	12%	6%	8%	7%	7%	8%	7%	7%
2007		16%	16%	12%	15%	7%	10%	6%	7%	6%	6%
2008		16%	16%	8%	6%	7%	7%	6%	7%	6%	6%
2009		15%	15%	8%	5%	8%	15%	7%	8%	7%	7%
2010		27%	27%	10%	7%	9%	9%	8%	9%	8%	8%
2011		10%	10%	13%	17%	7%	17%	10%	10%	7%	7%
2012		14%	14%	16%	7%	3%	7%	4%	4%	3%	3%
2013		17%	17%	14%	10%	4%	10%	6%	6%	4%	4%
2014		15%	15%	8%	5%	2%	5%	3%	3%	2%	2%

Table 11 (cont'd). Canadian and total exploitation rates for Coho salmon stocks summarized by NCC Statistical Area, 1954-2014.

	Total Exploitation Rates										
Year	**01**	**02E**	**02W**	**03**	**04**	**05**	**06**	**07**	**08**	**09**	**10**
1954		24%	24%	51%	55%	30%	42%	33%	34%	26%	26%
1955		24%	24%	51%	55%	30%	42%	33%	34%	26%	26%
1956		24%	24%	51%	55%	30%	42%	33%	34%	26%	26%
1957		24%	24%	51%	55%	30%	42%	33%	34%	26%	26%
1958		24%	24%	51%	55%	30%	42%	33%	34%	26%	26%
1959		24%	24%	51%	55%	30%	42%	33%	34%	26%	26%
1960		24%	24%	51%	55%	30%	42%	33%	34%	26%	26%
1961		24%	24%	51%	55%	30%	42%	33%	34%	26%	26%
1962		24%	24%	51%	55%	30%	42%	33%	34%	26%	26%
1963		22%	22%	46%	50%	27%	38%	30%	31%	24%	24%
1964		28%	28%	59%	63%	35%	48%	38%	39%	30%	30%
1965		21%	21%	45%	48%	26%	36%	29%	30%	23%	23%
1966		26%	26%	55%	59%	32%	45%	36%	37%	28%	28%
1967		21%	21%	44%	47%	26%	36%	28%	29%	22%	22%
1968		26%	26%	55%	59%	32%	45%	36%	37%	28%	28%
1969		22%	22%	46%	50%	27%	38%	30%	31%	24%	24%
1970		25%	25%	53%	57%	31%	43%	35%	35%	27%	27%
1971		25%	25%	53%	57%	31%	43%	35%	35%	27%	27%
1972		29%	29%	61%	66%	36%	50%	40%	41%	31%	31%
1973		23%	23%	47%	51%	28%	39%	31%	32%	24%	24%
1974		25%	25%	52%	56%	31%	43%	34%	35%	26%	26%
1975		20%	20%	43%	46%	25%	35%	28%	28%	22%	22%
1976		20%	20%	43%	46%	25%	35%	28%	28%	22%	22%
1977		26%	26%	55%	59%	32%	45%	36%	37%	28%	28%
1978		30%	30%	64%	69%	38%	52%	42%	43%	33%	33%
1979		31%	31%	66%	71%	39%	54%	43%	44%	34%	34%
1980		33%	33%	69%	74%	41%	56%	45%	46%	35%	35%
1981		30%	30%	62%	67%	37%	51%	41%	41%	32%	32%
1982		26%	26%	54%	58%	32%	44%	35%	36%	27%	27%
1983		36%	36%	75%	81%	45%	62%	49%	50%	38%	38%
1984		32%	32%	67%	72%	40%	55%	44%	45%	34%	34%
1985		33%	33%	70%	75%	41%	57%	45%	46%	35%	35%
1986		37%	37%	77%	83%	46%	63%	50%	51%	39%	39%
1987		28%	28%	59%	64%	35%	49%	39%	40%	30%	30%
1988		28%	28%	59%	63%	35%	48%	38%	39%	30%	30%
1989		27%	27%	57%	61%	34%	47%	37%	38%	29%	29%
1990		31%	31%	65%	70%	38%	53%	42%	43%	33%	33%
1991		22%	22%	66%	62%	32%	50%	38%	38%	26%	26%
1992		19%	19%	64%	65%	33%	55%	39%	40%	25%	25%
1993		19%	19%	64%	57%	29%	46%	34%	35%	23%	23%
1994		22%	22%	73%	66%	33%	55%	40%	40%	26%	26%
1995		16%	16%	69%	38%	20%	31%	23%	24%	16%	16%
1996		26%	26%	62%	74%	40%	57%	45%	46%	34%	34%
1997		22%	22%	55%	50%	38%	55%	45%	45%	30%	30%
1998		4%	4%	48%	20%	12%	21%	15%	16%	9%	9%
1999		2%	2%	50%	22%	12%	22%	15%	16%	8%	8%
2000		0%	0%	53%	18%	9%	14%	11%	11%	6%	6%
2001		0%	0%	54%	28%	16%	27%	19%	20%	10%	10%
2002		0%	0%	22%	23%	12%	19%	14%	15%	9%	9%
2003		5%	5%	46%	27%	16%	24%	18%	19%	11%	11%
2004		56%	56%	55%	40%	22%	29%	25%	26%	17%	17%
2005		63%	63%	57%	27%	17%	33%	21%	22%	13%	13%
2006		21%	21%	47%	23%	14%	24%	17%	18%	11%	11%
2007		19%	19%	50%	42%	18%	38%	23%	24%	12%	12%
2008		19%	19%	38%	34%	18%	35%	22%	23%	12%	12%
2009		17%	17%	29%	37%	21%	47%	27%	27%	14%	14%
2010		27%	27%	42%	30%	18%	32%	22%	23%	13%	13%
2011		11%	11%	54%	43%	17%	43%	26%	26%	12%	12%
2012		14%	14%	55%	34%	14%	34%	20%	20%	8%	8%
2013		18%	18%	65%	37%	15%	37%	22%	22%	9%	9%
2014		18%	18%	42%	22%	9%	22%	13%	13%	5%	5%

Table 12. Canadian and total exploitation rates for Chinook salmon stocks summarized by NCC Statistical Area, 1980-2014.

	Canadian Exploitation Rates											
Year	**01**	**02E**	**02W**	**03**	**04**	**05**	**06**	**07**	**08**	**9S**	**9W**	**10**
1980										28%	59%	17%
1981										31%	34%	17%
1982										22%	69%	20%
1983										17%	44%	23%
1984					29%					22%	66%	16%
1985					27%		8%		32%	23%	38%	56%
1986				20%	35%		8%		32%	33%	39%	38%
1987				19%	26%		8%		32%	21%	37%	21%
1988				19%	33%		8%		32%	22%	33%	17%
1989				20%	27%		8%		32%	24%	34%	26%
1990				20%	32%		8%		28%	20%	35%	18%
1991				33%	38%		5%		35%	38%	36%	21%
1992				49%	30%		11%		38%	19%	26%	33%
1993				42%	37%		9%		30%	22%	25%	14%
1994				41%	34%		6%		29%	22%	32%	14%
1995				58%	45%		5%		33%	27%	26%	13%
1996				44%	22%		2%		30%	10%	26%	6%
1997				43%	19%		5%		33%	9%	28%	9%
1998				45%	15%		6%		39%	8%	31%	6%
1999				55%	26%		4%		25%	8%	75%	6%
2000				40%	24%		4%		29%	7%	26%	6%
2001				32%	15%		3%		34%	7%	37%	6%
2002				47%	17%		14%		45%	7%	36%	6%
2003				35%	18%		19%		55%	8%	56%	6%
2004				49%	23%		11%		49%	8%	34%	1%
2005				45%	22%		18%		49%	9%	28%	1%
2006				34%	24%		10%		31%	8%	32%	1%
2007				37%	16%		8%		40%	9%	20%	1%
2008				27%	35%		4%		31%	7%	13%	
2009				24%	15%		8%		51%	8%	19%	
2010				24%	19%		11%		44%	18%	26%	
2011				41%	22%		17%		53%	11%	23%	
2012				37%	15%		6%		41%	14%	32%	
2013				44%	18%		4%		34%	9%	28%	
2014				41%	16%		9%		38%	12%	38%	

Table 12 (cont'd). Canadian and total exploitation rates for Chinook salmon stocks summarized by NCC Statistical Area, 1980-2014.

	Total Exploitation Rates											
Year	**01**	**02E**	**02W**	**03**	**04**	**05**	**06**	**07**	**08**	**9S**	**9W**	**10**
1980										28%	59%	17%
1981										31%	34%	17%
1982										22%	69%	20%
1983										17%	44%	23%
1984					55%					22%	66%	16%
1985					55%		20%		44%	23%	38%	56%
1986				21%	44%		20%		44%	33%	39%	38%
1987				22%	41%		20%		44%	21%	37%	21%
1988				23%	63%		20%		44%	22%	33%	17%
1989				22%	48%		20%		44%	24%	34%	26%
1990				22%	45%		33%		52%	20%	35%	18%
1991				39%	63%		13%		42%	38%	36%	21%
1992				51%	45%		20%		46%	19%	26%	33%
1993				44%	52%		21%		41%	22%	25%	14%
1994				43%	47%		15%		37%	22%	32%	14%
1995				61%	61%		11%		38%	27%	26%	13%
1996				46%	40%		5%		33%	10%	26%	6%
1997				45%	40%		11%		39%	9%	28%	9%
1998				47%	28%		14%		46%	8%	31%	6%
1999				58%	46%		13%		33%	8%	75%	6%
2000				42%	42%		10%		35%	7%	26%	6%
2001				34%	39%		12%		42%	7%	37%	6%
2002				49%	38%		20%		51%	7%	36%	6%
2003				36%	35%		24%		60%	8%	56%	6%
2004				51%	37%		21%		58%	8%	34%	1%
2005				45%	43%		32%		62%	9%	28%	1%
2006				38%	43%		19%		40%	8%	32%	1%
2007				38%	33%		22%		53%	9%	20%	1%
2008				27%	46%		12%		38%	7%	13%	
2009				27%	34%		18%		60%	8%	19%	
2010				26%	28%		23%		54%	18%	26%	
2011				43%	36%		31%		66%	11%	23%	
2012				40%	33%		20%		53%	14%	32%	
2013				47%	32%		8%		38%	9%	28%	
2014				44%	31%		15%		43%	12%	38%	

FIGURES

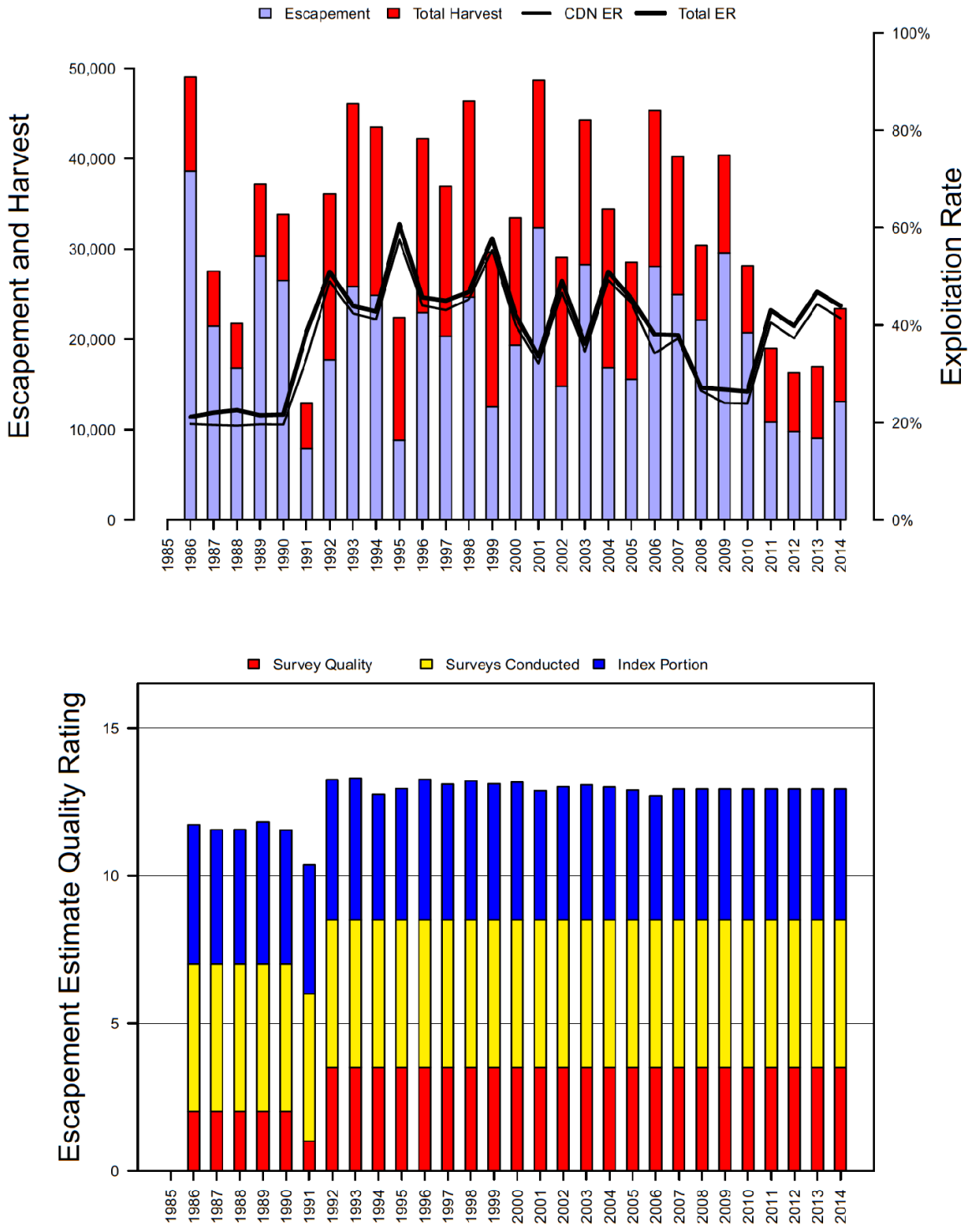


Figure 3. Escapement, harvests, and exploitation rate trends for Area 3 (Nass) Chinook.

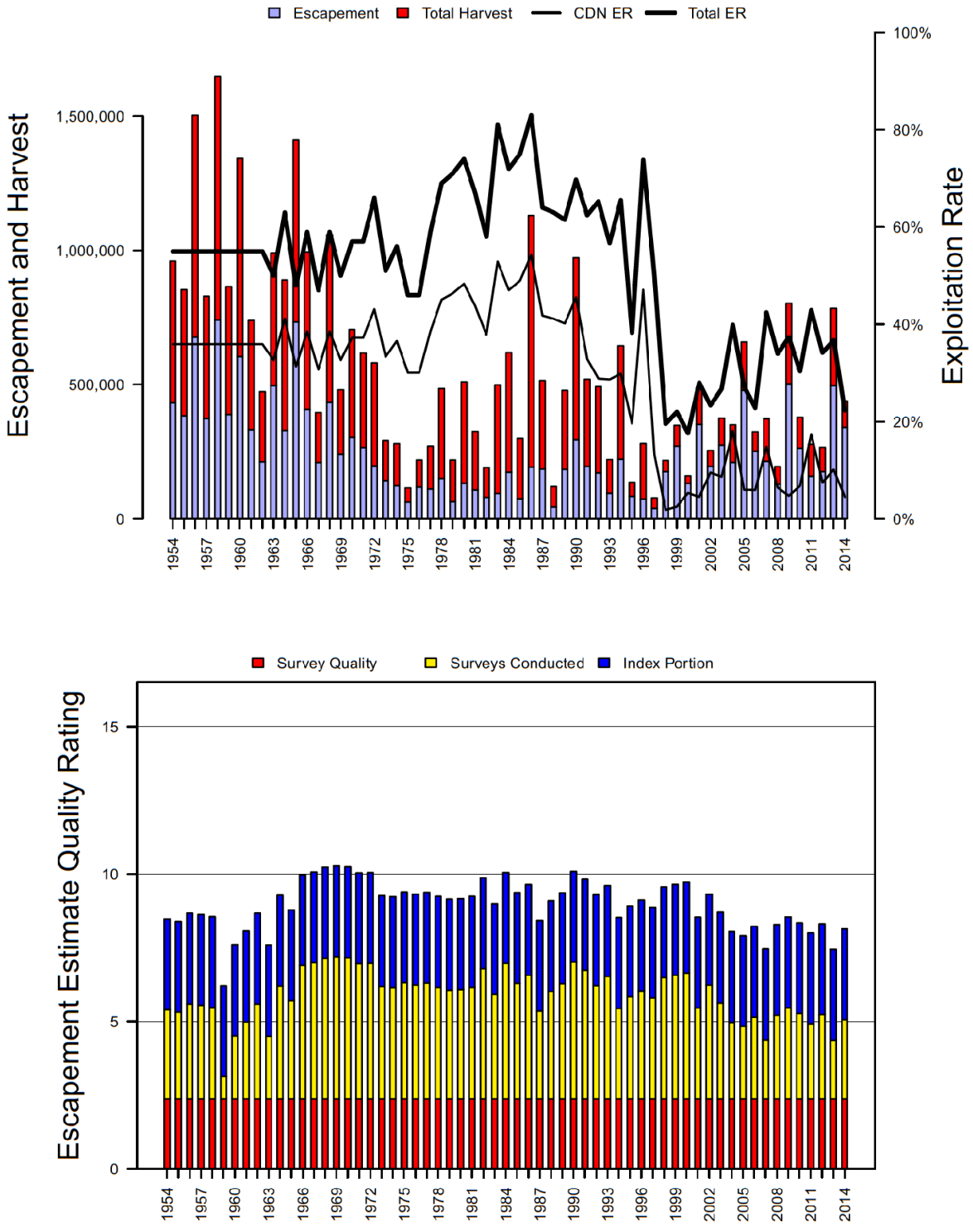


Figure 4. Escapement, harvests, and exploitation rate trends for Area 4 (Skeena) Coho.

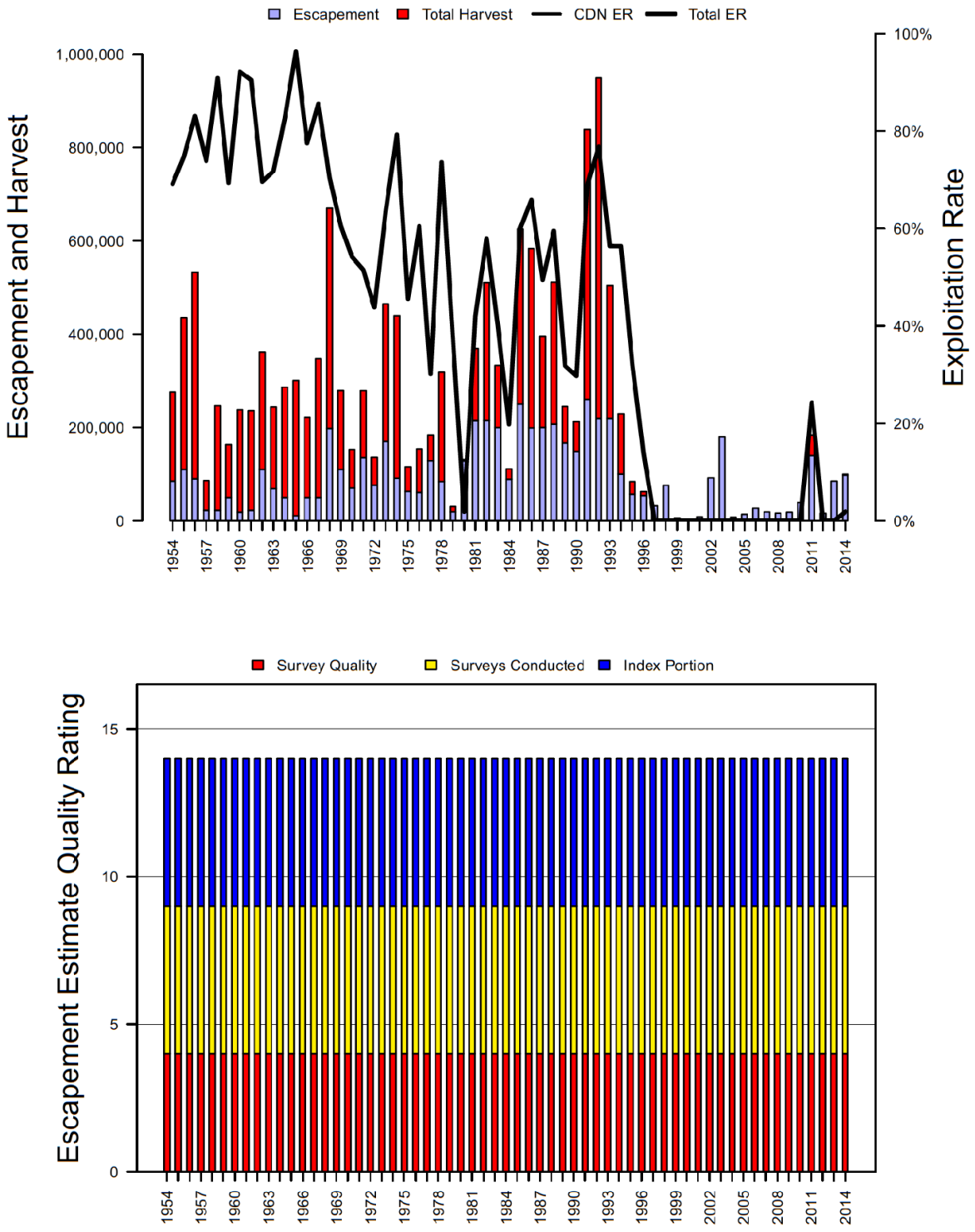


Figure 5. Escapement, harvests, and exploitation rate trends for Long Lake Sockeye CU (Area 10 Smith Inlet Sockeye).

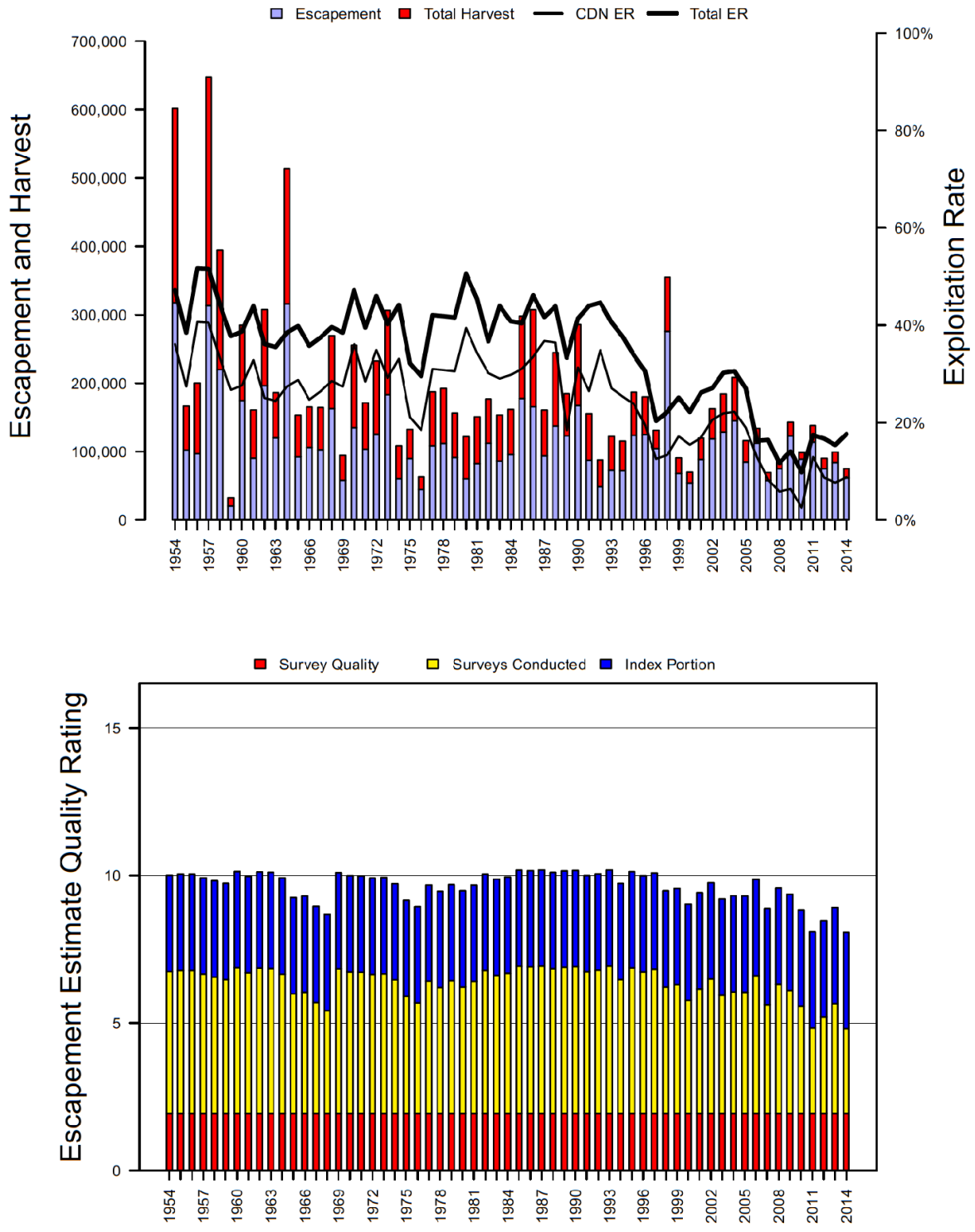


Figure 6. Escapement, harvests, and exploitation rate trends for the Hecate Lowlands Chum salmon CU.

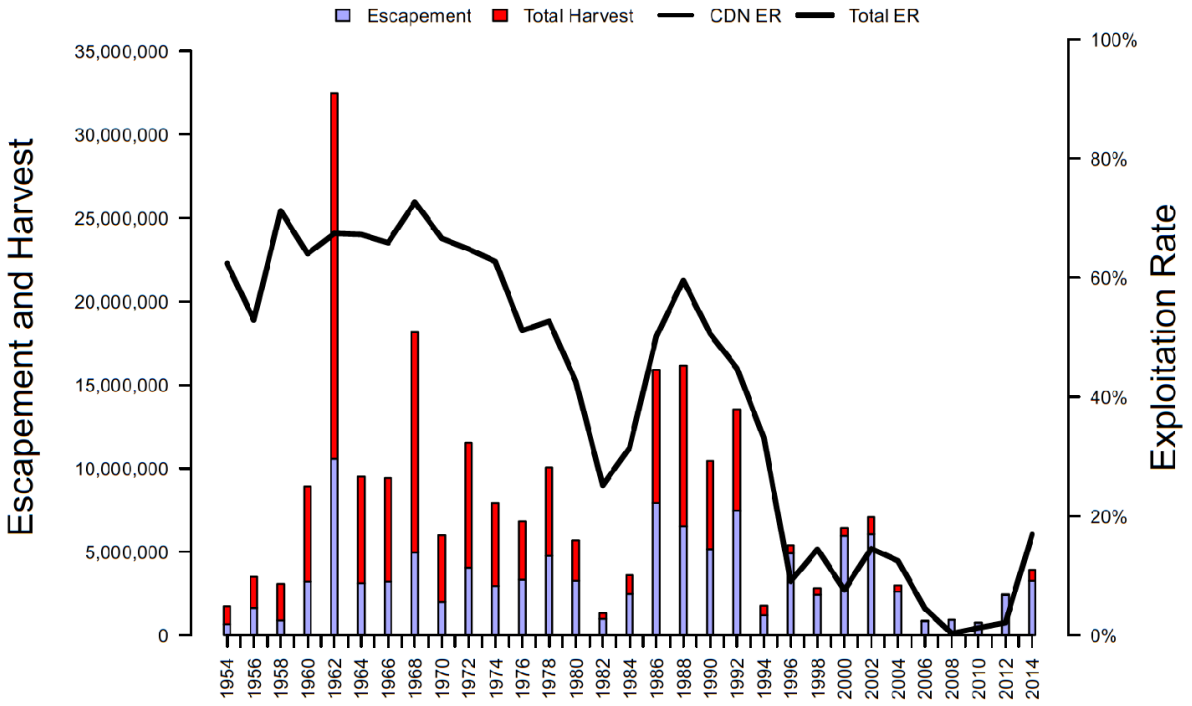


Figure 1. Pink (even years) run reconstruction summary for the Hecate Strait−Fjords Conservation Unit.

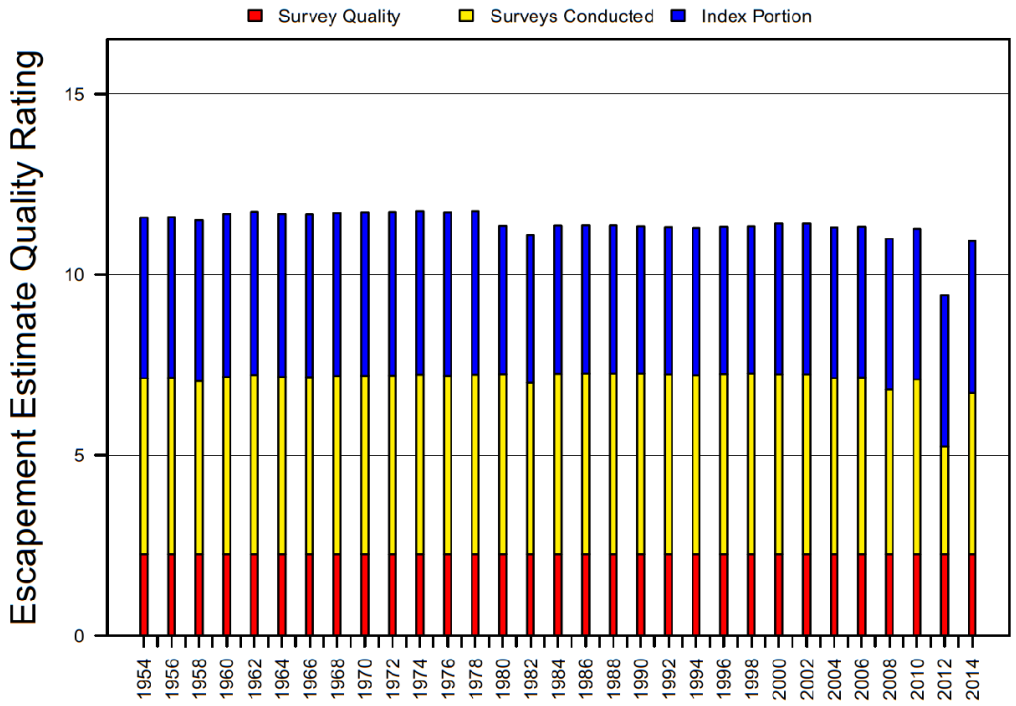


Figure 7. Escapement, harvests, and exploitation rate trends for Hecate Strait Fjords even year Pink salmon CU.

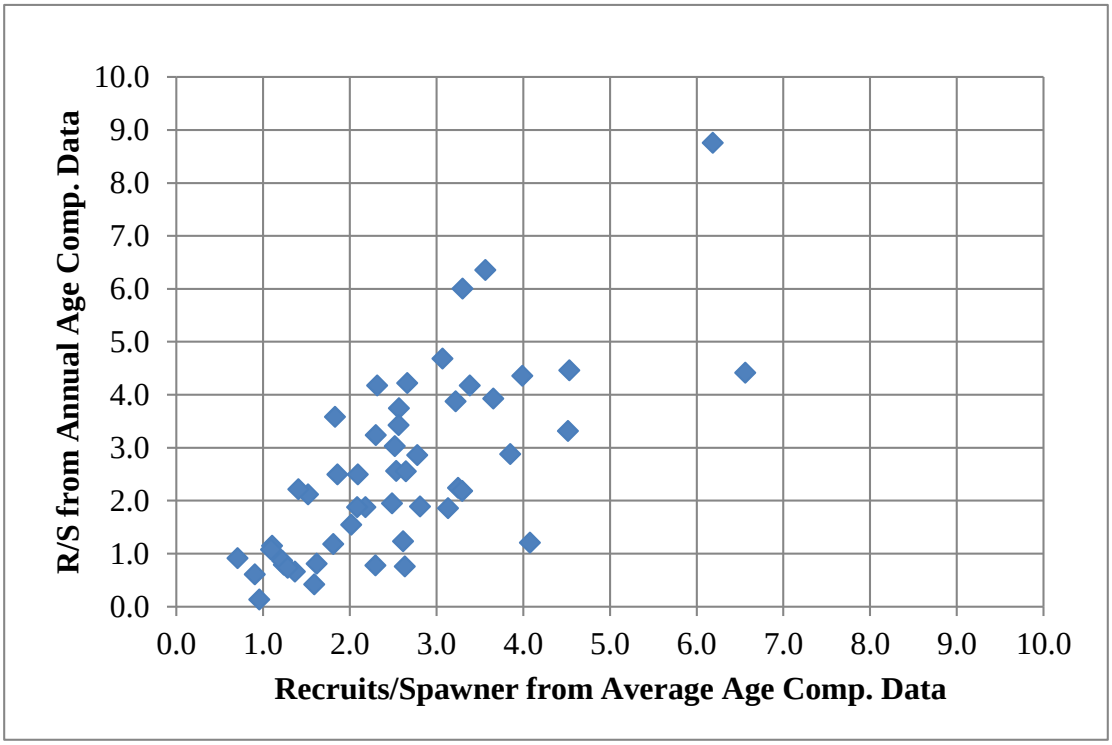


Figure 8. Comparison of estimates of recruits per spawner for Babine Sockeye using average and annual age composition estimates.

APPENDICES

APPENDIX A

Methods used to estimate total escapement, the total return to Canada and total run size for North and Central coast salmon stocks.

The assessment of long-term trends in abundance is critical for determining stock status, setting annual fisheries management goals and defining harvest sharing agreements for First Nations, sport and commercial fisheries. The first task in any stock assessment is to define the stocks to be assessed. For salmon populations, the resolution of stock units range from specific run-timing groups for a specific spawning area to numerous spawning streams within a geographic region. While sound biological and genetic rationale are available to define some of these stock groups, the practical constraints on our ability to assess long-trend trends in abundance for specific salmon stocks is largely determined by the quantity and quality of the available catch and escapement data. For all salmon stocks, the minimum requirement for stock specific assessments is information on the number of adults returning to the spawning area (i.e., spawning escapement). Escapement data are available for a large number of streams but not all streams and all species within each statistical area. Since both escapement and catch data are routinely organized by statistical area, we used the North Coast and Central Coast (NCC) statistical areas (Areas 1-10) as the basic units for our initial assessment. Within these statistical areas there are a number of instances where the assessment is limited to a specific stock or stock group because of data quality or limitations (e.g., Skeena Sockeye, Nass Sockeye, Nass Coho, Bella Coola Chinook). The goal for these analyses was to provide systematic estimates of the total escapement, total return to Canadian waters, total run size and exploitation rates for each salmon species by statistical area. The exploitations rates for each statistical area could then be applied to escapement estimates for each Conservation Unit (CU) to produce estimates of total run size for each CU.

The major sources of data and estimates used in these analyses were:

- Annual escapement data for all monitored streams within a statistical area;
- Weekly catch data for Sockeye, Pink and Chum by gear type for each statistical area;
- Annual exploitation rate estimates for Chinook and Coho from CWT data and the NCC Coho Model; and
- Annual estimates of the catch and escapement for Nass and Skeena Sockeye aggregates and CUs from the Northern Boundary run reconstruction (NBSRR) Model.

The procedures used for each combination of species and statistical area were determined by the quantity and quality of the available data. The most common approach used to estimate total escapement was the indicator stream method, where a series of expansions were used to convert the observed escapement for frequently monitored streams into a series of annual escapement estimates for a statistical area. The procedures and equations used to estimate the total annual escapement are described below.

Symbols and notation

a = statistical area
i = indicator stream or river (sum = I)
j = non-indicator stream or river (sum = J)
s = species
d = decade (1=1980-89, 2=1990-99)
y = year in a decade with escapement survey data (max. 10)
Y_{siad} = total years of escapement survey data, by stratum
w = weighting factor
C = catch
$\bar{E}_{siad}$ = observed indicator stream escapement, averaged over years with survey data, by stratum
$\bar{E}_{sjad}$ = observed non-indicator stream escapement, averaged over years with survey data, by stratum
E_{siady} = observed escapement to an indicator stream, by stratum
E'_{sady} = adjusted observed escapement to all indicator streams, by stratum
$\hat{E}_{sady}$ = total estimated escapement by stratum
P = portion of total mean escapements of all streams accounted for by stream r
F'_{sady} = correction factor for missing indicator stream survey data, by stratum
F''_{sady} = correction factor non-indicator stream contributions, by stratum
F'''_{sa} = correction factor for observer efficiency, by species and area
ER_{Total} = total exploitation rate (i.e., total harvest) for a specific year, species and statistical area
ER_{CDN} = Canadian exploitation rate for a specific year, species and statistical area
$TRTC$ = total return to Canada for a specific year, species and statistical area

Description of estimators

The observed escapement of a species to an indicator stream, average over years with survey data in a decade and stratum is

$$\bar{E}_{siad} = \frac{\sum_{y=1}^{Y_{srd}} E_{siady}}{Y_{siad}}$$

The indicator stream escapement contribution to that of all indicator streams in a stratum is

$$P_{siad} = \frac{\bar{E}_{siad}}{\sum_{i=1}^{I} \bar{E}_{siad}}$$

An expansion factor is used to weight the contributions of indicator streams with missing survey data, and give an adjusted observed escapement to all indicator streams in a stratum

$$F'_{sady} = \frac{1}{\sum_{i=1}^{I}\left(P_{siad} \cdot w_{siady}\right)} \qquad \begin{cases} w_{siady} = 0 \text{ if } E_{siady} = 0 \\ w_{siady} = 1 \text{ if } E_{siady} > 0 \end{cases}$$

$$E'_{sady} = F'_{sady} \sum_{i=1}^{I} E_{siady}$$

The overall observed escapement to all streams in an area is obtained by accounting for the contribution of non-indicator streams to the total average escapement for all streams in that statistical area for the user defined decade or period with the best survey coverage for that statistical area (Appendix Table A1).

$$F''_{sady} = \frac{\sum_{i=1}^{I} \overline{E}_{siady} + \sum_{j=1}^{J} \overline{E}_{sjady}}{\sum_{i=1}^{I} \overline{E}_{siady}}$$

$$E_{sady} = E'_{sady} \cdot F''_{sady}$$

The same approach was used to account for the contribution of non-indicator streams within a CU. The decade or period with best survey coverage has to be defined for each CU (Appendix Table A2) since the historical pattern of stream survey effort and number of indicator streams associated with each CU could be substantially different from the totals for the associated statistical area. Summaries of the resulting F''_{sady} values for each species by year and statistical area are provided in Appendix Tables (A3).

Finally, the total estimated escapement to a statistical area is obtained by accounting for observer efficiency, as determined by the regional DFO staff familiar with the escapement monitoring techniques used in each statistical area (Table A4). In the current analyses, the correction factors are considered to be constant over all years for each species, but vary both between species and in some instances between survey areas

$$\hat{E}_{sady} = E_{sady} \cdot F'''_{sa}$$

The stock-specific exploitation rates were derived from indicator stocks for Chinook and Coho salmon or by combining catch and escapement data for individual or groups of statistical areas for Sockeye, Pink, and Chum salmon. A summary of the methods and sources used to compute these exploitation rates are described in the report for all species with additional information provided in Appendix B for Sockeye and Appendix C for Chinook.

The Total Run (TR) in a given year for each species and statistical area was estimated by combining the estimated total escapement (TE) with an estimate of the annual exploitation rate for all fisheries (ER_{Total}) in the following equation:

$$TR = TE / (1-ER_{Total})$$

The Total Return to Canada (TRTC) in a given year for each species and statistical area was estimated by combining the estimated total escapement (TE) with an estimate of the annual exploitation rate for Canadian fisheries (ER_{CDN}) in the following equation:

$$TRTC = TE + TR * ER_{CDN}$$

For a few area-species combinations, the desired estimates were derived from formal run reconstruction or Cohort analyses (e.g., Nass and Skeena Sockeye, Atnarko Chinook).

Appendix Table A1. Summary of the number of streams, number of indicator streams, and portion of the total escapement represented by indicator stream by decade for each North Coast and Central Coast Statistical Area. Shaded cells indicate the specific periods used when decadal averages are not appropriate.

Area	Species	TotalNoStreams	Streams1950s	Streams1960s	Streams1970s	Streams1980s	Streams1990s	Streams2000s	Streams2010s	Indicators	Indicators1950s	Indicators1960s	Indicators1970s	Indicators1980s	Indicators1990s	Indicators2000s	Indicators2010s	Ind_Portion1950s	Ind_Portion1960s	Ind_Portion1970s	Ind_Portion1980s	Ind_Portion1990s	Ind_Portion2000s	Ind_Portion2010s	AvgPeriod
01	CM	12	8	8	10	10	7	11	3	4	4	4	4	4	4	4	3	0.99	1.00	0.90	0.98	1.00	0.99	1.00	0
02E	CM	125	57	80	90	114	111	84	56	40	31	36	39	39	39	40	37	0.77	0.72	0.75	0.77	0.84	0.95	0.97	1
02W	CM	71	52	53	56	56	68	60	40	36	31	34	35	35	36	36	30	0.85	0.82	0.73	0.75	0.90	0.94	0.96	0
03	CM	58	24	25	36	40	31	29	17	13	11	12	12	12	12	13	10	0.86	0.80	0.89	0.89	0.99	0.99	0.93	1
04	CM	57	19	35	27	42	40	14	12	10	6	10	9	10	10	8	9	0.51	0.83	0.68	0.78	0.74	0.97	0.92	4
05	CM	48	37	34	36	34	30	23	13	11	11	11	9	10	10	11	8	0.47	0.58	0.35	0.59	0.89	0.92	0.98	4
06	CM	139	108	110	108	129	103	85	68	52	47	49	50	51	52	52	48	0.54	0.62	0.70	0.74	0.45	0.56	0.87	1 *
07	CM	80	48	46	55	66	64	58	41	37	31	31	31	32	32	37	32	0.87	0.90	0.87	0.89	0.96	0.99	0.99	4
08	CM	57	28	28	30	38	38	45	25	24	13	13	14	14	14	24	18	0.81	0.88	0.88	0.90	0.94	0.90	0.97	0
09	CM	23	13	12	17	21	19	16	8	7	6	6	7	7	7	7	7	0.69	0.66	0.57	0.54	0.68	0.99	1.00	0
10	CM	5	3	3	3	4	4	5	2	3	2	2	2	3	3	3	2	0.83	0.48	0.79	0.91	0.94	0.99	1.00	0
01	CN	2	1	1	2	2	1	1		1	1	1	1	1	1	1		1.00	1.00	0.99	0.99	1.00	1.00		
02E	CN	6		1			5	2																	
03	CN	31	9	16	24	20	22	10	5	6	4	5	6	6	6	6	5	0.60	0.38	0.49	0.45	0.49	0.93	1.00	4
04	CN	87	23	51	48	58	55	39	17	17	10	13	14	15	17	17	11	0.95	0.83	0.80	0.87	0.95	0.99	1.00	4
05	CN	3	1	1	1	2	2	1	1	1	1	1	1	1	1	1	1	1.00	1.00	1.00	1.00	0.96	1.00	1.00	5
06	CN	42	20	25	21	29	20	11	7	3	2	3	3	3	3	3	2	0.10	0.07	0.04	0.02	0.01	0.65	0.54	
07	CN	3	1	3		2																			
08	CN	10	4	4	5	9	7	4	2	2	2	2	2	2	2	2	2	0.95	0.97	0.96	0.98	0.98	0.95	1.00	4
09	CN	15	6	8	11	11	10	9	3	7	4	6	7	7	7	7	3	0.97	0.99	0.97	0.98	1.00	1.00	1.00	1
10	CN	2	1	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1.00	0.99	0.97	0.97	0.99	1.00	1.00	4
01	CO	16	12	13	15	15	13	11																	
02E	CO	126	49	66	74	116	106	58	9	6	6	6	6	6	6	6	6	0.42	0.46	0.45	0.46	0.54	0.85	0.97	4
02W	CO	57	30	35	30	43	45	31	8	3	1	3	3	3	3	3		0.03	0.05	0.09	0.13	0.09	0.08		4
03	CO	65	17	25	47	58	27	20	8	8	3	6	8	8	6	8	7	0.17	0.09	0.18	0.30	0.67	0.86	0.97	1
04	CO	175	59	99	94	116	114	91	43	47	27	38	40	40	41	42	30	0.69	0.75	0.67	0.69	0.81	0.91	0.85	4
05	CO	54	43	43	48	50	41	7	10	29	28	28	28	28	28	5	7	0.90	0.87	0.95	0.88	0.86	0.94	0.96	4
06	CO	143	104	102	92	133	88	40	30	22	19	20	20	21	22	22	19	0.17	0.31	0.36	0.34	0.23	0.88	0.59	1
07	CO	62	41	39	39	50	45	22	6	5	5	5	4	5	5	5	4	0.14	0.26	0.21	0.33	0.74	0.85	0.98	4
08	CO	54	24	21	23	23	16	34	25	14	5	5	5	5	5	14	13	0.68	0.69	0.56	0.77	0.96	0.94	0.92	3
09	CO	26	12	19	22	23	17	6	2	2	2	2	2	2	2	2	2	0.31	0.28	0.22	0.18	0.72	0.91	1.00	1
10	CO	11	8	7	6	5	6	3	1	2	1	2	2		1	1	1	0.16	0.47	0.10		0.92	0.99	1.00	5
01	PKe	17	13	13	15	15	15	14	9	7	6	7	7	7	7	7	7	0.91	0.91	0.91	0.97	0.99	0.98	0.80	0
02E	PKe	101	37	50	59	76	85	59	38	23	20	20	23	23	23	23	22	0.99	0.96	0.93	0.93	0.97	0.99	0.95	4
02W	PKe	63	32	33	43	50	53	38	21	12	9	9	12	12	12	12	11	0.92	0.79	0.83	0.94	0.88	0.92	0.96	4
03	PKe	76	24	29	53	64	55	45	32	22	12	12	18	20	22	22	19	0.83	0.87	0.88	0.80	0.91	0.96	0.97	4
04	PKe	120	50	66	70	95	92	38	17	14	13	14	14	14	14	14	10	0.51	0.77	0.70	0.68	0.79	0.97	1.00	4
05	PKe	52	43	42	48	49	49	36	20	15	15	15	15	15	15	15	12	0.56	0.66	0.56	0.68	0.79	0.88	0.91	4
06	PKe	135	107	107	109	125	110	91	74	50	45	47	48	50	50	50	48	0.62	0.80	0.76	0.88	0.79	0.87	0.90	4
07	PKe	66	44	46	52	56	53	49	27	21	20	21	21	21	21	21	19	0.87	0.82	0.77	0.84	0.91	0.93	0.93	4
08	PKe	49	27	27	30	37	34	41	14	14	14	14	14	14	14	14	7	0.94	0.98	0.97	0.79	0.88	0.98	0.98	0
09	PKe	26	11	12	21	23	22	18	6	12	9	10	12	12	12	12	6	0.97	0.98	0.98	0.90	0.96	0.99	1.00	0
10	PKe	6	3	2	2	5	4	3		1	1	1	1	1	1	1		0.99	1.00	0.98	0.98	0.98	0.98		4
01	PKo	13	11	12	13	13	13	13																	
02E	PKo	57	28	34	42	42	44	38	3	6	6	6	6	6	6	6	3	0.81	0.52	0.51	0.41	0.58	0.59	1.00	0
02W	PKo	35	22	22	29	30	31	24	1																4
03	PKo	70	24	29	52	59	52	44	27	20	12	12	18	20	20	20	14	0.84	0.87	0.89	0.82	0.90	0.95	0.92	4

Appendix Table A1 (cont'd). Summary of the number of streams, number of indicator streams, and portion of the total escapement represented by indicator stream by decade for each North Coast and Central Coast Statistical Area. Shaded cells indicate the specific periods used when decadal averages are not appropriate.

Area	Species	TotalNoStreams	Streams1950s	Streams1960s	Streams1970s	Streams1980s	Streams1990s	Streams2000s	Streams2010s	Indicators	Indicators1950s	Indicators1960s	Indicators1970s	Indicators1980s	Indicators1990s	Indicators2000s	Indicators2010s	Ind_Portion1950s	Ind_Portion1960s	Ind_Portion1970s	Ind_Portion1980s	Ind_Portion1990s	Ind_Portion2000s	Ind_Portion2010s	AvgPeriod
04	PKo	125	48	67	74	104	91	42	22	13	11	13	13	13	13	13	12	0.50	0.75	0.70	0.66	0.76	0.95	0.98	4
05	PKo	52	43	42	48	49	48	37	22	12	12	12	12	12	12	12	12	0.51	0.62	0.53	0.62	0.68	0.80	0.93	4
06	PKo	130	107	107	109	121	106	92	70	48	43	45	46	48	48	48	46	0.61	0.79	0.73	0.86	0.77	0.86	0.76	4
07	PKo	70	44	45	54	59	51	51	36	21	20	21	21	21	21	21	19	0.87	0.82	0.78	0.84	0.91	0.93	0.93	0
08	PKo	51	27	27	30	37	33	45	17	13	13	13	13	13	13	13	7	0.94	0.98	0.97	0.79	0.88	0.98	0.98	0
09	PKo	24	12	12	19	22	20	18	10	6	5	6	6	6	6	6	5	0.41	0.48	0.49	0.37	0.74	0.92	0.97	0
10	PKo	7	4	2	2	6	4	3		1	1	1	1	1	1	1		0.99	1.00	0.98	0.98	0.98	0.98		4
01	SX	7	5	7	6	6	5	5	4	3	3	3	3	3	3	3	3	0.97	0.87	0.92	0.91	0.99	0.97	0.99	4
02E	SX	14	2	4	4	12	6	5	1	2	1	2	2	2	2	2	1	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1
02W	SX	24	2	2	4	7	21	6	1	1	1	1	1	1	1	1	1	0.95	0.80	0.64	0.81	0.80	0.96	1.00	4
03	SX	25	10	12	17	19	9	7	8	5	4	4	5	5	4	5	5	0.97	0.82	0.84	0.87	0.91	1.00	1.00	1
04	SX	105	52	69	67	69	69	54	49	35	27	29	30	31	29	35	33	0.45	0.42	0.33	0.19	0.25	0.26	0.23	4
05	SX	29	20	23	21	18	27	12	7	8	8	8	7	8	8	8	6	0.60	0.68	0.55	0.74	0.86	0.87	0.95	4
06	SX	90	34	43	29	57	54	34	22	9	6	7	7	9	9	9	8	0.47	0.82	0.66	0.72	0.85	0.84	0.83	4
07	SX	39	18	15	20	32	22	17	13	7	6	6	6	7	7	7	7	0.71	0.75	0.64	0.86	0.96	0.99	0.98	1
08	SX	23	8	9	12	15	20	14	5	4	4	4	4	4	4	4	4	0.91	0.91	0.73	0.70	0.79	0.94	0.94	4
09	SX	19	11	12	15	19	13	9	6	8	8	8	8	8	8	8	6	0.73	0.59	0.57	0.46	0.40	1.00	1.00	4
10	SX	7	3	3	4	4	5	2	2	2	2	2	2	2	2	2	2	1.00	1.00	1.00	1.00	1.00	1.00	1.00	4

* Note: Kitimat Hatchery chum major recent producer and not an indicator stock

Appendix Table A2. Summary of the number of streams, number of indicator streams, and portion of the total escapement represented by indicator stream by decade for each North Coast and Central Coast Conservation Unit. Shaded cells indicate the specific periods used when decadal averages are not appropriate.

Species	CU Code	CU_name	TotalNoStreams	Streams1950s	Streams1960s	Streams1970s	Streams1980s	Streams1990s	Streams2000s	Streams2010s	Indicators	Indicators1950s	Indicators1960s	Indicators1970s	Indicators1980s	Indicators1990s	Indicators2000s	Indicators2010s	Ind_Portion1950s	Ind_Portion1960s	Ind_Portion1970s	Ind_Portion1980s	Ind_Portion1990s	Ind_Portion2000s	Ind_Portion2010s	AvgPeriod
CM	CM_12	Smith Inlet	11	7	6	7	8	9	9	4	5	3	3	4	5	5	5	4	0.82	0.63	0.82	0.92	0.94	0.99	1.00	0
CM	CM_13	Rivers Inlet	15	7	7	11	15	12	11	6	5	5	5	5	5	5	5	5	0.99	1.00	0.99	0.63	0.96	0.99	0.99	0
CM	CM_14	Wannock	1	1	1	1	1	1																		
CM	CM_15	Spiller-Fitz Hugh-Burke	69	39	36	44	55	49	51	30	28	22	21	22	23	23	28	20	0.81	0.87	0.85	0.84	0.93	0.95	0.97	0
CM	CM_16	Bella Coola-Dean Rivers	22	11	11	12	15	16	16	8	7	3	3	3	3	3	7	7	0.69	0.85	0.88	0.87	0.92	0.92	1.00	0
CM	CM_17	Bella Coola River-Late	9	1	1	1	1	2	9	7	7	1	1	1	1	1	7	7	1.00	1.00	1.00	1.00	0.97	0.89	1.00	3
CM	CM_18	Hecate Lowlands	141	111	108	113	124	111	73	49	41	39	40	41	41	41	41	34	0.57	0.65	0.55	0.71	0.90	0.96	0.91	1
CM	CM_19	Mussel-Kynoch	14	12	13	13	13	13	13	13	12	11	12	12	12	12	12	12	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0
CM	CM_20	Douglas-Gardner	62	44	45	44	58	43	45	40	27	24	25	25	26	27	27	26	0.45	0.59	0.68	0.70	0.38	0.47	0.85	1
CM	CM_21	East HG	95	46	66	75	89	84	57	41	32	25	30	32	32	32	32	30	0.69	0.70	0.70	0.72	0.82	0.95	0.95	4
CM	CM_22	Skidegate	40	17	18	20	32	36	39	24	13	11	11	12	12	12	13	12	0.91	0.79	0.86	0.87	0.86	0.92	0.93	0
CM	CM_23	West Haida Gwaii	61	46	49	51	49	59	48	31	31	26	29	30	30	31	31	25	0.82	0.81	0.72	0.73	0.91	0.95	0.99	0
CM	CM_24	North Haida Gwaii	11	7	7	9	9	6	10	3	3	3	3	3	3	3	3	3	0.99	1.00	0.89	0.97	1.00	0.99	1.00	0
CM	CM_25	North Haida Gwaii-Stanley Creek	1	1	1	1	1	1	1		1	1	1	1	1	1	1		1.00	1.00	1.00	1.00	1.00	1.00		0
CM	CM_26	Skeena Estuary	21	7	10	6	8	11	9	2	5	4	5	2	3	3	3	2	0.90	0.67	0.41	0.15	0.05	0.62	1.00	3
CM	CM_27	Lower Skeena	32	12	24	19	26	24	10	9	6	3	6	5	6	6	6	6	0.72	0.86	0.73	0.79	0.76	0.98	0.90	4
CM	CM_28	Middle Skeena	16	4	7	5	12	10	3	1	2	1	2	2	2	2	2	1	0.29	0.31	0.24	0.73	0.59	0.96	1.00	4
CM	CM_30	Portland Inlet	19	8	7	7	10	10	17	7	5	5	5	5	5	5	5	4	0.90	0.99	0.99	1.00	0.99	0.98	1.00	0
CM	CM_31	Lower Nass	20	7	8	16	13	8	2	4	1	1	1	1	1	1	1	1	0.05	0.31	0.00	0.01	0.06	0.74	0.23	4
CM	CM_32	Portland Canal-Observatory	15	9	9	13	15	10	7	6	6	5	5	6	6	6	6	5	0.91	0.68	0.92	0.99	0.99	1.00	0.88	1
CN	CN_36	Docee	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0
CN	CN_37	Rivers Inlet	14	5	8	10	11	10	8	2	6	3	5	6	6	6	6	2	0.82	0.93	0.84	0.88	0.98	1.00	1.00	1
CN	CN_38	Wannock	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0
CN	CN_39	Bella Coola-Bentinck	5	2	1	2	4	4	2	1	1	1	1	1	1	1	1	1	0.99	1.00	1.00	0.99	0.98	0.94	1.00	4
CN	CN_40	Dean River	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0
CN	CN_41	North & Central Coast-late timing	15	7	8	3	6	6	2	2	1	1	1	1	1	1	1	1	0.12	0.00	0.00	0.04	0.15	0.99	0.92	4
CN	CN_42	North & Central Coast-early timing	38	16	23	22	31	18	11	6	3	2	3	3	3	3	3	2	0.11	0.09	0.05	0.02	0.01	0.65	0.55	
CN	CN_43	Haida Gwaii-North	2	1	1	2	2	1	1		1	1	1	1	1	1	1		1.00	1.00	0.99	0.99	1.00	1.00		
CN	CN_44	Haida Gwaii-East	5		1			4	1																	
CN	CN_45	Skeena Estuary	4	1	3	2	4	1	1	2																
CN	CN_46	Ecstall	4	4	4	3	4	2	2		1	1	1	1	1	1	1		0.73	0.56	0.23	0.15	0.15	0.41		1
CN	CN_48	Lower Skeena	14	2	8	11	14	11	10	3	4		2	3	4	4	4	2		0.39	0.20	0.18	0.36	0.79	0.84	0
CN	CN_49	Kalum-early timing	2	2	2	2	2	2	2	1	1	1	1	1	1	1	1	1	0.76	0.38	0.86	0.81	0.84	0.96	1.00	0
CN	CN_50	Kalum-late timing	7		7	3	3	3	1	1	1		1	1	1	1	1	1		0.92	0.95	0.98	0.99	1.00	1.00	4
CN	CN_51	Lakelse	5	1	3	2	3	2																		
CN	CN_53	Middle Skeena-large lakes	12	6	7	8	7	9	7	6	5	5	5	5	5	5	5	5	0.99	0.99	0.98	1.00	1.00	1.00	1.00	0
CN	CN_54	Middle Skeena-mainstem tributaries	24	5	13	12	15	17	8	2	3	2	2	2	2	3	3	1	0.96	0.43	0.77	0.73	0.93	0.96	1.00	4
CN	CN_55	Upper Bulkley River	4	2	2	2	3	3	1		1	1	1	1	1	1	1		0.99	0.99	0.97	0.97	0.98	1.00		4
CN	CN_56	Upper Skeena	5			2	2	2	3	1																
CN	CN_57	Portland Sound-Observatory Inlet-Lower Nass	14	5	8	11	7	10	5	2	3	2	2	3	3	3	3	2	0.62	0.57	0.48	0.51	0.55	0.98	1.00	4
CN	CN_58	Upper Nass	17	4	8	13	13	12	5	3	3	2	3	3	3	3	3	3	0.60	0.24	0.50	0.44	0.47	0.90	1.00	4
CN	CN_80	Zymoetz	6		2	1	1	3	4	1	1					1	1	1					0.19	0.75	1.00	0
CO	CO_20	Smith Inlet	11	9	7	6	5	5	3	1	2	1	2	2		1	1	1	0.16	0.47	0.10		0.92	0.99	1.00	0
CO	CO_21	Rivers Inlet	24	10	18	21	22	16	6	2	2	2	2	2	2	2	2	2	0.41	0.33	0.23	0.18	0.72	0.91	1.00	1
CO	CO_22	Bella Coola-Dean Rivers	30	7	6	7	7	4	25	21	11	2	2	2	2	2	11	10	0.84	0.94	0.85	0.92	0.96	0.94	0.76	3
CO	CO_23	Haida Gwaii-East	109	47	62	69	101	92	50	8	5	5	5	5	5	5	5	5	0.19	0.29	0.33	0.34	0.45	0.77	0.95	4
CO	CO_24	Haida Gwaii-West	61	30	36	31	46	48	32	8	3	1	3	3	3	3	3		0.03	0.05	0.09	0.13	0.09	0.08		4
CO	CO_25	Haida Gwaii-Graham Island Lowlands	28	14	16	19	27	23	17	1	1	1	1	1	1	1	1	1	0.56	0.40	0.13	0.16	0.28	0.60	1.00	4
CO	CO_26	Mussel-Kynoch	14	10	10	10	12	11	9	1	2	2	2	2	2	2	2	1	0.33	0.55	0.63	0.80	0.84	0.92	1.00	4
CO	CO_27	Hecate Strait Mainland	176	137	137	131	155	119	35	19	36	35	35	34	35	35	12	13	0.35	0.50	0.49	0.56	0.54	0.75	0.74	1
CO	CO_28	Brim-Wahoo	2	1	2	2	2	2	2	2	2	1	2	2	2	2	2	2	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0
CO	CO_29	Douglas Channel-Kitimat Arm	33	12	12	11	32	9	5	6	2	1	1	1	2	2	2	2	0.05	0.05	0.08	0.03	0.01	0.53	0.46	1
CO	CO_30	Northern Coastal Streams	58	45	38	40	47	45	27	22	17	16	16	16	16	17	17	15	0.39	0.41	0.37	0.45	0.77	0.93	0.69	4
CO	CO_31	Skeena Estuary	23	8	14	10	21	12	5	3	3	2	2	2	3	3	3	1	0.76	0.30	0.25	0.49	0.69	0.94	0.14	1
CO	CO_32	Lower Skeena	84	25	40	39	56	71	45	16	20	15	17	18	19	20	19	11	0.81	0.84	0.68	0.72	0.82	0.83	0.72	4
CO	CO_33	Middle Skeena	73	32	52	50	49	36	36	22	20	9	18	18	18	16	16	14	0.40	0.39	0.45	0.43	0.47	0.55	0.64	1
CO	CO_34	Upper Skeena	17	4	5	7	3	4	10	6	4	1	1	2		2	4	4	0.65	0.81	0.11		0.78	0.99	0.96	3
CO	CO_35	Lower Nass	22	5	11	18	22	12	6	3	4	1	4	4	4	3	4	3	0.01	0.12	0.15	0.17	0.56	0.91	1.00	1
CO	CO_36	Upper Nass	13		3	12	13	6	3	3	2		1	2	2	1	2	2		0.26	0.32	0.42	0.89	0.94	0.93	1
CO	CO_37	Portland Sound-Observatory Inlet-Portland Canal	26	12	10	17	19	9	11	2	2	2	1	2	2	2	2	2	0.25	0.03	0.13	0.34	0.64	0.76	1.00	1

Appendix Table A2 (cont'd). Summary of the number of stream, number of indicator streams, and portion of the total escapement represented by indicator stream by decade for each North Coast and Central Coast Conservation Unit. Shaded cells indicate the specific periods used when decadal averages are not appropriate.

Species	CU Code	CU_name	TotalNoStreams	Streams1950s	Streams1960s	Streams1970s	Streams1980s	Streams1990s	Streams2000s	Streams2010s	Indicators	Indicators1950s	Indicators1960s	Indicators1970s	Indicators1980s	Indicators1990s	Indicators2000s	Indicators2010s	Ind_Portion1950s	Ind_Portion1960s	Ind_Portion1970s	Ind_Portion1980s	Ind_Portion1990s	Ind_Portion2000s	Ind_Portion2010s	AvgPeriod
Pke	PKe_5	Hecate Lowlands	177	128	126	141	158	147	104	53	39	38	38	39	39	39	39	32	0.68	0.74	0.71	0.78	0.83	0.93	0.97	4
Pke	PKe_6	Hecate Strait-Fjords	145	96	99	110	126	114	125	83	70	62	66	68	70	70	70	56	0.91	0.92	0.91	0.83	0.87	0.94	0.90	0
Pke	PKe_7	Nass-Skeena Estuary	151	66	81	100	128	112	79	49	37	26	27	33	35	37	37	30	0.74	0.80	0.76	0.73	0.82	0.95	0.98	4
Pke	PKe_8	Middle-Upper Skeena	52	19	24	31	38	42	12	5	3	3	3	3	3	3	3	3	0.34	0.63	0.64	0.62	0.78	0.99	1.00	4
Pke	PKe_9	North Haida Gwaii	17	13	13	15	15	15	14	9	7	6	7	7	7	7	7	7	0.91	0.91	0.91	0.97	0.99	0.98	0.80	0
Pke	PKe_10	East Haida Gwaii	98	36	48	58	74	83	58	37	23	20	20	23	23	23	23	22	0.99	0.97	0.93	0.93	0.97	0.99	0.95	4
Pke	PKe_11	West Haida Gwaii	66	33	35	44	52	55	39	22	12	9	9	12	12	12	12	11	0.91	0.78	0.83	0.94	0.88	0.92	0.96	4
Pke	PKe_12	Upper Nass	5		1	3	4	4	1																	
Pko	PKo_8	Homathko-Klinaklini-Smith-Rivers-Bella Coola-Dean	46	18	20	27	35	28	37	14	10	9	10	10	10	10	10	6	0.99	0.98	0.94	0.96	0.98	0.98	0.98	0
Pko	PKo_9	East Haida Gwaii	44	26	28	34	41	43	37	3	6	6	6	6	6	6	6	3	0.81	0.52	0.51	0.41	0.58	0.59	1.00	4
Pko	PKo_10	North Haida Gwaii	13	11	12	13	13	13	13																	
Pko	PKo_11	West Haida Gwaii	32	20	22	29	31	32	25	1																4
Pko	PKo_12	Hecate Strait-Lowlands	169	126	123	136	158	138	104	63	35	34	34	35	35	35	35	31	0.64	0.69	0.62	0.64	0.72	0.84	0.92	1
Pko	PKo_13	Hecate Strait-Fjords	100	77	79	82	92	85	95	73	52	47	50	50	52	52	52	48	0.83	0.83	0.82	0.67	0.67	0.88	0.79	0
Pko	PKo_14	Nass-Skeena Estuary	32	24	23	24	30	31	23	14	13	10	10	11	13	13	13	11	0.34	0.35	0.48	0.59	0.47	0.82	0.91	4
Pko	PKo_15	Lower Skeena	48	17	28	29	46	34	15	9	5	3	5	5	5	5	5	4	0.92	0.85	0.77	0.70	0.79	0.95	0.99	4
Pko	PKo_16	Middle & Upper Skeena	53	18	25	29	43	42	16	6	3	3	3	3	3	3	3	3	0.34	0.63	0.64	0.62	0.78	0.99	0.99	4
Pko	PKo_17	Nass-Portland-Observatory	58	22	26	45	51	44	38	24	16	11	11	16	16	16	16	12	0.84	0.87	0.89	0.81	0.90	0.95	0.91	4
Pko	PKo_18	Upper Nass	5		1	3	4	3	1	1																
SX	SX_L-15-01	Long	3	3	3	2	2	2	2	2	2	2	2	2	2	2	2	2	1.00	1.00	1.00	1.00	1.00	1.00	1.00	5
SX	SX_L-15-02	Owikeno	11	10	10	11	11	11	9	6	8	8	8	8	8	8	8	6	0.87	0.76	0.68	0.59	0.54	1.00	1.00	5
SX	SX_L-15-03	Owikeno-Late timing																								
SX	SX_L-15-04	Wannock[Owikeno]	1	1	1	1	1	1																		
SX	SX_L-16-01	South Atnarko Lakes																								
SX	SX_L-17-01	Ain/Skundale/Ian	1	1	1	1	1	1	1	1																
SX	SX_L-17-02	Awun	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.00	1.00	1.00	1.00	1.00	1.00	1.00	5
SX	SX_L-17-03	Fairfax	1	1	1	1	1	1	1																	
SX	SX_L-17-04	Jalun	1		1	1	1	1																		
SX	SX_L-17-05	Marian/Eden	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.00	1.00	1.00	1.00	1.00	1.00	1.00	5
SX	SX_L-17-06	Mathers	1		1	1	1	1	1		1		1	1	1	1	1			1.00	1.00	1.00	1.00	1.00		5
SX	SX_L-17-07	Mercer	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.00	1.00	1.00	1.00	1.00	1.00	1.00	5
SX	SX_L-17-08	Skidegate	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.00	1.00	1.00	1.00	1.00	1.00	1.00	5
SX	SX_L-17-09	Yakoun	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.00	1.00	1.00	1.00	1.00	1.00	1.00	5
SX	SX_L-17-10	Marie																								
SX	SX_L-17-11	(N)Mayer																								
SX	SX_L-17-12	(N)Gudal																								
SX	SX_L-18-01	Backland	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.00	1.00	1.00	1.00	1.00	1.00	1.00	5
SX	SX_L-18-02	Canoona	1		1	1	1	1	1	1	1		1	1	1	1	1	1		1.00	1.00	1.00	1.00	1.00	1.00	5
SX	SX_L-18-03	Dome	1					1																		
SX	SX_L-18-04	Evelyn	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.00	1.00	1.00	1.00	1.00	1.00	1.00	5
SX	SX_L-18-05	Kainet Creek	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.00	1.00	1.00	1.00	1.00	1.00	1.00	5
SX	SX_L-18-06	Kimsquit	1	1	1	1	1	1	1																	
SX	SX_L-18-07	Kitkiata	1	1	1	1	1	1	1	1																
SX	SX_L-18-08	Kitlope	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.00	1.00	1.00	1.00	1.00	1.00	1.00	5
SX	SX_L-18-09	Pine River	1	1	1	1	1		1																	
SX	SX_L-18-11	Whalen	1					1																		
SX	SX_L-19-01	Banks	1	1	1	1	1	1	1																	
SX	SX_L-19-02	Bloomfield	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.00	1.00	1.00	1.00	1.00	1.00	1.00	5
SX	SX_L-19-03	Bolton Creek	1	1	1	1		1																		
SX	SX_L-19-04	Bonilla	1	1	1	1	1	1	1																	
SX	SX_L-19-05	Borrowman Creek	1	1	1	1	1	1																		
SX	SX_L-19-06	Busey Creek	1	1	1																					
SX	SX_L-19-07	Cartwright Creek	1	1	1		1																			
SX	SX_L-19-08	Chic Chic	1					1																		
SX	SX_L-19-09	Tuwartz	1	1	1	1	1																			
SX	SX_L-19-10	Fannie Cove	2	1	1	1	1	1	2	1																
SX	SX_L-19-11	Curtis Inlet	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.00	1.00	1.00	1.00	1.00	1.00	1.00	5
SX	SX_L-19-12	Dallain Creek	1	1	1	1																				
SX	SX_L-19-13	Deer	1	1	1	1	1	1		1																
SX	SX_L-19-14	Devon	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.00	1.00	1.00	1.00	1.00	1.00	1.00	5
SX	SX_L-19-15	Douglas Creek	1	1	1		1	1																		
SX	SX_L-19-16	Elizabeth	1	1																						
SX	SX_L-19-17	Elsie/Hoy	1		1	1	1	1																		
SX	SX_L-19-18	End Hill Creek	1	1	1	1	1	1																		

Appendix Table A2 (cont'd). Summary of the number of streams, number of indicator streams, and portion of the total escapement represented by indicator stream by decade for each North Coast and Central Coast Conservation Unit. Shaded cells indicate the specific periods used when decadal averages are not appropriate.

Species	CU Code	CU_name	TotalNoStreams	Streams1950s	Streams1960s	Streams1970s	Streams1980s	Streams1990s	Streams2000s	Streams2010s	Indicators	Indicators1950s	Indicators1960s	Indicators1970s	Indicators1980s	Indicators1990s	Indicators2000s	Indicators2010s	Ind_Portion1950s	Ind_Portion1960s	Ind_Portion1970s	Ind_Portion1980s	Ind_Portion1990s	Ind_Portion2000s	Ind_Portion2010s	AvgPeriod
SX	SX_L-19-19	Evinrude Inlet	1	1	1	1	1	1																		
SX	SX_L-19-20	Freeda/Brodie	1	1	1		1	1	1		1	1	1		1	1	1		1.00	1.00		1.00	1.00	1.00		5
SX	SX_L-19-21	Hartley Bay	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.00	1.00	1.00	1.00	1.00	1.00	1.00	5
SX	SX_L-19-22	Hevenor Inlet	1		1	1	1	1																		
SX	SX_L-19-23	Higgins Lagoon	1	1	1	1	1																			
SX	SX_L-19-24	Kadjusdis River	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.00	1.00	1.00	1.00	1.00	1.00	1.00	5
SX	SX_L-19-25	Kdelmashan Creek	1	1	1	1	1																			
SX	SX_L-19-26	Keecha	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.00	1.00	1.00	1.00	1.00	1.00	1.00	5
SX	SX_L-19-27	Kent Inlet Lagoon Creek	1				1		1	1																
SX	SX_L-19-28	Kenzuwash Creeks	1		1	1		1																		
SX	SX_L-19-29	Keswar Creek	1	1	1	1	1	1																		
SX	SX_L-19-30	Kildidt Creek	1	1		1	1																			
SX	SX_L-19-31	Kildidt Lagoon Creek	1			1	1																			
SX	SX_L-19-32	Kisameet	1	1	1	1	1	1	1	1																
SX	SX_L-19-33	Koeye	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.00	1.00	1.00	1.00	1.00	1.00	1.00	5
SX	SX_L-19-34	Kooryet	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.00	1.00	1.00	1.00	1.00	1.00	1.00	5
SX	SX_L-19-35	Kunsoot River	1				1	1																		
SX	SX_L-19-36	Kwakwa Creek	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.00	1.00	1.00	1.00	1.00	1.00	1.00	5
SX	SX_L-19-37	Lewis Creek	1	1	1	1		1																		
SX	SX_L-19-38	Limestone Creek	1		1	1	1	1																		
SX	SX_L-19-39	Lowe/Simpson/Weare	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.00	1.00	1.00	1.00	1.00	1.00	1.00	5
SX	SX_L-19-40	Mary Cove Creek	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.00	1.00	1.00	1.00	1.00	1.00	1.00	5
SX	SX_L-19-41	Mcdonald Creek	1	1	1	1	1																			
SX	SX_L-19-42	Mcloughlin	1	1	1	1	1	1																		
SX	SX_L-19-43	Mikado	1	1	1	1	1	1	1		1	1	1	1	1	1	1		1.00	1.00	1.00	1.00	1.00	1.00		5
SX	SX_L-19-44	Monckton Inlet Creek	1	1	1		1	1																		
SX	SX_L-19-45	Namu	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.00	1.00	1.00	1.00	1.00	1.00	1.00	5
SX	SX_L-19-46	Port John	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.00	1.00	1.00	1.00	1.00	1.00	1.00	5
SX	SX_L-19-47	Powles Creek	1	1	1		1	1																		
SX	SX_L-19-48	Price Creek	1	1	1	1	1	1	1																	
SX	SX_L-19-49	Prudhomme	2	1	1	1	2	2	2	2	2	2	1	1	1	2	2	2	1.00	1.00	1.00	1.00	1.00	1.00	1.00	5
SX	SX_L-19-50	Roderick	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.00	1.00	1.00	1.00	1.00	1.00	1.00	5
SX	SX_L-19-51	Ryan Creek	1		1	1	1	1																		
SX	SX_L-19-52	Salter	1	1	1	1																				
SX	SX_L-19-53	Scoular/Kilpatrick	1	1	1	1	1	1																		
SX	SX_L-19-54	Shawatlan	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.00	1.00	1.00	1.00	1.00	1.00	1.00	5
SX	SX_L-19-55	Sheneeza Inlet	1	1	1	1	1	1																		
SX	SX_L-19-56	Ship Point Creek	1	1	1	1	1																			
SX	SX_L-19-57	Spencer Creek	1	1	1	1		1	1																	
SX	SX_L-19-58	Stannard Creek	1	1	1		1	1																		
SX	SX_L-19-59	Talamoosa Creek	1	1	1	1	1	1																		
SX	SX_L-19-60	Tankeeah River	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.00	1.00	1.00	1.00	1.00	1.00	1.00	5
SX	SX_L-19-61	Treneman Creek	1			1	1																			
SX	SX_L-19-62	Tsimtack Lakes	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.00	1.00	1.00	1.00	1.00	1.00	1.00	5
SX	SX_L-19-63	Tuno Creek East	1	1	1	1	1	1																		
SX	SX_L-19-64	Tuno Creek West	1	1	1	1	1																			
SX	SX_L-19-65	Tyler Creek	1				1	1																		
SX	SX_L-19-66	Wale Creek	1	1	1	1	1																			
SX	SX_L-19-67	Watt Bay																								
SX	SX_L-19-68	West Creek	1	1	1	1	1																			
SX	SX_L-19-69	Yaaklele Lagoon	1	1	1	1																				
SX	SX_L-19-70	Yeo	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.00	1.00	1.00	1.00	1.00	1.00	1.00	5
SX	SX_L-19-71	Sockeye Creek																								
SX	SX_L-19-72	(N)Sylvia Creek																								
SX	SX_L-19-73	(N)South Bonnila																								
SX	SX_L-20-01	Alastair	3	3	3	2	2	2	2	2	2	2	2	2	2	2	2	2	0.96	0.97	1.00	1.00	1.00	1.00	1.00	5
SX	SX_L-20-02	Aldrich																								
SX	SX_L-20-03	Dennis																								
SX	SX_L-20-04	Ecstall/Lower	1			1	1	1	1																	
SX	SX_L-20-05	Johnston	2	1	1	1	2	2	1		1	1	1	1	1	1	1		1.00	1.00	1.00	1.00	0.99	1.00		5
SX	SX_L-20-06	Kitsumkalum	7	5	7	6	6	3	2	2	2	2	2	2	2	1	2	2	0.40	0.19	0.37	0.32	0.94	1.00	1.00	5
SX	SX_L-20-07	Lakelse	9	2	5	5	7	6	5	5	3	2	3	3	3	3	3	3	1.00	0.99	0.98	0.93	0.98	1.00	0.99	5
SX	SX_L-20-08	Mcdonell	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.00	1.00	1.00	1.00	1.00	1.00	1.00	5

Appendix Table A2 (cont'd). Summary of the number of streams, number of indicator streams, and portion of the total escapement represented by indicator stream by decade for each North Coast and Central Coast Conservation Unit. Shaded cells indicate the specific periods used when decadal averages are not appropriate.

Species	CU Code	CU_name	TotalNoStreams	Streams1950s	Streams1960s	Streams1970s	Streams1980s	Streams1990s	Streams2000s	Streams2010s	Indicators	Indicators1950s	Indicators1960s	Indicators1970s	Indicators1980s	Indicators1990s	Indicators2000s	Indicators2010s	Ind_Portion1950s	Ind_Portion1960s	Ind_Portion1970s	Ind_Portion1980s	Ind_Portion1990s	Ind_Portion2000s	Ind_Portion2010s	AvgPeriod
SX	SX_L-21-01	Atna																								
SX	SX_L-21-02	Babine	33	23	23	24	23	28	21	21	9	9	9	9	9	9	9	9	0.38	0.37	0.31	0.17	0.22	0.22	0.17	5
SX	SX_L-21-03	Bulkley	1		1	1																				
SX	SX_L-21-05	Kitwancool	1		1	1	1	1	1	1	1		1	1	1	1	1	1		1.00	1.00	1.00	1.00	1.00	1.00	5
SX	SX_L-21-06	Maxan																								
SX	SX_L-21-07	Morice	4	1	4	4	2	1	2	1	1	1	1	1	1	1	1	1	1.00	0.84	0.94	0.98	1.00	0.99	1.00	5
SX	SX_L-21-08	Nilkitkwa	1			1	1	1																		
SX	SX_L-21-09	Stephens	2	2	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1.00	0.87	0.87	0.96	0.99	1.00	1.00	5
SX	SX_L-21-10	Swan	6	1	1	1	1	3	5	4	3	1	1	1	1	1	3	3	1.00	1.00	1.00	1.00	0.66	0.92	0.96	5
SX	SX_L-21-11	Tahlo/Morrison	2	2	2	2	2	2	1	2	1	1	1	1	1	1	1	1	0.93	0.96	0.96	1.00	1.00	1.00	0.98	5
SX	SX_L-21-12	Footsore/Hodder																								
SX	SX_L-21-13	(N)Onerka																								
SX	SX_L-22-01	Asitika	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.00	1.00	1.00	1.00	1.00	1.00	1.00	5
SX	SX_L-22-02	Azuklotz	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.00	1.00	1.00	1.00	1.00	1.00	1.00	5
SX	SX_L-22-03	Bear	3	3	3	3	2	2	2	1	2	2	2	2	2	1	2	1	0.99	0.50	0.52	1.00	0.80	1.00	1.00	5
SX	SX_L-22-04	Damshilgwit	1						1	1	1						1	1						1.00	1.00	5
SX	SX_L-22-05	Johanson	1	1	1	1	1	1																		
SX	SX_L-22-06	Kluatantan	1			1																				
SX	SX_L-22-07	Kluayaz	1			1																				
SX	SX_L-22-08	Motase	1			1	1	1	1	1	1			1	1	1	1	1			1.00	1.00	1.00	1.00	1.00	5
SX	SX_L-22-09	Sicintine	1		1																					
SX	SX_L-22-10	Slamgeesh	2		1	1	1		1																	
SX	SX_L-22-11	Spawning	1		1																					
SX	SX_L-22-12	Sustut	1	1	1	1	1	1																		
SX	SX_L-23-01	Clements	1	1	1	1	1																			
SX	SX_L-23-02	Split Mountain/Leverson	1	1	1	1	1																			
SX	SX_L-24-01	Bowser	1		1	1	1	1																		
SX	SX_L-24-02	Damdochax/Wiminasik	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.00	1.00	1.00	1.00	1.00	1.00	1.00	5
SX	SX_L-24-03	Fred Wright	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.00	1.00	1.00	1.00	1.00	1.00	1.00	5
SX	SX_L-24-04	Kwinageese																								
SX	SX_L-24-05	Meziadin	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.00	1.00	1.00	1.00	1.00	1.00	1.00	5
SX	SX_L-24-06	Oweegee	1			1	1																			
SX	SX_R12	Rivers-Smith Inlets	8			3	7	2																		
SX	SX_R13	East Haida Gwaii	12	1	2	2	10	4	3																	
SX	SX_R14	West Haida Gwaii	22			2	5	19	4																	
SX	SX_R15	North Haida Gwaii	2	1	2	1	1		1																	
SX	SX_R16	Northern Coastal Fjords	73	5	12	14	42	52	37	18	4	1	1	1	4	4	4	3	0.99	0.99	0.97	0.89	0.93	0.87	0.43	5
SX	SX_R17	Northern Coastal Streams	33	12	12	7	17	15	5	2																
SX	SX_R18	Skeena River	13	2	6	2	7	6																		
SX	SX_R19	Skeena River-high interior	1						1	1	1						1	1						1.00	1.00	5
SX	SX_R20	Lower Nass-Portland	15	5	6	9	10	3	3	4	1	1	1	1	1	1	1	1	0.73	0.69	0.84	0.88	0.94	1.00	0.99	5
SX	SX_R21	Upper Nass River	3			1	2	2	1	1	1			1	1		1	1			1.00	0.94		1.00	1.00	5
SX	SX_R22	Northern Transboundary Fjords	13			1	12	12	9																	
SX	SX_R23	Chilkat River																								
SX	SX_R24	Alsek River	3				2	2	2																	

Appendix Table A3. Summary of the factors used to expand the observed escapement to indicator streams to estimate the total escapement for each species by Statistical Area.

Species	Stat. Area	Factor 1	Factor 2	Factor 3
Chum Salmon				
	01	2.22	1.05	1.50
	02E	1.08	1.31	1.50
	02W	1.21	1.24	1.50
	03	1.07	1.19	1.50
	04	4.22	1.48	1.30
	05	1.25	2.03	1.50
	06	1.06	1.38	1.50
	07	1.10	1.10	1.50
	08	1.12	1.19	1.50
	09	1.18	1.64	1.50
	10	1.18	1.28	1.50
Chinook Salmon				
	03	1.00	1.11	1.00
	04	1.11	1.23	1.21
	06	1.46	4.01	1.00
	08	1.00	1.04	1.03
	9S	1.89	1.44	1.50
	9W	1.00	1.00	1.86
	10	1.03	1.00	1.50
Coho Salmon				
	02E	1.12	2.21	3.00
	02W	1.68	20.71	5.00
	03	2.63	4.03	3.00
	04	1.57	1.63	3.00
	05	5.34	1.35	3.00
	06	1.42	3.16	3.00
	07	1.58	2.41	3.00
	08	1.51	1.12	1.50
	09	1.37	7.78	3.00
	10	1.88	1.36	3.00
Pink Salmon (even)				
	01	1.01	1.08	1.50
	02E	9.09	1.08	1.50
	02W	1.23	1.16	1.50
	03	1.32	1.29	1.50
	04	1.11	1.56	1.50
	05	1.07	1.52	1.50
	06	1.02	1.26	1.50
	07	1.03	1.17	1.50
	08	1.28	1.11	1.50
	09	1.09	1.09	1.50
	10	1.00	1.04	1.50

Appendix Table A3. (cont'd). Summary of the factors used to expand the observed escapement to indicator streams to estimate the total escapement for each species by Statistical Area.

Species	Stat. Area	Factor 1	Factor 2	Factor 3
Pink Salmon (odd)				
	02E	1.42	2.21	1.50
	03	1.14	1.32	1.50
	04	1.02	1.63	1.50
	05	1.03	1.72	1.50
	06	1.05	1.28	1.50
	07	1.03	1.21	1.50
	08	1.01	1.12	1.50
	09	11.74	1.97	1.50
	10	1.00	1.04	1.50
Sockeye Salmon				
	01	1.15	1.13	2.00
	02E	1.15	1.01	2.00
	02W	1.00	1.23	2.00
	03	1.00	1.00	1.00
	04	1.00	1.00	1.00
	05	2.04	1.31	2.00
	06	1.16	1.48	2.00
	07	1.44	1.32	2.00
	08	1.13	1.42	2.00
	09	1.06	2.27	2.00
	10	1.00	1.00	1.00

Appendix Table A4. Summary of the factors used to expand the observed escapement to indicator streams to estimate the total escapement for each salmon Conservation Unit.

Species	CU No.	CU Name	Factor 1	Factor 2	Factor 3
Chum Salmon					
	CM_12	Smith Inlet	1.18	1.20	1.50
	CM_13	Rivers Inlet	1.18	1.28	1.50
	CM_15	Spiller-Fitz-Hugh-Burke	1.15	1.16	1.50
	CM_16	Bella Colla-Dean Rivers	1.35	1.18	1.50
	CM_17	Bella Coola River-Late	1.08	1.68	1.50
	CM_18	Hecate Lowlands	1.14	1.53	1.50
	CM_19	Mussel-Kynock	1.01	1.00	1.50
	CM_20	Douglas-Gardner	1.02	2.35	1.50
	CM_21	East HG	1.03	1.34	1.50
	CM_22	Skidegate	1.08	1.18	1.50
	CM_23	West Haida Gwaii	1.25	1.26	1.50
	CM_24	North Haida Gwaii	1.31	1.05	1.50
	CM_25	North Haida Gwaii-Stanley Creek	1.00	1.00	1.50
	CM_26	Skeena Estuary	4.94	3.31	1.50
	CM_27	Lower Skeena	10.57	1.42	1.50
	CM_28	Middle Skeena	8.24	1.78	1.39
	CM_30	Portland Inlet	1.05	1.06	1.50
	CM_31	Lower Nass	1.00	180.67	1.50
	CM_32	Portland Canal-Observatory	1.12	1.05	1.50
Chinook Salmon					
	CN_36	Docee	1.03	1.00	1.50
	CN_37	Rivers Inlet	1.89	1.44	1.50
	CN_38	Wannock	1.00	1.00	1.86
	CN_39	Bella Coola-Bentinck	1.00	1.00	1.00
	CN_40	Dean River	1.00	1.00	1.00
	CN_41	North & Central Coast-late timing	1.00	11.44	1.50
	CN_42	North & Central Coast-early timing	1.46	4.01	1.00
	CN_43	Haida Gwaii-North	1.00	1.03	1.50
	CN_46	Ecstall	1.00	6.72	1.30
	CN_48	Lower Skeena	1.65	4.30	1.30
	CN_49	Kalum-early timing	1.00	1.39	1.30
	CN_50	Kalum-late timing	1.00	1.06	1.00
	CN_53	Middle Skeena-large lakes	1.27	1.01	1.30
	CN_54	Middle Skeena-mainstem tributaries	6.15	1.33	1.30
	CN_55	Upper Bulkley River	1.00	1.14	1.30
	CN_57	Portland Sound-Observatory Inlet-Lower Nass	1.00	1.91	1.00
	CN_58	Upper Nass	1.00	1.00	1.00
Coho Salmon					
	CO_20	Smith Inlet	1.88	1.11	2.03
	CO_21	Rivers Inlet	1.37	7.45	3.00
	CO_22	Bella Coola-Dean Rivers	2.80	1.09	1.15
	CO_23	Haida Gwaii-East	1.09	2.76	3.00
	CO_24	Haida Gwaii-West	1.68	20.91	5.00
	CO_25	Haida Gwaii-Graham Island Lowlands	1.00	7.10	2.00
	CO_26	Mussel-Kynoch	1.13	1.51	3.00
	CO_27	Hecate Strait Mainland	2.47	1.93	3.00
	CO_28	Brim-Wahoo	1.26	1.00	3.00
	CO_29	Douglas Channel-Kitimat Arm	1.33	33.80	3.00
	CO_30	Northern Coastal Streams	1.38	2.26	3.00
	CO_31	Skeena Estuary	1.91	2.93	3.00
	CO_32	Lower Skeena	1.50	1.56	3.00
	CO_33	Middle Skeena	1.58	2.36	3.00
	CO_33a	Babine	1.00	1.00	1.00
	CO_34	Upper Skeena	2.91	1.12	3.00
	CO_35	Lower Nass	1.91	6.10	3.00
	CO_36	Upper Nass	1.03	3.22	1.00
	CO_37	Portland Sound-Observatory Inlet-Portland Canal	1.16	3.52	3.00

Appendix Table A4. (cont'd). Summary of the factors used to expand the observed escapement to indicator streams to estimate the total escapement for each salmon Conservation Unit.

Species	CU No.	CU Name	Factor 1	Factor 2	Factor 3
Pink Even					
	PKe_5	Hecate Lowlands	1.10	1.36	1.50
	PKe_6	Hecate Strait-Fjords	1.04	1.17	1.50
	PKe_7	Nass-Skeena Estuary	1.16	1.40	1.50
	PKe_8	Middle-Upper Skeena	1.09	1.78	1.50
	PKe_9	North Haida Gwaii	1.01	1.08	1.50
	PKe_10	East Haida Gwaii	9.09	1.08	1.50
	PKe_11	West Haida Gwaii	1.23	1.16	1.50
Pink Odd					
	PKo_8	Smith-Rivers+	1.02	1.05	1.50
	PKo_9	East Haida Gwaii	1.42	2.29	1.50
	PKo_12	Hecate Strait-Lowlands	1.04	1.64	1.50
	PKo_13	Hecate Strait-Fjords	1.04	1.40	1.50
	PKo_14	Nass-Skeena Estuary	1.12	1.98	1.50
	PKo_15	Lower Skeena	1.01	1.48	1.50
	PKo_16	Middle & Upper Skeena	1.03	1.80	1.50
	PKo_17	Nass-Portland-Observatory	1.17	1.32	1.50
Sockeye					
	SX_L-15-01	Long	1.00	1.00	1.00
	SX_L-15-02	Owikeno	1.06	1.68	2.00
	SX_L-17-02	Awun	1.00	1.00	2.00
	SX_L-17-05	Marian	1.00	1.00	2.00
	SX_L-17-06	Mathers	1.00	1.00	1.84
	SX_L-17-07	Mercer	1.00	1.00	2.00
	SX_L-17-08	Skidegate	1.00	1.00	1.78
	SX_L-17-09	Yakoun	1.00	1.00	2.00
	SX_L-18-01	Backland	1.00	1.00	2.00
	SX_L-18-02	Canoona	1.00	1.00	2.00
	SX_L-18-04	Evelyn	1.00	1.00	2.00
	SX_L-18-05	Kainet Creek	1.00	1.00	2.00
	SX_L-18-08	Kitlope	1.00	1.00	2.00
	SX_L-19-02	Bloomfield	1.00	1.00	2.00
	SX_L-19-11	Curtis Inlet	1.00	1.00	2.00
	SX_L-19-14	Devon	1.00	1.00	2.00
	SX_L-19-20	Freeda	1.00	1.00	2.00
	SX_L-19-21	Hartley Bay	1.00	1.00	2.00
	SX_L-19-24	Kadjusdis River	1.00	1.00	2.00
	SX_L-19-26	Keecha	1.00	1.00	2.00
	SX_L-19-33	Koeye	1.00	1.00	2.00
	SX_L-19-34	Kooryet	1.00	1.00	2.00
	SX_L-19-36	Kwakwa Creek	1.00	1.00	2.00
	SX_L-19-39	Lowe/Simpson/Weir	1.00	1.00	2.00
	SX_L-19-40	Mary Cove Creek	1.00	1.00	2.00
	SX_L-19-43	Mikado	1.00	1.00	2.00
	SX_L-19-45	Namu	1.00	1.00	2.00
	SX_L-19-46	Port John	1.00	1.00	2.00
	SX_L-19-49	Prudhomme	1.38	1.00	2.00
	SX_L-19-50	Roderick	1.00	1.00	2.00
	SX_L-19-54	Shawatlan	1.00	1.00	2.00
	SX_L-19-60	Tankeeah River	1.00	1.00	2.00
	SX_L-19-62	Tsimtack/Moore/Roger	1.00	1.00	2.00
	SX_L-19-70	Yeo	1.00	1.00	2.00
	SX_L-20-01	Alastair	1.02	1.12	2.00
	SX_L-20-05	Johnston	1.00	1.00	2.00
	SX_L-20-06	Kitsumkalum	1.03	2.13	2.00
	SX_L-20-07	Lakelse	1.20	1.09	2.00
	SX_L-20-08	Mcdonell	1.00	1.00	2.00

Appendix Table A4. (cont'd). Summary of the factors used to expand the observed escapement to indicator streams to estimate the total escapement for each salmon Conservation Unit.

Species	CU No.	CU Name	Factor 1	Factor 2	Factor 3
	SX_L-21-02-EW	Babine-Early-Wild	1.00	1.00	1.00
	SX_L-21-02-F	Babine-Fulton	1.00	1.00	1.00
	SX_L-21-02-LW	Babine-Late-Wild	1.00	1.00	1.00
	SX_L-21-02-MW	Babine-Mid-Wild	1.00	1.00	1.00
	SX_L-21-02-P	Babine-Pinkut	1.00	1.00	1.00
	SX_L-21-05	Kitwancool	1.00	1.00	1.44
	SX_L-21-07	Morice	1.00	1.21	1.35
	SX_L-21-09	Stephens	1.00	1.12	2.00
	SX_L-21-10	Swan	2.42	2.34	2.00
	SX_L-21-11	Tahlo/Morrison	1.00	1.12	2.00
	SX_L-22-01	Asitika	1.00	1.00	2.00
	SX_L-22-02	Azuklotz	1.00	1.00	2.00
	SX_L-22-03	Bear	2.42	1.42	2.00
	SX_L-22-04	Damshilgwit	1.00	1.00	1.00
	SX_L-22-08	Motase	1.00	1.00	2.00
	SX_L-24-02	Damdochax	1.00	1.00	1.00
	SX_L-24-03	Fred Wright	1.00	1.00	1.00
	SX_L-24-05	Meziadin	1.00	1.00	1.00
	SX_R16	Northern Coastal Fjords	1.00	1.22	2.00
	SX_R19	Skeena River-high interior	1.00	1.00	1.00
	SX_R20	Lower Nass - Portland	1.00	1.42	2.00
	SX_R21	Upper Nass River	1.00	1.10	1.00

APPENDIX B

Northern Boundary Sockeye run reconstruction model run timing parameters for Nass and Skeena Sockeye Conservation Units.

This appendix provides a brief description of the run timing parameters and modifications made to the Northern Boundary Sockeye Run Reconstruction (NBSRR) model and Skeena Sockeye In-River (SSIR) Model to derive Canadian and Total exploitation rate (ER) estimates for each Sockeye run timing group and CU within the Nass and Skeena watersheds.

The available data and methods needed to derive ERs for Nass and Skeena Sockeye CUs were examined by Steve Cox-Rogers, Karl English, Bill Gazey, and Richard Alexander on 5 October 2011 during a one day workshop. In the absence of detailed historic stock composition data for each fishery that harvests Nass and Skeena Sockeye, we used existing information on run timing and geographic distribution of CUs within the Nass and Skeena watersheds to define the stock groups to be included in the model. While we could have defined separate sub-stocks for each CU, there was little point in deriving separate ER estimates for CUs that had similar timing and were exposed to all the same fisheries. For two of the major CUs (Meziadin and Babine), there was sufficient differences in run timing within these CUs to warrant the disaggregation of these CUs. These initial discussions resulted in the definition of 10 sub-stocks for Nass Sockeye (Table B1) and 20 sub-stocks for Skeena Sockeye (Table B2).

Test fisheries on the lower portions of the Nass and Skeena watersheds have documented substantially year to year variability in the run timing for the total Sockeye returns to these watersheds. Daily escapement estimates for Nass and Skeena Sockeye from test fishery data have been used in the NBSRR model to derive estimates of harvest and ER for major northern boundary Sockeye stocks from 1982-2014. In order to retain information on the annual variability in run timing for the aggregate Nass and Skeena stocks, the timing for each sub-stock was defined using a number of days "offset" relative to the 50% point for the aggregate stocks. For example: an offset of -14 days for Gingit Sockeye indicates a run timing two weeks earlier than that for the aggregate for all Nass Sockeye stocks and an offset of 14 days for Damdochax and Kwinageese Sockeye indicates that these stocks are typically two weeks later than the Nass aggregate (Table B1). The average CU timing offset from the mean run timing for the Nass Sockeye aggregate was estimated using DNA stock composition data reported in Hall et al. (2011). The average CU timing offset from the mean run timing for the Skeena Sockeye aggregate was derived from Cox-Rogers (2012). The timing distribution for each CU is defined by a normal curve with its peak defined by the offset parameter and duration determined by the standard deviation (SD) parameter (e.g., a duration of 9 weeks = 63d = a SD of 10.5d). The duration of runs for Nass Sockeye varied between 63 and 105 days for the different sub-stocks based on fairly consistent run timing patterns from recent DNA data. The duration of runs for Skeena Sockeye varied between 47 and 94 days for the different sub-stocks based on run timing patterns from recent DNA data reported in Cox-Rogers (2012) (Table B2).

For Nass Sockeye, the run timing offset and duration parameters were held constant for all years. While the available DNA data does suggest that there can been substantial difference in the

relative timing and run duration for major stock components of Nass Sockeye, these data are only available for a few recent years in the 1982-2014 time-series. Appendix Figure B1 provides an example of the shape of the 2005 aggregate run based on the average timing and duration parameters for Nass Sockeye and Appendix Figure B2 shows the 2005 using parameters derived from the 2005 DNA data.

For Skeena Sockeye, the run timing offset parameters were held constant for all years and the run duration parameters were constant for every year, except 2006 when the aggregate run timing was late and the duration of the Babine enhanced Sockeye notably longer than in other years. Appendix Figures B3-B5 provide examples of the Skeena run timing distributions for an example of a later than "normal" run timing (2006), "normal" run timing (2007) and earlier than "normal" run timing (2008), respectively.

Appendix Tables B3 and B4 provide the preliminary estimates of the total exploitation rates and Canadian exploitation rates for each Nass and Skeena sockeye CU. These exploitation rates include all Nass and Skeena Sockeye harvested in marine and freshwater fisheries. The values in the "Total" column represent the exploitation rates for the all Nass Sockeye (Area3) and all Skeena Sockeye (Area 4), respectively. The aggregate values are the same as the 1982-2014 values in Table 8 for Area 3 and 4 Sockeye.

Appendix Table B1. Relative abundance, run timing and duration parameters for ten Nass Sockeye sub-stocks.

Sub-stock Number	Sub-Stock Name	Timing Offset	Timing SD	Average % of Escapement
1	Damdochax	14	14	1.5%
2	Kwinagees	14	10.5	3.4%
3	Oweegee	14	14	0.1%
4	Bowser	14	14	8.3%
5	Hanna-Tin	-7	17.5	56.9%
6	MezBeach	21	14	25.4%
7	BrownBear	21	17.5	2.1%
8	Cranberry	21	17.5	0.7%
9	Gingit+	-14	10.5	1.2%
10	Zolzap	0	17.5	0.3%

Appendix Table B2. Relative abundance, run timing and duration parameters for twenty Skeena Sockeye sub-stocks.

#	Stocks (Geographic CUs)	Short Name	CUs in Group	Offset (days)	Duration (days)	Default SD (days)	2006 SD (days)	Avg Escapement	Avg %
1	Kluatantan/Kluayaz	Kluatan+	2	-10.5	84	14.0	14.0	1,000	0.1%
2	Motase	Motase	1	3.5	74	12.3	12.3	442	0.0%
3	Sustut/Johanson/Spawning	Sustut+	3	-3.5	67	11.2	11.2	3,362	0.3%
4	Bear/Azuklotz/Asitka	Bear+	3	-3.5	67	11.2	11.2	5,301	0.4%
5	Slamgeesh/Damshilgwit	Slamgeesh	2	-3.5	67	11.2	11.2	1,000	0.1%
6	Sicintine	Sicintine	1	-3.5	67	11.2	11.2	1,000	0.1%
7	Babine W Early	Babine-WE	1	-10.5	67	11.2	11.2	50,658	4.0%
8	Babine W Middle	Babine-WM	1	-3.5	67	11.2	11.2	22,134	1.8%
9	Babine W Late	Babine-WL	1	10.5	67	11.2	11.2	214,920	17.1%
10	Babine Pinkut	Babine-P	1	-3.5	67	11.2	14.0	291,396	23.1%
11	Babine Fulton	Babine-F	1	3.5	67	11.2	14.0	578,934	45.9%
12	Swan/Stephans/Club	Swan+	3	-10.5	60	10.1	10.1	19,305	1.5%
13	Bulkley/Maxan	Bulkley+	2	-10.5	84	14.0	14.0	1,000	0.1%
14	Morice/Atna	Morice+	2	-10.5	84	14.0	14.0	14,781	1.2%
15	Kitwanga	Kitwanga	1	3.5	94	15.7	15.7	2,213	0.2%
16	Zymoetz [1]	Zymoetz	3	-17.5	47	7.8	7.8	6,275	0.5%
17	Kalum	Kalum	1	-3.5	84	14.0	14.0	14,293	1.1%
18	Lakelse	Lakelse	1	-21.0	64	10.6	10.6	11,688	0.9%
19	Alastair	Alastair	1	-14.0	87	14.6	14.6	16,345	1.3%
20	Johnston	Johnston	1	-21.0	64	10.6	10.6	4,373	0.3%

[1] Zymoetz includes three sockeye lake CUs in the Zymoetz watershed (Mcdonell, Aldrich and Dennis)

Appendix Table B3. Canadian and total exploitation rate estimates (%) for each Nass Sockeye CU, 1982-14.

	Nass Sockeye - Canadian Stock Exploitation Rate by CU										
	Damdochax	Kwinagees	Oweegee	Bowser	Hanna-Tin	MezBeach	BrownBear	Cranberry	Gingit+	Zolzap	**Total**
1982	44.9	46.2	44.9	44.9	45.1	44.2	40.7	40.7	47.4	44.6	**44.8**
1983	48.0	53.5	48.0	48.0	30.5	46.3	40.8	40.8	12.1	37.1	**38.7**
1984	40.1	41.8	40.1	40.1	32.4	40.5	38.4	38.4	29.3	35.0	**36.6**
1985	37.0	39.7	37.0	37.0	23.0	38.4	33.4	33.4	14.8	27.2	**30.0**
1986	26.6	29.5	26.6	26.6	23.0	24.4	22.7	22.7	19.0	24.4	**25.0**
1987	41.8	43.2	41.8	41.8	26.2	45.6	43.2	43.2	16.7	31.1	**36.0**
1988	30.2	32.6	30.2	30.2	22.2	30.7	28.1	28.1	16.8	24.5	**25.8**
1989	42.3	45.5	42.3	42.3	34.6	40.4	37.1	37.1	28.1	37.4	**40.1**
1990	25.7	25.8	25.7	25.7	19.7	28.6	27.6	27.6	18.3	21.2	**23.7**
1991	49.2	52.9	49.2	49.2	39.4	48.1	45.3	45.3	30.2	42.9	**43.6**
1992	51.4	53.3	51.4	51.4	42.0	50.8	48.3	48.3	32.4	45.4	**45.9**
1993	54.7	57.5	54.7	54.7	44.4	53.1	51.8	51.8	33.4	48.7	**48.7**
1994	33.0	32.5	33.0	33.0	34.4	31.6	31.9	31.9	35.1	34.6	**33.4**
1995	55.3	59.8	55.3	55.3	50.2	49.7	46.8	46.8	42.1	53.1	**50.5**
1996	47.0	50.1	47.0	47.0	46.9	42.1	41.1	41.1	42.1	47.9	**45.1**
1997	30.6	29.6	30.6	30.6	35.4	27.8	29.9	29.9	36.7	34.7	**32.5**
1998	18.9	19.1	18.9	18.9	32.4	13.9	14.3	14.3	40.0	28.7	**25.3**
1999	50.7	52.3	50.7	50.7	53.6	47.0	44.1	44.1	55.2	52.8	**51.5**
2000	54.4	54.8	54.4	54.4	54.5	51.4	50.4	50.4	52.8	55.1	**53.5**
2001	33.0	33.2	33.0	33.0	39.7	31.9	31.7	31.7	44.6	37.2	**36.2**
2002	62.5	63.2	62.5	62.5	63.1	59.4	58.8	58.8	61.4	63.2	**62.2**
2003	58.2	57.5	58.2	58.2	70.6	49.0	50.1	50.1	74.1	68.5	**64.9**
2004	39.2	40.5	39.2	39.2	56.2	29.0	30.2	30.2	59.5	52.4	**47.7**
2005	35.3	34.7	35.3	35.3	50.0	30.1	31.7	31.7	54.3	46.5	**44.7**
2006	39.8	36.5	39.8	39.8	56.0	34.9	37.6	37.6	61.1	52.5	**49.8**
2007	25.2	29.7	25.2	25.2	44.4	16.1	14.4	14.4	50.6	38.7	**32.3**
2008	32.5	34.1	32.5	32.5	30.3	30.6	28.9	28.9	28.6	31.2	**30.5**
2009	26.0	25.9	26.0	26.0	36.2	20.1	20.7	20.7	38.5	34.0	**31.3**
2010	30.1	27.9	30.1	30.1	41.7	26.0	28.1	28.1	47.0	39.1	**37.1**
2011	31.0	32.9	31.0	31.0	33.7	28.6	28.2	28.2	35.9	32.9	**32.6**
2012	43.6	43.2	43.6	43.6	46.8	40.7	41.4	41.4	47.5	46.3	**45.3**
2013	40.4	39.4	40.4	40.4	47.6	35.2	36.1	36.1	49.5	46.3	**44.4**
2014	31.0	30.1	31.0	31.0	46.0	27.0	27.3	27.3	53.4	42.4	**40.5**

Appendix Table B3. (cont'd). Canadian and total exploitation rate estimates (%) for each Nass Sockeye CU, 1982-14.

	Nass Sockeye - Total Stock Exploitation Rate by CU										
	Damdochax	Kwinagees	Oweegee	Bowser	Hanna-Tin	MezBeach	BrownBear	Cranberry	Gingit+	Zolzap	**Total**
1982	66.3	67.4	66.3	66.3	58.0	68.3	67.6	67.6	55.1	60.5	**62.0**
1983	75.8	76.4	75.8	75.8	48.3	82.2	81.4	81.4	25.5	58.6	**66.0**
1984	70.8	69.8	70.8	70.8	48.8	78.3	77.3	77.3	38.8	56.0	**62.8**
1985	60.3	60.8	60.3	60.3	39.0	68.3	67.2	67.2	29.2	45.5	**51.6**
1986	74.8	74.5	74.8	74.8	50.3	82.1	80.9	80.9	34.7	58.4	**67.6**
1987	71.7	72.4	71.7	71.7	46.8	78.7	75.7	75.7	31.4	55.0	**62.7**
1988	69.2	70.8	69.2	69.2	52.4	74.1	71.9	71.9	41.5	57.6	**61.2**
1989	82.8	83.8	82.8	82.8	61.2	88.2	86.5	86.5	49.6	68.6	**78.3**
1990	69.9	71.1	69.9	69.9	48.6	76.0	72.9	72.9	36.9	55.1	**61.4**
1991	76.2	76.6	76.2	76.2	55.7	81.9	79.9	79.9	40.9	62.6	**67.8**
1992	74.0	73.5	74.0	74.0	55.3	79.4	77.9	77.9	41.6	61.4	**65.7**
1993	81.5	83.0	81.5	81.5	68.0	83.4	81.8	81.8	59.4	72.8	**75.0**
1994	68.1	68.8	68.1	68.1	59.4	68.3	67.4	67.4	54.7	63.0	**63.0**
1995	85.0	86.9	85.0	85.0	69.9	84.9	82.9	82.9	58.5	76.3	**77.4**
1996	84.2	83.6	84.2	84.2	72.6	86.7	85.9	85.9	63.9	77.1	**79.3**
1997	79.3	81.6	79.3	79.3	71.5	77.3	75.9	75.9	65.9	74.7	**74.8**
1998	63.8	58.9	63.8	63.8	57.8	71.2	71.9	71.9	61.1	59.6	**62.6**
1999	77.4	77.1	77.4	77.4	72.6	80.0	79.5	79.5	71.2	73.9	**75.0**
2000	72.6	73.4	72.6	72.6	64.6	72.0	70.0	70.0	59.2	67.5	**67.3**
2001	72.4	72.5	72.4	72.4	67.9	76.5	75.3	75.3	69.8	68.7	**71.4**
2002	72.5	72.6	72.5	72.5	71.3	70.0	69.7	69.7	68.5	72.2	**71.1**
2003	74.0	71.0	74.0	74.0	79.6	72.7	74.7	74.7	83.0	79.1	**77.6**
2004	77.2	74.8	77.2	77.2	78.0	79.0	80.0	80.0	79.4	78.0	**78.1**
2005	63.2	63.0	63.2	63.2	68.0	61.8	61.8	61.8	71.6	67.0	**66.3**
2006	64.7	64.2	64.7	64.7	69.8	62.2	62.8	62.8	72.7	69.1	**67.7**
2007	75.4	70.0	75.4	75.4	66.1	82.9	84.4	84.4	66.1	68.5	**73.2**
2008	47.2	47.2	47.2	47.2	39.0	50.5	50.3	50.3	35.3	41.5	**42.7**
2009	59.0	56.6	59.0	59.0	56.3	60.5	62.0	62.0	54.7	58.0	**57.5**
2010	43.3	40.2	43.3	43.3	50.4	42.2	43.9	43.9	54.8	49.2	**47.8**
2011	50.3	53.4	50.3	50.3	50.7	47.1	45.5	45.5	53.7	50.8	**50.3**
2012	54.4	52.6	54.4	54.4	59.2	52.3	54.0	54.0	61.3	58.5	**57.4**
2013	58.4	56.7	58.4	58.4	59.4	57.7	58.1	58.1	59.1	59.6	**58.9**
2014	48.2	46.5	48.2	48.2	55.6	47.0	48.4	48.4	61.9	54.5	**53.2**

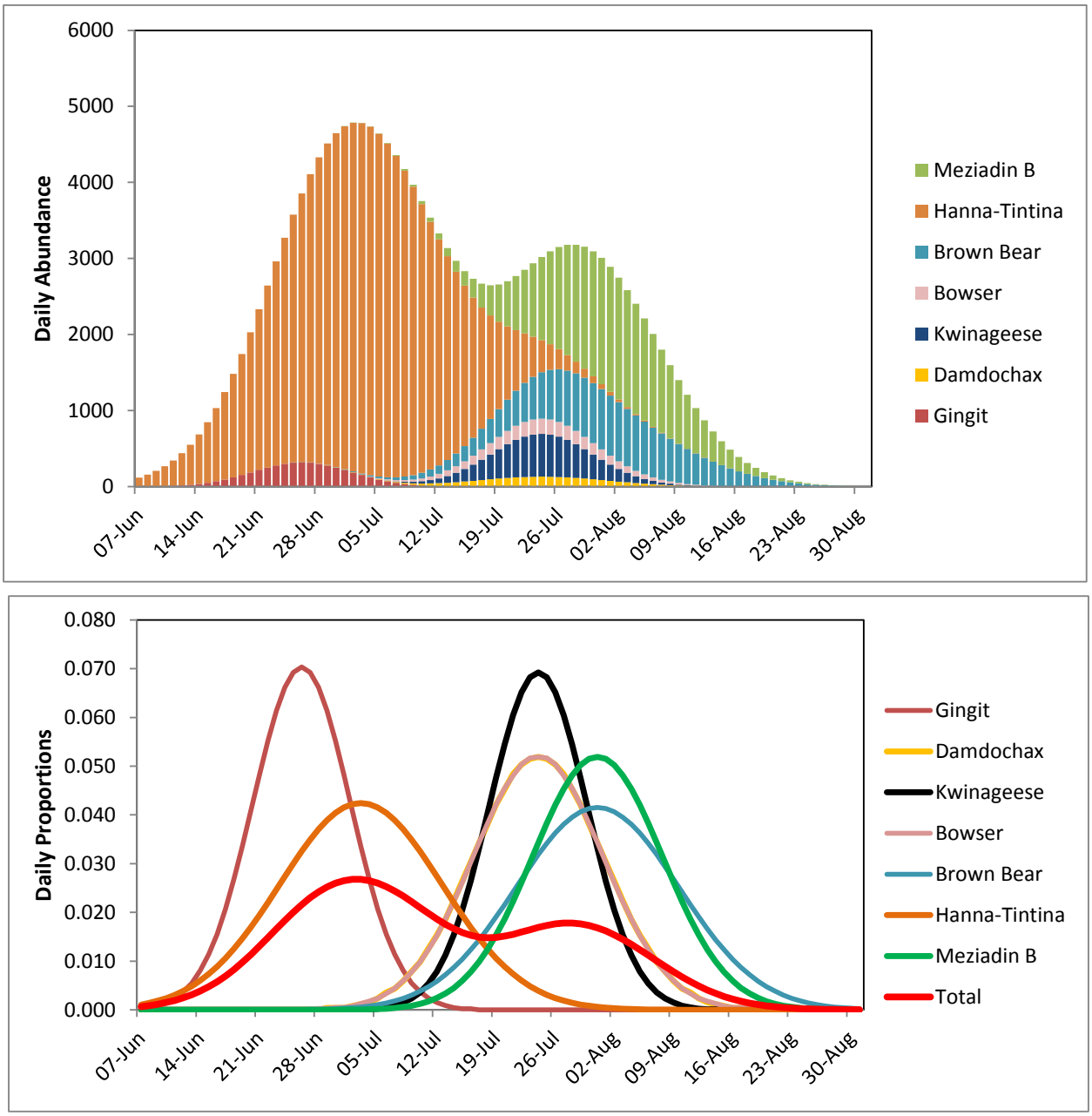
Appendix Table B4. Canadian and total exploitation rate estimates (%) for each Skeena Sockeye CU, 1982-14.

	Skeena Sockeye - Canadian Stock Exploitation Rate by CU																				
	Kluatan+	Motase	Sustut+	Bear+	Slamgeesh	Sicintine	Babine-WE	Babine-WM	Babine-WL	Babine-P	Babine-F	Swan+	Bulkley+	Morice+	Kitwanga	Zymoetz	Kalum	Lakelse	Alastair	Johnston	**Total**
1982	46.1	60.4	57.1	57.1	57.1	57.1	48.3	58.6	61.0	58.6	63.4	42.5	59.0	59.0	48.9	17.0	49.6	14.6	32.7	12.3	**60.0**
1983	31.8	34.3	33.6	33.6	33.6	33.6	32.7	35.2	33.7	35.2	36.7	23.9	48.1	48.1	25.9	5.9	24.4	5.4	13.4	3.4	**34.7**
1984	34.9	45.1	42.6	42.6	42.6	42.6	35.2	43.6	44.6	43.6	47.9	29.5	59.0	59.0	34.9	10.6	34.0	10.6	23.6	9.7	**45.1**
1985	38.8	48.2	49.2	49.2	49.2	49.2	43.0	49.6	44.8	49.6	50.4	42.1	53.4	53.4	40.0	31.3	41.7	19.6	28.6	18.7	**47.9**
1986	36.0	40.2	41.7	41.7	41.7	41.7	39.8	43.5	38.3	43.5	42.7	33.7	49.8	49.8	33.1	18.2	31.8	13.7	22.1	11.8	**41.1**
1987	24.7	37.2	31.5	31.5	31.5	31.5	25.8	32.5	42.2	32.5	38.4	22.0	42.5	42.5	32.0	10.1	26.7	7.6	15.4	6.1	**36.3**
1988	45.7	49.4	51.6	51.6	51.6	51.6	48.8	52.4	45.4	52.4	51.6	46.2	61.9	61.9	42.2	35.0	45.2	28.5	36.5	27.3	**50.0**
1989	37.6	39.2	40.8	40.8	40.8	40.8	40.8	42.0	37.5	42.0	40.9	35.6	40.5	40.5	32.5	24.1	33.0	18.0	24.5	16.0	**39.7**
1990	38.0	44.1	43.9	43.9	43.9	43.9	39.6	45.0	42.2	45.0	46.7	35.4	54.7	54.7	36.0	23.9	37.4	21.1	28.7	19.8	**44.4**
1991	40.0	46.4	48.9	48.9	48.9	48.9	43.1	49.7	41.5	49.7	49.7	40.4	48.7	48.7	35.9	26.5	41.1	19.8	30.7	19.2	**46.7**
1992	47.1	48.2	51.3	51.3	51.3	51.3	52.2	54.0	44.4	54.0	52.2	47.0	59.6	59.6	39.6	41.9	45.6	35.4	41.1	34.2	**50.3**
1993	43.9	46.7	51.2	51.2	51.2	51.2	54.7	57.4	43.0	57.4	53.3	48.1	53.9	53.9	37.9	39.3	45.2	31.2	37.8	29.5	**51.1**
1994	35.8	34.8	53.0	40.2	40.2	40.2	41.6	42.9	29.6	42.9	39.1	37.3	48.1	48.1	28.2	28.5	32.8	22.8	28.3	20.5	**37.6**
1995	47.2	53.1	57.0	57.0	57.0	57.0	52.5	59.5	47.0	59.5	59.5	49.0	62.0	62.0	40.3	32.5	47.9	27.0	37.3	25.4	**55.8**
1996	51.5	60.3	67.1	63.3	63.3	63.3	57.6	65.3	55.0	69.8	70.6	56.6	56.9	56.9	48.5	39.1	55.0	29.0	42.4	28.1	**65.9**
1997	53.0	49.8	61.1	57.2	57.2	57.2	59.7	60.6	41.8	66.3	56.8	56.9	64.3	64.3	43.6	47.9	48.7	41.0	45.3	39.4	**55.9**
1998	31.1	22.1	41.5	30.5	30.5	30.5	34.9	32.0	15.2	32.0	24.5	28.8	43.7	43.7	13.1	19.3	17.4	15.0	16.5	10.5	**24.2**
1999	19.2	11.8	28.8	13.4	13.4	13.4	20.7	17.3	12.9	17.3	15.1	10.7	17.6	17.6	7.1	6.2	6.0	13.7	12.5	11.7	**15.1**
2000	49.9	54.1	66.7	58.8	58.8	58.8	56.3	61.0	47.8	70.0	68.0	51.1	54.6	54.6	42.9	35.4	44.5	27.1	36.3	25.2	**64.1**
2001	27.7	41.7	45.8	40.4	40.4	40.4	41.8	50.8	44.3	58.9	69.9	29.2	34.4	34.4	31.6	15.7	33.0	11.3	20.4	10.4	**55.8**
2002	40.2	48.8	55.8	47.8	47.8	47.8	43.7	50.1	48.7	50.1	52.6	38.8	39.7	39.7	39.8	22.7	39.0	20.4	29.5	16.8	**49.6**
2003	24.7	28.7	49.1	30.5	30.5	30.5	28.8	32.5	26.4	32.5	31.6	24.8	24.1	24.1	21.2	13.8	23.2	11.1	16.3	8.8	**29.8**
2004	26.9	27.0	45.6	28.5	28.5	28.5	31.3	31.4	26.0	31.4	30.1	23.4	23.6	23.6	19.9	15.8	20.3	12.8	14.4	8.7	**28.4**
2005	22.8	12.8	50.7	16.1	16.1	16.1	26.2	20.6	12.9	20.6	16.2	11.8	14.0	14.0	7.4	7.4	6.5	7.1	5.8	2.5	**15.9**
2006	34.4	39.7	68.6	43.3	43.3	43.3	44.3	48.8	45.5	51.4	54.9	38.6	40.7	40.7	31.4	26.7	31.6	18.6	22.8	16.0	**50.9**
2007	19.9	26.1	36.6	27.5	27.5	27.5	25.2	31.7	24.6	31.7	32.7	19.8	19.6	19.6	16.9	8.3	20.6	7.1	13.0	5.3	**29.5**
2008	27.3	43.3	78.3	34.3	34.3	34.3	35.4	46.2	54.9	55.0	57.8	19.7	34.8	34.8	34.2	5.1	28.7	6.2	16.8	3.7	**54.6**
2009	13.0	10.8	65.0	12.1	12.1	12.1	23.0	20.0	14.5	20.0	17.5	10.2	18.5	18.5	7.4	7.0	6.7	6.7	5.3	2.5	**16.6**
2010	23.6	21.4	70.3	22.6	22.6	22.6	30.7	28.7	23.5	28.7	26.9	17.3	23.2	23.2	12.9	8.2	10.1	7.7	7.3	2.5	**24.5**
2011	22.6	28.5	42.6	25.7	25.7	25.7	28.0	30.9	33.1	30.9	52.9	19.0	20.1	20.1	23.9	8.6	19.2	7.6	11.7	4.4	**40.6**
2012	23.3	28.8	47.6	27.8	27.8	27.8	31.2	34.1	30.1	63.2	42.8	21.1	22.9	22.9	22.1	6.7	20.6	6.9	14.1	5.0	**42.1**
2013	12.5	8.0	36.9	9.3	9.3	9.3	14.3	11.0	7.8	11.0	9.3	7.5	14.1	14.1	4.6	3.2	3.1	2.8	2.5	1.0	**8.4**
2014	18.4	19.4	31.9	24.0	24.0	24.0	25.4	28.4	14.1	35.6	42.3	18.9	17.3	17.3	12.3	7.5	15.8	7.0	11.5	5.4	**36.8**

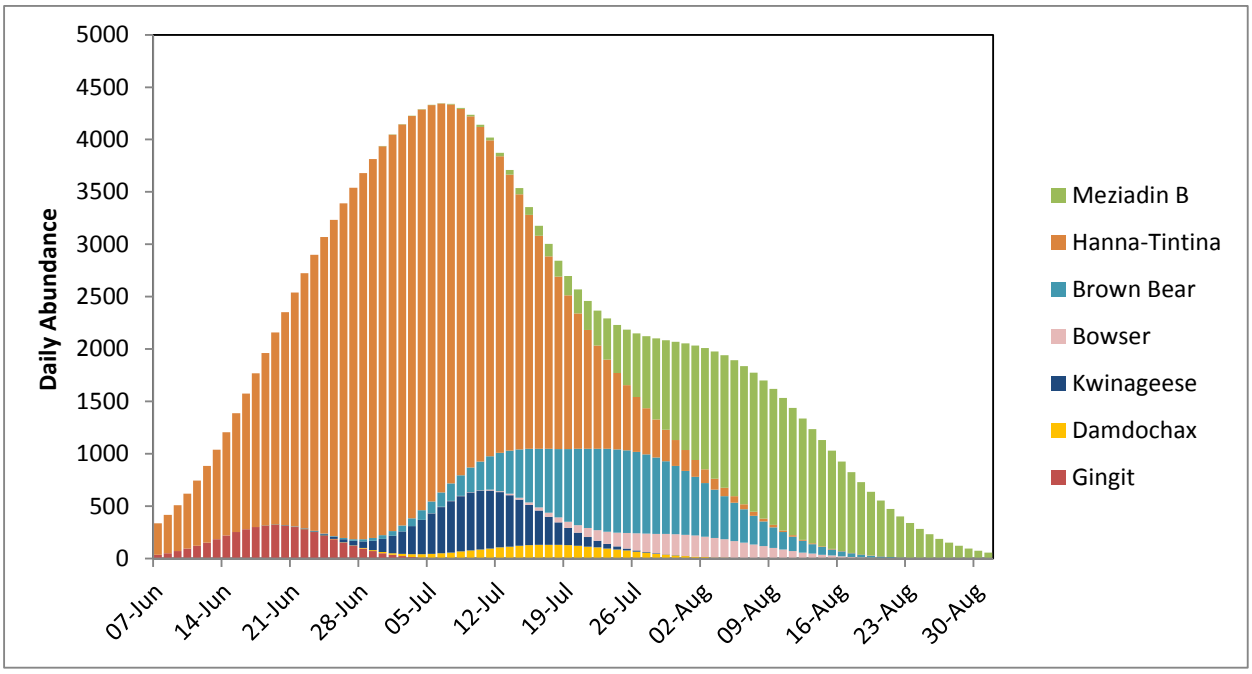
Appendix Table B4 (cont'd). Canadian and total exploitation rate estimates (%) for each Skeena Sockeye CU, 1982-14.

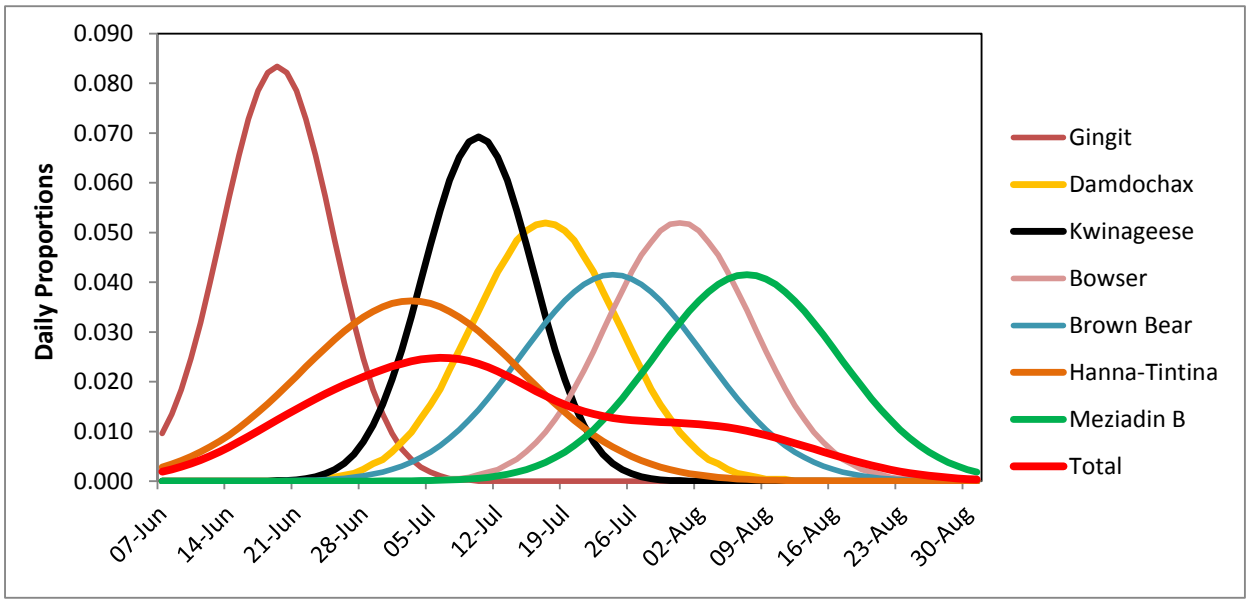
	Skeena Sockeye - Total Stock Exploitation Rate by CU																				
	Kluatan+	Motase	Sustut+	Bear+	Slamgeesh	Sicintine	Babine-WE	Babine-WM	Babine-WL	Babine-P	Babine-F	Swan+	Bulkley+	Morice+	Kitwanga	Zymoetz	Kalum	Lakelse	Alastair	Johnston	**Total**
1982	50.6	68.0	63.2	63.2	63.2	63.2	52.7	64.7	70.4	64.7	70.6	46.8	63.6	63.6	61.3	18.9	56.0	16.1	36.5	13.9	**67.2**
1983	38.8	52.3	43.2	43.2	43.2	43.2	38.6	44.9	60.7	44.9	52.2	29.7	55.2	55.2	53.2	8.6	37.3	7.3	18.8	5.3	**50.5**
1984	38.9	55.5	46.8	46.8	46.8	46.8	37.7	47.8	62.7	47.8	56.5	31.8	62.9	62.9	51.7	12.6	41.1	12.7	27.0	11.8	**54.0**
1985	42.5	58.8	54.4	54.4	54.4	54.4	45.9	54.8	61.4	54.8	59.9	44.8	57.0	57.0	54.1	33.0	48.6	20.9	31.4	20.1	**57.1**
1986	42.7	57.2	50.2	50.2	50.2	50.2	44.7	51.9	63.9	51.9	58.5	38.0	56.6	56.6	53.3	21.9	43.3	17.4	27.8	15.5	**56.1**
1987	26.8	41.8	34.2	34.2	34.2	34.2	27.6	35.2	49.0	35.2	42.8	23.7	44.6	44.6	37.0	11.6	30.0	8.7	17.1	7.2	**40.4**
1988	51.9	63.4	60.0	60.0	60.0	60.0	54.0	60.9	65.3	60.9	64.9	51.1	68.0	68.0	58.9	37.6	55.1	30.8	41.5	29.7	**62.5**
1989	44.2	55.3	49.7	49.7	49.7	49.7	46.3	51.0	61.1	51.0	55.7	40.8	47.0	47.0	53.6	27.4	44.2	20.5	29.7	18.6	**54.0**
1990	46.4	62.8	54.3	54.3	54.3	54.3	46.5	55.3	70.0	55.3	63.5	42.0	63.1	63.1	61.0	28.1	51.1	24.3	35.5	23.0	**61.3**
1991	45.7	65.3	56.3	56.3	56.3	56.3	46.3	57.1	71.2	57.1	66.2	42.9	54.3	54.3	62.0	27.7	53.3	20.9	34.9	20.2	**63.2**
1992	53.1	67.6	58.8	58.8	58.8	58.8	55.6	61.5	75.1	61.5	69.3	49.8	65.6	65.6	65.6	43.3	58.1	36.7	45.9	35.5	**67.2**
1993	47.9	60.2	56.8	56.8	56.8	56.8	57.4	63.0	65.5	63.0	64.9	50.4	57.8	57.8	60.9	40.4	53.7	32.1	40.8	30.4	**62.6**
1994	42.1	58.0	61.5	48.7	48.7	48.7	44.8	51.4	67.2	51.4	59.3	39.7	54.4	54.4	59.3	29.2	47.2	23.5	32.9	21.1	**57.6**
1995	50.4	65.8	61.0	61.0	61.0	61.0	54.2	63.5	69.5	63.5	69.5	50.5	65.2	65.2	64.0	33.2	55.8	27.7	39.8	26.1	**66.4**
1996	55.2	69.6	71.0	67.2	67.2	67.2	60.3	69.2	71.3	73.7	78.1	59.1	60.5	60.5	64.2	41.6	61.2	31.5	45.6	30.5	**73.9**
1997	61.0	69.0	72.7	68.8	68.8	68.8	66.7	72.2	70.2	77.9	74.7	63.7	72.2	72.2	67.6	50.3	62.0	43.3	51.7	41.7	**72.8**
1998	36.4	43.7	49.3	38.3	38.3	38.3	38.6	39.8	51.4	39.8	42.4	32.4	49.0	49.0	44.2	21.1	30.1	16.3	20.4	11.8	**41.9**
1999	22.9	19.9	32.2	16.8	16.8	16.8	24.0	20.7	27.8	20.7	21.6	13.9	21.3	21.3	20.7	10.8	11.6	17.3	15.9	15.2	**22.1**
2000	51.5	60.2	69.0	61.2	61.2	61.2	57.3	63.4	59.3	72.3	73.3	52.0	56.3	56.3	51.1	35.8	48.1	27.5	37.6	25.6	**69.3**
2001	31.4	54.1	51.5	46.0	46.0	46.0	44.4	56.5	63.8	64.5	80.8	31.7	38.0	38.0	49.0	16.6	40.8	12.0	23.0	11.1	**66.5**
2002	42.9	52.4	58.6	50.6	50.6	50.6	46.3	52.9	53.6	52.9	55.9	41.5	42.3	42.3	44.7	25.0	42.1	22.5	32.0	18.9	**52.9**
2003	27.6	36.7	52.3	33.7	33.7	33.7	31.1	35.7	41.0	35.7	38.3	26.8	27.1	27.1	35.4	16.4	28.3	13.4	18.9	11.1	**36.5**
2004	30.2	40.8	50.5	33.3	33.3	33.3	33.4	36.2	49.8	36.2	41.7	25.3	26.9	26.9	41.0	16.9	28.3	13.6	16.8	9.5	**39.9**
2005	29.6	31.5	61.9	27.3	27.3	27.3	32.8	31.8	37.1	31.8	34.8	18.5	20.7	20.7	25.4	12.2	18.2	10.9	11.2	6.3	**32.2**
2006	36.7	47.2	73.2	47.9	47.9	47.9	46.3	53.3	54.2	56.0	62.8	40.5	43.0	43.0	38.0	27.3	36.0	19.1	24.5	16.6	**57.3**
2007	26.0	47.8	43.7	34.5	34.5	34.5	29.1	38.8	62.2	38.8	49.9	23.3	25.7	25.7	53.6	11.4	34.4	9.5	17.8	7.6	**47.7**
2008	28.1	45.7	79.0	35.0	35.0	35.0	35.9	47.0	60.0	55.7	59.3	20.2	35.7	35.7	44.7	5.7	30.5	6.7	17.6	4.3	**56.5**
2009	15.0	19.1	67.8	14.8	14.8	14.8	24.3	22.7	30.5	22.7	24.2	11.3	20.5	20.5	21.7	7.6	11.5	7.2	6.8	3.0	**23.3**
2010	25.5	27.1	72.4	24.7	24.7	24.7	32.1	30.8	34.6	30.8	31.4	18.6	25.1	25.1	25.3	9.3	13.8	8.7	8.9	3.5	**28.8**
2011	25.9	37.2	46.8	29.9	29.9	29.9	30.5	35.1	47.1	35.1	60.8	21.3	23.5	23.5	35.0	10.3	25.0	9.0	14.4	5.8	**47.8**
2012	25.0	32.4	48.9	29.1	29.1	29.1	32.6	35.4	38.1	64.6	45.2	22.4	24.6	24.6	32.0	9.3	23.2	8.9	15.8	7.0	**44.8**
2013	14.1	13.1	38.9	11.4	11.4	11.4	15.5	13.1	17.6	13.1	13.3	8.7	15.7	15.7	13.8	4.0	6.3	3.3	3.7	1.5	**12.2**
2014	22.9	37.2	38.4	30.5	30.5	30.5	28.1	34.8	43.3	42.1	57.8	21.2	21.8	21.8	38.5	8.6	26.3	8.0	14.9	6.5	**50.6**

Appendix Figure B1. Run timing distributions for Nass Sockeye sub-stocks using average timing parameters for the 2005 Sockeye return.

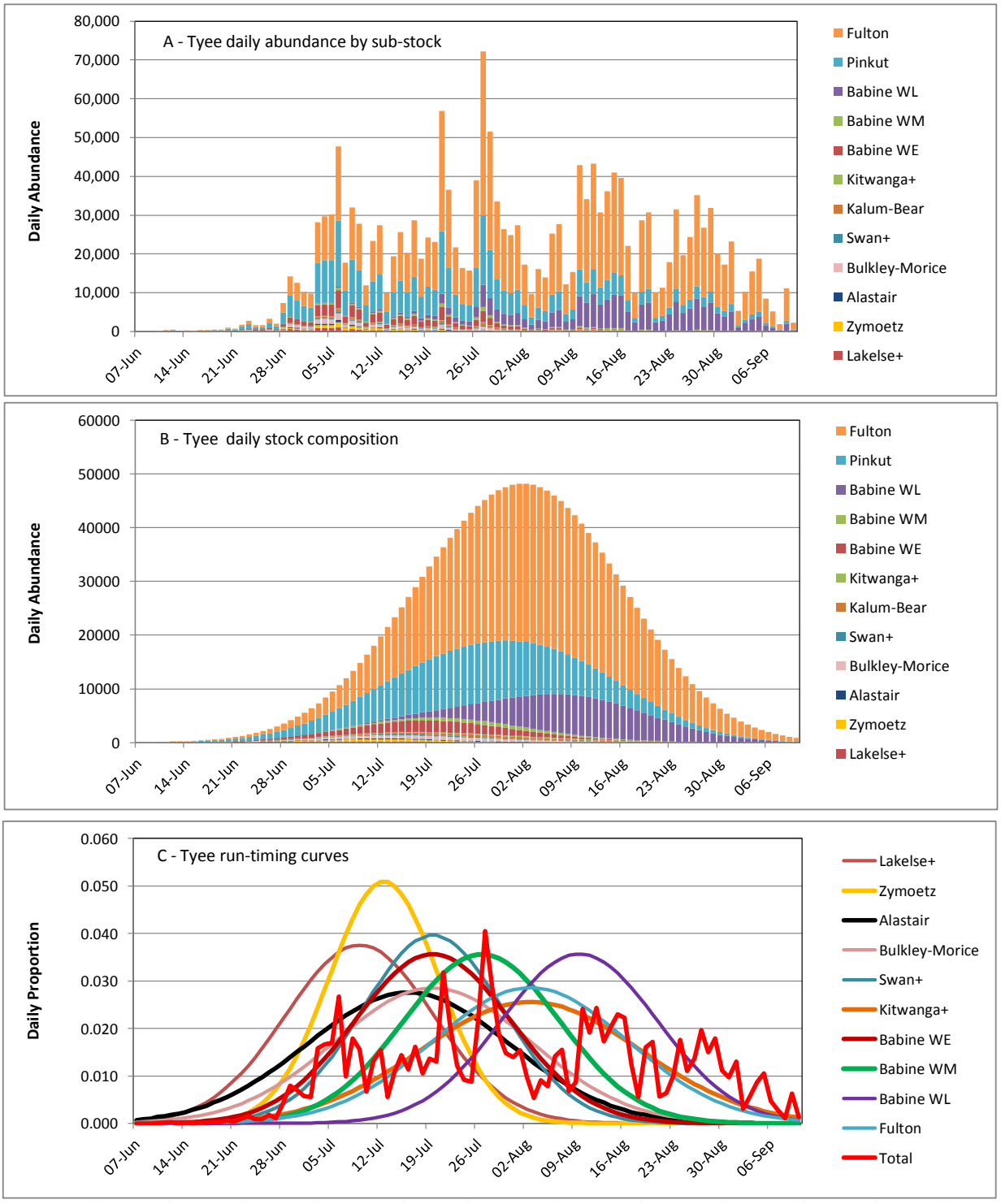


Appendix Figure B2. Run timing distributions for Nass Sockeye sub-stocks using run timing parameters derived from 2005 DNA data for the 2005 Sockeye return.

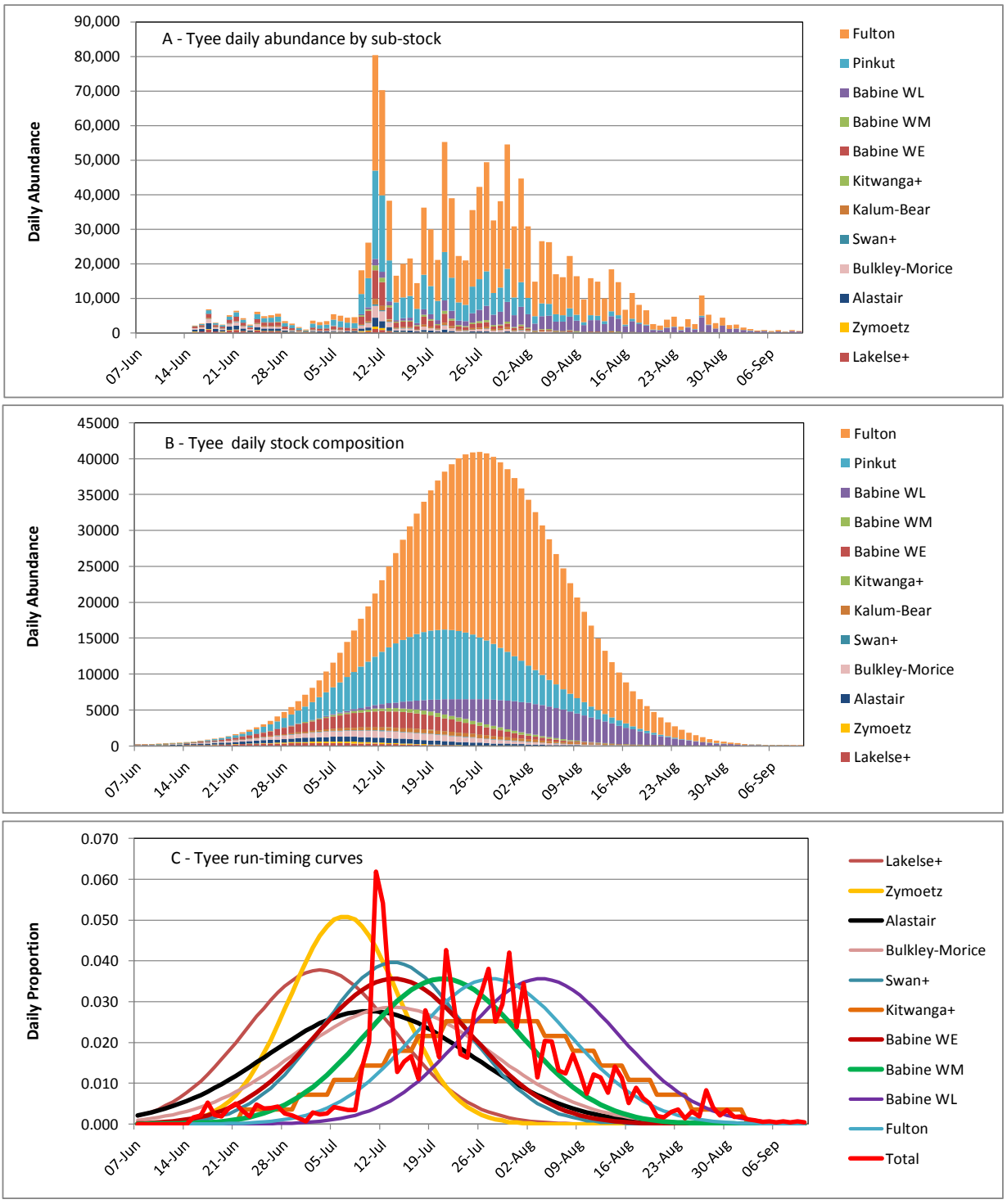




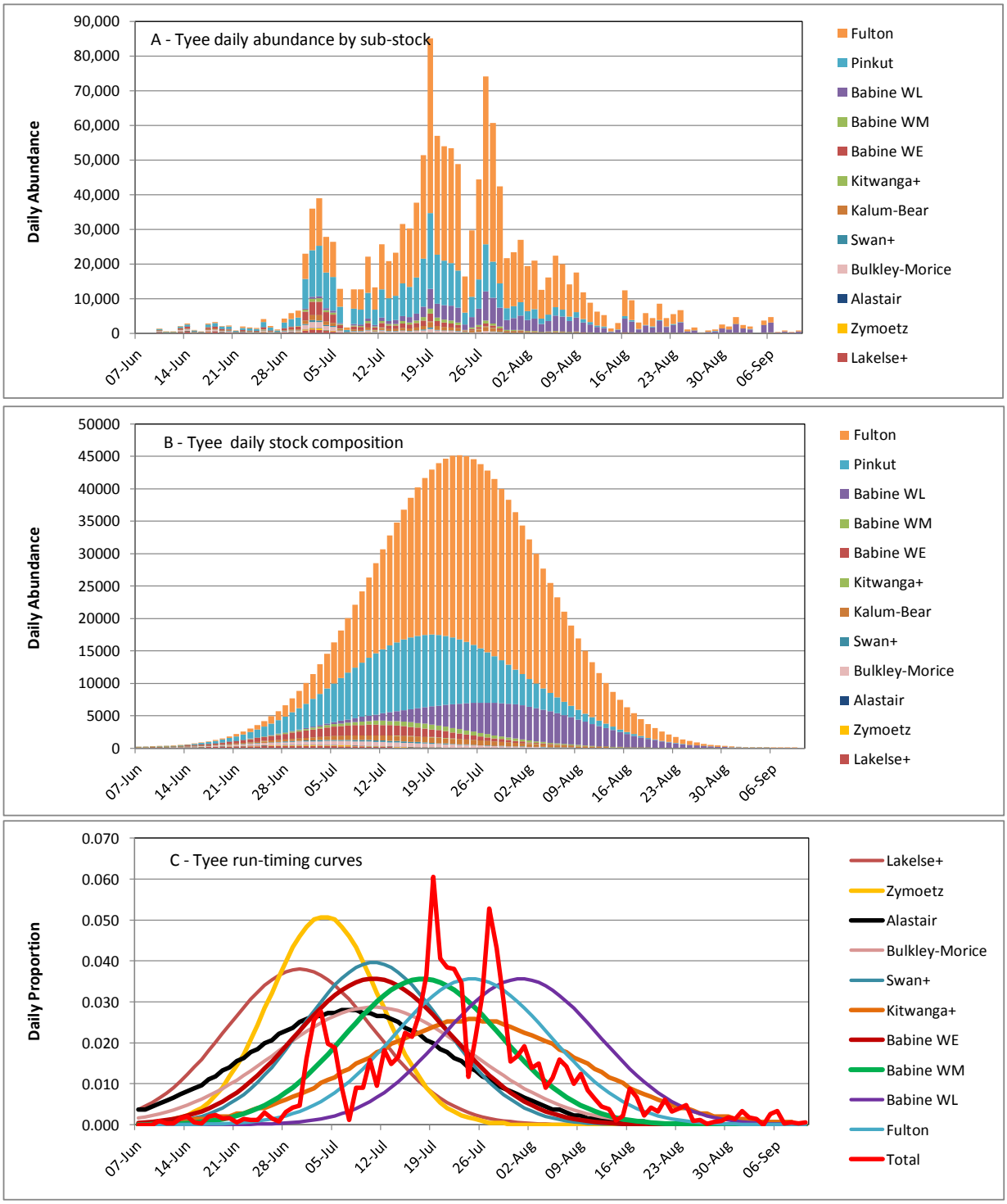
Appendix Figure B3. Estimated Tyee daily abundance, stock composition and run-timing curves for Skeena sockeye stocks in 2006 (late run-timing year).



Appendix Figure B4. Estimated Tyee daily abundance, stock composition, and run-timing curves for Skeena sockeye stocks in 2007 (average run-timing year).



Appendix Figure B5. Estimated Tyee daily abundance, stock composition and run-timing curves for Skeena sockeye stocks in 2008 (early run-timing year).



APPENDIX C

Annual escapement and run size estimates for North and Central coast Coho salmon

Appendix Table C1. Annual estimates of escapement catch and total stock size estimates for Coho salmon returning to the Nass River, 1992-2014.

	Catch						Net Escapement						Exploitation rates [10]		
	Marine		In-river												
Year	Alaska [1]	Canadian [2]	Nisga'a [3]	Other FN [4]	Sport [5]	Total	Coastal [6]	Lower [7]	Mid-to-Upper [8]	Total	TRTC	Total run size [9]	US	Can	Total
				0.25%	0.27%										
1992	144,954	47,301	3,393	*160*	*173*	195,981	27,248	18,527	63,409	109,184	160,212	305,166	*47.5%*	*16.7%*	64.2%
1993	56,531	18,447	595	*48*	*52*	75,672	11,954	12,438	18,947	43,340	62,481	119,012	47.5%	16.1%	63.6%
1994	407,359	141,096	2,530	*362*	*391*	551,738	33,719	30,099	143,026	206,844	351,223	758,582	53.7%	19.0%	72.7%
1995	82,483	19,417	1,402	*56*	*61*	103,419	13,949	10,930	22,219	47,098	68,034	150,517	54.8%	13.9%	68.7%
1996	81,392	44,433	2,178	*110*	*119*	128,233	23,205	12,553	43,642	79,400	126,240	207,633	39.2%	22.6%	61.8%
1997	27,591	5,348	293	*31*	*34*	33,297	9,342	5,714	12,420	27,476	33,182	60,773	45.4%	9.4%	54.8%
1998	61,664	0	2,075	*95*	*103*	63,936	20,833	11,717	37,565	70,115	72,388	134,051	46.0%	1.7%	47.7%
1999	99,990	2,484	1,122	*144*	*156*	103,896	29,601	16,533	56,988	103,123	107,029	207,019	48.3%	1.9%	50.2%
2000	92,413	25,080	1,950	98	271	119,812	29,115	5,885	71,137	106,136	133,535	225,949	40.9%	12.1%	53.0%
2001	176,003	32,686	14,706	399	500	224,294	47,639	67,395	79,726	194,761	243,052	419,055	42.0%	11.5%	53.5%
2002	62,532	12,431	9,016	26	369	84,374	63,016	68,045	161,262	292,323	314,165	376,697	16.6%	5.8%	22.4%
2003	88,564	15,889	14,882	68	178	119,581	23,508	49,829	67,564	140,901	171,918	260,483	34.0%	11.9%	45.9%
2004	90,984	11,318	20,337	44	232	122,915	30,501	22,542	45,955	98,998	130,929	221,914	41.0%	14.4%	55.4%
2005	*163,381*	*34,717*	14,969	718	505	214,290	40,488	32,219	87,153	159,861	210,770	374,150	*43.7%*	*13.6%*	57.3%
2006	*65,965*	*14,017*	8,425	392	91	88,890	31,394	22,162	48,137	101,693	124,618	190,583	*34.6%*	*12.0%*	46.6%
2007	*106,795*	*22,693*	9,515	127	638	139,768	41,205	51,738	48,987	141,930	174,903	281,698	*37.9%*	*11.7%*	49.6%
2008	*56,209*	*11,944*	3,450	54	97	71,755	12,526	18,847	84,105	115,477	131,023	187,232	*30.0%*	*8.3%*	38.3%
2009	*118,000*	*25,074*	13,794	327	2,026	159,220	112,537	79,443	188,903	380,882	422,103	540,103	*21.8%*	*7.6%*	29.5%
2010	*92,375*	*19,629*	10,292	193	295	122,784	49,902	35,227	83,786	168,914	199,323	291,698	*31.7%*	*10.4%*	42.1%
2011	76,636	22,236	2,635	18	228	101,753	7,648	5,399	72,864	85,910	111,027	187,663	40.8%	13.4%	54.2%
2012	107,979	33,156	12,082	187	164	153,568	37,182	26,248	62,326	125,756	171,344	279,324	38.7%	16.3%	55.0%
2013	766,970	187,903	19,370	46	438	974,727	235,193	166,029	117,263	518,485	726,242	1,493,212	51.4%	13.9%	65.3%
2014	137,638	23,668	8,452	60	306	170,124	24,774	89,279	117,657	231,710	264,196	401,834	34.3%	8.1%	42.3%
Mean: 92-9	120,245	34,816	1,699	126	136	157,022	21,231	14,814	49,777	85,822	122,599	242,844	47.8%	12.7%	60.5%
Mean: 00-c	146,830	32,829	10,925	184	423	191,190	52,442	49,352	89,122	190,916	235,277	382,106	36.0%	11.4%	47.4%

[1] From 1992-2004 and since 2011, Alaskan catch of Nass Coho was derived from the total marine harvest estimate less Canadian catch based on coded-wire-tagging marine exploitation rate data from Zolzap Creek (Baxter and Stephens 2005; Nisga'a Fisheries 2013). From 2005-2010, Alaskan catch was derived from the 1993-2004 mean harvest rate (82%) of the estimated marine catch of Nass Coho in Areas 1-4 from NJTC estimates.

[2] From 1992-2004, and since 2011, Canadian marine catch of Nass Coho was derived from the total marine harvest estimate less Alaskan catch based on CWT marine exploitation rate data from Zolzap Creek (Baxter and Stephens 2005; Nisga'a Fisheries 2013). From 2005-2010, Canadian catch of Nass Coho was estimated by the JTC for tidal sport, net, and troll fisheries in Areas 1-4.

[3] Nisga'a catch from annual catch monitoring program of the Nisga'a Fisheries Program (see annual reports).

[4] Other First Nation catch includes Gitanyow and was calculated for 1992-99 based on the average proportion (0.25%) of reported harvest to mid-to-Upper escapement from 2000-2010. Since 2000, catches were provided by the NJTC.

[5] Sport catch was calculated for 1992-99 based on the average proportion (0.27%) of reported harvests to mid-to-Upper escapement from 2000-2010. Since 2000, catches were provided by the NJTC.

[6] Coastal estimates are provided by NJTC based on annual Lower Nass habitat-capacity estimates (or if available, Coastal estimates from Lachmach, Kincolith, and/or Salmon Cove) prorated to a habitat-capacity estimates for Coastal Nass area streams (Bocking and Peacock 2004).

[7] Lower Nass estimates are provided by NJTC based on annual capacity estimates for index streams (Zolzap, Ansedegan, Diskangieq, and/or Ginlulak) prorated to a habitat-capacity model estimates developed for Lower Nass area streams (Bocking and Peacock 2004).

[8] Mid-to-Upper Nass escapement estimates are from the annual Nisga'a Fisheries fishwheel mark-recapture program.

[9] Total run size is the sum of the estimates of the total catch and escapement.

[10] Exploitation rates for 1992 (italics) are based on 1993 Zolzap CWT estimates plus estimated in-river harvests. US exploitation rates from 1993-2004, and since 2011, are based on CWT data from Zolzap Creek (Baxter and Stephens 2005; Nisga'a Fisheries 2013). US exploitation rates from 2005-2010 are estimated as 82% (92-04 average) of the total marine catch divided by the total run. Canadian ERs are estimated as the proportion of the total catch estimate of Nass Coho from Canadian marine (from CWT data from Zolzap) and in-river (from NJTC) areas divided by the total run.

Appendix Table C2. Annual estimates of escapement catch and total stock size estimates for Coho salmon returning to the Skeena River, 1980-2014.

		Harvest by Major Fishery					Exploitation Rate						Portion of Harvest					
Year	Total Escape[1]	FN FSC	BC Comm.[2]	BC Sport[2]	Alaska[2]	Total Run	FN FSC	BC Comm.	BC Sport	Alaska	Total[3]	FN FSC	BC Comm.	BC Sport	Alaska	CDN ER	Total ER
1980	132,666	5,527	139,216	3,834	92,997	374,240	1%	37%	1%	25%	65%	2%	58%	2%	38%	40%	65%
1981	107,580	16,086	106,046	2,920	70,840	303,472	5%	35%	1%	23%	65%	8%	54%	1%	36%	41%	65%
1982	79,973	24,500	71,436	1,967	47,720	225,597	11%	32%	1%	21%	65%	17%	49%	1%	33%	43%	65%
1983	94,788	26,690	86,055	2,370	57,486	267,389	10%	32%	1%	21%	65%	15%	50%	1%	33%	43%	65%
1984	173,431	25,164	171,413	4,720	114,505	489,234	5%	35%	1%	23%	65%	8%	54%	1%	36%	41%	65%
1985	74,821	10,829	73,966	2,037	49,410	211,064	5%	35%	1%	23%	65%	8%	54%	1%	36%	41%	65%
1986	192,083	21,266	193,743	5,335	129,422	541,850	4%	36%	1%	24%	65%	6%	55%	2%	37%	41%	65%
1987	185,316	7,616	194,526	5,357	129,945	522,761	1%	37%	1%	25%	65%	2%	58%	2%	39%	40%	65%
1988	44,423	1,161	47,023	1,295	31,412	125,314	1%	38%	1%	25%	65%	1%	58%	2%	39%	39%	65%
1989	184,143	2,714	189,296	0	102,007	478,159	1%	40%	0%	21%	61%	1%	64%	0%	35%	40%	61%
1990	294,214	8,517	420,874	13,445	235,231	972,281	1%	43%	1%	24%	70%	1%	62%	2%	35%	46%	70%
1991	195,353	4,946	156,731	9,182	153,651	519,864	1%	30%	2%	30%	62%	2%	48%	3%	47%	33%	62%
1992	170,941	2,300	139,623	0	179,436	492,301	0%	28%	0%	36%	65%	1%	43%	0%	56%	29%	65%
1993	95,588	479	62,751	0	61,851	220,668	0%	28%	0%	28%	57%	0%	50%	0%	49%	29%	57%
1994	222,184	4,237	159,127	29,004	230,083	644,635	1%	25%	4%	36%	66%	1%	38%	7%	54%	30%	66%
1995	84,190	1,447	21,696	3,561	25,478	136,373	1%	16%	3%	19%	38%	3%	42%	7%	49%	20%	38%
1996	73,584	2,494	91,091	38,666	74,916	280,750	1%	32%	14%	27%	74%	1%	44%	19%	36%	47%	74%
1997	39,067	1,157	4,453	4,709	28,792	78,179	1%	6%	6%	37%	50%	3%	11%	12%	74%	13%	50%
1998	175,135	1,197	0	2,786	38,516	217,635	1%	0%	1%	18%	20%	3%	0%	7%	91%	2%	20%
1999	271,439	4,024	99	4,602	67,845	348,009	1%	0%	1%	19%	22%	5%	0%	6%	89%	3%	22%
2000	136,076	1,515	0	7,310	20,280	165,181	1%	0%	4%	12%	18%	5%	0%	25%	70%	5%	18%
2001	381,718	4,542	1,662	17,697	124,609	530,228	1%	0%	3%	24%	28%	3%	1%	12%	84%	5%	28%
2002	195,287	5,653	4,107	14,461	35,188	254,697	2%	2%	6%	14%	23%	10%	7%	24%	59%	10%	23%
2003	291,844	2,421	16,183	15,864	71,935	398,248	1%	4%	4%	18%	27%	2%	15%	15%	68%	9%	27%
2004	215,689	5,635	26,198	33,163	78,177	358,863	2%	7%	9%	22%	40%	4%	18%	23%	55%	18%	40%
2005	479,097	7,770	12,259	19,318	140,214	658,658	1%	2%	3%	21%	27%	4%	7%	11%	78%	6%	27%
2006	278,158	2,231	9,456	9,685	60,783	360,312	1%	3%	3%	17%	23%	3%	12%	12%	74%	6%	23%
2007	214,421	2,732	37,235	15,298	102,881	372,567	1%	10%	4%	28%	42%	2%	24%	10%	65%	15%	42%
2008	128,608	1,639	4,372	6,507	53,556	194,682	1%	2%	3%	28%	34%	2%	7%	10%	81%	6%	34%
2009	502,981	6,409	22,347	9,339	261,497	802,573	1%	3%	1%	33%	37%	2%	7%	3%	87%	5%	37%
2010	272,734	3,475	16,749	6,337	92,345	391,641	1%	4%	2%	24%	30%	3%	14%	5%	78%	7%	30%
2011	183,670	2,340	47,896	5,831	82,047	321,784	1%	15%	2%	25%	43%	2%	35%	4%	59%	17%	43%
2012	175,522	2,237	12,178	5,507	71,126	266,569	1%	5%	2%	27%	34%	2%	13%	6%	78%	7%	34%
2013	496,215	6,323	55,693	17,170	208,616	784,016	1%	7%	2%	27%	37%	2%	19%	6%	72%	10%	37%
2014	421,523	5,371	9,397	9,701	96,640	542,633	1%	2%	2%	18%	22%	4%	8%	8%	80%	5%	22%
Average																	
1980-14	207,556	6,647	74,426	9,399	97,755	395,784	2%	18%	3%	24%	47%	4%	31%	7%	58%	23%	47%
1989-91	224,570	5,392	255,634	7,542	163,630	656,768	1%	38%	1%	25%	65%	1%	58%	2%	39%	40%	65%

[1] Escapement estimate derived by expanding the Area 4 indicator streams to the total escapement for Area 4 Coho.

[2] Catch estimates for BC commercial, BC sport and Alaska for 1980-88 are based on the average contributions for each of these fisheries for 1989-91.

[3] Total exploitation rates for 1980-88 are based on the average total exploitation rates for 1989-91.

Appendix Table C3. Babine Coho escapement, catch and exploitation rate estimates for 1954-2014 derived from Babine fence counts, 1954-88 ERs from analysis by Blair Holtby and 1989-2014 ERs from Appendix Table C2 based on Tobaggan Creek CWT data.

Year	Adj. Babine Escapement	Canadian Catch	Canadian ER	Total Return to Canada	Total Harvest	Total ER	Total Rum
1954	3,359	2,681	36%	6,040	4,105	55%	7,464
1955	9,714	7,754	36%	17,468	11,873	55%	21,587
1956	9,857	7,868	36%	17,725	12,047	55%	21,904
1957	4,421	3,529	36%	7,950	5,403	55%	9,824
1958	8,438	6,735	36%	15,173	10,313	55%	18,751
1959	12,004	9,582	36%	21,586	14,672	55%	26,676
1960	7,942	6,339	36%	14,281	9,707	55%	17,649
1961	14,416	11,507	36%	25,923	17,620	55%	32,036
1962	15,183	12,119	36%	27,302	18,557	55%	33,740
1963	7,737	5,053	33%	12,790	7,737	50%	15,474
1964	10,689	11,886	41%	22,575	18,200	63%	28,889
1965	22,985	13,856	31%	36,841	21,217	48%	44,202
1966	13,377	12,572	39%	25,949	19,250	59%	32,627
1967	12,487	7,232	31%	19,719	11,073	47%	23,560
1968	13,054	12,268	39%	25,322	18,785	59%	31,839
1969	6,702	4,377	33%	11,079	6,702	50%	13,404
1970	10,404	9,007	37%	19,411	13,791	57%	24,195
1971	9,909	8,578	37%	18,487	13,135	57%	23,044
1972	5,381	6,822	43%	12,203	10,445	66%	15,826
1973	11,606	7,889	33%	19,495	12,080	51%	23,686
1974	13,661	11,355	37%	25,016	17,387	56%	31,048
1975	4,913	2,733	30%	7,646	4,185	46%	9,098
1976	4,499	2,503	30%	7,002	3,832	46%	8,331
1977	10,474	9,843	39%	20,317	15,072	59%	25,546
1978	11,861	17,241	45%	29,102	26,400	69%	38,261
1979	2,909	4,651	46%	7,560	7,122	71%	10,031
1980	5,046	9,379	48%	14,425	14,362	74%	19,408
1981	2,486	3,296	44%	5,782	5,047	67%	7,533
1982	2,673	2,411	38%	5,084	3,691	58%	6,364
1983	3,402	9,472	53%	12,874	14,503	81%	17,905
1984	3,241	5,443	47%	8,684	8,334	72%	11,575
1985	2,129	4,171	49%	6,300	6,387	75%	8,516
1986	3,671	11,705	54%	15,376	17,923	83%	21,594
1987	2,101	2,439	42%	4,540	3,735	64%	5,836
1988	3,225	3,586	41%	6,811	5,491	63%	8,716
1989	5,228	5,451	40%	10,679	8,347	61%	13,575
1990	8,038	12,098	46%	20,136	18,525	70%	26,563
1991	6,720	5,878	33%	12,598	11,164	62%	17,884
1992	2,610	2,167	29%	4,777	4,906	65%	7,516
1993	2,899	1,918	29%	4,817	3,794	57%	6,693
1994	4,656	4,031	30%	8,687	8,852	66%	13,508
1995	2,653	841	20%	3,494	1,644	38%	4,297
1996	3,120	5,607	47%	8,727	8,784	74%	11,904
1997	621	164	13%	785	621	50%	1,242
1998	4,547	103	2%	4,650	1,103	20%	5,650
1999	14,954	481	3%	15,434	4,218	22%	19,172
2000	2,239	145	5%	2,384	479	18%	2,717
2001	21,625	1,354	5%	22,979	8,413	28%	30,038
2002	12,478	1,548	10%	14,026	3,796	23%	16,275
2003	7,888	932	9%	8,820	2,876	27%	10,764
2004	9,047	2,726	18%	11,773	6,005	40%	15,052
2005	24,486	2,011	6%	26,497	9,177	27%	33,663
2006	16,595	1,275	6%	17,870	4,901	23%	21,496
2007	7,473	1,926	15%	9,400	5,512	42%	12,985
2008	16,180	1,575	6%	17,755	8,313	34%	24,493
2009	20,723	1,570	5%	22,292	12,343	37%	33,066
2010	9,546	930	7%	10,476	4,162	30%	13,708
2011	12,933	3,948	17%	16,881	9,725	43%	22,658
2012	11,480	1,303	7%	12,783	5,955	34%	17,434
2013	28,068	4,479	10%	32,547	16,279	37%	44,347
2014	23,692	1,375	5%	25,067	6,807	22%	30,499

Appendix Table C4. Summary of available exploitation rates for Area 2E-2W, 3, and 4 Coho.

	Area 2E & 2W - Haida Gwaii					Area 3 - Lower and Middle Nass					Area 4 - Middle and Upper Skeena				
	Deena CAN ER	Model CAN ER	Best CAN ER	Model AK ER	Best TOT ER	Nisga'a CAN ER	Model CAN ER	Best CAN ER	Nisga'a AK ER	TOT ER	CAN ER	Model CAN ER	Best CAN ER	AK ER	TOT ER
1954-88 -->	(Adj. Babine)		(Adj. Babine)	(Adj. Deena)	CDN+AK			(Adj. Babine)	(Adj. Babine)	CDN+AK			Babine	Babine	CDN+AK
1989-91 -->	(Adj. Babine)		(Adj. Babine)	(Adj. Deena)	CDN+AK	(Avg A3)		(Adj. Babine)	(Adj. Babine)	CDN+AK	(A4)		(A4)	(A4)	CDN+AK
1992-96 -->	(Area 3)		(Area 3)	(Adj. Deena)	CDN+AK	(A3)		(A3)	(A3)	CDN+AK	(A4)		(A4)	(A4)	CDN+AK
1997-10 -->	Deena		Deena	Deena	CDN+AK	(A3)		(A3)	(A3)	CDN+AK	(A4)		(A4)	(A4)	CDN+AK
2011-14 -->	Deena		Deena	Deena	CDN+AK	(A3)		(A3)	(A3)	CDN+AK	(A4)		(A4)	(A4)	CDN+AK
Year															
1954	21.0%		21.0%	3.3%	24.3%			21.0%	30.1%	51.1%			35.9%	19.1%	55.0%
1955	21.0%		21.0%	3.3%	24.3%			21.0%	30.1%	51.1%			35.9%	19.1%	55.0%
1956	21.0%		21.0%	3.3%	24.3%			21.0%	30.1%	51.1%			35.9%	19.1%	55.0%
1957	21.0%		21.0%	3.3%	24.3%			21.0%	30.1%	51.1%			35.9%	19.1%	55.0%
1958	21.0%		21.0%	3.3%	24.3%			21.0%	30.1%	51.1%			35.9%	19.1%	55.0%
1959	21.0%		21.0%	3.3%	24.3%			21.0%	30.1%	51.1%			35.9%	19.1%	55.0%
1960	21.0%		21.0%	3.3%	24.3%			21.0%	30.1%	51.1%			35.9%	19.1%	55.0%
1961	21.0%		21.0%	3.3%	24.3%			21.0%	30.1%	51.1%			35.9%	19.1%	55.0%
1962	21.0%		21.0%	3.3%	24.3%			21.0%	30.1%	51.1%			35.9%	19.1%	55.0%
1963	19.1%		19.1%	3.0%	22.1%			19.1%	27.4%	46.5%			32.7%	17.3%	50.0%
1964	24.0%		24.0%	3.8%	27.8%			24.0%	34.5%	58.6%			41.1%	21.9%	63.0%
1965	18.3%		18.3%	2.9%	21.2%			18.3%	26.3%	44.6%			31.3%	16.7%	48.0%
1966	22.5%		22.5%	3.6%	26.1%			22.5%	32.3%	54.8%			38.5%	20.5%	59.0%
1967	17.9%		17.9%	2.8%	20.8%			17.9%	25.8%	43.7%			30.7%	16.3%	47.0%
1968	22.5%		22.5%	3.6%	26.1%			22.5%	32.3%	54.8%			38.5%	20.5%	59.0%
1969	19.1%		19.1%	3.0%	22.1%			19.1%	27.4%	46.5%			32.7%	17.3%	50.0%
1970	21.7%		21.7%	3.4%	25.2%			21.7%	31.2%	53.0%			37.2%	19.8%	57.0%
1971	21.7%		21.7%	3.4%	25.2%			21.7%	31.2%	53.0%			37.2%	19.8%	57.0%
1972	25.2%		25.2%	4.0%	29.2%			25.2%	36.2%	61.4%			43.1%	22.9%	66.0%
1973	19.5%		19.5%	3.1%	22.5%			19.5%	28.0%	47.4%			33.3%	17.7%	51.0%
1974	21.4%		21.4%	3.4%	24.7%			21.4%	30.7%	52.1%			36.6%	19.4%	56.0%
1975	17.6%		17.6%	2.8%	20.3%			17.6%	25.2%	42.8%			30.0%	16.0%	46.0%
1976	17.6%		17.6%	2.8%	20.3%			17.6%	25.2%	42.8%			30.0%	16.0%	46.0%
1977	22.5%		22.5%	3.6%	26.1%			22.5%	32.3%	54.8%			38.5%	20.5%	59.0%
1978	26.3%		26.3%	4.2%	30.5%			26.3%	37.8%	64.1%			45.1%	23.9%	69.0%
1979	27.1%		27.1%	4.3%	31.4%			27.1%	38.9%	66.0%			46.4%	24.6%	71.0%
1980	28.2%	15.4%	28.2%	4.5%	32.7%	17.7%	25.9%	28.2%	40.6%	68.8%	39.7%	33.5%	48.3%	25.7%	74.0%
1981	25.6%	15.4%	25.6%	4.0%	29.6%	17.7%	25.9%	25.6%	36.7%	62.3%	41.2%	33.5%	43.8%	23.2%	67.0%
1982	22.1%	15.4%	22.1%	3.5%	25.6%	17.7%	25.9%	22.1%	31.8%	53.9%	43.4%	33.5%	37.9%	20.1%	58.0%
1983	30.9%	15.4%	30.9%	4.9%	35.8%	17.7%	25.9%	30.9%	44.4%	75.3%	43.1%	33.5%	52.9%	28.1%	81.0%
1984	27.5%	15.4%	27.5%	4.3%	31.8%	17.7%	25.9%	27.5%	39.5%	66.9%	41.1%	33.5%	47.0%	25.0%	72.0%
1985	28.6%	15.4%	28.6%	4.5%	33.1%	17.7%	25.9%	28.6%	41.1%	69.7%	41.1%	33.5%	49.0%	26.0%	75.0%
1986	31.7%	15.4%	31.7%	5.0%	36.7%	17.7%	25.9%	31.7%	45.5%	77.2%	40.7%	33.5%	54.2%	28.8%	83.0%
1987	24.4%	15.4%	24.4%	3.9%	28.3%	17.7%	25.9%	24.4%	35.1%	59.5%	39.7%	33.5%	41.8%	22.2%	64.0%
1988	24.0%	15.4%	24.0%	3.8%	27.8%	17.7%	25.9%	24.0%	34.5%	58.6%	39.5%	33.5%	41.1%	21.9%	63.0%
1989	23.5%	15.4%	23.5%	3.7%	27.2%	17.7%	25.9%	23.5%	33.7%	57.2%	40.2%	33.5%	40.2%	21.3%	61.5%
1990	26.6%	15.4%	26.6%	4.2%	30.8%	17.7%	25.9%	26.6%	38.2%	64.8%	45.5%	33.5%	45.5%	24.2%	69.7%
1991	19.2%	15.4%	19.2%	3.0%	22.2%	17.7%	25.9%	19.2%	46.7%	65.9%	32.9%	33.5%	32.9%	29.6%	62.4%
1992	16.7%	15.4%	16.7%	2.6%	19.4%	16.7%	25.9%	16.7%	47.5%	64.2%	28.8%	33.5%	28.8%	36.4%	65.3%
1993	16.1%	15.4%	16.1%	2.5%	18.6%	16.1%	25.9%	16.1%	47.5%	63.6%	28.7%	33.5%	28.7%	28.0%	56.7%
1994	19.0%	15.4%	19.0%	3.0%	22.0%	19.0%	25.9%	19.0%	53.7%	72.7%	29.8%	33.5%	29.8%	35.7%	65.5%
1995	13.9%	15.4%	13.9%	2.2%	16.1%	13.9%	25.9%	13.9%	54.8%	68.7%	19.6%	33.5%	19.6%	18.7%	38.3%
1996	22.6%	15.4%	22.6%	3.6%	26.1%	22.6%	25.9%	22.6%	39.2%	61.8%	47.1%	33.5%	47.1%	26.7%	73.8%
1997	18.9%	12.7%	18.9%	3.3%	22.3%	9.4%	12.4%	9.4%	45.4%	54.8%	13.2%	24.1%	13.2%	36.8%	50.0%
1998	0.0%	2.3%	0.0%	4.3%	4.3%	1.7%	3.2%	1.7%	46.0%	47.7%	1.8%	6.4%	1.8%	17.7%	19.5%
1999	0.0%	1.0%	0.0%	2.1%	2.1%	1.9%	4.8%	1.9%	48.3%	50.2%	2.5%	6.0%	2.5%	19.5%	22.0%
2000	0.0%	0.7%	0.0%	0.0%	0.0%	12.1%	3.5%	12.1%	40.9%	53.0%	5.3%	6.9%	5.3%	12.3%	17.6%
2001	0.0%	1.3%	0.0%	0.1%	0.1%	11.5%	4.8%	11.5%	42.0%	53.5%	4.5%	12.8%	4.5%	23.5%	28.0%
2002	0.0%	2.9%	0.0%	0.0%	0.0%	5.8%	6.7%	5.8%	16.6%	22.4%	9.5%	13.7%	9.5%	13.8%	23.3%
2003	5.0%	3.4%	5.0%	0.1%	5.1%	11.9%	7.1%	11.9%	34.0%	45.9%	8.7%	9.7%	8.7%	18.1%	26.7%
2004	54.7%	4.0%	54.7%	1.2%	55.9%	14.4%	9.5%	14.4%	41.0%	55.4%	18.1%	10.9%	18.1%	21.8%	39.9%
2005	44.4%	2.9%	44.4%	18.3%	62.7%	13.6%	8.1%	13.6%	43.7%	57.3%	6.0%	9.8%	6.0%	21.3%	27.3%
2006	17.0%	4.0%	17.0%	3.6%	20.6%	12.0%	8.0%	12.0%	34.6%	46.6%	5.9%	11.8%	5.9%	16.9%	22.8%
2007	16.2%	4.0%	16.2%	2.4%	18.6%	11.7%	9.6%	11.7%	37.9%	49.6%	14.8%	12.1%	14.8%	27.6%	42.4%
2008	16.2%	4.8%	16.2%	2.4%	18.6%	8.3%	6.7%	8.3%	30.0%	38.3%	6.4%	10.4%	6.4%	27.5%	33.9%
2009	15.5%	5.5%	15.5%	1.1%	16.6%	7.6%	8.4%	7.6%	21.8%	29.5%	4.7%	11.4%	4.7%	32.6%	37.3%
2010	27.1%	6.3%	27.1%	0.1%	27.2%	10.4%	7.9%	10.4%	31.7%	42.1%	6.8%	11.3%	6.8%	23.6%	30.4%
2011	10.3%		10.3%	0.3%	10.6%	13.4%		13.4%	40.8%	54.2%	17.4%		17.4%	25.5%	42.9%
2012	13.9%		13.9%	0.4%	14.3%	16.3%		16.3%	38.7%	55.0%	7.5%		7.5%	26.7%	34.2%
2013	17.5%		17.5%	0.5%	18.0%	13.9%		13.9%	51.4%	65.3%	10.1%		10.1%	26.6%	36.7%
2014	15.0%		15.0%	2.6%	17.6%	8.1%		8.1%	34.3%	42.3%	4.5%		4.5%	17.8%	22.3%
Average (1992-97) -->			17.9%	2.9%	20.8%			16.3%	48.0%				27.9%	30.4%	
Average (1997-14) -->			15.1%	2.4%	17.5%			10.2%	37.7%				8.2%	22.8%	

Appendix Table C5. Summary of available exploitation rates for Area 6-8 Coho.

	Area 6 - Douglas Channel-Kitimat Arm					Area 6-8 - Northern Coastal Streams					Area 8 - Bella Coola & Dean Rivers				
	CAN ER	Model CAN ER	Best CAN ER	AK ER	TOT ER	CAN ER	Model CAN ER	Best CAN ER	AK ER	TOT ER	CAN ER	Model CAN ER	Best CAN ER	AK ER	TOT ER
1954-88 -->	Babine		(Adj Babine)	Babine	CDN+AK	Babine		(Adj Babine)	Babine*60%	CDN+AK	Babine		(Adj Babine)	Babine*60%	CDN+AK
1989-91 -->	(A4)		(Adj A4)	(A4)	CDN+AK	(A4)		(Adj A4)	A4*60%	CDN+AK	(A4)		(Adj A4)	A4*60%	CDN+AK
1992-96 -->	(A4)		(Adj A4)	(A4)	CDN+AK	(A4)		(Adj A4)	A4*60%	CDN+AK	(A4)		(Adj A4)	A4*60%	CDN+AK
1997-10 -->	(A4)		Model	(A4)	CDN+AK	(A4)		Model	A4*60%	CDN+AK	(A4)		Model	A4*60%	CDN+AK
2011-14 -->	(A4)		(A4)	(A4)	CDN+AK	(A4)		(A4)	A4*60%	CDN+AK	(A4)		(A4)	A4*60%	CDN+AK
Year															
1954	35.9%		22.7%	19.1%	41.8%	35.9%		21.9%	11.4%	33.3%	35.9%		22.6%	11.4%	34.0%
1955	35.9%		22.7%	19.1%	41.8%	35.9%		21.9%	11.4%	33.3%	35.9%		22.6%	11.4%	34.0%
1956	35.9%		22.7%	19.1%	41.8%	35.9%		21.9%	11.4%	33.3%	35.9%		22.6%	11.4%	34.0%
1957	35.9%		22.7%	19.1%	41.8%	35.9%		21.9%	11.4%	33.3%	35.9%		22.6%	11.4%	34.0%
1958	35.9%		22.7%	19.1%	41.8%	35.9%		21.9%	11.4%	33.3%	35.9%		22.6%	11.4%	34.0%
1959	35.9%		22.7%	19.1%	41.8%	35.9%		21.9%	11.4%	33.3%	35.9%		22.6%	11.4%	34.0%
1960	35.9%		22.7%	19.1%	41.8%	35.9%		21.9%	11.4%	33.3%	35.9%		22.6%	11.4%	34.0%
1961	35.9%		22.7%	19.1%	41.8%	35.9%		21.9%	11.4%	33.3%	35.9%		22.6%	11.4%	34.0%
1962	35.9%		22.7%	19.1%	41.8%	35.9%		21.9%	11.4%	33.3%	35.9%		22.6%	11.4%	34.0%
1963	32.7%		20.7%	17.3%	38.0%	32.7%		19.9%	10.4%	30.3%	32.7%		20.5%	10.4%	30.9%
1964	41.1%		26.0%	21.9%	47.9%	41.1%		25.1%	13.1%	38.2%	41.1%		25.9%	13.1%	39.0%
1965	31.3%		19.8%	16.7%	36.5%	31.3%		19.1%	10.0%	29.1%	31.3%		19.7%	10.0%	29.7%
1966	38.5%		24.4%	20.5%	44.9%	38.5%		23.5%	12.3%	35.8%	38.5%		24.2%	12.3%	36.5%
1967	30.7%		19.4%	16.3%	35.7%	30.7%		18.7%	9.8%	28.5%	30.7%		19.3%	9.8%	29.1%
1968	38.5%		24.4%	20.5%	44.9%	38.5%		23.5%	12.3%	35.8%	38.5%		24.2%	12.3%	36.5%
1969	32.7%		20.7%	17.3%	38.0%	32.7%		19.9%	10.4%	30.3%	32.7%		20.5%	10.4%	30.9%
1970	37.2%		23.6%	19.8%	43.3%	37.2%		22.7%	11.9%	34.5%	37.2%		23.4%	11.9%	35.3%
1971	37.2%		23.6%	19.8%	43.3%	37.2%		22.7%	11.9%	34.5%	37.2%		23.4%	11.9%	35.3%
1972	43.1%		27.3%	22.9%	50.2%	43.1%		26.3%	13.7%	40.0%	43.1%		27.1%	13.7%	40.9%
1973	33.3%		21.1%	17.7%	38.8%	33.3%		20.3%	10.6%	30.9%	33.3%		21.0%	10.6%	31.6%
1974	36.6%		23.2%	19.4%	42.6%	36.6%		22.3%	11.7%	33.9%	36.6%		23.0%	11.7%	34.7%
1975	30.0%		19.0%	16.0%	35.0%	30.0%		18.3%	9.6%	27.9%	30.0%		18.9%	9.6%	28.5%
1976	30.0%		19.0%	16.0%	35.0%	30.0%		18.3%	9.6%	27.9%	30.0%		18.9%	9.6%	28.5%
1977	38.5%		24.4%	20.5%	44.9%	38.5%		23.5%	12.3%	35.8%	38.5%		24.2%	12.3%	36.5%
1978	45.1%		28.5%	23.9%	52.5%	45.1%		27.5%	14.4%	41.8%	45.1%		28.3%	14.4%	42.7%
1979	46.4%		29.4%	24.6%	54.0%	46.4%		28.3%	14.8%	43.0%	46.4%		29.2%	14.8%	43.9%
1980	48.3%	25.6%	30.6%	25.7%	56.3%	48.3%	24.7%	29.5%	15.4%	44.9%	48.3%	25.5%	30.4%	15.4%	45.8%
1981	43.8%	25.6%	27.7%	23.2%	50.9%	43.8%	24.7%	26.7%	13.9%	40.6%	43.8%	25.5%	27.5%	13.9%	41.5%
1982	37.9%	25.6%	24.0%	20.1%	44.1%	37.9%	24.7%	23.1%	12.1%	35.2%	37.9%	25.5%	23.8%	12.1%	35.9%
1983	52.9%	25.6%	33.5%	28.1%	61.6%	52.9%	24.7%	32.2%	16.9%	49.1%	52.9%	25.5%	33.3%	16.9%	50.1%
1984	47.0%	25.6%	29.8%	25.0%	54.7%	47.0%	24.7%	28.7%	15.0%	43.6%	47.0%	25.5%	29.6%	15.0%	44.6%
1985	49.0%	25.6%	31.0%	26.0%	57.0%	49.0%	24.7%	29.8%	15.6%	45.5%	49.0%	25.5%	30.8%	15.6%	46.4%
1986	54.2%	25.6%	34.3%	28.8%	63.1%	54.2%	24.7%	33.0%	17.3%	50.3%	54.2%	25.5%	34.1%	17.3%	51.4%
1987	41.8%	25.6%	26.5%	22.2%	48.7%	41.8%	24.7%	25.5%	13.3%	38.8%	41.8%	25.5%	26.3%	13.3%	39.6%
1988	41.1%	25.6%	26.0%	21.9%	47.9%	41.1%	24.7%	25.1%	13.1%	38.2%	41.1%	25.5%	25.9%	13.1%	39.0%
1989	40.2%	25.6%	25.4%	21.3%	46.8%	40.2%	24.7%	24.5%	12.8%	37.3%	40.2%	25.5%	25.3%	12.8%	38.1%
1990	45.5%	25.6%	28.8%	24.2%	53.0%	45.5%	24.7%	27.8%	14.5%	42.3%	45.5%	25.5%	28.6%	14.5%	43.2%
1991	32.9%	25.6%	20.8%	29.6%	50.4%	32.9%	24.7%	20.0%	17.7%	37.8%	32.9%	25.5%	20.7%	17.7%	38.4%
1992	28.8%	25.6%	18.2%	36.4%	54.7%	28.8%	24.7%	17.6%	21.9%	39.4%	28.8%	25.5%	18.1%	21.9%	40.0%
1993	28.7%	25.6%	18.1%	28.0%	46.2%	28.7%	24.7%	17.5%	16.8%	34.3%	28.7%	25.5%	18.0%	16.8%	34.8%
1994	29.8%	25.6%	18.9%	35.7%	54.6%	29.8%	24.7%	18.2%	21.4%	39.6%	29.8%	25.5%	18.8%	21.4%	40.2%
1995	19.6%	25.6%	12.4%	18.7%	31.1%	19.6%	24.7%	11.9%	11.2%	23.1%	19.6%	25.5%	12.3%	11.2%	23.5%
1996	47.1%	25.6%	29.8%	26.7%	56.5%	47.1%	24.7%	28.7%	16.0%	44.7%	47.1%	25.5%	29.6%	16.0%	45.6%
1997	13.2%	18.3%	18.3%	36.8%	55.2%	13.2%	22.5%	22.5%	22.1%	44.6%	13.2%	23.3%	23.3%	22.1%	45.4%
1998	1.8%	3.4%	3.4%	17.7%	21.1%	1.8%	4.6%	4.6%	10.6%	15.2%	1.8%	5.3%	5.3%	10.6%	15.9%
1999	2.5%	2.7%	2.7%	19.5%	22.2%	2.5%	3.6%	3.6%	11.7%	15.3%	2.5%	4.3%	4.3%	11.7%	16.0%
2000	5.3%	2.0%	2.0%	12.3%	14.3%	5.3%	3.2%	3.2%	7.4%	10.5%	5.3%	3.9%	3.9%	7.4%	11.3%
2001	4.5%	3.8%	3.8%	23.5%	27.3%	4.5%	5.2%	5.2%	14.1%	19.4%	4.5%	6.2%	6.2%	14.1%	20.3%
2002	9.5%	5.2%	5.2%	13.8%	19.0%	9.5%	5.6%	5.6%	8.3%	13.9%	9.5%	6.5%	6.5%	8.3%	14.8%
2003	8.7%	6.2%	6.2%	18.1%	24.2%	8.7%	7.4%	7.4%	10.8%	18.3%	8.7%	8.4%	8.4%	10.8%	19.2%
2004	18.1%	7.5%	7.5%	21.8%	29.3%	18.1%	12.4%	12.4%	13.1%	25.5%	18.1%	13.3%	13.3%	13.1%	26.4%
2005	6.0%	11.6%	11.6%	21.3%	32.9%	6.0%	7.9%	7.9%	12.8%	20.7%	6.0%	8.9%	8.9%	12.8%	21.6%
2006	5.9%	7.1%	7.1%	16.9%	24.0%	5.9%	6.8%	6.8%	10.1%	16.9%	5.9%	7.7%	7.7%	10.1%	17.8%
2007	14.8%	10.0%	10.0%	27.6%	37.6%	14.8%	6.0%	6.0%	16.6%	22.6%	14.8%	6.9%	6.9%	16.6%	23.5%
2008	6.4%	7.4%	7.4%	27.5%	34.9%	6.4%	5.7%	5.7%	16.5%	22.2%	6.4%	6.6%	6.6%	16.5%	23.1%
2009	4.7%	14.5%	14.5%	32.6%	47.1%	4.7%	7.0%	7.0%	19.5%	26.5%	4.7%	7.9%	7.9%	19.5%	27.4%
2010	6.8%	8.7%	8.7%	23.6%	32.3%	6.8%	8.1%	8.1%	14.1%	22.2%	6.8%	9.0%	9.0%	14.1%	23.1%
2011	17.4%		17.4%	25.5%	42.9%	17.4%		10.5%	15.3%	25.8%	17.4%		10.5%	15.3%	25.8%
2012	7.5%		7.5%	26.7%	34.2%	7.5%		4.5%	16.0%	20.5%	7.5%		4.5%	16.0%	20.5%
2013	10.1%		10.1%	26.6%	36.7%	10.1%		6.1%	16.0%	22.0%	10.1%		6.1%	16.0%	22.0%
2014	4.5%		4.5%	17.8%	22.3%	4.5%		2.7%	10.7%	13.4%	4.5%		2.7%	10.7%	13.4%
Avg (1980-96)	40.5%	25.6%	25.6%			40.5%	24.7%	24.7%			40.5%	25.5%	25.5%		

Appendix Table C6. Summary of available exploitation rates for Area 4-9 and 9-10 Coho.

	Area 4-9 - Hecate Strait Mainland					Area 9-10 - Rivers Inlet & Smith Inlet				
	CAN ER	Model CAN ER	Best CAN ER	AK ER	TOT ER	CAN ER	Model CAN ER	Best CAN ER	AK ER	TOT ER
1954-88 -->	Babine		(Adj Babine)	Babine*40%	CDN+AK	Babine		(Adj Babine)	Babine*20%	CDN+AK
1989-91 -->	(A4)		(Adj A4)	A4*40%	CDN+AK	(A4)		(Adj A4)	A4*20%	CDN+AK
1992-96 -->	(A4)		(Adj A4)	A4*40%	CDN+AK	(A4)		(Adj A4)	A4*20%	CDN+AK
1997-10 -->	(A4)		Model	A4*40%	CDN+AK	(A4)		Model	A4*20%	CDN+AK
2011-14 -->	(A4)		A4*40%	A4*40%	CDN+AK	(A4)		A4*40%	A4*20%	CDN+AK
Year										
1954	35.9%		22.6%	7.6%	30.2%	35.9%		22.2%	3.8%	26.0%
1955	35.9%		22.6%	7.6%	30.2%	35.9%		22.2%	3.8%	26.0%
1956	35.9%		22.6%	7.6%	30.2%	35.9%		22.2%	3.8%	26.0%
1957	35.9%		22.6%	7.6%	30.2%	35.9%		22.2%	3.8%	26.0%
1958	35.9%		22.6%	7.6%	30.2%	35.9%		22.2%	3.8%	26.0%
1959	35.9%		22.6%	7.6%	30.2%	35.9%		22.2%	3.8%	26.0%
1960	35.9%		22.6%	7.6%	30.2%	35.9%		22.2%	3.8%	26.0%
1961	35.9%		22.6%	7.6%	30.2%	35.9%		22.2%	3.8%	26.0%
1962	35.9%		22.6%	7.6%	30.2%	35.9%		22.2%	3.8%	26.0%
1963	32.7%		20.5%	6.9%	27.5%	32.7%		20.1%	3.5%	23.6%
1964	41.1%		25.9%	8.7%	34.6%	41.1%		25.4%	4.4%	29.7%
1965	31.3%		19.7%	6.7%	26.4%	31.3%		19.3%	3.3%	22.7%
1966	38.5%		24.2%	8.2%	32.4%	38.5%		23.8%	4.1%	27.9%
1967	30.7%		19.3%	6.5%	25.8%	30.7%		18.9%	3.3%	22.2%
1968	38.5%		24.2%	8.2%	32.4%	38.5%		23.8%	4.1%	27.9%
1969	32.7%		20.5%	6.9%	27.5%	32.7%		20.1%	3.5%	23.6%
1970	37.2%		23.4%	7.9%	31.3%	37.2%		23.0%	4.0%	26.9%
1971	37.2%		23.4%	7.9%	31.3%	37.2%		23.0%	4.0%	26.9%
1972	43.1%		27.1%	9.2%	36.3%	43.1%		26.6%	4.6%	31.2%
1973	33.3%		21.0%	7.1%	28.0%	33.3%		20.5%	3.5%	24.1%
1974	36.6%		23.0%	7.8%	30.8%	36.6%		22.6%	3.9%	26.4%
1975	30.0%		18.9%	6.4%	25.3%	30.0%		18.5%	3.2%	21.7%
1976	30.0%		18.9%	6.4%	25.3%	30.0%		18.5%	3.2%	21.7%
1977	38.5%		24.2%	8.2%	32.4%	38.5%		23.8%	4.1%	27.9%
1978	45.1%		28.3%	9.6%	37.9%	45.1%		27.8%	4.8%	32.6%
1979	46.4%		29.2%	9.9%	39.0%	46.4%		28.6%	4.9%	33.5%
1980	48.3%	25.5%	30.4%	10.3%	40.7%	48.3%	25.0%	29.8%	5.1%	34.9%
1981	43.8%	25.5%	27.5%	9.3%	36.8%	43.8%	25.0%	27.0%	4.6%	31.6%
1982	37.9%	25.5%	23.8%	8.0%	31.9%	37.9%	25.0%	23.4%	4.0%	27.4%
1983	52.9%	25.5%	33.3%	11.2%	44.5%	52.9%	25.0%	32.6%	5.6%	38.2%
1984	47.0%	25.5%	29.6%	10.0%	39.6%	47.0%	25.0%	29.0%	5.0%	34.0%
1985	49.0%	25.5%	30.8%	10.4%	41.2%	49.0%	25.0%	30.2%	5.2%	35.4%
1986	54.2%	25.5%	34.1%	11.5%	45.6%	54.2%	25.0%	33.4%	5.8%	39.2%
1987	41.8%	25.5%	26.3%	8.9%	35.2%	41.8%	25.0%	25.8%	4.4%	30.2%
1988	41.1%	25.5%	25.9%	8.7%	34.6%	41.1%	25.0%	25.4%	4.4%	29.7%
1989	40.2%	25.5%	25.3%	8.5%	33.8%	40.2%	25.0%	24.8%	4.3%	29.0%
1990	45.5%	25.5%	28.6%	9.7%	38.3%	45.5%	25.0%	28.1%	4.8%	32.9%
1991	32.9%	25.5%	20.7%	11.8%	32.5%	32.9%	25.0%	20.3%	5.9%	26.2%
1992	28.8%	25.5%	18.1%	14.6%	32.7%	28.8%	25.0%	17.8%	7.3%	25.1%
1993	28.7%	25.5%	18.0%	11.2%	29.2%	28.7%	25.0%	17.7%	5.6%	23.3%
1994	29.8%	25.5%	18.8%	14.3%	33.0%	29.8%	25.0%	18.4%	7.1%	25.5%
1995	19.6%	25.5%	12.3%	7.5%	19.8%	19.6%	25.0%	12.1%	3.7%	15.8%
1996	47.1%	25.5%	29.6%	10.7%	40.3%	47.1%	25.0%	29.0%	5.3%	34.4%
1997	13.2%	23.3%	23.3%	14.7%	38.0%	13.2%	22.8%	22.8%	7.4%	30.1%
1998	1.8%	5.3%	5.3%	7.1%	12.4%	1.8%	5.2%	5.2%	3.5%	8.7%
1999	2.5%	4.3%	4.3%	7.8%	12.1%	2.5%	4.1%	4.1%	3.9%	8.0%
2000	5.3%	3.9%	3.9%	4.9%	8.8%	5.3%	3.7%	3.7%	2.5%	6.1%
2001	4.5%	6.2%	6.2%	9.4%	15.6%	4.5%	5.7%	5.7%	4.7%	10.4%
2002	9.5%	6.5%	6.5%	5.5%	12.1%	9.5%	6.0%	6.0%	2.8%	8.8%
2003	8.7%	8.4%	8.4%	7.2%	15.6%	8.7%	7.9%	7.9%	3.6%	11.5%
2004	18.1%	13.3%	13.3%	8.7%	22.0%	18.1%	12.8%	12.8%	4.4%	17.2%
2005	6.0%	8.9%	8.9%	8.5%	17.4%	6.0%	8.4%	8.4%	4.3%	12.6%
2006	5.9%	7.7%	7.7%	6.7%	14.5%	5.9%	7.2%	7.2%	3.4%	10.6%
2007	14.8%	6.9%	6.9%	11.0%	18.0%	14.8%	6.4%	6.4%	5.5%	12.0%
2008	6.4%	6.6%	6.6%	11.0%	17.6%	6.4%	6.1%	6.1%	5.5%	11.6%
2009	4.7%	7.9%	7.9%	13.0%	20.9%	4.7%	7.4%	7.4%	6.5%	13.9%
2010	6.8%	9.0%	9.0%	9.4%	18.4%	6.8%	8.5%	8.5%	4.7%	13.2%
2011	17.4%		7.0%	10.2%	17.2%	17.4%		7.0%	5.1%	12.1%
2012	7.5%		3.0%	10.7%	13.7%	7.5%		3.0%	5.3%	8.3%
2013	10.1%		4.0%	10.6%	14.7%	10.1%		4.0%	5.3%	9.4%
2014	4.5%		1.8%	7.1%	8.9%	4.5%		1.8%	3.6%	5.4%
Avg (1980-96)	40.5%	25.5%	25.5%			40.5%	25.0%	25.0%		

APPENDIX D

Annual escapement and run size estimates for North and Central coast Chinook salmon

Appendix Table D1. Annual estimates of escapement catch and total stock size estimates for adult Chinook salmon returning to the Nass River, 1986-2014.

	Upper & Middle Nass River								Lower Nass R. & Coastal Nass Area				Total Nass Area													
		In-river Catch							In-river Catch					In-river Catch				Marine Catch[h]			Release Mortality					
Year	Net Esc.[a]	Git.[b]	Sport[c]	Nisga'a[d]	Total	Run size to GW[e]	Coastal Esc. Obs.	Factor	Net Esc.[f]	Sport[c]	Nisga'a[d]	Total	Net Esc.[g]	Git.[b]	Sport[c]	Nisga'a[d]	Total	Comm.	Sport	Total	Comm	Sport	Nisga'a	Total Return to Canada[i]	Alaskan catch[j]	Total Run[k]
1986	36,523	*166*	*331*	*939*	*1,436*	*37,959*			2,138	*0*	*3,038*	*3,038*	38,661	*166*	*331*	*3,977*	*4,474*	*3,259*	*1,933*	*5,192*				48,327	700	49,027
1987	19,540	*92*	*184*	*521*	*797*	*20,337*			1,930	*0*	*1,687*	*1,687*	21,470	*92*	*184*	*2,208*	*2,484*	*1,810*	*1,074*	*2,884*				26,838	700	27,538
1988	15,345	*72*	*144*	*409*	*625*	*15,970*			1,503	*0*	*1,324*	*1,324*	16,848	*72*	*144*	*1,733*	*1,949*	*1,420*	*842*	*2,262*				21,059	700	21,759
1989	28,133	*125*	*250*	*709*	*1,084*	*29,217*			1,068	*0*	*2,295*	*2,295*	29,201	*125*	*250*	*3,004*	*3,379*	*2,461*	*1,460*	*3,921*				36,501	700	37,201
1990	24,051	*114*	*227*	*644*	*985*	*25,036*			2,460	*0*	*2,083*	*2,083*	26,511	*114*	*227*	*2,727*	*3,068*	*2,235*	*1,326*	*3,561*				33,140	700	33,840
1991	6,907	*73*	*146*	*415*	*634*	*7,541*			1,019	*0*	*1,341*	*1,341*	7,926	*73*	*146*	*1,756*	*1,975*	*1,439*	*854*	*2,293*				12,194	700	12,894
1992	16,808	612	1,339	1,308	3,259	20,067	605	*1.50*	908	0	5,751	5,751	17,716	612	1,339	7,059	9,010	5,465	3,207	8,672				35,397	700	36,097
1993	24,814	600	983	1,526	3,109	27,923	693	*1.50*	1,039	0	4,060	4,060	25,853	600	983	5,586	7,169	7,809	4,583	12,393				45,414	700	46,114
1994	21,169	120	893	2,098	3,111	24,280	2,468	*1.50*	3,703	0	4,115	4,115	24,872	120	893	6,213	7,226	6,731	3,951	10,682				42,780	700	43,480
1995	7,844	72	695	1,812	2,579	10,423	649	*1.50*	973	0	4,904	4,904	8,817	72	695	6,716	7,483	3,409	2,001	5,409				21,709	700	22,409
1996	21,842	49	477	1,834	2,360	24,202	738	*1.50*	1,108	0	5,866	5,866	22,950	49	477	7,700	8,226	6,538	3,837	10,376				41,551	700	42,251
1997	18,702	41	203	1,877	2,121	20,823	1,090	*1.50*	1,635	0	4,828	4,828	20,337	41	203	6,705	6,949	5,664	3,324	8,989				36,275	700	36,975
1998	23,213	345	196	1,595	2,136	25,349	975	*1.50*	1,462	0	7,470	7,470	24,675	345	196	9,065	9,606	7,191	4,221	11,412				45,693	700	46,393
1999	11,544	193	82	1,608	1,883	13,427	655	*1.50*	982	0	7,309	7,309	12,526	193	82	8,917	9,192	4,562	2,677	7,239				28,957	700	29,657
2000	18,047	49	1,023	2,498	3,570	21,617	868	*1.50*	1,302	214	6,828	7,042	19,348	49	1,237	9,326	10,612	1,826	986	2,812				32,773	700	33,473
2001	28,329	195	722	5,457	6,374	34,703	1,551	*2.59*	4,011	328	6,307	6,635	32,340	195	1,050	11,764	13,009	928	1,705	2,633				47,982	700	48,682
2002	13,352	151	703	1,875	2,729	16,081	731	*1.99*	1,452	167	3,556	3,723	14,804	151	870	5,431	6,452	5,980	1,116	7,096				28,352	700	29,052
2003	25,848	181	1,030	2,403	3,614	29,462	1,415	*1.71*	2,425	160	4,306	4,466	28,274	181	1,190	6,709	8,080	6,076	1,167	7,243				43,597	700	44,297
2004	15,185	230	643	1,926	2,799	17,984	831	*2.03*	1,691	287	3,950	4,237	16,875	230	930	5,876	7,036	6,689	1,925	8,614	1080	84	108	33,797	598	34,395
2005	13,706	179	617	2,262	3,058	16,764	750	*2.49*	1,865	156	4,283	4,439	15,571	179	773	6,545	7,497	3,115	1,542	4,657	498	0	56	28,279	251	28,530
2006	23,594	456	1,043	3,525	5,024	28,618	1,292	*3.46*	4,467	268	4,181	4,449	28,061	456	1,311	7,706	9,473	4,513	983	5,496	437	0	103	43,570	1750	45,320
2007	22,136	24	993	4,020	5,037	27,173	1,212	*2.33*	2,828	525	2,704	3,229	24,964	24	1,518	6,724	8,266	4,031	1,810	5,841	781	0	90	39,942	274	40,216
2008	19,630	174	798	1,085	2,057	21,687	1,075	*2.33*	2,508	519	3,365	3,884	22,138	174	1,317	4,450	5,941	385	1,620	2,005	92	0	26	30,202	190	30,392
2009	26,226	148	1,103	2,785	4,036	30,262	1,436	*2.33*	3,350	193	2,650	2,843	29,576	148	1,296	5,435	6,879	1,123	1,316	2,439	304	0	84	39,282	1111	40,393
2010	18,381	88	534	1,703	2,325	20,706	1,006	*2.33*	2,348	13	2,878	2,891	20,729	88	547	4,581	5,216	822	399	1,221	173	46	62	27,447	696	28,143
2011	9,600	103	542	1,232	1,877	11,477	526	*2.33*	1,226	27	3,352	3,379	10,826	103	569	4,584	5,256	1,204	898	2,102	254	73	21	18,532	482	19,014
2012	8,688	105	532	1,460	2,097	10,785	476	*2.33*	1,110	18	2,087	2,105	9,797	105	550	3,547	4,202	794	494	1,288	503	15	66	15,871	413	16,284
2013	8,011	52	466	1,711	2,229	10,240	439	*2.33*	1,023	6	2,641	2,647	9,034	52	472	4,352	4,876	1,084	518	1,602	898	42	107	16,559	431	16,990
2014	11,627	72	714	1,941	2,727	14,354	637	*2.33*	1,485	1	3,973	3,974	13,112	72	715	5,914	6,701	1,645	734	2,379	415	79	116	22,802	593	23,396
Mean:																										
92-99	18,200	300	600	1,700	2,600	20,800			1,500	0	5,500	5,500	19,700	300	600	7,200	8,100	5,900	3,500	9,400				37,200	700	37,900
00+	17,500	100	800	2,400	3,300	20,800			2,200	200	3,800	4,000	19,700	100	1,000	6,200	7,300	2,700	1,100	3,800	500	0	100	31,300	600	31,900
94+	17,500	100	700	2,200	3,000	20,500			2,000	100	4,400	4,500	19,500	100	800	6,600	7,500	3,500	1,800	5,300	500	0	100	32,700	700	33,300
Min	7,844	24	82	1,085	1,877	10,240			908	0	2,087	2,105	8,817	24	82	3,547	4,202	385	399	1,221	92	0	21	15,871	190	16,284
Max	28,329	612	1,339	5,457	6,374	34,703			4,467	525	7,470	7,470	32,340	612	1,518	11,764	13,009	7,809	4,583	12,393	1,080	84	116	47,982	1,750	48,682

[a] Net escapement estimates are from radio telemetry (1992-1993; Koski et al. 1996ab) and mark recapture (1994-current) fishwheel programs (see annual reports cited in text) conducted by Nisga'a Fisheries.

[b] Chinook salmon catches in the Gitanyow fishery are from radio telemetry estimates for 1992-1993, and for other years from DFO (Jim Steward, Prince Rupert, BC, pers. comm.) and GFA (Greg Rush, Kitwanga, BC).

[c] In-river sport catch estimates of Nass Chinook salmon from 1992-2004 are from Baxter (2005), and 2005-10 are from Nisga'a Fisheries (2006-2011).

[d] Nisga'a catch estimates of Nass River Chinook salmon from 1992 to 2005 are from Stephens and Humble (2006), and 2006-10 are from Nisga'a Fisheries (2007-2011).

[e] Run size estimates of Nass River Chinook salmon to Gitwinksihlkw are derived by summing the Upper and Middle net escapement and in-river catch.

[f] Net escapement estimates of Chinook salmon for the Lower Nass and Coastal areas are calculated in two steps. The first step sums observed escapements from DFO aerial surveys of Ishkeenickh, Iknouk, Kincolith, Kwinamass, and Kitsault systems; and correcting for missing data based on proportions among systems for 1977-current year. The second step expands the summed escapement in step 1 to account for true escapement; 150% for 1992-2000; 2001-2006 by observed proportion of mark-recapture (Kwinamass) and/or weir (Kincolith) estimates to visual surveys conducted on Kwinamass and Kincolith rivers; and 233% for 2007-current year as the mean mark-recapture expansion estimate from Kwinamass (2002-2006), respectively.

[g] The total net escapement estimate of adult Nass Chinook salmon to the Nass River are derived by summing the Upper and Middle net escapement to the Lower and Coastal net escapement estimate.

[h] Estimates are provided by the Nisga'a-Canada-BC Joint technical committee.

[i] Total Return to Canada estimates for Nass River Chinook salmon are derived by summing the total estimates of net escapement, in-river catch and marine catch.

[j] Alaskan catch data were updated by DFO (Ivan Winther, Prince Rupert, BC) in May 2011 for 1992-2010 based on results from genetic analyses. For 2011-current year, 2.7% ER (from 2010) is being used to calculate Alaskan catch until genetic data are available.

[k] Total run size estimates for Nass River Chinook salmon are derived by summing the Total Return to Canada and Alaskan catch.

Appendix Table D2. Annual escapement estimates for Chinook indicator streams and total stock size estimates for Skeena River Chinook, 1984-2014.

Year	Babine River	Bear River	Kispiox River	Morice River	Kitsumkalum River	Johnston Creek	Index Streams Totals		Stat. Area 4		First Nation Harvest [2]	Commercial Catch [3]	Sport Catch [3]	Return to Canada	Alaska Catch	Total Run
							Obs.	Adj.	Obs.	Est.[1]						
	fence count															
1984	1,400	12,000	1,100	4,500	11,825	100	30,925	30,925	38,707	46,935	9,585	20,604	0	77,124	26,330	103,454
1985	658	21,500	2,300	11,300	8,308	600	44,666	44,666	55,906	67,789	12,390	28,543	0	108,722	42,814	151,537
1986	252	17,000	4,000	15,000	10,151	600	47,003	47,003	58,831	71,336	21,344	23,949	0	116,629	11,210	127,839
1987	711	7,200	4,000	10,000	24,508	200	46,619	46,619	58,351	70,753	11,770	19,296	429	102,249	18,010	120,259
1988	1,057	14,000	5,000	12,000	22,755	800	55,612	55,612	69,607	84,402	17,035	58,519	1,125	161,081	69,772	230,854
1989	1,983	12,500	3,500	10,200	19,900	250	48,333	48,333	60,496	73,355	14,814	20,781	2,171	111,121	28,846	139,967
1990	1,604	10,000	4,500	12,000	20,000	300	48,404	48,404	58,811	70,828	23,752	16,761	901	112,242	17,121	129,363
1991	1,043	5,500	3,500	25,500	9,200	150	44,893	44,893	54,545	65,691	15,375	45,396	6,943	133,404	43,260	176,664
1992	1,685	10,500	14,000	16,000	14,000		56,185	56,349	68,464	82,454	15,526	23,964	5,077	127,021	23,964	150,985
1993	1,290	23,000	3,400	18,000	15,000	50	60,740	60,740	73,799	88,879	13,062	50,582	5,058	157,581	26,736	184,317
1994	395		4,500		14,000	50	18,945	49,446	60,077	72,353	9,811	31,716	4,956	118,836	17,840	136,676
1995	493	9,500	2,300	10,500	6,312		29,105	29,190	35,466	42,713	6,544	39,975	2,738	91,969	18,618	110,588
1996	1,893	19,000	4,300	30,000	11,849		67,042	67,238	81,693	98,387	6,091	29,027	611	134,116	29,333	163,448
1997	1,128	9,500	3,700	18,000	5,342		37,670	37,780	45,902	55,282	7,730	7,069	3,252	73,333	19,511	92,845
1998	2,753	8,500	5,500	14,000	9,521		40,274	40,391	49,075	59,104	11,577	887	296	71,863	10,491	82,354
1999	579	6,000	6,000	17,000	10,000		39,579	39,694	48,229	58,084	17,316	517	10,737	86,654	21,603	108,258
2000	2,927	10,000		17,000	14,533	200	44,660	51,990	64,082	77,433	13,452	7,743	10,207	108,835	23,934	132,769
2001	3,531	12,000	8,000	18,000	24,076	150	65,757	65,757	81,051	97,938	10,354	14,455	0	122,746	37,464	160,210
2002	2,332	2,500	3,514	7,500	23,849		39,695	39,860	49,130	59,367	6,290	4,114	5,796	75,567	20,194	95,761
2003	3,348	6,000	6,400	10,000	23,608		49,356	49,561	61,088	73,815	10,803	6,472	3,149	94,239	19,941	114,179
2004	1,667	3,000		4,800	25,767		35,234	41,215	50,801	61,385	11,428	1,499	9,372	83,684	14,526	98,211
2005	1,876	1,400		7,000	15,046		25,322	29,620	36,510	44,116	7,958	2,411	6,268	60,753	16,393	77,146
2006	3,538	1,700		13,000	12,368		30,606	35,801	44,128	53,322	8,396	8,159	5,828	75,704	17,774	93,478
2007	2,096	800		11,000	16,265		30,161	35,281	43,487	52,547	5,829	1,562	5,113	65,051	13,634	78,685
2008	2,363	7,818		6,000	10,374		26,555	31,063	38,287	46,264	10,318	13,321	6,661	76,564	9,001	85,565
2009	1,618	8,597		12,082	10,703		33,000	38,602	47,580	57,493	8,136	1,071	3,571	70,271	17,498	87,769
2010	3,161	6,646	3,357	11,897	13,712		38,773	38,979	48,045	58,054	8,061	2,517	4,547	73,179	7,957	81,136
2011	1,835	1,638		16,263	12,105		31,841	35,636	43,925	53,076	7,911	7,310	3,337	71,635	11,442	83,076
2012	1,370	3,066		17,471	9,363		31,270	34,997	43,137	52,124	7,770	778	3,371	64,043	13,744	77,787
2013	1,795	2,668		9,321	10,934		24,718	27,664	34,099	41,203	6,142	3,912	782	52,038	8,606	60,644
2014	978	4,582		9,047	10,308		24,915	27,885	34,370	41,531	6,191	908	2,269	50,899	9,305	60,204
Averages																
1980s	1,010	14,033	3,317	10,500	16,241	425	45,526	45,526	56,983	69,095	14,490	28,615	621	112,821	32,830	145,652
1990s	1,286	11,278	5,170	17,889	11,522	138	47,283	47,413	57,606	69,377	12,678	24,589	4,057	110,702	22,848	133,550
2000s	2,530	5,382	5,971	10,638	17,659	175	42,355	41,875	51,614	62,368	9,296	6,081	5,596	83,341	19,036	102,377
2010s	1,828	3,720	3,357	12,800	11,284	175	33,164	41,875	40,715	49,198	7,215	3,085	2,861	62,359	10,211	72,570
1980s	2%	31%	7%	23%	36%	1%			80%		33%	65%	1%			
1990s	3%	24%	11%	38%	24%	0%			82%		31%	60%	10%			
2000s	6%	13%	14%	25%	42%	0%			81%		44%	29%	27%			
2010s	6%	11%	10%	39%	34%	1%			81%							

[1] Estimated total escapement = (104% of index stock escapement + 135% of other stock escapement)* 110% for missed stocks (mainstem spawners).

[2] FN chinook catches 2011-14 were assumed to be 14.7% of the annual escapement estimate based on the ration of FN catch to escapement for 2000-09.

[3] Canadian commercial and sport estimates of Total Fishery Mortality estimates from PSC CTC analysis (TCChinook 11) which does not include FN catches.

Appendix Table D3. Annual escapement and total stock size estimates for Area 6 Chinook salmon, 1980-2014.

Year	Wahoo River	Brim River	Khutze River	Index Stream Total Obs.	Index Stream Total Adj. [1]	Total Area 6 Escapement [2]	Exp Factor 2	CDN Harvest	Alaska Harvest	Total Run	Marine CDN ER	Marine TOT ER
1980	50	150	60	260	260	1,044	4.0	105	162	1,310	8%	20%
1981	100	150	10	260	260	1,044	4.0	105	162	1,310	8%	20%
1982	150	200	35	385	385	1,545	4.0	156	239	1,940	8%	20%
1983	100	200	40	340	340	1,365	4.0	137	211	1,713	8%	20%
1984	50	200	38	288	288	1,156	4.0	116	179	1,451	8%	20%
1985	50	125	30	205	205	823	4.0	83	127	1,033	8%	20%
1986	50	200	40	290	290	1,164	4.0	117	180	1,461	8%	20%
1987	10	150	71	231	231	927	4.0	93	144	1,164	8%	20%
1988		50	20	70	156	627	4.0	63	97	787	8%	20%
1989		50	25	75	167	672	4.0	68	104	843	8%	20%
1990	200	20	60	280	280	1,124	4.0	138	424	1,686	8%	33%
1991	25	10	62	97	97	389	4.0	24	34	448	5%	13%
1992	100	20	30	150	150	602	4.0	79	69	750	11%	20%
1993	200	10	42	252	252	1,012	4.0	121	147	1,279	9%	21%
1994	110	25	20	155	155	622	4.0	47	60	729	6%	15%
1995	78	12	29	119	119	478	4.0	28	31	537	5%	11%
1996	100			100	181	727	4.0	16	24	767	2%	5%
1997	70	25	55	150	150	602	4.0	36	41	679	5%	11%
1998	180	12	38	230	230	923	4.0	67	84	1,074	6%	14%
1999	35	16	31	82	82	329	4.0	15	32	377	4%	13%
2000			25	25	167	672	4.0	26	49	747	4%	10%
2001	185	20	12	217	217	871	4.0	33	84	989	3%	12%
2002	185	20		205	241	967	4.0	170	68	1,206	14%	20%
2003	130	10	35	175	175	702	4.0	171	46	920	19%	24%
2004	80	30	17	127	127	510	4.0	70	67	647	11%	21%
2005	130	5	16	151	151	606	4.0	162	124	892	18%	32%
2006	200		19	219	312	1,253	4.0	151	152	1,556	10%	19%
2007	500			500	906	3,636	4.0	352	648	4,636	8%	22%
2008	110		35	145	207	830	4.0	37	73	940	4%	12%
2009	322			322	583	2,342	4.0	237	270	2,849	8%	18%
2010	60	10		70	82	330	4.0	49	51	430	11%	23%
2011	4			4	7	29	4.0	7	6	42	17%	31%
2012	30			30	54	218	4.0	17	37	272	6%	20%
2013	140	3		143	168	675	4.0	28	34	737	4%	8%
2014	185	20		205	241	967	4.0	106	64	1,137	9%	15%

[1] Filled in missing data for indicator streams using 1980-2010 average contribution.

[2] Expansion for other streams with no enhancement in Area 6 using 1980-2010 average contribution.

Appendix Table D4. Annual escapement and total stock size estimates for Area 8 Chinook salmon, 1985-2014.

Year	Atnarko River[1]	Bella Coola River[2]	Dean River[3]	Index Stream Total Obs.	Index Stream Total Adj.[4]	Total Area 8 Escapement[5]	First Nation Harvest[6]	Commercial Catch	Sport Catch	Return to Canada	Alaska Harvest	Total Run
1985		27,560	4,000	31,560	32,960	33,765	1,656	14,989	2,545	52,955	7,241	60,196
1986		21,300	3,300	24,600	25,755	26,009	1,984	11,117	1,887	40,998	5,371	46,368
1987		14,425	1,144	15,569	15,969	16,618	1,305	7,081	1,202	26,206	3,421	29,626
1988		15,000	1,300	16,300	16,755	17,398	791	7,761	1,318	27,268	3,749	31,017
1989		22,000	2,300	24,300	25,105	25,422	1,961	10,853	1,843	40,079	5,243	45,322
1990	14,537	17,000	2,000	19,000	19,700	20,282	1,689	10,002	278	32,251	10,280	42,531
1991	12,098	17,800	2,400	20,200	21,040	21,283	1,631	9,363	1,918	34,195	2,695	36,890
1992	28,590	27,000	3,000	30,000	31,050	31,442	2,779	16,261	3,013	53,496	5,117	58,613
1993	30,824	35,000	700	35,700	35,945	37,152	2,738	12,936	3,491	56,317	6,983	63,300
1994	24,514	26,800	1,300	28,100	28,555	29,514	1,275	11,085	1,426	43,299	3,740	47,039
1995	20,376	32,000	1,100	33,100	33,485	34,609	3,201	11,559	3,687	53,056	3,099	56,155
1996	18,067	25,000	2,000	27,000	27,700	28,630	3,015	6,758	2,984	41,387	1,232	42,620
1997	9,788	18,000	1,400	19,400	19,890	20,558	3,036	5,543	2,472	31,609	1,848	33,457
1998	11,719	22,000	3,000	25,000	26,050	26,925	4,827	10,633	4,373	46,758	3,559	50,317
1999	14,398	25,000	1,800	26,800	27,430	28,351	3,103	4,395	3,093	38,942	3,337	42,279
2000	15,096	25,000	1,200	26,200	26,620	27,514	3,335	5,837	2,974	39,661	2,528	42,189
2001	20,929	24,000	3,795	27,795	29,123	30,101	3,606	10,771	3,495	47,973	4,137	52,110
2002	10,427	14,000	3,700	17,700	18,995	19,633	2,832	12,097	3,074	37,636	2,082	39,718
2003	11,925	15,000	3,700	18,700	19,995	20,666	3,103	16,689	8,968	49,426	2,496	51,922
2004	10,287	17,500	3,500	21,000	22,225	22,971	3,838	16,740	6,231	49,780	5,330	55,110
2005	10,159	17,500	2,200	19,700	20,470	21,157	3,894	14,068	9,138	48,257	7,200	55,457
2006	16,781	26,000	3,700	29,700	30,995	32,036	3,878	7,636	4,894	48,444	4,824	53,268
2007	7,160	11,000	2,300	13,300	14,105	14,579	1,896	7,041	3,343	26,858	4,054	30,912
2008	6,341	9,000	1,100	10,100	10,485	10,837	2,821	2,377	285	16,320	1,141	17,460
2009	8,917	10,600	1,400	12,000	12,490	12,909	3,729	10,054	2,689	29,382	2,689	32,071
2010	9,317	13,389	1,600	14,989	15,549	16,071	3,626	8,556	3,276	31,529	3,738	35,267
2011	8,082	9,100	750	9,850	10,113	10,452	1,767	10,603	3,618	26,440	3,970	30,409
2012	4,622	5,800	909	6,709	7,028	7,264	1,126	4,595	625	13,610	1,943	15,553
2013	19,962	24,777	3,885	28,662	30,022	31,030	4,811	8,920	3,480	48,241	2,127	50,368
2014		20,800	3,262	24,062	25,203	26,049	4,039	7,832	5,344	43,265	2,323	45,588
Averages 2000-09	11,802	16,960	2,660			21,240	3,293					
1990-94								11,929	2,025	43,912	5,763	
								61%	10%		29%	

Assumptions:

[1] Atnarko escapement estimates (excluding jacks) from Velez-Espino et a. (2014)

[2] Bella Coola escapement estimates from NuSEDS database (Bruce Baxter, DFO, pers. comm. 2015).

[3] Filled in missing Dean escapement estimates for 2012-14 using ratio of Dean to Bella Coola escapement for 2000-09.

[4] Expansion factor for Dean River observer efficiency & small stream observer efficiency: 1.35

[5] Filled in missing data for small stream stocks from 1993-03 using the average ratio of BC/Dean counts to small stream counts from 1977-92: 1.034

[6] Filled in missing First Nations catch harvest estimates for 2011-14 using ratio of FN Harvest to Bella Coola escapement for 2000-09. 15.5%

Appendix Table D5. Annual escapement and total stock size estimates for Area 9 summer Chinook salmon, 1980-2014.

	Kilbella	Chuckwalla	Ashlum	Neechanz	Index Stream Totals		Stat. Area 9		First Nation	Central	North	North	Canadian	Return to	Alaska	Total	CDN	Total
Year	River	River	Creek	River	Obs.	Adj.	Obs.	Est.[1]	Harvest[2]	Sport[3]	Sport[3]	Comm[3]	Catch	Canada	Catch[3]	Run	ER	ER
1980			25		25	651	939	1,409		139	0	88	226	1,635	416	2,051	11%	31%
1981	75	25	25		125	140	201	302		22	0	14	37	339	67	406	9%	26%
1982	400	550	50	75	1,075	1,075	1,551	2,327		246	0	155	401	2,728	736	3,464	12%	33%
1983	1,000	400	20	75	1,495	1,495	2,157	3,236		259	0	163	422	3,658	775	4,433	10%	27%
1984	175	400		75	650	676	975	1,463		126	0	79	205	1,668	376	2,044	10%	28%
1985	300	40	4	14	358	358	517	775		62	0	39	101	876	186	1,062	10%	27%
1986	150	25	60	26	261	261	377	565		62	0	39	102	667	186	853	12%	34%
1987	500	200	12	20	732	732	1,056	1,584		148	0	93	241	1,825	442	2,268	11%	30%
1988	200	175	10	20	405	405	584	877		69	0	71	141	1,017	199	1,217	12%	28%
1989	23	25	3	200	251	251	362	543		40	0	33	73	616	120	736	10%	26%
1990	80	40	15	400	535	535	772	1,158		95	0	60	155	1,313	295	1,609	10%	28%
1991	75	50	10		135	151	218	326		33	0	13	47	373	114	487	10%	33%
1992	400	150	10		560	625	902	1,353		141	0	47	188	1,541	371	1,912	10%	29%
1993	250	125	10	50	435	435	628	942		122	0	22	144	1,086	147	1,233	12%	24%
1994	200	100			300	350	505	758		72	3	34	109	866	74	940	12%	19%
1995	55	45			100	117	168	253		12	2	3	18	270	17	287	6%	12%
1996	300	200			500	583	842	1,263		82	0	0	82	1,345	79	1,424	6%	11%
1997	600	320	60		980	1,094	1,579	2,369		378	0	5	384	2,752	349	3,101	12%	24%
1998	1,000	780	10	22	1,812	1,812	2,615	3,922		477	20	0	496	4,418	138	4,556	11%	14%
1999	1,710	453	8	20	2,191	2,191	3,162	4,742		664	6	2	673	5,415	493	5,908	11%	20%
2000	1,232	898	230	149	2,509	2,509	3,620	5,431		620	6	2	627	6,058	460	6,518	10%	17%
2001	1,298	700	147	444	2,589	2,589	3,736	5,604		885	8	3	896	6,500	657	7,156	13%	22%
2002	1,600	600	250	330	2,780	2,780	4,012	6,017		890	8	3	901	6,918	660	7,578	12%	21%
2003	600	300	80		980	1,094	1,579	2,369		359	0	0	359	2,727	108	2,835	13%	16%
2004	550	400	100	140	1,190	1,190	1,717	2,576		477	0	0	477	3,053	640	3,693	13%	30%
2005	725	360	70	120	1,275	1,275	1,840	2,760		466	0	4	471	3,231	575	3,805	12%	27%
2006	610	320	65	115	1,110	1,110	1,602	2,403		397	55	8	459	2,862	356	3,218	14%	25%
2007	295	205	65	95	660	660	952	1,429		158	22	5	186	1,615	133	1,748	11%	18%
2008	350	180	70	100	700	700	1,010	1,515		78	60	0	138	1,653	166	1,819	8%	17%
2009	350	200	60	100	710	710	1,025	1,537		115	18	2	135	1,672	227	1,899	7%	19%
2010	150	75			225	262	379	568		79	13	2	93	661	96	757	12%	25%
2011		200			200	591	853	1,280		156	85	0	241	1,520	590	2,111	11%	39%
2012	170				170	328	473	709		77	20	4	100	809	107	916	11%	23%
2013	500				500	964	1,390	2,086		244	53	0	297	2,382	792	3,174	9%	34%
2014	300				300	578	834	1,251		151	59	27	236	1,488	1,206	2,693	9%	54%

Assumptions:

[1] The adjusted escapement estimates are 150% of the recorded escapement.

[2] First Nations catch in Area 9 was assumed to be Wannock chinook.

[3] Exploitation rates for Area 9 summer Chinook were assumed to be equal to those for Wannock Chinook for each marine fishery.

Appendix Table D6. Annual escapement and total stock size estimates for Area 9 Wannock Chinook salmon, 1980-2014.

Year	Wannock River [1]	Adjusted Escapement [2]	First Nation Harvest[3]	Central Sport[4]	North Sport[5]	North Comm[6]	Canadian Catch	Return to Canada[7]	Alaska Catch	Total Run	CDN ER	Total ER	Alaska ER
1980	2,000	3,885	10	383	0	242	625	4,510	1,146	5,656	11%	31%	20%
1981	3,000	5,827		432	0	273	705	6,532	1,293	7,824	9%	26%	17%
1982	750	1,457		154	0	97	251	1,708	461	2,169	12%	33%	21%
1983	1,750	3,399	50	272	0	172	444	3,843	814	4,657	10%	27%	17%
1984	750	1,457	40	125	0	79	204	1,661	374	2,035	10%	28%	18%
1985	3,000	5,827	37	467	0	295	762	6,589	1,398	7,986	10%	27%	17%
1986	6,000	11,654	50	1,285	0	811	2,096	13,750	3,846	17,596	12%	34%	22%
1987	4,500	8,740	28	815	0	514	1,329	10,069	2,439	12,508	11%	30%	19%
1988	4,000	7,769	50	612	0	634	1,246	9,015	1,768	10,783	12%	28%	16%
1989	3,000	5,827	0	428	0	354	782	6,609	1,282	7,891	10%	26%	16%
1990	3,500	6,798	0	560	0	352	912	7,710	1,734	9,444	10%	28%	18%
1991	4,000	7,769		793	0	321	1,114	8,883	2,717	11,600	10%	33%	23%
1992	7,500	14,567	3	1,516	0	503	2,019	16,586	3,990	20,576	10%	29%	19%
1993	8,000	15,538	1	2,013	0	370	2,383	17,921	2,429	20,350	12%	24%	12%
1994	3,500	6,798		650	23	304	977	7,775	660	8,435	12%	19%	8%
1995	3,000	5,827	0	286	47	73	405	6,232	381	6,614	6%	12%	6%
1996	2,500	4,856		316	0	0	316	5,172	304	5,476	6%	11%	6%
1997	4,000	7,769		1,241	0	18	1,259	9,028	1,144	10,172	12%	24%	11%
1998	3,500	6,798	30	826	34	0	860	7,658	239	7,897	11%	14%	3%
1999	500	971		136	1	0	138	1,109	101	1,210	11%	20%	8%
2000	4,500	8,740		997	9	3	1,009	9,749	740	10,489	10%	17%	7%
2001	3,000	5,827	1	920	8	3	932	6,759	683	7,441	13%	22%	9%
2002	2,800	5,438	2	804	7	3	814	6,252	597	6,849	12%	21%	9%
2003	1,000	1,942		294	0	0	294	2,236	88	2,324	13%	16%	4%
2004	3,000	5,827	0	1,079	0	0	1,079	6,906	1,449	8,355	13%	30%	17%
2005	4,500	8,740	67	1,477	0	14	1,491	10,231	1,820	12,051	12%	27%	15%
2006	3,000	5,827	22	962	133	18	1,114	6,941	863	7,804	14%	25%	11%
2007	4,500	8,740	12	968	137	33	1,138	9,878	813	10,691	11%	18%	8%
2008	5,000	9,711	126	501	383	0	884	10,595	1,063	11,658	8%	17%	9%
2009	3,800	7,381	63	551	87	12	649	8,030	1,088	9,119	7%	19%	12%
2010	4,000	7,769	21	1,078	174	21	1,273	9,042	1,311	10,354	12%	25%	13%
2011	4,200	8,157		994	539	0	1,533	9,690	3,763	13,453	11%	39%	28%
2012	3,800	4,000		432	111	21	565	4,565	605	5,170	11%	23%	12%
2013	4,000	6,400		748	162	0	910	7,310	2,431	9,741	9%	34%	25%
2014	3,740	3,960		478	185	84	748	4,708	3,815	8,523	9%	54%	45%

Assumptions:

[1] Mark recapture (MR) studies were conducted in 1991 (4,000 females), 1992 (15,000 fish), 1993 (17,400 fish) and 2000 (7433 fish; PST report). Carcass counts were expanded by the average ratio of MR estimates to carcass counts in 1992, 1993 and 2000.

[2] DIDSON/ARIS sonar system counts for 2012-14, expansion factor (1980-2011) based on ratio of MR and carcass counts: 1.94

[3] First Nations catch in Area 9 was assumed to be Wannock chinook and a component of the escapement estimates, therefore, not included in the total catch estimates.

[4] Central Coast sport catch of Wannock chinook derived from annual catch estimates and adjusted escapement estimates.

[5] North Coast sport catch estimate was derived form CWT data using the ratio of the estimated CWT recoveries in the Central Sport and North Sport fisheries.

[6] North Coast commercial catch estimate was derived form CWT data using the ratio of the estimated CWT recoveries in the Central Sport and North commercial fisheries.

[7] Total return to Canada = sum of the Canadian catch and adjusted escapement estimates.

Appendix Table D7. Annual escapement and total stock size estimates for Area 10 Chinook salmon, 1980-2014.

	Docee	Nekite	Index Stream Totals		Stat. Area 10		First Nation	Commercial	Sport	Return to	Alaska	Total
Year	River	River	Obs.	Adj.	Obs.	Est.[1]	Harvest[2]	Catch[3]	Catch[4]	Canada	Catch[5]	Run
1980	1200		1,200	1,250	1,250	1,875	19	149	185	2,228	566	2,794
1981	1000	20	1,020	1,020	1,020	1,530	15	104	113	1,763	349	2,112
1982	1500		1,500	1,562	1,562	2,343	23	275	248	2,890	780	3,670
1983	1000	50	1,050	1,050	1,050	1,575	16	252	126	1,968	417	2,385
1984	750	20	770	770	770	1,155	12	72	99	1,337	301	1,638
1985	200	30	230	230	230	345	3	361	28	737	156	893
1986	500	32	532	532	532	798	8	360	88	1,254	351	1,605
1987	1000	50	1,050	1,050	1,050	1,575	16	205	147	1,943	471	2,413
1988	1000	50	1,050	1,050	1,050	1,575	16	107	124	1,822	357	2,179
1989	200	25	225	225	225	338	3	70	25	435	84	520
1990	500	10	510	510	510	765	8	66	63	902	203	1,104
1991	500		500	521	521	781	8	99	80	967	296	1,263
1992	500		500	521	521	781	8	256	81	1,126	271	1,397
1993	1000	50	1,050	1,050	1,050	1,575	16	67	204	1,862	252	2,114
1994	750	15	765	765	765	1,148	11	40	110	1,308	111	1,420
1995	400		400	417	417	625	6	12	31	674	41	715
1996	250		250	260	260	391	4	2	25	421	25	446
1997	100		100	104	104	156	2	5	25	187	24	211
1998	1100		1,100	1,146	1,146	1,718	17	0	209	1,944	61	2,005
1999	500		500	521	521	781	8	0	109	898	82	980
2000	500		500	521	521	781	8	0	89	878	67	945
2001	300		300	312	312	469	5	0	74	547	55	603
2002	300		300	312	312	469	5	0	69	543	52	594
2003	300		300	312	312	469	5	0	71	544	22	566
2004	480		480	500	500	750	7	0	139	896	188	1,084
2005	300		300	312	312	469	5	0	79	553	98	651
2006	700		700	729	729	1,094	11	0	181	1,285	160	1,445
2007	600		600	625	625	937	9	0	104	1,051	86	1,137
2008	315		315	328	328	492	0	0	25	517	52	569
2009												
2010												
2011	250		250	260	260	391			48	438	170	608
2012												
2013												
2014												

Assumptions:

[1] The adjusted escapement estimates are 150% of the recorded escapement.

[2] First Nations catch was estimated to be 1% of the adjusted escapement estimate.

[3] Commercial catch was estimated using fixed %'s of the Area 10 commercial harvest (2% of troll, 5% of gillnet).

[4] Sport catch estimated using the Central Coast sport harvest rate for Wannock Chinook.

[5] Alaska catch was estimated using the exploitation rate for Wannock Chinook in Alaskan fisheries.

APPENDIX E

Model Assumptions and Uncertainties

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Model Assumptions and Uncertainties

Many of the following assumptions are similar to those reported in English et al. (2012), however, some have been revised as a result of changes to the analytical procedures and some new assumptions have been added to the list. All new assumptions have a letter code after the assumption number (e.g. Assumption 26a).

Escapement Estimation

The assumptions associated with deriving escapement estimates for a specific CU are:

A. **Assumption 1 – Selection of indicator streams:** The escapement estimates for the selected set of indicator streams within a CU provide a reliable indication of the year to year variability and trends in escapement for that CU;
B. **Assumption 2 – Correction factors for missing estimates for indicator streams (Factor 1):** For decades with at least one escapement estimate for each indicator stream, the average of the available escapement estimates for each indicator streams within a CU represent the relative contribution of each indicator stream to the total for all indicator streams in a CU;
C. **Assumption 3 – Correction factors for converting the total estimate for indicator streams to a total for all streams in a CU (Factor 2):** The average of the escapement estimates for the period when the largest number of streams were surveyed within a CU (e.g., 1980-1999 for many CUs) provide an adequate estimate of the contribution the indicator streams to the total escapement for a CU;
D. **Assumption 4 – Correction factor for observer efficiency (Factor 3):** on average the recorded escapement estimates for streams within a CU tend to underestimate the total escapement.
    a. For a specific species and statistical area, this correction factor is the same across all years; therefore, this factor will not affect the trend in escapement estimates.
    b. The purpose of this factor is to increase the escapement estimates in order to obtain a more realistic estimate of total run size and exploitation rate (ER) for some species and areas.
    c. This factor does not affect our ER estimates for those statistical areas and CUs where ERs were derived from analyses of CWT data (all Coho and some Chinook CUs), the NBSRR model or the Chum Models which use the NBSRR harvest rates (HRs) to derive ERs for Area 3-5 Chum CUs.

E. For Pink and Chum returns to Area 1, 2E, 2W and Areas 6-10, and Sockeye returns to Area 6-10, where run size is estimated by adding local area catch estimates to the escapement estimate (TCC&E), the above methods used to correct for escapement underestimation in the nuSEDS data will result in higher escapement estimates and thus lower ERs estimates.
F. There are a few instances where indicator streams and the above correction factors were not used because better escapement estimates have been derived from other sources. For Nass (Area 3) Sockeye, Chinook and Coho, the 1992-2014 escapement estimates were derived from mark-recapture studies which estimate the total number of fish migrating upstream of a canyon in the lower Nass River (see Nisga'a Fisheries Annual Reports and Appendix Table C1 and D1). For

Skeena (Area 4) sockeye, the escapement time series was derived by combining sockeye counts from the Babine fence with escapement estimates for non-Babine stocks (see Alexander et al. 2010).

Total Canadian Catch and Escapement (TCC&E) Estimates

G. **Assumption 5 – Stock composition in fisheries:** The sockeye, pink or chum harvested in a specific statistical area are destined to spawn in streams within that statistical area.
H. **Assumption 6 – Catch estimates for Area 1, 2E, 2W and Area 6-10:** The catch estimates derived from DFO databases for commercial fisheries in these statistical areas represent the vast majority of the harvest of sockeye, pink and chum in these statistical areas.
I. **Assumption 7 – Alaska catch estimates:** Alaska fisheries do not harvest significant numbers of sockeye, pink and chum salmon originating from Area 1, 2E, 2W and Area 6-10.

Northern Boundary Sockeye Run Reconstruction Model

J. **Assumption 8 – Marine ERs for aggregate sockeye stocks 1982-14:** The combination of fishery specific stock composition estimates, migration route parameters and daily escapement estimates for Nass and Skeena sockeye used in the NBSRR model produce reliable estimates of the marine ERs for Canadian and Alaskan fisheries.
K. **Assumption 9 – Marine ERs for Nass and Skeena sockeye CUs:** the migration routes are that same for all Nass sockeye CUs and the available data on differences in migration timing for Nass sockeye CUs is sufficient to estimate marine ERs for Nass sockeye CUs.
L. **Assumption 10 – Marine ERs for Skeena sockeye CUs:** The migration routes are that same for all Skeena sockeye CUs and the available data on differences in migration timing for Skeena sockeye CUs is sufficient to estimate marine ERs for Skeena sockeye CUs.
M. **Assumption 11 – Area 5 sockeye ERs:** ERs for Area 5 sockeye stocks in Canadian and Alaskan fisheries are the same as those estimated for the Lakelse sockeye CU.
N. Note: the ER estimates provided in Appendix B are different from those presented in previous reports because they include all harvests in marine and freshwater fisheries and both Canadian and Total ERs are provided for each CU and the aggregate Nass and Skeena stocks.

Pink Salmon Run Reconstruction Model

O. **Assumption 12 – HRs for Area 3 Inside and Area 4 pink salmon stocks 1982-95:** The combination of daily catch estimates, migration route, run timing and annual escapement estimates for Northern Boundary pink salmon stocks in the Gazey and English (2000) run reconstruction model produced reliable estimates of the HRs for Area 3 Inside and Area 4 pink salmon stocks in Area 3 and Area 4 fisheries and ERs in Alaskan fisheries.
P. **Assumption 13 – Equal vulnerability:** The vulnerability of each pink salmon stock in each Northern Boundary fishery will be proportional to the abundance of that stock in that fishery during each fishing period.

Effort–Harvest Rate (EHR) Analysis Models

Q. **Assumption 14 – Area 3 HRs for Area 3 Inside pink salmon:** The EHR relationship derived for Area 3 Inside pink salmon stocks harvested in Area 3 fisheries for 1982-95 can be used to estimate annual HRs for 1954-81 and 1996-2014 using weekly fishing effort estimates and Pink salmon CPE estimates for Area 3 seine and gillnet fisheries in these years.

R. **Assumption 15 –Area 3 and 4 HRs for Area 4 pink salmon:** The EHR relationship derived for Area 4 Pink salmon stocks in harvested Area 3 and 4 fisheries for 1982-95 can be used to estimate annual HRs for 1954-81 and 1996-2014 using weekly fishing effort estimates and Pink salmon CPE estimates for Area 3 and 4 seine and gillnet fisheries in these years.

S. **Assumption 16 –Area 3 and 4 HRs for Area 5 pink salmon:** Only half (50%) of Area 5 pink salmon are vulnerable to fisheries in Area 3 and 4; and the run-timing of Area 5 pink salmon is one week later than that for Area 4 pink salmon. The Effort–HR relationship for Area 4 pink salmon stocks is appropriate for estimating HRs for Area 5 pink salmon stocks.

T. **Assumption 17 – Alaska ERs for Area 3 Inside and Area 4 pink salmon:** EER relationships for Area 3 Inside and Area 4 pink salmon stocks harvested in Alaska seine fisheries in Districts 101-104 for 1982-95 can be used to estimate annual ERs 1996-2014 from annual fishing effort estimates for these Alaskan fisheries from 1996-2014. The average Alaska ERs for 1982-95 provide a reasonable estimate of the annual Alaska ERs for Area 3 and Area 4 Pink salmon from 1954-81.

U. **Assumption 18 – Alaska ERs for Area 5 pink salmon:** ERs for Area 5 pink salmon in Alaskan fisheries is the same as that estimated for Area 4 pink salmon.

V. **Assumption 19 – Canadian ERs for Area 3 Inside, Area 4 and Area 5 pink salmon:** The average portion that Area 3 and Area 4 HRs were of the total Canadian HRs during the 1982-95 period is appropriate for the 1954-81 and 1996-2014 to expand the Area 3 and 4 HRs to total Canadian HRs that can be combined with Alaskan ERs to compute total Canadian ERs for Area 3 Inside, Area 4 and Area 5 pink salmon stocks.

Chum Models

W. **Assumption 20 – Canadian HRs for Area 3 chum stocks for 1982-14:** Area 3 chum migrating through fisheries in Area 3, 4 and 5 have the same weekly HR as those estimated for co-migrating Nass (Area 3) sockeye using the NBSRR model results for 1982-14;

X. **Assumption 21 – Canadian HRs for Area 4 chum stocks for 1982-14:** Area 4 chum migrating through fisheries in Area 3, 4 and 5 have the same weekly HRs as those estimated for co-migrating Skeena (Area 4) sockeye using the NBSRR model results for 1982-14;

Y. **Assumption 22 – Canadian HRs for Area 5 chum stocks for 1982-14:** Area 5 chum migrating through fisheries in Area 3, 4 and 5 have the same weekly HRs as those estimated for co-migrating Skeena (Area 4) sockeye using the NBSRR model results for 1982-14.

Z. **Assumption 23 – Run timing for Area 3-5 chum salmon:** The 1994-2009 daily Nass fishwheel chum catch per effort provides a reasonable estimate of the run timing for Area 3 chum stocks; the Skeena test fishery provides a reasonable estimate of the run timing for Area 4 chum stocks; and the run timing for Area 5 chum was estimated to be one week later than that for Area 4 chum.

AA. **Assumption 24 – Non-retention fisheries:** The mortality rate for chum salmon released during non-retention fisheries was assumed to be 10% for purse seine fisheries and 60% for gillnet fisheries. Therefore, weekly HRs estimated for sockeye salmon were reduced by these factors during weeks when chum non-retention regulations were in effect.

BB. **Assumption 25 – Alaska ERs for Area 3 chum salmon**: Area 3 chum migrating through Alaskan fisheries have the same annual ER as those estimated for Nass (Area 3) Pink salmon from the Area 3 EHR Model for all years.

CC. **Assumption 26 – Alaska ERs for Area 4-5 chum salmon:** Area 4 and 5 chum migrating through Alaskan fisheries have the same annual ER as those estimated for Skeena (Area 4) Pink salmon from the Area 3+4 EHR Model for all years.

DD. **Assumption 26a – Canadian HRs for Area 3, 4 and 5 chum stocks from 1954-81:** Canadian HRs for Area 3, 4 and 5 chum stock from 1954-81 were assumed to be equal to those estimated for Pink salmon for these years using the A3-EHR Model and A3+4 EHR Model.

Coho Exploitation Rates

EE. Page 8 in the report describes the link between the various Coho ER indicator stocks and the NCC statistical areas. Table 5 defines the link between each CU and the Coho ERs estimated for each statistical area or group of statistical areas.

FF. **Assumption 27 – Coho CWT data:** The available information on the number of CWT Coho caught in fisheries and escaping to spawning areas is adequate to estimate ERs for these indicator stocks and these ERs are appropriate for other unmarked Coho populations in the associated statistical area or CU.

GG. **Assumption 28 – NCC Coho Model:** Dave Peacock will need to provide the assumptions associated with this model.

HH. **Assumption 28a – Area 3 Coho ERs** – Canadian and Alaskan ERs for 1954-91 were assumed to be equal to those for Babine Coho, adjusted by the ratio of the average Area 3 ER to average Babine ER for 1992-97. Canadian and Alaskan ERs for 1992-14 were derived by the Nisga'a Joint Technical Committee based CWT recovery data for Zolzap Creek Coho and escapement estimates for Coho streams in the Nass Area (see Appendix Table C1, Richard Alexander, pers. comm.).

II. **Assumption 28b – Area 4 Coho ERs** – Canadian and Alaskan ERs for 1954-88 were assumed to be equal to those for Babine Coho in Holtby (1999). Canadian and Alaskan ERs for 1989-14 were derived by combining CWT recovery data for Toboggan Creek Coho with First Nation catch estimates for Skeena River fisheries and the annual escapement estimates for Coho streams in Area 4. (see Appendix Table C2 and C3).

JJ. **Assumption 28c – Haida Gwaii Coho ERs** – Canadian ERs for 1954-96 were assumed to be equal to those for Area 3 Coho described above. Alaskan ERs for 1954-96 were assumed to be equal to those for Area 3 Coho, adjusted by the ratio of the average Area 3 ER to average Deena ER for Alaskan fisheries for 1997-14. Canadian and Alaskan ERs for 1997-14 were derived from the CWT recovery data for Deena River Coho (Joel Sawada, DFO Nanaimo, pers. comm.) (see Appendix Table C4).

KK. **Assumption 28d – Area 6 Coho ERs** – Area 6 Canadian ERs for 1997-2010 were from the NCC Coho Model (Dave Peacock, pers. comm.). The Canadian ER estimates for 2011-2014 were assumed to be equal to those for Babine/Area 4 Coho, as described above. The Canadian ERs

for 1954-96 were derived using the ratio of the average Canadian ERs for Babine/Area 4 Coho for 1980-96 to the baseline Canadian ER estimate of 25.6% for Area 5/6 Coho from the NCC Coho Model. The Alaska ERs for Area 6 Coho were assumed to be equal to those estimated for Area 4 Coho for all years (see Appendix Table C5).

LL. **Assumption 28e – Area 6-8 Coho ERs** – Area 6-8 Canadian ERs for 1997-2010 were from the NCC Coho Model (Dave Peacock, pers. comm.). The Canadian ER estimates for 2011-2014 were assumed to be 60% of those for Babine/Area 4 Coho. The Canadian ERs for 1954-96 were derived using the ratio of the average Canadian ERs for Babine/Area 4 Coho for 1980-96 to the baseline Canadian ER estimate of 24.7% for Area 6-8 Coho from the NCC Coho Model. The Alaska ERs for Area 6-8 Coho were assumed to be 60% of those estimated for Area 4 Coho for all years (see Appendix Table C5).

MM. **Assumption 28f – Area 8 Coho ERs** – Area 8 Canadian ERs for 1997-2010 were from the NCC Coho Model (Dave Peacock, pers. comm.). The Canadian ER estimates for 2011-2014 were assumed to be 60% of those for Babine/Area 4 Coho. The Canadian ERs for 1954-96 were derived using the ratio of the average Canadian ERs for Babine/Area 4 Coho for 1980-96 to the baseline Canadian ER estimate of 25.5% for Area 8 Coho from the NCC Coho Model. The Alaska ERs for Area 8 Coho were assumed to be 60% of those estimated for Area 4 Coho for all years (see Appendix Table C5).

NN. **Assumption 28g– Area 4-9 Coho ERs** – Area 4-9 Canadian ERs for 1997-2010 were from the NCC Coho Model (Dave Peacock, pers. comm.). The Canadian ER estimates for 2011-2014 were assumed to be 40% of those for Babine/Area 4 Coho. The Canadian ERs for 1954-96 were derived using the ratio of the average Canadian ERs for Babine/Area 4 Coho for 1980-96 to the baseline Canadian ER estimate of 25.5% for Area 4-9 Coho from the NCC Coho Model. The Alaska ERs for Area 4-9 Coho were assumed to be 40% of those estimated for Area 4 Coho for all years (see Appendix Table C6).

OO. **Assumption 28h Area 9-10 Coho ERs** – Area 9-10 Canadian ERs for 1997-2010 were from the NCC Coho Model (Dave Peacock, pers. comm.). The Canadian ER estimates for 2011-2014 were assumed to be 20% of those for Babine/Area 4 Coho. The Canadian ERs for 1954-96 were derived using the ratio of the average Canadian ERs for Babine/Area 4 Coho for 1980-96 to the baseline Canadian ER estimate of 25.0% for Area 4-9 Coho from the NCC Coho Model. The Alaska ERs for Area 9-10 Coho were assumed to be 20% of those estimated for Area 4 Coho for all years (see Appendix Table C6).

Chinook Exploitation Rates

PP. Table 6 in the report defines the link between each CU and the Chinook ERs estimated for each Chinook ER indicator stock. Appendix C provides the tables with the escapement and catch estimates and assumptions used to derive these ERs. The analysis years along with the primary source for data and assumptions are provided in the overarching assumptions for each Chinook ER indicator stock below.

QQ. **Assumption 29 – Nass Chinook:** Estimates of escapement and catch for Nass River Chinook derived by the Nisga'a Joint Technical Committee for 1992-2010 are adequate to produce reliable annual ER estimates for Nass Chinook (see Appendix Table C1).

RR. **Assumption 30 – Skeena Chinook:** Estimates of escapement and catch for Skeena River Chinook derived by DFO for 1984-2010 are adequate to produce reliable annual ER estimates for Skeena Chinook (see Appendix Table C2).

SS. **Assumption 31 – Area 6 Chinook:** The marine ERs for Skeena Chinook are appropriate for Area 6 chinook streams where production has not be directly affected by the release of hatchery reared fish.

TT. **Assumption 32 – Area 8 Chinook:** The ERs for Area 8 chinook were derived from analysis of Atnarko River Chinook CWT data (see Appendix Table C4, Velez-Espino et al. 2011 for assumptions associated with these analyses).

UU. **Assumption 33 – Area 9 summer Chinook:** Canadian and Alaskan Marine ERs were assumed to be equal to those estimated for Wannock Chinook. It is likely that the Canadian ERs for Area 9 Summer Chinook are higher than those for Wannock Chinook, however, the CWT recovery data for Area 9 Summer Chinook is very limited compared to that for Wannock Chinook (see Appendix Table D5).

VV. **Assumption 34 – Area 9 Wannock Chinook:** Estimates of escapement and recreational fishery catch estimates for the Central Coast 1980-14 alone with CWT recovery data for Wannock Chinook 1988-14 are adequate to produce reliable annual ER estimates for Wannock Chinook (see Appendix Table D6).

WW. **Assumption 35 – Area 10 Chinook:** Harvest estimates for Area 10 Chinook in Canadian were derived using the following assumptions: 1) First Nations catch was 1% of the adjusted escapement estimate; 2) commercial catch was 2% of the Area 10 Troll Catch and 5% of the Area 10 gillnet catch; and 3) the harvest rate for Area 10 Chinook in the central coast recreational fishery was equal to the harvest rate for Wannock Chinook in the Area 7-9 recreational fisheries. Exploitation Rate estimates for Area 10 Chinook in Alaskan fisheries were assumed to be equal to those derived for Wannock Chinook in Alaskan fisheries (see Appendix Table D7).