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A Technical Review of the Management Approach for Stream-Type Fraser River Chinook

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Foreword

This series documents the scientific basis for the evaluation of aquatic resources and ecosystems in Canada. As such, it addresses the issues of the day in the time frames required and the documents it contains are not intended as definitive statements on the subjects addressed but rather as progress reports on ongoing investigations.

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ABSTRACT

Starting in 2008, Fisheries and Oceans Canada (DFO) implemented a series of fisheries closures and restrictions to protect Fraser Spring 4_2 Chinook Salmon stocks. These restrictions were expanded in 2010, and again in 2012, to allow additional protections for Fraser Spring 5_2 and Summer 5_2 Chinook Salmon stocks. The 2012 management approach was documented in a letter written by the Regional Director for DFO's Pacific Region Fisheries Management Branch to First Nations and stakeholder groups (RD directive). An objective of the 2012 management approach was to ensure that First Nations fishing for food, social, and ceremonial purposes had priority over other use. In this paper, we present a technical review of the available data and methods with which to evaluate recent management outcomes relative to the objectives laid out in the 2012 RD directive. We summarize recent patterns in spawner abundance, biological properties, and annual exploitation rates for Fraser River Spring 4_2, Spring 5_2, Summer 5_2 Chinook stock management units. We then compare two alternative approaches for estimating fishery- and sector-specific exploitation rate indices using readily available data and assessment tools. The first of these approaches relies on the coded wire tag (CWT) mark and recovery program for the Spring 4_2 Nicola River CWT indicator stock, while the second combines an existing Fraser River Chinook Run Reconstruction model with genetic stock identification (GSI) catch composition estimates from marine fisheries. We then use predicted exploitation rate indices from the Run Reconstruction approach to evaluate management outcomes relative the objectives stated in the 2012 RD directive. Results show that all three stream-type Fraser Chinook stock management units (SMUs) show depressed escapement in recent years and consistent declines over the last four years. Time series of exploitation rate indices for the Spring 4_2 SMU were similar for the CWT and Run Reconstruction methods, but with higher values for the Run Reconstruction approach. Results from the Run Reconstruction approach show that stream-type Fraser Chinook have experienced a reduction in exploitation rates in recent years, and that First Nations fisheries have experienced a larger reduction in harvest impacts than other sectors. However, data were insufficient to fully evaluate management performance relative to harvest reduction and allocation objectives. The reliance on an exploitation rate index, as opposed to a complete estimate of total mortality, meant that exploitation rate indices were underestimates. Furthermore, an uncertainty analysis highlighted that measurement of sector-specific changes in exploitation rates were highly uncertain, especially for lower impact recreational and commercial fisheries, whose estimates relied on GSI sampling. The fact that we cannot estimate reductions in commercial and recreational fisheries with reasonable error, using the available data, does not mean that they did not occur. The management measures implemented in various fisheries, such as time and area closures during periods of peak stream-type Fraser Chinook migration, were reasonably expected to reduce impacts on stream-type Fraser Chinook. We make recommendations for future work to address key gaps in the management and assessment framework for stream-type Fraser Chinook.

1 OVERVIEW OF TECHNICAL REVIEW APPROACH

The objectives of this technical review are to:

1. Summarize trends in spawner abundance, biological properties, and annual exploitation rates for Fraser River Spring 4_2, Spring 5_2, Summer 5_2 Chinook Salmon stock management units (SMUs) over the review period.
2. Estimate and present fishery mortalities (catch and release by First Nations, recreational, commercial), as well as the proportion of overall harvests attributable to each harvest sector. Where direct estimates are not available, use alternative methods to project fishery mortalities (e.g., using a run reconstruction approach or other method) to the extent possible.
3. To the extent possible, evaluate management outcomes relative to the stated management objectives in the 2012 letter written by the Regional Director for DFO's Pacific Region to First Nations and stakeholder groups (Appendix A; hereafter referred to as the 2012 RD directive) for Fraser River Spring 4_2, Spring 5_2 and Summer 5_2 Chinook SMUs.
4. Examine and identify uncertainties in the data and methods. Use sensitivity analyses to identify which information gaps have the largest potential impact on estimated outcomes.
5. Document data sources, data treatments, models, key assumptions, uncertainties, and implications for results.

In order to address these objectives, we compiled detailed data on escapement, marine survival rate, length-at-age, age composition, fishery catch, fishery releases, fishery effort, and stock composition of catch, as estimated using coded wire tag (CWT) and genetic stock identification (GSI) data. Data used for our analyses are described in Section 4, with datasets compiled in accompanying appendices. Changes in biological properties, such as length-at-age and age composition, are relevant to the current review because they influence fisheries selectivity. Reductions in both of these properties have the potential to reduce the effectiveness of management measures.

We then compare two alternative approaches for estimating fishery- and sector-specific exploitation rate indices using readily available data and assessment tools. The first of these approaches relies on the Joint Chinook Technical Committee (CTC) Exploitation Rate Analysis (ERA), applied to the Spring 4_2 Nicola River CWT indicator stock. The second approach combined the annual Fraser River Chinook Run Reconstruction model with GSI catch composition estimates from marine fisheries.

Next, we use predicted exploitation rate indices from the Run Reconstruction approach to evaluate management outcomes relative to the objectives stated in the 2012 RD directive (Appendix A). The Run Reconstruction approach alone was used for this evaluation because there are no current CWT indicator stocks for either the Fraser Spring 5_2 or Summer 5_2 stock management units.

Finally, we make recommendations for future work to be undertaken to address key gaps in the management and assessment framework for stream-type Fraser Chinook.

Given known limitations in the information available to estimate biological status and harvest impacts, the approach taken for this review is to:

1. Comprehensively describe the available data and identify key uncertainties associated with each data set;
2. Identify sources of uncertainty associated with the methods used to assess harvest impacts;

3. Evaluate the sensitivity of estimated harvest impacts to key sources of uncertainty in both the input data and the assessment method using sensitivity analyses and uncertainty analysis using Monte Carlo simulation.

2 CONTEXT

Stream-type Fraser Chinook include 13 conservation units that are aggregated into three SMUs referred to as Fraser Spring 4_2 Chinook, Fraser Spring 5_2 Chinook and Fraser Summer 5_2 Chinook. These populations are called 'stream-type' because they spend their first year in freshwater before migrating to offshore marine areas to rear. After one to four years in the ocean, they mature and return to the Fraser River in the spring and early summer. These stocks are very important to Fraser River First Nations, both in terms of the cultural value as the 'first fish' returning to the Fraser River and the importance to upriver Nations who depend on the health of single stocks for harvest in terminal spawning areas.

From 1979 to 2006, the aggregate spawner abundance of stream-type Fraser Chinook averaged (± standard deviation) 12,593 (±7,348), 33,695 (±12,116) and 32,771 (±11,741) for the Fraser Spring 4_2, Spring 5_2 and Summer 5_2 SMUs, respectively (run reconstruction input values; Table J - 1). Calendar Year Exploitation Rates (CYERs) for the Fraser Spring 4_2 Nicola CWT indicator stock averaged 28% (1978 to 2006 return years; Table I - 1) and 55% for the Fraser Spring 5_2 Dome CWT indicator (1990 to 2006 return years; Table I - 2). During that period, brood year marine survival rates averaged 3.6% for the Fraser Spring 4_2 Nicola CWT indicator stock (1985 to 2002 brood years; Table I - 3) and about 1.4% for the Fraser Spring 5_2 Dome CWT indicator (1987 to 1998 brood years; Table I - 4).

By 2007, the spawner abundance of these stream-type Fraser Chinook was well below average. Of particular concern was the Spring 4_2 SMU whose aggregate spawning abundance (return minus catch) was below 3,000; one of the lowest on record (Figure 2, Table J - 1). This low escapement was likely due to a combination of high exploitation and low marine survival rate. The 2007 CYER on the Spring 4_2 stock management unit was estimated to be 60%; more than double the long-term average, and the highest on record (Table I - 1). Over 85% of the harvest mortality in 2007 was associated with Fraser River recreational and First Nation fisheries. Additionally, the 2003 brood year had an estimated marine survival rate of 0.2%; the second lowest value on record (Table I - 3). Stream-type Chinook from the 2003 brood year entered the ocean in 2005, a sea-entry year for which low marine survival rates were observed for many southern BC salmon stocks (CTC 2011). DFO was concerned that fishery impacts would contribute to further stock declines if exploitation rates were maintained at 2007 levels (i.e. well above average) and marine survival rates remained low. Therefore, beginning in 2008 DFO implemented measures to reduce harvest impacts on Fraser Spring 4_2 Chinook stocks. These measures affected Fraser River fisheries and Southern BC marine fisheries in key migration corridors such as the Juan de Fuca Strait and southern Strait of Georgia. Measures have remained in place since then, as marine survival rates have remained low.

About the same time that the 2008 measures were introduced, members of the Cheam First Nation partially won an appeal at the BC Supreme Court in relation to multiple fishing convictions from 1999 Chinook fisheries. The Court concluded that "the appellants' constitutional right to fish for food, social and ceremonial (FSC) purposes was not given priority over the recreational fishers at a time when there was insufficient fish to meet the appellants' fishing needs" *(R. v. Tommy*, 2008 BCSC 1095). In applying principles set out in *R. v. Sparrow*, (1990) 1 S.C.R. 1075, the Court agreed with the appellants that First Nations unfairly bore the brunt of DFO's conservation measures to reduce harvest impacts on stream-type Fraser River Chinook. The issue was that First Nations FSC needs were not met, yet recreational fisheries continued. Although the Court acknowledged that recreational impacts were minimal and confirmed previous judgements that FSC access is not an exclusive right (*R. v. Gladstone*, 1996, 2 S.C.R. 723, *R.* v. *Jack,* 1996, 16 B.C.L.R., *R.* v. *Sampson*, 1996, 16 B.C.L.R.), a contributing factor for *R. v. Tommy* was that prior to the fishing season DFO knew there were insufficient fish to meet FSC needs.

Starting in 2010, management measures were introduced to reduce impacts on Spring 5_2 and Summer 5_2 Fraser Chinook in addition to those already in place for Spring 4_2 Chinook. Similar to Fraser 4_2 Chinook, the majority of harvest impacts on the Spring 5_2 and Summer 5_2 stock management units were from Fraser River First Nation fisheries (estimated at about 62%, based on historic Dome CWT indicator stock data). Therefore, any consequential reduction in harvest impacts required reducing First Nation access. However, given R. v. Tommy, unresolved questions as to how to prioritize constitutionally protected FSC fisheries remained. On the one hand, some Nations continued to assert that unless FSC needs are met, prioritizing constitutionally protected fisheries required exclusive First Nation access. On the other hand, the social and economic consequences of exclusive First Nation access are significant and egregious for recreational and commercial harvest groups whose impacts on stream-type Fraser Chinook are relatively low in mixed-stock fisheries targeting stronger non-Fraser stocks.

In 2012, DFO set out a management approach for stream-type Fraser Chinook designed to reconcile multiple objectives. That is, meeting conservation needs while prioritizing First Nation FSC access and providing stable access for stronger co-migrating stocks in mixed-stock fisheries. This approach was documented in the 2012 RD directive (Appendix A). The letter set exploitation rate limits for Fraser Spring 5_2 and Summer 5_2 Chinook stocks, described actions the department would take to achieve these targets, and anticipated allocations of harvest reductions among sectors. Fisheries targeted for reductions were those operating in the times and areas where stream-type Fraser Chinook are most vulnerable during their return migration to spawning grounds. While harvest opportunities were reduced for all sectors, including First Nation fisheries, the intent was to implement a management approach whereby the brunt of conservation measures would be borne by recreational and commercial fisheries.

Objectives for years in which return abundance for Spring 5_2 and Summer 5_2 stocks combined was less than 30,000 fish (i.e., “Zone 1”) set out in the 2012 RD directive were as follows:

- When in Zone 1, reduce exploitation rates on Fraser River Spring 5_2 and Summer 5_2 Chinook by a minimum of 50% from the 50–60% exploitation rates in the early 2000’s (resulting in an overall exploitation rate in Canada of less than 30% for Fraser River Spring 5_2 Chinook).
- When in Zone 1, distribute the exploitation rate reductions such that the recreational and commercial sectors have a greater overall reduction than First Nations. The proposed measures projected a reduction of 44% to the First Nations FSC exploitation rate (producing an exploitation rate of 20%), a reduction of 73% to the recreational sector (producing an exploitation rate of 4.3%), and a reduction of 77% to the commercial sector (producing an exploitation rate of 2.1%).
- First Nations fishing for FSC purposes will have priority over other uses and will be provided the majority of the available fishery exploitation.

An additional outcome inferred from a comparison of the intended distribution of exploitation rate reductions among sectors is as follows:

- Increase the proportion of the Fraser River Spring 5_2 exploitation rate that is taken by the First Nations FSC fishery.

Implementation of the 2012 RD directive was controversial. As already described, the negative impact on all fisheries was significant and questions remained for First Nations as to whether the management approach met the legal standard for prioritizing FSC access. To further complicate the situation, there was significant uncertainty as to whether the specific targets were achieved because the data available to evaluate harvest impacts is limited, particularly for evaluating whether or not the anticipated allocation of harvest reductions were met. First Nations, whose access to stream-type Chinook continued to be reduced, questioned whether they are unfairly bearing the brunt of conservation. In the absence of stock-specific rebuilding objectives and a comprehensive assessment of fishery impacts on stock rebuilding time, all harvest sectors questioned to what extent fishery reductions are warranted.

In the 2012 RD directive, DFO committed to reviewing the management approach after 5 years of implementation. In 2016, a Terms of Reference document was developed for the review with two phases planned. Phase 1 is a technical review of the available data and evaluation of the resulting harvest impacts in relation to objectives set out in the 2012 RD. This paper presents results of that review completed by a joint technical working group that included biologists from Fraser River First Nation organizations and DFO (for a list of working group members see Section 8). During Phase 2, a consultative process will be used to review and potentially adapt the overall management response and procedures for stream-type Fraser Chinook. The data, analysis, and recommendations presented in this review are intended to assist that decision-making process.

3 BACKGROUND

3.1 STOCK PROFILE

3.1.1 Life History and Stock Structure

Stream-type Fraser Chinook rear in freshwater for one year prior to migrating to offshore ocean areas to feed. Most mature after two to three years in the ocean and then return to the Fraser River during the spring and early summer period to spawn later (Bailey et al. 2001). The 13 stream-type Fraser Chinook conservation units (CUs) are aggregated for harvest management into three SMUs) differentiated by run timing, geographical distribution and life history. These SMUs are referred to as Fraser Spring 4_2 Chinook, Fraser Spring 5_2 Chinook and Fraser Summer 5_2 Chinook. They are also referred to as Fraser Spring 1.2, Chinook, Fraser Spring 1.3 Chinook, and Fraser Summer 1.3 Chinook using an alternate European aging convention. The age labels refer to the dominant age at return for the group, although it should be noted that age of maturation is variable for all groups.

Fraser Spring 4_2 Chinook originate from tributaries throughout the Fraser River system, with many (but not all) originating from the Lower Thompson River (Figure 1). There are 2 CUs associated with the Spring 4_2 SMU: South Thompson-Bessette Creek SU 1.2 and Lower Thompson SP 1.2 CUs (Holtby and Ciruna 2007, Brown et al. in revision[1]). Note that CU naming conventions for Chinook salmon indicate both their dominant age based on the European ageing convention (e.g., 1.2, 1.3) and their dominant run timing (SP = spring, SUM = summer, FA = Fall), where run timing used in the naming of CUs does not always match the dominant run timing used in SMU-level naming. Long-term aggregate spawning abundance averages about 12,000 fish for the Spring 4_2 Chinook SMU (11,448 ± 7,189; Fraser run

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[1] Brown, G., Thiess, M.E., Pestal, G., Holt, C.A and Patten, B. In Revision. Integrated Biological Status Assessments under the Wild Salmon Policy Using Standardized Metrics and Expert Judgement: Southern British Columbia Chinook Salmon (*Oncorhynchus tshawytscha*) Conservation Units. DFO Can. Sci. Advis. Sec. Res. Doc.

reconstruction 1979-2018). Spawning adults are primarily 4-year-olds (mean annual proportion of hatchery fish spawning at age 4 from the Nicola indictor stock between 1995 and 2018 = 88% ±12%) with lower numbers of age 5 (8.5% ±1.1%) and age 3-year-olds (3.6% ±4.5%; Figure 6). Ocean rearing occurs primarily in offshore areas. Return timing of mature fish is from early March through late July with peak migration in June (Candy et al. 2002).

Spring 5_2 Chinook originate from tributaries dispersed across the Fraser River system, including within the mid- and upper Fraser basins, North and South Thompson basins and the Birkenhead system of the Lower Fraser (Figure 1). There are five Conservation Units associated with the aggregate Spring 5_2 SMU, including the Lower Fraser SP 1.3, Middle Fraser-Fraser Canyon SP 1.3, Middle Fraser SP 1.3, Upper Fraser River SP 1.3 and North Thompson SP 1.3 (Holtby and Ciruna 2007, Brown et al. in revision). Long-term aggregate spawning abundance averages about 30,000 fish (29,017 ±13,115; Fraser run reconstruction 1979-2018). While age 5 is the dominant spawning age for most Spring 5_2 Chinook, data on age composition in recent (i.e. last 10) years is limited (Healey 1983). Ocean rearing occurs primarily in offshore areas. Return timing of mature fish is from early March through late July with peak migration in June (Candy et al. 2002).

Summer 5_2 Chinook originate from tributaries dispersed across the Fraser River system, including the mid- Fraser and North and South Thompson basins and the Lower Fraser (Figure 1). There are 6 Conservation Units associated with the Summer 5_2 SMU, including the Lower Fraser-Upper Pitt SU 1.3, Lower Fraser River SU 1.3, Middle Fraser River-Portage FA 1.3, Middle Fraser SU 1.3, South Thompson SU 1.3 and North Thompson SU 1.3 (Holtby and Ciruna 2007, Brown et al. in revision[1]). Long-term aggregate spawning abundance averages about 30,000 fish (29,536 ± 12,227; Fraser run reconstruction 1979-2018). Spawning age for these populations can be variable. While age-5 is the dominant age class on the spawning grounds in most years, age-4 fish can dominate in some years. Between 2010 and 2018, the mean annual proportion of fish spawning at age-5 from the Chilko indicator stock was 56% (± 14%), while the mean proportion spawning at age-4 was 39% (± 13%). Age-3 and age-6 fish were also observed on the spawning grounds at Chilko during these years, but in smaller numbers: age-3 mean = 2% (± 3%); age-6 mean = 3% (± 2%). Ocean rearing is primarily in offshore areas. However, relative to other stream-type Fraser Chinook, more of these fish are intercepted in coastal areas suggesting their return migration route may be different (Candy et al. 2002). Return timing of mature fish is from early March through August with peak migration in July (Candy et al. 2002).

3.1.2 Stock Status

The 2014 Wild Salmon Policy (WSP) integrated status assessment (generally using data up to 2012 return year) classified 7 of the 13 associated conservation units (CUs) as having the poorest status level, “red”, indicating that biological considerations should be the primary driver for management of these CUs (DFO 2016). In 2018, a status assessment by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) classified 7 of the 13 associated designated units as endangered and 4 as threatened based on recent declines in abundance (COSEWIC 2018).

3.1.3 Stock Enhancement

Relative to other areas in BC, hatchery supplementation of stream-type Fraser Chinook stocks is very limited. The Spius Creek Hatchery annually releases about 330,000 and 160,000 Chinook from Fraser Spring 4_2 and Summer 5_2 stocks, respectively (Table 2). The objective of these projects is ‘assessment’ (DFO 2018a). All fish are tagged with CWTs and externally marked with an adipose fin clip.

3.1.4 Harvest Impacts / Marine Distribution

Canadian and US marine fisheries have lower impacts on stream-type Fraser Chinook when compared to far-north migrating Fraser Chinook (i.e., the Fraser Summer 4_1 or Fall 4_1 SMUs) that rear in south-east Alaska and co-migrate with other salmon species south to the Fraser River through coastal areas of BC (Healey 1983, CTC 2018a). Two factors contribute to this difference, which is inferred through historical patterns of CWT recoveries. First, stream-type Fraser Chinook tend to migrate into offshore waters during their first year at sea, meaning that they are not vulnerable to coastal fisheries in Canada or the US until their return migration (Candy et al. 2002). The second factor contributing to lower fishery impacts on stream-type Fraser Chinook compared to other Fraser stocks is that their return migration occurs in the spring and early summer, a period when fishing effort is low, relative to later months. Spring 4_2 and Spring 5_2 Chinook tend to make landfall off the south-west of Vancouver Island starting in early spring, then migrate through the Strait of Juan de Fuca, to the lower Strait of Georgia, and finally, up the Fraser River. However, early timing is less of a mitigating factor for the later migrating Summer 5_2 SMU, whose peak migration occurs in July (Candy et al. 2002).

For the Spring 4_2 SMU, the CWT-derived CYER estimated for the Nicola CWT indicator stock averaged 30% for the historic period (1988-2008; range 11-60%; Table I - 1) and 23% in more recent years (2009-2018; range 10-55%; Table I - 1). Since 2000, 58% of Canadian exploitation occurs in Fraser River First Nation and Fraser River Recreational fisheries, averaging about 43% and 15% of the total exploitation, respectively. Other fisheries that account for a larger portion of the exploitation include recreational fisheries in the Strait of Juan de Fuca approach area (about 12%) and US fisheries in southern waters (about 11%).

For the Spring 5_2 SMU, the CWT-derived CYER estimated for the Dome CWT indicator stock averaged about 46% (1990-2000; range 15-69%; Table I - 2) for the historic period and about 62% from 2000 to 2006 (range 50-75%; Table I-2). The majority (about 70%) of Canadian exploitation in the both periods occurred in Fraser River First Nation and Recreational fisheries, accounting for about 62% and 7% of the total exploitation, respectively. Other fisheries that account for a larger portion of the exploitation include recreational fisheries in the Strait of Juan de Fuca approach area (about 9%) and US fisheries in southern waters (about 9%). Dome Creek was discontinued as a CWT indicator stock after 2006 due to concerns about data quality—sampling rates were low, which means that the ~60% exploitation rates estimated for this stock in its last few years are unreliable. There is currently no CWT indicator stock for the Spring 5_2 SMU.

There are no CWT-derived exploitation rate data for the Summer 5_2 SMU as there is no CWT indicator stock. However, recoveries of fish from various stocks that were CWT tagged in past years show that relatively more fish from this SMU are caught in coastal fisheries, both in southeast Alaska and Canada (Table 3). A coded-wire tagging program has been initiated on the Chilko River in recent years to assess the feasibility of developing a Summer 5_2 CWT indicator stock.

3.2 HARVEST MANAGEMENT FRAMEWORK

Ocean fisheries for coastal BC Chinook are managed under an international coast-wide regime mandated by Chapter 3 of the Canada-US Pacific Salmon Treaty (PST; PSC 2019). Under the PST, Canadian and US fisheries are assigned to one of two management regimes that dictate upper limits on catch or total mortality: Aggregate abundance-based management (AABM) or Individual stock based management (ISBM). AABM fisheries catch Chinook from multiple Canadian and US origin populations, and are collectively managed to total allowable catches (TACs) under a variable harvest rate strategy. ISBM fisheries occur in approach areas, and are managed according to national obligations for CYER on specific stocks. The key difference between AABM and ISBM fisheries is how management objectives and harvest control rules are set (i.e., on an aggregate stock versus individual stock basis). Both fisheries are mixed-stock, although relatively fewer stocks contribute to catch in ISBM areas.

Management in Canadian fisheries is also dictated by requirements to protect domestic stocks of concern, including considerations that may arise through the Wild Salmon Policy (WSP) and the Species at Risk Act (SARA). To meet these requirements, additional management measures are in place. Catch allocations are made according to the Allocation Policy for Pacific Salmon (DFO, 1999), which identifies the general social and economic objectives associated with salmon fisheries. Terminal fishing opportunities targeting specific stocks are provided if harvestable surpluses are identified.

3.2.1 Management Under the Pacific Salmon Treaty

Management Objectives

The overarching biological objective of the PST is to “prevent overfishing and provide for optimum production”. The overarching sociological objective of the PST regime is that each country receives “benefits equivalent to the production of salmon originating in its waters”. The goal of the PST Chinook management regime specifically is to implement fishery management measures that are “appropriate for recovering, sustaining, and protecting Chinook salmon stocks in Canada and US and are responsive to changes in the productivity of Chinook salmon stocks associated with environmental conditions” (PSC 2019, Chapter 3). The objective is to meet maximum sustainable yield (MSY), or other agreed biologically-based numeric escapement or exploitation rate objectives, across stock management units.

Harvest Control Rules

AABM Fisheries

AABM fisheries are managed under a variable harvest rate strategy. The allowable harvest rate on the aggregate abundance of mixed stocks contributing to each AABM fishery increases with an abundance index, or AI, specific to the fishery. For each AI, there is a corresponding harvest rate index that sets the total allowable catch (TAC) set out in ‘Table 1’ of Chapter 3 of the PST (PSC 2019).

ISBM Fisheries

With the renewed 2018 PST, ISBM fisheries are now managed under a fixed exploitation rate strategy for multiple indicator stocks. For stocks that are either not meeting their management objective or do not have a management objective defined, total CYER in ISBM fisheries is limited. Canadian stock specific ISBM limits are set out in Attachment 1 of Chapter 3 of the PST (PSC 2019).

Management Measures (or Tactics)

Controls

For Canadian AABM fisheries (northern British Columbia [NBC] and west coast Vancouver Island [WCVI]) , the primary harvest control is limiting the TAC for participating fisheries. TACs for commercial fisheries are determined after accounting for expected catch in First Nation FSC fisheries and recreational fisheries. Secondary controls, including measures such as size and seasonal limits and gear restrictions, are designed to reduce impacts on juvenile Chinook and stocks of conservation concern, as well as to limit bycatch.

For Canadian ISBM fisheries, harvest impacts are controlled through management measures such as size and seasonal limits, gear restrictions, bag limits, and hatchery-selective fisheries.

Monitoring Requirements

Monitoring and assessment of harvest impacts under the PST relies on a coast-wide CWT program, as outlined in the PST. The objective of the coast-wide CWT program is to generate estimates of marine survival and exploitation rate and marine distribution parameters for indicator stocks that are used to represent all populations within a stock management unit (PSC 2019).

Implementation of PST Chapter 3 requires:

- Estimates of catch and release for all fisheries;
- Estimates of the catch of fish marked with CWTs from Canadian and US indicator stocks from all fisheries;
- Estimates of indicator stock CWT escapement;
- Estimates of escapement for stocks with escapement-based management objectives; and
- Escapement estimates are needed for the standardized set of rivers that comprise the PSC model stock and that represent the stock group. These are two different entities. The model stock includes rivers that are natural and hatchery stocks, whereas the stock group includes rivers that are largely natural origin production.

Evaluation

For AABM fisheries, the calibration of the CTC model completed for the following year, using updated catch and escapement information and CTC's exploitation rate analysis (ERA), is used to evaluate AABM fishery catch levels versus 'post-season' estimates of an abundance index, and the corresponding TAC set out in the Treaty. When an AABM fishery exceeds the post-season catch limit by more than 10% in two consecutive years, the responsible party (i.e. Canada or US) is expected to propose additional management measures to reduce the deviation.

For ISBM fisheries, the CYER for indicator stocks representing SMUs is estimated using a 3-year running average and compared to allowable limits for that stock that are set out in the Treaty. If CYER limits are exceeded by more than 10%, then the responsible party (i.e. Canada or US) is expected to propose additional management measures to reduce the deviation.

Biological objectives of the Treaty are evaluated by monitoring whether specific indicator stocks representing PST stock management units are meeting their management objective (i.e. MSY escapement target, rebuilding exploitation rate, etc.). However, for many Canadian and US SMUs, specific management objectives have not been determined. That is, there are no explicit escapement or rebuilding exploitation rate objectives in place or, at least, objectives that have been agreed upon bilaterally. For stocks which either are not meeting biological objectives or do not have one defined, CYER is limited to levels negotiated in the Treaty.

Currently, there is no provision to further adjust harvest limits in response to overfishing, either AABM TACs or CYERs, outside further negotiation of the Treaty. Similarly, sociological objectives of the PST are not explicitly evaluated outside of the 10-year negotiation process.

3.2.2 Canadian Domestic Management for Stream-type Fraser Chinook

Stream-type Fraser Chinook have been identified as a conservation concern. Therefore additional management measures are in place to meet requirements of the WSP and Salmon Allocation Policy. These management measures are described in the annual Southern BC Integrated Fisheries Management Plan (IFMP; DFO 2018a). Specific controls, such as time and area closures or additional gear restrictions, have evolved over time, are summarized in Appendix B.

Management Objectives

For Fraser Spring 4_2 Chinook, the 2018/19 IFMP identified the management objective as "to conserve these populations by continuing to minimize incidental harvests in Canadian ocean fisheries and to continue fisheries management measures in the Fraser River to limit overall impacts and support rebuilding" (DFO 2018a).

For Fraser Spring 5_2 and Summer 5_2 Chinook, the IFMP objective is "to conserve these populations consistent with the management zones outlined [within the IFMP]" (DFO 2018a).

These management zones, which are described in the subsequent Harvest Control Rule section, are designed to meet the exploitation and allocation objectives identified in the 2012 RD Directive (Appendix A).

In 2018, a further 25% reduction in fishery impacts on stream-type Fraser Chinook was imposed on BC fisheries with the objective to increase prey availability for endangered Southern Resident Killer Whales. Assuming recent year impacts averaging 22% for Fraser Spring 4_2 Chinook (CYER, based on CTC ERA analysis) and expected impacts of 30% of Fraser Spring and Summer 5_2 Chinook (CYER, based on the harvest control rule), this reduction implied desired 2018 CYER limits of 17% and 23% for Fraser Spring 4_2 and the Spring and Summer 5_2 aggregates, respectively.

Harvest Control Rule

For the Fraser Spring 4_2 SMU, management measures are in place to 'minimize' incidental harvest of the stock. However, no specific stock objectives are set for either escapement or exploitation rate and it is unclear how harvest is adjusted for changes in either stock status or impacting fisheries. There is no specific harvest control rule.

For the Spring 5_2 and Summer 5_2 SMUs, the harvest control rule is applied to the combined stock aggregate. The rule is a variable escapement target strategy: allowable harvest increases with increasing aggregate stock abundance relative to three zones. While the delineation of management zones have changed somewhat between 2010 and 2018, the following definitions are taken from the 2018-19 IFMP:

- **Zone 3** (greater than 85,000 terminal return): Manage to meet expected spawner abundance of at least 60,000 spawners in order to promote populations rebuilding towards estimated MSY levels
- **Zone 2** (45,000 to 85,000 terminal return): Manage to an escapement goal of at least 30,000 and up to 60,000 to avoid population declines
- **Zone 1** (below or equal to 45,000 terminal return): Expected spawner abundance will likely be 30,000 or less. Highest level of management restrictions used to maximize escapement

A set of management actions are associated with each zone, with harvest restrictions escalating from Zone 3, through to Zone 1. Fishery restrictions started out in Zone 1 each year and were only moved into a higher zone when in-season estimates of terminal return exceed the required threshold. In-season aggregate stock abundance is assessed using an catch-per-unit-effort (CPUE) index generated from the Albion test fishery.

Management Measures

Controls

Fisheries targeted for management measures to reduce impacts on stream-type Fraser Chinook include the Northern troll (Area F), WCVI troll (Area G), Juan de Fuca recreational, Strait of Georgia recreational, Fraser River recreational, and Fraser River FSC. Management measures include various size and seasonal limits, gear restrictions, bag limits and hatchery-selective fisheries. These measures evolved over time and are summarized in Appendix B. Note that additional regulations, such as annual bag limits and general gear restrictions included in standard conditions of licences, are not summarized in these tables.

Appendix B also explains the rationale for additional measures that have been implemented to reduce impacts on stream-type Fraser Chinook. Management measures were designed using knowledge of stock distribution and migration timing and fishery impacts from multiple sources of information including all CWT recoveries from tagged stocks within the respective stock management units (i.e., not just those from CWT indicator stocks), results of GSI fishery sampling, analysis of historical exploitation patterns, estimates of fishing effort, fishery catchability, relative stock abundance, etc. That is, the information used to design the many different management measures used to achieve the management objective (or, better, harvest control rule when defined) is not the same as that used to set or evaluate the objectives.

Monitoring Requirements

Requirements for evaluation and implementation of the domestic management procedures include:

- Estimates of catch and release for impacting fisheries;
- Estimates of fishing effort for impacting fisheries;
- Estimates of indicator stock CWT catch for impacting fisheries;
- Estimates of indicator stock CWT escapement;
- GSI estimates of catch composition from fisheries impacting stream-type Fraser Chinook; and
- Estimates of aggregate escapement for all Fraser Chinook SMUs.

Evaluation

For Fraser River fisheries, the Fraser Chinook Run Reconstruction model is used annually by DFO to generate stock-specific estimates of total run size returning to the Fraser River and fishery-specific in-river harvest rates (English et al. 2007). The model allows managers to estimate the contribution of different stocks to in-river catch from mixed-stock fisheries, and monitor trends in stock- and sector-specific harvest rates over time.

For marine fisheries, CWT indicator stocks are used to evaluate harvest impacts relative to domestic management objectives; however, there are no current CWT indicator stocks for the Spring 5_2 and Summer 5_2 SMUs. As a result, stock composition estimates derived using GSI methods are often relied on to evaluate potential harvest impacts for these SMUs in marine fisheries.

Escapement monitoring of Chinook salmon spawning sites within the Fraser River is conducted annually. In addition to their use in the CTC's Chinook Model, estimates of site-specific escapement (or, in some cases indices of escapement) are used in the Fraser Chinook Run Reconstruction model, support the development of annual IFMPs, and inform integrated status assessments under the WSP (DFO 2016).

4 DATA SOURCES

Data used in this evaluation include escapement estimates, catch, effort and release data from fisheries; and estimates of catch composition from either from CWT recoveries or DNA sampling for GSI. The assessment also relies on annual estimates of terminal run size that are generated through the Fraser River Chinook run reconstruction model and estimates of CYER for the Spring 4_2 and Spring 5_2 stock management units generated through the CTC ERA.

Comprehensive escapement and fishery data were compiled for the period from 2000 to 2018 for fisheries and periods for which stream-type Fraser Chinook are most vulnerable and/or for which management measures were implemented to target reductions. These fisheries include Northern troll; WCVI troll; WCVI recreational; JDF recreational; Strait of Georgia recreational; Fraser River recreational; Fraser River commercial net; and Fraser River FSC. For reference, all data are described below and tabulated in the Appendices to this paper. Results of the Fraser River Chinook Run Reconstruction and Spring 4_2 and Spring 5_2 ERA analysis are also described and tabulated in Appendices.

Although not all of the data presented in the Appendices are used in our analysis, a significant amount of effort was directed at compiling and tabulating relevant information. These data provide additional perspective when qualifying key sources of uncertainty in the analysis. For example, the degree to which missing fishery samples cause concern is informed by the amount of catch associated with the period. Also, Phase 2 of the management review is intended to use a consultation process to inform potential adaptation of the management procedure. Success of such a process will depend on a common understanding among First Nations and stakeholders of the data available to inform the management procedure and its associated limitations.

Data and/or estimates were either extracted from the following databases or provided to the authors by program leads:

- **FOS -** Fisheries Operating System database;
- **CRES -** Recreational catch reporting and estimation database; and
- **MRP -** Mark-recapture program CWT tag and recovery database.

4.1 ESCAPEMENT ESTIMATES

We use two sources of escapement estimates for two different purposes. The first set is used to drive the Fraser River Chinook Run Reconstruction Model, as described below (Table C - 1). The second set comes from the Chinook Technical Committee's (CTC) Catch and Escapement Report (data up to 2017 are published in CTC, 2018b; 2018 data were provided by Nicole Trouton, DFO, Kamloops, BC, pers. comm.), and was used to summarize SMU-level patterns in escapement when summarising biological status (Table C - 2).

Because the Run Reconstruction data set is intended to represent total escapement from all spawning sites contributing to in-river catch, it includes more streams, and more infilling for year/site combinations for which sampling was not done. Most escapement estimates are derived from visual surveys of spawning grounds made by aerial over-flight, boat, or stream walk (Figure C-1). In these cases, annual escapement estimates are obtained by expanding observed counts of live and/or dead fish using assessment methods such as Peak Count, or in the case of the Nechako system, Area-Under-the-Curve (AUC; Parken et al. 2003; Holt and Cox 2008). A small number of stocks have had more intensive escapement survey programs used in some years, including counting fences, mark-recapture studies, and resistivity counters (Figure C-1). Infilling of missing data was done for combinations of years and stocks without escapement estimates based on the average proportion of the aggregate SMU-level escapement that a given stock accounted for in years with data. A more detailed overview of infilling algorithms in available in English et al. (2007). The relative proportion of infilled escapement estimates is greatest for the Summer 5_2 SMU, followed by the Spring 5_2 SMU, with the number of stocks requiring infilling varying among years (see Table C-3 and Figure C-1). Between 1995 and 2018, the percentage of total Spring 4_2 escapement that was infilled for the Run Reconstruction Model varied from 0-8% among years, while the percentages for the Spring 5_2 and Summer 5_2 SMUs varied from 6-32% and 3-32%, respectively.

In comparison, the CTC series uses a subset of spawning sites within the Fraser River that have been surveyed with relatively consistent methods over time and are thus most appropriate for examining patterns in spawner abundance at the SMU level (for comparison, see Figures C - 2 to C – 4). There are still cases within the CTC data set in which escapement estimates at a given spawning site could not be estimated in a given year, often due to weather restrictions. In these cases, missing estimates were infilled using the English et al. (2007) method (CTC, 2018b). Between 2012 and 2016, infilling of this series was never more than 6% of the total escapement in a given year for Spring 4_2 Chinook and never more than 2% for Spring 5_2 and Summer 5_2 Chinook (Table C - 3). The Run Reconstruction model and CTC escapement series are nearly perfectly correlated, with linear model R^2 values of 1, 0.97, 0.95 for Spring 4_2, Spring 5_2, and Summer 5_2, respectively (Figures C – 2 to C – 4).

A separate escapement database has been developed for the purpose of assessing CU-level trends in escapement to inform integrated status assessments under the Wild Salmon Policy (Brown et al., in revision) as well as assessments by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). We did not use this data set when summarising biological status; instead, we reference the outcomes of these recent status assessments to summarize biological status at the CU-level.

4.1.1 Sources of Uncertainty

- The majority of escapement estimates rely on visual survey methods, which require assumptions about the ability of observers to see fish and the timing of fish presence in the survey area. Variation in these factors, both among years and among surveys within a given year, are key sources of uncertainty in visual survey estimates. Estimates of coefficients of variation (CV) from the literature span the 20-30% range for mark–recapture studies, 30-40% for rigorous visual survey estimates, and up to 70% for visual surveys estimates when counting conditions are poor (Korman and Higgins 1997; Bradford et al. 2005) Uncertainty is especially high for the peak count method, which relies on the assumption that the ratio between the peak count and total escapement is constant among years. The peak count method has been shown to produce imprecise escapement estimates, with expected biases between −14% and +21%, and observed bias up to -51% (Parken et al. 2003). For a summary of escapement enumeration methods, see Figure C-1.
- Infilling of missing escapement data for some stocks in some years further contributes to uncertainty in escapement data sets. A key assumption of infilling is that the proportion of aggregate SMU-level escapement attributed to a single stock is constant among years (see English et al. 2007 for more detail)

4.2 BIOLOGICAL DATA

Evidence of demographic shifts towards shorter generation times and decreased size-at-age have been observed in Alaska (Lewis et al. 2015), as well in Washington and BC CWT stocks (although not specifically for the Nicola River Spring 4_2 indicator stock; DFO 2018b). Such changes are relevant to management decision-making because they change fishery selectivity, and thus, the effectiveness of management measures. For example, maximum size limits for un-marked Chinook salmon are used in Juan de Fuca and Georgia Strait recreational fisheries to reduce harvest on 5-year-old fish from Fraser River Spring 5_2 and Summer 5_2 SMUs. If length-at-age has changed in recent years for these stocks, the proportion of fish from these SMUs subject to retention may increase, making these measures less effective.

To explore potential changes in length-at-age and age composition for early-timed Fraser River Chinook, we summarized available data for a subset of stocks. Data sets were provided by Fraser and Interior Area Stock Assessment (Chuck Parken, DFO, Kamloops, BC, pers. comm; Appendix D). Paired length and age data from spawning fish were available from two stocks from the Summer 5_2 SMU (Chilko River and Nechako River) and the one stock from the Spring 4_2 SMU (Nicola River). Lengths were measured on the spawning grounds as POH (postorbital-hypural length), which is the distance measured from behind the eye to the hypural plate near the start of the tail. Ageing for both Chilko and Nechako River samples was done via scale analysis, while samples from the Nicola River were aged using a combination of scale analysis and CWT recoveries. Ages determined by CWTs are considered more reliable than those estimated from scale analysis, since CWT age is known from tagging date, whereas scale age is prone to aging error (Chuck Parken, DFO, Kamloops, BC pers. comm.). We separated out samples analyzed using these two approaches when presenting results.

Age composition data were available from two of the stocks with available length-at-age data: Nicola River and Chilko River. Age composition was represented as the proportion of fish sampled from the spawning grounds assigned to each total age class. For the Nicola River, patterns are summarized separately for both clipped and unclipped samples. For the Chilko River, only unclipped samples were provided. Ageing for clipped samples, which represent hatchery-produced fish, was determined via CWT. Ageing for unclipped samples, which represent naturally produced spawners, was done via scale analysis. CWT-based ages from clipped samples are assumed to be estimated without error. For Nicola, estimates of proportion-at-age from scale-based data from unclipped samples were corrected for ageing error using a bias-correction matrix calculated using paired samples for which both CWT and scale ages were available (Chuck Parken, DFO, Kamloops, BC pers. comm.).

Age and size data for stream-type Fraser Chinook stock management units are tabulated in Appendix D.

4.2.1 Sources of Uncertainty

- Both length-at-age and age composition data are only available for a limited number of indicator stocks. It is unknown how well these stocks represent broader patterns among all spawning sites.
- Age estimates determined via scale reading for the length-at-age data set have not been corrected for potential biases in scale analysis, (although Nicola estimates for proportions-at-age have been) and are thus expected to contain ageing error.

4.3 FISHERY CATCH, RELEASE, AND EFFORT DATA

4.3.1 Fraser River Test Fisheries

Chinook caught and released in Fraser River test fisheries are tabulated in Table E - 1 for the period from 2009 to 2018.

4.3.2 First Nation

First Nation Fraser River Chinook catch and release statistics are generated through a variety of methods. These methods include fisher-dependent reporting, creel surveys, and fisher-independent monitoring programs. For fisher-dependent cases, catch and release are estimated by summing annual reports submitted as required under communal licence conditions. Creel survey methods involve using combination of effort counts and fisher interviews to collect catch-per-unit-effort (CPUE) data. For these cases, catch and release are estimated from the product of effort and average catch-per-unit-effort. Catch and release from beach seine fisheries are estimated from counts of independent monitors at landing sites. Observations from charter patrols may be used to adjust the overall estimates.

Chinook caught in Fraser River FSC fisheries are tabulated in Table E - 2 for the period from 2009 to 2018. Releases are tabulated in Table E - 3. Chinook caught and released in Fraser River First Nation economic opportunity (EO) fisheries are tabulated in Table E - 4.

Note Chinook caught in marine FSC fisheries are not compiled. However, compared to catch of Chinook in Fraser River FSC fisheries reported catches are generally relatively low (e.g. DFO 2018c).

Sources of uncertainty

- Inaccurate reporting of landed catch may result in imprecise catch estimates. Inaccuracies may be associated with either estimation of catch or misidentification of species.
- Inaccurate reporting of releases may result in imprecise release estimates. Inaccuracies may be associated with either estimation of releases or misidentification of species.
- Incomplete reporting, either intentional or unintentional, will result in estimates of catch and releases that are biased low.
- For fishery openings monitored through creel survey methods, precision depends on the number of effort surveys and creel interviews and variability of effort and CPUE.
- Illegal and unreported fishing activity.

4.3.3 Recreational

Catch, release and fishing effort statistics are generated from annual creel surveys conducted across southern BC and the Fraser River. The creel survey methodology is described in English et al. (2002). Creel surveys combine angler surveys and aerial boat counts to estimate recreational catch, release and effort. Anglers are interviewed at the end of fishing trips to provide both average catch and release by species and average fishing times, while the aerial counts from chartered aircraft capture ‘instantaneous’ snapshots of the number of recreational boats/anglers fishing at the time of the flight. The fishing times obtained through angler interviews are used to generate a daily profile of fishing activity which is used to expand the ‘instantaneous’ aerial counts of boats/anglers fishing to an estimate of the total number of boats/anglers fishing that day. In the most basic sense, the estimate of the number of boats/anglers fishing is multiplied by the average catch by species to estimate the total catch by species on that day. Estimates of daily catch rate are obtained using a stratified random sampling design for angler interviews and aerial counts that attempts to minimize bias. Daily estimates are expanded to generate monthly estimates using stratification by day type (weekday vs. weekend), location (by creel sub-area) and time (monthly and time of the day).

For areas and periods when the creel survey does not operate, information from the voluntary guide logbook program and from the internet recreational survey (iREC) program are used to are either augment and/or adjusted with ancillary information from the voluntary guide logbook and iREC programs. Currently data from the iREC program are only used to augment or adjust creel survey estimates during creel survey periods in the marine area.

Chinook caught and released in Fraser River recreational fisheries are tabulated in Table E - 6 for the period from 2009 to 2018. Chinook catch, release and fishing effort estimates for southern BC marine recreational fisheries for the period from 2000 to 2018 are tabulated in Table F - 1 to F-6. The catch and release estimates tabulated include all Chinook encountered – not just those associated with stream-type Fraser Chinook stocks. These estimates are used in this paper to evaluate recreational harvest impacts on stream-type Fraser Chinook. For Fraser River recreational catches, catch is attributed to stocks using run reconstruction techniques. For southern BC marine recreational fisheries, the portion of catch associated with Fraser River Chinook stocks is estimated from either CWT or GSI sampling.

Initiated in 2012, the iREC program generates catch and effort estimates through a random email survey of license holders (DFO 2015). iREC collects survey data throughout the year and therefore provides information for times and periods when the creel survey or logbook programs do not operate. Apparent sources of bias in the iREC survey design limit their utility pending further development and evaluation of calibration factors (DFO 2015). Therefore, iREC data were not used directly in our analysis of recreational harvest impacts on stream-type Fraser Chinook. However, to understand the potential magnitude of catch and release of Chinook that may be associated with times and periods when the creel survey does not operate, annual iREC estimates of catch and release are compiled in Table F - 7. Table F - 8 summarizes the portion of Chinook catch and release in marine recreational fisheries that occurs outside creel survey periods. These proportions are estimated using iREC data only – i.e. comparing iREC catch and release estimates during periods which the creel survey is operating with un-surveyed periods.

Sources of uncertainty

- Precision depends on the number of effort surveys and creel interviews and variability of effort and CPUE. Reductions in survey effort over the last decade resulted in higher imprecision of recreational catch, release and effort statistics.
- The creel survey does not cover all periods when recreational fisheries are open. Therefore, recreational catch statistics based solely on creel survey periods are biased low. Reductions in survey effort over the last decade resulted in less coverage.
- Inaccurate reporting of landed catch may result in imprecise catch estimates. Inaccuracies may be associated with either intentional misreporting or unintentional misidentification of species.
- Inaccurate reporting of releases may result in imprecise release estimates. Inaccuracies may be associated with either poor angler recall or misidentification of species released.
- Illegal and unreported fishing activity.

4.3.4 Commercial

Commercial catch, release and effort statistics are generated through fisher-dependent logbook reports and adjusted for accuracy through various verification methods. License conditions require all commercial harvesters to report their participation in an opening and the subsequent number of fish caught and released by “hailing out” and then “hailing in” through either the Fishery Operating System (FOS) telephone system or electronic (ELOG) reporting. Commercial harvesters are also required to maintain a paper logbook of fishing activity which is submitted annually for review.

For each licence-gear type, commercial catch and release statistics are estimated by summing individual logbook catch from each harvester as reported through the FOS database. Catch and release estimates are stratified by time (duration of the opening), by area. Effort is estimated by summing individual “start fishing report” from each harvester as reported through the FOS database. Effort estimates are stratified by time (duration of the opening) and by area.

Results of verification activities may be used to adjust the estimates for incomplete or inaccurate reporting. Verification activities include, but are not limited to, dockside monitoring programs, on-board observers, independent effort counts, cross-referencing sales slip data,and data verification. Using this information, catch estimates are corrected by adjusting either the reported average CPUE of participating vessels and/or the total reported effort or catch for the opening.

Chinook caught and released in Fraser River commercial fisheries are tabulated in Table E - 5 for the period from 2009 to 2018. BC marine Chinook commercial catch, release and fishing effort estimates for the period from 2001 to 2018 are tabulated in Appendix G. The catch and release estimates tabulated include all Chinook encountered – i.e. not just those associated with stream-type Fraser Chinook stocks. These estimates are used in this paper to evaluate commercial harvest impacts on stream-type Fraser Chinook.

Sources of uncertainty

- Inaccurate reporting of landed catch may result in imprecise catch estimates. Inaccuracies may be associated with either estimation of catch or misidentification of species.
- Inaccurate reporting of releases may result in imprecise release estimates. Inaccuracies may be associated with either estimation of releases or misidentification of species.
- Incomplete reporting, either intentional or unintentional, will result in estimates of catch and releases that are biased low.
- Illegal and unreported fishing activity.

4.4 CWT RECOVERIES IN CATCH

CWTs with unique stock and brood identification codes are implanted in juvenile salmon and then recovered in catch and escapement as the fish mature via either direct sampling or voluntary recovery programs. Minimally, CWT recovery information in fisheries allows for evaluation of marine distribution patterns for tagged stocks. Operation of the CWT Mark-Recovery program is dependent on coordination with related escapement and catch monitoring programs. For each recovery stratum (for either catch or escapement) sampled, or ‘observed’, tags are expanded to account for the sample rate, or ‘submission rate’ in the case of voluntary recovery programs, to estimate the number of tags from individual stocks associated with the fishery or escapement. The estimated number of tags can be further expanded by the tagging rate to estimate the total number of fish from a tagged stock in the stratum.

CWT recovery data from all tagged releases of Spring 4_2 Chinook from recovery year 1978 onward are tabulated in Table H - 1. CWT recovery data from all tagged releases of Spring 5_2 Chinook from recovery year 1976 onward are tabulated in Table H-2. CWT recovery data from all tagged released releases of Summer 5_2 Chinook from recovery year 1976 onward are tabulated in Table H-3. These tables include recoveries in fisheries of all CWT tagged Chinook from stream-type Fraser Chinook from recovery year 1976 to 2018. With the exception of those CWT recoveries associated with the Nicola Spring 4_2 and Dome Spring 5_2 CWT indicator stocks, these data are not used in our evaluation of harvest impacts. These data were compiled to provide ancillary information about patterns of marine distribution and timing of stream-type Fraser Chinook through fisheries. That is, additional context for assumptions made in our analyses and for future work. Average distribution of marine recoveries by catch location for all three stock management units is summarized in Table 3. Average distribution of marine recoveries by month period for all three stock management units is summarized in Table 4.

4.4.1 Sources of Uncertainty

- Fisheries that are not sampled result in estimates of CWT recoveries that are biased low.
- Fisheries for which sampling rates are very low result in imprecise estimates of CWT recoveries due to sampling variability. Therefore, CWT samples may not represent that landed catch well.
- If the contribution of the CWT indicator stock to the fishery is very low, estimates of CWT recoveries will be imprecise due to sampling variability.
- For voluntary CWT recovery programs in place for recreational fisheries there is a significant level of uncertainty associated with the sample rates. Sample rates are calculated from the observed adipose fin clip rate in the fishery stratum estimated from creel survey data.
- Uncertainty in associated catch and escapement estimates for individual sampling stratum results in uncertainty in the sampling rate and CWT contributions.
- CWT catch samples from landed catch may not represent the stock composition of released catch, either of legal-sized releases when hatchery-selective measures are in place or of sub-legal releases which may be comprised of different fish (e.g. resident ‘feeders').

4.5 CTC EXPLOITATION RATE ANALYSIS (ERA)

The annual CTC exploitation rate analysis (ERA) uses cohort analysis to estimate brood-year specific mortality for 45 indicator stocks from Canada and the US by reconstructing the cohort size and exploitation history using CWT release and recovery data (CTC 1988). Specifically, the analysis provides stock-specific estimates of brood year total mortality rates by age and fishery, as well as estimates of maturation rates, and early marine survival rate indices (age -2 or age-3, depending on life history type). Estimates of CYER and age-3 marine survival rate from the 2019 ERA analysis were provided to us by Gayle Brown (DFO, Pacific Biological Station, pers. com). Estimates from 2016 to 2018 are based on incomplete cohorts that have not been fully observed at all ages, and thus, these values are expected to change as more data becomes available in the next few years (CTC 1988).

CYER estimates from CTC ERA analysis for the Fraser Spring 4_2 (Nicola) and Fraser Spring 5_2 (Dome) CWT indicator stocks are compiled in Table I - 1 and Table I – 2 of Appendix I, respectively. Marine survival rate estimates are tabulated in Table I – 3 and Table I - 4 and displayed for Nicola in Figure 7. Marine survival and exploitation rate estimates produced by the ERA are deterministic; however, methods are available to estimate uncertainty intervals around these estimates (Bernard and Clark 1996). While we did not consider these methods as part of our current analyses, future assessment work using ERA results could explore options for representing uncertainty around these values.

Table I - 5 and Table I - 9 tabulate observed CWT recoveries by fishery stratum for the Fraser Spring 4_2 and Spring 5_2 CWT indicator stocks, respectively. Table I - 6 and Table I - 10 tabulate sample catch sample expansions (1/sample rate) by fishery stratum for the Fraser Spring 4_2 and Spring 5_2 CWT indicator stocks, respectively. Table I - 7 and Table I - 11 tabulate estimated tags by fishery stratum for the Fraser Spring 4_2 and Spring 5_2 CWT indicator stocks, respectively. These are the data used in the CTC ERA analysis. Table I - 13 provides release and drop-off mortality rates used to calculate total mortality estimates using CWT data for the CTC ERA analysis.

CWT sample data are not available for all fishing periods and all years. Therefore, infilling techniques are used to estimate CWT recoveries for un-sampled fishing times and areas. Table I – 8 and Table I – 12 tabulate stratum for which auxiliary data were used to estimate tags for the Fraser Spring 4_2 and Spring 5_2 CWT indicator stocks, respectively. The majority of auxiliary records are for terminal in-river fisheries in the case of the Fraser stocks. Methods used for infilling are not well described in citable sources. Therefore, we identify stratum for which auxiliary data are used but do not describe from year to year the approach used to generate infilled data.

4.5.1 Sources of Uncertainty

- The general uncertainties associated with CWT recoveries and expansions described in the preceding section.
- CWT-based estimates of exploitation rate for a SMU are based on a single indicator stock. Indicator stocks may not adequately represent harvest impacts on non-indicator stocks if there is significant variation in migration timing and abundance among stocks within an SMU.
- CWT-based estimates of marine survival rate for a SMU are based on a single stock. Indicator stocks may not adequately represent marine survival rate on non-indicator stocks if there is significant variation in marine survival rates among populations within a SMU. Moreover, tag loss and/or tagging mortality may result in estimates of marine survival rate that are biased low.
- The Nicola CWT indicator stock is enhanced and CWT tagged fish are adipose fin-clipped. When hatchery mark-selective type management measures are in place, such as in the Juan de Fuca recreational fishery in recent years, CWT estimates of exploitation rate for hatchery indicators are biased high.
- The CTC's exploitation rate analysis makes several assumptions (CTC 1988), which if not met, will increase uncertainty in estimated exploitation rates. These assumptions include:
    - For ocean age-2 and older fish, age-specific natural mortality is assumed constant among years and among stocks.
    - To generate total mortality estimates, encounter rates are modelled for some fisheries using assumptions of relative stock abundance.
    - Maturation rates for incomplete brood years are assumed equal to the stock- and age-specific average of the most recent nine completed brood years.
- Limited tag recoveries in fisheries and spawning escapements is a key source of uncertainty for exploitation rate index (ERI) estimates generated for both Nicola and Dome indicator stocks at the scale of fishery strata used in our analyses. A minimum of 10 observed tags within a sampling stratum (defined by fishery, time period, and age) is recommended to provide a 30% standard error on estimated tags within fishery strata that represent at least 2.5% of the stocks total exploitation rate (PSC Coded Wire Tag Working Group 2008). A sampling rate of 20% is used as a general criterion to ensure the 10 tag minimum is met (Pacific Salmon Commission Coded Wire Tag Working Group 2008). Observed tag recoveries and sampling rates for most BC fisheries generally fall short of these guidelines (e.g. review catch-sample rates in Table I - 7). Within the Fraser River, sampling rates are often < 1%. In JDF recreational fisheries, sampling rates since 2009 have been below 11% in all years but one, and have been less than 5% in four of those years. Observed tags from the Nicola indicator stock have ranged from 1 to 6 per year over this period. Currently, coefficient of variations (CVs) are not reported for the ERA analysis.
- For some fishery stratum for which no or few tags are recovered, imputation methods used to infill tags create a significant source of uncertainty in CWT-based estimates of ERI. The

potential effect is most significant for Fraser River First Nation fisheries and the Juan de Fuca and Strait of Georgia recreational fisheries because these fisheries have the highest relative impacts.

4.6 FRASER RIVER CHINOOK RUN RECONSTRUCTION MODEL

The Fraser River Chinook Run Reconstruction model is used by DFO to generate annual stock-specific estimates of total run size returning to the Fraser River and fishery-specific in-river harvest rates for 84 individual spawning populations, grouped into five stock aggregates, analogous to SMUs (English et al. 2007). The model allows managers to estimate the contribution of different stocks to in-river catch from mixed-stock fisheries. Model inputs include fishery-specific catch data and timing estimates, as well as stock-specific estimates of spawning escapement, the estimated timing of arrival on the spawning groups, and estimated migration rates through different fisheries.

We used datasets used as inputs to the 2018 version of the model as a basis for evaluating harvest impacts on stream-type Fraser River Chinook (folder name = 1979-2018_Run Reconstruction V15_ 06Mar2019 ; Nicole Trouton, DFO, Kamloops, BC, pers. comm.), including time series of escapement for 84 Chinook salmon stocks, stock-specific spawn timing, stock-specific migration timing, and fishery catch and fishing patterns from 23 fishing areas. Appendix J summarizes results from the 2018 version of the Fraser River Chinook Run Reconstruction Model by stock management unit for return years 1979 to 2018.

Input files of fishery catch were updated for the purpose of our analysis to include finer-scale representation of fishery sectors and incorporate incidental fishing mortality (see section 5.2.3 for more detail). Appendix K provides select inputs, including those that we altered for the purposes of this paper. All other Fraser River Chinook Run Reconstruction model datasets, including infilled escapement series, provided as part of the 2018 version were assumed to be correct, and were used as provided.

4.6.1 Sources of Uncertainty

- Several assumptions are made within the Fraser River Chinook Run Reconstruction model (English et al. 2007), which if not met, will increase uncertainty in estimated exploitation rates. These include:
  - The run timing of stocks through fisheries is assumed constant among years. Since run-timing assumptions within the run reconstruction model determine the allocation of harvest impacts among SMUs, bias in assumed parameters or between-year variability due to environmental factors will introduce uncertainty into ERI estimates.
  - All stocks are assumed to have equal vulnerability to in-river fisheries. This assumption may not be appropriate given that fish from the Spring 4_2 SMU are typically smaller than fish returning to the Spring 5_2 and Summer 5_2 SMUs, and the inherent size-selectivity of gillnet gear.
  - Pre-spawn or en-route mortalities are unknown. There is little information on either of these sources of mortality that could be used to assess their magnitude.
- Incorrect or missing escapement, catch, or release data within the datasets associated with the Run Reconstruction Model will cause uncertainty in estimated ERIs. Infilling of missing escapement data are required for some stocks in some years, with rates being highest for the Summer 5_2 SMU. Release datasets are not considered complete, so total in-river mortalities are expected to be underestimated.

4.7 GENETIC STOCK IDENTIFICATION (GSI) CATCH SAMPLES

Genetic stock identification (GSI) uses DNA information to identify the stock of origin of samples, most often taken in mixed-stock fisheries. Baseline tissue samples are collected from individuals within populations and then analyzed using genetic methods to establish unique allelic patterns associated with the population. Once baselines are established, statistical mixture models are used to associate samples with their stocks of origin (Beacham et al. 2012, Beacham et al. 2018). Although samples may be nominally assigned to individual populations, the accuracy of stock composition estimates improves with aggregation – i.e. assignment of fish to larger-scale stock groupings. This result is particularly true when fewer, or less discriminating, genetic markers are used in the mixture model or when baseline sample data for individual populations are limited. The precision of GSI estimates are generally improving as the power of DNA fingerprinting techniques evolve and population baselines are expanded.

All GSI stock composition estimates from samples of Chinook taken from BC marine fisheries are tabulated in Appendix L. Stock composition data from Northern BC Troll and Recreational fisheries, WCVI troll and recreational fisheries and the JDF recreational fishery are used to estimate the proportion of marine Chinook caught and released associated with Fraser Chinook SMUs. GSI sample sizes for several marine fisheries are too small to support adequate statistical performance. Annual stock composition estimates are likely to be biased. These concerns are especially relevant for recreational fisheries that often had sampling rates less than 1.5% for year-month-area strata (Appendix L). Under these circumstances, rare stocks, such as stream-type Fraser Chinook, may not always be detected. Based on the analyses of Allen-Moran et al. (2013), detecting a stock that accounts for only 3% of the catch with a coefficient of variation of <= 30% from a mixed-stock fishery stratum with a total landing size of 10,000, requires a sample size of 265 fish. To maintain a 99% probability of detecting that stock, a minimum sample size of 150 fish is required. These level of landings and stock composition are comparable with WCVI and NBC commercial and recreational fishery patterns for some year-month-area strata, for which our samples sizes are often well below these levels (Appendix L).

Strait of Georgia GSI sampling results were not used in our analyses because samples are collected through the voluntary sampling program and therefore may not be representative of overall catch. Some areas with avid volunteers have much higher sampling rates than areas without volunteers. However, these sampling results are compiled to provide ancillary information about patterns of marine distribution and timing through fisheries (Tables L- 13 to L - 16). In 2018, a direct sampling program was added to the voluntary program to improve sample representativeness.

For the fisheries we did use in analyses, GSI sample data were not available in all years, months, and areas. Therefore, infilling techniques are used to estimate stock composition for un-sampled periods. When infilling, the average stock composition estimated over years with data for each fishery strata was assumed for infilled years. Several fisheries (WCVI troll, WCVI recreational, and T'aaq-wiihak) required infilling in the last three years, 2016-2018. Therefore, stock composition estimates for the latter half of the time series are more uncertain and potentially biased as relative stock abundance in mixed stock fisheries changes from year to year. These methods are described in Appendix M.

GSI sampling is restricted to the creel survey periods, which varied by fishery and are restricted to the periods of highest fishing effort (Appendix L, Appendix M). iREC data show that Chinook catch does occur outside of the creel sampled periods for recreational fisheries (Section 4.3.3;Table 5; Appendix F); however, catch composition estimates for these periods are not available. In the absence of data, we assumed that none of the catch from unsampled periods was attributed to stream-type Fraser Chinook. If stream-type Fraser Chinook were present in fisheries during these shoulder seasons, our catch estimates will be biased low.

Because genetic samples are not routinely collected from released catch, we assumed that for a given fishery, the proportions of fish from each of the stream-type Fraser SMUs in released catch were equal to the proportions observed in landed catch samples.

We used only legal-sized fishery releases (typically < 45 cm) when estimating SMU-level release numbers, thereby assuming that 0% of sub-legal releases were stream-type Fraser Chinook. This assumption is based on offshore marine distribution of these stocks. Juveniles typically migrate to offshore areas during their first year at sea and are not exposed to marine fisheries until their return migration.

4.7.1 Sources of Uncertainty

- Due to limited baseline data, individual stock identification through GSI is much less accurate than aggregate stock associations. However, individual stock assignments were used to estimate the contribution of Spring 5_2 and Summer 5_2 stocks to fisheries separately. These SMUs are typically aggregated in GSI baselines.
- Estimates of stock composition are imprecise for fisheries with low sampling rates due to sampling variability and the low contribution of stream-type Fraser Chinook to the fishery. Furthermore, rare stocks such as stream-type Fraser Chinook, are more likely to be missed when sample rates are low. As a result, annual stock composition estimates are likely to be biased.
- Infilling of stock composition estimates was required for several years with missing GSI data (Appendix M). Several fisheries (WCVI troll, WCVI recreational, and T'aaq-wiihak) required infilling in the last three years, 2016-2018. Therefore, stock composition estimates for the latter half of the time series are more uncertain and potentially biased as relative stock abundance in mixed stock fisheries changes from year to year.
- GSI catch samples may not represent the landed catch. For the JDF recreational fishery, which uses size-selective fishery restrictions, we assume that the proportion of the catch sampled from each size category is in proportion to the total retained catch from each size category.
- GSI catch samples from landed catch does not represent the stock composition of released catch, either of legal-sized releases when hatchery-selective measures are in place or of sub-legal releases which may be comprised of different fish (e.g. resident ‘feeders').
- The potential impact of fisheries on sub-legal sized releases.

5 ANALYSIS AND RESULTS

5.1 BIOLOGICAL STATUS

5.1.1 Methods

We use four different metrics to summarise biological status: (1) examining escapement time series, (2) summarizing WSP and COSEWIC assessment results, (3) looking for evidence of demographic shifts, and (4) looking for evidence of changes in early marine survival rate.

To examine recent changes in aggregate escapement in stream-type Fraser Chinook SMUs, we present annual spawner abundance indices for each of the three stream-type SMUs based on escapement data summarized for the CTC Catch and Escapement Report (CTC, 2019; data were provided by Nicole Trouton, DFO, Kamloops, BC, pers. comm.). This data series uses a subset of spawning sites within the Fraser River that have been surveyed with relatively consistent methods over time and are thus most appropriate for examining trends in spawner abundance at the SMU level. For cases in which escapement estimates at a given spawning site could not be estimated in a given year, often due to weather restrictions, missing estimates were infilled assuming average proportional contribution to the aggregate escapement for missing sites (see English et al. 2007 for more detail).

Finer-scale changes in escapement and biological status are summarized using the outcomes of two comprehensive status assessments that have been completed on these SMUs in recent years. In 2014, an Integrated Status Assessment consistent with the Wild Salmon Policy was completed (DFO 2016). In 2018 COSEWIC assessed the status of all Southern BC Chinook (COSEWIC 2018). We provide summaries of relevant results from these two assessments.

To explore potential changes in size-at-age for early-time Fraser Chinook, we summarize length-at-age of spawning adults using two stocks from the Summer 5_2 SMU (Chilko River and Nechako River) and the one stock from the Spring 4_2 SMU (Nicola River). We plot the median (± 95% quantiles) of sampled lengths from each age class in each year sampled. Data are described in more detail in section 4.2. A minimum of five fish from a given age class in a given year was used as a threshold for inclusion in plots.

Because size limits are used as a management measure to reduce harvest impacts on stream-type Fraser Chinook stocks, temporal changes in the proportion of migrating adults that are above specified size limits are also of interest. For example, maximum size limits for unmarked Chinook salmon are used in Juan de Fuca and Georgia Strait recreational fisheries to reduce harvest on 5-year-old fish from Fraser River Spring 5_2 and Summer 5_2 SMUs. If length-at-age has changed in recent years for these stocks, the proportion of fish from these SMUs subject to retention may increase, making these measures less effective. In order to compare length-at-age to fishery size limits used in the marine environment, we converted POH length measurements taken on the spawning grounds to estimated fork lengths (FL) (distance from the tip of the snout to the end of the middle caudal fin rays) in the marine environment using the following equation (Chuck Parken, DFO, Kamloops, BC, pers. comm.):

$$FL = 1.269 * POH - 3.1812$$

This equation was estimated based on paired POH and fork length measurements taken at the Albion test fishery (approx. 50 km upstream of the Fraser River mouth) in 1981 and 2008 (n= 800 and 841, respectively; R^2 =0.85). We characterize size distributions in the marine environment over time as cumulative distribution functions (CDFs) of size-at-age, and also as the proportion of fish that are above three size thresholds that are often used in fishery regulations for the Juan de Fuca and Strait of Georgia recreational fisheries: 45, 67, and 85 cm.

A limitation of the above size-based analyses is the reliance on only three stocks from which length-at-age data are available from the spawning grounds. A more comprehensive dataset of annual length-at-age measurements from all migrating Fraser Chinook salmon is available from the Albion test fishery near the mouth of the Fraser River. However, since only a small portion of these fish are tagged, samples are not associated with a specific stock or SMU. As a comparison with the analysis described above, we create the same plots for age 4_2 and 5_2 fish sampled at the Albion test fishery for POH length and scale age. While many of the age 4_2 measured at Albion are expected to come from the Spring 4_2 SMU, some proportion will be age 4 fish returning to the Spring and Summer 5_2 SMUs. Similarly, age 5_2 fish will be a mixture of fish from the Spring and Summer 5_2 SMUs, as well as some proportion of 5-year-old fish returning to Spring 4_2 SMU. While we can’t look at SMU-level data using the Albion dataset, these figures will show changes in the approximate size of the mixture of fish encountered by mixed-stock fisheries.

We also present data on age composition of spawning escapement for two stocks: Nicola River (Spring 4_2; data series from 1995-2018) and Chilko River (Summer 5_2; data series from 2010-2018). Age composition is represented as the proportion of fish sampled from the spawning grounds assigned to each total age class. For the Nicola River, age composition is summarized separately for both clipped and unclipped samples. For the Chilko River, only unclipped samples were provided. Additional details on these data are provided in Section 4.2

Finally, we look at patterns in early marine survival rate (smolt to age-3) over time for the Nicola River indicator stock using estimates produced by the CTC's ERA As noted in Section 4.5, marine survival rates produced by the ERA do not include estimates of uncertainty.

5.1.2 Results

At an aggregate level, all three stream-type Fraser Chinook SMUs show depressed escapement in recent years compared to long-term averages and consistent declines over the last three years. Since 2005, the CTC escapement index for the Fraser Spring 4_2 SMU has been below peak levels seen during the 1990s and 2000s, with the exception of a high observation in 2014 (Figure 2). The estimated Spring 4_2 escapement index in 2018 of 2,100 spawners was comparable with previous low points in the series (e.g., 2,173 in 2009 and 2,474 in 2007), and well below the long-term 1995-2018 average index level of 12,954. While the CTC's escapement index for the Spring 5_2 SMU has fluctuated over the available time period, two of the lowest escapements in the series have occurred in the most recent two years (Figure 2). The estimated index in 2018 was 8,482, which was the lowest since 1995 and substantially lower than the 1995-2018 average of 22,547 spawners. Similarly, the CTC escapement index for the Summer 5_2 aggregate in recent years has generally been lower than seen in the first 10 years of the time series, with many recent years (2007,2008, 2011-2013, 2016- 2018) being below the minimum value observed between 1995 and 2006 (19,205 observed in 1999). The escapement index in 2018 of 5,443 spawners was the lowest since 1995, and substantially lower than the 1995-2018 average of 21,819.

At a finer scale, the results of two recent status assessments for Southern BC Chinook show that most WSP CUs or COSEWIC Designatable Units (DUs) are considered to be at low status (Table 1). In 2014, a status assessment consistent with the Wild Salmon Policy identified 7 stream-type Fraser River CUs as being at red status (i.e., the poorest status level), 1 with red/amber status, 1 with amber status, and 4 with insufficient data to assess. None of the stream-type Fraser CUs were assessed as having green status (i.e., the highest status level). More recently in 2018, COSEWIC assessed 12 DUs of naturally spawning stream-type Fraser Chinook, of which 7 were assessed as Endangered, 4 were assessed as Threatened, and 1 was assessed as Special Concern.

Recent declines in length-at-age for 4-, 5-, and 6-year-old fish from the Chilko stock are apparent since 2014; however, the available time series is too short and patchy over the 1970-2018 time frame to indicate whether these declines are outside the natural range of variability for this stock (Figure 3). Median sampled lengths for age-4 and age-5 fish in 2017 are at levels similar to those measured in 1980. Median sampled lengths for age-6 fish between 2015 and 2017 are lower than those previously observed for this age class.

Nechako shows a relatively stable pattern in length-at-age for age-4, -5, and -6 fish between 1977 and 2010 based on visual inspection of data (Figure 3). Data for this stock are not available past 2010, so recent changes in length cannot be evaluated.

The Nicola Spring 4_2 stock shows a gradual decline in the length of age-4 fish in recent years when scale samples are used to measure age (e.g., 2009-2017). Prior to this period, Nicola scale samples showed a general pattern of increasing length for age-4 fish between the late-1990's and 2009. Current lengths of age-4 samples in 2017 are consistent with the previous low point of the series in the late-1990's. Years with scale samples of age-5 fish are relatively infrequent; however, samples from the most recent year, 2015, are also consistent with the low point of the series in the late 1990's. When CWT recoveries were used to measure age instead of scale samples, the length-at-age of sampled fish was relatively stable over the available time period of 1997 – 2017. In the case of the latter, all samples are from hatchery-reared fish.

Comparison of length-at-age samples (converted to fork length) from the spawning grounds using CDFs shows a decreasing pattern in length-at-age for both Summer 5_2 and Spring 4_2 SMUs in recent years (Figure 4). CDFs are positioned further left in recent years, meaning a higher proportion of fish are smaller. As a result, the proportions of fish vulnerable to retention at maximum size limits of 67 and 85 cm are predicted to have increased in recent years. When looking for the same curves using the Albion length data, we see similar results for age-5_2 fish, but not for 4_2's (Figure 5). A decreasing pattern in the proportion of age-5_2 fish reaching 85cm is also apparent from a visual inspection of the Albion data.

While estimates of the proportion of fish returning by age class varied over time for the Nicola Spring 4_2 stock and the Chilko Summer 5_2 stock, no consistent, long-term changes are apparent from a visual inspection of the data (Figure 6).

Marine survival rates for the Nicola Spring 4_2 indicator stock have remained consistently low since the 2000 brood year when compared to peak levels estimated for 1989-1990 and 1995-1999 brood years (Figure 7). The estimated early marine survival rate from the 2015 brood year, which is the most recent estimate available, is 0.65%. This level is much lower than the peak levels of 6 – 8% estimated for some brood years in the 1990s.

Based on the indicators assessed above, there is evidence of poor status across the three stream-type SMUs. Depressed escapement levels reported here at the SMU level, combined with conservation concerns reported at the DU/CU level in recent COSEWIC and WSP assessments, indicate poor status in recent years. While evidence of demographic shifts are apparent for some populations, further research is required to assess trends over time. Early marine survival rate has been significantly lower in the period since 2000, which has likely contributed to depressed escapement levels.

5.2 ESTIMATION OF HARVEST IMPACTS

5.2.1 Definition of Exploitation Rate Index

The impact of salmon fisheries is quantified as the exploitation rate experienced by the defined population. Total mortality exploitation rates are defined as the total proportion of the population that is killed by fisheries, either through retained catch or incidental mortality in which fish die as a result of fishing encounters (e.g. release mortality, gear "drop-offs"; see Patterson et al., 2017a for a comprehensive review). The total size of a stock is estimated by summing escapement (i.e. fish that have escaped fisheries and returned to their natal river to spawn) and catch of that population across all fisheries. Chinook mature at multiple ages. As a result, exploitation rates and stock size may be estimated for either brood year or calendar year. In the former case, catch and escapement from a single brood year are summed across multiple return years. In the latter case, catch and escapement summed from a single return year includes fish from multiple brood years. In this review, we present calendar year (or annual) exploitation rate indices to be consistent with the original harvest reduction objectives outlined in the 2012 RD directive, which focused on annual fishery management actions in response to anticipated total return abundance in a given year.

Because most salmon fisheries are 'mixed-stock' (harvesting more than one population simultaneously), catch needs to be associated with specific populations to estimate stock-specific exploitation rates. Generally two approaches are used to estimate the proportion of a single stock in catch: (i) empirically-based approaches that use tagging studies or genetic sampling to identify the populations that are present in the catch and (ii) run reconstruction approaches that model run timing and vulnerability assumptions to estimate stock-specific catch. We use information derived from both of these approaches to estimate harvest impacts on stream-type Fraser Chinook. First, we use recoveries of coded-wire tags (CWTs) from two indicator stocks, Nicola River (Spring 4_2 SMU; 1995 - 2018) and Dome Creek (Spring 5_2 SMU; 1995 – 1998; 2001-2003; 2005) to develop empirically-based exploitation rate indices. Second, we combined the existing Fraser River Chinook Run Reconstruction Model (English et al. 2007), which estimates total returns to the Fraser and annual harvest rates by SMU for in-river fisheries, with SMU-specific catch estimates for marine fisheries obtained using GSI (Figure 8).

Both methods have inherent shortcomings and limitations, largely because of uncertainty associated with limited or deficient sample data. For example, in many years, estimated CWT recoveries in Fraser River First Nation fisheries have been imputed because the fishery was not directly sampled (Appendix E). Similarly, not all marine fisheries have been sampled for DNA in all year, so infilling is required (Appendix M). Furthermore, GSI sample sizes are often too small to determine the presence of rare stocks, such as upriver Fraser Chinook, with certainty.

We used an annual exploitation rate index (ERI) to characterize recent harvest impacts from key Canadian fisheries intercepting stream-type Fraser Chinook on each of the three stream-type Fraser SMUs:

Eq. 1
$$ERI_{y,s,f} = \frac{C_{y,s,f}}{E_{y,s}+\sum_{f}^{\mathrm{F}} C_{y,s,f}}$$

where, $ERI_{y,s,f}$ is the annual index of exploitation rate for fishery *f* on SMU *s* in year *y*, $E_{y,s}$ is the total escapement of fish from all age classes to SMU *s* in year *y* and $\sum_{f}^{\mathrm{F}} C_{y,s,f}$ is the total catch of fish from SMU *s* in year *y* summed over all *F* fisheries included in the index.

The following 11 fisheries are included in the ERIs developed using both CWT-based and RR-based methods: Fraser River FSC, Fraser River Recreational, Fraser River commercial fisheries from the in-river portion of Area 29, Fraser First Nations economic opportunity (EO) fishery, Fraser test fisheries (including Whonnock, Cottonwood, Albion, and Qualark), WCVI AABM recreational fishery, WCVI commercial troll fisheries (Area G), Juan de Fuca recreational fisheries, Northern BC recreational fisheries, Northern BC commercial troll fishery (Area F), T'aaq-wiihak EO commercial troll fishery.

Although stream-type Fraser Chinook are intercepted in other fisheries (e.g. US fisheries, Strait of Georgia and Johnstone Strait recreational fisheries) these impacts were not represented in this analysis due to a lack of GSI estimates that could be used to assign stock composition when using the Run Reconstruction approach. As a result, the ERIs we develop are known to underestimate total exploitation rates. Impacts from excluded fisheries have been relatively small in the past. US fisheries have been estimated to account for, on average, less than 3% of the total fishing mortality on Fraser River Spring 4_2 Chinook between 2009 and 2016, and only 0.2% of the total fishing mortality on Spring 5_2 Chinook for the final years (1999-2006) of the Dome Creek indicator stock program (CTC 2018b). Similarly, the Strait of Georgia recreational fishery was estimated to account for 1.1% of the total fishing mortality on the Spring 5_2 SMU based on Dome Creek CWT analyses presented in the 2012 RD directive (for years 2000-2003, 2005, 2006). The exploitation rate indices we present thus represent trends in harvest impacts attributable to what are believed to be the highest impact Canadian fisheries.

5.2.2 CWT-based Approach

We used estimates of ‘expanded CWT recoveries’ that represent total mortality from the CTC’s ERA (CTC 1988) to develop calendar-year ERIs specific to our indexed fisheries for both Nicola and Dome Creek indicator stocks using Equation 1. Expanded recoveries are estimated values in which samples of observed recoveries have been expanded for the fraction of the total catch in a year-age-fishery stratum that was sampled, as well as for the fraction of untagged fish associated to a CWT release group (Johnson 2004).

Because we used total mortality estimates from the CTC’s ERA analysis as a basis for calculating CWT-based ERIs, an understanding of how the ERA represents incidental mortality is required to interpret our results. We provide an overview of the methods used to calculate incidental mortality in the ERA here, and refer readers to additional literature for more detail.

Incidental mortality, as represented in the ERA, includes mortality of legal-size and sublegal-size fish in both Chinook retention and Chinook non-retention fisheries. Legal and sublegal fishery-specific mortality rates are applied to four types of Chinook salmon encounters: (i) sub-legal releases from Chinook retention fisheries, (ii) sub-legal releases from Chinook non-retention fisheries, (iii) legal releases from Chinook non-retention fisheries, and (iv) drop-off (sub-legal and legal fish that are encountered, but lost from gear before reaching the boat). Age-specific Chinook encounters associated with all four mortality types are calculated from historical observations of CWTs estimated in each ERA fishery. Fishery, year and age-specific proportion non-vulnerable (PNV) factors are used to calculate the number of encounters. The PNV factors are calculated using the minimum legal size of retention in a fishery applied to an assumed normal distribution of historical records of observed lengths of tagged Chinook at each age caught in the fishery. The PNV factors are fixed parameter values in the ERA which change only when the minimum size limit changes for a fishery.

Calculation of release mortalities of sublegal and legal-sized releases from age-specific encounters is done using fishery-and size-specific incidental mortality rates. The catch of tagged fish at the youngest age for a stock (i.e., total age 3 for stream-type stocks) is typically low or sporadic even though fish at the youngest age are encountered and will suffer mortality. The sporadic occurrence of tagged fish is a consequence of both the low vulnerability of fish at the youngest age and the CWT sampling process. To address this situation, the ERA calculation algorithm uses the catch of tagged fish at the subsequent age if the catch at the youngest age is 0. While fishery-specific incidental mortality rates used in the CTC’s Chinook Model are available in published PSC technical committee reports (e.g., Appendix F of CTC 2018c), incidental mortality rates for the finer scale of fisheries represented in the CTC’s ERA model are not currently available from published sources (i.e., the CTC Model fisheries consist of groupings of the ERA fisheries). The PNV values for ERA fisheries are readily available upon request to the CTC (Gayle Brown, Fisheries and Ocean Canada, Nanaimo, BC, pers. comm).

A number of different methods are available for calculation of release mortalities in Chinook non-retention (CNR) fisheries with the choice of method dependent on type of data available (estimates of legal and sub-legal size Chinook released in the CNR periods, a measure of effort in the retention and CNR periods, etc). A fishery, stock and age-specific catchability coefficient is also required for CNR fisheries that operate in an annual period with no retention component. We refer readers to relevant CTC technical reports for a description of the methods used to estimate encounters and release mortalities (CTC 2004, CTC 2018b).

CWT-based ERIs were calculated for the Nicola River Spring 4_2 indicator stock using available data from 1995 to 2018. CWT-based ERIs were also calculated for the Spring 5_2 Dome Creek indicator stock; however, estimates for this stock were limited to years with available data: 1995-1998, 2001-2003, and 2005.

5.2.3 Run Reconstruction Model-based Approach

In the run reconstruction (RR) approach to estimating exploitation rates, SMU-level estimates of in-river catch and escapement generated using a variant of the Fraser River Chinook Run Reconstruction model are combined with GSI estimates of SMU-level catch from marine fisheries to create exploitation rate indices using this slightly revised version of Equation 1:

Eq. 1 – rearranged
$$ERI_{y,s,f} = \frac{C_{y,s,f}}{\left(E_{y,s} + \sum_{f}^{F^F} C_{y,s,f} + \sum_{f}^{F^M} C_{y,s,f}\right)}$$

where, the $\sum_{f}^{\mathrm{F}} C_{y,s,f}$ term from Equation 1 has been explicitly divided into two components: $\left(\sum_{f}^{\mathrm{F^F}} C_{y,s,f}\right)$ and $\left(\sum_{f}^{\mathrm{F^M}} C_{y,s,f}\right)$. The first of these represents the sum of catches from SMU s in $\mathrm{F^F}$ in-river (Fraser) fisheries, as estimated by the Run Reconstruction model. The second component represents the sum of catches from SMU s in $\mathrm{F^M}$ marine fisheries generated using GSI estimates of catch (Appendix M). A schematic of this estimation scheme is shown in Figure 8.

The current version of the Fraser River Chinook Run Reconstruction Model represents 84 Chinook salmon stocks that move upstream through 23 fishing areas. Within each area, fishery catch is divided among multiple fishery types (e.g., First Nations, Recreational, Commercial) so that in-river harvest rates specific to each fishery type, fishing area, and stock can be calculated. An earlier version of this model which contained 61 stocks and 21 fisheries was described by English et al. (2007). While the number of stocks and fisheries has been updated since 2007 to allow for a more detailed representation of the Fraser system, the model structure and equations remain unchanged.

The current version of the Fraser River Chinook Run Reconstruction Model is maintained as a Visual Basic (VB) program. The 2018 VB version (Nicole Trouton, DFO, Kamloops, BC, pers. comm.) was transcribed into the software language R for our current analyses, and is available from author Kendra Holt. Subsequent changes to the 2018 Fraser River Chinook Run Reconstruction Model that were made for the purpose of this review work were implemented using the translated R version (from here referred to as the RR Model). These changes are as follows:

1. We expanded the list of fishery types from three to five in order to explicitly separate out harvest impacts owing to test fisheries, First Nations Economic Opportunity fisheries, and the in-river components of Area 29 commercial fisheries. Previously, all of these fisheries were classified as commercial fisheries (Table 6).
2. Release mortality and drop-off mortality from in-river fisheries was incorporated into exploitation rate estimates.
3. In the Fraser River Chinook Run Reconstruction Model catches are entered as a weekly total, then distributed across days for which the fishery was open. Weekly start dates for upper Fraser fisheries were changed from Sunday to Monday because in the most recent model formulation there was a mismatch between model formulation and data input that resulted in catches being removed from the model one week later. Starting the fishery on Monday is likely a better approximation of the true timing (Jamie Scroggie, DFO, Kamloops, BC, pers. comm.).

4. The model was modified to allow for sensitivity analyses by allowing for changes in various inputs, as well as to be run as a Monte-Carlo simulation, where various inputs are randomly drawn from probability distributions.

Multiple gear types can be used within a single in-river fishery type listed in Table 6, which meant that applying gear-specific release mortality and drop-off rates required catch and release data to be further delineated by gear type. For lower Fraser fisheries (river mouth – Sawmill), resource management biologists provided detailed catch and release data, consistent with those data used in the most recent Fraser River Chinook Run Reconstruction model types, but with all gear types provided for each fishing event (provided by Karen Burnett, DFO, Delta, BC, pers. comm.). For upper Fraser fisheries (upstream of Sawmill), gear-specific data consistent with Fraser River Chinook Run Reconstruction inputs were not made available to us in time for this report. Instead, area-by-area rules were used to assign releases to gear type (Jamie Scroggie, DFO, Kamloops, BC, pers. comm.).

Release mortality and drop-off mortality values for our base analysis, which are shown in Table 7, were taken from two CTC reports that compiled relevant published estimates (CTC 1997, 2004). Note that these values differ from those used as inputs to the CTC's ERA analysis (Table I - 15). The rationale for mortality and drop-off rates used for each sector in our base case is provided in Table K - 3. We split Fraser River releases into 5 gear categories when specifying release and drop-off mortality rates: Gillnet (includes drift net, set net, tangle-tooth), Purse Seine, Beach Seine, and Fishwheel/Dip net, and Hook and Line (Table 7). For both in-river and marine recreational fisheries, we assume hook and line gear was used. Note that First Nations tributary fisheries are included in Table K-3 even though the current Fraser River Chinook Run Reconstruction model dataset doesn't contain any non-zero release values. It should be noted that the release and drop-off mortality rates here do not generally account for all types of fishery-related incidental mortality (FRIM) (see Patterson et al. 2017a & 2017b), and therefore may underestimate the impacts of FRIM. Accounting for all types of FRIM (including delayed mortality, increased predations, etc.) would have required a significant collection of data and expert elicitation across all fisheries represented in this analysis, which was an exercise outside the scope of this review.

5.2.4 Results

SMU-level ERIs

At the SMU level, ERIs estimated for the Spring 4_2 SMU using the RR approach are typically higher than those obtained using the CWT approach for the Nicola indicator stock, despite the same fisheries being indexed (Figure 9, Figure 10). The higher ERIs produced by the RR approach may be attributable to negative bias in escapement estimates used within the RR model. Several spawning sites within the Spring 4_2 SMU rely on Peak Count methods to estimate escapement, which are known to be negatively biased. In comparison, escapement estimates for the Spring 4_2 Nicola River CWT indicator stock are unbiased. There are some years however in which the CWT-based and RR-based ERIs are very similar (2009, 2012, 2016). These years have some of the highest ERIs in the time series; this pattern suggests that the two methods tend to perform similarly when harvest impacts are high but diverge when impacts are lower. An exception to this pattern in 2018, which had relatively high impacts but different magnitudes of ERI. A linear model fit to the two ERIs had an R^2 value of 0.59, indicating a linear model explained 59% of the variation in the two data sets (Figure 10).

When harvest impacts are characterized using the RR approach, ERIs for the Spring 4_2 SMU are relatively stable between 2012 and 2017, with values during this period being lower than 2009-2011. In contrast, the CWT-based approach resulted in more variable ERIs. CWT-based ERIs peaked between 2005 and 2009 before decreasing to lower, but more variable levels compared to the RR-based ERIs, between 2010 and 2017. Both CWT- and RR-based ERIs showed an increase in harvest impacts in 2018 compared to 2017. This increase in ERIs in 2018 corresponds with very low 2018 escapement inputs to the RR model (Appendix C).

For the Spring 5_2 SMU, there is no temporal overlap in ERIs estimated using the RR approach and the CWT approach. CWT-based ERIs show a general increase between 1995 and 2005; albeit with patchy coverage (Figure 9). The RR-based estimates, which extend from 2009 to 2018 show a lower and more stable pattern. A slight increase in ERI is apparent for the Spring 5_2 SMU in 2018 compared to earlier years; however, this increase is smaller than that seen for Spring 4_2 Chinook.

The lack of a CWT indicator program for the Summer 5_2 SMU means that the only available information on harvest impacts comes from the RR-based ERI between 2009 and 2018. ERIs for this SMU between 2013 and 2017 were generally lower than those experienced between 2009 and 2012 (with the exception of 2010); however, the calculated ERI shows a sharp increase in 2018 (Figure 9). As with the Spring 4_2 SMU, this pattern is driven by very low escapement inputs to the RR model for this SMU in 2018.

Fishery- and Sector-specific ERIs

ERI values calculated using the RR approach are provided by fishery for all three stream-type Fraser Chinook SMUs in Table 8 – Table 10, while ERI values by fishery obtained using the CWT-based approach for the Nicola indicator stock (Spring 4_2 Chinook) are provided in Table 11. ERI values by fishing sector (e.g., First Nations, recreational, commercial, test fisheries) calculated using the RR approach are provided by fishery for all three stream-type Fraser Chinook SMUs in Table 12.

Harvest impacts on Fraser Spring 4_2 Chinook attributable to Fraser River FSC fisheries, as characterized using the RR approach to estimating ERIs, show a mostly declining pattern between 2009 and 2013, followed by a relatively stable period between 2013 and 2017 (Figure 11). A large increase is estimated for 2018 to a level comparable with 2009. In comparison to FSC, all other Fraser River fisheries have had relatively small harvest impacts. Harvest impacts on Fraser Spring 4_2 Chinook attributable to Fraser recreational fisheries showed an initial decline between 2009 and 2010 using the RR-based ERI, followed by a stabilization at around 0.1%. There were no estimated harvest impacts of Fraser River Area 29 commercial fisheries on Spring 4_2 Chinook between 2009 and 2017, while harvest impacts from Fraser EO and Test fisheries were low. Harvest impacts on Fraser Spring 4_2 Chinook attributable to Juan de Fuca recreational fisheries showed an initial decline between 2009 and 2010, followed by a stabilization at low levels after that. All other marine fisheries showed variable harvest impacts on Spring 4_2 Chinook over time.

In-river CWT tag recoveries summarized for the CTC's ERA analysis did not support breaking down Fraser River net fisheries into the finer-scale fishery groupings used in our RR analysis (e.g., FSC, EO, Test). As a result, we can only compare Spring 4_2 RR- and CWT-based ERIs for Fraser Net fisheries as a whole. First Nations FSC fisheries are the major contributor to the "Fraser Net" grouping. While RR-based ERIs are higher than CWT-based ERIs for Spring 4_2 Chinook, patterns in ERIs are similar for the two approaches at this scale (Figure 12). A major discrepancy between RR-based and CWT-based ERIs for Fraser recreational fisheries is apparent in 2009, with the CWT-based estimates several orders of magnitude higher than the RR-based estimates (Figure 12). A comparison of Spring 4_2 RR-based and CWT-based ERIs for marine fisheries showed variable concurrence. The two approaches produced similar ERIs for the JDF recreational fishery in most years, with the exception of 2016 and 2018. While the magnitude of impacts were between the two approaches were similar for other fisheries, annual patterns of increases or decreases did not always line up (e.g., WCVI recreational, NBC troll; Figure 12).

Harvest impacts on Spring 5_2 Chinook from Fraser in-river fisheries showed similar patterns to Spring 4_2 Chinook (Figure 13). This result is likely a function of their assumed overlap in run timing through the Fraser River within the Fraser Run Reconstruction Model, which means that catch from a given river stratum in a given week would be consistently split among these two SMUs. The highest impact fishery on Spring 5_2 Chinook is Fraser FSC, which shows mostly declining pattern between 2009 and 2013, followed by a relatively stable level between 2013 and 2017, and then a large increase in 2018 (Figure 13). Harvest impacts from marine fisheries on Spring 5_2 Chinook have been relatively stable, including Juan de Fuca recreational (withstanding an initial decrease between 2009 and 2010) and Northern BC recreational. A period of increasing harvest impacts are estimated for Northern BC Troll and WCVI Commercial Troll leading up to 2017, followed by a decrease in both fisheries in 2018.

Harvest impacts on Fraser Summer 5_2 Chinook attributable to Fraser River FSC and Fraser River Recreational fisheries show recent declines (Figure 14). Most other fisheries show variable harvest impacts over time with no apparent trends, with the exception of the JDF recreational fishery which shows a variable but increasing pattern in recent years.

5.3 EVALUATION OF MANAGEMENT OUTCOMES

While CWT-based estimates of exploitation rates for the Spring 5_2 Dome Creek indicator stock are not available past 2006, the 2012 RD directive referenced fishery-specific 2010 exploitation rates that were estimated by adjusting 2002-2006 exploitation rates to account for management actions that had occurred between 2006 and 2010 (Appendix A). These 2010 estimates were then used as a basis for projecting anticipated 2012+ harvest reductions under the proposed management approach.

Management performance relative to objectives described in the 2012 RD directive are summarized as follows, where “Zone 1 years” are those in which the combined Spring 5_2 and Summer 5_2 return abundance to the Fraser River was expected to be less than 30,000 fish (see section 3.2.2).

Objective 1: *When in Zone 1, reduce exploitation rates on Fraser River Spring 5_2 and Summer 5_2 Chinook by a minimum of 50% from the 50–60% exploitation rates in the early 2000’s (resulting in an overall exploitation rate of less than 30% for Fraser River Spring 5_2 Chinook).*

We are not able to directly measure performance relative to this objective because we do not have total ER estimates for these SMUs in recent years or a consistent index of ERs covering 2000-2017. Instead, we attempt to inform discussions on expected performance related to this objective in two ways.

First, we look at the difference between CWT-based estimates of Total ER versus ERIs for years with CWT indicator data, and suggest a range of plausible Total ER values for recent zone 1 years based on this difference. An analysis of ERA outputs for the Dome Creek CWT indicator stock, which was used as an indicator of Fraser Spring 5_2 Chinook for the years 1995-1998, 2001-2003, and 2005, shows that the fisheries included in our ERI accounted for, on average, 97.4 % (range = 92.8 – 100%) of the Total ER for Dome Creek over this time period. Expanding our estimated average Zone 1 ERI values from the RR analysis by the resulting 2.6% of the ER that is not indexed gives an approximation of the total exploitation rate experienced by Spring 5_2 stocks in recent Zone 1 years. A key assumption of this approximation is that the relative magnitude of harvest impacts from non-indexed fisheries has remained constant between 1995 and 2017. Based on an average Zone 1 ERI of 22.6% for Spring 5_2 (Table 14) the approximated Zone 1 Total ER for this SMU based on the 2.6% expansion factor is 23.2 %. In the absence of a historical CWT indicator for the Fraser River Summer 5_2 Chinook SMU, Dome Creek has been used as an indicator for this stock as well (e.g., in the 2012 RD directive). If Dome Creek is also assumed to be an indicator for the Fraser Chinook Summer 5_2 and the 2.6% expansion factor is applied to the average Zone 1 ERI of 23.9% (Table 15), the approximated Zone 1 Total ER would be 24.5% for this SMU.

An alternative estimate of the difference between Total ER and our ERI can be derived using ERA outputs for the Nicola River CWT indicator stock which has a time series covering 1995 - 2017. While this indicator is intended to represent the Fraser River Spring 4_2 Chinook SMU, it has an advantage over Dome Creek because it allows a comparison on Total ER to ERI in recent years that have been managed using Zone management. Looking exclusively at Zone 1 years (i.e., 2013, 2016, 2017), the ERI accounts for 75.1% (range = 57.4 – 87.9%) of the Total ERI for Nicola. Using the same approach to expansion as was done for Dome Creek above, the approximated Zone 1 Total ER for Fraser River Spring 5_2 Chinook would be 30.1 % when applying the Nicola expansion, while that of Fraser River Summer 5_2 Chinook would be 31.8%.

A second approach to looking at performance relative to this objective is to compare RR-based ERIs from 2010 with those seen for recent Zone 1 years. While reduction targets in the 2012 RD directive were set relative to a base period in the early 2000s, Table 1 from the letter provides an estimate of total exploitation rate in 2010. As a result, we are able to infer the necessary reduction in exploitation rates from 2010 levels that would be required to meet the specified reduction targets for Zone 1 years. For example, while the target reduction was 'at least' 50% from based period levels of 64%, the 2010 ER was predicted to be already reduced to 54%. As a result, reaching the projected Zone 1 ER of 29.8% required a further 44% reduction. The results of this analysis are shown in Table 13 - Table 15 for each of the three SMUs, as well as in Table 16 where inferred reductions in ER for Spring 5_2 and Summer 5_2 SMUs are compared against realized reductions. Note that when measuring ERI for 2010, we use a three-year window centred on 2010 (2009 – 2010). A three-year window was used rather than the 2010 estimate on its own due to high inter-annual variability in ERI estimates, especially at the sector-specific level that is used for Management Objectives 2-3. The 2009-2011 window was expected to give us a more stable estimate of harvest impacts prior to the implementation of the 2012 RD Directive.

The ERI for Spring 5_2 Chinook in recent Zone 1 years (2013, 2016, 2017) was, on average, 24.0% lower than the 2009 – 2011 average. The ERI for Summer 5_2 Chinook in Zone 1 years was, on average, 11.4% lower than the 2009 – 2011 average. These values are less than the 44% reduction objective relative to 2010 inferred from the 2012 RD directive.

Based on the above analyses, we conclude that for Spring 5_2 and Summer 5_2 SMUs 1) exploitation rates from our indexed Canadian fisheries in recent Zone 1 years are lower than the rates experienced by these SMUs prior to 2012; however, realized reductions were smaller than targeted reductions, and 2) Total ERs on both SMUs are likely less than or equal to 30%. The ability of the total ER < 30% objective to be met despite the 50% percent reduction target not being met suggests that exploitation rates represented by our expanded RR model approach would be less than those obtained using the CWT-based approach for Dome.

***Objective 2**: When in Zone 1, distribute the exploitation rate reductions such that the recreational and commercial sectors have a greater overall reduction than First Nations. The proposed measures projected a reduction of 44% to the First Nations FSC exploitation rate (producing an exploitation rate of 20%), a reduction of 73% to the recreational sector (producing an exploitation rate of 4.3%), and a reduction of 77% to the commercial sector (producing an exploitation rate of 2.1%).*

As with Objective 1, we are not able to directly measure performance relative to this objective because we do not have current total ER estimates for these SMUs or a consistent index of ERs covering 2000-2017. Instead, we use the approach described for Objective 1 in which we infer sector-specific reductions relative to 2010 that would be required to reach sector-specific projected ERs. We then compare sector-specific RR-based ERIs from recent Zone 1 years (2013, 2016, 2017) with reduction targets relative to 2010 that we infer from the 2012 RD directive (Table 16).

Note that the fishery-specific estimates of 2010 exploitation rates from the RD directive, which we use as a basis for comparison, often differed from the 2009-2011 RR-based ERI estimates, which has implications for the ability of fisheries to achieve anticipated reductions. For example, the 2012 RD directive estimated that the exploitation rate on Spring 5_2 Chinook from the WCVI Troll fishery was 5.5%. It was then anticipated that this rate could be reduced to 0.6% under the proposed management actions, which would have substantially reduced commercial impacts. In comparison, our RR-based ERIs are 1.0 % for both Spring 5_2 and Summer 5_2 Chinook, which is harder to reduce (and harder to evaluate). One of the likely reasons for the large discrepancy in estimated impacts was that the 2012 RD directive did not account for management measures that had already been implemented in 2008 to reduce impacts on stream-type Fraser Chinook. These measures included effort reductions and caps in spring and early summer WCVI troll fisheries.

Results rolled up to the sector level are shown in Table 13 - Table 15 or each of the three SMUs, as well as in Table 16 where the Zone 1 reductions in ERI for Spring 5_2 and Summer 5_2 SMUs are shown relative to the projected reductions identified in the 2012 RD directive. First Nations FSC fisheries experienced 46.7% and 54.3% reductions in harvest impacts on the Spring 5_2 and Summer 5_2 SMUs, respectively, in Zone 1 years compared to 2009-2012 levels. These reductions were equal to those projected for Spring 5_2 and greater than those projected for Summer 5_2. In contrast, reductions in both recreational and commercial fisheries catch were smaller than projected levels for both SMUs, with the ERI for recreational fisheries actually increasing for the Summer 5_2 in Zone 1 years. ERIs for both commercial and recreational fisheries tend to be low and variable among years however, so high uncertainty is expected in these values. We further explore these uncertainties using sensitivity analyses.

***Objective 3**: First Nations fishing for food, social and ceremonial purposes will have priority over other uses and will be provided the majority of the available fishery exploitation.*

Evaluation of performance relative to this objective can be informed by summaries of the proportion of catch taken by First Nations FSC fisheries compared to other sectors, as well as the ERIs for this sector relative to others (Table 13 - Table 15). For all three stream-type Fraser Chinook SMUs, First Nations FSC fisheries take a larger proportion of total annual catch from indexed fisheries than recreational or commercial sectors. Between 2012 and 2018, First Nations FSC fisheries took an average of 74.1% of the Spring 4_2 catch, 51.7% of the Spring 5_2 catch, and 40.8% of the Summer 5_2 catch.

***Objective 4**: Increase the proportion of the Fraser River Spring 5_2 exploitation rate that is taken by the First Nations FSC fishery*

Prior to the implementation of the 2012 RD directive in 2012, FSC fisheries accounted for an average of 65.4% of the catch of Spring 5_2 Chinook over the time period of 2009 – 2011. This value dropped to 51.7% for years from 2012 onwards (Table 14).

While this objective is specific to Spring 5_2 Chinook, we also summarize changes in the proportion of catch between these two time periods for the other two SMUs. Between 2009 and 2011, FSC fisheries accounted for an average of 76.7% of the catch of Spring 4_2 Chinook. This value was largely unchanged over all years from 2012 onwards, with an average annual proportion of 74.1% (Table 13). For Summer 5_2 Chinook, the average proportion of the catch attributed to First Nations FSC fisheries was 55.9 % from 2009 to 2011. This value dropped to 40.8% for years from 2012 onwards (Table 15).

5.4 SENSITIVITY ANALYSIS

5.4.1 Methods

We use sensitivity analyses to examine the extent to which systematic biases in input data or incorrect assumptions affect estimated quantities of interest.

Three metrics were used for sensitivity analyses:

1. Annual SMU-level estimates of ERI
2. The proportion of catch attributed to each sector in recent years,
3. Sector-specific estimates of the relative change in ERIs between 2009-2011 and recent Zone 1 years (2013, 2016, 2017)

These metrics were selected to align with our measurement of management performance under Objectives 1-4 in Section 3 above.

Twenty-six scenarios were selected to represent key sources of uncertainty, or concerns, about input data and assumptions, as outlined in Table 17. For example, sensitivity analyses were conducted on the number of fishery releases from several fisheries, release mortality rates, RR model assumptions, escapement data, and estimates of catch composition for select fisheries.

The scenario focused on release mortality rates used an alternative parameterization of release mortality based on values used in the Southern BC Salmon IFMP (Table 7). Drop-off mortality is not explicitly accounted for in the IFMP (although, release mortality rates are sometimes increased to account for this effect; W. Luedke, DFO, South Coast Stock Assessment), so all drop-off mortality rates have been set to 0 in this scenario.

Two scenarios are focused on recent concerns about returns to the Bonaparte River in 2018. The holes in the fishway on Bonaparte River (part of the Spring 4_2 SMU) expanded in 2018, creating a barrier to migrating Chinook salmon. The resulting escapement estimate was five fish. The number of fish that were unable to pass through the fishway and experienced en-route mortality or emigrated to a nearby spawning site at the Deadman River is uncertain. While fish that moved into the neighbouring Deadman River would have been included in spawner counts for this spawning site, and therefore still included in estimates of MU-level harvest rates, the potential for en-route mortality is a bigger concern. In the event of en-route mortality of fish returning to the Bonaparte River, a larger portion of catch from downstream in-river fisheries may have been allocated to Spring 5_2 and Summer 5_2 SMUs than would have been otherwise. Such a case would result in overestimates of both in-river catch and total run size for these SMUs. An en-route mortality event would also lead to an overestimate of harvest rates for the Spring 4_2 SMU (and other SMUs migrating during the Bonaparte migration period), since total run size will be underestimated, and therefore catch will make up a larger proportion of total run.

We used a sensitivity analysis on escapement to the Bonaparte River to test how allowing a larger portion of fish from this system to migrate up the Fraser River within the RR model affected harvest rates across SMUs. We considered two levels of Bonaparte escapement in 2018 based on estimates of recruits-per-spawner (R/S) from Bonaparte and neighbouring streams that had previously been developed by DFO staff (Chuck Parken, DFO, Kamloops, BC, pers. comm.). In both cases, escapement to Bonaparte in 2014 was assumed to represent brood year escapement, and the selected R/S value was applied to the value to get an estimated 2018 recruitment to Bonaparte. The 2017 CYER of 15.4% for the Nicola indicator stock was then applied to the 2018 recruitment to get an estimated escapement. This analysis involves several assumptions, such as all Bonaparte fish return at age 4, and unmarked hatchery fish recruited from fish that spawned in the river naturally (i.e. R/S is overestimated for naturally spawning fish).

In the first scenario, escapements to the Bonaparte River were combined with those from the neighboring Deadman River when calculating R/S. This scenario is based on the hypothesis that fish that returned to Bonaparte and could not ascend the fishway instead swam into the Deadman and were counted there. Movement from Bonaparte to Deadman has been observed in the past (Chuck Parken, DFO, Kamloops, BC, pers. comm.). he calculated R/S value for this scenario was 0.02, which lead to an 2018 escapement estimate for Bonaparte of 211 fish. We label this sensitivity analysis scenario “Bonaparte 2018: PS Mort Low”. In the second scenario, the R/S value from Louis Creek (which had the highest R/S value of neighbouring spawning sites) was used. The calculated R/S value for this scenario was 0.18, which lead to a 2018 estimate for Bonaparte of 1,970 fish. We label this sensitivity analysis scenario “Bonaparte 2018: PS Mort High”.

5.4.2 Results

Results from the sensitivity analysis scenarios are presented in Figure 15 to Figure 19 using tornado plots that highlight the relative influence each scenario had on estimated quantities of interest relative to the base case. For example, in Figure 15 to Figure 17, scenarios are ordered such that those placed closer to the top of the graph had, on average over all years, a higher influence on SMU-level estimates of ERI.

The sensitivity scenarios with the largest effect on annual ERIs compared to the base case varied among SMUs. For the Spring 4_2 SMU, a 20% decrease in vulnerability to in-river fisheries (scenario = “Vulnerability: Spring4_2”) often had the largest impact on annual ERIs (Figure 15). Under the “Vulnerability: Spring4_2” scenario, the drop in total percentage points for the Spring 4_2 ERI ranged from 1.7 – 6.0%. Scenarios in which the peak date of run timing was moved 7 days earlier or later for all spawning sites within a given SMU also had a relatively large impact on annual ERIs; especially when spawning timing was changed for Spring 4_2 or Spring 5_2 SMUs, due to the greater overlap in their run timing (Figure 15). Changing the duration of spawn timing had less of an impact.

For Spring 5_2, Chinook, the model was most sensitive to changes in the peak date of spawn timing and those that used a 20% increase and 20% decrease in the ratio of Spring 5_2 to Summer 5_2 abundance used to split stock composition estimates among these two SMUs for Northern BC recreational and commercial troll fisheries (“NBC Abundance Ratio Inc” and “NBC Abundance Ratio Dec”; Figure 16). Both these scenarios shifted the distribution of harvest impacts between Spring 5_2 and Summer 5_2 SMUs.

The Summer 5_2 SMU was often most sensitive to a 20% increase or decrease in Summer 5_2 escapement (“Escapement: Summer 5_2 Inc” and “Escapement: Summer 5_2 Dec” scenarios), which resulted in changes in ERI of 0.7-2.3 percentage points in either direction (Figure 17). As with Spring 5_2 Chinook, changes in the NBC abundance ratio and the timing of the peak spawning date for Summer 5_2 and Spring 5_2 Chinook also ranked relatively high in some years.

Sensitivity scenarios that represented systematic biases in low impact fisheries typically had negligible effects on annual ERIs estimates. For example, increasing the total mortality on Fraser recreational fisheries or commercial fisheries by 10% to represent potential underestimation of releases (“Total Mort: Fraser Comm” and “Total Mort: Fraser Rec” scenarios) or increasing the number of Spring 5_2 and Summer 5_2 fish released from JDF recreational fisheries by 20% or 60% (“Releases: JDF Rec 20” and “Releases: JDF Rec 60”) had negligible impacts on SMU-level ERI estimates in all years, never changing total ERI by more than 0.09% (in the most extreme case altering base case ERI from 25.33% to 25.42% for the Summer 5_2 SMU in 2016). In comparison, biases in the highest impact fishery, Fraser FSC, usually ranked as having the second largest effect on annual Spring 4_2 and Spring 5_2 ERI estimates (increasing

ERI by 0.5-1.9%). However, despite the generally high ranking of the TotalMort: Fraser FSC scenario, changes in the total annual ERI were always less than 2 percentage points.

The sensitivity scenario that used release mortality rates from the IFMP instead of the CTC-based values used in the base case had relatively minor effects on SMU-level ERI estimates (< 1.1% total change in ERI), with the exception of the Summer 5_2 SMU in 2018. Under the "Release Mortality: IFMP" scenario, the Summer 5_2 ERI for 2018 decreased by 6.9 percentage points, dropping from 51.9% in the base case to 45.0% in the sensitivity case. This decrease was a result of large release estimates from the Fraser River EO fishery in 2018 combined with lower release mortality rates for this fishery in the IFMP scenario.

In 2018 the most influential factor for both the Spring 4_2 and Spring 5_2 SMUs was the scenario representing the highest level of en-route mortality at Bonaparte ("Bonaparte 2018: PS Mort High"; Figure 15, Figure 16). Under this scenario, the ERI for the Spring 4_2 SMU dropped from 38.6% in the base case to 32.0%, while that of the co-migrating Spring 5_2 SMU dropped from 31.6% in the base case to 29.4%. This scenario was chosen as a "bookend" at the upper end of plausible unobserved return to Bonaparte that died before spawning. It is based on the nearby population with the highest recruits-per-spawner value, which is significantly higher what is typically observed at Bonaparte. The more conservative estimate of en-route mortality based on the recruits-per-spawner value from Bonaparte and a closely associated stream (Deadman), resulted in a change in Spring 4_2 ERI of -0.8% (i.e., 38.6% in the base scenario compared to 37.8% in the sensitivity test), which was of smaller magnitude than several other scenarios. When considering the proportion of ERI attributed to each sector as a basis for sensitivity testing, results were relatively insensitive over the range of scenarios considered (Figure 18). Absolute changes in proportions were always less than 2.3%. The average relative change in sector-specific ERIs between 2009-2011 and recent Zone 1 years was more sensitive to scenarios (on an absolute scale) with changes of up to 10% (Figure 19). For the Spring 4_2 SMU, changes in peak spawning date for the Spring 5_2 SMU ("Spring 5_2 Timing" scenario), and changes in Spring 4_2 vulnerability ("Vulnerability Spring 4_2" scenario) on the average proportion of ERI attributed to each sector in Zone 1 years (Figure 18). When looking at changes in ERI timing was similarly important, with changes in peak spawning date of Spring 4_2 and Spring 5_2 SMUs having the largest effects (Figure 19). For the Spring 5_2 and Summer 5_2 SMUs, the most influential scenarios for proportion of ERI attributed to each sector were the 20% increase and 20% decrease in the NBC Abundance Ratio (Figure 18). When looking at changes in ERI between 2009-2011 and recent Zone 1 years, timing of peak spawning for each SMU were the most influential scenarios (Figure 19). For example, for the Spring 5_2 SMU, moving the peak spawning date forward one week resulted in a 9.7% decrease in the change in commercial ERI (from the base scenario of 29.6% to 19.9%), and delaying the peak spawn date by a week resulted in an 8.4% increase (from 29.6% to 38.1%).

5.5 UNCERTAINTY ANALYSIS

5.5.1 Methods

Monte Carlo simulations were used to demonstrate the extent to which the magnitude of uncertainty in data inputs and parameters affected the level of uncertainty around estimated quantities of interest. Hypothetical probability distributions were assumed for key input data and parameters to represent random sampling error (Table 18). Simulation replicates were then run, in which input data and parameters were randomly drawn from the specified distributions, and the RR Model ERI estimation routine was applied to the sampled data in each replicate. Probability distributions around metrics estimated using the model were summarized over all replicates. Three same three metrics that were used for sensitivity analyses were used for the uncertainty analysis (annual SMU-level estimates of ERI, the proportion of catch attributed to each sector in recent years, and sector-specific estimates of the relative change in ERIs between 2009-2011 and recent Zone 1 years).

Three different levels of hypothetical uncertainty were chosen after consultation with the Technical Working Group, and examined in these analyses: low, moderate, and high. Under each scenario, the level of uncertainty on most input parameters were changed concurrently to their low, moderate, or high levels. After multiple runs we found that results were stationary beyond approximately 250 replicates, and chose to run 300 replicates for each level of uncertainty level. Uncertainty was applied to escapement, catch, and spawn timing (peak date and duration). For escapement and catch, where we expect uncertainty to be proportional to magnitude, we applied lognormal uncertainty using specified coefficients of variation (CV).

$$\tilde{X} = Xe^{\epsilon_x}$$

$$\epsilon_x \sim Normal(0, CV_x^2)$$

For peak date and spawning duration we didn't want uncertainty to be proportional to magnitude (there isn't a reason we would expect a later spawning date to have higher absolute uncertainty), so we added normal uncertainty with input standard deviation values.

$$\tilde{X} = X + \epsilon_x$$

$$\epsilon_x \sim Normal(0, sd_x^2)$$

Coefficients of variation for catch and escapement, and standard deviation values for peak and duration of spawning are shown in Table 18.

In order to incorporate uncertainty in GSI stock allocations of marine catch, we used GSI-estimated stock proportions ($\hat{p}$) of catch, and sample sizes (n) to generate random stock proportions ($\hat{p}_{sim}$). In order to simplify this problem, we assumed that the estimated proportions (based on the GSI mixture model) were the "true" stock proportions of the catch, then simulated sampling n GSI samples from this catch, using random samples from a hypergeometric distribution. The hypergeometric distribution is a discrete probability distribution that can be used to estimate the probability of k successes in n random draws without replacement, from a population size N with Ksuccess "states" present in the population. Using this distribution to represent sampling variability in landed catch composition is consistent with the approach used by Allen-Moran et al. (2013). For each catch value to be allocated across populations we drew from a hypergeometric distribution:

$$\hat{n} \sim Hypergeometric(N, K, n)$$

Where:

$$N = Total\ Catch$$

$$K = \hat{p} * N$$

$$n = Number\ of\ GSI\ samples\ taken\ from\ catch$$

And:

$$\hat{p}_{sim} = \hat{n}/N$$

The level of variability introduced for GSI catch sampling did not vary across the low, medium, and high uncertainty scenarios outlined in Table 18. The same hypergeometric distribution was used for all uncertainty scenarios.

The uncertainty scenarios were consider as part of this analysis are not expected to represent the full range of uncertainty in ERIs for two reasons: 1) the CVs used in Table 18 are hypothetical; while our Technical Working Group believed them to be reasonable, they are not based on empirical studies or formal expert elicitation approaches, and 2) some known sources of uncertainty were not included, such as stock assignment error and uncertainty in assumed incidental mortality rates. The scenarios are useful however in demonstrating how introducing even low to moderate levels of uncertainty into our analysis affects our ability to precisely estimate management performance.

5.5.2 Results

SMU-level results of the Monte Carlo simulations used to examine the effects of uncertainty on RR-based ERIs are shown in Table 19. The upper 97.5% quantiles on ERI estimates for Spring 5_2 and Summer 5_2 Chinook in two recent zone 1 years (2016 for Summer 5_2 and 2017 for both Spring 5_2 and Summer 5_2), were 29-30% even under the low variability scenario. Given that our ERIs only represent a portion total exploitation rate and that delayed incidental mortality is not necessarily accounted for in our release mortality rates, we would not be able to conclude with reasonable (i.e., >95%) certainty in these scenarios that the management objective of maintaining total exploitation rates below 30% in Zone 1 years was met.

The effects of uncertainty on fishery-specific annual ERIs are shown in Figure 20 - Figure 22. Among the in-river fisheries, the effects of the low, medium, and high variability sensitivity scenarios are most apparent in these figures for the highest impact fishery, Fraser FSC. While some of the lower impact in-river fisheries had larger relative variability than Fraser FSC, the upper bounds on 95% probability intervals remained < 1-2% for these fisheries in all scenarios.

For marine fisheries, the 95% probability intervals are generally similar among low, medium, and high variability scenarios. The sources of uncertainty that where assigned low, medium, and high levels in the uncertainty analysis (i.e., those listed in Table 18) are predominantly from RR model assumptions and data inputs (with the exception of uncertainty in marine catch estimates). In contrast, uncertainties in GSI catch composition are probability-based, and do not vary across uncertainty scenarios. The low sensitivity of ERI estimates to the “low”, “medium”, and “high” scenarios therefore indicates that the sampling uncertainty in GSI catch composition estimates is the key source of uncertainty in marine fishery ERIs. Uncertainty in low-impact marine fisheries was relatively high in some cases, even under the low variability scenario. For example, in 2018, the 95% probability interval on the Spring 4_2 ERI from the WCVI recreational fishery under the low variability scenario was 0.5% to 5.7%, and 0.5% to 6.4% in the high variability scenario.

Examining the impact of uncertainty on performance metrics relevant to objectives about reductions in ERIs or the distribution of harvest shows that our measurement of performance relative to these objectives is uncertain, especially for sectors with relatively low impacts (Figure 23, Figure 24). While there is a high (> 97.5%) probability that the ERI index for FSC impacts on Spring 5_2 Chinook has declined by at least 38% between 2009-2011 and recent Zone 1 years in the high variability scenario, the 95% probability density functions for both commercial and recreational sectors are much wider and allow for both increases and decreases in ERI over this time period (Figure 23). Similarly, the 95% probability intervals for the estimated proportion of ERI attributed to each sector is recent Zone 1 years is highly uncertain for all sectors except Test fisheries (Figure 24).

6 SUMMARY OF KEY RESULTS

We presented information on spawner abundance, recent stock status assessments, and size-at-age of spawning fish to look for evidence of recent changes in stock status. Fishery catch, release and effort statistics and stock composition data (GSI and CWT) were compiled to evaluate fishery impacts and distribution. Where data permitted, two alternate estimates of exploitation rate were provided, i) results of the CTC 'exploitation rate analysis', or ERA, for the Nicola Spring 4_2 and Dome Spring 5_2 CWT indicator stocks and ii) an extension of the Fraser River Chinook Run Reconstruction using GSI sampling data to estimate catch in marine fisheries (RR Model). For comparison purposes, both the CWT and RR model estimates are indexed for a sub-set of Canadian marine fisheries because GSI data are not available for all fisheries. Because there are currently no CWT indicator stocks for either the Spring 5_2 or Summer 5_2 stock management units, only the RR approach was used to estimate harvest impacts on these stocks in recent years (2009 – 2018) for the sub-set of indexed fisheries. Performance relative to desired management outcomes identified in the 2012 RD directive was evaluated using results from the extended run reconstruction.

Although we identified key sources of uncertainty associated with input data and run reconstruction model assumptions throughout the paper, empirically-based estimates of uncertainty associated with each source were not readily available. Thus, instead of directly estimating uncertainty in exploitation rate indices, we used sensitivity analyses to determine which of the key sources of uncertainty identified and qualified by our joint technical working group had the largest potential impact on estimated outcomes.

The results of our evaluation are summarized here.

6.1 EVALUATION OF BIOLOGICAL STATUS

- Status of these stocks remains low. At an aggregate level, all three stream-type Fraser Chinook SMUs show depressed escapement in recent years compared to long-term averages and consistent declines over the last four years. Escapement levels in 2018 were the lowest since 1995 for all three SMUs.
- At the CU-level, recent WSP (2014) and COSEWIC (2018) assessments classified about half of the stream-type Fraser Chinook CUs (or DUs in the case of COSEWIC) as either 'red' or endangered.
- For some stocks and ages with data, there is evidence of declining length-at-age, which raises concerns about the potential effect of these changes on stock productivity and the potential for reduced effectiveness of size-based management restrictions over time and the potential impact of size-selective fisheries (i.e. 'high-grading').
- Recent early marine survival rates for the Nicola Spring 4_2 CWT indicator stock have been very low, averaging 1.3% over the last five brood years. Preliminary estimated marine survival rate from the 2015 brood year, which is the most recent estimate available, is 0.65%.

6.2 EVALUATION OF MANAGEMENT OUTCOMES

- Spring 5_2 and Summer 5_2 exploitation rates from our indexed Canadian fisheries in recent Zone 1 years are lower than the rates experienced by these SMUs prior to 2012. Based on an approximation of the proportion of total exploitation rates that our indexed fisheries accounted for using available CWT data from indicator stocks, we infer that he Total ERs on both SMUs likely averaged less than or equal to 30% in Zone 1 years. However, sensitivity analyses show that even in the low variability scenario, there is at least a 2-3% probability that exploitation rates from our indexed Canadian fisheries in recent Zone 1 years (2016, 2017) exceeded 30%.
- Overall, this analysis suggests that Objective 2 was unlikely achieved; however, considerable uncertainty exists in this conclusion. Base case results showed that reductions in harvest impacts on Spring 5_2 and Summer 5_2 Chinook for First Nations FSC fisheries

were higher than those intended for both SMUs, as outlined in the 2012 RD directive. In contrast, reductions in both recreational and commercial harvest impacts were smaller than intended. First Nations FSC fisheries experienced 47% and 54% reductions in harvest impacts on the Spring 5_2 and Summer 5_2 SMUs, respectively, in Zone 1 years compared to 2009-2012 levels (Table 16). Recreational fisheries were estimated to have little change in Spring 5_2 ERIs in Zone 1 years and a 58% increase in Summer 5_2 ERIs. Commercial fisheries were estimated to have 43% and 30% increases in harvest impacts for Spring 5_2 and Summer 5_2 SMUs, respectively (Table 16). Sensitivity analyses highlighted that measurement of sector-specific changes in exploitation rates such as these are highly uncertain, especially for recreational and commercial sectors that have relatively low impacts and heavy reliance on GSI sampling of catch composition.

- For all three stream-type Fraser Chinook SMUs, First Nations FSC fisheries take a larger proportion of total annual catch from indexed fisheries than recreational or commercial sectors. Between 2012 and 2018, First Nations FSC fisheries took an average of 74.1% of the Spring 4_2 catch, 51.7% of the Spring 5_2 catch, and 40.8% of the Summer 5_2 catch. Based on these estimates, First Nations FSC fisheries only took the majority of the catch (defined as greater than 50% of the catch) for two of the three SMUs, suggesting that Objective 3 was not fully met.
- The proportion of harvest impacts attributed to FSC fisheries is estimated to have remained relatively unchanged for Spring 4_2 Chinook between the three-year period prior to the implementation of the 2012 RD directive (2009-2011) and after implementation (2012-2018); however, FSC fisheries were estimated to account for a smaller portion of harvest impacts on Spring 5_2 and Summer 5_2 Chinook in recent years compared to the earlier time period. Sensitivity analyses on the impact of uncertainty on the distribution of harvest impacts among sectors highlight that these proportions are highly uncertain, even under the low variability scenario.
- While the RR approach to ERI estimation provided the above insights into management performance relative to objectives, data limitations, as documented in the “Sources of Uncertainty” sections through this document, precluded a definitive evaluation of management performance relative to the objectives identified in the 2012 RD directive.

6.3 SENSITIVITY ANALYSIS

- Sensitivity analyses of the impact of systematic biases in data inputs and model assumptions showed that, given the range of scenarios considered, estimated annual harvest impacts were most sensitive to assumptions of equal fishery vulnerability of all SMUs within the RR model, the peak spawning date used within the RR model, the abundance ratio used to split Spring 5_2 and Summer 5_2 catch composition estimates for Northern BC recreational and commercial fisheries, consistent biases in escapement data, and high en-route mortality in a single year (2018).
- In comparison, sensitivity scenarios that represented systematic biases in relatively low impact fisheries, such as biases in stock composition estimates for JDF or total mortality estimates from Fraser River recreational fisheries, had negligible effects on annual harvest impacts.
- The relative influence of each of these scenarios is a function of the magnitude of bias assumed within the scenario. While these values were deemed reasonable by the joint technical working group overseeing this assessment, they were not empirically-based. Therefore, the ability of these results to highlight key information gaps is limited by the plausibility of the values we selected.

- Metrics on sector-specific reductions in harvest impacts and the distribution of harvest among sectors were relatively insensitive over the range of bias scenarios considered. This result occurs because biases were assumed consistent among years.

6.4 UNCERTAINTY ANALYSIS

- Sampling uncertainty in GSI catch composition estimates was a key source of uncertainty in estimated exploitation rate indices for marine fisheries. Uncertainty in estimated annual fishery impacts were high for most marine fisheries, regardless of the uncertainty scenario used.
- Uncertainty in RR model inputs and model assumptions also contributed to uncertainty in annual exploitation rate indices for in-river fisheries. Within the Fraser, relatively low impact fisheries (commercial, recreational, economic opportunity) had larger relative variability than the high-impact Fraser FSC fishery; however, the upper bounds on 95% probability intervals remained < 1-2% for these fisheries in all scenarios.
- When stochastic variability in input data and assumptions were introduced into the estimation procedure, our measurement of performance relative to objectives about reductions in ERIs or the distribution of harvest among sectors became highly uncertain. This result was especially true for recreational and commercial sectors with relatively low impacts. It is expected that aggregating the recreational and commercial fisheries to the same extent as the Fraser FSC fishery (which consists of at least 26 component FSC fisheries) would decrease the variance in ERI estimates associated with these fisheries.

7 FUTURE WORK

Given the data limitations and uncertainties that affect this assessment, we recommend that the following work be undertaken to address key gaps in the assessment and management framework for stream-type Fraser Chinook.

Management Objectives:

- Clearly-defined and measurable stock and fishery objectives for stream-type Fraser Chinook salmon should be developed to guide future management responses. Current objectives from the IFMP and 2012 RD directive can be characterized as ‘means-based objectives’. That is, even if they are measurable, they characterize a desired management response (e.g. reduce exploitation rates, minimize incidental harvest, allocate harvest reductions) rather than intended outcomes (e.g., rebuild stock to a given level over a specified time-frame). While data-limitations for stream-type Fraser Chinook make the development of biologically-based benchmarks and rebuilding goals more challenging, this work is needed to support anticipated new rebuilding regulations under Bill C-68 and DFO’s Precautionary Approach Framework. Given data limitations, habitat-based (Parken et al. 2006) or percentile-based benchmarks (Holt et al. 2018) could be considered. If rebuilding objectives were more clearly defined, the overall assessment and decision-making process would allow for more objective and transparent evaluation of the impact of relatively small fishery impacts, such as culturally important Fraser River First Nation ‘first fish’ fisheries.
- Furthermore, fine-scale objectives related to fishery-specific exploitation rates from low impact fisheries and allocation of impacts among sectors, such as those defined in the 2012 RD directive, should only be set if there are data systems in place to support subsequent evaluations. While we have attempted to evaluate management performance relative to the RD directive, data-limitations and the large number of assumptions required in our analyses make our results highly uncertain. While we are able to conclude with some confidence that

exploitation rate objectives set out in the 2012 RD directive were likely met, we cannot conclude that allocation objectives, expressed as percentage reductions in fisheries, were met. For lower impact fisheries, both the 'base-period' exploitation rate and subsequent fishing impacts are uncertain to due sampling variation and error. However, the fact that we cannot detect reductions in lower impact fisheries given the available data, does not mean they did not occur. The management measures implemented in various fisheries, such as time and area closures during periods of peak stream-type Fraser Chinook migration, were reasonably expected to reduce impacts on stream-type Fraser Chinook.

- Closed-loop feedback simulations, possibly within the context of a First Nation and stakeholder supported Management Strategy Evaluation (MSE), could be used to support rebuilding efforts for these stocks by providing insights into the impacts of various harvest strategies on the probability of achieving rebuilding goals. Under the MSE approach, robustness to data uncertainties can be taken into account by developing multiple operating models that reflect different hypotheses about complex stock and fishery dynamics. The goal of the MSE process then becomes selecting a harvest decision-making approach that achieves acceptable performance relative to various management objectives (e.g. rebuilding objectives, allocation objectives, economic objectives, etc.) over a wide range of operating models (Punt et al. 2016). A generic closed-loop simulation tool to inform salmon recovery planning has recently been developed by DFO scientists that could be used as a basis for this type of work (Holt, Freshwater et al., in prep).

Annual Harvest Planning and Evaluation Tools:

- The expanded version of the Fraser River Chinook Run Reconstruction model used to estimate exploitation rate indices for this assessment has several limitations. The model does not allow for variability in migration timing among years or differential gear selectivity among ages. In addition, the approach we have taken to add SMU-specific catch data from marine fisheries to the estimation routine assumes that all marine fisheries occur simultaneously, which they do not. Future evaluations of fishery-specific impacts from both marine and freshwater fisheries should explore the development of an integrated forward stock-depletion model that uses maximum likelihood estimation to fit to multiple datasets from both in-river and marine fisheries (e.g., Branch and Hilborn 2010). The inclusion of additional data sources, including age composition of catch and GSI stock composition could also be considered (Chasco et al., 2007, Branch and Hilborn 2010; Cunningham et al. 2017). Empirical, literature-derived or expert-based approaches to characterizing uncertainty in data inputs should also be explored. Such an approach would provide uncertainty estimates on exploitation rates that capture the full range of uncertainty in the data. This tool could also be used to inform annual fishery planning processes and the evaluation of management performance relative to calendar-year exploitation rate caps for ISBM fisheries under the new Canada-US Pacific Salmon Treaty. Such an approach would require improved data collection from fisheries (see below).
- The sensitivity of annual exploitation rate indices from the RR Model to assumptions about the peak date of arrival to spawning sites highlights the importance of this type of information when using a model-based approach to allocate catch among stocks. We support plans to analyze GSI samples collected at the Albion test fishery and recommend incorporating this information into the Fraser River Chinook Run Reconstruction model to inform annual run timing. However, further work needs to be done to design the sampling program – e.g. to ensure that an adequate number of samples can be collected from the Albion Test Fishery and that uncertainty associated with GSI stock assignments is accounted for.

- Annual harvest planning tools used to inform fishing plans should be reviewed, including the performance of the in-season run size estimation model based on Albion test fishery data and spreadsheet tools used to develop fishing plans for in-river fisheries (e.g. the Chinook Impact Assessment and Planning Evaluation Tool “ChIAPET”). Exploitation rate indices from in-river fisheries in 2018 were higher than the previous five consecutive years for all SMUs despite being return abundances being the lowest on record in recent years. While an evaluation of these tools was outside of the scope of the current review, our results suggest that this work is a priority. These planning models can be used tactically to design fishery management measures and support sociological decision-making (e.g. allocation of catch or harvest opportunity), but they do not need to be coupled with assessment of the overall management objectives (i.e. whether or not the stock met a clearly-defined rebuilding objective). It is important to clearly define the decision-making context when determining assessment and monitoring requirements and criteria for which the performance of the management procedure will be evaluated.

Data Collection and Monitoring:

- For implementation of Chapter 3 of the Pacific Salmon Treaty, work is underway to develop CWT indicator stocks for Spring 5_2 and Summer 5_2 SMUs. However, an increased reliance on CWT data will only work if sampling rates can be increased and made more representative. Our data summaries highlight that observed tag recoveries from the Spring 4_2 Nicola indicator stock are low in many years, resulting in expansion factors well above recommended levels. The need for increased tag recovery rates is particularly acute for Fraser First Nation fisheries, but also applies to recreational fisheries. For First Nation fisheries, feasibility of sampling methods should consider cultural issues. For example, submitting heads from clipped fish is often problematic for First Nations who value and use the whole fish. Less invasive sampling methods or use of passive technologies, such as GSI or Passive Integrated Transponder (PIT) tagging, may be more practical in this situation.. Alternatively, rethinking how CWTs are sampled in First Nation fisheries may be an option to improve recovery rates (e.g., developing *in situ* dissection programs).
- Given the number of years it takes to establish a CWT indicator stock, GSI data will continue to be the only available data in the near-term from which to characterize harvest impacts from marine fisheries on Spring 5_2 and Summer 5_2 SMUs. Furthermore, GSI sampling has several advantages compared to tagging studies, including the ability to gain information from every fish sampled (including released catch) and the ability to represent naturally spawning stocks. We therefore recommend the development of consistent, annual GSI sampling programs for all fisheries impacting stream-type Fraser stocks. The development of guidelines on minimum sampling rates to achieve desired levels of precision, such as those undertaken by Allen-Morran et al. (2013), should be undertaken if GSI samples are to be relied on for exploitation rate estimation. More comprehensive collection of GSI data would also improve planning tools used to design management measures.
- Further work should be done to improve GSI baselines and stock identification to the SMU level. For example, our results were highly sensitive to the fact that we used terminal run size ratios to de-aggregate Spring 5_2 and Summer 5_2 estimated catch in NBC fisheries.
- Both CWT and GSI sampling are costly, so any decisions to increase sampling intensity, especially on relatively low-impact fisheries, will need to be part of a larger systematic sampling framework that considers trade-offs with other sampling needs, particularly given the current stock rebuilding context. Informed and effective recovery planning requires other types of assessment information to understand the effects of non-harvest factors on stock declines (e.g. habitat loss and destruction or climate change impacts). However, there are very few long-term ecological monitoring programs in place for salmon populations to inform

these evaluations. This issue points to the larger need for an evaluation of the overall management and assessment procedures for stream-type Fraser Chinook, including development of a comprehensive rebuilding plan with explicit rebuilding objectives.

- We found substantial discrepancies in monthly recreational catch and release estimates obtained from the creel sampling program and the iRec sampling program. These discrepancies are highest for release estimates in the shoulder seasons during which creel sampling is sparse (April, May, September). Ongoing work to resolve these discrepancies should continue given the increasing reliance on iRec data sources for recreational fishery data.
- This assessment represents the first time fishing-related incidental mortality (FRIM) has been incorporated into the Fraser River Chinook Run Reconstruction Model. However, we caution that both release numbers and rates of release mortality are highly uncertain for both marine and in-river fisheries. We used release and drop-off mortality rates identified by the Pacific Salmon Commission's Chinook Technical Committee (CTC 1997, 2004). However, a future assessment of total exploitation rate for these fisheries should consider applying the risk assessment approach developed by Patterson et al. (2017b) to develop detailed estimates of FRIM. Using the Patterson et al. (2017b) approach, five major risk factors are scored and used as a basis for developing estimates of FRIM: (i) capture time, (ii) handling time, (iii) visible injuries upon release, (iv) water temperature, and (v) evidence of predation. Implementation of this approach will require monitoring approaches to characterize risk factors in addition to release rates.
- The escapement datasets for Spring 5_2 and Summer 5_2 SMUs used to drive the RR Model required considerable infilling of missing spawning-site year combinations; approximately 30% of sites required infilling in several years. More consistent coverage of escapement monitoring would likely improve confidence in escapement estimates and resulting estimates of harvest impacts via the RR Model. However, as with catch sampling above, decisions about the level of effort afforded to increased escapement monitoring should be made in the context of trade-offs with other sampling needs and the level of precision needed to guide decision-making relative to management objectives. Again, this issue points to the larger need for an evaluation of the overall management and assessment procedures for stream-type Fraser Chinook.

Data & Information Management:

- Finally, the overall assessment and decision-making process for stream-type Fraser Chinook would benefit from improved documentation and transparency of data and assessment methods, as well as routine publication of this information in citable sources and retrievable databases.

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9 REFERENCES

9.1 LEGAL CITATIONS

R.* v. *Sparrow, [1990] 1 S.C.R. 1075

***R. v. Tommy*,** 2008 BCSC 1095

R.* v. *Jack (1996), 16 B.C.L.R.

R. v. Gladstone, [1996] 2 S.C.R. 723

R.* v. *Sampson (1996), 16 B.C.L.R.

9.2 SCIENTIFIC LITERATURE

Allen-Moran, S.D., Satterthwaite, W.H., and Mohr, M.S. 2013. Sample size recommendations for estimating stock composition using genetic stock identification (GSI). Natl. Ocean. Atmos. Adm. Tech. Memo. NOAA-TM-NMFS-SWFSC-513. (Accessed September 5, 2019)

Bailey, R.E., Irvine, J.R., Candy, J.R., Parken, C.K., Lemke, S.L., Sullivan, M. and Wetklo, M. Summary of stock assessment information for the selected early returning chinook salmon populations of the Fraser River watershed. Can. Stock Assess. Secretariat Res. Doc. 2001/134.

Bass, A.L., Hinch, S.G., Teffer, A.K. Patterson, D.A., Miller, K.M. 2019. Fisheries capture and infectious agents are associated with travel rate and survival of Chinook salmon during spawning migration. Fish. Res. 209: 156-166.

Beacham, T.D., Supernalt, J., Wetklo, M., Deagle, B.E. 2003. The geographic basis for population structure in Fraser River Chinook salmon (*Oncorhynchus tshawytscha*). Fishery Bulletin. 101(2): 229-242

Beacham, T.D., Jonsen, K., and Wallace, C. 2012. A comparison of stock and individual identification for Chinook salmon in British Columbia provided by microsatellites and single-nucleotide polymorphisms. Mar. Coast. Fish. 4(1): 1–22.

Beacham, T.D., Wallace, C., MacConnachie, C., Jonsen, K., McIntosh, B., Candy, J.R., and Withler, R.E. 2018. Population and individual identification of Chinook salmon in British Columbia through parentage-based tagging and genetic stock identification with single nucleotide polymorphisms. Can. J. Fish. Aquat. Sci. 75(7): 1096–1105.

Bernard, D.R. and Clark, J.E. 1996. Estimating salmon harvest with coded-wire tags. Can. J. Fish. Aquat. Sci. 53: 2323-2332.

Branch, T.A., and Hilborn, R. 2010. A general model for reconstructing salmon runs. Can. J. Fish. Aquat. Sci. 67(5): 886–904.

Bradford, M.J., Korman, J., and Higgins, P.S. 2005. Using confidence intervals to estimate the response of salmon populations (Oncorhynchus spp.) to experimental habitat alterations. Can. J. Fish. Aquat. Sci. 62(12): 2716–2726.

Candy J.R., J.E., Irvine, Parken, C.K., Lemke, R.E. Bailey, M. Wetklo and K. Jonsen. 2002 A discussion paper on possible new stock groupings (Conservation Unit) for Fraser River Chinook Salmon. Can. Stock Assess. Secretariat Res. Doc. 2002/085.

Chasco, B.E., Hilborn, R., and Punt, A.E. 2007. Run reconstruction of mixed-stock fisheries using age composition data. Can. J. Fish. Aquat. Sci. 64(11): 1479–1490.

Chasco, B.E., Kaplan, I.C., Thomas, A.C., Acvedo-Gutierrez, A., Noren, D.P., Ford, M.J., Hanson, M.B., Scordino, J.J., Jeffries, S.J., Marshall, K.N. Shelton, A.O., Matkin, C., Burke, B.J., Ward, E.J. 2017. Competing tradeoffs between increasing marine mammal predation and fisheries harvest of Chinook salmon. Sci. Rep-UK 7: 15439.

Chinook Technical Committee (CTC). 1988. Exploitation Rate Analysis: a report of the analytical work group of the Chinook Technical Committee. TCCHINOOK (88)-2. (Accessed September 5, 2019)

Chinook Technical Committee (CTC). 1997. Incidental fishing mortality of Chinook Salmon: mortality rates applicable to Pacific Salmon Commission fisheries. TCCHINOOK (97)-1. (Accessed September 5, 2019)

Chinook Technical Committee (CTC). 2004. Estimation and application of incidental fishing mortality in Chinook Salmon management under the 1999 agreement to The Pacific Salmon Treaty. TCCHINOOK (04)-1. (Accessed September 5, 2019)

Chinook Technical Committee (CTC). 2011. 2010 Annual Report of the Exploitation Rate Analysis and Model Calibration. TCCHINOOK (11)-3.

Chinook Technical Committee (CTC). 2018a. 2017 Exploitation Rate Analysis and Model Calibration Volume One. TCCHINOOK (18)-1. (Accessed September 5, 2019)

Chinook Technical Committee (CTC). 2018b. 2017 Exploitation Rate Analysis and Model Calibration Volume Two: Appendix Supplement. TCCHINOOK (18)-1 V2. (Accessed September 5, 2019)

Chinook Technical Committee (CTC). 2019. Annual report of catch and escapement for 2018. TCCHINOOK (19)-01. (Accessed September 5, 2019)

COSEWIC. 2018. Canadian Wildlife Species at Risk. Committee on the Status of Endangered Wildlife in Canada. (Accessed May 9, 2019)

Cunningham, C.J., Branch, T.A., Dann, T.H., Smith, M., Seeb, J.E., Seeb, L.W., and Hilborn, R. 2017. A general model for salmon run reconstruction that accounts for interception and differences in availability to harvest. Can. J. Fish. Aquat. Sci. 75(3): 439–451.

DFO. 1999. An allocation policy for Pacific salmon: a new direction: the fourth in a series of papers from Fisheries and Oceans Canada. (Accessed January 6, 2020).

DFO. 2015. Evaluation of the Internet Recreational Effort and Catch (iREC) Survey methods. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2015/059. (Accessed September 5, 2019)

DFO. 2016. Integrated biological status of southern British Columbia Chinook Salmon (Oncorhyncus tshawytscha) under the Wild Salmon Policy. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2016/042. (Accessed September 5, 2019)

DFO. 2018a. Integrated Fisheries Management Plan for Southern BC Salmon. (Accessed September 5, 2019)

DFO. 2018b. Science information to support consultation on BC Chinook Salmon fishery management measures in 2018. DFO Can. Sci. Advis. Sec. Sci. Resp. 2018/035. (Accessed September 5, 2019)

DFO. 2018c. Post-season report for the 2018 Canadian Treaty Limit Fisheries. (Accessed September 30, 2019)

Dorner, B., Catalano, M.J., and Peterman, R.M. 2017. Spatial and temporal patterns of covariation in productivity of Chinook salmon populations of the north eastern Pacific Ocean. Can. J. Fish. Aquat. Sci. 00: 1-14.

English, K.K., Searing, G.F., and Nagtegaal, D.A. 2002. Review of the Strait of Georgia Recreational Creel Survey, 1983-1999. Can. Tech. Rep. Fish. Aquat. Sci. 2414: 81 p.

English, K.K., Bailey, R.E., and Robichaud, D. 2007. Assessment of chinook returns to the Fraser River watershed using run reconstruction techniques 1982-4. DFO Can. Sci. Advis. Sec. Res. Doc. 2007/020: vi + 76 p. (Accessed September 5, 2019)

Ford, J.K.B., Wright, B.M., Ellis, G.M., Candy, J.R. 2009. Chinook salmon predation by resident killer whales: seasonal and regional selectivity, stock identity of prey, and consumption rates. Can. Sci. Advis. Sec. Res. Doc. 2009/101: iv + 43 p. (Accessed September 5, 2019)

Healey, M.C. 1983. Coastwide distribution and ocean migration patterns of stream- and oceantype Chinook salmon, Oncorhynchus tshawytscha. Can. Field Nat. 97: 427–433.

Holt, K.R. and Cox, S.P. Evaluation of visual survey methods for monitoring Pacific salmon (Oncorhynchus spp.) escapement in relation to conservation guidelines. 2008. Can. J. Fish. Aquat. Sci. 65: 212-226.

Holtby, L.B., and Ciruna, K.A. 2007. Conservation Units for Pacific Salmon under the Wild Salmon Policy. DFO Can. Sci. Advis. Sec. Res. Doc. 2007/070: viii + 350 p. (Accessed September 5, 2019)

Johnson, K.J. 2004. Regional overview of coded wire tagging of anadromous salmon and steelhead in Northwest America. (Accessed September 5, 2019)

Korman, J., and Higgins, P.S. 1997. Utility of escapement time series data for monitoring the response of salmon populations to habitat alteration. Can. J. Fish. Aquat. Sci. 54(9): 2058–2067.

Lewis, B., Grant, W.S., Brenner, R.E., and Hamazaki, T. 2015. Changes in Size and Age of Chinook Salmon Oncorhynchus tshawytscha Returning to Alaska. PLoS One 10(6): e0130184.

Ohlberger, J., Ward, E.J., Schindler, D.E., Lewis, B. 2018. Demographic changes in Chinook salmon across the Northeast Pacific Ocean. Fish Fisheries. 19(3): 533-546.

Pacific Salmon Commission Coded Wire Tag Workgroup. 2008. An action plan in response to Coded Wire Tag (CWT) Expert Panel Recommendations. Pacific Salmon Comm. Tech. Rep. No. 25: 170 p. (Accessed January 6, 2020).

PSC (Pacific Salmon Commission). 2019. Treaty Between the Government of Canada and the Government of the United States of America Concerning Pacific Salmon. (Accessed January 6, 2020).

Parken, C.K., Bailey, R.E. and Irvine, J.R.. 2003. Incorporating uncertainty into area-under-the-curve and peak count salmon escapement estimation. N. Am. J. Fish. Manag. 23:78-90.

Parken, C.K., R.E. McNicol and J.R. Irvine. 2006 Habitat-based methods to estimate escapement goals for data limited Chinook salmon stocks in British Columbia. DFO Can. Sci. Advis. Sec. Res. Doc. 2006/083. (Accessed September 5, 2019)

Patterson, D.A., Robinson, K.A., Raby, G.D., Bass, A.L., Houtman, R., Hinch, S.G., and Cooke, S.J. 2017. Guidance to Derive and Update Fishing-Related Incidental Mortality Rates for Pacific Salmon. DFO Can. Sci. Advis. Sec. Res. Doc 2017/011: vii + 56. (Accessed September 5, 2019)

Peterman, R.M., Beamesderfer, R., and. Bue, B. 2016. Review of methods for forecasting Chinook salmon abundance in the Pacfic salmon treaty areas. (Accessed September 5, 2019)

Riddell, B., Bradford, M. Carmichael, R, Hankin, D., Peterman, R. and Wertheimer, A. 2013. Assessment of Status and Factors for Decline of Southern BC Chinook Salmon: Independent Panel's Report. Prepared with the assistance of D.R. Marmorek and A.W. Hall, ESSA Technologies Ltd., Vancouver, B.C. for Fisheries and Oceans Canada (Vancouver. BC) and Fraser River Aboriginal Fisheries Secretariat (Merritt, BC). xxix + 165 pp. + Appendices. (Accessed September 5, 2019)

Teffer, A.K. Bass, A.L, Miller, K.M., Patterson, D.A., Juanes, F., and Hinch, S.G. Infections, fisheries capture, temperature, and host responses: multistressor influences on survival and behaviour of adult Chinook salmon. 2018. Can. J. Fish. Aquat. Sci. 75(11): 2069-2083.

Trites, A.W. and Rosen, D.A.S. (eds). 2018. Availability of Prey for Southern Resident Killer Whales. Technical Workshop Proceedings. November 15–17, 2017. Marine Mammal Research Unit, Institute for the Oceans and Fisheries, University of British Columbia, Vancouver, B.C., 64 pages. (Accessed September 5, 2019)

Tucker, S., Trudel, M., Welch, D.W., Candy, J.R., Morris, J.F.T., Thiess, M.E., Wallace, C. and Beacham, T.D. 2011. Life history and seasonal stock-specific migration of juvenile Chinook Salmon. Trans. Am. Fish. Soc. 140:1101-1119.

Vélez-Espino, L.A., Ford, J.K.B., Araujo, H.A., Ellis, G., Parken, C.K., Sharma, R.. 2014. Relative importance of Chinook Salmon abundance on resident killer whale population growth and viability. Aquat. Conserv. 25:756–780.

10 TABLES

Table 1. Recent status assessment of stream-type timed Fraser Chinook stock management units. "WSP Status" shows the results of an Integrated Status Assessment consistent with DFO's Wild Salmon Policy for stream-type Fraser Chinook Conservation Units (CUs; DFO 2016) while the "COSEWIC" status shows the results of a recent assessment for Designatable Units identified by COSEWIC (COSEWIC 2018). COSEWIC designatable units have been aligned to CU names for this table.

SMU	Conservation Unit	WSP Status (2016)	COSEWIC (2018)
Spring 4_2	Lower Thompson_SP_1.2	RED	TBD
	South Thompson-Bessette Creek_SU_1.2	RED	Endangered
Spring 5_2	Lower Fraser River_SP_1.3	DD	Special Concern
	Middle Fraser River_SP_1.3	DD	Endangered
	Middle Fraser-Fraser Canyon_SP_1.3	RED	Threatened
	North Thompson_SP_1.3	RED	Endangered
	Upper Fraser River_SP_1.3	RED	Threatened
Summer 5_2	Lower Fraser River_SU_1.3	DD	Threatened
	Lower Fraser River-Upper Pitt_SU_1.3	DD	Endangered
	Middle Fraser River_SU_1.3	AMBER	Threatened
	Middle Fraser River-Portage_FA_1.3	RED	Endangered
	North Thompson_SU_1.3	RED	Endangered
	South Thompson_SU_1.3	RED/AMBER	Endangered

Table 2. Average number of stream-type Chinook released from hatchery facilities, brood years 2014 – 2016.

STOCK MANAGEMENT UNIT	MAJOR HATCHERY FACILITIES	Chinook Released (Average BYs 2014-2016)	
		Fed Fry	Smolt 1+
Fraser Spring 4_2	Spius Creek	57,000	252,000
Fraser Spring 5_2	Spius Creek	10,500 (2016)	47,200 (2016)
Fraser Summer 5_2	Spius Creek	86,000	72,000

*Table 3. Distribution by catch location of **marine estimated CWT** recoveries for all tagged Spring 4_2, Spring 5_2, Summer 5_2 and Summer 4_1 Chinook (for reference, data pooled over all recovery years). Recovery years for which CWT data are available include 1979-2018 for Spring 4_2, 1976 -2009 for Spring 5_2, 1979-1999 and 2018 for Summer 5_2 and 1977-2018 for the Summer 4_1 SMUs .*

Stock Management Unit	Recovery Location						
	AK	NBC	WCVI	JDF	JST	GST	US South
Spring 4_2	1%	15%	17%	28%	2%	14%	23%
Spring 5_2	11%	31%	18%	18%	1%	11%	10%
Summer 5_2	9%	35%	35%	6%	1%	3%	11%
Summer 4_1	26%	40%	8%	10%	6%	4%	6%

*Table 4. Prescene (P) or absence (A) by month of **marine estimated CWT** recoveries for all tagged Spring 4_2, Spring 5_2, Summer 5_2 and Summer 4_1 Chinook (for reference). Recovery years for which CWT data are available include 1979-2018 for Spring 4_2, 1976 -2009 for Spring 5_2, 1979-1999 and 2018 for Summer 5_2 and 1977-2018 for the Summer 4_1 SMUs .*

Month	Spring 4_2	Spring 5_2	Summer 5_2	Summer 4_1
JAN	A	A	A	P
FEB	A	P	A	P
MAR	P	P	P	P
APR	P	P	P	P
MAY	P	P	P	P
JUN	P	P	P	P
JUL	P	P	P	P
AUG	P	P	P	P
SEP	P	P	P	P
OCT	P	P	P	P
NOV	A	A	P	P
DEC	P	P	P	P

Table 5. Average portion of recreational kept and released Chinook that were accounted for in periods with IREC survey data, but no creel survey. (The proportion is calculated using iREC data – i.e. the amount of iREC estimated catch or released Chinook in periods with no creel estimate over the total annual iREC estimate.)

Region	**Parameter**	
	Kept	**Released**
JST	5%	9%
GSPTN	9%	12%
GSPTS	13%	21%
NWVI	1%	2%
SWVI	2%	1%
JDF	16%	31%
Average	**7%**	**12%**

Table 6. Comparison of fishery types used in the current DFO version of the Fraser River Run Reconstruction model with the expanded set of fishery types used for the 5-year review. Note that the rows map to each other, such that catch previously attributed to the "Commercial" fishery has been split among test fisheries, First Nations Economic Opportunity fisheries, and the in-river components of Area 29 commercial fisheries.

Fishery Types used for Annual DFO Management	**Fishery Types used for 5-Year Review**
First Nations	First Nations FSC fisheries
Commercial	Test Fisheries (Qualark and Lower Fraser)
	First Nations EO fisheries
	Area 29 commercial fisheries (29E and 29B fisheries combined)
Recreational	Recreational fisheries

Table 7. Release mortality rates used for the Run Reconstruction approach to ER estimation. See Table K - 2 for literature sources used to select these values.

Fishery Location	Fishery Type	Gear	Base Release Mort.	Base Drop-off Rate	IFMP Release Mort.	IFMP Drop-off Rate
Fraser	Sport	Assume hook and line	12.3%	6.9%	15%	0%
Fraser	FN & Commercial	Gillnet	90%	8%	60%	0%
Fraser	FN & Commercial	Purse Seine	40%	8%	25%	0%
Fraser	FN & Commercial	Beach Seine	5%	0%	5%	0%
Fraser	FN & Commercial	Fish Wheel/Dip Net	5%	0%	5%	0%
Tributary	Sport	Assume hook and line	12.3%	6.9%	15%	0%
Tributary	FN	Assume gillnet	90%	8%	60%	0%
Marine	T’aaq-wiihak	Assume Troll	20%	1.7%	15%	0%
Marine	WCVI Troll	Troll	20%	1.7%	15%	0%
Marine	Northern Troll	Troll	20%	1.7%	15%	0%
Marine	JDF Recreational	Assume hook and line	10%	15%	15%	0%
Marine	WCVI Recreational	Assume hook and line	10%	15%	15%	0%
Marine	Northern BC Rec.	Assume hook and line	10%	15%	15%	0%

Table 8. Annual ER Index values for Spring 4_2 Chinook estimated using the Run Reconstruction approach, broken out by zone management levels. In 2018, a management regime aimed at improving prey availability for Southern Resident Killer Whales was implemented rather than the previous zone management approach, which is indicated as "SRKW". Averages across all years within a given zone are also shown.

Year	Zone	Fraser FN	Fraser Rec.	Fraser Comm.	Fraser EO	Fraser Test	WCVI Rec.	WCVI Troll	JDF Rec.	NBC Rec.	NBC Troll	T'aaq. Comm.
2009	NA	30.88%	0.85%	0.00%	0.00%	0.75%	1.9%	1.17%	11.47%	0.10%	2.10%	NA
2010	2	21.48%	0.01%	0.00%	0.07%	1.24%	0.10%	0.40%	1.06%	0.47%	1.00%	NA
2011	2	28.37%	0.02%	0.00%	0.21%	0.65%	2.62%	1.66%	2.48%	0.13%	0.04%	NA
2012	2	22.04%	0.01%	0.00%	0.04%	0.52%	1.16%	0.07%	2.11%	0. 00%	0.47%	0.00%
2013	1	11.56%	0.00%	0.00%	0.02%	0.66%	4.11%	0.01%	2.94%	0.00%	0.01%	0.01%
2014	2	17.97%	0.01%	0.00%	0.09%	0.74%	0.40%	2.05%	1.93%	0.00%	0.84%	0.12%
2015	2	15.76%	0.01%	0.00%	0.02%	0.80%	0.57%	1.68%	4.05%	0.05%	2.19%	0.01%
2016	1	15.95%	0.00%	0.00%	0.00%	0.63%	1.33%	1.23%	1.56%	2.03%	0.59%	0.03%
2017	1	17.11%	0.00%	0.00%	0.00%	0.52%	2.41%	1.50%	1.27%	1.6%	0.00%	0.06%
2018	SRKW	32.5%	0.10%	0.00%	0.00%	0.78%	2.59%	1.35%	1.16%	0.00%	0.00%	0.16%
Zone 1 Average		14.87%	0.00%	0.00%	0.01%	0.6%	2.62%	0.91%	1.92%	1.21%	0.20%	0.03%
Zone 2 Average		21.12%	0.01%	0.00%	0.09%	0.79%	0.97%	1.17%	2.33%	0.13%	0.91%	0.04%

Table 9. Annual ER Index values for Spring 5_2 Chinook estimated using the Run Reconstruction approach, broken out by zone management levels. In 2018, a management regime aimed at improving prey availability for Southern Resident Killer Whales was implemented rather than the previous zone management approach, which is indicated as "SRKW". Averages across all years within a given zone are also shown.

Year	**Zone**	**Fraser FN**	**Fraser Rec.**	**Fraser Comm.**	**Fraser EO**	**Fraser Test**	**WCVI Rec.**	**WCVI Troll**	**JDF Rec.**	**NBC Rec.**	**NBC Troll**	**T'aaq. Comm.**
2009	NA	20.86%	0.67%	0.00%	0.02%	0.88%	0.23%	0.85%	6.42%	1.41%	3.09%	NA
2010	2	14.8%	0.20%	0.00%	0.03%	1.34%	0.01%	0.42%	1.44%	1.47%	3.84%	NA
2011	2	20.64%	0.23%	0.00%	0.08%	0.81%	0.56%	1.68%	3.29%	1.65%	2.21%	NA
2012	2	18.72%	0.23%	0.00%	0.00%	0.59%	1.24%	1.69%	4.88%	2.26%	3.76%	0.10%
2013	1	8.52%	0.00%	0.00%	0.00%	0.84%	0.60%	0. 00%	4.33%	1.44%	2.68%	0.30%
2014	2	11.47%	0.79%	0.00%	0.01%	1.04%	1.06%	0.71%	3.31%	1.1%	3.58%	0.43%
2015	2	8.97%	0.77%	0.00%	0. 00%	1.01%	1.3%	1.06%	5.32%	0.54%	2.37%	0. 00%
2016	1	11.07%	0.00%	0.00%	0. 00%	0.88%	1.00%	1.56%	2.26%	1.08%	4.53%	0.19%
2017	1	10.41%	0.00%	0. 00%	0. 00%	0.57%	1.67%	1.77%	4.04%	1.6%	6.09%	0.32%
2018	SRKW	20.07%	0.01%	0.01%	0. 00%	1.01%	1.12%	0.73%	4.01%	1.56%	2.68%	0.40%
Zone 1 Average		10.00%	0.00%	0.00%	0. 00%	0.76%	1.09%	1.11%	3.54%	1.37%	4.43%	0.27%
Zone 2 Average		14.92%	0.44%	0.00%	0.02%	0.96%	0.83%	1.11%	3.65%	1.4%	3.15%	0.18%

Table 10. Annual ER Index values for Summer 5_2 Chinook estimated using the Run Reconstruction approach, broken out by zone management levels. In 2018, a management regime aimed at improving prey availability for Southern Resident Killer Whales was implemented rather than the previous zone management approach, which is indicated as "SRKW". Averages across all years within a given zone are also shown.

Year	Zone	Fraser FN	Fraser Rec.	Fraser Comm.	Fraser EO	Fraser Test	WCVI Rec.	WCVI Troll	JDF Rec.	NBC Rec.	NBC Troll	T'aaq. Comm.
2009	NA	12.48%	1.36%	0.00%	0.07%	1.24%	1.38%	0.75%	5.02%	1.42%	3.1%	NA
2010	2	9.53%	1.13%	0.37%	1.11%	1.18%	0.01%	0.11%	0.82%	1.49%	3.88%	NA
2011	2	22.22%	1.21%	0.27%	0.23%	1.13%	2.08%	2.13%	1.49%	1.65%	2.21%	NA
2012	2	25.46%	1.3%	0.00%	0.02%	1.1%	1.85%	0.13%	3.17%	2.33%	3.87%	0.04%
2013	1	6.48%	1.1%	0.01%	0.06%	1.0%	0.91%	0.00%	6.96%	1.4%	2.61%	0.09%
2014	2	10.1%	1.3%	0.05%	0.59%	1.12%	0.72%	2.1%	2.04%	1.08%	3.55%	1.59%
2015	2	5.39%	0.82%	0.00%	0.05%	1.11%	0.75%	0.07%	2.9%	0.56%	2.46%	0.35%
2016	1	6.44%	1.35%	0.00%	0.00%	1.38%	1.67%	1.28%	7.36%	1.01%	4.26%	0.57%
2017	1	7.3%	0.55%	0.00%	0.00%	0.55%	2.81%	2.69%	3.49%	1.56%	5.96%	0.92%
2018	SRKW	23.15%	0.03%	1.99%	15.14%	1.0%	1.33%	0.47%	3.69%	1.55%	2.68%	0.93%
Zone 1 Average		6.74%	1.0%	0.00%	0.02%	0.98%	1.8%	1.32%	5.94%	1.32%	4.28%	0.53%
Zone 2 Average		14.54%	1.15%	0.14%	0.4%	1.13%	1.08%	0.91%	2.08%	1.42%	3.19%	0.66%

Table 11. Estimated time series of CWT-based Exploitation Rate Indices (ERIs) by fishery for Spring 4_2 Chinook (Nicola indicator stock). In 2018, a management regime aimed at improving prey availability for Southern Resident Killer Whales was implemented rather than the previous zone management approach, which is indicated as "SRKW".

Year	Zone	Fraser Net	Fraser Rec.	JDF Rec.	NBC Rec.	NBC Troll	WCVI Rec.	WCVI Troll
2009	NA	20.22%	21.69%	8.82%	0.00%	0.37%	0.00%	0.00%
2010	2	4.73%	0.00%	0.57%	0.18%	1.64%	0.09%	0.00%
2011	2	4.50%	2.64%	2.64%	0.00%	0.93%	0.47%	0.00%
2012	2	20.68%	0.97%	2.10%	1.13%	0.65%	0.00%	0.00%
2013	1	2.25%	0.00%	3.70%	0.00%	1.31%	0.00%	0.22%
2014	2	10.93%	0.93%	0.93%	0.00%	0.00%	0.00%	2.33%
2015	2	11.18%	0.00%	2.91%	0.20%	0.26%	0.00%	0.26%
2016	1	11.19%	0.00%	7.89%	0.00%	1.92%	0.00%	1.07%
2017	1	8.10%	0.00%	1.90%	0.00%	1.14%	0.00%	1.24%
2018	SRKW Actions	18.90%	0.00%	3.37%	0.34%	0.00%	0.00%	1.12%
Zone 1 Average		7.18%	0.00%	4.50%	0.00%	1.46%	0.00%	0.84%
Zone 2 Average		10.41%	0.91%	1.83%	0.30%	0.70%	0.11%	0.52%

Table 12. Estimated time series of RR-based Exploitation Rate Indices (ERIs) by fishery sector for each of the three stream-type Fraser Chinook SMUs.

Year	Spring 4_2				Spring 5_2				Summer 5_2			
	FN	Rec.	Comm.	Test	FN	Rec.	Comm.	Test	FN	Rec.	Comm.	Test
2009	30.88%	14.32%	3.27%	0.75%	20.86%	8.73%	3.96%	0.88%	12.48%	9.18%	3.92%	1.24%
2010	21.48%	1.65%	1.48%	1.24%	14.80%	3.13%	4.29%	1.34%	9.53%	3.44%	5.48%	1.18%
2011	28.37%	5.26%	1.90%	0.65%	20.64%	5.73%	3.97%	0.81%	22.22%	6.43%	4.84%	1.13%
2012	22.04%	3.27%	0.57%	0.52%	18.72%	8.61%	5.55%	0.59%	25.46%	8.65%	4.06%	1.10%
2013	11.56%	7.05%	0.05%	0.66%	8.52%	6.37%	2.98%	0.84%	6.48%	10.38%	2.77%	1.00%
2014	17.97%	2.35%	3.09%	0.74%	11.47%	6.26%	4.73%	1.04%	10.10%	5.15%	7.88%	1.12%
2015	15.76%	4.68%	3.91%	0.80%	8.97%	7.93%	3.44%	1.01%	5.39%	5.03%	2.93%	1.11%
2016	15.95%	4.92%	1.85%	0.63%	11.07%	4.34%	6.29%	0.88%	6.44%	11.40%	6.11%	1.38%
2017	17.11%	5.28%	1.56%	0.52%	10.41%	7.30%	8.18%	0.57%	7.30%	8.42%	9.57%	0.55%
2018	32.50%	3.86%	1.50%	0.78%	20.07%	6.69%	3.82%	1.01%	23.15%	6.60%	21.20%	1.00%

Table 13. Comparison of average catch, average ERI, and the average proportion of total annual indexed fishery catch attributed to each fishery and sector from the Spring 4_2 SMU for three different time periods. The first time period (2009-2011) represents the introduction of increased management restrictions for stream-type Fraser Chinook, the second time period (2012-2018) represents implementation of the 2012 RD directive, and the third time period is specific to Zone 1 management years. The "% Change in Catch" and "% Change in ERI" metrics measure the relative increase or decrease in average catch and ERI values relative to the 2009-2011 period.

	2009 – 2011			**2012-2018**					**Zone 1 Years (2013, 2016, 2017)**				
	Avg. Catch	**Avg. ERI (%)**	**Catch Prop.**	**Avg. Catch**	**Avg. ERI (%)**	**Catch Prop.**	**% Change in Catch**	**% Change in ERI**	**Avg. Catch**	**Avg. ERI (%)**	**Catch Prop.**	**% Change in Catch**	**% Change in ERI**
By Fishery													
Fraser FSC	2250	26.91	76.67	2458	18.98	74.12	9.25%	-29.46%	1399	14.87	69	-37.84%	-44.74%
Fraser Rec.	14	0.3	0.6	2	0.02	0.06	-89.04%	-93.48%	0	0	0	-100. %	-100. %
Fraser Comm.	0	0	0	0	0	0	-	-	0	0	0	-	-
Fraser EO	9	0.1	0.3	6	0.02	0.10	-40.31%	-75.41%	1	0.01	0.04	-92.86%	-92.33%
Fraser Test	82	0.88	2.66	84	0.67	2.46	2.09%	-24.38%	52	0.61	2.60	-36.18%	-31.12%
WCVI Rec	92	1.54	3.28	144	1.80	6.51	57.40%	16.45%	199	2.62	10.92	117.45%	69.69%
WCVI Troll	82	1.08	2.85	175	1.13	4.37	113.94%	4.62%	84	0.91	3.88	2.86%	-15.22%
JDF Rec.	263	5	10.21	266	2.15	7.91	1.09%	-57.08%	156	1.93	8.14	-40.81%	-61.51%
NBC Rec.	21	0.23	0.66	43	0.52	1.89	102.90%	123.94%	99	1.21	4.37	365.62%	416.05%
NBC Troll	78	1.04	2.76	105	0.59	2.37	35.01%	-43.91%	24	0.2	0.89	-69.10%	-80.73%
Taaq.	-	-	-	8	0.05	0.20	-	-	3	0.03	0.15	-	-
SoG Rec.	Data Deficient												
JS Rec.	Data Deficient												
By Sector													
FSC	2250	26.91	76.67	2458	18.98	74.12	9.25%	-29.46%	1399	14.87	69	-37.84%	-44.74%
Sport	390	7.07	14.76	455	4.49	16.37	16.57%	-36.59%	454	5.75	23.43	16.4 %	-18.72%
Commercial	169	2.22	5.91	293	1.79	7.04	73.63%	-19.21%	112	1.16	4.96	-33.79%	-47.90%
Test	82	0.88	2.66	84	0.67	2.46	2.09%	-24.38%	52	0.61	2.6	-36.18%	-31.12%
All Fisheries	2891	37.1	100	3290	25.9	100	13.8 %	-30.1 %	3290	22.4	100	-30.2 %	-39.60%

Table 14. Comparison of average catch, average ERI, and the average proportion of total annual indexed fishery catch attributed to each fishery and sector from the Spring 5_2 SMU for three different time periods. The first time period (2009-2011) represents the introduction of increased management restrictions for stream-type Fraser Chinook, the second time period (2012-2018) represents implementation of the 2012 RD directive, and the third time period is specific to Zone 1 management years. The "% Change in Catch" and "% Change in ERI" metrics measure the relative increase or decrease in average catch and ERI values relative to the 2009-2011 period.

	2009 – 2011			**2012-2018**					**Zone 1 Years (2013, 2016, 2017)**				
	Avg. Catch	**Avg. ERI (%)**	**Catch Prop.**	**Avg. Catch**	**Avg. ERI (%)**	**Catch Prop.**	**% Change in Catch**	**% Change in ERI**	**Avg. Catch**	**Avg. ERI (%)**	**Catch Prop.**	**% Change in Catch**	**% Change in ERI**
By Fishery													
Fraser FSC	5441	18.76	65.37	2874	12.75	51.73	-47.18%	-32.07%	1824	10	47.14	-66.48%	-46.71%
Fraser Rec.	118	0.36	1.14	89	0.26	1.09	-24.24%	-29.75%	0	0	0	-100. %	-100. %
Fraser Comm.	0	0	0	0	0	0	-	-	0	0	0	-	-
Fraser EO	9	0.04	0.14	1	0	0.01	-89.29%	-93.73%	0	0	0.01	-96.43%	-96.39%
Fraser Test	276	1.01	3.60	195	0.85	3.37	-29.26%	-16.13%	132	0.76	3.37	-52. %	-24.56%
WCVI Rec	57	0.27	0.74	223	1.14	4.04	291.73%	328.32%	157	1.09	4.17	174.85%	308.37%
WCVI Troll	250	0.98	3.25	229	1.07	4.25	-8.52%	9.44%	178	1.11	4.65	-29.03%	13.18%
JDF Rec.	1067	3.72	10.56	819	4.02	14.82	-23.2 %	8.09%	554	3.54	14.64	-48.05%	-4.76%
NBC Rec.	350	1.51	4.44	242	1.37	4.60	-30.79%	-9.52%	204	1.37	5.36	-41.75%	-9.19%
NBC Troll	864	3.05	10.75	808	3.67	15.05	-6.5 %	20.44%	738	4.43	19.4	-14.62%	45.52%
Taaq.	-	-	-	60	0.25	1.05	-	-	48	0.27	1.27	-	-
SoG Rec.	Data Deficient												
JS Rec.	Data Deficient												
By Sector													
FSC	5441	18.76	65.37	2874	12.75	51.73	-47.18%	-32.07%	1824	10	47.14	-66.48%	-46.71%
Sport	1591	5.86	16.89	1374	6.79	24.54	-13.67%	15.74%	915	6	24.17	-42.52%	2.41%
Commercial	1124	4.07	14.14	1098	5	20.36	-2.28%	22.75%	964	5.82	25.32	-14.24%	42.87%
Test	276	1.01	3.6	195	0.85	3.37	-29.26%	-16.13%	132	0.76	3.37	-52. %	-24.56%
All Fisheries	8432	29.7	100	5541	25.4	100	-34.3 %	-14.6 %	5541	22.6	100	-54.5 %	-24. %

Table 15. Comparison of average catch, average ERI, and the average proportion of total annual indexed fishery catch attributed to each fishery and sector from the Summer 5_2 SMU for three different time periods. The first time period (2009-2011) represents the introduction of increased management restrictions for stream-type Fraser Chinook, the second time period (2012-2018) represents implementation of the 2012 RD directive, and the third time period is specific to Zone 1 management years. The "% Change in Catch" and "% Change in ERI" metrics measure the relative increase or decrease in average catch and ERI values relative to the 2009-2011 period.

	2009 – 2011			**2012-2018**					**Zone 1 Years (2013, 2016, 2017)**				
	Avg. Catch	**Avg. ERI (%)**	**Catch Prop.**	**Avg. Catch**	**Avg. ERI (%)**	**Catch Prop.**	**% Change in Catch**	**% Change in ERI**	**Avg. Catch**	**Avg. ERI (%)**	**Catch Prop.**	**% Change in Catch**	**% Change in ERI**
By Fishery													
Fraser FSC	5487	14.74	55.91	2513	12.04	40.76	-54.2 %	-18.32%	1205	6.74	30.43	-78.05%	-54.31%
Fraser Rec.	434	1.23	4.72	237	0.92	3.82	-45.35%	-25.32%	180	1	4.32	-58.57%	-18.89%
Fraser Comm.	72	0.21	0.94	1	0.29	0.02	-99.01%	36.73%	0	0	0	-100. %	-97.91%
Fraser EO	85	0.47	1.11	55	2.27	0.84	-35.55%	381.61%	4	0.02	0.1	-94.88%	-95.88%
Fraser Test	410	1.18	4.57	266	1.04	4.6	-35.28%	-12.12%	177	0.98	4.25	-56.86%	-17.1 %
WCVI Rec	380	1.15	3.31	267	1.44	5.31	-29.71%	24.32%	255	1.8	6.7	-32.84%	55.73%
WCVI Troll	367	1	3.25	230	0.96	4.05	-37.35%	-3.34%	197	1.33	5.39	-46.36%	32.84%
JDF Rec.	854	2.44	8.25	869	4.23	17.15	1.7 %	73.14%	974	5.94	23.58	14.05%	143.05%
NBC Rec.	462	1.52	5.1	260	1.36	4.77	-43.73%	-10.53%	194	1.33	4.95	-58.11%	-12.68%
NBC Troll	1088	3.06	12.84	863	3.62	15.71	-20.72%	18.35%	698	4.27	18.06	-35.85%	39.53%
Taaq.	-	-	-	180	0.64	2.97	-	-	83	0.53	2.21	-	-
SoG Rec.	Data Deficient												
JS Rec.	Data Deficient												
By Sector													
FSC	5487	14.74	55.91	2513	12.04	40.76	-54.2 %	-18.32%	1205	6.74	30.43	-78.05%	-54.31%
Sport	2130	6.35	21.38	1633	7.95	31.05	-23.34%	25.13%	1603	10.07	39.55	-24.76%	58.48%
Commercial	1611	4.75	18.14	1328	7.79	23.58	-17.59%	64.13%	982	6.15	25.77	-39.06%	29.61%
Test	410	1.18	4.57	266	1.04	4.6	-35.28%	-12.12%	177	0.98	4.25	-56.86%	-17.1 %
All Fisheries	9639	27	100	5740	28.8	100	-40.5 %	6.6 %	5740	23.9	100	-58.9 %	-11.4 %

Table 16. Comparison of the expected change in exploitation rates on Fraser River Spring 5_2 and Summer 5_2 Chinook salmon between 2010 and Zone 1 years with the average realized change in the Run Reconstruction Model exploitation rate index (ERI) between the 2010 and recent Zone 1 years (2013, 2016, 2017). Note that the expected change is taken from the 2012 RD directive (Appendix A), and was calculated relative to an estimated 2010 level (Table 1 in letter), while the realized change is measured as the difference between the estimated ERIs over the 3-year period around 2010 (2009 – 2011) and those from recent Zone 1 years.

Sector	**Expected Change in ER**	**Realized Change in ERI**	
		Spring 5_2	**Summer 5_2**
FSC	-41.70%	-46.71%	-54.31%
Recreational	-31.70%	2.41%	58.48%
Commercial	-75.00%	42.87%	29.61%
Total	-44.30%	-24.00 %	-11.40 %

Table 17. Description of sensitivity analyses used to test concerns about potential biases in input data and model assumptions.

Concern	**How tested**	**Sensitivity analysis name**
Underestimation of releases from JDF recreational fishery due to assumption that the composition of released catch is equal to that of landed catch	Increase the number of releases from Spring 5_2 and Summer 5_2 SMUs by 20% and 60%	Releases: JDF Rec 20 Releases: JDF Rec 60
Underestimation of releases from Fraser River commercial fisheries due to missing data	Increase the total mortality from Fraser River commercial fisheries by 10%	Total Mort: Fraser Comm
Underestimation of releases from Fraser River recreational fisheries due to missing data	Increase the total mortality from Fraser River recreational fisheries by 10%	Total Mort: Fraser Sport
Underestimation of released catch from Fraser River FSC fisheries due to missing data	Increase the total mortality from Fraser River FSC fisheries by 10%	Total Mort: Fraser FSC
Release mortality rates are highly uncertain. Values used in salmon IFMPs provide an alternative set of values to be considered.	Apply release mortality estimates from the salmon IFMP to all fisheries (see Table 7 for values)	Release Mortality: IFMP
The Run Reconstruction Model attributes in-river catches to individual spawning stocks based on fixed peak spawning dates that are held constant over time. Despite strong assumptions about peak spawn dates, there is considerable uncertainty around these values.	Move peak spawn date 7 days forward and 7 days backward for all spawning sites within a specified SMU.	Spring 4.2 Timing Spring 5.2 Timing Summer 5.2 Timing
The duration of spawn timing, which is used in the Run Reconstruction Model to spread escapement over time, are fixed values that are held constant over time. Despite strong assumptions about spawning duration values, there is considerable uncertainty around these values.	Change spawn duration so that it is 10 days shorter or 10 days longer for all spawning sites within a specified SMU.	Spring 4.2 Duration Spring 5.2 Duration Summer 5.2 Duration
Given concerns about declining body size, it is possible that age 4 fish from the Spring 4_2 SMU have become less vulnerable to Fraser In-river fisheries in recent years	Reduce the percentage of Spring 4_2 abundance that is vulnerable to all in-river Fraser fisheries by 20%	Vulnerability: Spring 4.2

Concern	How tested	Sensitivity analysis name
Escapement estimates from the Summer 5_2 SMU require more infilling of missing values than Spring 4_2 and Spring 5_2 SMUs, which could potentially cause systematic biases in estimated escapements	Change escapement values for all Summer 5_2 stocks in the run reconstruction so that they are 20% higher or lower in all years	Escapement: Summer 5.2
Splits in catch composition between Spring 5_2 and Summer 5_2 SMUs for Northern BC troll and NBC recreational fisheries are based on the annual ratio of return abundance to the Fraser River for these SMUs, as estimated by the RR model. This assumption cause biases in estimated catch and releases	Change ratio of Spring 5_2 to Summer 5_2 abundance that is used to divide catch composition among these two SMUs to be 20% higher or 20% lower in all years	NBC Abundance Ratio
In 2018 the fishway on Bonaparte River (Spring 4_2 SMU) did not facilitate fish passage, resulting in an escapement estimate of 5 fish. It is uncertain whether fish that were unable to pass experienced en-route mortality or moved to a nearby spawning site. The RR model cannot account for en-route mortality, and therefore ER estimates may have been affected.	Increase Bonaparte escapement in 2018 to test the impact of en-route mortality on exploitation rate estimates for co-migrating stocks. Two different Bonaparte escapement levels are tested: (i) 211 fish (Low) and (ii) 1970 fish (High).	Bonaparte 2018: PS Mort Low Bonaparte 2018: PS Mort High

Table 18. Coefficients of variation and standard deviations used in Monte Carlo sensitivity analyses.

Data Input	Low	Med	High
Escapement	0.1	0.2	0.3
Fraser River Catch	0.05	0.1	0.15
Tributary Catch	0.05	0.1	0.15
Peak spawning date	3	4	5
Duration of spawning	3	4	5
Marine Catch	0.1	0.15	0.2

Table 19. Results of Monte Carlo simulations, showing median, lower 2.5% and upper 97.5% quantile (bounds of 95% probability distribution interval) estimates of total ERI by SMU, for the low, medium, and high variability scenarios.

Year	Uncertainty Level	Spring 4_2			Spring 5_2			Summer 5_2		
2009	Low	44.68	**48.76**	53.16	32.52	**34.24**	36.17	24.76	**26.81**	28.96
	Med	43.57	**48.46**	53.68	31.33	**33.99**	37.02	23.98	**26.64**	29.62
	High	42.02	**48.19**	55.27	29.79	**33.65**	37.25	22.70	**26.45**	30.64
2010	Low	22.95	**25.49**	28.32	21.48	**23.36**	25.55	17.62	**19.63**	21.98
	Med	21.55	**25.37**	29.23	20.39	**23.02**	25.96	16.61	**19.41**	22.37
	High	19.86	**24.86**	29.68	19.33	**22.72**	26.34	15.86	**19.37**	23.23
2011	Low	31.66	**35.67**	40.71	28.77	**30.96**	33.33	31.51	**34.44**	37.55
	Med	30.93	**35.60**	41.41	27.68	**30.77**	33.98	30.13	**34.09**	38.31
	High	28.96	**35.36**	42.19	26.54	**30.70**	34.83	28.89	**33.98**	39.11
2012	Low	23.16	**26.20**	29.28	30.61	**33.30**	36.30	36.30	**39.08**	41.83
	Med	22.08	**26.17**	30.68	29.63	**33.28**	36.79	34.99	**38.76**	42.40
	High	20.36	**25.78**	31.45	28.74	**33.24**	38.29	33.59	**38.29**	43.61
2013	Low	14.66	**18.93**	25.36	16.50	**18.60**	21.15	17.69	**20.51**	24.31
	Med	14.17	**18.65**	26.44	16.03	**18.43**	21.97	17.37	**20.36**	24.23
	High	13.43	**17.95**	27.25	15.28	**18.32**	21.96	16.06	**20.16**	25.16
2014	Low	21.64	**23.98**	26.56	21.40	**23.46**	25.61	22.02	**24.26**	26.68
	Med	20.53	**23.97**	27.31	20.75	**23.46**	26.17	21.02	**24.09**	27.61
	High	19.34	**23.62**	28.52	19.90	**23.09**	26.80	19.72	**23.89**	28.27
2015	Low	21.91	**24.90**	28.38	19.11	**21.25**	23.77	12.44	**14.40**	16.72
	Med	20.65	**24.94**	29.56	18.36	**21.26**	24.70	12.20	**14.22**	16.98
	High	18.97	**24.35**	30.61	17.21	**20.88**	25.04	11.52	**14.23**	17.41
2016	Low	19.93	**23.03**	26.67	20.01	**22.46**	25.30	21.67	**25.26**	28.95
	Med	19.18	**23.04**	27.34	19.45	**22.46**	25.80	21.26	**25.07**	29.10
	High	18.24	**22.64**	28.38	18.72	**22.25**	26.44	19.93	**24.77**	30.40
2017	Low	21.50	**24.21**	27.82	23.75	**26.29**	29.53	22.71	**25.75**	28.78
	Med	20.16	**24.05**	29.08	22.62	**26.25**	29.63	21.81	**25.67**	29.34
	High	18.80	**23.88**	29.39	21.91	**26.06**	30.55	21.16	**25.70**	30.67
2018	Low	35.02	**38.17**	41.45	29.27	**31.46**	33.59	50.25	**52.74**	55.46
	Med	33.22	**37.92**	42.84	28.28	**31.29**	34.31	48.55	**52.91**	57.39
	High	31.05	**37.32**	44.01	26.55	**30.75**	34.73	46.59	**52.69**	58.25

11 FIGURES

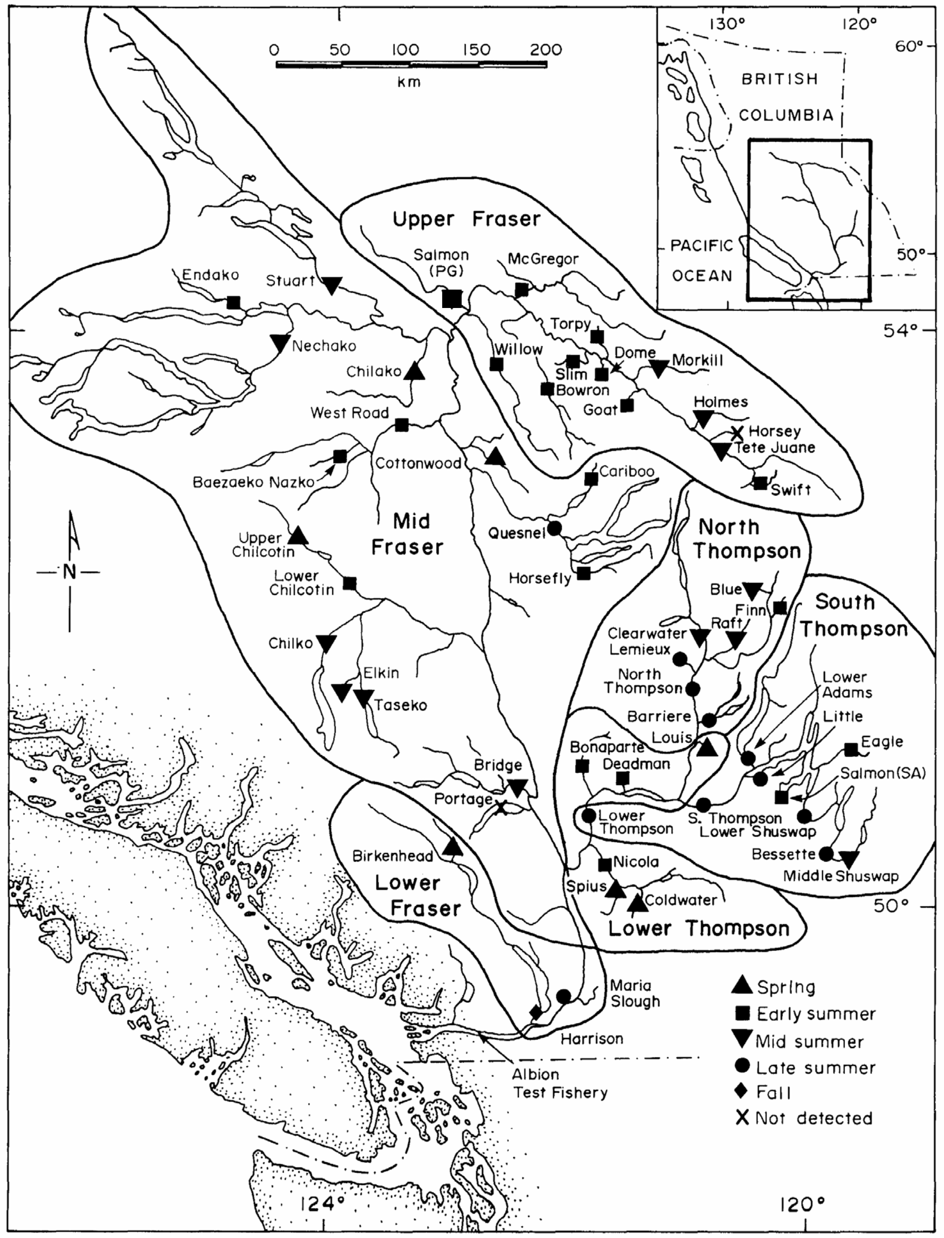

Figure 1. Location of major Fraser River Chinook populations from run-timing aggregates (Beacham et al, 2003).

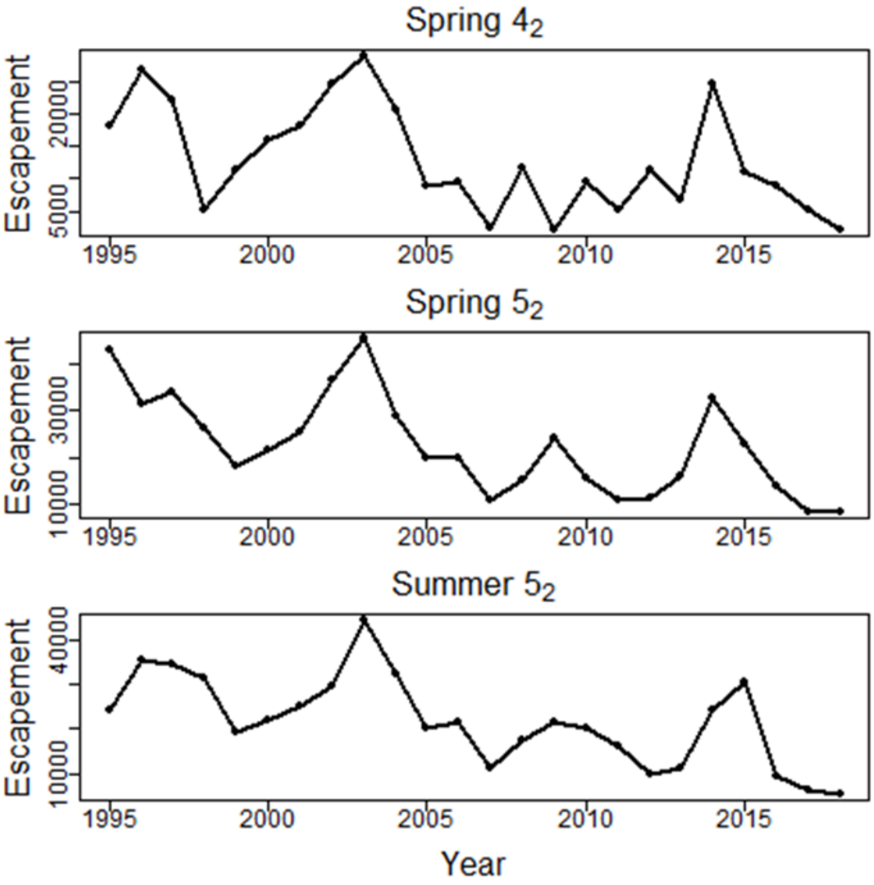

Figure 2. Escapement time series for the Fraser River Spring 4_2, Spring 5_2, and Summer 5_2 SMUs based on infilled escapement datasets used for the Chinook Technical Committee's Escapement and Data Report (CTC 2019).

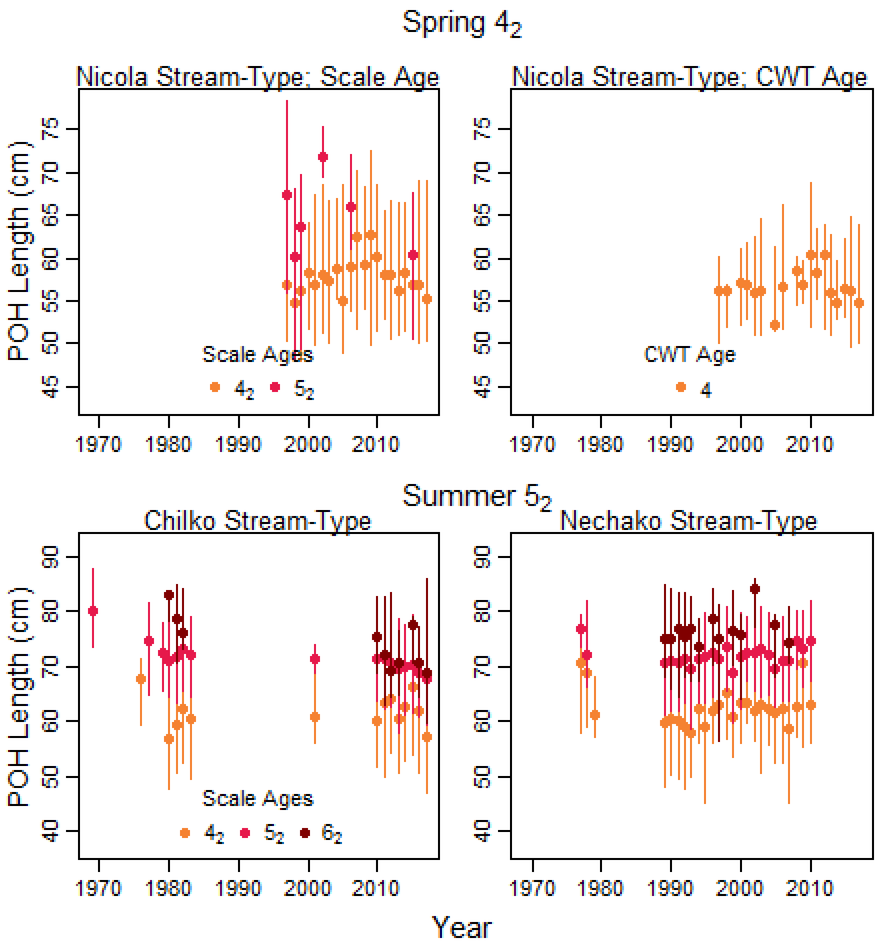

Figure 3. Size-at-age for sampled Summer 5_2 (Chilko and Nechako) and Spring 4_2 (Nicola) stocks. Chilko and Nechako age estimates are based on scale ages, where CWT ages are also available for some Nicola fish. Points are median with vertical lines showing 95% quantiles. Only year-age combinations with more than 5 observations were included.

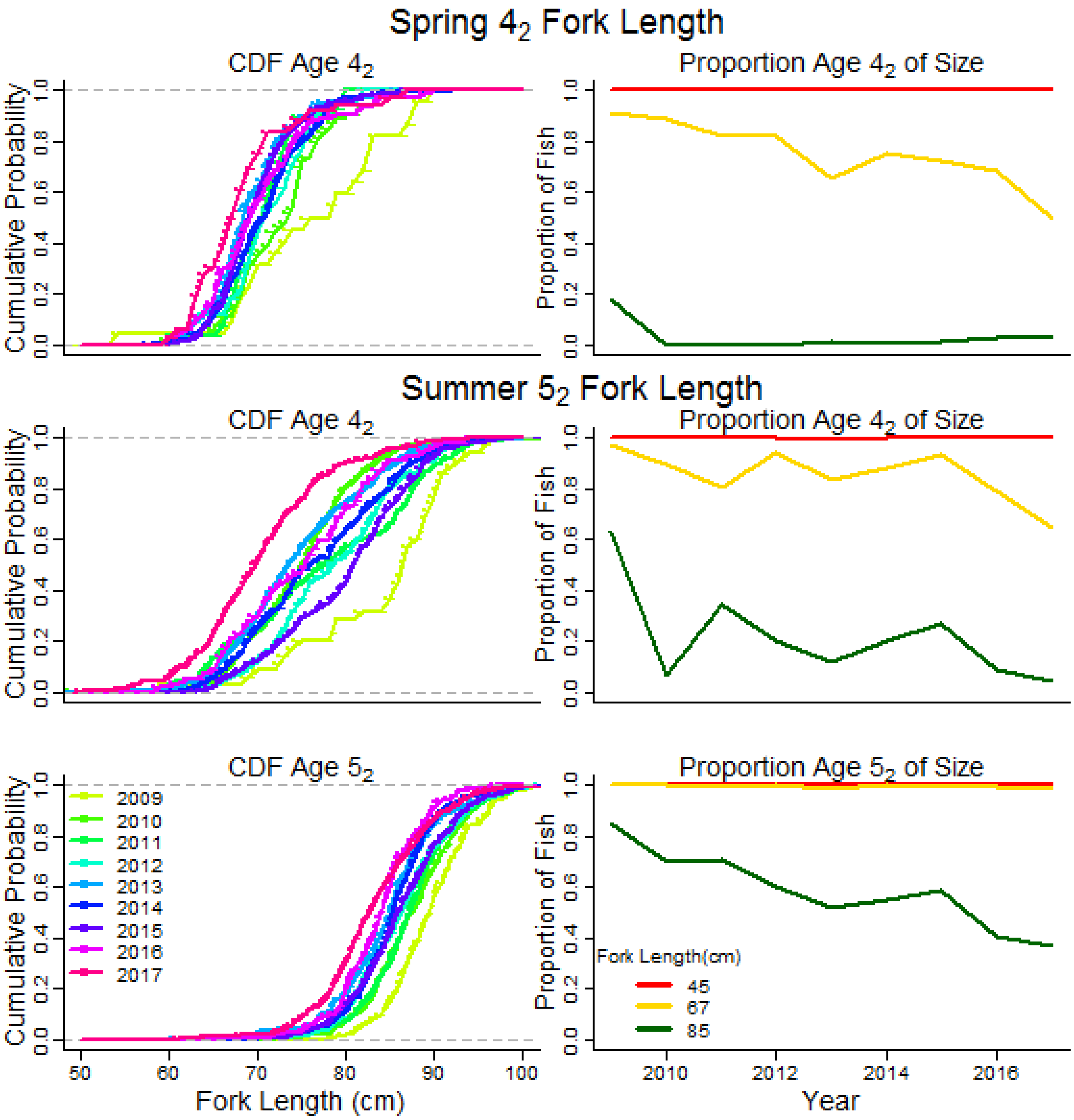

Figure 4. Left: cumulative distributions of estimated marine fork lengths (estimated from POH lengths on the spawning grounds) for Spring 4_2 Chinook (indicator stock is Nicola) and Summer 5_2 Chinook (indicators: Chilko and Nechako), by age, for years with more than 5 length observations. Right side panels show the estimated proportion of each age group that are above a given set of thresholds close to those often used in management: 45, 67, and 85cm

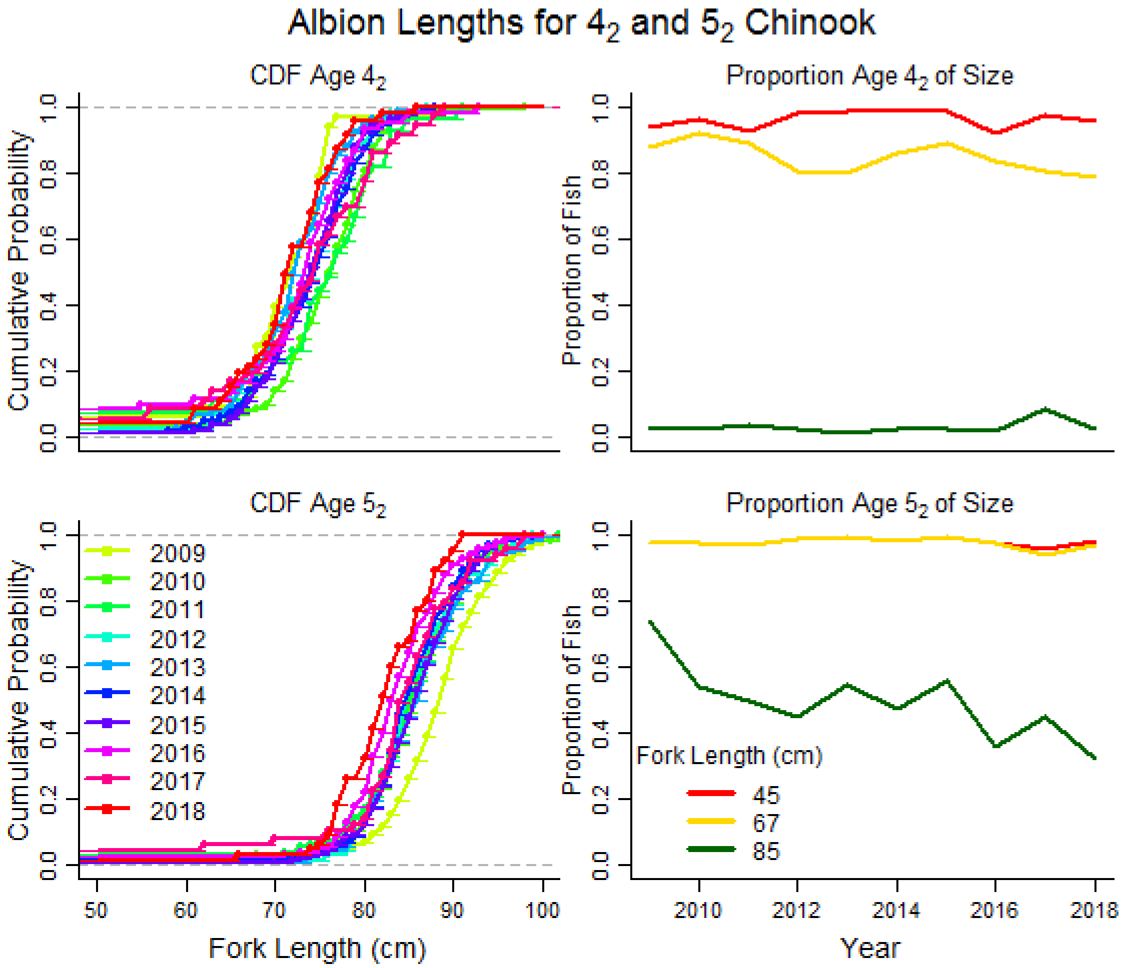

Figure 5. Left: cumulative distributions of estimated marine fork lengths (estimated from POH lengths measured at Albion) for aged 4_2 and 5_2 Chinook, which will be a mix of all early timed stocks. Right side panels show the estimated proportion of each age group that are above a given set of thresholds close to those often used in management: 45, 67, and 85cm

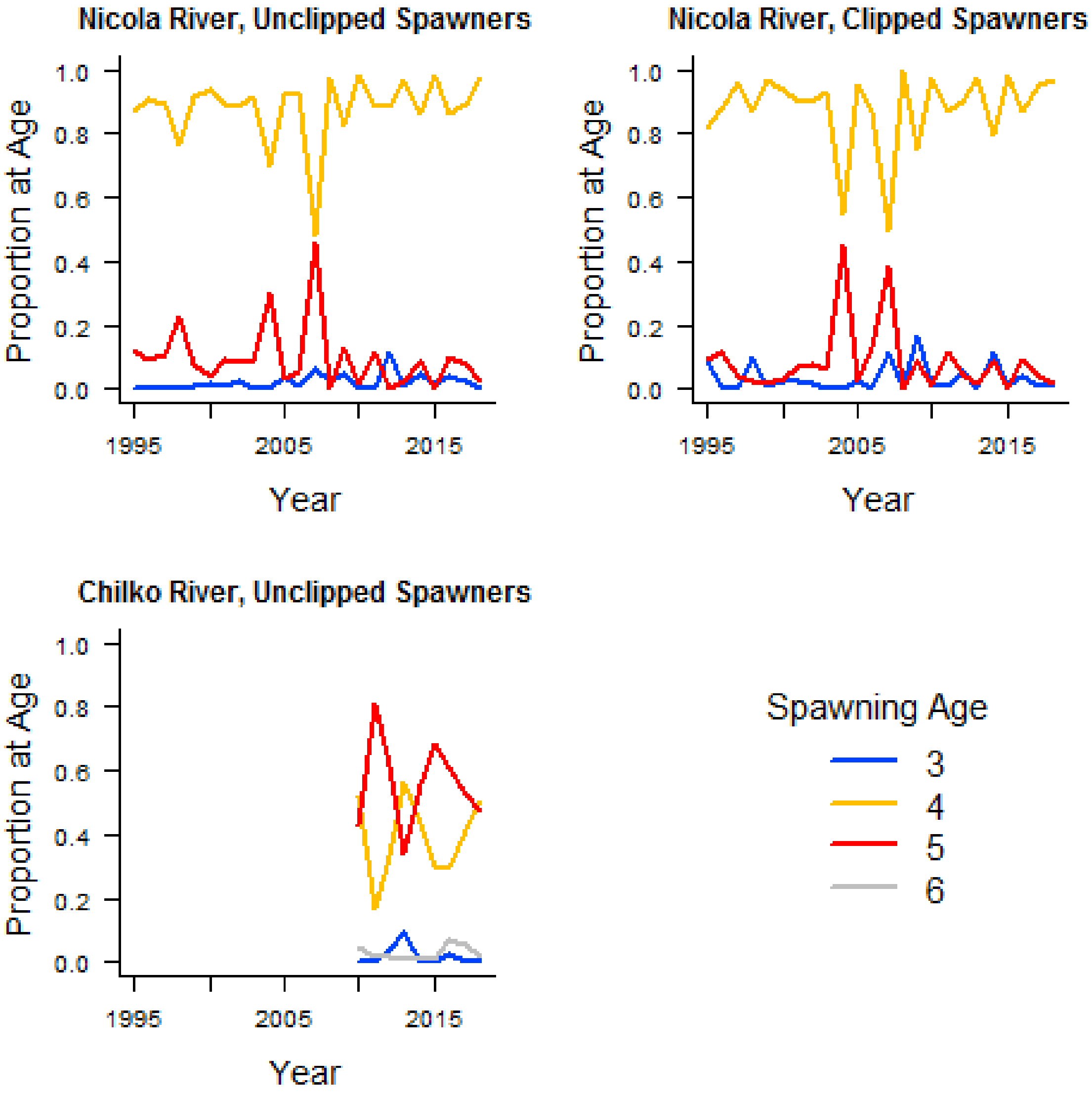

Figure 6. Proportion of spawning escapement at age for two indicator streams by return year, Nicola River (Spring 4_2, top panels) and Chilko River (Summer 5_2, bottom left). For Nicola, data from both unclipped spanwers and clipped spawner are shown, while for Chilko, only unclipped spawners are shown.

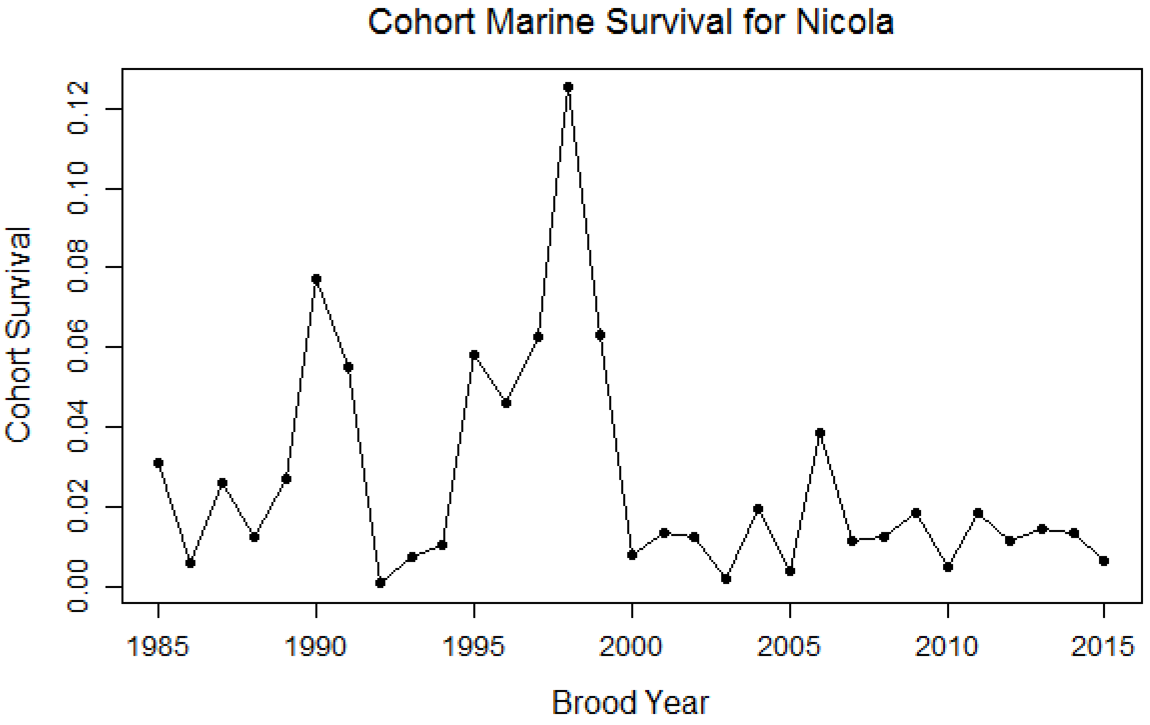

Figure 7. Estimates of early marine survival (smolt to age 3) for the Nicola River indicator stock (Spring 4_2 SMU). Estimates from 2013 to 2015 brood years are based on incomplete cohorts that have not been fully observed at all ages, and thus, these values are expected to change as more data becomes available in the next few years (CTC 1988).

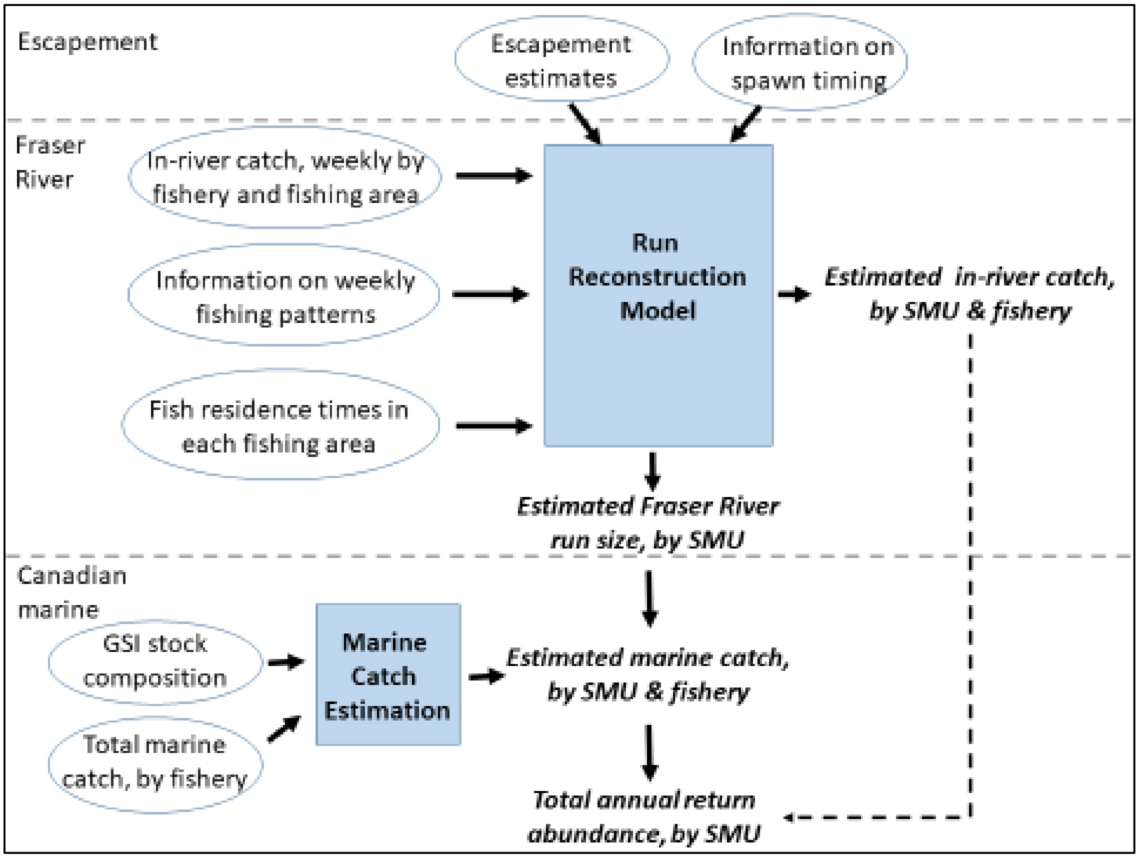

Figure 8. Flow diagram of estimation routine used for the Run Reconstruction Approach to estimating exploitation rate indices. Data inputs are shown in ovals while modelling tools (i.e., the Fraser Run Reconstruction Model) or algorithms (Marine Catch Estimation, as described in Appendix M) are shown in boxes. Note that "Total Return Abundance, by SMU" includes only our indexed Canadian fisheries with GSI data, and thus is really an index of return abundance.

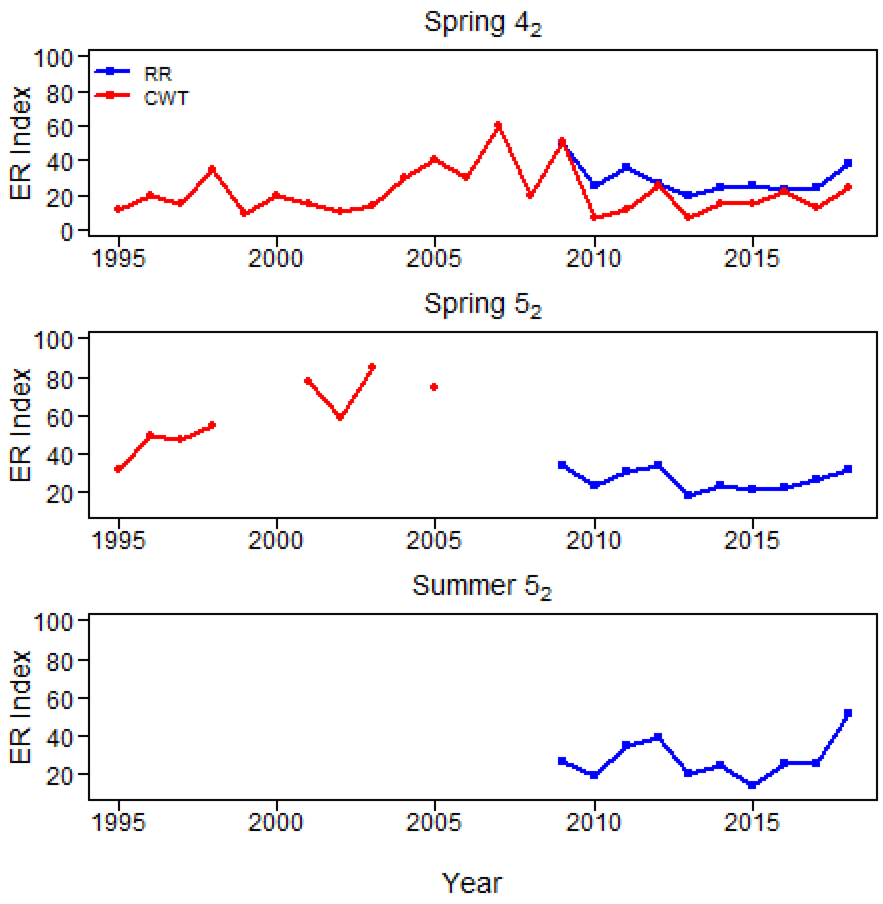

Figure 9. Exploitation rate indices for the three Fraser River stream-type Chinook SMUs developed using the Run Reconstruction Model and CWT approaches to ERI Estimation.

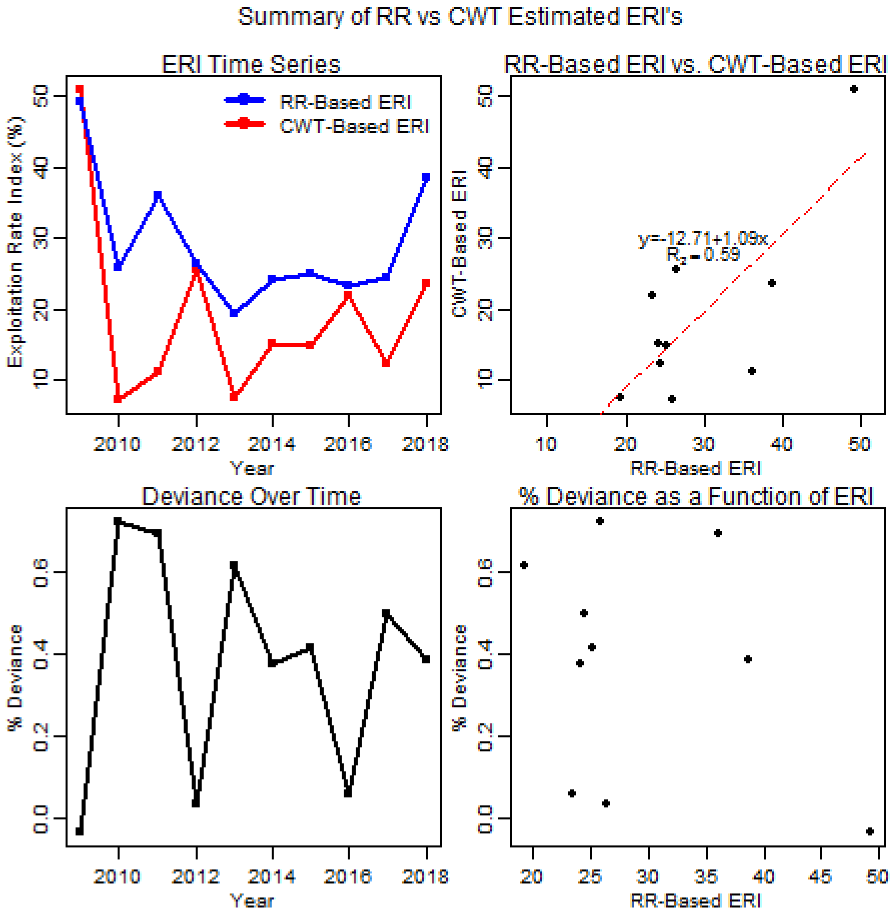

Figure 10. Comparison between CWT-estimated and run-reconstruction-estimated exploitation rate indices for the Spring 4_2 SMU. A linear model fit to the two ERIs (top right panel) had an R^2 value of 0.59, indicating the model explained 59% of the variation in the two data sets. A linear model fit to % Deviance versus RR-based ERIs (bottom right panel) had a low R^2 value (0.11), which is interpreted as having no significant relationship, and therefore has not been shown.

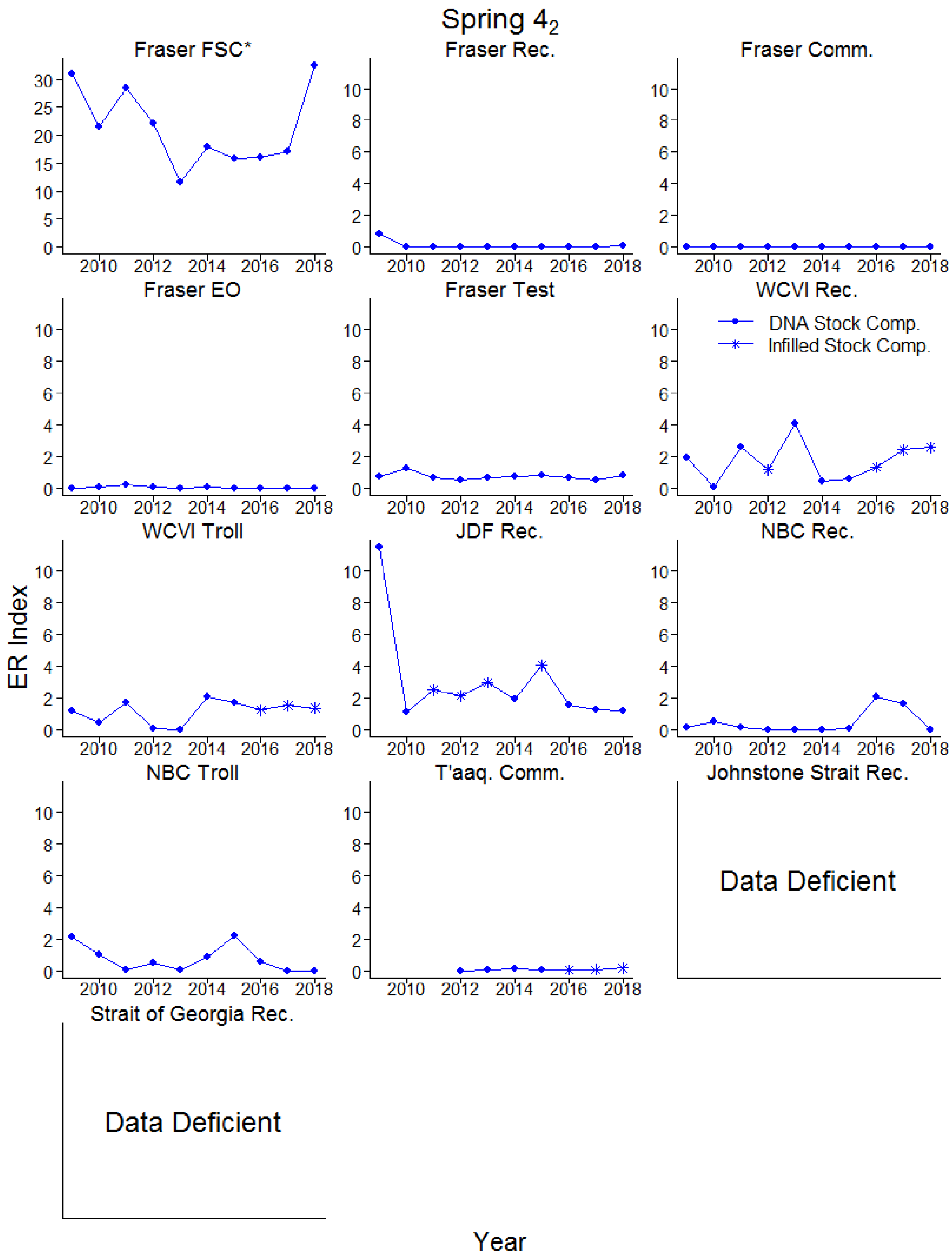

Figure 11. Exploitation rate indices by fishery for the Spring 4_2 stock management unit based on estimates from the Run Reconstruction model & GSI (DNA) approach. For marine fisheries, the blue asterisks show years in which infilling assumptions were used in that fishery to account for missing stock composition (DNA) data.

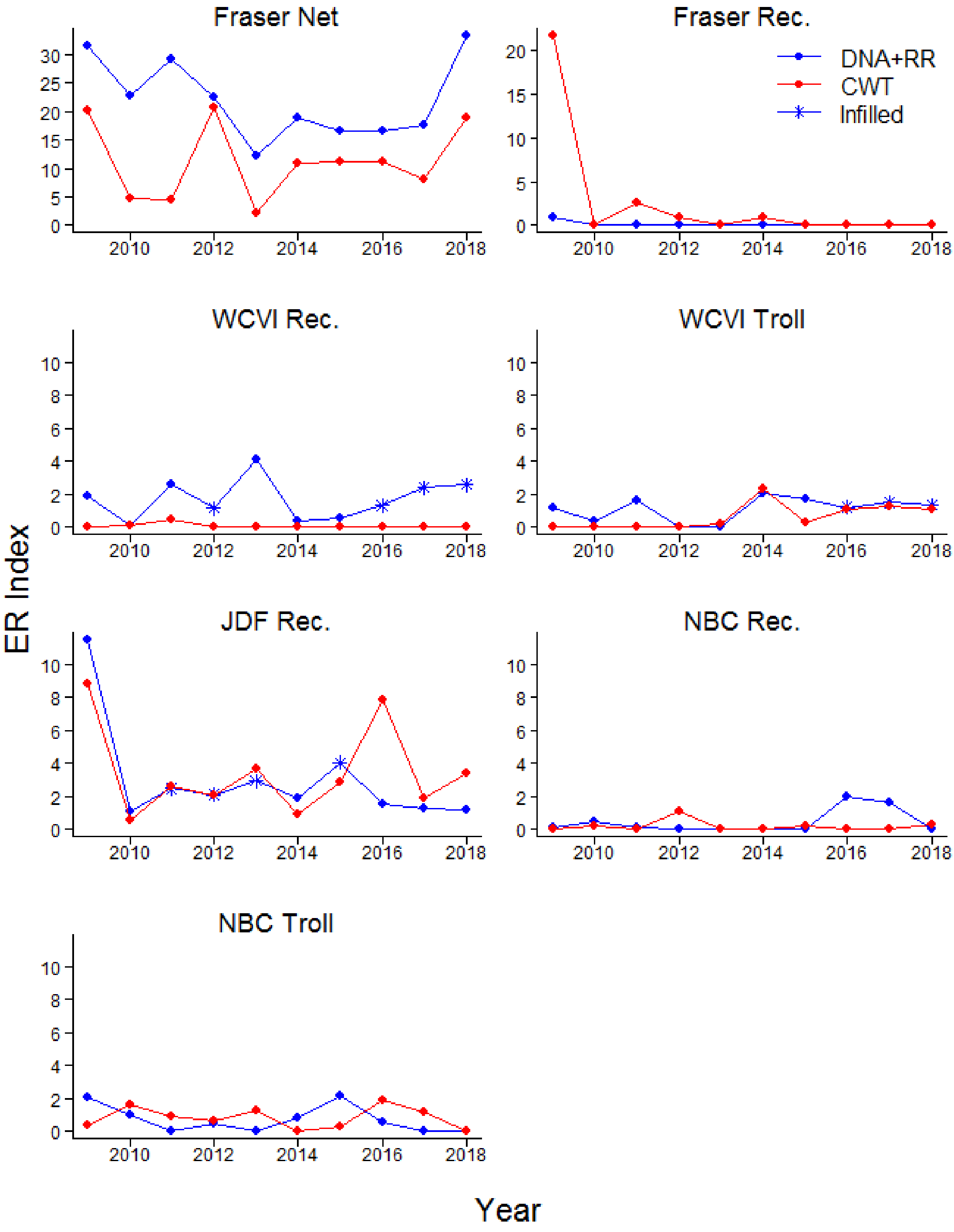

Figure 12. Comparison of ERIs for the Spring 4_2 SMU developed using the Run Reconstruction approach and developed using CWT recoveries from the Nicola River indicator stock for the subset of fisheries in which both methods can be applied. "Fraser Net" fisheries include First Nations FSC, EO, and Test fisheries. For marine fisheries, the blue asterisks show years in which infilling assumptions were used in that fishery to account for missing stock composition (DNA) data.

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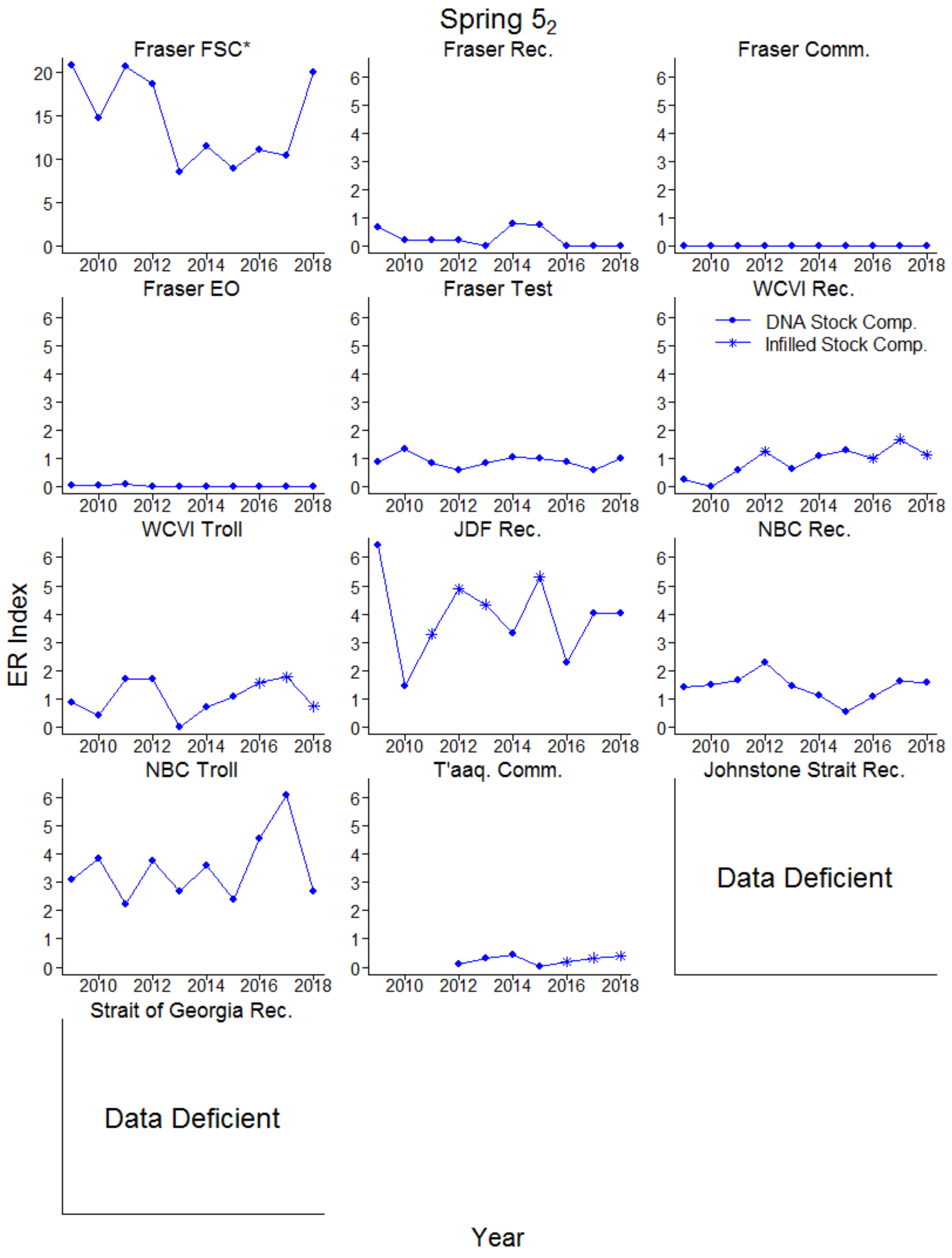


Figure 13. Exploitation rate indices by fishery for the Spring 52 Stock management unit based on estimates from the Run Reconstruction model approach. For marine fisheries, the blue asterisks show years in which infilling assumptions were used in that fishery to account for missing stock composition (DNA) data.

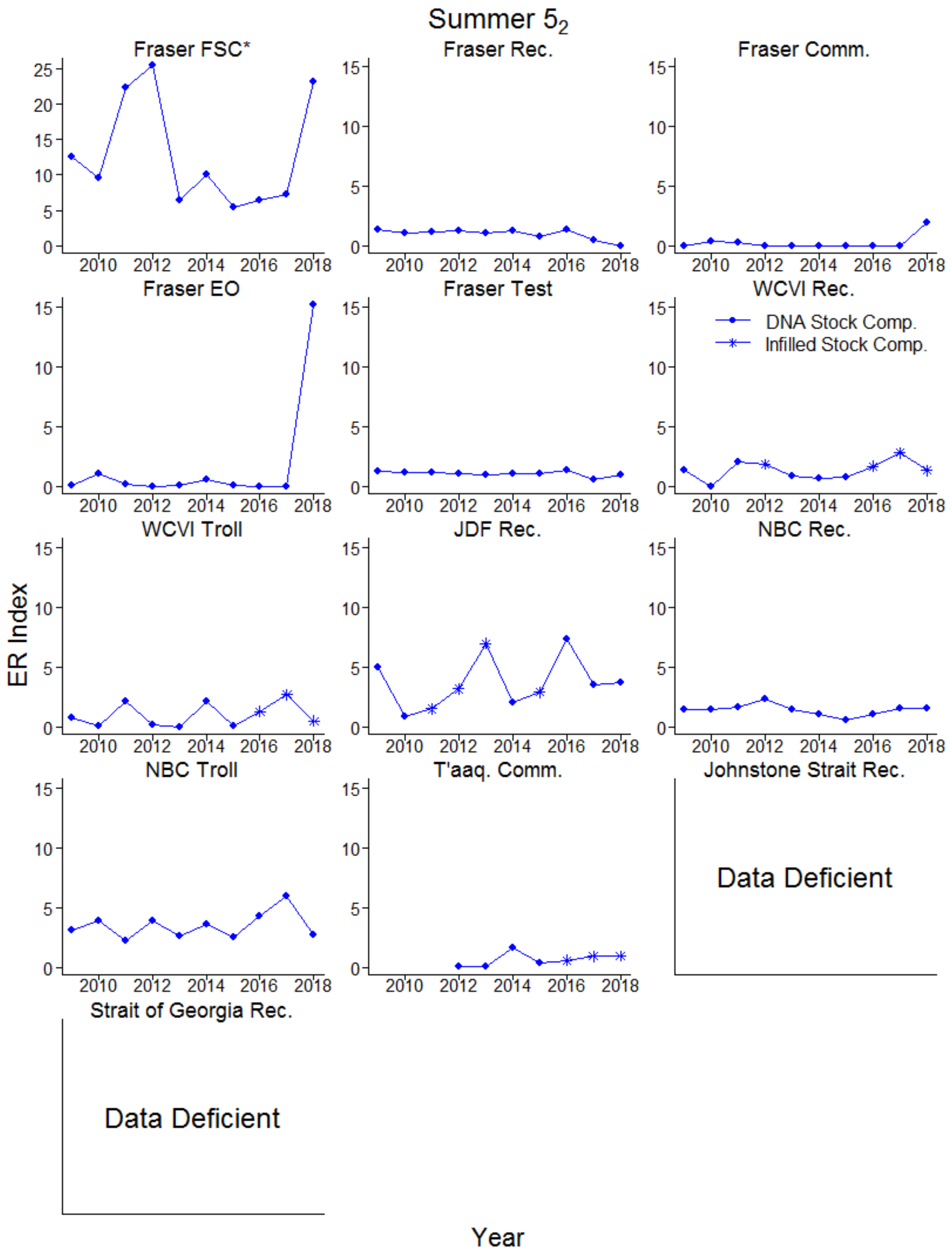


Figure 14. Exploitation rate indices by fishery for the Summer 52 Stock management unit based on estimates from the Run Reconstruction model approach. For marine fisheries, the blue asterisks show years in which infilling assumptions were used in that fishery to account for missing stock composition (DNA) data.

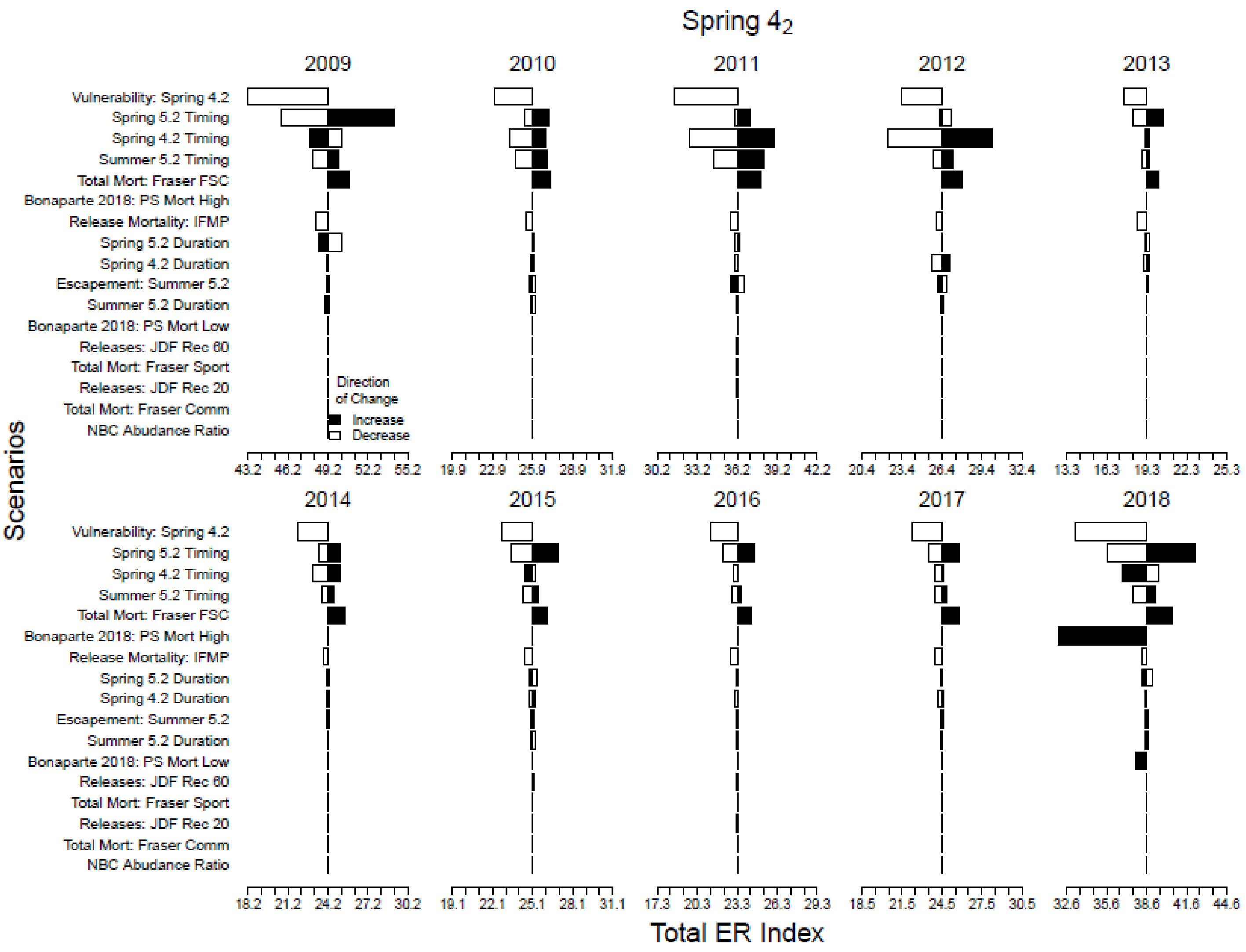


Figure 15. Results of sensitivity analysis scenarios showing effects of consistent bias in input models or parameters on RR-based ERIs for the Spring 4_2 SMU. Scenario descriptions are provided in Table 17. Black bars show the effect of increasing a given data input or parameter in a sensitivity analysis scenario, while white bars show the effect of decreasing.

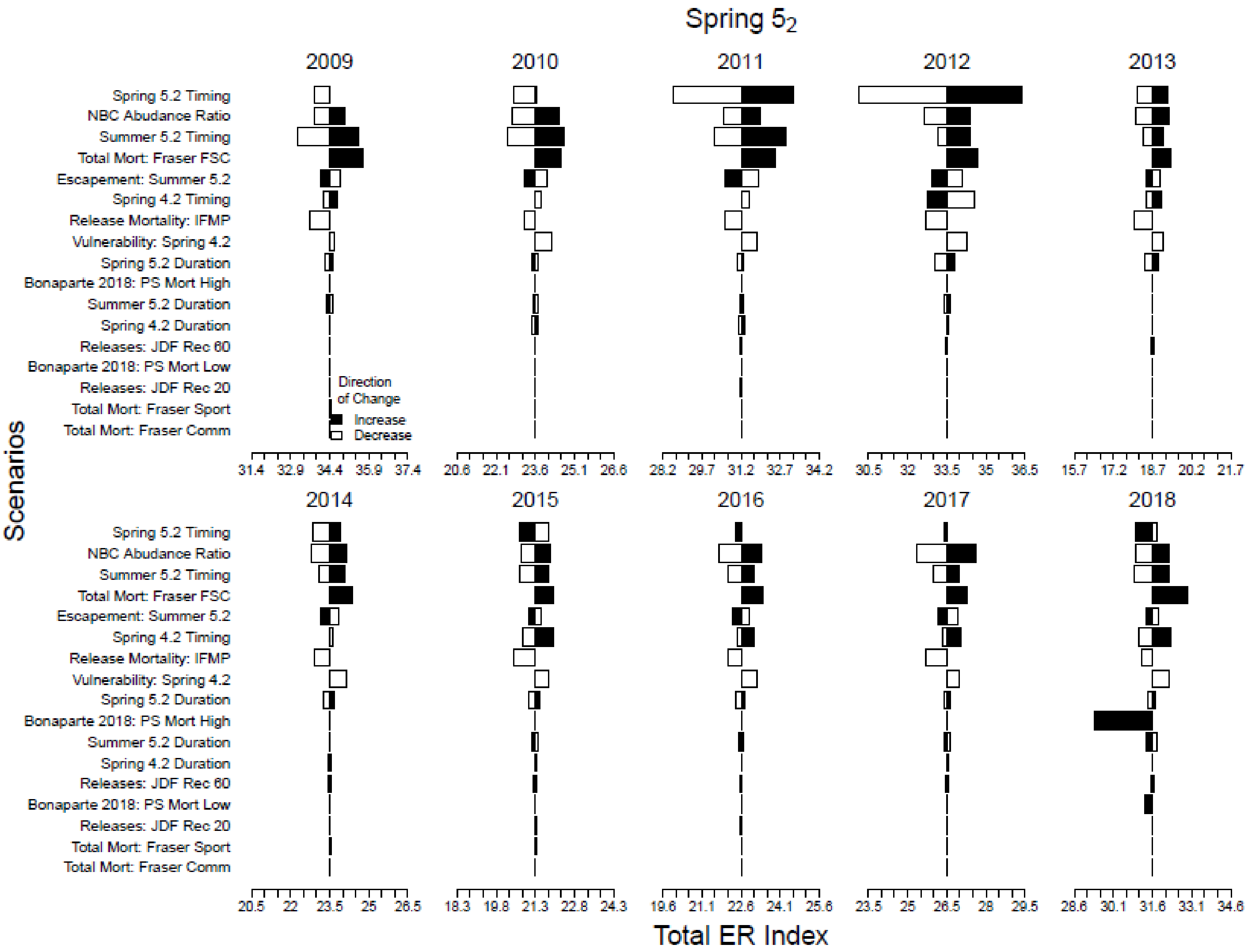


Figure 16. Results of sensitivity analysis scenarios showing effects of consistent bias in input models or parameters on RR-based ERIs for the Spring 5_2 SMU. Scenario descriptions are provided in Table 17. Black bars show the effect of increasing a given data input or parameter in a sensitivity analysis scenario, while white bars show the effect of decreasing.

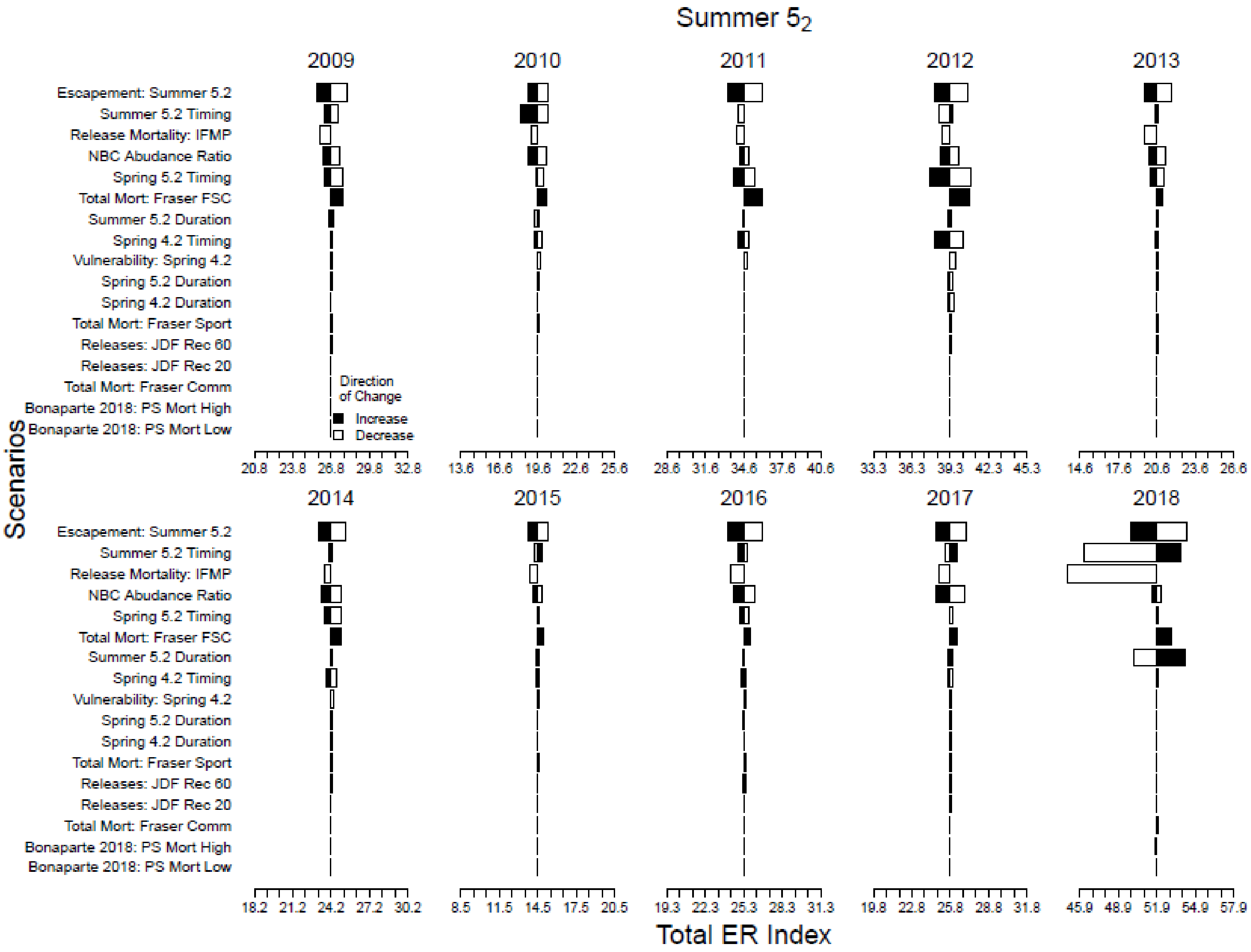


Figure 17. Results of sensitivity analysis scenarios showing effects of consistent bias in input models or parameters on RR-based ERIs for the Summer 5_2 SMU. Scenario descriptions are provided in Table 17. Black bars show the effect of increasing a given data input or parameter in a sensitivity analysis scenario, while white bars show the effect of decreasing.

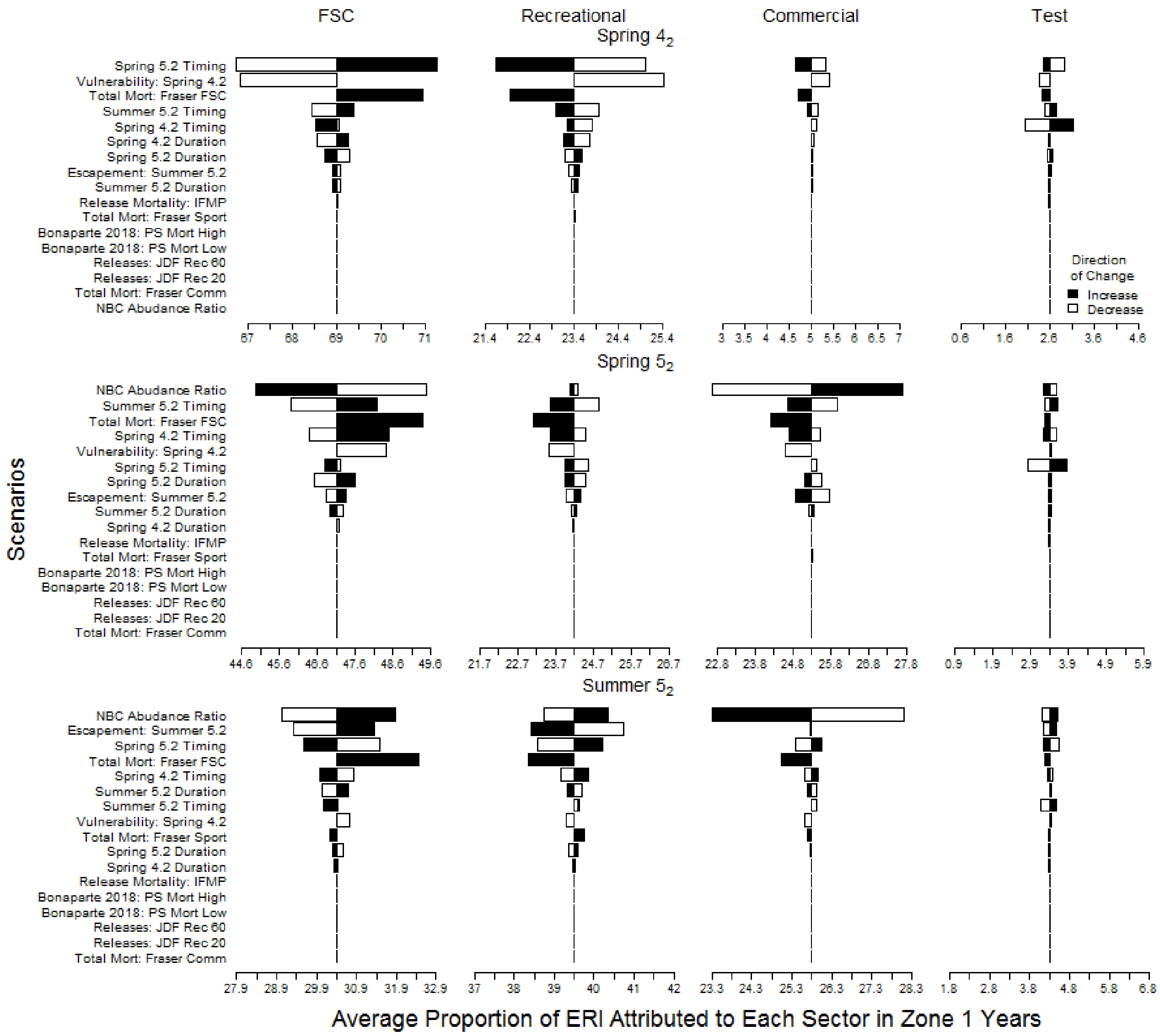


Figure 18. Results of sensitivity analysis scenarios showing effects of consistent bias in model inputs or parameters on average estimates of the relative allocation of ERI by sector in recent Zone 1 years (2013, 2016, 2017). Scenario descriptions are provided in Table 17. Black bars show the effect of increasing a given data input or parameter in a sensitivity analysis scenario, while white bars show the effect of decreasing.

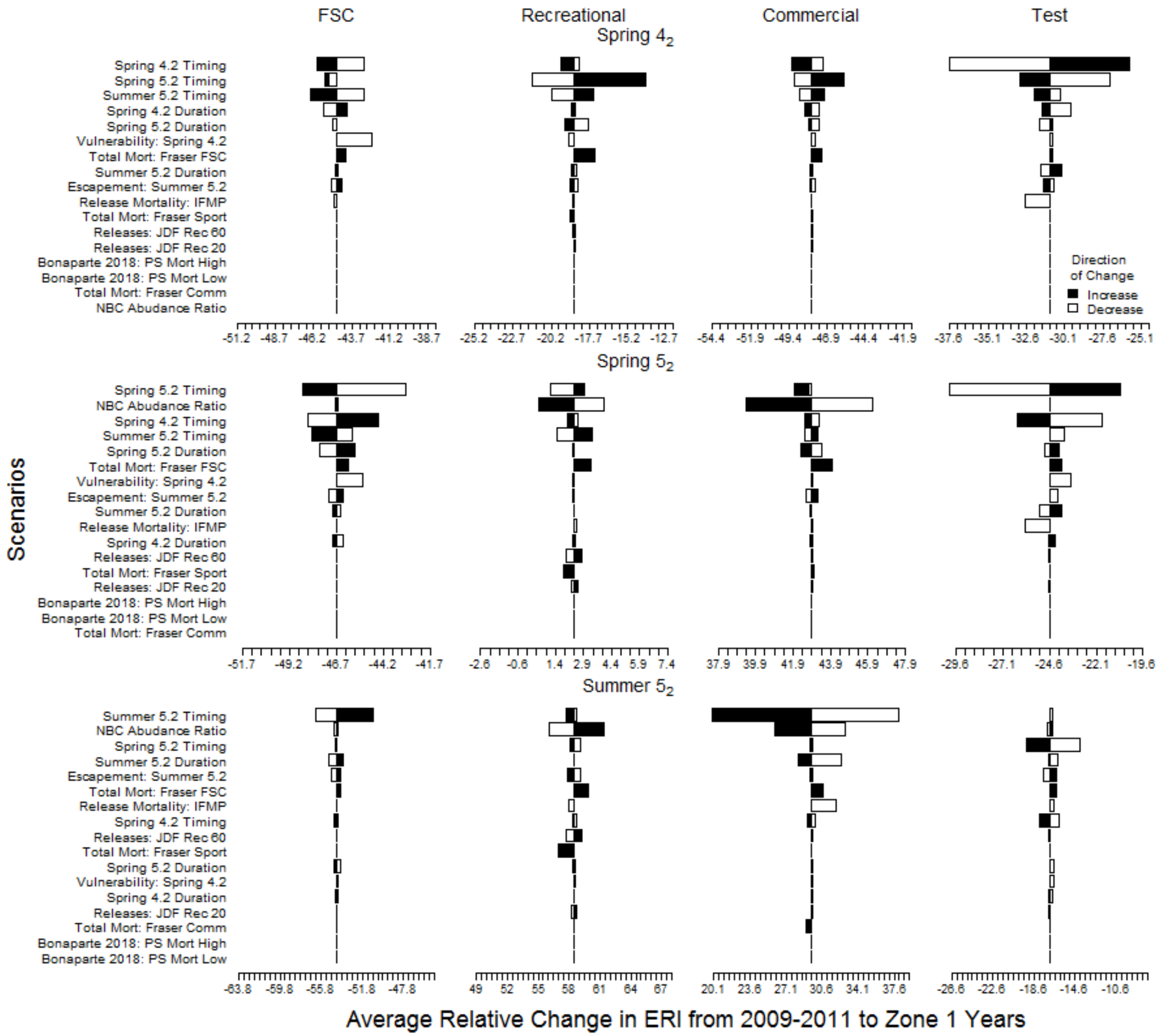


Figure 19. Results of sensitivity analysis scenarios showing effects of consistent bias in model inputs or parameters on average estimates of the % Change in ERI from the 2009-2011 period to recent Zone 1 years. Scenario descriptions are provided in Table 17. Black bars show the effect of increasing a given data input or parameter in a sensitivity analysis scenario, while white bars show the effect of decreasing.

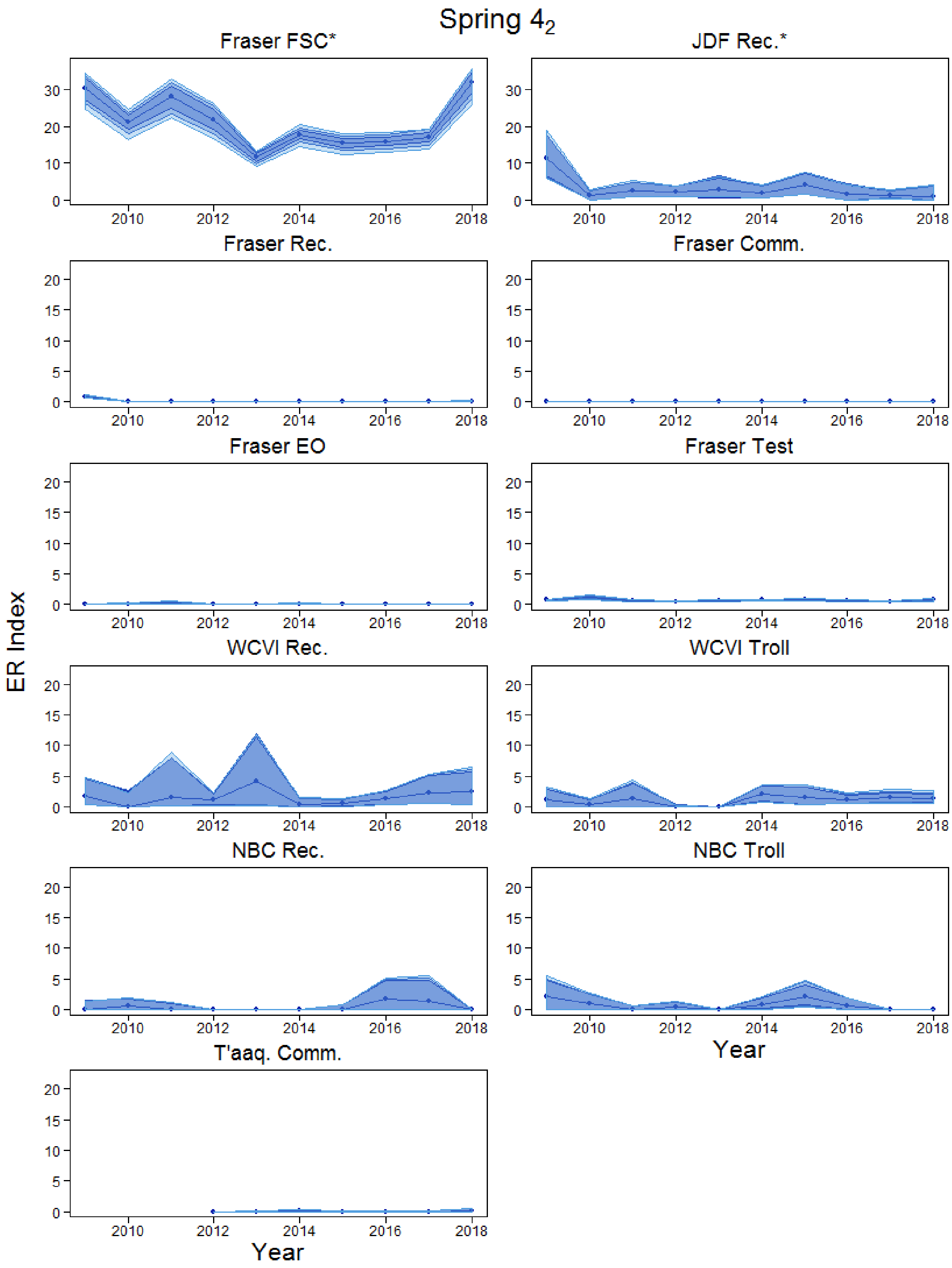


*Figure 20. Results of Monte Carlo simulation uncertainty analysis for the Spring 4_2 SMU. Points indicate median values, and transparent bands indicate 95% probability distributions for low, med, high variability scenarios (more transparent, wider, bands correspond to high variability). *Note that Fraser FN and JDF Rec. fisheries have different x-axes values than other fisheries.*

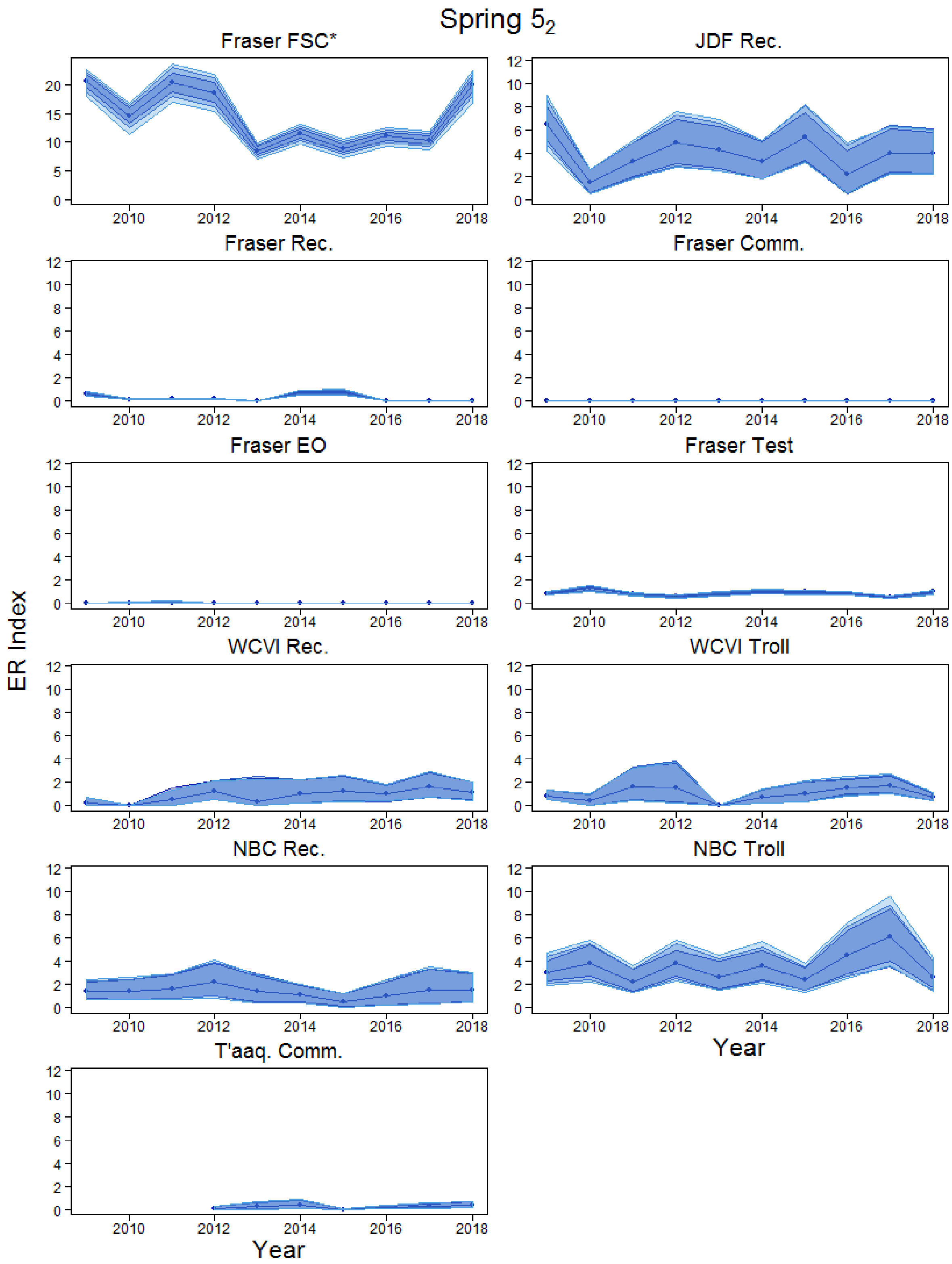


*Figure 21. Results of Monte Carlo simulation uncertainty analysis for the Spring 5_2 SMU. Points indicate median values, and transparent bands indicate 95% probability distributions for low, med, high variability scenarios (more transparent, wider, bands correspond to high variability). *Note that Fraser FN has different x-axes values than other fisheries.*

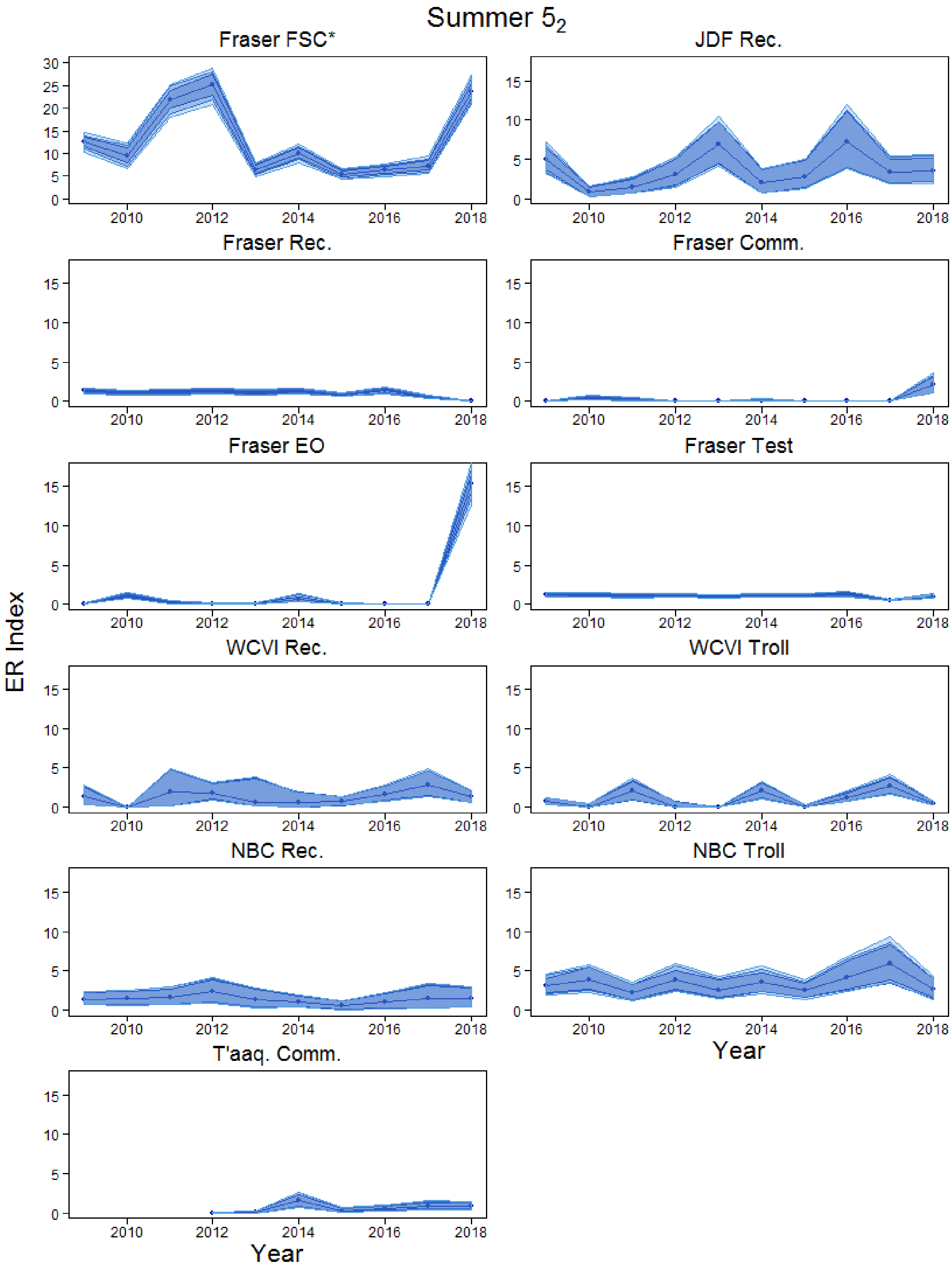


*Figure 22. Results of Monte Carlo simulation uncertainty analysis for the Summer 5_2 SMU. Points indicate median values, and transparent bands indicate 95% probability distributions for low, med, high variability scenarios (more transparent, wider, bands correspond to high variability). *Note that Fraser FN and JDF Rec. fisheries have different x-axes values.*

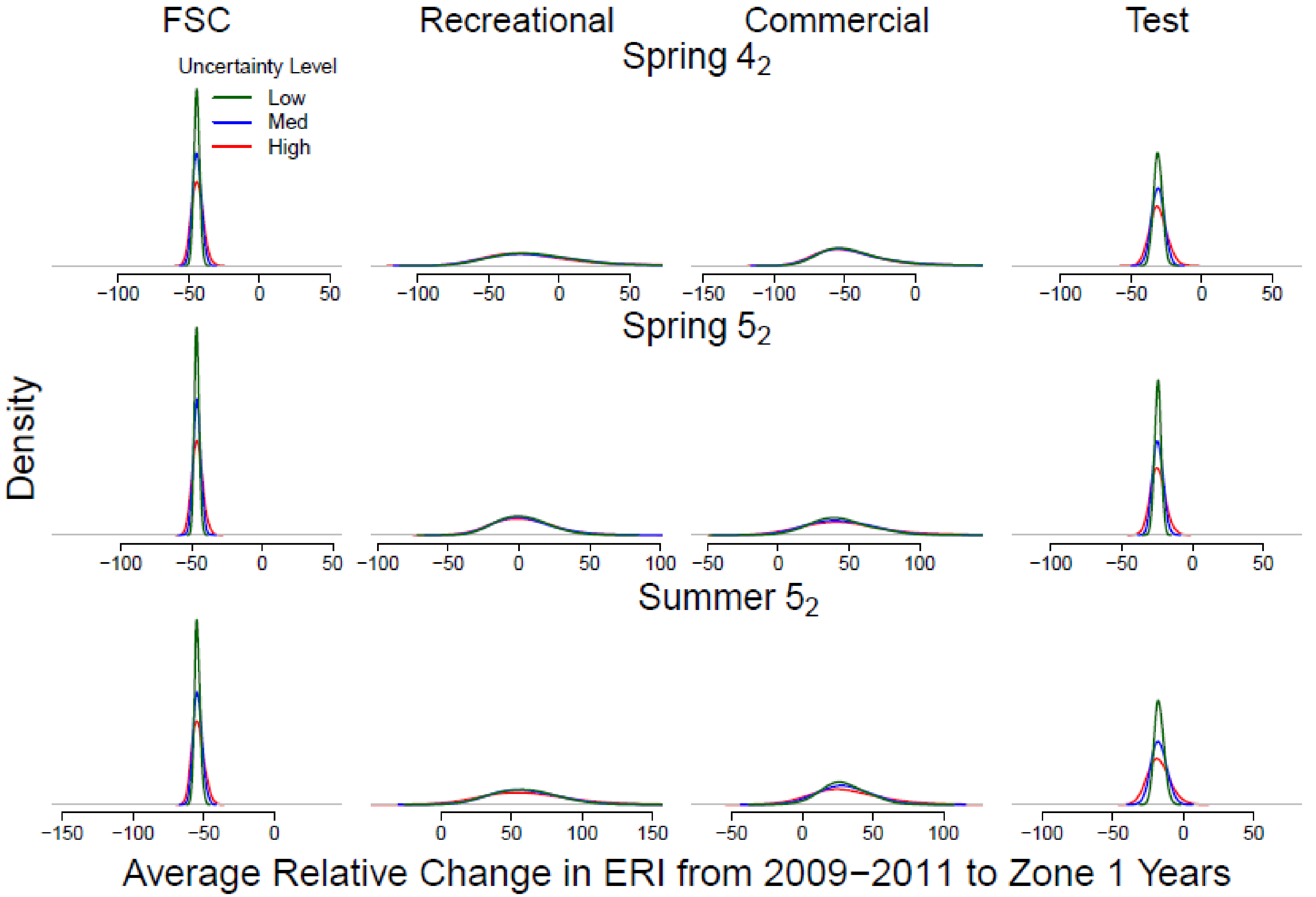


Figure 23. Probability distributions from Monte Carlo simulations showing uncertainty in the relative change in average ER index between 2009-2011 and zone 1 years (2013, 2016, 2017), across simulated uncertainty levels. Note that each stock/sector plot has different x-axis bounds, but the widths of each are the same, so allow for comparison of distribution width.

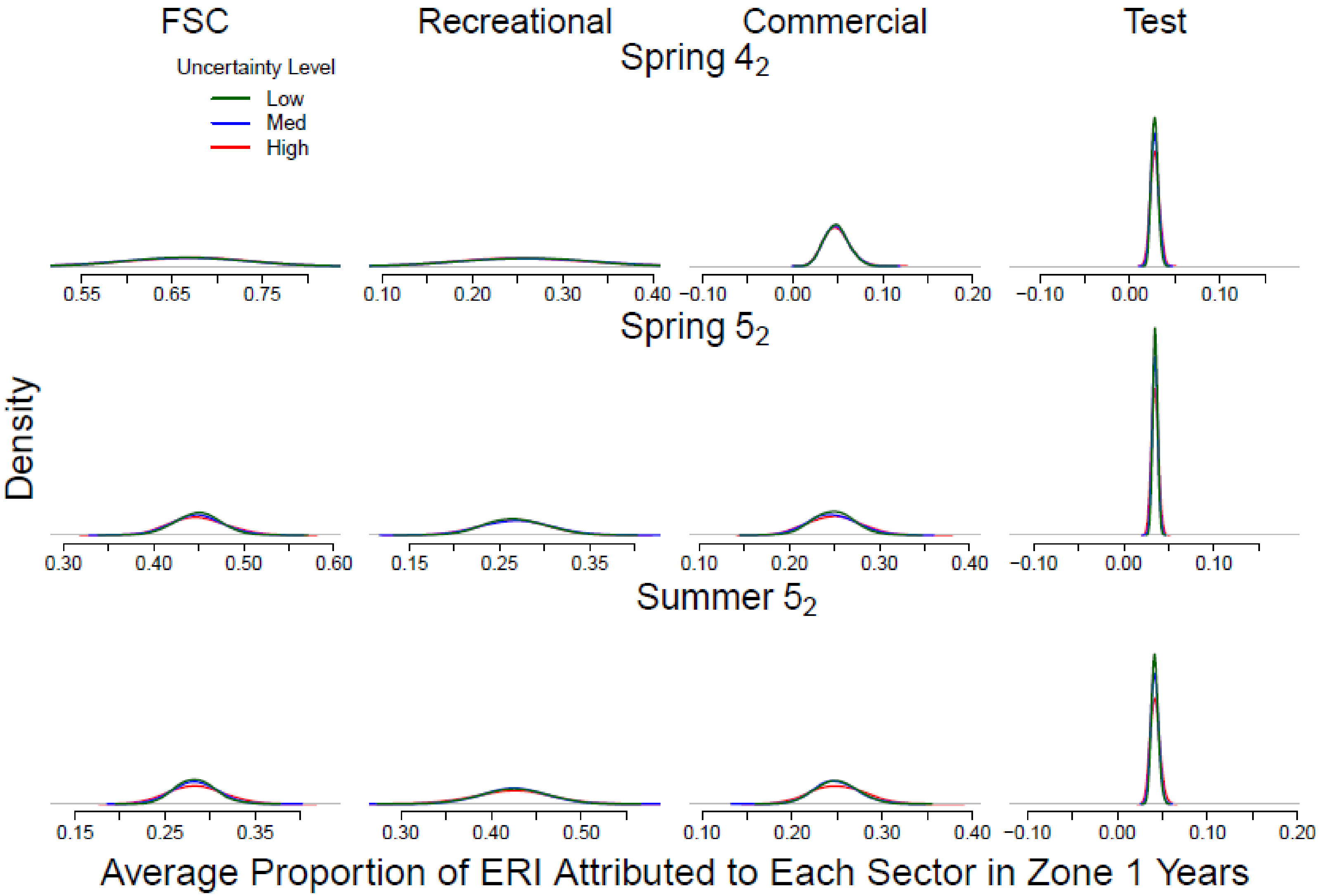


Figure 24. Probability distributions from Monte Carlo simulations showing uncertainty in the average proportional allocation of ER index between sectors for zone 1 years (2013, 2016, 2017), across simulated uncertainty levels. Note that each stock/sector plot has different x-axis bounds, but the widths of each are the same, so allow for comparison of distribution width

APPENDIX A: REGIONAL DIRECTOR DIRECTIVE

2012 DFO LETTER TO STAKEHOLDERS

Fisheries and Oceans
Canada

Pêches et Océans
Canada

Pacific Region
Suite 200 – 401 Burrard Street
Vancouver, British Columbia
V6C 3S4

Région du Pacifique
Piece 200 – 401 rue Burrard
Vancouver (C.-B.)
V6C 2\3S4

April 27, 2012

Via E-mail

Dear First Nations Chiefs, Councilors and Fisheries Representatives,

Subject: Fraser River Spring 5_2 and Summer 5_2 Chinook Management.

As part of developing the Salmon Integrated Fisheries Management Plans in 2012, the Department has been consulting with First Nations, recreational and commercial harvesters seeking feedback on a potential reduction in exploitation rates on Spring 5_2 and Summer 5_2 chinook. The objective is to reduce the exploitation rate by a minimum of 50% from exploitation rates of 50% to 60% observed in the early 2000's to an exploitation rate of less than 30% to address expected poor returns of less than 30 thousand Spring 5_2 and Summer 5_2 chinook to the Fraser River. These actions would build on and extend actions implemented in recent years that were designed to protect and conserve southern BC chinook stocks of concern and, in particular, Fraser Spring 4_2 chinook. The Department is seeking feedback on two possible approaches for management of Spring 5_2 and Summer 5_2 chinook for 2012.

Fraser River chinook populations comprise 17 Wild Salmon Policy conservation units and are organized into 5 management units. These management units are organized based on life history of the populations and return timing of adults to the Fraser as follows: Spring 4_2, Spring 5_2, Summer 5_2, Summer 4_1 and Fall 4_1. These management units are intended to align fisheries management objectives with indicator stocks, escapement, catch, and exploitation rate data used in the Pacific Salmon Treaty process. Chinook populations in the first three management units (Spring 4_2, Spring 5_2, and Summer 5_2) contain 13 Wild Salmon Policy conservation units that are of conservation concern due to declining trends in spawner abundance and very low survival rates in recent years. Fraser Spring 4_2 chinook return to spawn from early March through late July and migration peaks in June in the lower Fraser River; return timing of Spring 5_2 chinook is similar. However, Summer 5_2 chinook have later timing and return to the Fraser River to spawn from late June to August with a peak in late July, approximately 1 month later than Spring 4_2 and Spring 5_2 chinook.

In recent years, there has been substantial work undertaken to develop and implement closures and other restrictions to protect Fraser Spring 4_2 stocks; these actions are planned to continue for 2012. In addition to the Fraser Spring 4_2-directed actions, the salmon integrated fisheries management plan details a three zone management approach for Fraser Spring 5_2 and Summer 5_2 chinook based on: 1) less than 30 thousand chinook (zone 1); 2) 30 to 60 thousand chinook (zone 2); or 3) greater hand 60 thousand chinook (Zone 3) returning to the Fraser River.

Chinook returns less than 30 thousand are associated with high conservation concern; only 5 of the last 35 years have had spawner abundances in this range. In 2012, returns of Fraser Spring 5_2 and Summer 5_2 chinook are expected to be less than 30 thousand, based on approximately 22 thousand spawners in the parental brood year (2007) and continuing low return rates that have averaged 1 adult return per spawner or less in recent years. Given the poor pre-season outlook, the Department is planning to implement management actions based on returns being less 30, 000 (zone 1). The abundance of Spring 5_2 and Summer 5_2 will be assessed in-season.

Results from the in-season assessment of Spring 5_2 and Summer 5_2 chinook returns to the Fraser will be used to finalize which of the 3 management zones identified in the management plan will be applied. The Department will use the relationship between the cumulative Catch Per Unit Effort (CPUE) of chinook caught in the Albion test fishery from May 6th through June 16th to provide an in-season estimate of returns of Spring 5_2 and Summer 5_2 chinook to the mouth of the Fraser River. Updates of the predicted return for informational purposes are tentatively planned for May 22nd and June 4th, however, management actions for Spring 5_2 and Summer 5_2 chinook will be implemented based on the final in-season update which is planned for June 18th.

A key challenge with developing appropriate management approaches for Spring 5_2 and Summer 5_2 chinook has been a lack of current indicator stock data (i.e. a coded wire tagged chinook population) to estimate exploitation rates on these populations for all fisheries. Current coded wire tag (CWT) indicator data and associated information on the distribution of mortalities in fisheries exists only for the Spring 4_2 (Nicola), Summer 4_1 (Shuswap) and Fraser Fall 4_1 (Chilliwack/Harrison) groups; older data is available for Spring 5_2 (Dome Creek data ended in 2006) but not for the Summer 5_2 chinook.

In order to support the discussion of additional management actions for a return of less than 30 thousand (zone 1) , the Department has provided a summary of estimated exploitation rates in recent years for all fisheries impacting on Spring 5_2 chinook (see Table 1, status quo-2010). This information is based on estimated exploitation rates from a 2000 to 2006 base period for Dome Creek (Spring 5_2) coded wire tag information. However, because coded wire tag information is not available after 2006, projected exploitation rates for 2010 were made by adjusting the base period exploitation rates to account for recent management actions that have occurred since the 2002 to 2006 period. Recent (e.g. 2010) exploitation rate estimates in Table 1 largely reflect recent fishery management actions that were implemented to conserve Fraser Spring 4_2 chinook. Based on Table 1, there appear to be five primary areas where these stocks have been most impacted by fisheries: Northern (Area F) and West Coast of Vancouver Island (Area G) commercial troll fisheries; Juan de Fuca (Victoria area) and Fraser River recreational fisheries; and Fraser River First Nation food, social and ceremonial fisheries. Exploitation rates appear to be low in other areas.

Similar calculations for Summer 5_2 chinook are not possible as coded wire tag information is insufficient to estimate mortality distributions for this management unit. However, the Department has compiled a technical information package on Spring 5_2 and Summer 5_2 chinook that summarizes available information. Where information is available, relative changes in impacts on Summer 5_2 chinook are provided for reference.

Differing views have emerged in response to the Department's proposal to reduce exploitation rates on Spring 5_2 and Summer 5_2 chinook by a minimum of 50% from exploitation rates of 50% to 60% observed in the early 2000's. One view that has been offered is that management actions implemented in recent years to protect Fraser River Spring 4_2 chinook may be sufficient to also protect Spring 5_2 and Summer 5_2 chinook given the substantial run timing overlaps of these groups. However, another view is that additional management actions will be required to account for the approximately 1 month later timing of Summer 5_2 chinook and to reduce exploitation rates further.

Table 1 also provides a comparison of the expected outcomes of two possible approaches for returns of less than 30 thousand Spring 5_2 and Summer 5_2 chinook (zone 1) in 2012.

Option 1 identifies proposed management actions that have been implemented in recent years to protect Fraser River Spring 4_2 chinook with some modification to commercial fisheries in order to further reduce harvest impacts;

- In developing Option 1, management actions proposed are similar to those implemented in 2010 and 2011 to protect Fraser River Spring 4_2 chinook with the following additions:
    - the West Coast of Vancouver Island (Area G) commercial troll is proposed closed for June and July, and
    - any commercial net fisheries for Fraser sockeye are proposed to have chinook non-retention
- These actions are proposed to further reduce Spring 5_2 and Summer 5_2 impacts and consistent with Allocation priorities.

Option 2 identifies proposed management actions to further reduce overall exploitation rates on Spring 5_2 chinook while also providing additional protection to later timed Summer 5_2 chinook.

For marine waters:

- North Coast (Area F) Troll: Fishery is currently closed and is proposed to open June 21. Southern portions of the fishing area including Areas 6 to 10 and 106 to 110 will remain closed in 2012.

- West Coast of Vancouver Island (Area G) troll fishery: Fishery is proposed to be closed during June and July. Management during April and May will be will include a combination of closed times, monthly effort restrictions and catch limits. This fishery opened April 19th in the northwest portions of Vancouver Island; the next opening is planned for May 1. From April 19th to May 31st monthly effort restrictions and catch limits will also be in place in this fishery to limit total harvest rates. Effort (e.g. boat days) from the June period will be moved to either May, August or September

- Juan de Fuca recreational fishery: March 1 through June 15th, the daily limit is two (2) chinook per day which may be wild or hatchery marked between 45 and 67 cm or hatchery marked greater than 67cm in Subareas 19-1 to 19-4 and 20-5. From June 16th through July 20th, the daily limit will be two (2) chinook per day which may be wild or hatchery marked between 45 and 85cm or hatchery marked greater than 85cm in the same areas.

- Strait of Georgia recreational fishery (corridor between Victoria and the Fraser River): May 1 to June 15th, the daily limit is two (2) chinook per day wild or hatchery marked only one of which may be greater than 67 cm in Subareas 18-1 to 18-6, 18-9, 18-11, 19-5 and portions of 29-4 and 29-5. From June 16th to July 20th, the daily limit will be two (2) chinook per day which may be wild or hatchery marked between 62cm and 85cm (retention of hatchery marked greater than 85cm may also be considered).

- Strait of Georgia recreational fishery (off the mouth of the Fraser): Effective May 1 through July 27th, in Sub areas 29-6, 29-7, 29-9 and 29-10, non-retention of chinook salmon.

For Fraser River tidal and non-tidal waters:

- Fraser River recreational fishery (tidal and non-tidal Fraser):

  i) Tidal and non-tidal Fraser in Region 2: No fishing for salmon January 1st through July 27th.

  ii) non-tidal Fraser in Region 3: Closed to fishing for salmon until August 21st. Thompson River from Kamloops Lake downstream to the confluence of the Fraser River and waters of the Fraser river downstream of the confluence of the Thompson River to the Alexandra Bridge no fishing for salmon to August 21st. Clearwater and North Thompson Rivers: no fishing for salmon. South Thompson River: no fishing for salmon to August 15th. July 15th to August 15th: no fishing for salmon (Mouth of Bessette Creek); July 25th to Aug 15th: 1 chinook per day 77cm or greater monthly limit of 4/month (Mabel Lake and Shuswap River);

  iii) All waters of Region 5 and 7: no fishing for salmon.

- First Nations fisheries: Very limited fisheries considered. Expected exploitation rates on Fraser Spring 5_2 and Summer 5_2 chinook would need to be reduced by at least 45% under this option. Harvests of Spring 5_2 and Summer 5_2 chinook may occur during chinook-directed fisheries or as by-catch in sockeye-directed fisheries. The Department is consulting with First Nations to assess potential fishing plans and management measures for First Nations food, social and ceremonial (FSC) fisheries in 2012.
- any commercial net fisheries for Fraser sockeye are proposed to have chinook non-retention

In developing Option 2, the Department has proposed management actions in the 5 primary areas where Spring 5_2 chinook appeared to be most impacted. In proposing specific fishery management actions, the Department was guided by its policies and management practices. In particular, DFO manages fisheries such that conservation is paramount. After conservation, DFO is committed to priority of First Nations harvest opportunities for FSC purposes over all other uses in managing salmon fisheries according to policies such as *Canada's Policy for Conservation of Wild Pacific Salmon (2005)* and the *Allocation Policy for Pacific Salmon (1999)*.

The expected outcome of Option 2 is a substantial reduction of exploitation rates on Spring 5_2 chinook and additional protection of Summer 5_2 chinook compared with Option 1. While overall exploitation rates will be reduced most substantially under Option 2, First Nations fishing for food, social and ceremonial purposes will have priority over other uses and be provided the majority of the available fishery exploitation. Commercial and recreational fisheries will have the greatest overall reductions; only low impact fisheries will remain. In permitting some recreational and commercial fisheries in marine waters, the actions outlined above are intended to provide the greatest protection to Spring 5_2 and Summer 5_2 chinook while avoiding broad fishery closures in areas with very low or no impacts on these stocks.

The Department will be meeting with First Nations, commercial and recreational harvesters to gather further feedback on these options, as well as, on specific fishery management actions that have been proposed. These discussions will occur as part of the final round of meetings to discuss the draft Salmon Integrated Fisheries Management plans and feedback received will be used to inform the management approach implemented in 2012. In the event that the Albion chinook test fishery indicates that Spring 5_2 and Summer 5_2 chinook returns to the Fraser River are larger than 30 thousand even after accounting any uncertainty in the run size estimate, the Department intends to implement management actions consistent with zone 2 or 3. These actions will be in addition to previously developed management actions for Spring 4_2 chinook.

Further updates on specific management actions will be communicated publicly using the Department's fishery notice system.

In addition to the proposed fishery management actions for 2012, the Department is continuing with work to develop a management framework for conserving and management southern British Columbia chinook conservation units, including Fraser chinook. Technical work has begun on the status of Southern British Columbia chinook populations and identification of key factors limiting their production. This work is expected to include: a detailed evaluation of the status of chinook populations; an assessment of the role of productivity (e.g. climate, ocean and freshwater environments), exploitation rates, hatchery enhancement and habitat on the current status of these chinook populations; and advice on potential actions to address bottlenecks and improve future prospects for recovery. A scientific workshop is being planned for the fall to review findings.

Despite different views on proposed management approaches, the Department would like to acknowledge the strong commitment to conserving Fraser chinook populations expressed by all First Nations, recreational and commercial harvesters. The Department will continue to work with all harvesters to seek ways of reconciling their varied interests, identifying mutually beneficial solutions, and ensuring conservation objectives are met to provide for future opportunities. Feedback is requested before May 11th, 2012.

Sincerely,

Rebecca Reid,

Regional Director, Fisheries Management Branch

Cc:
Fraser River Aboriginal Fisheries Secretariat
Gerry Kristianson, Sport Fishing Advisory Board
Peter Sakich, Commercial Salmon Advisory Board
Sue Farlinger, Regional Director General
Andrew Thomson, Area Director, South Coast Area
Jennifer Nener, Area Director, Lower Fraser Area
Barry Rosenberger, Area Director, BC Interior Area
Mel Kotyk, Area Director, North Coast Area

Table 1: Fishery Exploitation Rate summaries for Spring 5_2 chinook

a) Fraser Spring 5_2 Chinook Exploitation Rate Summary by fishery.

Fishery	Base Period Avg.			Option 1: Modified Status Quo		Option 2: <30% Exploitation Rate	
	Actual ER	Status Quo (2010)	% Change vs. Base Period	ER Estimate	% Change vs. Base Period	ER Estimate	% Change vs. Base Period
US Total	1.4%	1.4%		1.4%	0%	1.4%	0%
Northern BC Troll	3.9%	1.8%	-53%	1.8%	-54%	1.4%	-65%
Northern Sport	0.1%	0.1%		0.1%	0%	0.1%	
Northern Net	0.0%	0.0%		0.0%		0.0%	
WCVI Troll	4.2%	5.5%	31%	0.6%	-86%	0.6%	-86%
WCVI Sport	1.3%	1.3%		1.3%	0%	1.3%	0%
Georgia St. Troll	0.0%	0.0%		0.0%		0.0%	
Georgia St. Sport	1.1%	1.1%	0%	1.1%	0%	0.8%	-27%
Juan de Fuca Sport	11.8%	3.4%	-71%	3.4%	-71%	1.9%	-84%
Canadian Ocean Total	**22.4%**	**13.2%**	**41%**	**8.3%**	**-63%**	**6.1%**	**-72%**
Fraser First Nations (FSC)	35.6%	34.3%	-4%	34.3%	-4%	20.0%	-44%
Fraser Mainstem and Tributaries Sport	1.7%	0.4%	-76%	0.4%	-76%	0.2%	-88%
Fraser Commercial (includes EO)	1.1%	1.1%	-0%	0.1%	-91%	0.1%	-91%
Test Fishery	2.0%	2.0%		2.0%	0%	2.0%	
In-River Total	**40.4%**	**37.8%**	**-6%**	**36.8%**	**-9%**	**22.3%**	**-45%**
Total Canadian Exploitation Rate	**62.8%**	**51.0%**	**-19%**	**45.1%**	**-28%**	**28.4%**	**-55%**
Total Exploitation Rate	**64.2%**	**52.4%**	**-18%**	**46.5%**	**-28%**	**29.8%**	**-54%**

Notes: Base Period consists of 2000 to 2003, 2005, 2006. All Base Period estimates are from Dome CWT recoveries.

b) Fraser Spring 5_2 Chinook Canadian Fishery Exploitation Rate Summary for First Nations, recreational and commercial fisheries.

	Base Period Avg.			Option 1: Modified Status Quo		Option 2: <30% Exploitation Rate	
Fishery	Actual ER	Status Quo (2010)	% Change vs. Base Period	ER Estimate	% Change vs. Base Period	ER Estimate	% Change vs. Base Period
First Nations	35.6%	34.3%	-3.7%	34.3%	-4%	20.0%	-44%
Recreational	16.0%	6.3%	-60.6%	6.3%	-61%	4.3%	-73%
Commercial	9.2%	8.4%	-8.3%	2.5%	-73%	2.1%	-78%
Test	2.0%	2.0%	0.0%	2.0%	0%	2.0%	0%
Total	62.8%	51.0%	-19%	45.1%	-28%	28.4%	-55%

c) Relative Allocation of CDN Exploitation Rate (test fishery removed)

	Base Period Avg.		Option 1: Modified Status Quo	Option 2: <30% Exploitation Rate
Fishery	Actual	Status Quo (2010)	Estimate	Estimate
First Nations	59%	70%	80%	76%
Recreational	26%	13%	15%	16%
Commercial	15%	17%	6%	8%
Total	100%	100%	100%	100%

Proposed Zone 1: Option 2 – 2012 Management Measures Summary for Fraser Chinook

Fishery	Area	March 1 15 31	April 1 15 30	May 1 15 31	June 1 15 30	July 1 15 31	August 1 15 31
Commercial:							
Area F Troll	North Coast	Closed- Status Quo			June 21st Opening		
Area G Troll	NWVI (Area 125 to 127)	Closed March 15 to April 18	April 19 to May 31 managed to boat day effort/catch target limit		Closed		
	SWVI (Area 123/124)		May 1 to May 31 managed to boat day effort/catch target limit				
Recreational: Marine							
Juan de Fuca	West of Cadboro Point to Sheringham Point. Subareas 19-1 to -4 and 20-5	March 1- June 15: 2 chinook between 45-67 cm (hatchery or wild) or hatchery marked only >67cm			June 16 to July 20: 2 chinook between 45-85 cm (hatchery or wild) or hatchery marked only >85cm		
Georgia Strait	Corridor between Juan de Fuca and Fraser River (Subareas 18-1 to 18-6, 18-9, 18-11, 19-5, and portions of Subareas 29-4 and 29-5)			May 1 to June 15: 2 chinook (hatchery or wild) of which oly 1 may be greater than 67cm. Minimum size limit of 62cm.	June 16 to July 20: 2 chinook between 62-85 cm (hatchery or wild)		
Georgia Strait	Area 29 off Fraser River (Area 29-6, 7, 9-10)			May 1 to July 27: Non-retention of Chinook			
Recreational: Fraser Tidal + Non-tidal							
Fraser Tidal	Fraser River Tidal (Areas 29-11 to -17)	Jan 1 to July 27: Closed - No fishing for salmon					
Fraser Non-tidal	Freshwater (Mission to Alexandra Bridge)	Jan 1 to July 27: Closed - No fishing for salmon					
Freshwater (Alexandra Bridge upstream and Thompson River (downstream from Kamloops Lake to the confluence with the Fraser)		Jan 1 to Aug 21: Closed - No fishing for salmon					
Region 3 Tributaries		Clearwater and North Thompson Rivers: Closed - No fishing for salmon to Dec 31. South Thompson River: Closed - No fishing for salmon to August 15. Mouth of Bessette Creek: Closed - No fishing for salmon July 15 to August 15.					
						Mabel Lake and Shuswap River: July 25 to August 15 - 1 chinook per day greater than 77 cm with a limit of 4/month	
Fraser River	Freshwater (Region 5 & 7)	Jan 1 to Dec 31: Closed - No fishing for salmon					
Fraser River First Nations	Lower Fraser: Below Port Mann	Limited fisheries considered. Exploitation rates reduces by 45% from the base period					
	Lower Fraser: Port Mann to Sawmill	Limited fisheries considered. Exploitation rates reduces by 45% from the base period					
	BC Interior: Sawmill to Kelly Cr. and Thompson below the Bonaparte	Closed-Status Quo	Limited fisheries considered. Exploitation rates reduces by 45% from the base period				
Albion Test Fishery	Fraser River Chinook Assessment Fishery	Closed-Status Quo	Late April 1: Start of chinook test fishery				

Proposed Zone 1: Option 1 – 2012 Management Measures Summary for Fraser Chinook

Fishery	Area	March	April	May	June	July	August
		1 15 31	1 15 30	1 15 31	1 15 30	1 15 31	1 15 31
Commercial:							
Area F Troll	North Coast	Closed- Status Quo			June 15th Opening		
Area G Troll	NWVI (Area 125 to 127) SWVI (Area 123/124)	Closed March 15 to April 22	April 23 to May 31 managed to boat day effort/catch target limit		Closed		
Recreational: Marine							
Juan de Fuca	West of Cadboro Point to Sheringham Point. Subareas 19-1 to -4 and 20-5	March 1- June 15: 2 chinook between 45-67 cm (hatchery or wild) or > 67cm (hatchery marked only)			June 16 to July 15: 2 chinook of which only 1 may be greater than 67cm. Mininum size of 45cm		
Georgia Strait	Corridor between Juan de Fuca and Fraser River (Subareas 18-1 to 18-6, 18-9, 18-11, 19-5, and portions of Subareas 29-4 and 29-5)			May 1 to July 15: 2 chinook of which only 1 may be greater than 67cm. Minimum size limit of 62cm.			
Georgia Strait	Area 29 off Fraser River (Area 29-6, 7, 9-10)			May 1 to July 15: Non-retention of Chinook		July 16 - 27: 2 chinook or hatchery between 62cm and 77cm	
Recreational: Fraser Tidal + Non-tidal							
Fraser Tidal	Fraser River Tidal (Areas 29-11 to -17)	Jan 1 to July 15: Closed - No fishing for salmon				July 16 - 27: 1 chinook between 30cm and 77cm	
Fraser Non-tidal	Freshwater (Mission to Alexandra Bridge)	Jan 1 to July 15: Closed - No fishing for salmon				July 16 - 27: 1 chinook between 30cm and 77cm	
	Freshwater (Alexandra Bridge upstream)	Jan 1 to July 15: Closed - No fishing for salmon				July 16 to August 21: No fishing for Salmon (Mouth of Nicola River); July 15 to August 15: no Fishing for Salmon (Mouth of Bessette Creek); July 25 to Aug 15: 1 Chinook per day >77cm monthly limit of 4/month or Greater (Mabel Lake and Shuswap River); August 5 to August 15: No Fishing for Salmon (South Thompson River)	
	Freshwater (Region 5 & 7)	Jan 1 to July 15: Closed - No fishing for salmon				1 Chinook per day day between 30cm and 77cm at the following dates and locations: July 10-25 (Fraser River at Prince George); July 15 to Aug 15 (Bworon River); July 15 to Sept 01 (Quesnel River); July 25 to Aug 16 (Chilko River); July 27 to Aug 18 (Cariboo River)	
Fraser River First Nations	Lower Fraser: Below Port Mann	Limited fisheries considered. Exploitation rates similar to 2010					
	Lower Fraser: Port Mann to Sawmill	Limited fisheries considered. Exploitation rates similar to 2010					
	BC Interior: Sawmill to Kelly Cr. and Thompson below the Bonaparte	Closed-Status Quo	Limited fisheries considered. Exploitation rates similar to 2010				
Albion Test Fishery	Fraser River Chinook Assessment Fishery	Closed-Status Quo	Late April 1: Start of chinook test fishery				

Proposed Zone 1: Option 1 – 2012 Management Measures Summary for Fraser Chinook

Fishery	Area	March 1 15 31	April 1 15 30	May 1 15 31	June 1 15 30	July 1 15 31	August 1 15 31
Commercial:							
Area F Troll	North Coast	Closed- Status Quo			June 15th Opening		
Area G Troll	NWVI (Area 125 to 127) SWVI (Area 123/124)	Closed March 15 to April 22	April 19 to approx. June 10 managed to boat day effort/catch target limit		Closed June 16 to July 24		
Recreational: Marine							
Juan de Fuca	West of Cadboro Point to Sheringham Point. Subareas 19-1 to -4 and 20-5	March 1- June 15: 2 chinook between 45-67 cm (hatchery or wild) or >67cm (hatchery marked only)			June 16 to July 15: 2 chinook of which only 1 may be greater than 67cm.		
Georgia Strait	Corridor between Juan de Fuca and Fraser River (Subareas 18-1 to 18-6, 18-9, 18-11, 19-5, and portions of Subareas 29-4 and 29-5)			May 1 to July 15: 2 chinook of which only 1 may be greater than 67cm. Minimum size limit of 62cm.			
Georgia Strait	Area 29 off Fraser River (Area 29-6, 7, 9-10)			May 1 to July 15: Non-retention of Chinook		July 16 - 27: 2 chinook or hatchery between 62cm and 77cm	
Recreational: Fraser Tidal + Non-tidal							
Fraser Tidal	Fraser River Tidal (Areas 29-11 to -17)	Jan 1 to July 15: Closed - No fishing for salmon				July 16 - 27: 1 chinook between 30cm and 77cm	
Fraser Non-tidal	Freshwater (Mission to Alexandra Bridge)	Jan 1 to July 15: Closed - No fishing for salmon				July 16 - 27: 1 chinook between 30cm and 77cm	
	Freshwater (Alexandra Bridge upstream)	Jan 1 to July 15: Closed - No fishing for salmon				July 16 to August 21: No fishing for Salmon (Mouth of Nicola River); July 15 to August 15: no Fishing for Salmon (Mouth of Bessette Creek); July 25 to Aug 15: 1 Chinook per day >77cm monthly limit of 4/month or Greater (Mabel Lake and Shuswap River); August 5 to August 15: No Fishing for Salmon (South Thompson River)	
	Freshwater (Region 5 & 7)	Jan 1 to July 15: Closed - No fishing for salmon				1 Chinook per day day between 30cm and 77cm at the following dates and locations: July 10-25 (Fraser River at Prince George); July 15 to Aug 15 (Bworon River); July 15 to Sept 01 (Quesnel River); July 25 to Aug 16 (Chilko River); July 27 to Aug 18 (Cariboo River)	
Fraser River First Nations	Lower Fraser: Below Port Mann	Limited fisheries considered. Exploitation rates similar to 2010					
	Lower Fraser: Port Mann to Sawmill	Limited fisheries considered. Exploitation rates similar to 2010					
	BC Interior: Sawmill to Kelly Cr. and Thompson below the Bonaparte	Closed-Status Quo	Limited fisheries considered. Exploitation rates similar to 2010				
Albion Test Fishery	Fraser River Chinook Assessment Fishery	Closed-Status Quo	Late April 1: Start of chinook test fishery				

APPENDIX B: MANAGEMENT MEASURES

NORTHERN BC TROLL (AREA F)

Harvest Impacts

The more offshore rearing and migration pattern of stream-type Fraser Chinook stock management units means that expected harvest impacts in northern BC fisheries, including Area F troll, are relatively low. Calendar-year exploitation rate estimates for the Spring 4_2 Nicola CWT indicator stock averaged about 1% for the period prior to 2008 (Table I-1) . Impacts on later timed Spring 5_2 and Summer 5_2 Chinook were likely higher. Historic exploitation rate estimates from the discontinued Spring 5_2 Dome CWT indicator averaged about 1.5% prior to 2008 (Table I-2). While there are no historic estimates of CWT exploitation rate for the Summer 5_2 unit, relatively more CWTs from tagged stocks within that unit were recovered in northern fisheries (Table H-3). Stock composition from GSI sampling shows a similar result. The contribution of stream-type Fraser Chinook to Area F troll catch averages about 0.1% for the Spring 4_2 stock management unit and 3.1% for the combined Spring and Summer 5_2 stock management units (Table K-1). Associated annual mortalities average about 115 and 3764 for the Spring 4_2 and combined Spring and Summer 5_2 stock management units, respectively (Table K-2). This pattern suggests that the 'offshore' migration pattern characteristic of stream-type Fraser Chinook is less pronounced for the later migrating stocks and the Spring 5_2 unit in particular. Although timing of fisheries may also be a factor, relatively more Spring 5_2 Chinook are also intercepted in south-east Alaskan fisheries where fisheries occur over more protracted period.

Since 2000, The NBC troll fishery has been limited to a 3.2% exploitation impact on WCVI Chinook. This limit results in fishing closures during the early to mid-summer period when WCVI and Fraser Summer 5_2 Chinook migrate through the area. In some past years, these closures limited fishing opportunity to the extent that the fishery did not achieve its TAC thereby further reducing impacts on co-migrating stocks, such as Fraser Summer 5_2 Chinook.

Management Measures

Until 2018, no additional management measures were in place for stream-type Fraser Chinook (Figure B - 1) because measures in place to reduce impacts on WCVI Chinook were likely to also result in reductions on stream-type Fraser Chinook. In 2018, when further reductions in harvest of stream-type Fraser Chinook were mandated, the opening of the fishery was delayed to July 10 if the Fraser Spring/Summer 5_2 aggregate was assessed in the low (or Level 1) management zone (Figure B - 1).

WCVI TROLL (AREA G)

Harvest Impacts

Similar to Northern BC, the offshore rearing and migration pattern of stream-type Fraser Chinook stock management units means that harvest impacts in WCVI area fisheries, including the WCVI troll, are relatively low. However, on their return migration they generally make 'landfall' off the south-west Vancouver Island in spring and early summer and are vulnerable to WCVI fisheries during that period. Calendar-year exploitation rate estimates for the Spring 4_2 Nicola CWT indicator stock averaged about 2.1% for the years prior to 2008 (Table I - 1). Historic exploitation rate estimates from the discontinued Spring 5_2 Dome CWT indicator were similar averaging about 2.0% for years prior to 2008 (Table I - 2). Impacts on later migrating Summer 5_2 Chinook were likely higher. While there are no historic CWT estimates of exploitation rate for the Summer 5_2 unit, relatively more CWTs from tagged stocks from that unit were recovered in WCVI fisheries (Table H-3) in historic periods (i.e. prior to 1998).

Adjustments to WCVI troll fisheries staring in 1998 due to conservation concerns for Interior Fraser Coho changed the historical fishing pattern. Fishery closures were put in place to limit impacts on Interior Fraser Coho during the traditional summer fishing period. In addition to these changes, overall effort and catch of Chinook in WCVI troll fisheries declined significantly as a result of negotiated reductions to Chinook WCVI AABM TAC in the 2008 PST and then again in the 2018 PST. As a result of these changes, impacts on the later timed Summer 5_2 aggregate were likely reduced relative to historic periods. On the other hand, increased fishing effort during spring periods likely increased impacts on earlier migrating Spring 4_2 and Spring 5_2 Fraser Chinook, particularly during the period from about 2000 to 2007.

In recent years, stock composition from GSI sampling shows relatively low contribution of stream-type Fraser Chinook to WCVI troll catch. The contribution of stream-type Fraser Chinook to WCVI troll catch averages about 0.1%, 0.4% and 0.3% for the Spring 4_2, Spring 5_2 and Summer 5_2 stock management units, respectively (all periods, Table K-5). Associated annual mortalities average about 160, 290 and 330 for the Spring 4_2, Spring 5_2 and Summer 5_2 stock management units, respectively (Table K-6).

Management Measures

Starting in 2008, management measures implemented for Area G to reduce impacts on early timed Fraser Chinook included time and area closures and effort and catch limits (Figure B-2, Figure B-3). These measures were in place during the period when stream-type Fraser Chinook stocks are most vulnerable to fishery from April through to early summer. Closures were extended through the June and July period when the Fraser Spring/Summer 5_2 aggregate was assessed in the low (or Level 1) management zone. Time and area closures were more extensive in the south-west area (SWVI, Figure B-3).

WCVI RECREATIONAL

Harvest Impacts

Although stream-type Fraser Chinook migrate through WCVI areas, harvest impacts in offshore WCVI recreational fisheries are relatively low because the majority of fishing effort takes place in July and August (Table F-1, Table F-2). Calendar-year exploitation rate estimates for the Spring 4_2 Nicola CWT indicator stock averaged less than 0.5% for the years prior to 2008 (Table I - 1). Historic exploitation rate estimates from the discontinued Spring 5_2 Dome CWT indicator were similar averaging about 0.5% for years prior to 2008 (Table I - 2).

Management Measures

No additional management measures were implemented.

JUAN DE FUCA RECREATIONAL

Harvest Impacts

Stream-type Fraser Chinook are vulnerable to recreational fisheries in the Juan de Fuca area in the spring and early summer period on their return migration to the Fraser River. Impacts in the Juan de Fuca recreational fishery are generally higher than other marine fisheries because the fishery occurs directly in the migration corridor of stream-type Fraser Chinook. Calendar-year exploitation rate estimates for the Spring 4_2 Nicola CWT indicator stock averaged about 2.6%

for the period prior to 2007 (Table I - 1). Historic exploitation rate estimates from the discontinued Spring 5_2 Dome CWT indicator averaged about 5.6% for the period prior to 2008 (Table I - 2). While there are no historic CWT estimates of exploitation rate for the Summer 5_2 unit, CWTs from tagged stocks from that unit were recovered in JDF recreational fisheries (Table H - 3). Catch, release and effort statistics for the Juan de Fuca recreational fishery are shown in Table F-6.

In recent years, stock composition from GSI sampling shows relatively higher contribution of stream-type Fraser Chinook Juan de Fuca recreational catch, compared to other southern BC fisheries. The contribution of stream-type Fraser Chinook to Juan de Fuca catch averages about 1.4%, 3.7% and 2.6% for the Spring 4_2, Spring 5_2 and Summer 5_2 stock management units, respectively (all periods, Table K-11). Associated annual mortalities average about 210, 800 and 750 for the Spring 4_2, Spring 5_2 and Summer 5_2 stock management units, respectively (Table K-12).

Management Measures

Starting in 2008, management measures implemented for JDF recreational fishery to reduce impacts on early timed Fraser Chinook included wild retention limits (e.g. ‘mixed’ mark-selective fisheries) and additional size limits (Figure B-4). These measures were in place during the period when these stocks are most vulnerable to fishery from April through to early summer. Measures were extended through the June and July period when the Fraser Spring/Summer 5_2 aggregate is assessed in the low (or Level 1) management zone.

STRAIT OF GEORGIA RECREATIONAL

Harvest Impacts

Stream-type Fraser Chinook are vulnerable to recreational fisheries in the Strait of Georgia area in the spring and early summer period on their return migration to the Fraser River. Calendar-year exploitation rate estimates for the Spring 4_2 Nicola CWT indicator stock averaged about 1.2% for the period prior to 2008 (Table I - 1). Historic exploitation rate estimates from the discontinued Spring 5_2 Dome CWT indicator averaged about 2.4% for the period prior to 2008 (Table I - 2). While there are no historic estimates of exploitation rate for the Summer 5_2 unit, recoveries of CWT tags from this unit in the area is much less than other fisheries. Overall, about half as many CWT tags were recovered in the Strait of Georgia and Johnstone Strait recreational fisheries relative to the Juan de Fuca area (Table H-3). Tags recovered in the fishery are recovered throughout the area, although there are so few recoveries in any one area there are no discernable patterns.

GSI sample data are more limited for Strait of Georgia recreational fisheries. Until 2018, most samples were collected through the volunteer ‘Avid Angler’ program that was initiated in 2012. Results are summarized in Table K - 13, Table K - 14, Table K - 15 and Table K - 16. Notwithstanding generally low sample sizes, the contribution of stream-type Fraser Chinook to Strait of Georgia recreational catch was low in recent years.

Management Measures

Starting in 2008, Management measures implemented for Strait of Georgia recreational fishery to reduce impacts on early timed Fraser Chinook include time and area closures (Chinook non-retention) and additional size limits on retained catch (Figure B - 5). Measures were targeted for the southern Strait of Georgia, the major migration corridor for stream-type Fraser Chinook. These measures were in place during the period when these stocks are most vulnerable to fishery from April through to early summer. Measures were extended through the June and July period when the Fraser Spring/Summer 5_2 aggregate was assessed in the low (or Level 1) management zone.

FRASER RIVER RECREATIONAL

Harvest Impacts

Stream-type Fraser River Chinook migrate into the river starting in early spring (March) through to mid-summer (early August). Peak migration occurs from late May to mid-July. Most recreational fishing effort and catch occurs in the lower Fraser River. Calendar-year exploitation rate estimates for the Spring 4_2 Nicola CWT indicator stock averaged about 7.4% for the period prior to 2007 (Table I-1). Historic exploitation rate estimates from the discontinued Spring 5_2 Dome CWT indicator averaged about 4.3% for the period prior to 2008 (Table I-2). There are no historic CWT estimates of exploitation rate for the Summer 5_2 unit.

The Fraser Run reconstruction generates estimates of Fraser River harvest rate for all Fraser Chinook stock management units. Prior to 2008, the average Fraser recreational fishery harvest rates were estimated at 4.4%, 2.4% and 3.3% for the Fraser Spring 4_2, Fraser Spring 5_2 and Fraser Summer 5_2 stock management units, respectively (Table J-3). Average annual catch was 898, 1050 and 1508 for the Fraser Spring 4_2, Fraser Spring 5_2 and Fraser Summer 5_2 stock management units, respectively (Table J-3).

Since 2009, the average total catch of Chinook in Fraser River recreational fisheries has averaged 7125 (Table E-6) for the late summer and fall periods when Chinook retention was permitted.

Management Measures

Management measures implemented for Fraser River recreational fisheries to reduce impacts on early timed Fraser Chinook included time and area closures (both Chinook non-retention and full salmon closures), additional size limits on retained catch, and reduced bag limits (Figure B-6). These measures were in place during the period when the stocks are migrating from March through to early summer. Measures were extended through the June and July period when the Fraser Spring/Summer 5_2 aggregate was assessed in the low (or Level 1) management zone.

FRASER RIVER COMMERCIAL NET

Harvest Impacts

Chinook-directed commercial net fisheries within the Fraser River have been closed since 1980 to promote stock rebuilding approach. Retention of Chinook by-catch is permitted during the in-river sockeye-directed fisheries that usually occur from late July to early September and chum-directed fisheries in October and November (Table E-5).

Management Measures

Given closures already in place, no additional management measures were implemented for Fraser River commercial net fisheries.

FRASER RIVER ECONOMIC OPPORTUNITY FISHERIES

Harvest Impacts

There are First Nation economic opportunity fisheries for Chinook in various areas of the Fraser River watershed. Since 2009, total annual catch has averaged about 3300 (Table E-4). The impact of these fisheries on stream-type Fraser Chinook stocks is likely very low since the fisheries do not start until August and they target more abundant Summer 4_1 and Fraser Fall Chinook stock management units.

Management Measures

Given time and area closures already in place, no additional management measures were implemented for Fraser River economic opportunity fisheries.

FRASER RIVER FOOD SOCIAL CEREMONIAL FISHERIES

Harvest Impacts

Stream-type Fraser River Chinook migrate into the river starting in early spring (March) through to mid-summer (early August). Peak migration occurs from late May to mid-July. First Nation fisheries occur throughout the Fraser River watershed although the majority of catch is in the lower river (Table E-2). Calendar-year exploitation rate estimates for the Spring 4_2 Nicola CWT indicator stock averaged about 10% for the period prior to 2007 (Table I-1). Historic exploitation rate estimates from the discontinued Spring 5_2 Dome CWT indicator averaged about 36% for the period prior to 2008 (Table I-2). There are no historic CWT estimates of exploitation rate for the Summer 5_2 unit.

The Fraser Run reconstruction generates estimates of Fraser River harvest rate for all Fraser Chinook stock management units. Prior to 2008, the average Fraser FSC fishery harvest rates were estimated at 25%, 17% and 9% for the Fraser Spring 4_2, Fraser Spring 5_2 and Fraser Summer 5_2 stock management units, respectively (Table J-2). Average annual catch was 4770, 6497 and 3650 for the Fraser Spring 4_2, Fraser Spring 5_2 and Fraser Summer 5_2 stock management units, respectively (Table J-2).

Management Measures

Starting in 2008, management measures implemented for Fraser River FSC fisheries to reduce impacts on early timed Fraser Chinook included time and area closures, limited catch (e.g. ceremonial fisheries only), limited effort (e.g. reduced communal fishery time), and various gear restrictions (Figure B-7). These measures were in place during the period when the stocks are migrating from April through to early summer. Measures were extended through the June and July period when the Fraser Spring/Summer 5_2 aggregate was assessed in the low (or Level 1) management zone.

ALBION TEST FISHERY

Harvest Impacts

The Albion Test Fishery provides an important platform to gather in-season data to estimate run size by indexing catch-per-unit-effort. However, Chinook are retained to gather biological samples. The number of Chinook retained during April to July period averages about 180 (Table E-1).

Management Measures

Starting in 2012, the start of the Albion Test Fishery has been delayed to mid-April to reduce impacts on stream-type Fraser Chinook (Figure B-8).

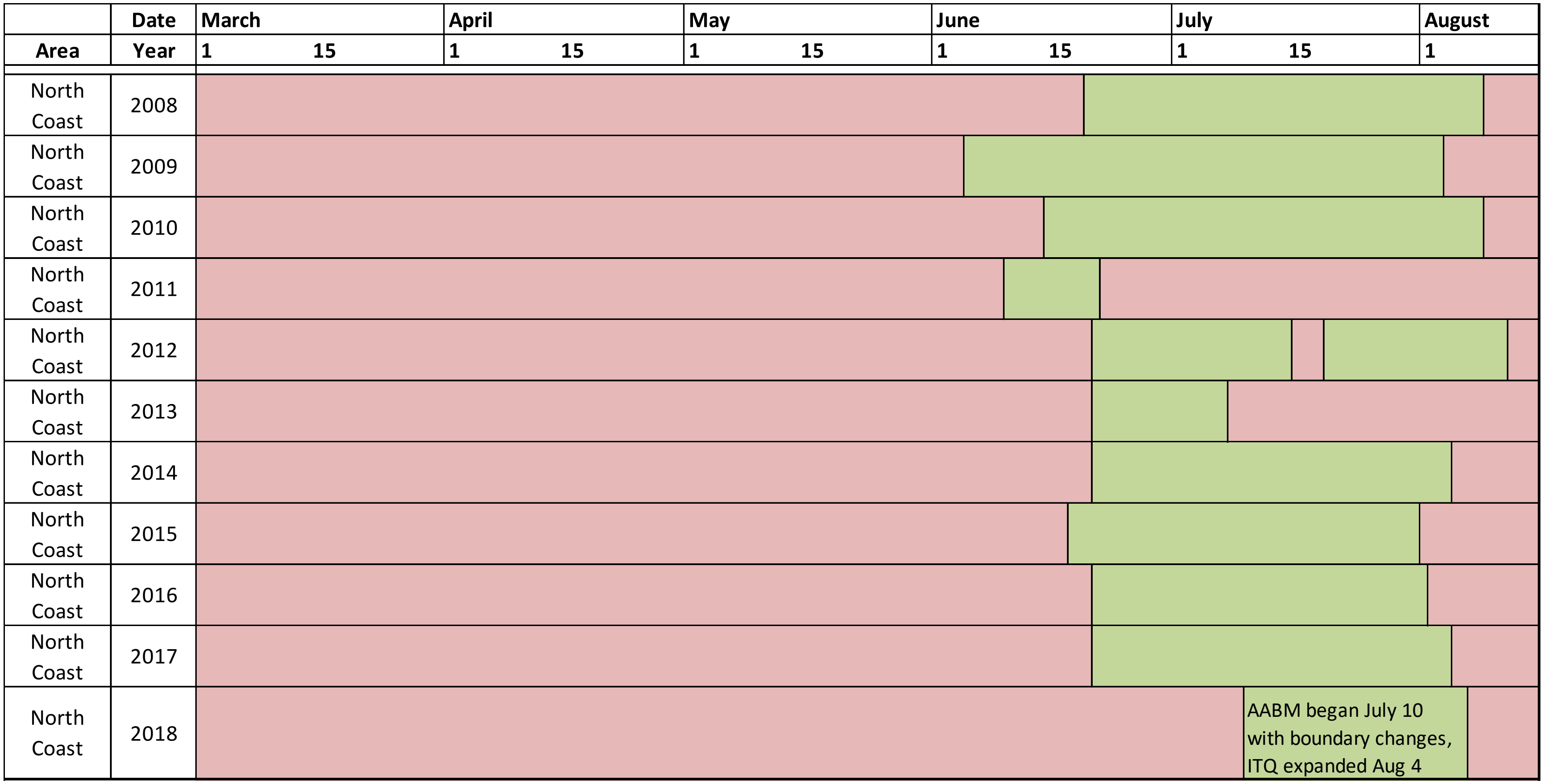


Figure B - 1. Summary of management measures in implemented in the NBC Troll fishery, 2008 to 2018.

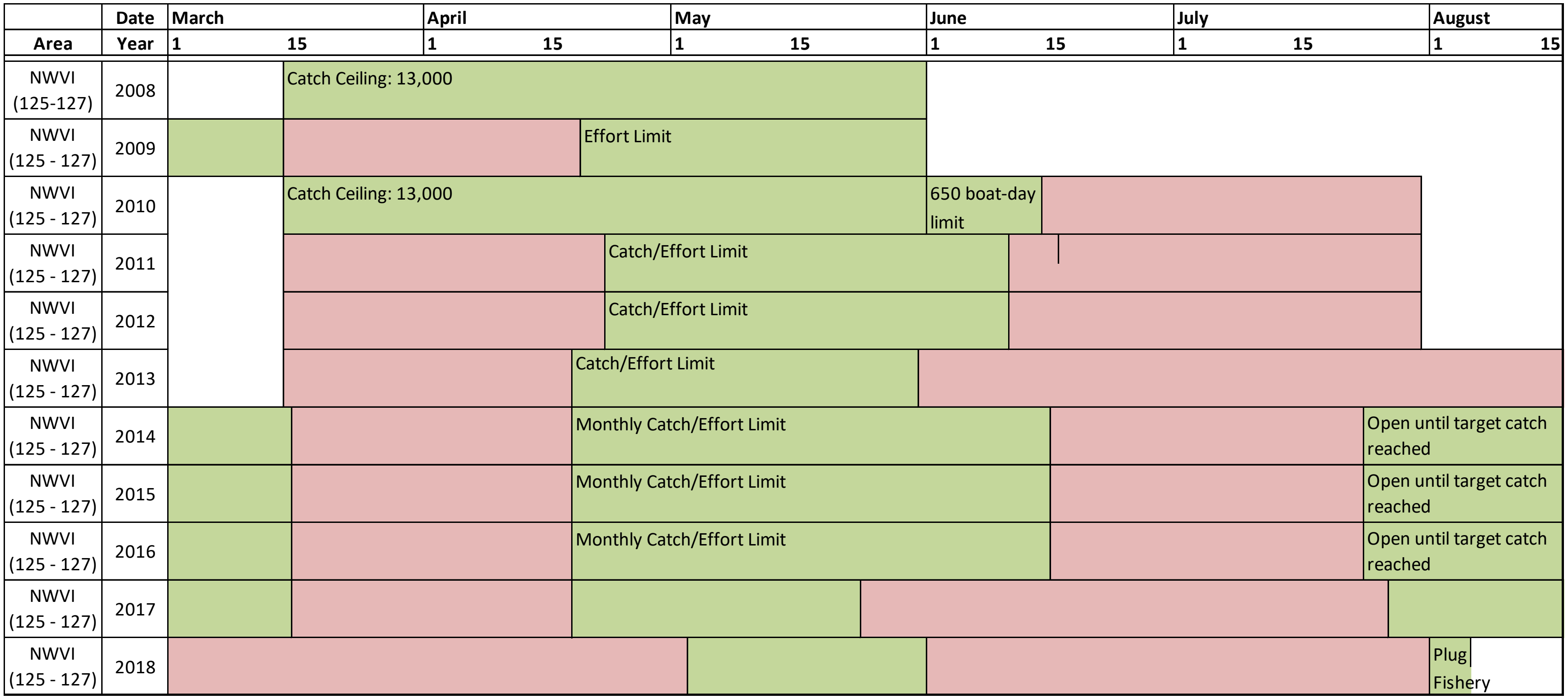
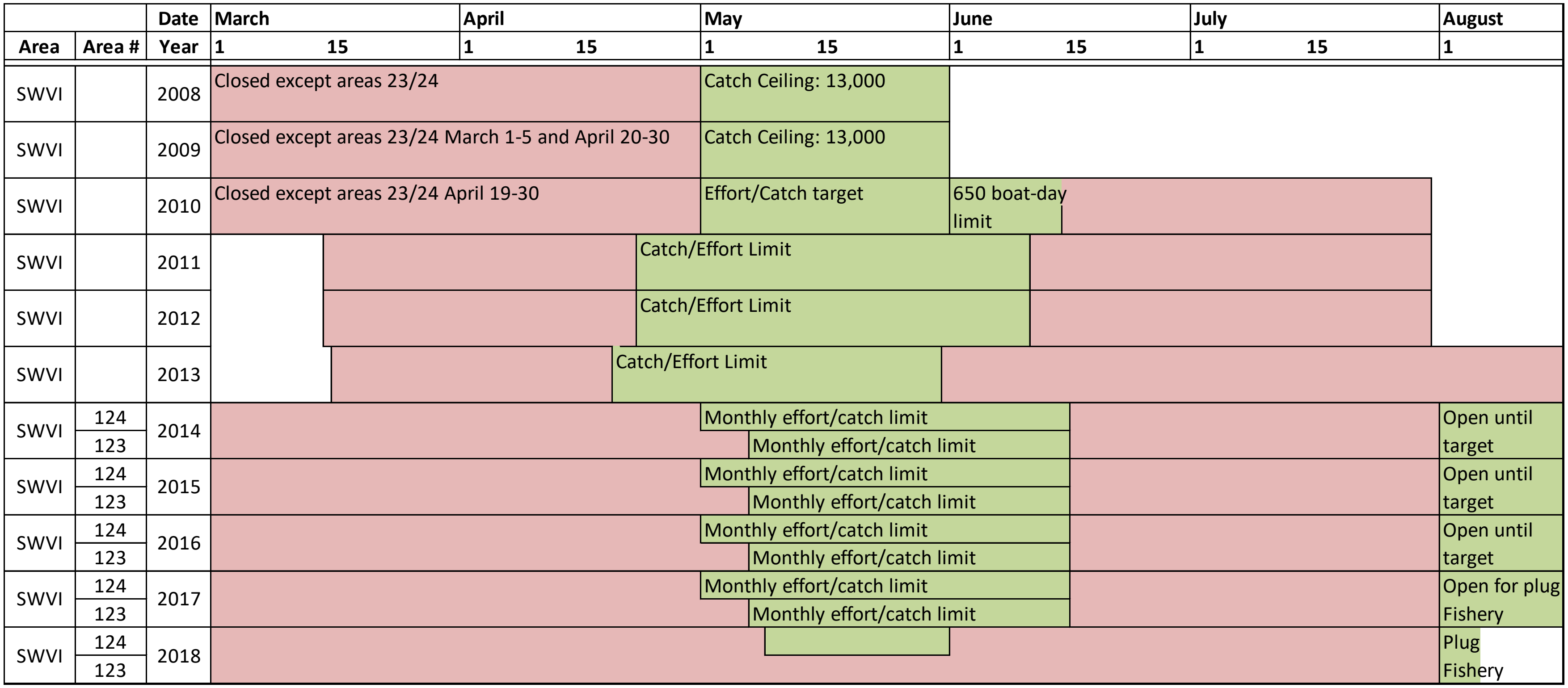
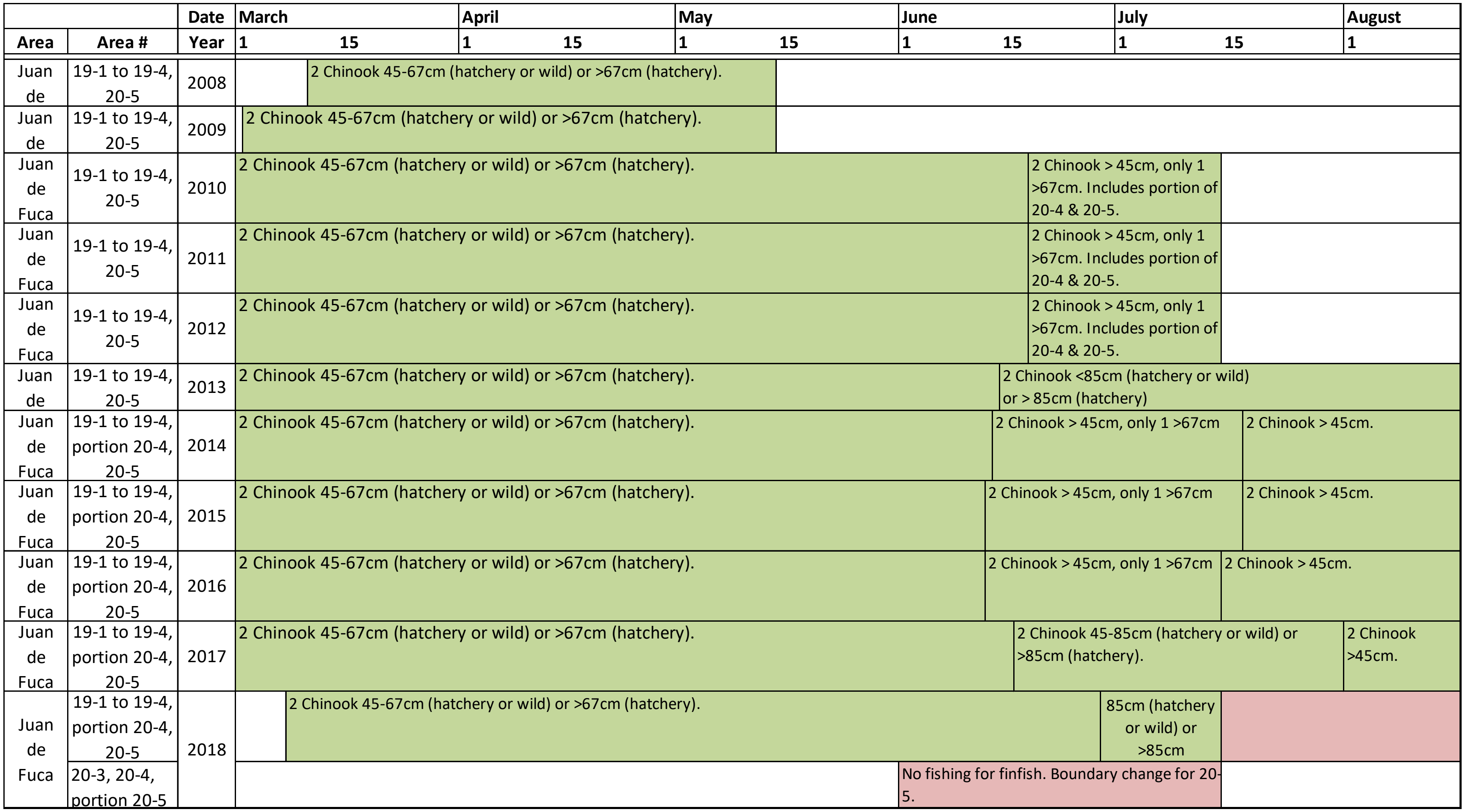


Figure B - 2. Summary of management measures in implemented in the WCVI Troll fishery (NWVI area), 2008 to 2018.



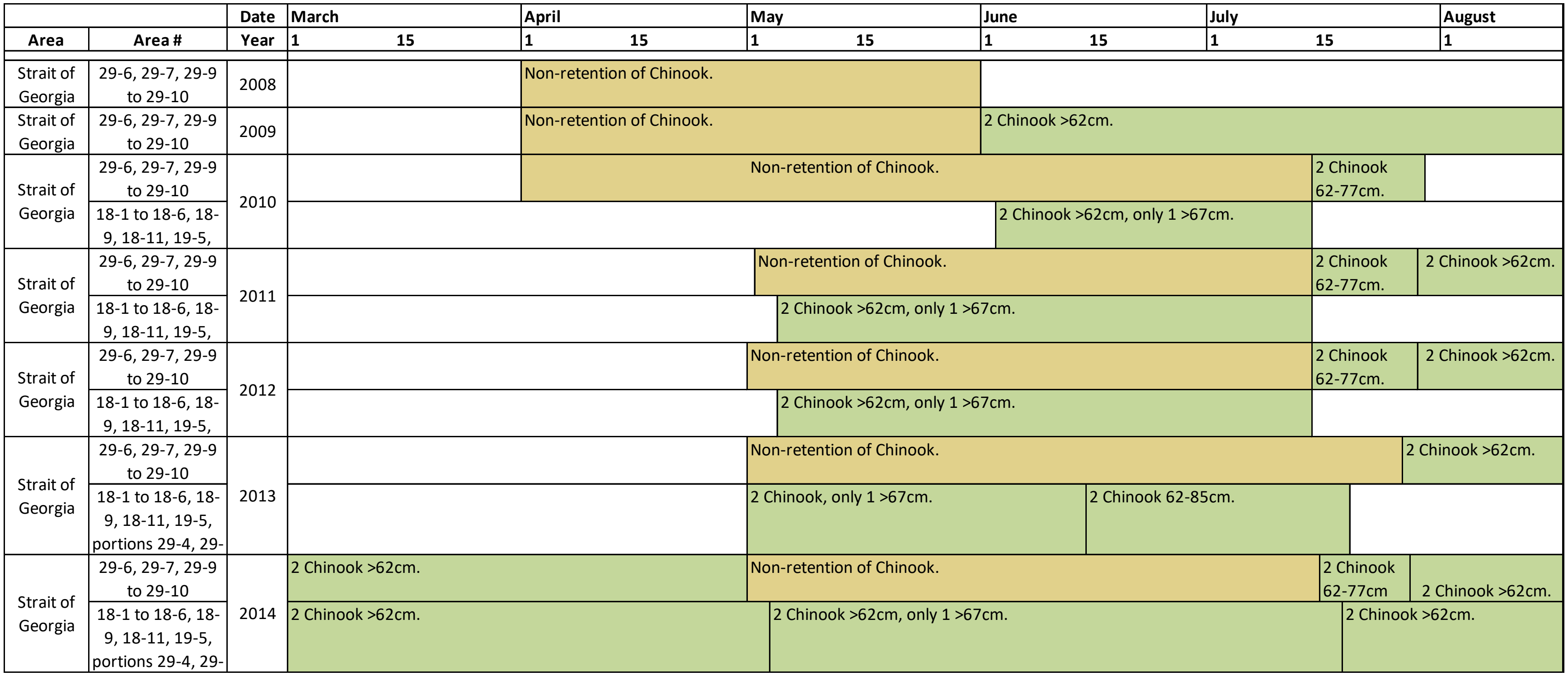
Area	Area #	Date Year	March	April	May	June	July	August
			1 15	1 15	1 15	1 15	1 15	1
SWVI		2008	Closed except areas 23/24		Catch Ceiling: 13,000			
SWVI		2009	Closed except areas 23/24 March 1-5 and April 20-30		Catch Ceiling: 13,000			
SWVI		2010	Closed except areas 23/24 April 19-30		Effort/Catch target	650 boat-day limit		
SWVI		2011		Catch/Effort Limit				
SWVI		2012		Catch/Effort Limit				
SWVI		2013		Catch/Effort Limit				
SWVI	124	2014			Monthly effort/catch limit			Open until target
	123				Monthly effort/catch limit			
SWVI	124	2015			Monthly effort/catch limit			Open until target
	123				Monthly effort/catch limit			
SWVI	124	2016			Monthly effort/catch limit			Open until target
	123				Monthly effort/catch limit			
SWVI	124	2017			Monthly effort/catch limit			Open for plug Fishery
	123				Monthly effort/catch limit			
SWVI	124	2018						Plug Fishery
	123							

Figure B - 3. Summary of management measures in implemented in the WCVI Troll fishery (SWVI area), 2008 to 2018.



		Date	March		April		May		June		July		August
Area	Area #	Year	1	15	1	15	1	15	1	15	1	15	1
Juan de	19-1 to 19-4, 20-5	2008		2 Chinook 45-67cm (hatchery or wild) or >67cm (hatchery).									
Juan de	19-1 to 19-4, 20-5	2009	2 Chinook 45-67cm (hatchery or wild) or >67cm (hatchery).										
Juan de Fuca	19-1 to 19-4, 20-5	2010	2 Chinook 45-67cm (hatchery or wild) or >67cm (hatchery).							2 Chinook > 45cm, only 1 >67cm. Includes portion of 20-4 & 20-5.			
Juan de Fuca	19-1 to 19-4, 20-5	2011	2 Chinook 45-67cm (hatchery or wild) or >67cm (hatchery).							2 Chinook > 45cm, only 1 >67cm. Includes portion of 20-4 & 20-5.			
Juan de Fuca	19-1 to 19-4, 20-5	2012	2 Chinook 45-67cm (hatchery or wild) or >67cm (hatchery).							2 Chinook > 45cm, only 1 >67cm. Includes portion of 20-4 & 20-5.			
Juan de	19-1 to 19-4, 20-5	2013	2 Chinook 45-67cm (hatchery or wild) or >67cm (hatchery).							2 Chinook <85cm (hatchery or wild) or > 85cm (hatchery)			
Juan de Fuca	19-1 to 19-4, portion 20-4, 20-5	2014	2 Chinook 45-67cm (hatchery or wild) or >67cm (hatchery).							2 Chinook > 45cm, only 1 >67cm		2 Chinook > 45cm.	
Juan de Fuca	19-1 to 19-4, portion 20-4, 20-5	2015	2 Chinook 45-67cm (hatchery or wild) or >67cm (hatchery).							2 Chinook > 45cm, only 1 >67cm		2 Chinook > 45cm.	
Juan de Fuca	19-1 to 19-4, portion 20-4, 20-5	2016	2 Chinook 45-67cm (hatchery or wild) or >67cm (hatchery).							2 Chinook > 45cm, only 1 >67cm		2 Chinook > 45cm.	
Juan de Fuca	19-1 to 19-4, portion 20-4, 20-5	2017	2 Chinook 45-67cm (hatchery or wild) or >67cm (hatchery).							2 Chinook 45-85cm (hatchery or wild) or >85cm (hatchery).			2 Chinook >45cm.
Juan de Fuca	19-1 to 19-4, portion 20-4, 20-5	2018	2 Chinook 45-67cm (hatchery or wild) or >67cm (hatchery).								85cm (hatchery or wild) or >85cm		
	20-3, 20-4, portion 20-5								No fishing for finfish. Boundary change for 20-5.				

Figure B - 4. Summary of management measures in implemented in the Juan de Fuca recreational fishery, 2008 to 2018.

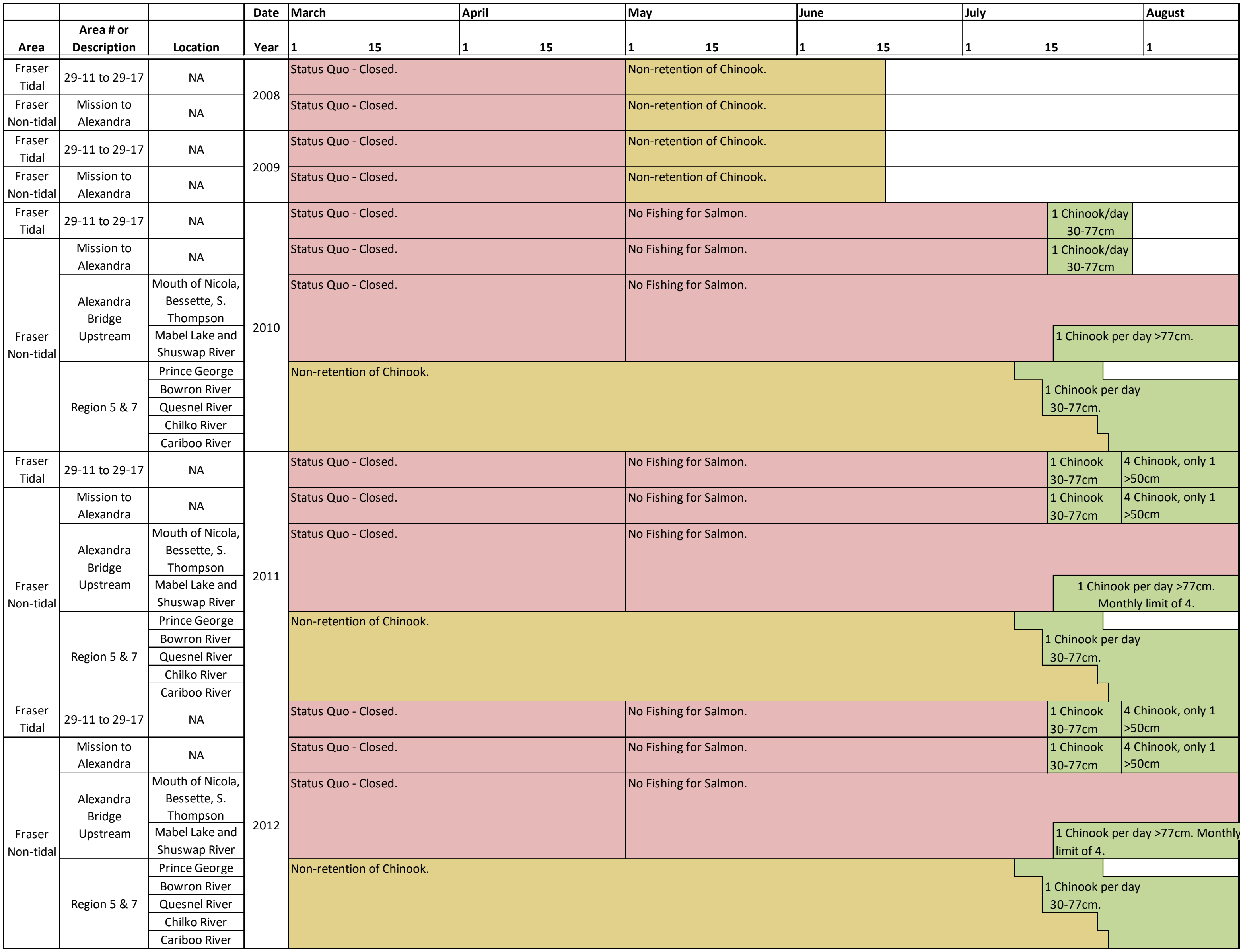


Area	Area #	Date Year	March 1 15	April 1 15	May 1 15	June 1 15	July 1 15	August 1
Strait of Georgia	29-6, 29-7, 29-9 to 29-10	2008		Non-retention of Chinook.				
Strait of Georgia	29-6, 29-7, 29-9 to 29-10	2009		Non-retention of Chinook.		2 Chinook >62cm.		
Strait of Georgia	29-6, 29-7, 29-9 to 29-10	2010		Non-retention of Chinook.			2 Chinook 62-77cm.	
	18-1 to 18-6, 18-9, 18-11, 19-5,					2 Chinook >62cm, only 1 >67cm.		
Strait of Georgia	29-6, 29-7, 29-9 to 29-10	2011			Non-retention of Chinook.		2 Chinook 62-77cm. 2 Chinook >62cm.	
	18-1 to 18-6, 18-9, 18-11, 19-5,				2 Chinook >62cm, only 1 >67cm.			
Strait of Georgia	29-6, 29-7, 29-9 to 29-10	2012			Non-retention of Chinook.		2 Chinook 62-77cm. 2 Chinook >62cm.	
	18-1 to 18-6, 18-9, 18-11, 19-5,				2 Chinook >62cm, only 1 >67cm.			
Strait of Georgia	29-6, 29-7, 29-9 to 29-10	2013			Non-retention of Chinook.		2 Chinook >62cm.	
	18-1 to 18-6, 18-9, 18-11, 19-5, portions 29-4, 29-				2 Chinook, only 1 >67cm.	2 Chinook 62-85cm.		
Strait of Georgia	29-6, 29-7, 29-9 to 29-10	2014	2 Chinook >62cm.		Non-retention of Chinook.		2 Chinook 62-77cm 2 Chinook >62cm.	
	18-1 to 18-6, 18-9, 18-11, 19-5, portions 29-4, 29-		2 Chinook >62cm.		2 Chinook >62cm, only 1 >67cm.		2 Chinook >62cm.	

Figure B - 5. Summary of management measures in implemented in the Strait of Georgia recreational fishery, 2008 to 2018.

		Date	March		April		May		June		July		August
Area	**Area #**	**Year**	**1**	**15**	**1**	**15**	**1**	**15**	**1**	**15**	**1**	**15**	**1**
Strait of Georgia	29-6, 29-7, 29-9 to 29-10	2015	2 Chinook >62cm.				Non-retention of Chinook						2 Chinook >62cm.
	18-1 to 18-6, 18-9, 18-11, 19-5, portions 29-4,		2 Chinook >62cm.				2 Chinook >62cm, only 1 >67cm.			2 Chinook >62cm.			
Strait of Georgia	29-6, 29-7, 29-9 to 29-10	2016	Non-retention of Chinook										2 Chinook >62cm.
	18-1 to 18-6, 18-9, 18-11, 19-5, portions 29-4,		2 Chinook >62cm.				2 Chinook >62cm, only 1 >67cm.			2 Chinook >62cm.			
Strait of Georgia	29-6, 29-7, 29-9 to 29-10	2017	Non-retention of Chinook.										
	18-1 to 18-6, 18-9, 18-11, 19-5, portions 29-4,		2 Chinook >62cm.				2 Chinook >62cm, only 1 >67cm.			2 Chinook 62-85cm.		2 Chinook >62cm.	
Strait of Georgia	29-6, 29-7, 29-9 to 29-10	2018	Non-retention of Chinook.										
	18-1 to 18-6, 18-9, 18-11, 19-5,		2 Chinook >62cm.				2 Chinook >62cm, only 1 >67cm.			2 Chinook 62-85cm.			2 Chinook >62cm.

Figure B- 5. Continued.



Area	Area # or Description	Location	Date Year	March 1	March 15	April 1	April 15	May 1	May 15	June 1	June 15	July 1	July 15	August 1
Fraser Tidal	29-11 to 29-17	NA	2008	Status Quo - Closed.				Non-retention of Chinook.						
Fraser Non-tidal	Mission to Alexandra	NA		Status Quo - Closed.				Non-retention of Chinook.						
Fraser Tidal	29-11 to 29-17	NA	2009	Status Quo - Closed.				Non-retention of Chinook.						
Fraser Non-tidal	Mission to Alexandra	NA		Status Quo - Closed.				Non-retention of Chinook.						
Fraser Tidal	29-11 to 29-17	NA	2010	Status Quo - Closed.				No Fishing for Salmon.					1 Chinook/day 30-77cm	
Fraser Non-tidal	Mission to Alexandra	NA		Status Quo - Closed.				No Fishing for Salmon.					1 Chinook/day 30-77cm	
	Alexandra Bridge Upstream	Mouth of Nicola, Bessette, S. Thompson		Status Quo - Closed.				No Fishing for Salmon.						
		Mabel Lake and Shuswap River											1 Chinook per day >77cm.	
	Region 5 & 7	Prince George		Non-retention of Chinook.									1 Chinook per day 30-77cm.	
		Bowron River												
		Quesnel River												
		Chilko River												
		Cariboo River												
Fraser Tidal	29-11 to 29-17	NA	2011	Status Quo - Closed.				No Fishing for Salmon.					1 Chinook 30-77cm	4 Chinook, only 1 >50cm
Fraser Non-tidal	Mission to Alexandra	NA		Status Quo - Closed.				No Fishing for Salmon.					1 Chinook 30-77cm	4 Chinook, only 1 >50cm
	Alexandra Bridge Upstream	Mouth of Nicola, Bessette, S. Thompson		Status Quo - Closed.				No Fishing for Salmon.						
		Mabel Lake and Shuswap River											1 Chinook per day >77cm. Monthly limit of 4.	
	Region 5 & 7	Prince George		Non-retention of Chinook.									1 Chinook per day 30-77cm.	
		Bowron River												
		Quesnel River												
		Chilko River												
		Cariboo River												
Fraser Tidal	29-11 to 29-17	NA	2012	Status Quo - Closed.				No Fishing for Salmon.					1 Chinook 30-77cm	4 Chinook, only 1 >50cm
Fraser Non-tidal	Mission to Alexandra	NA		Status Quo - Closed.				No Fishing for Salmon.					1 Chinook 30-77cm	4 Chinook, only 1 >50cm
	Alexandra Bridge Upstream	Mouth of Nicola, Bessette, S. Thompson		Status Quo - Closed.				No Fishing for Salmon.						
		Mabel Lake and Shuswap River											1 Chinook per day >77cm. Monthly limit of 4.	
	Region 5 & 7	Prince George		Non-retention of Chinook.									1 Chinook per day 30-77cm.	
		Bowron River												
		Quesnel River												
		Chilko River												
		Cariboo River												

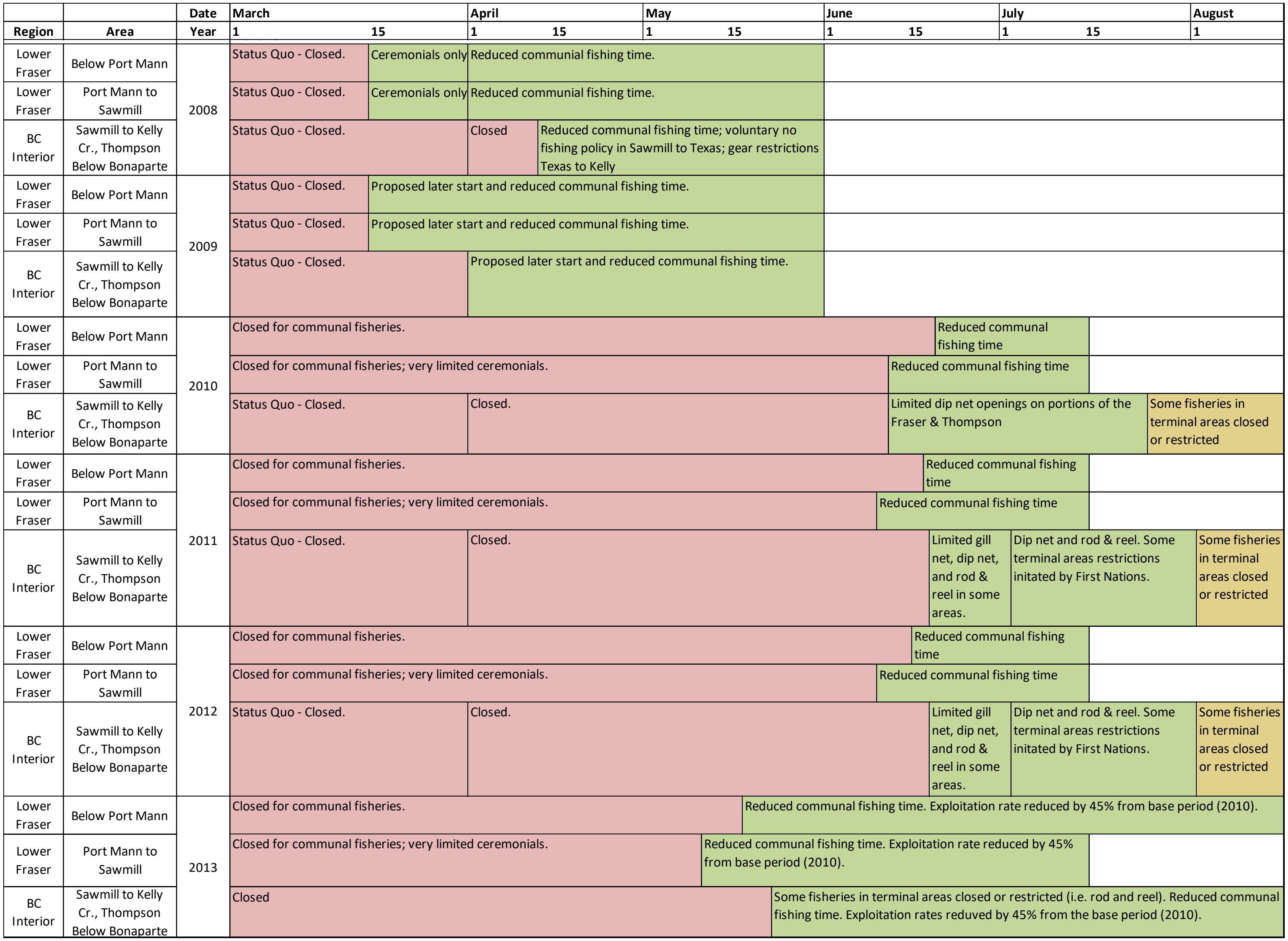
Figure B - 6. Summary of management measures in implemented in the Fraser River recreational fishery, 2008 to 2018.

		Date	March		April		May		June		July		August
Area # or Description	Location	Year	1	15	1	15	1	15	1	15	1	15	1
NA	2013	Status Quo - Closed.					No Fishing for Salmon.					4 Chinook, only 1 >50cm	
NA		Status Quo - Closed.					No Fishing for Salmon.					4 Chinook, only 1 >50cm	
NA		Status Quo - Closed.					No Fishing for Salmon.						
NA		Status Quo - Closed.					No Fishing for Salmon (Spring/Summer 5-2 targeted).						
NA	2014	Status Quo - Closed.					No Fishing for Salmon.						4 Chinook, only 1 >50cm.
NA		Status Quo - Closed.					No Fishing for Salmon.						4 Chinook, only 1 >50cm.
Region 3		Status Quo - Closed.									No fishing for Salmon.	4 Chinook per day <50cm.	
Mouth of Nicola												No Fishing	
Clearwater & N. Thompson		Status Quo - Closed.									No fishing for Salmon.		1 Chinook 30-77cm.
S. Thompson & Bessette Creek												No Fishing for salmon.	
Bridge River/Fraser Near Bridge										Sun-Thurs 1 Chinook 30-77cm.			
Nechako - Prince George		No fishing for Salmon.										Catch & Release	
Bowron River												1 Chinook per day 30-77cm.	
Quesnel River													
Chilko River												Catch & Release	
Cariboo River													
NA	2015	Status Quo - Closed.					No Fishing for Salmon.						4 Chinook, only 1 >50cm.
NA		Status Quo - Closed.					No Fishing for Salmon.						4 Chinook, only 1 >50cm.
Region 3		Status Quo - Closed.									No fishing for Salmon.	4 Chinook per day <50cm.	
Mouth of Nicola												No Fishing	
Clearwater & N. Thompson		Status Quo - Closed.									No fishing for Salmon.		1 Chinook 30-77cm.
S. Thompson & Bessette Creek												No Fishing for salmon.	
Bridge River/Fraser Near Bridge										Sun-Thurs 1 Chinook 30-77cm.			
Nechako - Prince George		No fishing for Salmon.										Catch & Release	
Bowron River												1 Chinook per day 30-77cm.	
Quesnel River													
Chilko River												Catch & Release	
Cariboo River													

Figure B–6. Continued.

		Date	March		April		May		June		July		August
Area # or Description	Location	Year	1	15	1	15	1	15	1	15	1	15	1
NA	2016	Status Quo - Closed.					No Fishing for Salmon.						4 Chinook, only 1 >50cm.
NA		Status Quo - Closed.					No Fishing for Salmon.						4 Chinook, only 1 >50cm,
Region 3		Status Quo - Closed.									No fishing for Salmon.	4 Chinook per day <50cm.	
Mouth of Nicola												No Fishing for salmon.	
Clearwater & N. Thompson		Status Quo - Closed.									No fishing for Salmon.		1 Chinook 30-77cm.
S. Thompson & Bessette Creek												No Fishing for salmon.	
Bridge River/Fraser Near Bridge										Sun-Thurs 1 Chinook 30-77cm.			
Nechako - Prince George		No fishing for Salmon.										Catch & Release	
Bowron River												1 Chinook per day 30-77cm.	
Quesnel River													
Chilko River												Catch & Release	
Cariboo River													
NA	2017	Status Quo - Closed.					No Fishing for Salmon.						
NA		Status Quo - Closed.					No Fishing for Salmon.						
NA		Status Quo - Closed.									No fishing for Salmon.		
NA		Status Quo - Closed.									No fishing for Salmon.		
NA		No fishing for Salmon.											
NA	2018	Status Quo - Closed.					1 Chinook per day.						4 /day only 1 >50cm
NA		Status Quo - Closed.					No Fishing for Salmon.						4 /day only 1 >50cm
NA		Status Quo - Closed.									No fishing for Salmon.		
NA		Status Quo - Closed.									No fishing for Salmon.		
NA		No fishing for Salmon.											

Figure B–6. Continued.

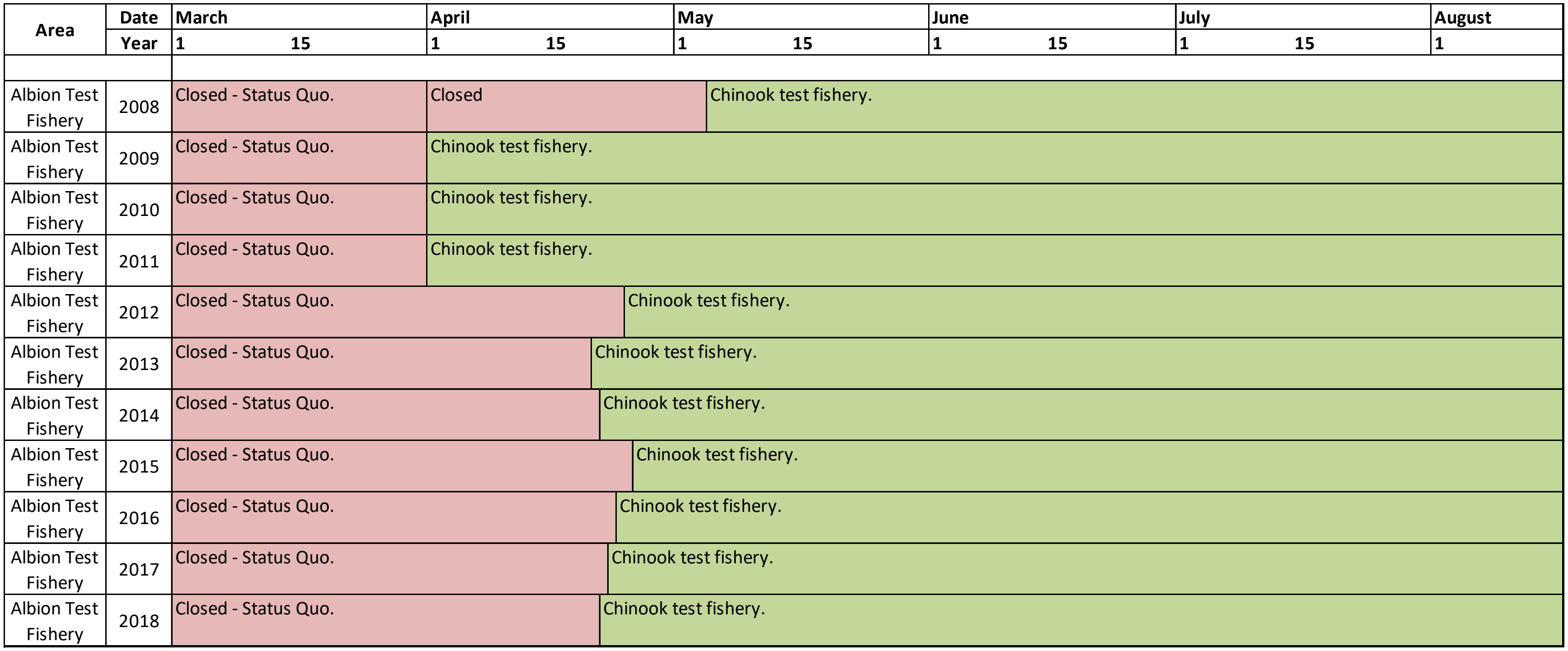


Region	Area	Date Year	March 1	15	April 1	15	May 1	15	June 1	15	July 1	15	August 1
Lower Fraser	Below Port Mann	2008	Status Quo - Closed.	Ceremonials only	Reduced communial fishing time.								
Lower Fraser	Port Mann to Sawmill		Status Quo - Closed.	Ceremonials only	Reduced communial fishing time.								
BC Interior	Sawmill to Kelly Cr., Thompson Below Bonaparte		Status Quo - Closed.		Closed	Reduced communal fishing time; voluntary no fishing policy in Sawmill to Texas; gear restrictions Texas to Kelly							
Lower Fraser	Below Port Mann	2009	Status Quo - Closed.	Proposed later start and reduced communal fishing time.									
Lower Fraser	Port Mann to Sawmill		Status Quo - Closed.	Proposed later start and reduced communal fishing time.									
BC Interior	Sawmill to Kelly Cr., Thompson Below Bonaparte		Status Quo - Closed.		Proposed later start and reduced communal fishing time.								
Lower Fraser	Below Port Mann	2010	Closed for communal fisheries.							Reduced communal fishing time			
Lower Fraser	Port Mann to Sawmill		Closed for communal fisheries; very limited ceremonials.							Reduced communal fishing time			
BC Interior	Sawmill to Kelly Cr., Thompson Below Bonaparte		Status Quo - Closed.		Closed.					Limited dip net openings on portions of the Fraser & Thompson			Some fisheries in terminal areas closed or restricted
Lower Fraser	Below Port Mann	2011	Closed for communal fisheries.							Reduced communal fishing time			
Lower Fraser	Port Mann to Sawmill		Closed for communal fisheries; very limited ceremonials.							Reduced communal fishing time			
BC Interior	Sawmill to Kelly Cr., Thompson Below Bonaparte		Status Quo - Closed.		Closed.					Limited gill net, dip net, and rod & reel in some areas.	Dip net and rod & reel. Some terminal areas restrictions initated by First Nations.		Some fisheries in terminal areas closed or restricted
Lower Fraser	Below Port Mann	2012	Closed for communal fisheries.							Reduced communal fishing time			
Lower Fraser	Port Mann to Sawmill		Closed for communal fisheries; very limited ceremonials.							Reduced communal fishing time			
BC Interior	Sawmill to Kelly Cr., Thompson Below Bonaparte		Status Quo - Closed.		Closed.					Limited gill net, dip net, and rod & reel in some areas.	Dip net and rod & reel. Some terminal areas restrictions initated by First Nations.		Some fisheries in terminal areas closed or restricted
Lower Fraser	Below Port Mann	2013	Closed for communal fisheries.					Reduced communal fishing time. Exploitation rate reduced by 45% from base period (2010).					
Lower Fraser	Port Mann to Sawmill		Closed for communal fisheries; very limited ceremonials.					Reduced communal fishing time. Exploitation rate reduced by 45% from base period (2010).					
BC Interior	Sawmill to Kelly Cr., Thompson Below Bonaparte		Closed					Some fisheries in terminal areas closed or restricted (i.e. rod and reel). Reduced communal fishing time. Exploitation rates reduved by 45% from the base period (2010).					

Figure B-7. Summary of management measures in implemented in Fraser River FSC fisheries, 2008 to 2018

		Date	March		April		May		June		July		August
Region	Area	Year	1	15	1	15	1	15	1	15	1	15	1
Lower Fraser	Below Port Mann	2014	Closed for communal fisheries.					No increases to Spring 4-2 exploitation rates over 2011-2013.					
Lower Fraser	Port Mann to Sawmill		Closed for communal fisheries; very limited ceremonials.					No increases to Spring 4-2 exploitation rates over 2011-2013.					
BC Interior	Sawmill to Kelly Cr., Thompson		Closed							Limited gill net, dip net,	Dip net and rod & reel. Some terminal areas restrictions		Some fisheries in terminal
Lower Fraser	Below Port Mann	2015	Closed for communal fisheries.				No increases to Spring 4-2 exploitation rates over 2011-2013.						
Lower Fraser	Port Mann to Sawmill		Closed for cummunal fisheries; very limited ceremonials.		No increases to Spring 4-2 exploitation rates over 2011-2013.								
BC Interior	Sawmill to Kelly Cr., Thompson		Closed							Limited gill net, dip net,	Dip net and rod & reel. Some terminal areas restrictions		Some fisheries in terminal
Lower Fraser	Below Port Mann	2016	Closed for communal fisheries.				Actual start						
Lower Fraser	Port Mann to Sawmill		Closed for cummunal fisheries; very limited ceremonials.				Actual start						
BC Interior	Sawmill to Kelly Cr., Thompson		Closed							Limited gill net, dip net,	Dip net and rod & reel. Some terminal areas restrictions		Some fisheries in terminal
Lower Fraser	Below Port Mann	2017	Closed for communal fisheries.			Actual start							
Lower Fraser	Port Mann to Sawmill		Closed for communal fisheries; very limited ceremonials.		Actual start								
BC Interior	Sawmill to Kelly Cr., Thompson		Closed							Limited gill net, dip net,	Dip net and rod & reel. Some terminal areas restrictions		Some fisheries in terminal
Lower Fraser	Below Port Mann	2018	Closed for communal fisheries.			Actual start							
Lower Fraser	Port Mann to Sawmill		Closed for communal fisheries; very limited ceremonials.		Actual start								
BC Interior	Sawmill to Kelly Cr., Thompson		Status Quo - Closed.		Actual start								

Figure B–7. Continued.



Area	Date	March		April		May		June		July		August
	Year	1	15	1	15	1	15	1	15	1	15	1
Albion Test Fishery	2008	Closed - Status Quo.		Closed		Chinook test fishery.						
Albion Test Fishery	2009	Closed - Status Quo.		Chinook test fishery.								
Albion Test Fishery	2010	Closed - Status Quo.		Chinook test fishery.								
Albion Test Fishery	2011	Closed - Status Quo.		Chinook test fishery.								
Albion Test Fishery	2012	Closed - Status Quo.			Chinook test fishery.							
Albion Test Fishery	2013	Closed - Status Quo.			Chinook test fishery.							
Albion Test Fishery	2014	Closed - Status Quo.			Chinook test fishery.							
Albion Test Fishery	2015	Closed - Status Quo.			Chinook test fishery.							
Albion Test Fishery	2016	Closed - Status Quo.			Chinook test fishery.							
Albion Test Fishery	2017	Closed - Status Quo.			Chinook test fishery.							
Albion Test Fishery	2018	Closed - Status Quo.			Chinook test fishery.							

Figure B-8. Summary of management measures in implemented for the Albion Test Fishery, 2008 to 2018.

APPENDIX C: ESCAPEMENT DATA

Table C - 1. Aggregate escapement data used as inputs to the Fraser Chinook Run Reconstruction model for stream-type stock management units.

Year	Spring 4_2	Spring 5_2	Summer 5_2
1979	3,506	14,550	12,482
1980	7,529	17,539	16,522
1981	3,773	11,355	15,827
1982	6,651	14,163	17,788
1983	3,284	22,015	19,742
1984	8,215	28,670	16,894
1985	12,076	43,089	22,827
1986	13,771	53,380	38,832
1987	7,093	52,212	33,808
1988	6,501	44,623	37,815
1989	9,127	32,990	20,174
1990	5,408	41,228	38,615
1991	7,427	29,160	33,523
1992	9,922	36,201	44,212
1993	13,619	36,621	24,559
1994	17,251	53,451	27,408
1995	18,981	39,934	34,609
1996	27,883	31,495	49,841
1997	22,678	36,644	48,667
1998	5,620	31,737	41,947
1999	12,142	21,714	29,264
2000	16,400	26,266	38,198
2001	18,970	30,289	43,113
2002	24,996	40,898	39,632
2003	29,254	50,554	57,813
2004	20,856	33,449	45,923
2005	9,470	22,153	29,382
2006	10,200	22,175	38,157
2007	2,657	12,151	16,158
2008	12,196	16,867	26,812
2009	2,515	27,440	31,638
2010	9,889	18,774	26,402
2011	5,429	12,140	23,502
2012	11,649	12,015	13,083
2013	7,345	17,821	17,760
2014	24,963	35,387	32,120
2015	11,515	25,235	43,139
2016	9,310	15,293	14,349
2017	5,474	9,580	9,910
2018	2,372	9,854	8,977

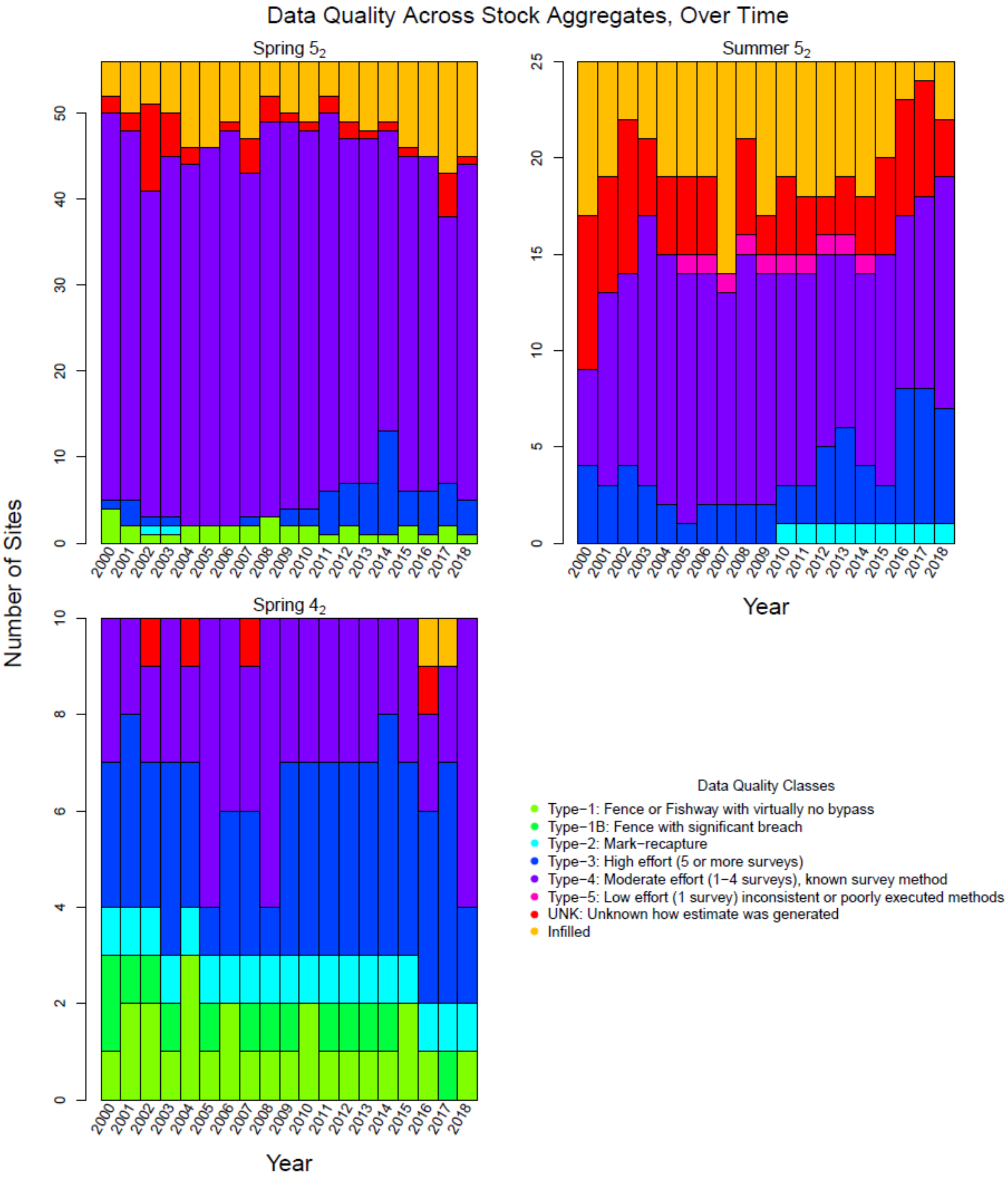


Figure C - 1. Data quality classes across spawning sites for escapement data set used as input to the Fraser Chinook Run Reconstruction Model, over years.

Table C - 2. Escapement indices for stream-type Fraser Chinook stock management units used for the Chinook Technical Committee's Escapement and Data Report (CTC 2019).

Year	Spring 4_2	Spring 5_2	Summer 5_2
1995	18,000	42,974	24,323
1996	26,627	31,379	35,339
1997	22,251	33,920	34,397
1998	5,105	26,163	31,542
1999	11,409	18,185	19,205
2000	16,002	21,542	21,868
2001	18,210	25,479	25,302
2002	24,477	36,563	29,561
2003	28,740	45,349	44,109
2004	20,427	28,706	32,339
2005	8,983	20,029	20,181
2006	9,601	20,077	21,362
2007	2,474	10,789	11,124
2008	11,774	15,373	17,340
2009	2,173	24,321	21,596
2010	9,406	15,584	20,377
2011	5,181	10,998	16,332
2012	11,359	11,186	9,769
2013	6,821	16,009	11,263
2014	24,614	32,905	24,424
2015	11,150	22,990	30,537
2016	8,904	13,781	9,522
2017	5,103	8,343	6,390
2018	2,100	8,482	5,443

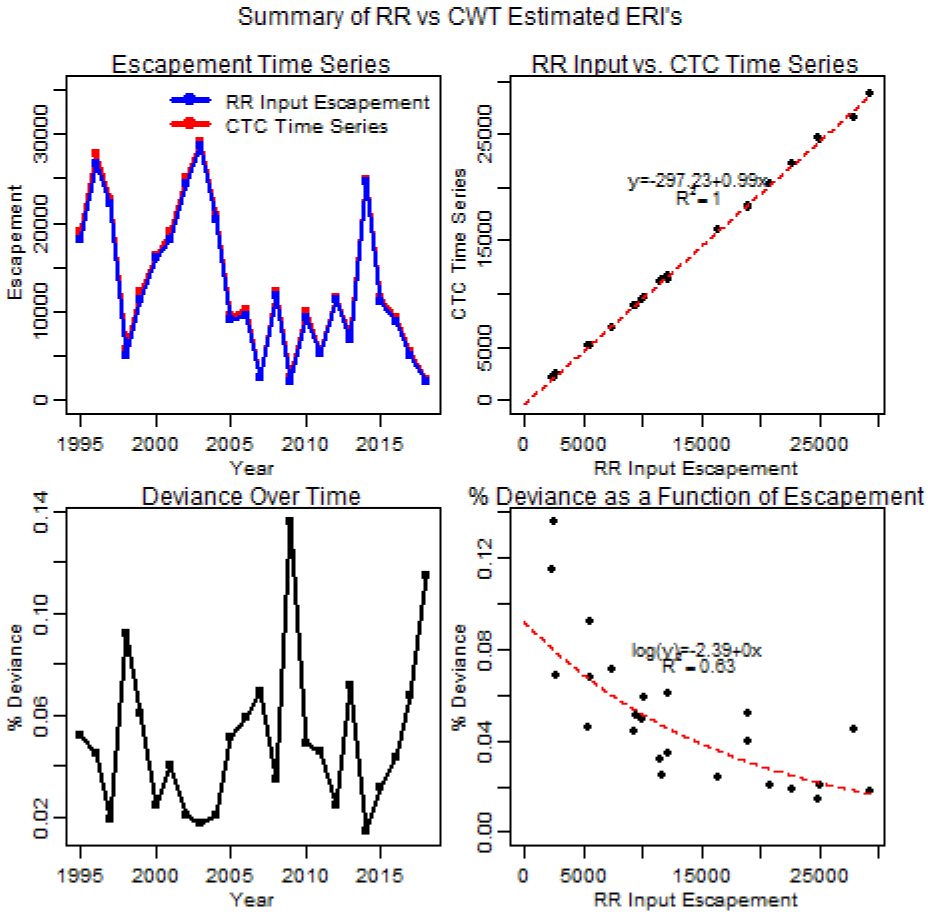


Figure C - 2. Comparison between the Run Reconstruction Model escapement series (Table C - 1) and the CTC- escapement series (Table C - 2) for the Spring 4_2 SMU. In this case a log-linear relationship was observed between escapement magnitude and % deviance. This means that as escapement increases, the difference between the two datasets declines, but the magnitude of this decline decreases as escapement increases.

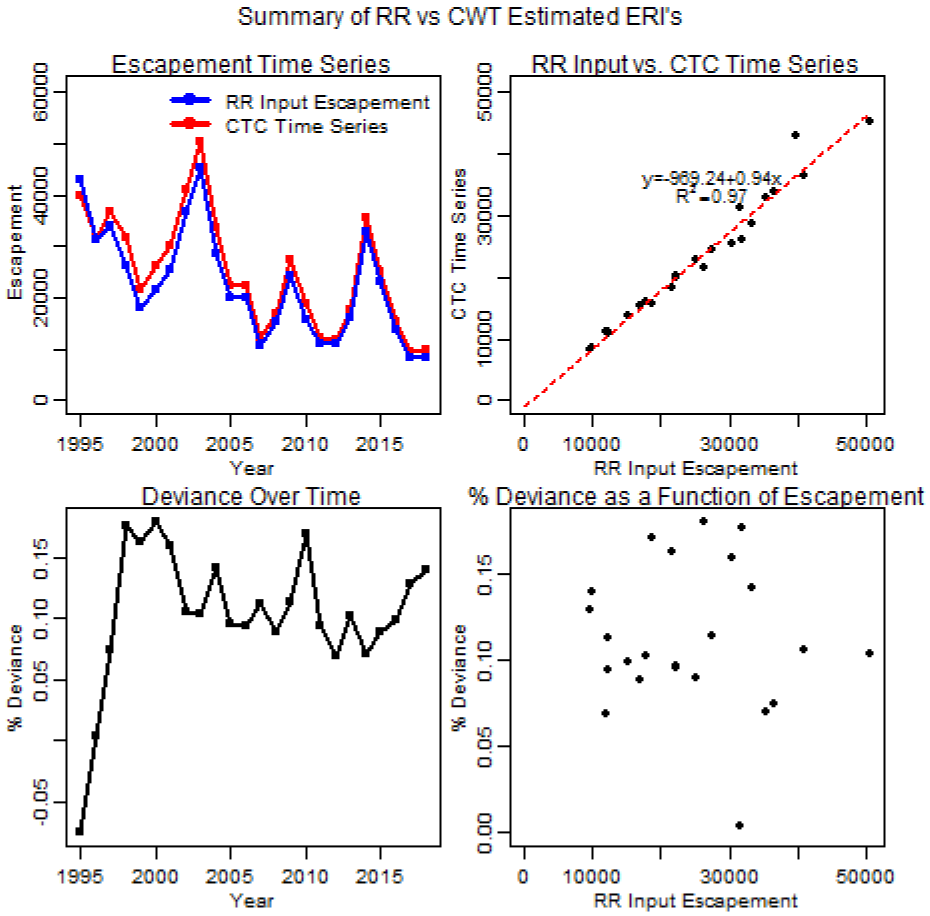


Figure C - 3. Comparison between the Run Reconstruction Model escapement series (Table C - 1) and the CTC- escapement series (Table C - 2) for the Spring 5_2 SMU. A linear model fit to % Deviance versus Run Reconstruction model escapement (bottom right panel) had a low R^2 value (0.065), which is interpreted as having no significant relationship, and therefore has not been shown.

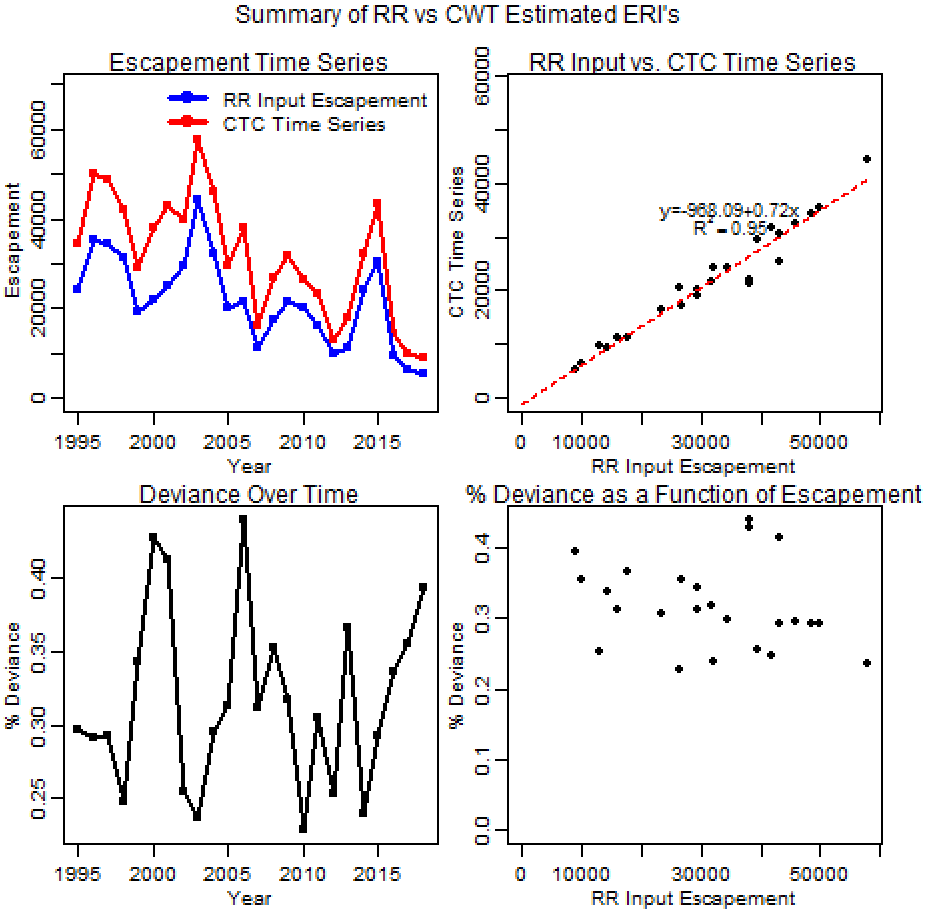


Figure C - 4. Comparison between the Run Reconstruction Model escapement series (Table C - 1) and the CTC- escapement series (Table C - 2) for the Summer 5_2 SMU. A linear model fit to % Deviance versus Run Reconstruction model escapement (bottom right panel) had a low R^2 value (0.050), which is interpreted as having no significant relationship, and therefore has not been shown.

Table C - 3. Comparison of CTC escapement series and Run Reconstruction Model escapement series. The number of sites includes sites that may comprise an aggregate stock in the Run Reconstruction Model. For the last row, run reconstruction stocks are characterized as infilled if one or more sites that comprise the stock is infilled that year. Therefore these values should be considered a maximum estimate of the magnitude of infilling. For run reconstruction data we looked at 1995-2018, for CWT we looked at 2012-2016.

	Spring 4_2		Spring 5_2		Summer 5_2	
Data Set	RR	CTC	RR	CTC	RR	CTC
Number of Sites	10	6	56	37	25	12
Number of infilled sites	0-2	0-1	4-17	0-1	1-13	0-1
Proportion of escapement infilled	0-8%	0-6%	6-32%	0-2%	3-32%	0-2%

APPENDIX D: AGE AND LENGTH DATA

Table D - 1. Summary of length-at-age data for Nicola river (Spring 4_2) Chinook, based on scale age. Data are only shown for year-age combinations with more than 5 observations. Ages have also been excluded that did not have more than one year with 5 observations. Median, interquartile range (width between 25% and 75% quantile) and sample size are given for each year-age combination.

Scale Age	Age 4_2 Size-at-Age			Age 5_2 Size-at-Age		
Year	**Median**	**IQR**	**n**	**Median**	**IQR**	**n**
1981	-	-	1	-	-	-
1997	56.94	5.08	254	67.50	11.72	18
1998	54.80	3.52	20	60.07	4.30	5
1999	56.16	4.69	205	63.59	7.52	8
2000	58.31	3.81	62	-	-	1
2001	56.94	4.88	36	-	-	2
2002	58.12	5.47	298	71.79	1.17	6
2003	57.34	5.08	113	-	-	3
2004	58.66	5.67	8	-	-	4
2005	54.99	6.25	38	-	-	-
2006	58.90	6.25	102	65.93	4.69	5
2007	62.42	11.72	17	-	-	1
2008	59.29	4.69	55	-	-	-
2009	62.81	10.94	22	-	-	-
2010	60.07	6.06	54	-	-	2
2011	58.08	3.56	28	-	-	1
2012	58.00	4.81	34	-	-	-
2013	56.16	4.22	76	-	-	-
2014	58.31	5.22	176	-	-	4
2015	56.94	4.14	109	60.34	8.81	6
2016	56.94	6.25	73	-	-	1
2017	55.34	4.94	36	-	-	1

Table D - 2. Summary of length-at-age data for Nicola river (Spring 4_2) Chinook, based on CWT age. Data are only shown for year-age combinations with more than 5 observations. Ages have also been excluded that did not have more than one year with 5 observations. Median, interquartile range (width between 25% and 75% quantile) and sample size are given for each year-age combination.

CWT Age	Age 4 Size-at-Age		
Year	**Median**	**IQR**	**n**
1997	56.16	4.49	6
1998	56.16	1.95	7
2000	57.14	3.42	24
2001	56.94	5.86	13
2002	55.97	5.28	30
2003	56.16	4.30	23
2004	-	-	3
2005	52.26	2.74	7
2006	56.55	3.81	14
2007	NA	NA	1
2008	58.51	1.95	12
2009	56.94	3.13	5
2010	60.46	7.23	23
2011	58.27	3.59	9
2012	60.31	5.24	9
2013	55.85	4.28	26
2014	54.83	1.17	5
2015	56.48	2.81	45
2016	56.09	4.59	34
2017	54.68	4.61	31

Table D - 3. Summary of length-at-age data for Chilko river (Spring 5_2) Chinook, based on scale age. Data are only shown for year-age combinations with more than 5 observations. Ages have also been excluded that did not have more than one year with 5 observations. Median, interquartile range (width between 25% and 75% quantile) and sample size are given for each year-age combination.

Scale Age	**Age 4_2 Size-at-Age**			**Age 5_2 Size-at-Age**			**Age 6_2 Size-at-Age**		
Year	**Median**	**IQR**	**n**	**Median**	**IQR**	**n**	**Median**	**IQR**	**n**
1969	-	-	1	80.00	7.00	7	-	-	-
1975	-	-	1	-	-	1	-	-	1
1976	67.70	6.95	7	-	-	2	-	-	-
1977	-	-	2	74.50	3.50	20	-	-	1
1978	-	-	1	-	-	3	-	-	-
1979	-	-	3	72.40	3.70	13	-	-	-
1980	56.75	10.25	56	71.00	5.00	276	83.00	2.00	5
1981	59.30	6.40	23	71.70	4.80	277	78.70	5.20	33
1982	62.35	7.10	50	73.20	5.60	374	76.10	4.67	12
1983	60.50	8.38	14	72.00	6.00	146	-	-	3
2001	60.93	4.77	5	71.48	2.15	7	-	-	-
2010	60.10	7.30	283	71.20	5.63	232	75.30	4.10	21
2011	63.50	13.20	140	71.20	5.00	653	72.00	9.40	13
2012	64.20	8.58	152	70.45	6.13	260	69.10	4.48	8
2013	60.40	8.80	457	69.50	5.55	282	70.60	3.75	7
2014	62.55	10.48	186	69.80	4.55	239	-	-	3
2015	66.25	8.83	176	70.20	5.75	367	77.70	6.00	5
2016	61.90	10.10	57	68.85	5.00	140	70.55	6.05	16
2017	57.20	7.40	245	67.70	6.43	300	68.90	10.40	30

Table D - 4. Summary of length-at-age data for Nechako river (Spring 5_2) Chinook, based on scale age. Data are only shown for year-age combinations with more than 5 observations. Ages have also been excluded that did not have more than one year with 5 observations. Median, interquartile range (width between 25% and 75% quantile) and sample size are given for each year-age combination.

Scale Age	**Age 4_2 Size-at-Age**			**Age 5_2 Size-at-Age**			**Age 6_2 Size-at-Age**		
Year	**Median**	**IQR**	**n**	**Median**	**IQR**	**n**	**Median**	**IQR**	**n**
1977	70.50	10.60	5	76.65	2.88	6	-	-	-
1978	68.70	7.20	41	72.00	5.38	34	-	-	1
1979	61.10	3.40	5	-	-	2	-	-	-
1989	59.80	5.40	59	70.50	6.80	103	75.10	5.15	30
1990	60.25	6.50	8	71.00	5.25	171	75.00	5.75	39
1991	60.00	5.13	30	70.50	6.50	113	77.00	6.50	53
1992	59.00	3.75	14	71.25	6.00	166	75.25	6.13	16
1993	58.00	6.00	25	69.50	5.50	135	76.75	7.88	28
1994	62.30	6.35	19	71.20	5.58	132	73.50	4.25	19
1995	58.85	5.63	26	71.60	5.70	175	-	-	2
1996	62.00	4.00	85	72.50	4.75	99	78.50	5.50	20
1997	63.05	3.70	42	71.40	5.03	156	75.10	5.70	7
1998	65.20	7.60	51	73.60	5.90	149	-	-	4
1999	60.95	3.75	90	68.70	6.73	104	76.30	9.60	9
2000	63.50	5.50	162	71.60	5.70	81	75.80	11.05	7
2001	63.25	5.68	20	72.45	4.97	158	-	-	1
2002	61.70	3.80	37	72.40	6.40	129	84.20	4.70	7
2003	62.80	6.50	51	73.15	5.75	106	-	-	4
2004	62.20	3.90	63	72.05	5.77	102	-	-	2
2005	61.65	10.75	46	69.50	6.05	115	77.70	4.30	5
2006	62.40	5.10	29	71.05	4.63	146	-	-	2
2007	58.50	4.88	10	71.10	5.70	45	74.20	5.30	9
2008	62.55	4.45	154	74.50	2.10	11	-	-	2
2009	70.60	8.40	35	73.30	5.15	127	-	-	-
2010	63.10	5.63	156	74.60	6.00	20	-	-	-

Table D - 5. Age composition data summary for unclipped Nicola Chinook.

Run Year	Age-3 Prop.	Age-4 Prop.	Age-5 Prop.
1995	0.0040	0.8733	0.1227
1996	0.0042	0.9047	0.0910
1997	0.0044	0.8912	0.1043
1998	0.0059	0.7654	0.2287
1999	0.0070	0.9152	0.0779
2000	0.0211	0.9380	0.0409
2001	0.0103	0.8933	0.0964
2002	0.0283	0.8888	0.0829
2003	0.0040	0.9121	0.0839
2004	0.0000	0.6972	0.3028
2005	0.0436	0.9256	0.0307
2006	0.0112	0.9298	0.0590
2007	0.0602	0.4823	0.4575
2008	0.0254	0.9746	0.0000
2009	0.0449	0.8240	0.1311
2010	0.0000	0.9844	0.0156
2011	0.0000	0.8841	0.1159
2012	0.1129	0.8871	0.0000
2013	0.0091	0.9651	0.0258
2014	0.0503	0.8645	0.0852
2015	0.0191	0.9809	0.0000
2016	0.0415	0.8619	0.0966
2017	0.0263	0.8928	0.0809
2018	0.0000	0.9755	0.0245

Table D - 6. Age composition data summary for clipped Nicola Chinook.

Run Year	Age-3 Prop.	Age-4 Prop.	Age-5 Prop.
1995	0.0850	0.8201	0.0949
1996	0.0072	0.8768	0.1160
1997	0.0000	0.9569	0.0431
1998	0.1031	0.8694	0.0275
1999	0.0099	0.9694	0.0206
2000	0.0252	0.9396	0.0352
2001	0.0270	0.9022	0.0708
2002	0.0200	0.9004	0.0796
2003	0.0046	0.9302	0.0652
2004	0.0027	0.5486	0.4487
2005	0.0239	0.9523	0.0239
2006	0.0000	0.8724	0.1276
2007	0.1164	0.5000	0.3836
2008	0.0000	1.0000	0.0000
2009	0.1679	0.7493	0.0828
2010	0.0163	0.9730	0.0108
2011	0.0134	0.8718	0.1148
2012	0.0541	0.8999	0.0460
2013	0.0033	0.9758	0.0209
2014	0.1151	0.7970	0.0880
2015	0.0134	0.9833	0.0033
2016	0.0387	0.8721	0.0892
2017	0.0099	0.9518	0.0384
2018	0.0116	0.9698	0.0186

Table D - 7. Age composition data summary for unclipped Chilko Chinook.

Run Year	Age-3 Prop.	Age-4 Prop.	Age-5 Prop.	Age-6 Prop.
2010	0.0060	0.5162	0.4311	0.0467
2011	0.0023	0.1670	0.8095	0.0213
2012	0.0413	0.3292	0.6127	0.0168
2013	0.0907	0.5643	0.3360	0.0090
2014	0.0023	0.4351	0.5528	0.0097
2015	0.0017	0.3046	0.6848	0.0089
2016	0.0254	0.2921	0.6103	0.0721
2017	0.0024	0.4172	0.5259	0.0545
2018	0.0000	0.5072	0.4734	0.0194

APPENDIX E: FRASER RIVER CATCH AND RELEASE DATA

Table E - 1. Chinook caught and released from Fraser test fisheries.

Year	Parameter	Fishery Area	Month								Total
			April	May	June	July	Aug	Oct	Nov	Sept	
2009	Catch	Albion	-	-	58	133	487	263	-	-	941
2009	Catch	Deas-Miss	17	19	135	411	959	577	148	-	2,266
2009	Catch	Qualark	-	-	-	27	89	38	-	-	154
2009	Release	Albion	-	-	1	5	14	1		-	21
2009	Release	Deas-Miss	-	-	-	-	-	-	-	-	0
2009	Release	Qualark	-	-		9	74	24	1	-	108
2009 Sum of Catch			17	19	193	571	1,535	878	148	-	3,361
2009 Sum of Release			-	-	1	14	88	25	1	-	129
2010	Catch	Albion	-	-	51	206	389	101	189	-	936
2010	Catch	Deas-Miss	29	23	159	611	588	338	405	10	2,163
2010	Catch	Qualark	-	-	-	5	20	13	-	-	38
2010	Release	Albion	-	-	-	2	1	-	-	-	3
2010	Release	Deas-Miss	-	-	-	-	-	-	-	-	0
2010	Release	Qualark	-	-	-	30	52	9	-	-	91
2010 Sum of Catch			29	23	210	822	997	452	594	10	3,137
2010 Sum of Release			-	-	-	32	53	9	-	-	94
2011	Catch	Albion	-	-	34	234	575	456	101	-	1,400
2011	Catch	Deas-Miss	28	20	21	59	856	661	694	6	2,345
2011	Catch	Qualark	-	-	-	2	323	274	14	-	613
2011	Release	Albion	-	-	-	5	2	2	-	-	9
2011	Release	Deas-Miss	-	-	-	-	-	-	-	-	0
2011	Release	Qualark	-	-	-	6	120	69	2	-	197
2011 Sum of Catch			28	20	55	295	1,754	1,391	809	6	4,358
2011 Sum of Release			-	-	-	11	122	71	2	-	206
2012	Catch	Albion	-	-	6	172	192	174	9	-	553
2012	Catch	Deas-Miss	3	6	8	56	380	480	104	2	1,039
2012	Catch	Qualark	-	-	-	61	134	20	-	-	215
2012	Release	Albion	-	-	2	1	1	17	1	-	22
2012	Release	Deas-Miss	-	-	-	-	-	-	-	-	-
2012	Release	Qualark	-	-	-	16	8	5	-	-	29
2012 Sum of Catch			3	6	14	289	706	674	113	2	1,807
2012 Sum of Release			-	-	2	17	9	22	1	-	51
2013	Catch	Albion	-	-	-	177	334	574	31	-	1,116

Year	Parameter	Fishery Area	Month								Total
			April	May	June	July	Aug	Oct	Nov	Sept	
2013	Catch	Deas-Miss	-	2	17	139	577	598	59	2	1,394
2013	Catch	Qualark	-	-	-	103	94	89	-	-	286
2013	Release	Albion	-	-	-	2	5	3	2	-	12
2013	Release	Deas-Miss	-	-	-	-	-	-	-	-	-
2013	Release	Qualark	-	-	-	39	20	7	-	-	66
2013 Sum of Catch			-	2	17	419	1,005	1,261	90	2	2,796
2013 Sum of Release			-	-	-	41	25	10	2	-	78
2014	Catch	Albion	-	-	55	251	213	321	32	-	872
2014	Catch	Deas-Miss	12	9	184	492	448	453	139	8	1,745
2014	Catch	Qualark	-	-	-	111	49	28	1	-	189
2014	Release	Albion	-	-	3	9	4	9	1	-	26
2014	Release	Deas-Miss	-	-	-	-	-	-	-	-	-
2014	Release	Qualark	-	-	-	80	105	90	-	-	275
2014 Sum of Catch			12	9	239	854	710	802	172	8	2,806
2014 Sum of Release			-	-	3	89	109	99	1	-	301
2015	Catch	Albion	-	-	19	155	617	784	-	-	1,575
2015	Catch	Deas-Miss	-	11	209	366	751	862	446	10	2,655
2015	Catch	Qualark	-	-	-	59	71	103	-	-	233
2015	Release	Albion	-	-	2	2	7	5	-	-	16
2015	Release	Deas-Miss	-	-	-	-	-	-	-	-	-
2015	Release	Qualark	-	-	-	104	81	115	-	-	300
2015 Sum of Catch			-	11	228	580	1,439	1,749	446	10	4,463
2015 Sum of Release			-	-	2	106	88	120	-	-	316
2016	Catch	Albion	-	-	-	45	318	104	-	-	467
2016	Catch	Deas-Miss	-	6	63	215	635	380	156	9	1,464
2016	Catch	Qualark	-	-	-	52	148	48	-	-	248
2016	Release	Albion	-	-	-	3	17	2	-	-	22
2016	Release	Deas-Miss	-	-	-	-	-	-	-	-	-
2016	Release	Qualark	-	-	-	21	8	2	-	-	31
2016 Sum of Catch			-	6	63	312	1,101	532	156	9	2,179
2016 Sum of Release			-	-	-	24	25	4	-	-	53
2017	Catch	Albion	-	-	-	33	173	275	19	-	500
2017	Catch	Deas-Miss	-	5	9	53	223	410	121	11	832
2017	Catch	Qualark	-	-	-	82	46	109	-	-	237
2017	Release	Albion	-	-	-	7	3	7	3	-	20

Year	Parameter	Fishery Area	Month								Total
			April	May	June	July	Aug	Oct	Nov	Sept	
2017	Release	Deas-Miss	-	-	-	-	-	-	-	-	-
2017	Release	Qualark	-	-	-	8	4	1	-	-	13
2017 Sum of Catch			-	5	9	168	442	794	140	11	1,569
2017 Sum of Release			-	-	-	15	7	8	3	-	33
2018	Catch	Albion	-	-	3	91	181	355	15	-	645
2018	Catch	Deas-Miss	-	1	21	159	207	358	74	3	823
2018	Catch	Qualark	-	-	-	98	83	64	-	-	245
2018	Release	Albion	-	-	2	7	-	7	1	-	17
2018	Release	Deas-Miss	-	-	-	-	-	-	-	-	-
2018	Release	Qualark	-		-	4	1	2	-	-	7
2018 Sum of Catch			-	1	24	348	471	777	89	3	1,713
2018 Sum of Release			-	-	2	11	1	9	1	-	24

Table E - 2. Chinook caught in Fraser River FSC fisheries.

Year	Fishery Area	Month										Total
		March	April	May	June	July	Aug	Sept	Oct	Nov	total	
2009	Stev-Deas	-	-	33	549	1,822	4,206	585	9	1	-	7,205
2009	Deas-Miss	-	6	53	904	960	2,386	323	4	2	-	4,638
2009	Miss-Harrison	-	4	33	476	379	396	68	35	13	-	1,404
2009	Harrison-Hope	-	87	160	2,013	1,280	1,816	202	20	4	-	5,582
2009	Hope-Sawm	5	83	211	2,395	1,579	2,318	350	-	-	-	6,941
2009	Harrison-Hope	-	-	1	79	365	10	-	-	-	-	455
2009	Hope-Sawm	-	-	-	28	126	4	-	-	-	-	158
2009	Qualark	-	-	6	59	200	261	4	-	-	-	530
2009	Thompson-Texas	-	-	-	-	37	15	-	-	-	-	52
2009	Texa-Kelly	-	-	-	-	37	14	-	-	-	-	51
2009	Deadm-Chil	-	-	-	-	56	79	2	-	-	-	137
2009	Quen-Naver	-	-	-	-	-	2	-	-	-	-	2
2009	Tete Juene	-	-	-	-	32	51	-	-	-	-	83
2009	Nechako	-	-	-	-	27	17	21	-	-	-	65
2009	Stuart	-	-	-	-	32	536	281	-	-	-	849
2009	Tomp-Bona	-	-	-	-	-	208	505	-	-	-	713
2009	Trib	-	-	-	-	-	-	-	-	-	480	480
2009 Total		5	180	497	6,503	6,932	12,319	2,341	68	20	480	29,345
2010	Stev-Deas	-	-	-	509	2,347	62	2	2	-	-	2,922
2010	Deas-Miss	-		4	378	2,356	370	12	33	-	-	3,153
2010	Miss-Harrison	-	-	-	230	623	178	5	18	3	-	1,057
2010	Harrison-Hope	-	2	4	528	1,588	528	89	16	-	-	2,755
2010	Hope-Sawm	-	-	5	871	974	944	18	-	-	-	2,812
2010	Harrison-Hope	-	-	-	16	107	110	33	-	-	-	266
2010	Hope-Sawm	-	-	-	7	34	2	-	-	-	-	43
2010	Qualark	-	-	-	76	30	106	21	-	-	-	233
2010	Sawm-Thompson	-	-	-	-	-	-	2	-	-	-	2
2010	Thompson-Texas	-	-	-	-	1	5	-	-	-	-	6
2010	Texa-Kelly	-	-	-	-	4	5	-	-	-	-	9
2010	Deadm-Chil	-	-	-	-	76	4	3	-	-	-	83
2010	Quen-Naver	-	-	-	-	-	4	-	-	-	-	4

Year	Fishery Area	Month										Total
		March	April	May	June	July	Aug	Sept	Oct	Nov	total	
2010	Naver-Salm	-	-	-	-		3	-	-	-	-	3
2010	Tete Juene	-	-	-	-	20	44	-	-	-	-	64
2010	Nechako	-	-	-	-	-	14	25	-	-	-	39
2010	Stuart	-	-	-	-	-	32	70	-	-	-	102
2010	Tomp-Bona	-	-	-	-	-	53	17	139	-	-	209
2010	Trib	-	-	-	-	-	-	-	-	-	1,475	1,475
2010 Total		-	2	13	2,615	8,160	2,464	297	208	3	1,475	15,237
2011	Stev-Deas	-	-	-	110	973	1,709	584	345		-	3,721
2011	Deas-Miss	-	-	-	85	591	1,920	546	116	1	-	3,259
2011	Miss-Harrison	-	-	-	225	259	2,373	204	318	24	-	3,403
2011	Harrison-Hope	-	3	4	389	2,072	2,527	692	51	9	-	5,747
2011	Hope-Sawm	-	-	4	578	4,390	5,197	1,620	-	-	-	11,789
2011	Qualark	-	-	-	-	-	-	-	-	-	-	-
2011	Harrison-Hope	-	-	-	-	-	1,203	259	-	-	-	1,462
2011	Hope-Sawm	-	-	-	-	-	233	-	-	-	-	233
2011	Qualark	-	-	-	-	113	718	19	-	-	-	850
2011	Thompson-Texas	-	-	-	-	-	41		-	-	-	41
2011	Texa-Kelly	-	-	-	-	-	203	2	-	-	-	205
2011	Deadm-Chil	-	-	-	-	-	103	30	-	-	-	133
2011	Quen-Naver	-	-	-	-	-	-	4	-	-	-	4
2011	Stuart	-	-	-	-	-	-	-	-	-	-	-
2011	Tete Juene	-	-	-	-	3	59	20	-	-	-	82
2011	Nechako	-	-	-	-	-	146	3	-	-	-	149
2011	Stuart	-	-	-	-	-	140	89	-	-	-	229
2011	Tomp-Bona	-	-	-	-	-	6	344	54	-	-	404
2011	Trib	-	-	-	-	-	-	-	-	-	667	667
2011 Total		-	3	8	1,387	8,401	16,578	4,416	884	34	667	32,378
2012	Stev-Deas	-	-	-	78	353	2,086	607	24	-	-	3,148
2012	Deas-Miss	-	-	-	101	549	1,325	579	10	-	-	2,564
2012	Miss-Harrison	-	-	-	132	847	895	235	154	13	-	2,276
2012	Harrison-Hope	-	7	5	547	1,528	1,357	498	1	6	-	3,949
2012	Hope-Sawm	-	-	-	149	4,154	2,833	2,334	-	-	-	9,470
2012	Qualark	-	-	-	-	-	-	-	-		-	-

Year	Fishery Area	Month										Total
		March	April	May	June	July	Aug	Sept	Oct	Nov	total	
2012	Harrison-Hope	-	-	-	-	46	1,139	1,635	-	-	-	2,820
2012	Hope-Sawm	-	-	-	-	2	385	3	-	-	-	390
2012	Qualark	-	-	-	2	35	185	46	-	-	-	268
2012	Sawm-Thompson	-	-	-	-	-	23	-	-	-	-	23
2012	Thompson -Texas	-	-	-	-	104	206	-	-	-	-	310
2012	Texa-Kelly	-	-	-	-	6	29	5	-	-	-	40
2012	Deadm-Chil	-	-	-	-	22	146	15	-	-	-	183
2012	Quen-Naver	-	-	-	-	-	-	1	-	-	-	1
2012	Tete Juene	-	-	-	-	16	98	18	-	-	-	132
2012	Nechako	-	-	-	-	-	42	81	-	-	-	123
2012	Stuart	-	-	-	-	-	149	76	-	-	-	225
2012	Chilcotin	-	-	-	-	-	2		-	-	-	2
2012	Tomp-Bona	-	-	-	-	-	3	907	2	-	-	912
2012	Trib	-	-	-	-	-	-	-	-	-	487	487
2012 Total		-	7	5	1,009	7,662	10,903	7,040	191	19	487	27,323
2013	Stev-Deas	-		3	66	270	388	1,153	50	-	-	1,930
2013	Deas-Miss	-	1	5	156	220	454	2,101	33	1	-	2,971
2013	Miss-Harrison	-	-	173	162	205	265	520	227	28	-	1,580
2013	Harrison-Hope	-	-	104	422	130	294	313	49	4	-	1,316
2013	Hope-Sawm	-	-	117	474	543	1,000	1,289	-	-	-	3,423
2013	Qualark	-	-	-	-	-	-	-	-	-	-	
2013	Harrison-Hope	-	-	-	-	40	489	-	-	-	-	529
2013	Hope-Sawm	-	-	-	-	-	171	-	-	-	-	171
2013	Qualark	-	-	-	28	140	189	-	-	-	-	357
2013	Texa-Kelly	-	-	-	-	-	-	-	-	-	-	
2013	Thompson -Texas	-	-	-	-	20	6	-	-	-	-	26
2013	Texa-Kelly	-	-	-	-	74	36	-	-	-	-	110
2013	Deadm-Chil	-	-	-	-	-	49	2	-	-	-	51
2013	Nechako	-	-	-	-	-	-	-	-	-	-	-
2013	Quen-Naver	-	-	-	-	-	3	-	-	-	-	3
2013	Naver-Salm	-	-	-	-	-	5	1	-	-	-	6
2013	Tete Juene	-	-	-	-	32	21	11	-	-	-	64
2013	Nechako	-	-	-	-	-	26	93	-	-	-	119
2013	Stuart	-	-	-	-	13	63	58	-	-	-	134

Year	Fishery Area	Month										Total
		March	April	May	June	July	Aug	Sept	Oct	Nov	total	
2013	Tomp-Bona	-	-	-	-	32	-	1,533	-	-	-	1,565
2013	Trib	-	-	-	-	-	-	-	-	-	454	454
2013 Total		-	1	402	1,308	1,719	3,459	7,074	359	33	454	14,809
2014	Stev-Deas	-	-	7	326	916	416	201	109	-	-	1,975
2014	Deas-Miss	-	-	17	499	642	560	-	160	-	-	1,878
2014	Miss-Harrison	-	6	188	812	670	994	23	1,125	-	-	3,818
2014	Harrison-Hope	-	8	86	1,167	1,105	1,198	-	159	-	-	3,723
2014	Hope-Sawm	-	1	85	1,965	3,157	2,383	-	-	-	-	7,591
2014	Qualark	-	-	-	-	-	-	-	-	-	-	-
2014	Harrison-Hope	-	-	-	10	47	619	144	-	-	-	820
2014	Hope-Sawm	-	-	-	-	5	238	-	-	-	-	243
2014	Qualark	-	-	-	52	66	382	21	-	-	-	521
2014	Sawm-Thompson	-	-	-	-	-	15	-	-	-	-	15
2014	Thompson-Texas	-	-	-	-	48	38	-	-	-	-	86
2014	Texa-Kelly	-	-	-	-	52	24		-	-	-	76
2014	Deadm-Chil	-	-	-	-	85	330	8	-	-	-	423
2014	Nechako	-	-	-	-	-	-	-	-	-	-	
2014	Quen-Naver	-	-	-	-	-	-	1	-	-	-	1
2014	Tete Juene	-	-	-	-	113	127	8	-	-	-	248
2014	Nechako	-	-	-	-	10	60	71	16	-	-	157
2014	Stuart	-	-	-	-	68	32	91	281	-	-	472
2014	Chilcotin	-	-	-	-	-	3			-	-	3
2014	Tomp-Bona	-	-	-	-	-	3	28	19	-	-	50
2014	Trib	-	-	-	-	-	-	-	-	-	557	557
2014 Total		-	15	383	4,831	6,984	7,422	596	1,869	-	557	22,657
2015	Stev-Deas	-	-	18	166	10	1,991	1,060	227	-	-	3,472
2015	Deas-Miss	-	19	40	373	-	2,016	1,044	177	3	-	3,672
2015	Miss-Harrison	-	108	181	849	10	866	670	368	11	-	3,063
2015	Harrison-Hope	-	55	100	759	23	1,420	697	60	5	-	3,119
2015	Hope-Sawm	-	41	139	1,486	3	3,620	1,811	-	-	-	7,100
2015	Qualark	-	-	-	-	-	-		-	-	-	
2015	Harrison-Hope	-	-	-	44	80	407	2	-	-	-	533
2015	Hope-Sawm	-	-	15	14	9	36	-	-	-	-	74
2015	Qualark	-	-	28	8	44	121	9	-	-	-	210

Year	Fishery Area	Month										Total
		March	April	May	June	July	Aug	Sept	Oct	Nov	total	
2015	Sawm-Thompson	-	-	-	-	-	4	22	-	-	-	26
2015	Thompson -Texas	-	-	-	-	6	3	-	-	-	-	9
2015	Texa-Kelly	-	-	-	-	40	9	1	-	-	-	50
2015	Deadm-Chil	-	-	-	-	104	255	1	-	-	-	360
2015	Tete Juene	-	-	-	-	-	-	-	-	-	-	-
2015	Nechako	-	-	-	-	-	-	-	-	-	-	-
2015	Naver-Salm	-	-	-	-	-	2	-	-	-	-	2
2015	Tete Juene	-	-	-	-	86	109	4	-	-	-	199
2015	Nechako	-	-	-	-		919	396	-	-	-	1,315
2015	Stuart	-	-	-	-	7	89	9	-	-	-	105
2015	Chilcotin	-	-	-	-		4	1	-	-	-	5
2015	Tomp-Bona	-	-	-	-	-	19	455	-	-	-	474
2015	Trib	-	-	-	-	-	-	-	-	-	277	277
2015 Total		-	223	521	,699	422	11,890	6,182	832	19	277	24,065
2016	Stev-Deas	-		11	206	174	343	-	50	-	-	784
2016	Deas-Miss	-	8	29	165	46	363	-	148	3	-	762
2016	Miss-Harrison	-	18	60	234	45	243	308	736	2	-	1,646
2016	Harrison-Hope	-	31	69	410	168	213	139	137	3	-	1,170
2016	Hope-Sawm	-	14	191	681	275	630	-	-	-	-	1,791
2016	Qualark	-	-		-	-	-	-	-	-	-	0
2016	Harrison-Hope	-	-	94	233	184	301	76	3	-	-	891
2016	Hope-Sawm	-	-	16	66	114	29	6	6	-	-	237
2016	Qualark	-	-	20	56	162	125	1	-	-	-	364
2016	Sawm-Thompson	-	-	-	-	-	20	-	-	-	-	20
2016	Thompson -Texas	-	-	-	-	9	30	-	-	-	-	39
2016	Texa-Kelly	-	-	-	-	28	20	-	-	-	-	48
2016	Deadm-Chil	-	-	-	-	-	31	-	-	-	-	31
2016	Naver-Salm	-	-	-	-	-	1	-	-	-	-	1
2016	Stuart	-	-	-	-	-		-	-	-	-	-
2016	Tete Juene	-	-	-	-	16	59	11	-	-	-	86
2016	Nechako	-	-	-	-	24	88	207	-	-	-	319
2016	Stuart	-	-	-	-	-	83	158	-	-	-	241
2016	Chilcotin	-	-	-	-	-	16		-	-	-	16
2016	Tomp-Bona	-	-	-	-	-	-	662	597	-	-	1,259

Year	Fishery Area	Month										Total
		March	April	May	June	July	Aug	Sept	Oct	Nov	total	
2016	Trib	-	-	-	-	-	-	-	-	-	268	268
2016 Total		-	71	490	2,051	1,245	2,595	1,568	1,677	8	268	9,973
2017	Stev-Deas	-	-	5	67	214	1,317	673	102	-	-	2,378
2017	Deas-Miss	-	1	22	151	47	522	407	103	2	-	1,255
2017	Miss-Harrison	-	59	102	252	77	1,350	448	221	1	-	2,510
2017	Harrison-Hope	-	12	47	220	141	804	286	15	3	-	1,528
2017	Hope-Sawm	-	18	74	338	336	2,674	2,218	-	-	-	5,658
2017	Qualark	-	-	-	-	-	-	-	-	-	-	
2017	Harrison-Hope	-	-	4	13	120	530	-	-	-	-	667
2017	Hope-Sawm	-	-	-	36	-	13	-	-	-	-	49
2017	Qualark	-	-	-	22	232	8		-	-	-	262
2017	Thompson-Texas	-	-	-	-	-	1	6	-	-	-	7
2017	Texa-Kelly	-	-	-	-	13	1	3	-	-	-	17
2017	Deadm-Chil	-	-	-	-	-	52	1	-	-	-	53
2017	Nechako	-	-	-	-	-	-	-	-	-	-	-
2017	Tete Juene	-	-	-	-	25	38	3	-	-	-	66
2017	Nechako	-	-	-	-	49	358	502	2	-	-	911
2017	Stuart	-	-	-	-	2	-	180	-	-	-	182
2017	Chilcotin	-	-	-	-	-	6	-	-	-	-	6
2017	Tomp-Bona	-	-	-	-	-	8	463	129	-	-	600
2017	Trib	-	-	-	-	-	-	-	-	-	198	198
2017 Total		-	90	254	1,099	1,256	7,682	5,190	572	6	198	16,347
2018	Stev-Deas	-	-	-	23	309	187	422	35	5	-	981
2018	Deas-Miss	-	7	18	117	246	509	947	4	4	-	1,852
2018	Miss-Harrison	-	48	66	261	250	706	3,086	198	190	-	4,805
2018	Harrison-Hope	-	11	66	403	548	435	1,281	58	8	-	2,810
2018	Hope-Sawm	-	19	32	545	1,404	960	1,528	-	-	-	4,488
2018	Harrison-Hope	-	-	-	270	204	152	165	-	-	-	791
2018	Hope-Sawm	-	-	-	64	85	29	9	-	-	-	187
2018	Qualark	-	-	-	13	183	20	-	-	-	-	216
2018	Thompson-Texas	-	-	-	-	7		-	-	-	-	7
2018	Texa-Kelly	-	-	-	-	36	5	-	-	-	-	41
2018	Deadm-Chil	-	-	-	-	75	30	13	-	-	-	118
2018	Nechako	-	-	-	-	-	-	-	-	-	-	-
2018	Stuart	-	-	-	-	-	-	-	-	-	-	-

Year	Fishery Area	Month										Total
		March	April	May	June	July	Aug	Sept	Oct	Nov	total	
2018	Tete Juene	-	-	-	-	14	53	7	-	-	-	74
2018	Nechako	-	-	-	-	67	126	30	15	-	-	238
2018	Stuart	-	-	-	-	7	24	129	142	-	-	302
2018	Chilcotin	-	-	-	-	-	2		-	-	-	2
2018	Tomp-Bona	-	-	-	-	-	19	77	-	-	-	96
2018	Trib	-	-	-	-	-	-	-	-	-	387	387
2018 Total		-	85	182	1,696	3,435	3,257	7,694	452	207	387	17,395

Table E - 3. Chinook released in Fraser River FSC fisheries.

Year	Fishery Area	Month										Total
		March	April	May	June	July	Aug	Sept	Oct	Nov	total	
2009	Stev-Deas	-	-	33	549	1,822	4,206	585	9	1	-	7,205
2009	Deas-Miss	-	6	53	904	960	2,386	323	4	2	-	4,638
2009	Miss-Harrison	-	4	33	476	379	396	68	35	13	-	1,404
2009	Harrison-Hope	-	87	160	2,013	1,280	1,816	202	20	4	-	5,582
2009	Hope-Sawm	5	83	211	2,395	1,579	2,318	350	-	-	-	6,941
2009	Harrison-Hope	-	-	1	79	365	10	-	-	-	-	455
2009	Hope-Sawm	-	-	-	28	126	4	-	-	-	-	158
2009	Qualark	-	-	6	59	200	261	4	-	-	-	530
2009	Thompson-Texas	-	-	-	-	37	15	-	-	-	-	52
2009	Texa-Kelly	-	-	-	-	37	14	-	-	-	-	51
2009	Deadm-Chil	-	-	-	-	56	79	2	-	-	-	137
2009	Quen-Naver	-	-	-	-	-	2	-	-	-	-	2
2009	Tete Juene	-	-	-	-	32	51	-	-	-	-	83
2009	Nechako	-	-	-	-	27	17	21	-	-	-	65
2009	Stuart	-	-	-	-	32	536	281	-	-	-	849
2009	Tomp-Bona	-	-	-	-	-	208	505	-	-	-	713
2009	Trib	-	-	-	-	-	-	-	-	-	480	480
2009 Total		5	180	497	6,503	6,932	12,319	2,341	68	20	480	29,345
2010	Stev-Deas	-	-	-	509	2,347	62	2	2	-	-	2,922
2010	Deas-Miss	-	-	4	378	2,356	370	12	33	-	-	3,153
2010	Miss-Harrison	-	-	-	230	623	178	5	18	3	-	1,057
2010	Harrison-Hope	-	2	4	528	1,588	528	89	16	-	-	2,755
2010	Hope-Sawm	-	-	5	871	974	944	18	-	-	-	2,812
2010	Harrison-Hope	-	-	-	16	107	110	33	-	-	-	266
2010	Hope-Sawm	-	-	-	7	34	2	-	-	-	-	43
2010	Qualark	-	-	-	76	30	106	21	-	-	-	233
2010	Sawm-Thompson	-	-	-	-	-	-	2	-	-	-	2
2010	Thompson-Texas	-	-	-	-	1	5	-	-	-	-	6
2010	Texa-Kelly	-	-	-	-	4	5	-	-	-	-	9
2010	Deadm-Chil	-	-	-	-	76	4	3	-	-	-	83
2010	Quen-Naver	-	-	-	-	-	4	-	-	-	-	4

Year	Fishery Area	Month										Total
		March	April	May	June	July	Aug	Sept	Oct	Nov	total	
2010	Naver-Salm	-	-	-	-		3	-	-	-	-	3
2010	Tete Juene	-	-	-	-	20	44	-	-	-	-	64
2010	Nechako	-	-	-	-	-	14	25	-	-	-	39
2010	Stuart	-	-	-	-	-	32	70	-	-	-	102
2010	Tomp-Bona	-	-	-	-	-	53	17	139	-	-	209
2010	Trib	-	-	-	-	-	-	-	-	-	1,475	1,475
2010 Total		-	2	13	2,615	8,160	2,464	297	208	3	1,475	15,237
2011	Stev-Deas	-	-	-	110	973	1,709	584	345	-	-	3,721
2011	Deas-Miss	-	-	-	85	591	1,920	546	116	1	-	3,259
2011	Miss-Harrison	-	-	-	225	259	2,373	204	318	24	-	3,403
2011	Harrison-Hope	-	3	4	389	2,072	2,527	692	51	9	-	5,747
2011	Hope-Sawm	-	-	4	578	4,390	5,197	1,620	-	-	-	11,789
2011	Qualark	-	-	-	-	-	-	-	-	-	-	-
2011	Harrison-Hope	-	-	-	-	-	1,203	259	-	-	-	1,462
2011	Hope-Sawm	-	-	-	-	-	233	-	-	-	-	233
2011	Qualark	-	-	-	-	113	718	19	-	-	-	850
2011	Thompson -Texas	-	-	-	-	-	41	-	-	-	-	41
2011	Texa-Kelly	-	-	-	-	-	203	2	-	-	-	205
2011	Deadm-Chil	-	-	-	-	-	103	30	-	-	-	133
2011	Quen-Naver	-	-	-	-	-	-	4	-	-	-	4
2011	Stuart	-	-	-	-	-			-	-	-	
2011	Tete Juene	-	-	-	-	3	59	20	-	-	-	82
2011	Nechako	-	-	-	-	-	146	3	-	-	-	149
2011	Stuart	-	-	-	-	-	140	89	-	-	-	229
2011	Tomp-Bona	-	-	-	-	-	6	344	54	-	-	404
2011	Trib	-	-	-	-	-	-	-	-	-	667	667
2011 Total		-	3	8	1,387	8,401	16,578	4,416	884	34	667	32,378
2012	Stev-Deas	-	-	-	78	353	2,086	607	24	-	-	3,148
2012	Deas-Miss	-	-	-	101	549	1,325	579	10	-	-	2,564
2012	Miss-Harrison	-	-	-	132	847	895	235	154	13	-	2,276
2012	Harrison-Hope	-	7	5	547	1,528	1,357	498	1	6	-	3,949
2012	Hope-Sawm	-	-	-	149	4,154	2,833	2,334	-	-	-	9,470
2012	Qualark	-	-	-	-	-	-		-	-	-	-
2012	Harrison-Hope	-	-	-	-	46	1,139	1,635	-	-	-	2,820

Year	Fishery Area	Month										Total
		March	April	May	June	July	Aug	Sept	Oct	Nov	total	
2012	Hope-Sawm	-	-	-	-	2	385	3	-	-	-	390
2012	Qualark	-	-	-	2	35	185	46	-	-	-	268
2012	Sawm-Thompson	-	-	-	-	-	23	-	-	-	-	23
2012	Thompson-Texas	-	-	-	-	104	206	-	-	-	-	310
2012	Texa-Kelly	-	-	-	-	6	29	5	-	-	-	40
2012	Deadm-Chil	-	-	-	-	22	146	15	-	-	-	183
2012	Quen-Naver	-	-	-	-	-	-	1	-	-	-	1
2012	Tete Juene	-	-	-	-	16	98	18	-	-	-	132
2012	Nechako	-	-	-	-	-	42	81	-	-	-	123
2012	Stuart	-	-	-	-	-	149	76	-	-	-	225
2012	Chilcotin	-	-	-	-	-	2		-	-	-	2
2012	Tomp-Bona	-	-	-	-	-	3	907	2	-	-	912
2012	Trib	-	-	-	-	-	-	-	-	-	487	487
2012 Total		-	7	5	1,009	7,662	10,903	7,040	191	19	487	27,323
2013	Stev-Deas	-	-	3	66	270	388	1,153	50	-	-	1,930
2013	Deas-Miss	-	1	5	156	220	454	2,101	33	1		2,971
2013	Miss-Harrison	-	-	173	162	205	265	520	227	28	-	1,580
2013	Harrison-Hope	-	-	104	422	130	294	313	49	4	-	1,316
2013	Hope-Sawm	-	-	117	474	543	1,000	1,289	-	-	-	3,423
2013	Qualark	-	-	-	-	-	-	-	-	-	-	-
2013	Harrison-Hope	-	-	-	-	40	489	-	-	-	-	529
2013	Hope-Sawm	-	-	-	-	-	171	-	-	-	-	171
2013	Qualark	-	-	-	28	140	189	-	-	-	-	357
2013	Texa-Kelly	-	-	-	-	-		-	-	-	-	-
2013	Thompson-Texas	-	-	-	-	20	6	-	-	-	-	26
2013	Texa-Kelly	-	-	-	-	74	36	-	-	-	-	110
2013	Deadm-Chil	-	-	-	-	-	49	2	-	-	-	51
2013	Nechako	-	-	-	-	-	-	-	-	-	-	-
2013	Quen-Naver	-	-	-	-	-	3		-	-	-	3
2013	Naver-Salm	-	-	-	-	-	5	1	-	-	-	6
2013	Tete Juene	-	-	-	-	32	21	11	-	-	-	64
2013	Nechako	-	-	-	-		26	93	-	-	-	119
2013	Stuart	-	-	-	-	13	63	58	-	-	-	134
2013	Tomp-Bona	-	-	-	-	32	-	1,533	-	-	-	1,565

Year	Fishery Area	Month										Total
		March	April	May	June	July	Aug	Sept	Oct	Nov	total	
2013	Trib	-	-	-	-	-	-	-	-	-	454	454
2013 Total		-	1	402	1,308	1,719	3,459	7,074	359	33	454	14,809
2014	Stev-Deas	-	-	7	326	916	416	201	109	-	-	1,975
2014	Deas-Miss	-	-	17	499	642	560	-	160	-	-	1,878
2014	Miss-Harrison	-	6	188	812	670	994	23	1,125	-	-	3,818
2014	Harrison-Hope	-	8	86	1,167	1,105	1,198	-	159	-	-	3,723
2014	Hope-Sawm	-	1	85	1,965	3,157	2,383	-	-	-	-	7,591
2014	Qualark	-	-	-		-	-	-	-	-	-	-
2014	Harrison-Hope	-	-	-	10	47	619	144	-	-	-	820
2014	Hope-Sawm	-	-	-	-	5	238	-	-	-	-	243
2014	Qualark	-	-	-	52	66	382	21	-	-	-	521
2014	Sawm-Thompson	-	-	-	-	-	15	-	-	-	-	15
2014	Thompson-Texas	-	-	-	-	48	38	-	-	-	-	86
2014	Texa-Kelly	-	-	-	-	52	24	-	-	-	-	76
2014	Deadm-Chil	-	-	-	-	85	330	8	-	-	-	423
2014	Nechako	-	-	-	-	-	-	-	-	-	-	-
2014	Quen-Naver	-	-	-	-	-	-	1	-	-	-	1
2014	Tete Juene	-	-	-	-	113	127	8	-	-	-	248
2014	Nechako	-	-	-	-	10	60	71	16	-	-	157
2014	Stuart	-	-	-	-	68	32	91	281	-	-	472
2014	Chilcotin	-	-	-	-	-	3			-	-	3
2014	Tomp-Bona	-	-	-	-	-	3	28	19	-	-	50
2014	Trib	-	-	-	-	-	-	-	-	-	557	557
2014 Total		-	15	383	4,831	6,984	7,422	596	1,869	-	557	22,657
2015	Stev-Deas	-	-	18	166	10	1,991	1,060	227	-	-	3,472
2015	Deas-Miss	-	19	40	373		2,016	1,044	177	3		3,672
2015	Miss-Harrison	-	108	181	849	10	866	670	368	11	-	3,063
2015	Harrison-Hope	-	55	100	759	23	1,420	697	60	5	-	3,119
2015	Hope-Sawm	-	41	139	1,486	3	3,620	1,811	-	-	-	7,100
2015	Qualark	-	-	-	-	-	-	-	-	-	-	-
2015	Harrison-Hope	-	-	-	44	80	407	2	-	-	-	533
2015	Hope-Sawm	-	-	15	14	9	36	-	-	-	-	74
2015	Qualark	-	-	28	8	44	121	9	-	-	-	210
2015	Sawm-Thompson	-	-	-	-	-	4	22	-	-	-	26

Year	Fishery Area	Month										Total
		March	April	May	June	July	Aug	Sept	Oct	Nov	total	
2015	Thompson -Texas	-	-	-	-	6	3	-	-	-	-	9
2015	Texa-Kelly	-	-	-	-	40	9	1	-	-	-	50
2015	Deadm-Chil	-	-	-	-	104	255	1	-	-	-	360
2015	Tete Juene	-	-	-	-	-	-	-	-	-	-	-
2015	Nechako	-	-	-	-	-	-	-	-	-	-	-
2015	Naver-Salm	-	-	-	-		2		-	-	-	2
2015	Tete Juene	-	-	-	-	86	109	4	-	-	-	199
2015	Nechako	-	-	-	-	-	919	396	-	-	-	1,315
2015	Stuart	-	-	-	-	7	89	9	-	-	-	105
2015	Chilcotin	-	-	-	-	-	4	1	-	-	-	5
2015	Tomp-Bona	-	-	-	-	-	19	455	-	-	-	474
2015	Trib	-	-	-	-	-	-	-	-	-	277	277
2015 Total		-	223	521	3,699	422	11,890	6,182	832	19	277	24,065
2016	Stev-Deas	-	-	11	206	174	343	-	50	-	-	784
2016	Deas-Miss	-	8	29	165	46	363	-	148	3	-	762
2016	Miss-Harrison	-	18	60	234	45	243	308	736	2	-	1,646
2016	Harrison-Hope	-	31	69	410	168	213	139	137	3	-	1,170
2016	Hope-Sawm	-	14	191	681	275	630	-	-	-	-	1,791
2016	Qualark	-	-	-	-	-	-	-	-	-	-	-
2016	Harrison-Hope	-	-	94	233	184	301	76	3	-	-	891
2016	Hope-Sawm	-	-	16	66	114	29	6	6	-	-	237
2016	Qualark	-		20	56	162	125	1	-	-	-	364
2016	Sawm-Thompson	-	-	-	-	-	20	-	-	-	-	20
2016	Thompson -Texas	-	-	-	-	9	30	-	-	-	-	39
2016	Texa-Kelly	-	-	-	-	28	20	-	-	-	-	48
2016	Deadm-Chil	-	-	-	-	-	31	-	-	-	-	31
2016	Naver-Salm	-	-	-	-	-	1	-	-	-	-	1
2016	Stuart	-	-	-	-	-	-	-	-	-	-	-
2016	Tete Juene	-	-	-	-	16	59	11	-	-	-	86
2016	Nechako	-	-	-	-	24	88	207	-	-	-	319
2016	Stuart	-	-	-	-	-	83	158	-	-	-	241
2016	Chilcotin	-	-	-	-	-	16		-	-	-	16
2016	Tomp-Bona	-	-	-	-	-	-	662	597	-	-	1,259
2016	Trib	-	-	-	-	-	-	-	-	-	268	268

Year	Fishery Area	Month										Total
		March	April	May	June	July	Aug	Sept	Oct	Nov	total	
2016 Total		-	71	490	2,051	1,245	2,595	1,568	1,67	8	268	9,973
2017	Stev-Deas	-	-	5	67	214	1,317	673	102	-	-	2,378
2017	Deas-Miss	-	1	22	151	47	522	407	103	2	-	1,255
2017	Miss-Harrison	-	59	102	252	77	1,350	448	221	1	-	2,510
2017	Harrison-Hope	-	12	47	220	141	804	286	15	3	-	1,528
2017	Hope-Sawm	-	18	74	338	336	2,674	2,218	-	-	-	5,658
2017	Qualark	-	-	-	-	-	-	-	-	-	-	
2017	Harrison-Hope	-	-	4	13	120	530	-	-	-	-	667
2017	Hope-Sawm	-	-	-	36	-	13	-	-	-	-	49
2017	Qualark	-	-	-	22	232	8	-	-	-	-	262
2017	Thompson-Texas	-	-	-	-	-	1	6	-	-	-	7
2017	Texa-Kelly	-	-	-	-	13	1	3	-	-	-	17
2017	Deadm-Chil	-	-	-	-	-	52	1	-	-	-	53
2017	Nechako	-	-	-	-	-	-	-	-	-	-	-
2017	Tete Juene	-	-	-	-	25	38	3	-	-	-	66
2017	Nechako	-	-	-	-	49	358	502	2	-	-	911
2017	Stuart	-	-	-	-	2	-	180	-	-	-	182
2017	Chilcotin	-	-	-	-	-	6		-	-	-	6
2017	Tomp-Bona	-	-	-	-	-	8	463	129	-	-	600
2017	Trib	-	-	-	-	-	-	-	-	-	198	198
2017 Total		-	90	254	1,099	1,256	7,682	5,190	572	6	198	16,347
2018	Stev-Deas	-		-	23	309	187	422	35	5	-	981
2018	Deas-Miss	-	7	18	117	246	509	947	4	4	-	1,852
2018	Miss-Harrison	-	48	66	261	250	706	3,086	198	190	-	4,805
2018	Harrison-Hope	-	11	66	403	548	435	1,281	58	8	-	2,810
2018	Hope-Sawm	-	19	32	545	1,404	960	1,528	-	-	-	4,488
2018	Harrison-Hope	-	-	-	270	204	152	165	-	-	-	791
2018	Hope-Sawm	-	-	-	64	85	29	9	-	-	-	187
2018	Qualark	-	-	-	13	183	20	-	-	-	-	216
2018	Thompson-Texas	-	-	-	-	7	-	-	-	-	-	7
2018	Texa-Kelly	-	-	-	-	36	5	-	-	-	-	41
2018	Deadm-Chil	-	-	-	-	75	30	13	-	-	-	118
2018	Nechako	-	-	-	-	-	-	-	-	-	-	-
2018	Stuart	-	-	-	-		-	-	-	-	-	-

Year	Fishery Area	Month										Total
		March	April	May	June	July	Aug	Sept	Oct	Nov	total	
2018	Tete Juene	-	-	-	-	14	53	7	-	-	-	74
2018	Nechako	-	-	-	-	67	126	30	15	-	-	238
2018	Stuart	-	-	-	-	7	24	129	142	-	-	302
2018	Chilcotin	-	-	-	-		2		-	-	-	2
2018	Tomp-Bona	-	-	-	-	-	19	77	-	-	-	96
2018	Trib	-	-	-	-	-	-	-		-	387	387
2018 Total		-	85	182	1,696	3,435	3,257	7,694	452	207	387	17,395

Table E - 4. Chinook caught and released in Fraser River EO fisheries.

Year	Parameter	Fishery Area	Month				Total
			Aug	Oct	Nov	Sept	
2009	Catch	Harrison-Hope	-	553	1,243	7	1,803
2009	Catch	Miss-Harrison	-	1,567	155	51	1,773
2009	Catch	Stev-Deas	-	102	5		107
2009	Catch	Tomp-Bona	13	518	-	-	531
2009	Release	Harrison-Hope	-	7	3	-	10
2009	Release	Miss-Harrison	-	42	8	10	60
2009	Release	Stev-Deas	-	7	1		8
2009	Release	Tomp-Bona	-	-	-	-	-
2009 Sum of Catch			13	2,740	1,403	58	4,214
2009 Sum of Release			-	56	12	10	78
2010	Catch	Deas-Miss	728	162	-	-	890
2010	Catch	Harrison-Hope	487	417	-	-	904
2010	Catch	Hope-Sawm	750	825	-	-	1,575
2010	Catch	Miss-Harrison	244	188	-	-	432
2010	Catch	Nechako	5	83	13	-	101
2010	Catch	Stev-Deas	346	323	-	-	669
2010	Catch	Stuart	10	904	1	-	915
2010	Release	Deas-Miss	-	1	-	-	1
2010	Release	Harrison-Hope	-	5	-	-	5
2010	Release	Hope-Sawm	1	-	-	-	1
2010	Release	Miss-Harrison	-	1	-	-	1
2010	Release	Nechako	-	-	-	-	-
2010	Release	Stev-Deas	-	-	-	-	-
2010	Release	Stuart	-	103	143	-	246
2010 Sum of Catch			2,570	2,902	14	-	5,486
2010 Sum of Release			1	110	143	-	254
2011	Catch	Deas-Miss	-	17		-	17
2011	Catch	Harrison-Hope	-	160	59	-	219
2011	Catch	Miss-Harrison	-	1,458	339	-	1,797
2011	Catch	Stev-Deas	276	387	4	5	672
2011	Catch	Stuart	555	4,700	72	-	5,327
2011	Catch	Tete Juene	-	-	-	-	-
2011	Release	Deas-Miss	-	44	-	-	44
2011	Release	Harrison-Hope	-	79	20	-	99
2011	Release	Miss-Harrison	-	47	18	-	65

Year	Parameter	Fishery Area	Month				Total
			Aug	Oct	Nov	Sept	
2011	Release	Stev-Deas	-	8	-	-	8
2011	Release	Stuart	-	2	-	-	2
2011	Release	Tete Juene	-	21	-	-	21
2011 Sum of Catch			831	6,722	474	5	8,032
2011 Sum of Release			-	201	38	-	239
2012	Catch	Harrison-Hope	-	-	-	-	-
2012	Catch	Miss-Harrison	-	-	29	2	31
2012	Catch	Stev-Deas	-	-	4	-	4
2012	Catch	Stuart	-	1,034	-	-	1,034
2012	Release	Harrison-Hope	-	-	8	6	14
2012	Release	Miss-Harrison	-	-	500	58	558
2012	Release	Stev-Deas	-	-	1	-	1
2012	Release	Stuart	-	-	-	-	-
2012 Sum of Catch			-	1,034	33	2	1,069
2012 Sum of Release			-	-	509	64	573
2013	Catch	Deas-Miss	-	1	-	-	1
2013	Catch	Harrison-Hope	-	25	-	-	25
2013	Catch	Hope-Sawm	-	-	-	-	
2013	Catch	Miss-Harrison	-	132	1	1	134
2013	Catch	Stev-Deas	-	11	-	-	11
2013	Catch	Stuart	-	1,733	-	-	1,733
2013	Release	Deas-Miss	-	40	-	-	40
2013	Release	Harrison-Hope	-	1,065	2	-	1,067
2013	Release	Hope-Sawm	-	7	-	-	7
2013	Release	Miss-Harrison	-	3,991	518	109	4,618
2013	Release	Stev-Deas	-	519	5	-	524
2013	Release	Stuart	-	-	-	-	-
2013 Sum of Catch			-	1,902	1	1	1,904
2013 Sum of Release			-	5,622	525	109	6,256
2014	Catch	Deas-Miss	97	1,543	-	-	1,640
2014	Catch	Harrison-Hope	80	977	-	-	1,057
2014	Catch	Hope-Sawm	154	2,306	-	-	2,460
2014	Catch	Miss-Harrison	41	1,134	-	-	1,175
2014	Catch	Stev-Deas	104	1,291	-	-	1,395
2014	Catch	Stuart	-	1,022	397	-	1,419
2014	Catch	Tomp-Bona	-	112	24	-	136

Year	Parameter	Fishery Area	Month				Total
			Aug	Oct	Nov	Sept	
2014	Release	Deas-Miss	-	6		-	6
2014	Release	Harrison-Hope	-	49	15	-	64
2014	Release	Hope-Sawm	-	9		-	9
2014	Release	Miss-Harrison	-	264	349	109	722
2014	Release	Stev-Deas	4	177	8	-	189
2014	Release	Stuart	-	1	1	-	2
2014	Release	Tomp-Bona	-	-	-	-	-
2014 Sum of Catch			476	8,385	421	-	9,282
2014 Sum of Release			4	506	373	109	992
2015	Catch	Deas-Miss	-	-	2	-	2
2015	Catch	Harrison-Hope	-	-	2	2	4
2015	Catch	Miss-Harrison	-	-	10	2	12
2015	Catch	Stev-Deas	-	-	4	-	4
2015	Catch	Stuart	-	2,493	-	-	2,493
2015	Release	Deas-Miss	-	-	-	-	-
2015	Release	Harrison-Hope	-	393	35	4	432
2015	Release	Miss-Harrison	-	406	334	271	1,011
2015	Release	Stev-Deas	-	38	-	-	38
2015	Release	Stuart	-	-	-	-	-
2015 Sum of Catch			-	2,493	18	4	2,515
2015 Sum of Release			-	837	369	275	1,481
2016	Catch	Harrison-Hope	-	-	-	-	-
2016	Catch	Miss-Harrison	-	-	7	1	8
2016	Catch	Stev-Deas	-	-	-	-	-
2016	Release	Harrison-Hope	-	-	5	-	5
2016	Release	Miss-Harrison	-	-	171	81	252
2016	Release	Stev-Deas	-	-	2	-	2
2016 Sum of Catch			-	-	7	1	8
2016 Sum of Release			-	-	178	81	259
2017	Catch	Miss-Harrison	-	-	8	7	15
2017	Release	Miss-Harrison	-	-	418	103	521
2017 Sum of Catch			-	-	8	7	15
2017 Sum of Release			-	-	418	103	521
2018	Catch	Deas-Miss	26	-	-	-	26
2018	Catch	Harrison-Hope	124	20	-	-	144
2018	Catch	Hope-Sawm	108	108	-	-	216

Year	Parameter	Fishery Area	Month				Total
			Aug	Oct	Nov	Sept	
2018	Catch	Miss-Harrison	-	-	-	-	-
2018	Catch	Stev-Deas	192	-	-	-	192
2018	Catch	Stuart	-	-	-	-	-
2018	Release	Deas-Miss	2	338	-	-	340
2018	Release	Harrison-Hope	120	219	79	-	418
2018	Release	Hope-Sawm	52	129		-	181
2018	Release	Miss-Harrison	30	204	257	-	491
2018	Release	Stev-Deas	30	-	-	-	30
2018	Release	Stuart	-	1,457	1,688	-	3,145
2018 Sum of Catch			450	128	-	-	578
2018 Sum of Release			234	2,347	2,024	-	4,605

Table E - 5. Chinook caught and released in Fraser River commercial fisheries (Area E and B).

Year	Parameter	Fishery Area	Month				Total
			Aug	Oct	Nov	Sept	
2009	Catch	Area 29 - Area B	-	-	-	-	-
2009	Catch	Area 29 - Area E	-	-	-	34	34
2009	Release	Area 29 - Area B	-	55	-	-	55
2009	Release	Area 29 - Area E	-	-	-	48	48
2009 Sum of Catch			-	-	-	34	34
2009 Sum of Release			-	55	-	48	103
2010	Catch	Area 29 - Area B	-	3	-	-	3
2010	Catch	Area 29 - Area E	3,122	3,263	-	-	6,385
2010	Release	Area 29 - Area B	-	85	-	-	85
2010	Release	Area 29 - Area E	45	18	-	-	63
2010 Sum of Catch			3,122	3,266	-	-	6,388
2010 Sum of Release			45	103	-	-	148
2011	Catch	Area 29 - Area B	-	63	-	-	63
2011	Catch	Area 29 - Area E	1,875	3,466	-	174	5,515
2011	Release	Area 29 - Area B	-	2,744	-		2,744
2011	Release	Area 29 - Area E	31	6	-	69	106
2011 Sum of Catch			1,875	3,529	-	174	5,578
2011 Sum of Release			31	2,750	-	69	2,850
2012	Catch	Area 29 - Area B	-	-	-	-	-
2012	Catch	Area 29 - Area E	-	-	2	-	2
2012	Release	Area 29 - Area B	-	-	2	-	2
2012	Release	Area 29 - Area E	-	-	39	-	39
2012 Sum of Catch			-	-	2	-	2
2012 Sum of Release			-	-	41	-	41
2013	Catch	Area 29 - Area B	-	75	5	-	80
2013	Catch	Area 29 - Area E	-		5	-	5
2013	Release	Area 29 - Area B	-	3,923	22	-	3,945
2013	Release	Area 29 - Area E	-		21	-	21
2013 Sum of Catch			-	75	10	-	85
2013 Sum of Release			-	3,923	43	-	3,966
2014	Catch	Area 29 - Area B	-	-	-	-	-
2014	Catch	Area 29 - Area E	-	-	-	-	-
2014	Release	Area 29 - Area B	-	80	-	-	80
2014	Release	Area 29 - Area E	17	7,737	84	27	7,865
2014 Sum of Catch			-	-	-	-	-

Year	Parameter	Fishery Area	Month				Total
			Aug	Oct	Nov	Sept	
2014 Sum of Release			17	7,817	84	27	7,945
2015	Catch	Area 29 - Area B	-	-	-	-	-
2015	Catch	Area 29 - Area E	-	-	3	-	3
2015	Release	Area 29 - Area B	-	21	-	-	21
2015	Release	Area 29 - Area E	-	-	80	-	80
2015 Sum of Catch			-	-	3	-	3
2015 Sum of Release			-	21	80	-	101
2016	Catch	Area 29 - Area E	-	-	3	-	3
2016	Release	Area 29 - Area E	-	-	49	-	49
2016 Sum of Catch			-	-	3	-	3
2016 Sum of Release			-	-	49	-	49
2017	Catch	Area 29 - Area E	-	-		-	-
2017	Release	Area 29 - Area E	-	-	104	-	104
2017 Sum of Catch			-	-	-	-	-
2017 Sum of Release			-	-	104	-	104
2018	Catch	Area 29 - Area B	-	-	-	-	-
2018	Catch	Area 29 - Area E	24	-	-	-	24
2018	Release	Area 29 - Area B	-	33	-	-	33
2018	Release	Area 29 - Area E	2,402	-	-	-	2,402
2018 Sum of Catch			24	-	-	-	24
2018 Sum of Release			2,402	33	-	-	2,435

Table E - 6. Chinook caught and released in Fraser River recreational fisheries (all periods).

Year	Fishery	Total Caught	Total Released
2009	Fraser River Recreational	8,636	12,209
2010	Fraser River Recreational	10,241	10,280
2011	Fraser River Recreational	5,590	6,077
2012	Fraser River Recreational	4,445	5,390
2013	Fraser River Recreational	6,479	10,086
2014	Fraser River Recreational	7,070	9,324
2015	Fraser River Recreational	7,605	5,500
2016	Fraser River Recreational	6,995	2,992
2017	Fraser River Recreational	8,319	5,867
2018	Fraser River Recreational	5,878	2,442

APPENDIX F: MARINE RECREATIONAL CATCH, EFFORT AND RELEASE DATA

Table F - 1. Kept, released Chinook and effort (boat-days) in NWVI offshore recreational fisheries, 2000 to 2018.

Parameter	Year	Month												Total
		1	2	3	4	5	6	7	8	9	10	11	12	
Kept	2000	-	-	-	-	-	40	404	360	-	-	-	-	804
Kept	2001	-	-	-	-	-	84	2,805	156	-	-	-	-	3,045
Kept	2002	-	-	-	-	-	58	552	489	-	-	-	-	1,099
Kept	2003	-	-	-	-	-		400	296	-	-	-	-	696
Kept	2004	-	-	-	-	-	110	555	1,060	2	10	-	-	1,737
Kept	2005	-	-	-	-	-	600	1,836	1,605	-	-	-	-	4,041
Kept	2006	-	-	-	-	-	9	6,368	5,871	-	-	-	-	12,248
Kept	2007	-	-	-	-	-	163	2,432	4,817	5	-	-	-	7,417
Kept	2008	-	-	-	-	-	732	5,267	8,271		-	-	-	14,270
Kept	2009	-	-	-	-	-	389	6,582	7,491		-	-	-	14,462
Kept	2010	-	-	-	-	-	630	6,121	5,655	97	-	-	-	12,503
Kept	2011	-	-	-	-	-	365	5,627	10,205	156	-	-	-	16,353
Kept	2012	-	-	-	-	-	2,707	6,826	10,040	34	-	-	-	19,607
Kept	2013	-	-	-	-	-	2,206	6,059	7,494		-	-	-	15,759
Kept	2014	-	-	-	-	-	177	6,772	6,646	44	-	-	-	13,639
Kept	2015	-	-	-	-	11	1,539	5,055	5,017	43	-	-	-	11,665
Kept	2016	-	-	-	-	64	3,247	4,401	2,041		-	-	-	9,753
Kept	2017	-	-	-	-	67	2,232	7,047	3,392	109	-	-	-	12,847
Kept	2018	-	-	-	-	16	944	3,251	1,972	95	-	-	-	6,278
Kept	AVG	-	-	-	-	40	902	4,124	4,362	65	10	-	-	9,380
Released	2002	-	-	-	-	-	1	114	8	-	-	-	-	123
Released	2003	-	-	-	-	-	-	16	17	-	-	-	-	33
Released	2004	-	-	-	-	-	-	178	271	-	16	-	-	465
Released	2005	-	-	-	-	-	-	151	411	-	-	-	-	562
Released	2006	-	-	-	-	-	-	262	1,132	-	-	-	-	1,394
Released	2007	-	-	-	-	-	-	79	652	-	-	-	-	731
Released	2008	-	-	-	-	-	3	632	1,462	-	-	-	-	2,097
Released	2009	-	-	-	-	-	37	621	736	-	-	-	-	1,394
Released	2010	-	-	-	-	-	934	6,696	8,425	250	-	-	-	16,305
Released	2011	-	-	-	-	-	68	808	518	27	-	-	-	1,421
Released	2012	-	-	-	-	-	4,206	6,786	4,546	4	-	-	-	15,542

Parameter	Year	Month												Total
		1	2	3	4	5	6	7	8	9	10	11	12	
Released	2013	-	-	-	-	-	1,168	2,109	1,303	-	-	-	-	4,580
Released	2014	-	-	-	-	-	-	3,577	3,181	10	-	-	-	6,768
Released	2015	-	-	-	-	16	792	3,019	1,949	8	-	-	-	5,784
Released	2016	-	-	-	-		420	641	318	-	-	-	-	1,379
Released	2017	-	-	-	-	10	83	1,507	707	-	-	-	-	2,307
Released	2018	-	-	-	-		64	331	396	-	-	-	-	791
Released Total	AVG	-	-	-	-	13	707	1,619	1,531	60	16			3,628
Released S-L	2001	-	-	-	-	-	-	418	117	-	-	-	-	535
Released S-L	2004	-	-	-	-	-	-	19	-	-	-	-	-	19
Released S-L	2005	-	-	-	-	-	-	106	39	-	-	-	-	145
Released S-L	2006	-	-	-	-	-	-	243	719	-	-	-	-	962
Released S-L	2007	-	-	-	-	-	-	38	523	-	-	-	-	561
Released S-L	2008	-	-	-	-	-	3	71	651	-	-	-	-	725
Released S-L	2009	-	-	-	-	-	169	1,107	744	-	-	-	-	2,020
Released S-L	2010	-	-	-	-	-	173	1,238	1,320	9	-	-	-	2,740
Released S-L	2011	-	-	-	-	-	39	299	577	21	-	-	-	936
Released S-L	2012	-	-	-	-	-	59	2,020	1,207	-	-	-	-	3,286
Released S-L	2013	-	-	-	-	-	296	856	983	-	-	-	-	2,135
Released S-L	2014	-	-	-	-	-	3	1,434	1,151	-	-	-	-	2,588
Released S-L	2015	-	-	-	-	-	66	1,161	595	-	-	-	-	1,822
Released S-L	2016	-	-	-	-	-	89	547	440	-	-	-	-	1,076
Released S-L	2017	-	-	-	-	-	108	269	420	-	-	-	-	797
Released S-L	2018	-	-	-	-	-	13	163	183	-	-	-	-	359
Released S-L	AVG	-	-	-	-	-	93	624	604	15	-	-	-	1,294
Effort	2000	-	-	-	-	-	9	107	116	-	-	-	-	232
Effort	2001	-	-	-	-	-	220	3,701	200	-	-	-	-	4,121
Effort	2002	-	-	-	-	-	19	612	625	15	-	-	-	1,271
Effort	2003	-	-	-	-	-	-	122	309	7	-	-	-	438
Effort	2004	-	-	-	-	-	29	287	418	1	2	-	-	737
Effort	2005	-	-	-	-	-	223	1,032	584	-	-	-	-	1,839
Effort	2006	-	-	-	-	-	3	3,236	3,572	-	-	-	-	6,811
Effort	2007	-	-	-	-	2	131	1,428	2,709	5	-	-	-	4,275
Effort	2008	-	-	-	-	-	679	3,220	4,746	-	-	-	-	8,645
Effort	2009	-	-	-	-	-	333	3,494	4,007	-	-	-	-	7,834
Effort	2010	-	-	-	-	-	586	3,062	3,222	26	-	-	-	6,896
Effort	2011	-	-	-	-	-	244	2,608	4,169	118	-	-	-	7,139

Parameter	Year	Month												Total
		1	2	3	4	5	6	7	8	9	10	11	12	
Effort	2012	-	-	-	-	-	1,130	3,222	4,552	74	-	-	-	8,978
Effort	2013	-	-	-	-	-	792	2,837	3,401	-	-	-	-	7,030
Effort	2014	-	-	-	-	-	136	3,176	3,551	35	-	-	-	6,898
Effort	2015	-	-	-	-	4	594	2,457	2,433	34	-	-	-	5,522
Effort	2016	-	-	-	-	146	1,749	2,605	1,831	158	-	-	-	6,489
Effort	2017	-	-	-	-	355	1,167	3,356	2,219	113	-	-	-	7,210
Effort	2018	-	-	-	-	35	865	2,296	1,656	330	-	-	-	5,182
Effort	AVG	-	-	-	-	108	495	2,256	2,333	76	2	-	-	5,134

Table F - 2. Kept, released Chinook and effort (boat-days) in SWVI offshore recreational fisheries, 2000 to 2018.

Parameter	Year	Month												Total
		1	2	3	4	5	6	7	8	9	10	11	12	
Kept	2000	-	-	-	-	-	4,582	5,364	2,222	1,442	-	-	-	13,610
Kept	2001	-	-	-	-	-	2,598	2,690	3,901	3,524	-	-	-	12,713
Kept	2002	-	-	-	553	2,097	7,611	10,806	4,567	867	-	-	-	26,501
Kept	2003	-	-	-	-	177	3,594	7,374	10,828	779	-	-	-	22,752
Kept	2004	-	-	-	7	243	5,319	12,909	12,154	1,401	10	-	-	32,043
Kept	2005	-	-	-	-	-	2,950	10,707	19,755	5,080	-	-	-	38,492
Kept	2006	-	-	-	150	150	2,552	9,590	6,121	2,035	-	-	-	20,598
Kept	2007	-	-	-	-	-	1,899	7,189	17,148	1,957	-	-	-	28,193
Kept	2008	-	-	-	-	48	2,712	9,959	14,160	2,187	-	-	-	29,066
Kept	2009	-	-	-	-	-	7,075	18,379	15,724	2,225	-	-	-	43,403
Kept	2010	-	-	-	-	-	5,088	12,876	15,993	2,172	-	-	-	36,129
Kept	2011	-	-	-	-	-	5,470	18,459	23,852	4,236	-	-	-	52,017
Kept	2012	-	-	-	-	41	4,384	16,058	15,416	983	-	-	-	36,882
Kept	2013	-	-	-	-	-	7,677	14,940	15,535	1,856	-	-	-	40,008
Kept	2014	-	-	-	-	-	6,420	13,892	9,076	1,019	-	-	-	30,407
Kept	2015	-	-	-	-	-	4,558	13,247	11,735	284	-	-	-	29,824
Kept	2016	-	-	-	-	622	6,025	12,177	8,571	343	-	-	-	27,738
Kept	2017	-	-	-	-	393	2,951	19,831	9,368	207	133	-	-	32,883
Kept	2018	-	-	-	-	143	3,829	12,515	8,230	248	-	-	-	24,965
Kept	AVG	-	-	-	237	435	4,594	12,051	11,808	1,729	72	-	-	30,433
Released	2001	-	-	-	-	-	3,072	312	978	-	-	-	-	4,362
Released	2002	-	-	-	-	186	2,466	4,230	2,716	52	-	-	-	9,650
Released	2003	-	-	-	-	51	2,699	5,893	8,146	28	-	-	-	16,817
Released	2004	-	-	-	-	134	1,653	6,614	5,463	226	15	-	-	14,105
Released	2005	-	-	-	-	-	1,050	4,141	9,271	1,977	-	-	-	16,439
Released	2006	-	-	-	-	-	1,152	5,639	1,790	1,019	-	-	-	9,600
Released	2007	-	-	-	-	-	208	882	1,958	146	-	-	-	3,194
Released	2008	-	-	-	-	-	661	3,038	6,945	436	-	-	-	11,080
Released	2009	-	-	-	-	-	4,588	5,425	1,794	852	-	-	-	12,659
Released	2010	-	-	-	-	-	2,622	7,160	8,038	1,856	-	-	-	19,676
Released	2011	-	-	-	-	-	1,608	7,922	8,924	1,206	-	-	-	19,660
Released	2012	-	-	-	-	-	1,375	6,546	8,615	210	-	-	-	16,746
Released	2013	-	-	-	-	-	2,639	10,632	12,817	742	-	-	-	26,830
Released	2014	-	-	-	-	-	8,809	14,439	9,137	1,560	-	-	-	33,945
Released	2015	-	-	-	-	-	2,221	6,075	3,695	26	-	-	-	12,017

Parameter	Year	Month												Total
		1	2	3	4	5	6	7	8	9	10	11	12	
Released	2016	-	-	-	-	26	1,218	2,550	1,783	59	-	-	-	5,636
Released	2017	-	-	-	-	4	1,206	7,640	3,531	11	-	-	-	12,392
Released	2018	-	-	-	-	-	1,090	2,281	3,178	29	-	-	-	14,400
Released	AVG	-	-	-	-	57	2,241	5,634	5,488	614	15	-	-	14,049
Released S-L	2001	-	-	-	-	-	335	593	343	6,543	-	-	-	7,814
Released S-L	2002	-	-	-	-	48	1,098	1,850	691	3	-	-	-	3,690
Released S-L	2003	-	-	-	-	1	747	1,102	989	1	-	-	-	2,840
Released S-L	2004	-	-	-	-	-	282	596	673	-	-	-	-	1,551
Released S-L	2005	-	-	-	-	-	285	716	648	166	-	-	-	1,815
Released S-L	2006	-	-	-	-	-	137	992	2,014	382	-	-	-	3,525
Released S-L	2007	-	-	-	-	-	68	1,599	4,497	192	-	-	-	6,356
Released S-L	2008	-	-	-	-	-	162	434	4,770	628	-	-	-	5,994
Released S-L	2009	-	-	-	-	-	3,427	6,448	5,227	535	-	-	-	15,637
Released S-L	2010	-	-	-	-	-	762	2,474	838	145	-	-	-	4,219
Released S-L	2011	-	-	-	-	-	1,147	5,096	2,077	512	-	-	-	8,832
Released S-L	2012	-	-	-	-	-	686	4,589	5,237	595	-	-	-	11,107
Released S-L	2013	-	-	-	-	-	2,280	5,061	2,994	423	-	-	-	10,758
Released S-L	2014	-	-	-	-	-	1,780	3,326	3,375	201	-	-	-	8,682
Released S-L	2015	-	-	-	-	-	485	2,122	1,416	43	-	-	-	4,066
Released S-L	2016	-	-	-	-	-	1,184	3,841	3,064	270	-	-	-	6,933
Released S-L	2017	-	-	-	-	-	1,137	4,034	2,468	70	-	-	-	7,709
Released S-L	2018	-	-	-	-	-	336	2,260	5,535	-	-	-	-	8,131
Released S-L	AVG	-	-	-	-	25	908	2,619	2,603	669	-	-	-	6,823
Effort	2000	-	-	-	-	-	3,205	2,661	2,310	611	-	-	-	8,787
Effort	2001	-	-	-	-	-	1,476	2,067	2,380	2,500	-	-	-	8,423
Effort	2002	-	-	-	370	805	3,419	4,780	3,356	959	-	-	-	13,689
Effort	2003	-	-	-	2	55	2,961	3,218	4,103	864	-	-	-	11,203
Effort	2004	-	-	-	3	81	3,215	4,643	4,303	705	3	-	-	12,953
Effort	2005	-	-	-	-	-	3,092	4,390	6,073	2,050	-	-	-	15,605
Effort	2006	-	-	-	-	138	3,396	5,752	4,493	1,608	1	-	-	15,388
Effort	2007	-	-	-	-	-	2,079	4,168	7,251	810	-	-	-	14,308
Effort	2008	-	-	-	-	590	2,365	4,301	6,241	1,446	99	-	-	15,042
Effort	2009	-	-	-	-	-	1,933	5,127	5,569	881	-	-	-	13,510
Effort	2010	-	-	-	-	-	2,089	3,429	4,970	964	-	-	-	11,452
Effort	2011	-	-	-	-	-	1,762	4,849	7,423	1,560	-	-	-	15,594
Effort	2012	-	-	-	-	37	1,812	5,092	5,904	863	-	-	-	13,708

Parameter	Year	Month												Total
		1	2	3	4	5	6	7	8	9	10	11	12	
Effort	2013	-	-	-	-	-	2,408	3,171	4,773	653	-	-	-	11,005
Effort	2014	-	-	-	-	-	1,952	3,687	2,662	613	-	-	-	8,914
Effort	2015	-	-	-	-	-	1,663	3,374	3,550	522	-	-	-	9,109
Effort	2016	-	-	-	-	517	1852	3410	3165	237	-	-	-	9,181
Effort	2017	-	-	-	-	573	1039	4915	2922	287	178	-	-	9,914
Effort	2018	-	-	-	-	487	1360	5451	4673	598	-	-	-	12,569
Effort	AVG	-	-	-	94	365	2,267	4,131	4,533	986	70	-	-	12,445

Table F - 3. Kept, released Chinook and effort (boat-days) in JST recreational fisheries, 2000 to 2018.

Parameter	Year	Month												Total
		1	2	3	4	5	6	7	8	9	10	11	12	
Kept	2000	-	-	-	-	-	1,091	2,228	2,400	-	-	-	-	5,719
Kept	2001	-	-	-	-	-	-	2,500	1,262	-	-	-	-	3,762
Kept	2002	-	-	-	-	-	-	-	2,330	-	-	-	-	2,330
Kept	2003	-	-	-	-	-	14	3,794	3,405	-	-	-	-	7,213
Kept	2004	-	-	-	-	-	-	5,684	7,110	-	-	-	-	2,794
Kept	2005	-	-	-	-	-	8	4,857	7,144	-	-	-	-	2,009
Kept	2006	-	-	-	-	5	8	3,625	3,601	-	-	-	-	7,239
Kept	2007	-	-	-	-	-	83	4,121	4,921	10	-	-	-	9,135
Kept	2008	-	-	-	-	-	569	2,577	1,207	-	-	-	-	4,353
Kept	2009	-	-	-	-	-	883	4,546	5,346	-	-	-	-	0,775
Kept	2010	-	-	-	-	-	703	4,440	4,251	-	-	-	-	9,394
Kept	2011	-	-	-	-	-	971	6,683	4,282	-	-	-	-	1,936
Kept	2012	-	-	-	-	-	1,381	4,121	2,798	-	-	-	-	8,300
Kept	2013	-	-	-	-	-	1,551	4,130	2,573	-	-	-	-	8,254
Kept	2014	-	-	-	-	-	2,669	4,377	2,292	-	-	-	-	9,338
Kept	2015	-	-	-	-	-	2,327	5,456	4,247	-	-	-	-	12,030
Kept	2016	-	-	-	-	-	2,321	3,087	3,326	-	-	-	-	8,734
Kept	2017	-	-	-	-	147	3,739	4,711	5,004	278	-	-	-	13,879
Kept	2018	-	-	-	-	435	4,472	5,794	3,079	177	-	-	-	13,957
Kept	AVG	-	-	-	-	196	1,424	4,263	3,715	155	-	-	-	9,008
Released	2000	-	-	-	-	-	-	176	161	-	-	-	-	337
Released	2001	-	-	-	-	-	-	373	135	-	-	-	-	508
Released	2002	-	-	-	-	-	-	-	368	-	-	-	-	368
Released	2003	-	-	-	-	-	9	560	465	-	-	-	-	1,034
Released	2004	-	-	-	-	-	-	1,505	2,745	-	-	-	-	4,250
Released	2005	-	-	-	-	-	-	1,247	2,359	-	-	-	-	3,606
Released	2006	-	-	-	-	-	-	287	79	-	-	-	-	366
Released	2007	-	-	-	-	-	-	768	1,006	-	-	-	-	1,774
Released	2008	-	-	-	-	-	105	561	221	-	-	-	-	887
Released	2009	-	-	-	-	-	121	743	567	-	-	-	-	1,431
Released	2010	-	-	-	-	-	149	515	494	-	-	-	-	1,158
Released	2011	-	-	-	-	-	229	1,141	583	-	-	-	-	1,953
Released	2012	-	-	-	-	-	201	723	547	-	-	-	-	1,471
Released	2013	-	-	-	-	-	331	1,081	241	-	-	-	-	1,653
Released	2014	-	-	-	-	-	417	597	158	-	-	-	-	1,172

Parameter	Year	Month												Total
		1	2	3	4	5	6	7	8	9	10	11	12	
Released	2015	-	-	-	-	-	533	1,209	705	-	-	-	-	2,447
Released	2016	-	-	-	-	-	403	279	281	-	-	-	-	963
Released	2017	-	-	-	-	40	86	435	396	-	-	-	-	1,493
Released	2018	-	-	-	-	26	994	970	345	-	-	-	-	2,335
Released	AVG	-	-	-	-	33	298	732	624	-	-	-	-	1,687
Released SL	2000	-	-	-	-	-	-	2,348	2,219	-	-	-	-	4,567
Released SL	2001	-	-	-	-	-	-	4,094	1,693	-	-	-	-	5,787
Released SL	2002	-	-	-	-	-	-	-	1,368	-	-	-	-	1,368
Released SL	2003	-	-	-	-	-	-	2,205	1,014	-	-	-	-	3,219
Released SL	2004	-	-	-	-	-	-	999	3,510	-	-	-	-	4,509
Released SL	2005	-	-	-	-	-	6	3,922	1,988	-	-	-	-	5,916
Released SL	2006	-	-	-	-	-	-	2,723	1,438	-	-	-	-	4,161
Released SL	2007	-	-	-	-	-	-	508	3,533	-	-	-	-	4,041
Released SL	2008	-	-	-	-	-	229	1,423	1,503	-	-	-	-	3,155
Released SL	2009	-	-	-	-	-	1,272	6,674	6,609	-	-	-	-	14,555
Released SL	2010	-	-	-	-	-	519	4,154	3,262	-	-	-	-	7,935
Released SL	2011	-	-	-	-	-	252	1,493	1,469	-	-	-	-	3,214
Released SL	2012	-	-	-	-	-	937	3,762	1,712	-	-	-	-	6,411
Released SL	2013	-	-	-	-	-	345	2,512	2,201	-	-	-	-	5,058
Released SL	2014	-	-	-	-	-	1,484	1,598	2,652	-	-	-	-	4,870
Released SL	2015	-	-	-	-	-	1,261	2,802	2,188	-	-	-	-	6,251
Released SL	2016	-	-	-	-	-	1,659	2,055	2,621	-	-	-	-	6,335
Released SL	2017	-	-	-	-	-	5,819	4,280	4,271	-	-	-	-	14,370
Released SL	2018	-	-	-	-	-	3,076	6,893	2,917	-	-	-	-	12,886
Released SL	AVG	-	-	-	-	-	1,405	3,025	2,535	-	-	-	-	6,965
Effort	2000	-	-	-	-	-	2,148	7,075	8,859	-	-	-	-	18,082
Effort	2001	-	-	-	-	-	-	6,092	4,733	-	-	-	-	10,825
Effort	2002	-	-	-	-	-	-	-	5,016	-	-	-	-	5,016
Effort	2003	-	-	-	-	-	26	6,008	8,024	-	-	-	-	14,058
Effort	2004	-	-	-	-	-	-	8,398	7,969	-	-	-	-	16,367
Effort	2005	-	-	-	-	-	2	7,020	11,670	-	-	-	-	18,692
Effort	2006	-	-	-	-	4	33	8,945	6,918	-	-	-	-	15,900
Effort	2007	-	-	-	-		28	7,794	10,149	1	-	-	-	17,972
Effort	2008	-	-	-	-	-	2,313	6,659	5,322	-	-	-	-	14,294
Effort	2009	-	-	-	-	-	2,015	6,287	7,975	-	-	-	-	16,277
Effort	2010	-	-	-	-	-	1,649	6,093	8,275	-	-	-	-	16,017

Parameter	Year	Month												Total
		1	2	3	4	5	6	7	8	9	10	11	12	
Effort	2011	-	-	-	-	-	2,062	7,765	7,121	-	-	-	-	16,948
Effort	2012	-	-	-	-	-	2,415	5,898	6,609	-	-	-	-	14,922
Effort	2013	-	-	-	-	-	1,186	4,626	5,361	-	-	-	-	11,173
Effort	2014	-	-	-	-	-	2,454	5,687	6,304	-	-	-	-	14,445
Effort	2015	-	-	-	-	-	2,092	5,325	5,962	-	-	-	-	13,379
Effort	2016	-	-	-	-	-	3229	6182	5917	-	-	-	-	15,328
Effort	2017	-	-	-	-	668	3035	5067	5777	947	-	-	-	15,494
Effort	2018	-	-	-	-	949	3696	6381	6392	1446	-	-	-	18,864
Effort	AVG	-	-	-	-	540	1,774	6,517	7,071	798	-	-	-	16,700

Table F - 4. Kept, released Chinook and effort (boat-days) in GSPTN recreational fisheries, 2000 to 2018.

Parameter	Year	Month												Total
		1	2	3	4	5	6	7	8	9	10	11	12	
Kept	2000	-	-	-	187	150	2,329	4,464	9,111	960	89	-	-	17,290
Kept	2001	-	-	-	129	456	4,340	7,733	7,347	1,465	25	-	-	21,495
Kept	2002	-	-	-	359	2,961	14,205	13,161	11,079	1,920	59	-	-	43,744
Kept	2003	-	-	-	217	1,968	4,186	3,580	3,557	521	15	-	-	14,044
Kept	2004	-	-	-	-	239	1,390	1,957	4,962	1,481	54	-	-	10,083
Kept	2005	-	-	-	-	772	1,177	3,056	3,165	2,217	3	-	-	10,390
Kept	2006	-	-	-	-	82	1,191	3,090	3,686	1,708	-	-	-	9,757
Kept	2007	-	-	-	26	1,471	1,904	2,475	5,260	1,226	4	-	-	12,366
Kept	2008	-	-	-	279	64	822	3,007	1,425	804	1	-	-	6,402
Kept	2009	-	-	-	-	737	1,907	3,378	5,422	636	-	-	-	12,080
Kept	2010	-	-	-	-	403	1,244	4,922	4,239	1,027	1	-	-	11,836
Kept	2011	-	-	-	-	503	3,203	4,281	4,826	2,695	-	-	-	15,508
Kept	2012	-	-	-	-	370	2,763	6,426	4,598	1,405	-	-	-	15,562
Kept	2013	-	-	-	-	1,017	9,088	5,419	6,743	1,875	-	-	-	24,142
Kept	2014	-	-	-	-	1,469	8,128	11,030	9,947	4,418	108	-	-	35,100
Kept	2015	-	551	39	-	1,343	9,398	9,223	15,377	7,178	-	-	-	43,109
Kept	2016	-	-	-	-	3,978	6,450	8,021	10,679	3,842	-	-	-	32,970
Kept	2017	-	-	-	-	2,979	10,520	9,770	15,207	3,679	22	-	-	42,177
Kept	2018	-	-	-	-	8,156	10,914	13,504	15,015	1,596	340	-	-	49,525
Kept	AVG	-	551	39	200	1,533	5,008	6,237	7,455	2,140	60	-	-	22,504
Released	2000	-	-	-	90	9	104	144	443	296	-	-	-	1,086
Released	2001	-	-	-	12	19	146	326	1,267	63	-	-	-	1,833
Released	2002	-	-	-	119	145	1,654	1,363	323	351	-	-	-	3,955
Released	2003	-	-	-	-	14	54	918	327	5	-	-	-	1,318
Released	2004	-	-	-	-	121	142	32	144	253	-	-	-	692
Released	2005	-	-	-	-	126	1	5	162	326	-	-	-	620
Released	2006	-	-	-	-	26	71	6	121	184	-	-	-	408
Released	2007	-	-	-	-	64	123	10	812	6	-	-	-	1,015
Released	2008	-	-	-	-	-	22	2	45	9	8	-	-	86
Released	2009	-	-	-	-	198	63	9	133	143	-	-	-	546
Released	2010	-	-	-	-	20	140	220	389	4	-	-	-	773
Released	2011	-	-	-	-	2	36	230	183	266	-	-	-	717
Released	2012	-	-	-	-	3	76	147	17	32	-	-	-	275
Released	2013	-	-	-	-	296	1,781	246	709	593	-	-	-	3,625
Released	2014	-	-	-	-	586	1,252	1,563	1,337	1,185	1	-	-	5,924

Parameter	Year	Month												Total
		1	2	3	4	5	6	7	8	9	10	11	12	
Released	2015	-	28	1	-	159	995	341	1,955	1,043	-	-	-	4,522
Released	2016	-	-	-	-	254	570	547	709	170	-	-	-	2,250
Released	2017	-	-	-	-	306	688	1,003	1,326	318	-	-	-	1,744
Released	2018	-	-	-	-	296	4,044	4,687	2,151	64	-	-	-	11,242
Released	AVG	-	28	1	74	147	630	621	661	280	5	-	-	2,445
Released S-L	2000	-	-	-	375	81	1,671	6,570	19,304	3,273	680	-	-	31,954
Released S-L	2001	-	-	-	141	338	3,032	6,549	5,337	3,123	70	-	-	18,590
Released S-L	2002	-	-	-	701	2,563	9,349	11,796	4,662	1,087	389	-	-	30,547
Released S-L	2003	-	-	-	290	1,424	1,307	721	2,713	2,647	62	-	-	9,164
Released S-L	2004	-	-	-	-	225	580	700	2,645	1,372	47	-	-	5,569
Released S-L	2005	-	-	-	-	1,380	923	2,203	1,247	672	49	-	-	6,474
Released S-L	2006	-	-	-	-	21	359	558	698	1,232	171	-	-	3,039
Released S-L	2007	-	-	-	61	864	4,319	6,115	6,124	1,594	68	-	-	19,145
Released S-L	2008	-	-	-	63	111	785	758	1,652	614	107	-	-	4,090
Released S-L	2009	-	-	-	-	1,131	2,121	2,917	2,761	1,182	-	-	-	10,112
Released S-L	2010	-	-	-	-	285	1,353	1,621	2,477	1,073	-	-	-	6,809
Released S-L	2011	-	-	-	-	666	912	3,018	2,798	3,294	-	-	-	10,688
Released S-L	2012	-	-	-	-	210	2,621	8,296	9,587	7,073	-	-	-	27,787
Released S-L	2013	-	-	-	-	-	14,033	11,329	18,408	3,307	-	-	-	47,077
Released S-L	2014	-	-	-	-	-	6,514	6,073	10,676	2,917	385	-	-	15,296
Released S-L	2015	-	1,009	185	-	-	5,353	6,565	10,060	2,299	-	-	-	25,471
Released S-L	2016	-	-	-	-	7,276	12,690	11,135	7,693	5,802	-	-	-	44,596
Released S-L	2017	-	-	-	-	2,817	6,649	8,672	24,506	8,919	175	-	-	51,738
Released S-L	2018	-	-	-	-	-	8,157	9,314	15,337	2,941	886	-	-	36,635
Released S-L	AVG	-	1,009	185	272	1,293	4,354	5,522	7,826	2,864	257	-	-	23,582
Effort	2000	-	-	-	3,835	1,731	11,434	20,257	31,758	11,691	3,820	-	-	84,526
Effort	2001	-	-	-	1,325	1,991	13,048	23,850	29,236	13,044	2,978	-	-	85,472
Effort	2002	-	-	-	3,576	6,680	21,615	26,145	35,396	7,451	3,540	-	-	104,403
Effort	2003	-	-	-	1,569	5,663	14,264	14,749	20,639	11,179	1,489	-	-	69,552
Effort	2004	-	-	-	-	5,454	7,693	11,194	14,434	7,512	3,010	-	-	49,297
Effort	2005	-	-	-	-	2,764	5,490	8,381	11,644	5,963	2,624	-	-	36,866
Effort	2006	-	-	-	-	1,801	5,206	8,449	9,370	6,627	1,915	-	-	33,368
Effort	2007	-	-	-	333	6,609	3,356	8,367	12,041	6,253	1,538	-	-	38,497
Effort	2008	-	-	-	325	1,334	3,124	8,890	9,085	6,357	2,413	-	-	31,528
Effort	2009	-	-	-	-	3,161	5,444	9,360	11,104	4,646	-	-	-	33,715
Effort	2010	-	-	-	-	1,674	2,851	7,842	10,792	5,815	949	-	-	29,923

Parameter	Year	Month												Total
		1	2	3	4	5	6	7	8	9	10	11	12	
Effort	2011	-	-	-	-	2,728	3,548	9,196	12,638	10,976	-	-	-	39,086
Effort	2012	-	-	-	-	3,115	5,394	10,540	11,857	8,186	-	-	-	39,092
Effort	2013	-	-	-	-	4,501	16,029	14,655	17,965	9,301	-	-	-	62,451
Effort	2014	-	-	-	-	4,074	7,398	13,719	21,435	8,937	1,172	-	-	56,735
Effort	2015	-	990	482	-	2,884	12,607	15,481	19,462	8,698	-	-	-	60,604
Effort	2016	-	-	-	-	7873	9548	16458	15188	11267	-	-	-	60,334
Effort	2017	-	-	-	-	5747	12318	24147	21599	10803	1393	-	-	76,007
Effort	2018	-	-	-	-	6308	11082	19684	25124	6500	2154	-	-	70,852
Effort	AVG	-	990	482	1,827	4,005	9,024	14,282	17,935	8,485	2,230	-	-	59,260

Table F - 5. Kept, released Chinook and effort (boat-days) in Georgia Strait Sport South (GSPTS) recreational fisheries, 2000 to 2018.

Parameter	Year	Month												Total
		1	2	3	4	5	6	7	8	9	10	11	12	
Kept	2000	-	-	-	747	281	671	694	891	1,340	-	-	-	4,624
Kept	2001	-	-	-	378	697	3,829	1,794	1,161	1,974	-	-	-	9,833
Kept	2002	-	-	-	1,346	2,505	1,522	1,109	1,707	983	43			9,215
Kept	2003	-	-	-	494	746	1,095	1,142	1,342	1,434	140	-	-	6,393
Kept	2004	-	-	-	54	263	145	454	728	1,433	694	-	-	3,771
Kept	2005		2	50	46	236	117	316	207	857	77	-	-	1,908
Kept	2006	27	14		38	650	164	296	92	847	300	-	-	2,428
Kept	2007	2	2	1	12	273	270	254	605	601	63	-	-	2,083
Kept	2008	-	5	-	416	202	105	723	489	542	22	-	-	2,504
Kept	2009	-	-	-	-	3,928	336	325	458	420	-	-	-	5,467
Kept	2010	-	-	6	-	492	1,106	718	469	311	-	-	-	3,102
Kept	2011	-	-	-	6	1,934	1,317	974	884	1,020	-		10	6,145
Kept	2012	77	110	109	4	1,890	2,273	558	1,545	323	-	-	-	6,889
Kept	2013	-				3,787	2,004	672	1,555	957	-	-	-	8,975
Kept	2014	-	1	2		4,779	1,903	1,247	1,980	1,236	-	-	-	11,148
Kept	2015	-		17	1	5,516	1,041	1,947	4,657	2,884	304	-	-	16,367
Kept	2016	-		9	91	4,434	1,731	1,219	1,644	2,556		-	-	11,684
Kept	2017	-		25	75	4,452	1,396	1,499	4,361	5,377	53	-	-	17,238
Kept	2018	-	39	988	21	10,533	1,361	1,318	2,883	1,023	105	-	-	18,271
Kept	AVG	35	25	121	249	2,505	1,178	908	1,456	1,375	180		10	7,792
Released	2000	-	-	-	229	45	34	20	40	248	-	-	-	616
Released	2001	-	-	-	87	21	111	211	269	227	-	-	-	926
Released	2002	-	-	-	141	192	178	17	104	276	-	-	-	908
Released	2003	-	-	-	27	244	147	271	133	283	-	-	-	1,105
Released	2004	-	-	-	-	111	68	19	356	449	18	-	-	1,021
Released	2005	-	-	-	-	98	151	146	-	62		-	-	457
Released	2006	6	7		-	-	-	-	-	16	60	-	-	89
Released	2007	-	-	-	2	495	88	17	129	53		-	-	784
Released	2008	-	-	-	46	55	23	60	40	85	1	-	-	310
Released	2009	-	-	-	-	3,212	9	39	83	49	-	-	-	3,392
Released	2010	-	-	-	-	44	420	107	70	125	-	-	-	766
Released	2011	-	-	-	-	166	325	583	128	155	-	2		1,359
Released	2012	45	19	29	-	486	831	50	241	32	-	-	-	1,733
Released	2013	-	-	-	-	4,603	574	79	121	338	-	-	-	5,715
Released	2014	-	-	-	-	9,100	1,673	1,134	131	284	-	-	-	12,322

Parameter	Year	Month												Total
		1	2	3	4	5	6	7	8	9	10	11	12	
Released	2015	-	-	-	-	447	235	735	454	153	-	-	-	2,024
Released	2016	-	-	-	-	351	146	205	143	622	-	-	-	1,467
Released	2017	-	-	-	175	308	219	575	753	190	-	-	-	2,058
Released	2018	-	43	56	-	795	9	185	280	33	112	-	-	1,513
Released	AVG	17	17	28	101	1,154	291	247	204	194	48	2		2,304
Released S-L	2000	-	-	-	1,038	385	672	2,081	3,025	6,527	-	-	-	13,728
Released S-L	2001	-	-	-	624	2,211	6,073	4,016	5,893	6,121	-	-	-	24,938
Released S-L	2002	-	-	-	1,977	7,012	3,236	3,555	4,357	1,690	338	-	-	22,165
Released S-L	2003	-	-	-	938	1,035	773	932	1,614	3,089	245	-	-	8,626
Released S-L	2004	-	-	-	24	121	40	402	4,247	1,519	223	66	-	6,642
Released S-L	2005	-	-	-	69	713	522	620	438	179	10	-	-	2,551
Released S-L	2006	10	1	-	17	203	93	236	367	155	116	-	-	1,198
Released S-L	2007	1	1	-	1	460	708	881	1,087	1,234	202	-	-	4,575
Released S-L	2008	17	4	-	517	130	177	395	1,762	1,253	67	-	-	4,322
Released S-L	2009	-	-	-	-	823	594	973	2,658	1,381	-	-	-	6,429
Released S-L	2010	-	-	-	-	333	1,376	1,025	1,821	779	-	-	-	5,334
Released S-L	2011	-	-	-	4	413	975	1,588	2,033	2,534	-	11	10	7,568
Released S-L	2012	115	285	331	8	441	884	1,038	10,943	1,943	-	-	-	15,988
Released S-L	2013	-	-	-	-	-	16,469	3,660	4,086	-	-	-	-	24,215
Released S-L	2014	-	-	-	-	-	-	-	2,260	89	-	-	-	9,506
Released S-L	2015	-	-	-	-	1,939	2,050	-	1,361	778	74	-	-	6,202
Released S-L	2016	-	-	21	182	9,817	-	-	-	-	-	-	-	10,020
Released S-L	2017	-	-	62	74	5,194	2,226	6,254	3,092	3,548	290	-	-	20,740
Released S-L	2018		67	2,924	-	107	4,042	3,015	4,920	979	66	-	-	16,120
Released S-L	AVG	36	72	556	421	1,843	2,406	1,917	3,109	1,988	163	39	10	12,560
Effort	2000	-	-	-	4,661	2,641	6,590	8,660	8,950	11,410	-	-	-	42,912
Effort	2001	-	-	-	3,269	3,022	13,857	11,583	13,711	11,065	-	-	-	56,507
Effort	2002	-	-	-	5,388	6,847	8,698	9,280	14,692	6,714	2,625	-	-	54,244
Effort	2003	-	-	-	3,960	4,016	8,373	12,204	15,584	11,857	1,666	-	-	57,660
Effort	2004	-	-	-	275	2,708	3,685	6,836	7,429	5,094	2,646	214	39	28,926
Effort	2005	17	20	49	250	2,486	4,395	5,511	5,349	4,200	830	-	29	23,136
Effort	2006	51	40	-	325	2,806	3,740	5,658	7,263	6,402	2,887	-	-	29,172
Effort	2007	4	5	7	99	2,795	2,987	5,506	5,685	4,965	1,350	-	-	23,403
Effort	2008	17	13	5	1,253	1,967	1,358	4,101	3,202	3,896	806	-	-	16,618
Effort	2009	-	4	-	19	5,322	3,552	5,283	6,668	3,710	-	-	-	24,558
Effort	2010	-	-	6	41	1,814	3,945	6,020	8,707	4,312	-	-	-	24,845

Parameter	Year	Month												Total
		1	2	3	4	5	6	7	8	9	10	11	12	
Effort	2011	-	-	-	45	6,480	3,342	8,497	8,864	7,277	8	11	25	34,549
Effort	2012	584	705	670	50	5,625	6,419	6,649	10,260	5,075	-	-	-	36,037
Effort	2013	-	-	79	120	6,686	7,636	7,841	10,410	6,030	51	-	-	38,853
Effort	2014	-	8	20	85	6,041	4,592	8,041	22,645	8,716	31	-	-	50,179
Effort	2015	-	21	88	107	8,523	4,139	9,199	12,674	6,262	1774	-	-	42,787
Effort	2016	-	-	38	121	8663	6119	10334	10558	8055	-	-	-	43,888
Effort	2017	-	-	190	560	10391	6857	10066	15739	12104	691	-	-	56,598
Effort	2018	-	74	2862	373	11695	6263	8241	16006	13264	251	-	-	59,029
Effort	AVG	112	89	309	1,105	5,291	5,608	7,869	10,758	7,390	1,201	56	19	39,807

Table F - 6. Kept, released Chinook and effort (boat-days) in Juan de Fuca recreational fisheries, 2000 to 2018.

Parameter	Year	Month												Total
		1	2	3	4	5	6	7	8	9	10	11	12	
Kept	2000	907	640	150	98	638	2,181	1,199	1,509	777	344	550	1,746	10,739
Kept	2001	1,160	1,246	417	505	486	5,013	2,192	4,572	1,258	97	449	618	18,013
Kept	2002	1,181	1,051	991	638	641	4,556	4,518	4,513	824	119	129	631	19,792
Kept	2003	1,118	138	342	1,322	664	3,747	4,769	4,238	1,455	106	385	496	18,780
Kept	2004	2,039	785	619	275	674	4,240	7,398	7,759	3,087	2,152	993	1,531	31,552
Kept	2005	1,640	500	380	141	491	1,925	3,824	6,063	2,928	75	-	1,250	19,217
Kept	2006	790	383	-	251	305	2,324	2,467	7,914	2,526	1,871	-	-	18,831
Kept	2007	869	1,073	396	439	379	2,198	3,090	7,021	1,981	256	414	456	18,572
Kept	2008	984	733	277	182	75	1,597	1,374	4,706	2,091	387	1,107	298	13,811
Kept	2009	589	327	63	95	313	4,742	3,286	7,991	3,575	1,831	624	2,149	25,585
Kept	2010	-	-	300	624	367	1,724	1,331	2,425	1,691	-	-	-	8,462
Kept	2011	-	476	246	535	399	1,180	2,935	4,808	1,787	339	303	551	13,559
Kept	2012	532	639	387	607	1,617	2,156	3,351	4,706	1,570	-	-	-	15,565
Kept	2013	-	-	303	71	357	4,109	4,375	11,170	2,117	426	-	-	22,928
Kept	2014	-	280	483	457	2,447	2,997	3,781	4,027	995	51	-	-	15,518
Kept	2015	-	895	206	792	2,057	3,911	7,206	12,728	4,423	75	-	-	32,293
Kept	2016	-	-	430	852	1,613	1,317	3,356	6,036	2,721	-	-	-	16,325
Kept	2017	-	-	577	764	573	1,660	2,336	8,503	3,470	372	-	-	18,255
Kept	2018	-	505	471	547	1,352	2,216	5,584	9,432	2,271	1,203	-	-	23,581
Kept	AVG	1,074	645	391	484	813	2,831	3,599	6,322	2,187	607	550	973	19,020
Released	2000	389	300	9	-	103	311	33	30	120	6	88	301	1,690
Released	2001	210	309	47	275	253	1,542	55	772	125	-	186	207	3,981
Released	2002	1,070	314	709	118	76	1,133	288	622	-	23	10	122	4,485
Released	2003	188	60	51	331	129	502	733	363	106	15	126	41	2,645
Released	2004	42	168	7	12	29	120	1,483	1,802	320	677	494	996	6,150
Released	2005	834	177	79	-	39	376	632	753	268	15	-	667	3,840
Released	2006	91	89	-	30	-	434	-	473	115	645	-	-	1,877
Released	2007	336	122	39	34	-	402	477	611	166	14	96	8	2,305
Released	2008	150	20	13	34	3	29	38	137	147	37	240	6	854
Released	2009	12	3	3	10	112	389	588	502	236	225	186	1,467	3,733
Released	2010	-	-	33	457	114	318	80	276	442	-	-	-	1,720
Released	2011	-	37	25	95	130	379	266	229	348	122	53	166	1,850
Released	2012	112	306	96	76	290	688	169	375	43	-	-	-	2,155
Released	2013	-	-	96	95	18	679	1,179	2,458	545	109	-	-	5,179
Released	2014	-	136	278	94	997	844	1,042	499	403	125	-	-	4,418

Parameter	Year	Month												Total
		1	2	3	4	5	6	7	8	9	10	11	12	
Released	2015	-	300	20	179	184	1,112	938	1,840	1,207	44	-	-	5,824
Released	2016	-	-	390	423	473	626	1,064	1,562	1,412	-	-	-	5,950
Released	2017	-	-	8	331	59	801	417	1,721	1,455	203	-	-	3,450
Released	2018	-	217	156	34	448	729	1,771	3,399	311	868	-	-	7,933
Released	AVG	312	171	114	155	203	601	625	970	432	209	164	3,981	7,936
Released S-L	2000	536	293	71	84	305	962	342	1,828	1,740	439	948	1,167	8,715
Released S-L	2001	1,221	2,666	873	517	218	1,910	597	1,329	1,029	51	397	648	11,456
Released S-L	2002	3,315	3,807	2,062	361	112	426	661	647	264	351	40	606	12,652
Released S-L	2003	949	186	169	320	132	936	943	960	709	76	259	272	5,911
Released S-L	2004	41	341	101	62	-	316	1,455	2,110	1,125	2,804	1,513	727	10,595
Released S-L	2005	489	239	144	5	38	392	813	698	1,229	380	-	320	4,747
Released S-L	2006	229	62	-	44	-	268	87	521	624	199	-	-	2,034
Released S-L	2007	182	80	52	14	48	464	2,345	2,202	1,004	317	234	76	7,018
Released S-L	2008	1,160	458	191	41	3	177	76	535	572	287	471	114	4,085
Released S-L	2009	167	42	20	24	269	1,461	3,199	13,060	13,902	5,736	693	1,860	40,433
Released S-L	2010	-	-	85	108	43	147	49	705	1,019	-	-	-	2,156
Released S-L	2011	-	226	61	33	9	237	1,049	2,066	3,451	746	214	962	9,054
Released S-L	2012	735	717	273	98	158	383	1,212	2,422	1,273	-	-	-	7,271
Released S-L	2013	-	-	129	14	83	1,830	1,341	6,459	2,156	727	-	-	12,739
Released S-L	2014	-	130	271	117	228	157	4,157	1,995	374	154	-	-	9,671
Released S-L	2015	-	561	55	127	100	1,569	3,837	5,230	3,535	459	-	-	15,473
Released S-L	2016	-	-	579	982	68	660	4,627	4,900	1,648	-	-	-	13,464
Released S-L	2017	-	-	69	439	185	576	3,987	8,008	3,292	1,452	-	-	18,008
Released S-L	2018	-	827	284	100	202	752	12,868	12,673	4,451	1,342	-	-	33,499
Released S-L	AVG	820	709	305	184	129	717	2,297	3,597	2,284	970	530	675	13,218
Effort	2000	1,231	869	677	1,834	3,508	8,473	8,138	7,374	5,451	1,885	1,376	2,534	43,350
Effort	2001	1,736	1,879	1,446	2,209	1,523	15,435	9,737	13,350	5,197	992	1,726	696	55,926
Effort	2002	2,429	1,464	1,539	2,206	4,392	15,191	12,065	11,178	5,223	2,401	885	1,367	60,340
Effort	2003	1,469	456	841	3,432	3,683	8,871	11,777	0,968	5,992	786	328	735	49,338
Effort	2004	1,678	1,035	1,994	1,857	2,822	10,114	10,488	10,850	7,951	3,846	687	877	54,199
Effort	2005	1,265	892	1,922	1,016	3,555	7,004	10,507	8,569	6,350	1,407	-	1,558	44,045
Effort	2006	1,312	1,280		1,255	2,650	8,260	8,644	11,671	7,360	2,875	-	-	45,307
Effort	2007	1,123	1,491	1,136	1,685	2,155	4,809	7,442	15,545	8,292	2,434	806	1,057	47,975
Effort	2008	1,638	870	1,467	1,279	2,093	6,266	6,476	12,786	6,366	2,218	1,086	531	43,076
Effort	2009	968	777	903	1,970	5,700	9,745	10,258	15,045	7,434	2,302	997	1,839	57,938
Effort	2010	-	-	1,420	2,687	2,838	6,016	9,076	10,486	5,259	-	-	-	37,782

Parameter	Year	Month												Total
		1	2	3	4	5	6	7	8	9	10	11	12	
Effort	2011	-	1,065	1,183	1,321	3,266	3,610	9,154	12,372	8,424	2,827	343	1,064	44,629
Effort	2012	699	689	2,098	2,152	6,228	4,553	7,909	9,567	7,771	-	-	-	41,666
Effort	2013	-	-	2,450	2,020	2,247	8,020	9,002	13,171	6,736	3,235	-	-	46,881
Effort	2014	-	449	1,517	1,880	4,674	6,095	8,452	12,151	6,797	3,330	-	-	45,345
Effort	2015	-	1,769	2,402	4,204	4,006	5,970	11,409	12,743	7,232	3040	-	-	52,775
Effort	2016	-	-	2070	3222	4935	5423	7444	11067	7705	-	-	-	41,866
Effort	2017	-	-	1024	1780	2243	3418	4836	11842	10382	1283	-	-	36,808
Effort	2018	-	524	1021	1318	3280	6122	9176	11241	8046	4191	-	-	44,919
Effort	AVG	1,413	1,034	1,506	2,070	3,463	7,547	9,052	11,683	7,051	2,441	915	1,226	49,401

Table F - 7. IREC (Internet Recreational Survey) Estimates for Southern BC areas.

Region	Parameter	Year	Month												Total
			1	2	3	4	5	6	7	8	9	10	11	12	
JST	Kept	2012	-	-	-	-	-	-	6,073	7,073	212	-	-	133	13,491
JST	Kept	2013	1,355	-	835	78	367	3,337	5,201	6,566	1,580	-	-	-	19,319
JST	Kept	2014	148	-	22	115	1,282	8,319	10,775	7,524	4,385	387	-	26	32,983
JST	Kept	2015	755	347	311	199	3,313	9,166	15,509	12,571	4,026	235	149	225	46,808
JST	Kept	2016	142	-	78	355	1,395	6,280	8,398	9,554	1,532	-	-	234	27,967
JST	Kept	2017	154	159	85	221	1,570	5,873	14,628	12,624	1,947	111	-	307	37,678
JST	Kept	2018	294	51	575	587	1,280	7,732	12,602	10,042	1,503	132	78	256	35,133
JST	Released	2012	-	-	-	-	-	-	11,347	4,726	595	379	-	463	17,510
JST	Released	2013	1,742	1,433	1,670	17	569	2,675	6,446	13,742	6,404	126	1,070	-	35,893
JST	Released	2014	148	-	-	600	1,658	6,863	10,341	10,723	11,948	687	-	115	43,082
JST	Released	2015	1,316	288	431	278	2,570	4,317	14,771	7,502	4,202	12	299	1,051	37,037
JST	Released	2016	354		78	949	3,347	10,670	9,424	9,509	2,915	238	312	468	38,263
JST	Released	2017	154	558	254	1,035	2,140	5,554	10,121	9,530	4,039	50	217	830	34,482
JST	Released	2018	441	103	818	1,461	2,266	10,126	19,650	17,190	2,149	227	78	682	55,190
GSPTN	Kept	2012	-	-	-	-	-	-	1,968	2,384	316	161	-	-	4,829
GSPTN	Kept	2013	194	-	-	218	730	2,413	2,172	3,753	661	697	-	294	11,132
GSPTN	Kept	2014	125	-	-	543	1,754	4,845	2,246	2,535	1,447	11	-	10	13,518
GSPTN	Kept	2015	589	490	331	562	3,753	2,954	2,076	3,894	641	404	-	75	15,769
GSPTN	Kept	2016	71	9	323	852	2,445	2,392	3,598	3,569	2,540	81	-	78	15,958
GSPTN	Kept	2017	364	80	254	616	3,677	4,864	3,711	4,791	1,601	332	73	53	20,415
GSPTN	Kept	2018	73	-	860	1,826	6,089	3,114	6,888	4,650	1,786	566	389	170	26,413
GSPTN	Released	2012	-	-	-	-	-	-	1,164	12,003	914	1,231	-	176	15,487
GSPTN	Released	2013	774	410	417	287	1,026	5,373	9,268	8,697	7,521	911	-	882	35,566
GSPTN	Released	2014	-	303	22	925	1,705	12,227	2,901	6,339	4,783	283	-	49	29,538
GSPTN	Released	2015	1,310	1,586	696	1,184	3,870	3,739	3,137	2,911	1,533	1,472	-	676	22,114
GSPTN	Released	2016	637	546	814	2,413	6,519	6,641	11,022	7,082	7,117	304	312	644	44,051
GSPTN	Released	2017	386	718	645	664	3,731	7,306	8,628	16,694	7,587	3,315	270	771	50,716
GSPTN	Released	2018	539		2,208	3,711	5,522	6,663	13,301	12,322	4,923	2,297	1,769	426	53,681
GSPTS	Kept	2012	-	-	-	-	-	-	707	2,341	2,129	1,779	-	854	7,809
GSPTS	Kept	2013	384	205	1,878	328	3,185	2,249	1,671	4,482	3,392	506	153	147	18,580
GSPTS	Kept	2014	-	289	819	606	4,761	2,092	1,364	1,797	1,705	358	95	-	13,887
GSPTS	Kept	2015	360	164	317	1,848	3,462	2,066	1,224	4,909	3,407	222	60	75	18,115
GSPTS	Kept	2016	212	759	1,589	958	2,574	2,001	1,303	1,697	2,764	258	141	312	14,570
GSPTS	Kept	2017	583	1,114	997	3,946	5,275	1,810	2,120	5,427	3,446	1,389	434	216	26,757
GSPTS	Kept	2018	353	318	1,843	4,267	9,000	3,105	3,210	2,794	2,049	-	187	445	27,572

Region	Parameter	Year	Month												Total
			1	2	3	4	5	6	7	8	9	10	11	12	
GSPTS	Released	2012	-	-	-	-	-	-	2,120	24,271	6,885	2,501	-	1,113	36,890
GSPTS	Released	2013	3,661	1,638	4,863	897	5,263	5,433	6,424	9,486	5,853	2,520	459	1,829	48,327
GSPTS	Released	2014	295	153	2,467	990	5,595	1,229	2,181	1,910	4,811	67	557	352	20,608
GSPTS	Released	2015	464	478	404	1,420	3,099	2,889	1,587	3,298	2,410	1,530	810	300	18,690
GSPTS	Released	2016	2,406	4,710	7,045	4,393	8,598	8,445	4,918	6,308	8,297	2,022	187	2,023	59,354
GSPTS	Released	2017	1,731	7,026	4,497	8,752	8,573	3,144	8,722	23,582	9,553	2,476	1,061	1,214	80,330
GSPTS	Released	2018	2,660	3,065	5,574	11,139	15,989	7,112	8,570	7,686	4,618	521	636	2,668	70,238
NWVI	Kept	2012	-	-	-	-	-	-	7,696	8,052	728	-	-	-	16,476
NWVI	Kept	2013	-	-	94	29	353	791	6,845	12,938	1,031	-	-	-	22,080
NWVI	Kept	2014	-	-	-	84	70	1,651	8,183	7,622	451	-	-	17	18,079
NWVI	Kept	2015	-	-	-	19	285	4,436	9,625	7,467	273	33			22,138
NWVI	Kept	2016	-	-	-	-	138	3,985	6,672	4,287	54	-	-	-	15,136
NWVI	Kept	2017	-	-	-	-	116	1,260	8,641	5,714	78	-	-	-	15,809
NWVI	Kept	2018	-	-	-	31	23	1,802	5,639	3,158	105	-	-	-	10,758
NWVI	Released	2012	-	-	-	-	-	-	13,488	6,545	832	482	-	-	21,347
NWVI	Released	2013	-	-	-	-	123	1,094	6,683	8,957	680	-	-	-	17,537
NWVI	Released	2014	-	-	-	214	119	586	8,097	8,119	261	-	-	17	17,413
NWVI	Released	2015	-	-	-	-	367	4,275	5,542	6,880	429	-	-	-	17,493
NWVI	Released	2016	-	-	-	-	-	1,607	3,137	7,462	147	-	-	-	12,354
NWVI	Released	2017	-	-	-	-	19	670	5,288	1,842	-	-	-	149	7,967
NWVI	Released	2018	-	-	-	47	-	1,472	3,227	1,524	44	-	-	-	6,314
SWVI	Kept	2012	-	-	-		-	-	10,896	10,952	2,367	189	-	-	24,405
SWVI	Kept	2013	-	-	-	17	679	6,369	13,205	15,121	2,819		-	-	38,210
SWVI	Kept	2014	-	-	188	-	1,079	4,970	9,906	12,455	1,909	72	-	-	30,579
SWVI	Kept	2015	-	46	228	114	1,188	6,468	12,216	16,497	648	-	-	-	37,406
SWVI	Kept	2016	-	-	106	106	1,083	5,252	10,193	9,507	1,263	28	-	-	27,537
SWVI	Kept	2017	-	159	-	24	567	2,437	11,575	12,475	1,568	155	-	13	28,975
SWVI	Kept	2018	-	-	-	79	203	5,283	10,134	11,808	519	76	-	-	28,101
SWVI	Released	2012	-	-	-	-	-	-	14,517	9,724	3,191	-	-	-	27,432
SWVI	Released	2013	-	-	-	-	201	8,026	13,495	20,519	3,002	-	-	-	45,243
SWVI	Released	2014	-	-	-	-	425	6,013	7,333	6,578	1,048	171	-	-	21,569
SWVI	Released	2015	-	91		-	450	3,604	10,401	14,740	711	166	36	-	30,199
SWVI	Released	2016	-	-	-	150	530	3,118	5,345	6,483	888	-	-	-	16,514
SWVI	Released	2017	-	-	-	145	364	1,839	8,916	5,578	1,199	-	-	-	18,042
SWVI	Released	2018	-	-	-	23	-	3,219	9,325	9,999	441	-	-	-	23,008
JDF	Kept	2012	-	-	-	-	-	-	4,589	4,415	4,667	1,675	1,702	1,786	18,833

Region	Parameter	Year	Month												Total
			1	2	3	4	5	6	7	8	9	10	11	12	
JDF	Kept	2013	2,469	906	1,521	399	781	3,681	6,170	14,074	3,415	1,518	917	2,108	37,961
JDF	Kept	2014	2,424	454	1,645	667	1,303	2,926	6,245	7,582	4,557	221	118	954	29,096
JDF	Kept	2015	1,244	2,237	695	1,290	2,629	6,552	6,834	15,288	4,038	451	135	1,121	42,515
JDF	Kept	2016	1,685	1,669	1,064	1,454	2,288	3,421	3,041	9,147	4,113	1,337	527	755	30,500
JDF	Kept	2017	2,450	1,429	430	1,245	1,238	3,976	5,948	13,303	3,700	1,610	1,757	891	37,976
JDF	Kept	2018	330	1,219	990	1,051	1,498	2,510	7,670	9,874	3,953	2,443	1,478	2,190	35,207
JDF	Released	2012	-	-	-	-	-	-	2,535	1,538	10,972	8,694	6,592	4,563	34,894
JDF	Released	2013	3,669	445	1,669	512	527	3,977	5,898	13,646	4,861	3,771	2,982	1,918	43,873
JDF	Released	2014	4,996	1,501	1,536	358	553	1,810	4,006	2,667	2,049	910	315	2,307	23,008
JDF	Released	2015	2,848	3,515	494	723	1,652	4,058	9,864	6,880	4,826	3,827	299	5,137	44,124
JDF	Released	2016	5,702	4,441	2,576	4,117	2,067	4,336	4,571	11,299	6,984	4,916	1,752	1,876	54,638
JDF	Released	2017	8,339	2,434	418	1,211	1,696	3,806	5,307	4,935	10,006	3,378	2,088	3,272	46,889
JDF	Released	2018	1,710	1,936	630	1,048	926	2,430	15,566	12,839	9,802	1,729	5,634	4,941	59,192

Table F - 8. The portion of IREC estimated catch and released Chinook in SBC recreational fisheries associated with periods for which there are no creel survey estimates.

Region	Year	Parameter	Month												Total
			1	2	3	4	5	6	7	8	9	10	11	12	
JST	2012	Kept	-	-	-	-	-	-	-	-	-	-	-	1%	1%
JST	2013	Kept	7%	-	4%	0%	-	-	-	-	-	-	-		12%
JST	2014	Kept	0%	-	0%	0%	-	-	-	-	-	-	-	0%	1%
JST	2015	Kept	2%	-		0%	7%	-	-	-	-	1%	0%	0%	10%
JST	2016	Kept	1%	-	0%	1%	-	-	-	-	-	-	-	1%	3%
JST	2017	Kept	0%	0%	0%	1%	-	-	-	-	-	-	-	1%	2%
JST	2018	Kept	1%	0%	2%	2%	-	-	-	-	-	-	0%	1%	5%
JST	2012	Released	-	-	-	-	-	-	-	-	-	2%	-	3%	5%
JST	2013	Released	5%	4%	5%	0%	-	-	-	-	-	0%	3%	-	17%
JST	2014	Released	0%	-	-	1%	-	-	-	-	-	-	-	0%	2%
JST	2015	Released	4%	-	-	1%	7%	-	-	-	-	0%	1%	3%	15%
JST	2016	Released	1%	-	0%	2%	-	-	-	-	-	1%	1%	1%	6%
JST	2017	Released	0%	2%	1%	3%	-	-	-	-	-	-	1%	2%	9%
JST	2018	Released	1%	0%	1%	3%	-	-	-	-	-	-	0%	1%	6%
GSPTN	2012	Kept	-	-	-	-	-	-	-	-	-	3%	-	-	3%
GSPTN	2013	Kept	2%	-	-	2%	-	-	-	-	-	6%	-	3%	13%
GSPTN	2014	Kept	1%	-	-	4%	-	-	-	-	-		-	0%	5%
GSPTN	2015	Kept	4%	-	-	4%	-	-	-	-	-	3%	-	0%	10%
GSPTN	2016	Kept	0%	0%	2%	5%	-	-	-	-	-	1%	-	0%	9%
GSPTN	2017	Kept	2%	0%	1%	3%	-	-	-	-	-	-	0%	0%	7%
GSPTN	2018	Kept	0%		3%	7%	-	-	-	-	-	-	1%	1%	13%
GSPTN	2012	Released	-	-	-	-	-	-	-	-	-	8%	-	1%	9%
GSPTN	2013	Released	2%	1%	1%	1%	-	-	-	-	-	3%	-	2%	10%
GSPTN	2014	Released	-	1%	0%	3%	-	-	-	-	-	-	-	0%	4%
GSPTN	2015	Released	6%	-	-	5%	-	-	-	-	-	7%	-	3%	21%
GSPTN	2016	Released	1%	1%	2%	5%	-	-	-	-	-	1%	1%	1%	13%
GSPTN	2017	Released	1%	1%	1%	1%	-	-	-	-	-	-	1%	2%	7%
GSPTN	2018	Released	1%		4%	7%	-	-	-	-	-	-	3%	1%	16%
GSPTS	2012	Kept	-	-	-	-	-	-	-	-	-	23%	-	11%	34%
GSPTS	2013	Kept	2%	1%	10%	2%	-	-	-	-	-	3%	1%	1%	19%
GSPTS	2014	Kept	-	-	-	4%	-	-	-	-	-	3%	1%	-	8%
GSPTS	2015	Kept	2%	1%	-	-	-	-	-	-	-	-	0%	0%	4%
GSPTS	2016	Kept	1%	5%	-	-	-	-	-	-	-	2%	1%	2%	12%
GSPTS	2017	Kept	2%	4%	-	-	-	-	-	-	-	-	2%	1%	9%

Region	Year	Parameter	Month												Total
			1	2	3	4	5	6	7	8	9	10	11	12	
GSPTS	2018	Kept	1%	-	-	-	-	-	-	-	-	-	1%	2%	4%
GSPTS	2012	Released	-	-	-	-	-	-	-	-	-	7%	-	3%	10%
GSPTS	2013	Released	8%	3%	10%	2%	-	-	-	-	-	5%	1%	4%	33%
GSPTS	2014	Released	1%	1%	12%	5%	-	-	-	-	-	0%	3%	2%	24%
GSPTS	2015	Released	2%	3%	2%	8%	-	-	-	-	-	-	4%	2%	21%
GSPTS	2016	Released	4%	8%	-	-	-	-	-	-	-	3%	0%	3%	19%
GSPTS	2017	Released	2%	9%	-	-	-	-	-	-	-	-	1%	2%	14%
GSPTS	2018	Released	4%	-	-	16%	-	-	-	-	-	-	1%	4%	24%
NWVI	2012	Kept	-	-	-	-	-	-	-	-	-	-	-	-	0%
NWVI	2013	Kept	-	-	0%	0%	2%	-	-	-	5%	-	-	-	7%
NWVI	2014	Kept	-	-	-	0%	0%	-	-	-	-	-	-	0%	1%
NWVI	2015	Kept	-	-	-	0%	-	-	-	-	-	0%	-	-	0%
NWVI	2016	Kept	-	-	-	-	-	-	-	-	0%	-	-	-	0%
NWVI	2017	Kept	-	-	-	-	-	-	-	-	-	-	-	-	0%
NWVI	2018	Kept	-	-	-	0%	-	-	-	-	-	-	-	-	0%
NWVI	2012	Released	-	-	-	-	-	-	-	-	-	2%	-	-	2%
NWVI	2013	Released	-	-	-	-	1%	-	-	-	4%	-	-	-	5%
NWVI	2014	Released	-	-	-	1%	1%	-	-	-	-	-	-	0%	2%
NWVI	2015	Released	-	-	-	-	-	-	-	-	-	-	-	-	0%
NWVI	2016	Released	-	-	-	-	-	-	-	-	1%	-	-	-	1%
NWVI	2017	Released	-	-	-	-	-	-	-	-	-	-	-	2%	2%
NWVI	2018	Released	-	-	-	1%	-	-	-	-	1%	-	-	-	1%
SWVI	2012	Kept	-	-	-	-	-	-	-	-	-	1%	-	-	1%
SWVI	2013	Kept	-	-	-	0%	2%	-	-	-	-	-	-	-	2%
SWVI	2014	Kept	-	-	1%	-	4%	-	-	-	-	0%	-	-	4%
SWVI	2015	Kept	-	0%	1%	0%	3%	-	-	-	-	-	-	-	4%
SWVI	2016	Kept	-	-	0%	0%	-	-	-	-	-	0%	-	-	1%
SWVI	2017	Kept	-	1%	-	0%	-	-	-	-	-	-	-	0%	1%
SWVI	2018	Kept	-	-	-	0%	-	-	-	-	-	0%	-	-	1%
SWVI	2012	Released	-	-	-	-	-	-	-	-	-	-	-	-	0%
SWVI	2013	Released	-	-	-	-	0%	-	-	-	-	-	-	-	0%
SWVI	2014	Released	-	-	-	-	2%	-	-	-	-	1%	-	-	3%
SWVI	2015	Released	-	0%	-	-	1%	-	-	-	-	1%	0%	-	2%
SWVI	2016	Released	-	-	-	1%	-	-	-	-	-	-	-	-	1%
SWVI	2017	Released	-	-	-	1%	-	-	-	-	-	-	-	-	1%
SWVI	2018	Released	-	-	-	0%	-	-	-	-	-	-	-	-	0%

Region	Year	Parameter	Month												Total
			1	2	3	4	5	6	7	8	9	10	11	12	
JDF	2012	Kept	-	-	-	-	-	-	-	-	-	9%	9%	9%	27%
JDF	2013	Kept	7%	2%	-	-	-	-	-	-	-	-	2%	6%	17%
JDF	2014	Kept	8%	-	-	-	-	-	-	-	-	-	0%	3%	12%
JDF	2015	Kept	3%	-	-	-	-	-	-	-	-	-	0%	3%	6%
JDF	2016	Kept	6%	5%	-	-	-	-	-	-	-	4%	2%	2%	20%
JDF	2017	Kept	6%	4%	-	-	-	-	-	-	-	-	5%	2%	17%
JDF	2018	Kept	1%	-	-	-	-	-	-	-	-	-	4%	6%	11%
JDF	2012	Released	-	-	-	-	-	-	-	-	-	25%	19%	13%	57%
JDF	2013	Released	8%	1%	-	-	-	-	-	-	-	-	7%	4%	21%
JDF	2014	Released	22%	-	-	-	-	-	-	-	-	-	1%	10%	33%
JDF	2015	Released	6%	-	-	-	-	-	-	-	-	-	1%	12%	19%
JDF	2016	Released	10%	8%	-	-	-	-	-	-	-	9%	3%	3%	34%
JDF	2017	Released	18%	5%	-	-	-	-	-	-	-	-	4%	7%	34%
JDF	2018	Released	3%	-	-	-	-	-	-	-	-	-	10%	8%	21%

APPENDIX G: MARINE COMMERCIAL CATCH, EFFORT AND RELEASE DATA

Table G - 1. Landed catch of Chinook in the Area F (Northern Troll) fishery, 2001 to 2018, by location and total.

Offshore

MONTH	YEAR																	
	2001	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
JAN	-	-	-	-	7	-	-	-	-	-	-	-	-	-	-	-	-	-
FEB	-	18	18	430	468	-	-	-	-	-	-	-	-	-	-	-	-	-
MAR	-	109	88	1,180	963	-	-	-	-	-	-	-	-	-	-	-	-	-
APR	-	4,776	5,735	2,901	-	200	-	-	-	-	-	-	-	-	-	-	-	-
MAY	-	41,087	12,608	404	200	290	-	-	-	-	-	-	-	-	-	-	-	-
JUN	-	16,716	55,819	79,584	78,862	49,857	31,049	17,555	33,912	30,745	66,104	31,975	46,307	63,293	76,395	61,505	27,848	-
JUL	11	34	18,435	37,145	44,660	38,083	23,072	15,245	27,358	33,655	-	31,978	14,124	62,889	11,142	52,154	45,452	35,221
AUG	7	717	94	252	8,264	17,515	11,296	6,376	4,392	6,166	98	4,715	10	5,568	1,210	11,823	7,306	22,539
SEP	4,514	10,482	19,383	-	1,971	1,447	-	1,966	703	-	-	885	-	7,816	1,179	9,587	2,046	5,449
OCT	95	240	72	503	25	-	-	-	-	-	-	-	-	-	-	-	-	-
NOV	-	-	-	31	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DEC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Offshore Total	**4,627**	**74,179**	**112,252**	**122,430**	**135,420**	**107,392**	**65,417**	**41,142**	**66,365**	**70,566**	**66,202**	**69,553**	**60,441**	**139,566**	**89,926**	**135,069**	**82,652**	**63,209**

Terminal

MONTH	YEAR																	
	2001	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
JAN	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FEB	-	-	-	283	433	-	-	-	-	-	-	-	-	-	-	-	-	-
MAR	-	16	4	1,232	1,111	-	-	-	-	-	-	-	-	-	-	-	-	-
APR	-	4,968	6,078	2,480	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MAY	-	13,792	1,810	-	200	100	-	-	-	-	-	-	-	-	-	-	-	-
JUN	907	4,784	8,360	19,954	7,046	4,352	2,882	1,521	2,737	5,343	4,843	2,813	4,613	8,160	12,396	4,844	5,466	-
JUL	904	64	3,684	11,299	7,147	9,387	4,637	1,530	1,285	7,612	-	5,809	4,484	13,945	4,087	7,429	7,472	2,699
AUG	-	640	328	6	2,117	5,880	4,351	1,181	383	897	-	1,931	5	2,414	192	1,039	1,620	3,108
SEP	3,160	5,039	4,642	-	1,795	2,181	-	482	595	26	-	416	-	8,138	109	1,068	532	1,260
OCT	158	-	-	872	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NOV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DEC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Term. Total	**5,129**	**29,303**	**24,906**	**36,126**	**19,849**	**21,900**	**11,870**	**4,714**	**5,000**	**13,878**	**4,843**	**10,969**	**9,102**	**32,657**	**16,784**	**14,380**	**15,090**	**7,067**
Area F Total	**9,756**	**103,482**	**137,158**	**158,556**	**155,269**	**129,292**	**77,287**	**45,856**	**71,365**	**84,444**	**71,045**	**80,522**	**69,543**	**172,223**	**106,710**	**149,449**	**97,742**	**70,276**

Table G - 2. Chinook released from the Area F (Northern Troll) fishery, 2001 to 2018, by location and total.

Offshore

MONTH	YEAR																	
	2001	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
JAN	-	-	-		8	-	-	-	-	-	-	-	-	-	-	-	-	-
FEB	-	-	-	7	35	-	-	-	-	-	-	-	-	-	-	-	-	-
MAR	-	1	-	18	22	-	-	-	-	-	-	-	-	-	-	-	-	-
APR	-	21	54	69	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MAY	-	705	156	2	8	6	-	-	-	-	-	-	-	-	-	-	-	-
JUN	-	518	641	911	3,974	1,102	1,760	976	1,673	1,715	2,664	2,218	3,740	2,452	4,901	3,027	2,727	-
JUL	399	-	926	1,615	3,782	2,794	3,887	1,016	2,542	3,909	18,252	7,036	17,459	5,232	27,276	7,219	13,341	10,496
AUG	528	4,887	8,507	21,767	7,828	2,925	3,696	1,348	3,235	3,578	7,051	2,233	9,028	5,450	11,756	3,851	7,880	8,077
SEP	83	979	174	596	694	155	299	332	247	141	216	168	573	561	629	916	1,411	770
OCT	1	22	-	84	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NOV	-	-	-	22	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DEC	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-
Offshore Total	**1,011**	**7,133**	**10,458**	**25,091**	**16,351**	**6,982**	**9,642**	**3,672**	**7,697**	**9,343**	**28,183**	**11,655**	**30,800**	**13,695**	**44,562**	**15,013**	**25,359**	**19,343**

Terminal

MONTH	YEAR																	
	2001	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
JAN	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FEB	-	-	-	10	21	-	-	-	-	-	-	-	-	-	-	-	-	-
MAR	-	-	-	39	15	-	-	-	-	-	-	-	-	-	-	-	-	-
APR	-	53	65	77	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MAY	-	269	29	-	9	-	-	-	-	-	-	-	-	-	-	-	-	-
JUN	62	149	123	241	421	77	192	120	239	534	337	141	283	539	1,111	389	951	-
JUL	1,069	-	73	139	320	501	953	357	211	1,010	4,241	1,507	3,308	1,177	2,792	1,230	2,070	877
AUG	604	1,026	3,983	9,312	3,333	790	1,864	1,253	2,013	1,114	3,088	879	6,986	4,157	1,344	1,874	5,486	1,703
SEP	1,219	415	197	1,580	1,563	82	75	127	1,463	1,337	245	1,014	2,338	1,048	65	455	289	212
OCT	-	-	-	36	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NOV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DEC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Term. Total	**2,954**	**1,912**	**4,470**	**11,434**	**5,682**	**1,450**	**3,084**	**1,857**	**3,926**	**3,995**	**7,911**	**3,541**	**12,915**	**6,921**	**5,312**	**3,948**	**8,796**	**2,792**
Area F Total	**3,965**	**9,045**	**14,928**	**36,525**	**22,033**	**8,432**	**12,726**	**5,529**	**11,623**	**13,338**	**36,094**	**15,196**	**43,715**	**20,616**	**49,874**	**18,961**	**34,155**	**22,135**

Table G - 3. Total effort (boat-days) in the Area F (Northern Troll) fishery, 2001 to 2018, by location and total.

Offshore

MONTH	YEAR																	
	2001	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
JAN	-	-	-	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-
FEB	-	1	1	23	42	-	-	-	-	-	-	-	-	-	-	-	-	-
MAR	-	13	16	105	92	-	-	-	-	-	-	-	-	-	-	-	-	-
APR	-	209	288	173	-	4	-	-	-	-	-	-	-	-	-	-	-	-
MAY	-	725	497	10	3	9	-	-	-	-	-	-	-	-	-	-	-	-
JUN	-	355	849	1,459	1,592	1,653	616	709	1,165	1,114	947	1,111	909	949	737	895	768	-
JUL	258	2	477	584	1,222	1,498	1,560	1,420	1,791	1,594	1,227	2,332	1,580	1,833	1,566	1,880	2,119	1,792
AUG	323	970	1,162	1,344	1,368	1,146	1,144	796	1,059	826	680	613	739	603	799	840	816	1,409
SEP	390	568	336	89	204	104	75	272	171	108	53	106	77	258	104	443	332	423
OCT	15	11	12	34	3	-	-	-	-	-	-	-	-	-	-	-	-	-
NOV	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DEC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Offshore Total	**986**	**2,854**	**3,638**	**3,824**	**4,530**	**4,414**	**3,395**	**3,197**	**4,186**	**3,642**	**2,907**	**4,162**	**3,305**	**3,643**	**3,205**	**4,058**	**4,035**	**3,624**

Terminal

MONTH	**YEAR**																	
	2001	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
JAN	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FEB	-	-	-	17	24	-	-	-	-	-	-	-	-	-	-	-	-	-
MAR	-	3	13	101	95	-	-	-	-	-	-	-	-	-	-	-	-	-
APR	-	284	256	143	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MAY	-	364	131	-	4	1	-	-	-	-	-	-	-	-	-	-	-	-
JUN	201	131	139	317	146	182	79	114	154	237	102	116	98	161	141	111	190	-
JUL	265	13	64	145	178	390	372	332	220	518	248	572	398	538	212	448	432	209
AUG	86	271	667	740	543	512	566	533	437	310	308	331	883	413	97	394	608	419
SEP	363	249	147	218	268	166	40	122	327	251	35	282	451	386	14	208	104	75
OCT	13	-	1	40	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NOV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DEC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Term. Total	**928**	**1,315**	**1,418**	**1,721**	**1,258**	**1,251**	**1,057**	**1,100**	**1,138**	**1,316**	**693**	**1,302**	**1,830**	**1,498**	**465**	**1,162**	**1,333**	**703**
Area F Total	**1,914**	**4,169**	**5,056**	**5,545**	**5,788**	**5,665**	**4,452**	**4,297**	**5,324**	**4,958**	**3,600**	**5,462**	**5,135**	**5,141**	**3,670**	**5,220**	**5,369**	**4,327**

Table G - 4. Landed catch of Chinook in the Area G (WCVI Troll) fishery, 2001 to 2018, by location and total.

Offshore

MONTH	**YEAR**																	
	2001	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
JAN	440	470	253	411	727	1,108	4,941	1,414	2,943	-	-	87	796	-	67	1	-	5
FEB	692	-	139	1,869	4,803	4,487	1,977	1,690	1,388	-	1,661	379	346	584	365	7	20	30
MAR	1,160	-	2,330	6,350	15,604	7,046	1,324	-	509	-	789	200	452	1,117	426	-	24	-
APR	7,898	24,790	31,327	50,846	56,977	20,243	5,118	1,719	3,315	7,926	8,221	10,016	1,045	13,238	3,692	6,185	3,687	-
MAY	22,945	71,347	75,613	51,042	26,409	7,051	23,685	11,430	17,983	30,953	40,437	22,120	25,522	40,084	25,854	31,676	23,160	10,534
JUN	-	22,670	25,628	-	-	20,807	25,102	15,634	12,165	23,284	34,395	-	-	-	-	-	-	-
JUL	-	2	-	-	-	-	-	-	-	-	15,620	-	-	26,494	-	-	8,169	-
AUG	4	5,064	-	-	-	912	-	9,099	9,630	11,642	21,283	4,280	-	10,002	13,953	7,574	6,758	5,063
SEP	18,697	3,845	-	31,951	16,690	24,098	5,982	45,157	-	3,980	-	17,264	2,531	15,151	7,341	2,390	4,279	2,572
OCT	3,235	11,924	17,905	11,256	12,198	16,026	3,137	1,882	-	-	-	3,344	2,358	213	178	-	-	-
NOV	49	296	2,955	7,951	2,156	1,099	-	1,209	-	-	57	90	28	18	13	-	-	-
DEC	110	133	656	67	1,627	548	-	1,032	-	-	129	119	8	-	1	-	-	-
Offshore Total	**55,230**	**140,541**	**156,806**	**161,743**	**137,191**	**103,425**	**71,266**	**90,266**	**47,933**	**77,785**	**122,592**	**57,899**	**33,086**	**106,901**	**51,890**	**47,833**	**46,097**	**18,204**

Terminal

MONTH	YEAR																	
	2001	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
JAN	541	1,869	1,634	1,150	1,135	360	499	220	451	-	-	42	222	49	119	50	72	69
FEB	310	-	1,338	968	847	667	610	259	152	-	188	163	12	2	247	335	256	111
MAR	127	-	180	1,693	643	837	932	-	77	-	86	43	51	305	305	315	334	297
APR	26	63	395	335	86	318	211	27	301	627	464	477	159	107	149	271	378	-
MAY	366	23	765	444	246	27	284	74	79	343	879	214	144	252	1,551	123	397	475
JUN	2	67	371	-	-	-	640	310	-	368	-	-	-	-	-	-	-	-
JUL	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AUG	-	-	-	290	184	-	-	-	-	-	-	-	-	-	-	-	-	-
SEP	-	-	6	94	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NOV	-	35	-	106	-	91	-	-	-	-	-	140	-	38	-	-	-	-
DEC	738	316	69	67	62	222	-	75	-	-	59	193	7	-	-	-	-	-
Term. Total	**2,111**	**2,374**	**4,858**	**5,147**	**3,203**	**2,522**	**3,176**	**965**	**1,060**	**1,338**	**1,676**	**1,272**	**605**	**753**	**2,371**	**1,094**	**1,437**	**952**
Area G Total	**57,341**	**142,915**	**161,664**	**166,890**	**140,394**	**105,947**	**74,442**	**91,231**	**48,993**	**79,123**	**124,268**	**59,171**	**33,691**	**107,654**	**54,261**	**48,927**	**47,534**	**19,156**

Table G - 5. Chinook released from the Area G (WCVI Troll) fishery, 2001 to 2018, by location and total.

Offshore

MONTH	YEAR																	
	2001	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
JAN	347	205	56	167	178	54	627	190	220	-	-	3	99	-	5	3	-	10
FEB	574	-	46	265	319	369	194	184	80	-	54	26	36	28	130	1	7	30
MAR	256	-	212	333	1,497	190	109	-	9	-	23	1	17	7	48	-	3	-
APR	1,878	1,927	2,718	2,147	2,826	573	242	38	66	235	168	163	18	224	216	516	514	-
MAY	4,735	5,748	8,133	2,871	1,738	343	1,540	146	1,133	1,330	1,166	754	2,837	2,831	997	866	2,655	715
JUN	-	2,712	1,726	-	-	1,300	1,218	348	1,169	2,254	3,093	-	-	-	-	-	-	-
JUL	673	3,960	-	-	-	-	-	-	-	-	477	-	-	1,095	-	-	237	-
AUG	1,505	4,312	5	-	-	3,845	-	174	801	537	687	236	-	354	156	298	387	648
SEP	3,363	418	65	1,119	1,400	2,372	1,945	4,583	470	797	562	4,008	150	1,884	412	850	933	669
OCT	1,061	1,098	1,941	978	1,032	1,807	1,464	758	-	-	-	994	282	92	22	-	-	-
NOV	56	0	474	1,353	541	168	-	157	-	-	21	23	22	17	-	-	-	-
DEC	100	120	125	4	161	92	-	109	-	-	19	37	7	-	7	-	-	-
Offshore Total	**14,548**	**20,570**	**15,501**	**9,237**	**9,692**	**11,113**	**7,339**	**6,687**	**3,948**	**5,153**	**6,270**	**6,245**	**3,468**	**6,532**	**1,993**	**2,534**	**4,736**	**2,072**

Terminal

MONTH	**YEAR**																	
	2001	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
JAN	782	557	588	328	259	77	144	60	131	-	-	18	66	31	28	101	35	31
FEB	388	-	289	255	194	154	255	94	54	-	7	40	11	-	57	166	135	100
MAR	74	-	62	255	69	104	273	-	4	-	15	15	7	83	84	150	129	157
APR	9	1	32	32	-	54	51	3	21	35	6	42	22	6	16	50	218	-
MAY	79	1	89	6	36	-	53	-	11	19	18	6	11	34	162	53	221	75
JUN	7	21	26	-	-	-	53	14	-	60	-	-	-	-	-	-	-	-
JUL	11	25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AUG	-	-	-	32	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SEP	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NOV	-	30	-	10	-	35	-	-	-	-	3	42	2	17	-	-	-	-
DEC	303	183	77	17	11	70	-	27	-	-	11	60	16	-	-	-	-	-
Term. Total	**1,653**	**818**	**1,164**	**936**	**569**	**494**	**829**	**198**	**221**	**114**	**60**	**223**	**135**	**171**	**347**	**520**	**738**	**363**
Area G Total	**16,201**	**21,388**	**16,665**	**10,173**	**10,261**	**11,607**	**8,168**	**6,885**	**4,169**	**5,267**	**6,330**	**6,468**	**3,603**	**6,703**	**2,340**	**3,054**	**5,474**	**2,435**

Table G - 6. Total effort (boat-days) in the Area G (WCVI Troll) fishery, 2001 to 2018, by location and total.

Offshore

MONTH	**YEAR**																	
	2001	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
JAN	19	22	14	35	38	52	225	157	237	-	-	9	53	-	10	1	-	4
FEB	53	-	11	124	225	342	146	182	237	-	98	27	37	19	31	1	8	9
MAR	80	-	129	307	917	621	108	-	105	-	47	24	53	36	34	-	3	-
APR	273	626	1,027	1,257	1,840	1,130	478	237	283	232	223	249	171	396	268	353	261	-
MAY	938	1,752	1,658	618	526	333	1,197	957	836	982	1,021	742	689	1,494	1,376	1,404	901	1,056
JUN	-	591	214	-	-	438	805	629	488	451	502	-	-	-	-	-	-	-
JUL	248	526	-	-	-	-	-	-	-	-	300	-	-	419	-	-	278	-
AUG	331	534	1	-	-	448	-	170	208	215	265	52		202	98	435	281	270
SEP	227	174	14	343	703	751	258	783	5	107	4	339	118	536	252	180	213	118
OCT	115	170	206	182	284	198	108	54	-	-	-	39	47	39	19	-	-	-
NOV	10	20	33	81	56	42	-	27	-	-	13	7	7	2	2	-	-	-
DEC	5	14	21	6	54	16	-	22	-	-	16	13	4	-	1	-	-	-
Offshore Total	**2,299**	**4,429**	**3,328**	**2,953**	**4,643**	**4,371**	**3,325**	**3,218**	**2,399**	**1,987**	**3,755**	**1,501**	**1,179**	**3,143**	**2,091**	**2,374**	**1,945**	**1,457**

Terminal

MONTH	YEAR																	
	2001	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
JAN	35	88	65	97	77	39	46	26	80	-	-	12	37	15	11	16	17	9
FEB	19	-	21	80	77	65	68	28	28	-	19	24	5	1	15	25	22	0
MAR	5	-	27	113	39	109	85	-	21	-	16	9	11	24	28	17	25	30
APR	3	2	20	31	4	29	39	17	39	55	28	28	17	12	8	31	30	-
MAY	22	2	20	6	3	2	26	11	12	27	32	15	18	17	125	32	41	39
JUN	105	227	8	-	-	-	23	14	-	13	-	-	-	-	-	-	-	-
JUL	101	278	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AUG	-	-	5	42	36	-	-	-	-	-	-	-	-	-	-	-	-	-
SEP	-	5	11	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NOV	-	11	-	4	-	7	-	-	-	-	2	15	6	12	3	-	-	-
DEC	28	33	18	8	7	14	-	4	-	-	15	19	9	-	-	-	-	-
Term. Total	**318**	**646**	**195**	**386**	**243**	**265**	**287**	**100**	**180**	**95**	**112**	**122**	**103**	**81**	**190**	**121**	**135**	**98**
Area G Total	**2,618**	**5,075**	**3,523**	**3,339**	**4,886**	**4,636**	**3,612**	**3,318**	**2,579**	**2,082**	**3,867**	**1,623**	**1,282**	**3,224**	**2,281**	**2,495**	**2,080**	**1,555**

Table G - 7. Landed catch of Chinook in the Area H (Georgia Strait Troll) fishery, 2001 to 2018, by location and total.

JST

MONTH	YEAR																	
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
APR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MAY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
JUL	468	112	91	428	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AUG	21	314	827	200	-	5	-	-	-	-	-	-	-	2	-	-	-	-
SEP	33	-	37	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OCT	13	20	150	13	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NOV	-	72	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
JST Total	**535**	**518**	**1,105**	**641**	**-**	**5**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**-**	**-**	**-**

GS

MONTH	YEAR																	
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
FEB	-	-	-	72	-	-	-	-	-	-	-	-	-	-	-	-	-	-
JUL	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AUG	-	112	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SEP	-	-	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OCT	-	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NOV	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GS Total	**10**	**114**	**9**	**72**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

Fraser

MONTH	YEAR																	
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
FEB	-	-	-	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-
JUL	29	-	2	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AUG	20	-	7	-	-	-	-	-	-	-	45	-	-	-	-	-	-	-
SEP	-	-	-	17	-	-	-	-	-	-	7	-	-	-	-	-	-	-
OCT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NOV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Fraser Total	**49**	-	**9**	**29**	-	-	-	-	-	-	**52**	-	-	-	-	-	-	-
Area H Total	**594**	**632**	**1,123**	**742**	-	**5**	-	-	-	-	**52**	-	-	**2**	-	-	-	-

Table G - 8. Chinook released from the Area H (Georgia Strait Troll) fishery, 2001 to 2018, by location and total.

JST

MONTH	**YEAR**																	
	2001	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
APR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MAY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
JUL	278	78	69	245	-	-	-	6	-	-	-	-	-	-	-	-	-	-
AUG	4	208	537	74	-	513	-	-	11	580	137	-	-	730	-	-	-	-
SEP	97	-	16	1	169	-	24	1	46	108	32	4	-	130	1	5	-	-
OCT	91	19	103	73	162	97	261	35	72	2	44	18	13	5	18	37	33	-
NOV	-	2	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
JST Total	**470**	**307**	**725**	**393**	**331**	**610**	**286**	**42**	**129**	**690**	**213**	**22**	**13**	**865**	**19**	**42**	**33**	**-**

GS

MONTH	**YEAR**																	
	2001	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
FEB	-	-	-	77	-	-	-	-	-	-	-	-	-	-	-	-	-	-
JUL	1	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AUG	-	68	-	-	-	2	-	-		9	-	-	-	-	-	-	-	-
SEP	-	-	1	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-
OCT	2	2		7	9	1	1	-	-	-	-	-	-	-	-	-	-	-
NOV	-	-	-	-	-	-	6	-	-	-	-	-	-	-	-	-	-	-
GS Total	**3**	**70**	**1**	**86**	**9**	**3**	**7**	**-**	**3**	**9**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

Fraser

MONTH	YEAR																	
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
FEB	-	-	-	19	-	-	-	-	-	-	-	-	-	-	-	-	-	-
JUL	14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AUG	27	-	7	1	-	6	-	-	-	25	11	-	-	22	-	-	-	-
SEP	-	-	-	2	-	-	-	-	3	68	15	-	-	203	-	-	-	-
OCT	3	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
NOV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Fraser Total	**44**	**-**	**7**	**22**	**1**	**6**	**-**	**-**	**3**	**93**	**26**	**-**	**-**	**225**	**-**	**-**	**-**	**-**
Area H Total	**517**	**377**	**733**	**501**	**341**	**619**	**293**	**42**	**135**	**792**	**239**	**22**	**13**	**1,090**	**19**	**42**	**33**	**-**

Table G - 9. Total effort (boat-days) in the Area H (Georgia Strait Troll) fishery, 2001 to 2018, by location and total.

JST

MONTH	YEAR																	
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
APR	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MAY	-	-	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-
JUL	545	170	125	606	-	-	-	20	-	-	-	-	-	-	-	-	-	-
AUG	41	543	1,226	298	-	811	-	-	12	729	178	-	-	541	-	-	-	-
SEP	134	-	74	2	285	-	29	2	77	206	32	14	5	118	6	4	4	-
OCT	140	223	501	477	438	549	427	324	339	20	333	234	198	30	243	243	240	-
NOV	-	12	-	-	-	-	6	2	2	-	-	-	1	2	1	-	-	-
JST Total	**860**	**948**	**1,926**	**1,389**	**723**	**1,360**	**462**	**348**	**430**	**955**	**543**	**248**	**204**	**691**	**250**	**247**	**244**	**-**

GS

MONTH	YEAR																	
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
FEB	-	-	-	36	-	-	-		-		-	-	-	-	-	-	-	-
JUL	5		2	2	-	-	-	9	-		-	-	-	-	-	-	-	-
AUG	-	301	6	-	-	7		-	-	28	-	-	-	-	-	-	-	-
SEP	-	-	14	-	-		2	-	3	2	-	-	-	-	-	-	-	-
OCT	36	33	14	30	27	17	3	-	1	-	-	-	-	-	-	-	1	-
NOV	20	1	3	5	2		1	-		-	-	-	-	-	2	-	-	-
GS Total	**61**	**335**	**39**	**73**	**29**	**24**	**6**	**9**	**4**	**30**	**-**	**-**	**-**	**-**	**2**	**-**	**1**	**-**

Fraser

MONTH	YEAR																	
	2001	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
FEB	-	-	-	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-
JUL	38	-	1	8	-	-	-	2	-	-	-	-	-	-	-	-	-	-
AUG	104	-	9	2	-	7	-	-	-	88	18	-	-	53	-	-	-	-
SEP	-	-	-	14	-	-	-	-	2	230	17	-	-	298	-	-	-	-
OCT	4	19	3	-	1	-	5	2	1	1	-	-	-	-	1	-	-	-
NOV	-	3	2	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-
Fraser Total	**146**	**22**	**15**	**31**	**2**	**8**	**5**	**4**	**3**	**319**	**35**	**-**	**-**	**351**	**1**	**-**	**-**	**-**
Area G Total	**1,067**	**1,305**	**1,980**	**1,493**	**754**	**1,392**	**473**	**361**	**437**	**1,304**	**578**	**248**	**204**	**1,042**	**253**	**247**	**245**	**-**

Table G - 10. Landed catch of Chinook, Area B seine licence, Fraser fishery, 2001 to 2018.

MONTH	**YEAR**																	
	2001	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
JUL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AUG	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SEP	-	-	-	-	-	-	-	-	-	3	63	-	75	20	-	-	-	-
OCT	-	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-
Area B Total	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**63**	**-**	**75**	**20**	**-**	**-**	**-**	**-**

Table G - 11. Chinook released from the Area B Fraser seine fishery, 2001 to 2018.

MONTH	**YEAR**																	
	2001	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
JUL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AUG	-	134	-	-	-	-	-	-	-	-	-	-	-	-	15	-	-	-
SEP	-	-	-	-	-	-	-	-	91	85	4,396	-	4,127	84	29	-	-	43
OCT	-	-	-	-	-	-	-	-	-	-	-	2	4	-	2	-	-	-
Area B Total	**-**	**134**	**-**	**-**	**-**	**-**	**-**	**-**	**91**	**85**	**4,396**	**2**	**4,131**	**84**	**46**	**-**	**-**	**43**

Table G - 12. Total effort (boat-days), Area B seine licence, Fraser fishery, 2001 to 2018.

MONTH	**YEAR**																	
	2001	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
JUL	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AUG	-	2	-	-	-	-	-	-	-	-	-	-	6	-	6	-	-	-
SEP	-	-	-	-	-	-	-	-	20	100	138	-	160	190	2	-	-	25
OCT	-	-	-	-	-	-	-	-	-	-	-	3	14	2	16	9	-	-
Area B Total	-	**2**	**-**	**1**	-	-	-	-	**20**	**100**	**138**	**3**	**180**	**192**	**24**	**9**	-	**25**

Table G - 13. Landed catch of Chinook, Area E gillnet licence, Fraser fishery, 2001 to 2018.

MONTH	YEAR																	
	2001	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
JUL	-	-	-	2,402	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AUG	98	4,230	5,713	5,122	-	2,782	-	-	-	4,456	3,299	-	-	3,815	-	-	-	24
SEP	-	-	-	-	54	638	-	-	-	1,929	2,042	-	-	2,697	-	-	-	-
OCT	-	79	53	150	66	22	88	-	33	-	-	1	5	1	4	3	-	-
NOV	6	5	35	37	19	10	-	-	-	-	174	-	-	-	-	-	-	-
Area E Total	**104**	**4,314**	**5,801**	**7,711**	**139**	**3,452**	**88**	**-**	**33**	**6,385**	**5,515**	**1**	**5**	**6,513**	**4**	**3**	**-**	**24**

Table G - 14. Chinook released from the Area E gillnet, Fraser fishery, 2001 to 2018.

MONTH	YEAR																	
	2001	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
JUL	-	-	-	2,402	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AUG	98	4,230	5,713	5,122	-	2,782	-	-	-	4,456	3,299	-	-	3,815	-	-	-	2,402
SEP	-	-	-	-	54	638	-	-	-	1,929	2,042	-	-	2,697	-	-	-	-
OCT	-	79	53	150	66	22	88	-	33	-	-	1	5	1	4	3	-	-
NOV	6	5	35	37	19	10	-	-	-	-	174	-	-	-	-	-	-	-
Area E Total	**104**	**4,314**	**5,801**	**7,711**	**139**	**3,452**	**88**	**-**	**33**	**6,385**	**5,515**	**1**	**5**	**6,513**	**4**	**3**	**-**	**2,402**

Table G - 15. Total effort (boat-days) Area E gillnet licence, Fraser Fishery, 2001 to 2018.

MONTH	YEAR																	
	2001	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
JUL	-	-	-	371	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AUG	49	1,542	807	744	-	1,045	-	-	-	2,072	1,094	-	-	1,147	-	-	-	1,102
SEP	-	23	-	-	27	303	-	-	-	865	28	-	-	1,448	-	-	-	-
OCT	-	155	152	126	159	373	227	204	200	-	-	155	173	428	407	377	329	-
NOV	277	59	206	135	151	88	191	-	1	-	296	-	-	-	-	-	-	-
Area E Total	**326**	**1,779**	**1,165**	**1,376**	**337**	**1,809**	**418**	**204**	**201**	**2,937**	**1,418**	**155**	**173**	**3,023**	**407**	**377**	**329**	**1,102**

APPENDIX H: CWT RECOVERY DATA

Table H - 1. Estimated marine CWT recoveries of all tagged Spring 4_2 Chinook.

Recovery	Recovery Location							
Year	AK	NBC	WCVI	JDF	JST	GST	US South	Total
1978	-	-	-	-	-	2	-	2
1979	-	12	7	-	-	13	-	31
1980	-	-	7	4	-	4	-	15
1981	-	4	-	-	-	64	4	71
1982	-	29	4	-	4	-	-	37
1983	-	-	-	-	-	2	-	2
1984	4	9	24	7	5	3	4	56
1985	3	-	12	12	-	2	2	31
1986	-	3	15	14	-	6	-	37
1987	-	11	11	14	10	6	8	60
1988	-	-	8	4	-	53	27	92
1989	-	23	22	104	-	74	98	320
1990	-	-	19	8	2	-	26	57
1991	5	9	54	72	7	11	63	222
1992	-	70	54	37	-	30	73	264
1993	-	57	104	61	13	91	129	454
1994	-	16	103	103	-	18	27	267
1995	-	31	54	52	-	22	45	204
1996	-	3	4	7	-	-	3	17
1997	-	3	-	11	-	-	12	26
1998	-	12	-	5	-	5	-	22
1999	-	-	-	12	-	4	16	32
2000	-	27	-	59	-	13	2	100
2001	2	9	5	85	-	33	22	155
2002	3	34	19	18	-	8	21	103
2003	2	39	33	55	-	16	8	152
2004	-	15	22	19	-	9	6	70
2005	-	4	15	14	-	10	2	45
2006	-	6	7	11	-	-	4	29
2007	-	-	8	-	-	-	2	11
2008	-	10	-	8	-	13	16	47
2009	-	-	-	21	-	-	12	34
2010	6	40	2	12	9	-	24	94
2011	-	8	3	16	4	2	22	56
2012	-	14	-	9	6	-	53	82
2013	-	15	3	48	3	9	52	131
2014	-	-	8	4		-	6	18
2015	-	9	4	42	5	-	22	81
2016	2	19	10	71	4	-	15	120
2017	-	7	11	21	9	8	29	85
2018	-	13	9	22	7	-	-	51

Table H - 2. Estimated marine CWT recoveries of all tagged Spring 5_2 Chinook.

Recovery	Recovery Location							
Year	AK	NBC	WCVI	JDF	JST	GST	US South	Total
1976	-	-	-	-	-	-	2	2
1978	-	-	5	-	4	3	-	12
1979	-	-		-	3	9	-	12
1980	-	-	11	-	-	-	-	11
1981	7	-	-	-	-	-	3	10
1982	-	8	-	-	-	-	-	8
1983	5	15	-	2	-	-	-	22
1984	-	5	3	-	-	-	-	9
1985	0	-	-	-	-	-	-	13
1986	-	16	14	-	-	2	9	41
1987	33	35	25	33	12	15	12	165
1988	38	80	55	11	3	56	34	278
1989	18	88	35	70	5	46	16	278
1990	66	76	21	21	-	9	11	203
1991	31	121	37	35	-	26	35	285
1992	31	100	44	21	11	23	20	250
1993	26	128	74	44	2	37	66	377
1994	27	92	41	56	-	31	4	251
1995	13	48	76	47	-	16	19	218
1996	7	3	2	19	-	-	5	36
1997	-	3	3	20	-	-	8	33
1998	2	-	-	12	-	5	-	18
1999	-	-	-	-	-	8	10	18
2000	-	-	-	19	-		3	22
2001	-	2	7	34	-	6	1	51
2002	-	15	16	15	-	-	5	51
2003	-	8	9	18	-	-	-	35
2004	-	-	-	-	-	-	-	-
2005	-	8	-	5	-	3	-	16
2006	-	-	7	4	-	2	1	15
2007	-	-	-	3	-	-	7	10
2008	3	-	-	15	-	-	-	18
2009	-	-	-	6	-	-	-	6

Table H - 3. Estimated marine CWT recoveries of all tagged Summer 5_2 Chinook.

Recovery Year	Recovery Location							
	AK	NBC	WCVI	JDF	JST	GST	US South	Total
1979	-	13	-	-	-	-	-	13
1980	-	-	-	4	-	-	4	8
1981	-	6	14	-	2	24	4	49
1982	5	8	27	7	-	-	18	64
1983	6	11	4	6	-	-	-	27
1984	2	-	11	6	-	3	12	34
1985	1	-	-	5	5	9	7	29
1986	10	38	31	-	-	11	5	94
1987	15	49	76	4	3	5	9	160
1988	19	54	141	5	7	4	33	263
1989	53	128	68	29	8	-	52	338
1990	51	260	117	20	5	15	47	514
1991	75	250	77	14	-	11	67	495
1992	17	218	184	30	8	3	46	507
1993	60	308	318	51	23	15	118	894
1994	14	107	207	66	-	18	35	446
1995	44	163	381	17	3	14	41	663
1996	35	-	2	21	-	5	2	67
1997	8	18	29	13	-	-	13	81
1998	29	62	-	5	-	16	11	123
1999	9	5	-	8	-	4	2	27
2018	-	-	7		-	-	-	7

APPENDIX I: CTC EXPLOITATION ANALYSIS RESULTS

Table I - 1. Estimated exploitation rate (total mortality) of the Nicola CWT Indicator Stock (Fraser Spring 4_2), CTC ERA.

	Alaska	North/Central BC			WCVI			Southern BC				S. US	Fraser River			
YEAR	AABM	AABM		ISBM	AABM		ISBM	ISBM				ISBM	ISBM			TOTAL
	All gear	Troll	Sport	All gear	Troll	Sport	All gear	JDFSPT	JSTSP	GSTSP	Other	All gear	Comm. GN	FRSPT	FN NET	
1988	0.0%	0.0%	0.0%	0.0%	2.1%	0.0%	0.0%	0.0%	0.0%	22.9%	1.0%	8.3%	6.8%	9.9%	0.0%	51.0%
1989	0.0%	0.5%	1.1%	0.2%	1.1%	0.0%	0.0%	7.4%	0.0%	5.0%	0.3%	4.0%	12.4%	2.4%	0.0%	34.3%
1990	0.0%	0.0%	0.0%	0.0%	2.5%	0.0%	0.0%	2.1%	0.0%	0.0%	0.0%	7.1%	0.0%	13.9%	14.2%	39.9%
1991	0.7%	0.0%	0.2%	0.2%	4.5%	0.0%	0.0%	4.5%	0.4%	0.4%	0.9%	2.8%	0.0%	7.3%	13.1%	35.0%
1992	0.0%	5.5%	0.0%	2.7%	5.5%	0.0%	0.0%	4.7%	1.8%	1.8%	0.9%	12.7%	0.0%	7.3%	6.3%	49.2%
1993	0.0%	3.2%	0.0%	0.2%	5.6%	1.2%	0.0%	1.9%	1.7%	3.3%	1.2%	5.2%	0.0%	5.2%	9.4%	38.2%
1994	0.0%	0.3%	0.0%	0.2%	4.0%	0.4%	0.0%	2.7%	0.0%	0.8%	0.0%	0.3%	0.0%	8.0%	1.3%	18.1%
1995	0.0%	0.3%	0.6%	0.0%	1.7%	0.5%	0.0%	1.5%	0.2%	1.3%	1.3%	0.5%	0.0%	3.6%	3.4%	15.0%
1996	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	18.8%	18.8%
1997	0.0%	0.0%	0.0%	0.9%	0.0%	0.0%	0.0%	4.9%	0.0%	0.0%	3.1%	11.2%	0.0%	6.3%	1.8%	28.1%
1998	0.0%	0.0%	4.8%	0.0%	0.0%	0.0%	0.0%	1.2%	0.0%	1.7%	1.0%	0.0%	0.0%	17.0%	10.0%	35.6%
1999	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.5%	0.0%	0.2%	0.0%	0.8%	0.0%	2.2%	6.9%	10.6%
2000	0.0%	0.0%	2.1%	0.0%	0.0%	0.0%	0.0%	3.6%	0.0%	0.8%	0.0%	0.0%	0.0%	5.3%	8.0%	19.8%
2001	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%	3.4%	0.4%	0.3%	0.0%	0.8%	0.0%	4.4%	6.7%	16.1%
2002	0.0%	1.5%	0.3%	0.2%	0.6%	0.0%	0.0%	0.8%	0.0%	0.3%	0.0%	1.0%	0.0%	2.5%	4.0%	11.2%
2003	0.2%	2.8%	0.0%	0.0%	0.9%	0.6%	0.0%	1.8%	0.0%	0.9%	0.0%	0.6%	0.0%	6.7%	0.6%	15.0%
2004	0.0%	2.3%	0.0%	0.0%	2.0%	0.0%	0.0%	1.4%	0.0%	2.5%	0.0%	0.9%	0.0%	0.0%	23.6%	32.7%
2005	0.0%	1.5%	0.0%	0.0%	3.9%	0.0%	0.0%	3.6%	0.0%	3.1%	0.0%	0.5%	0.0%	14.8%	14.5%	41.9%
2006	0.0%	1.6%	0.0%	0.0%	1.6%	0.0%	0.0%	2.8%	0.0%	0.0%	0.0%	1.2%	0.0%	9.5%	13.9%	30.6%

	Alaska	North/Central BC			WCVI			Southern BC				S. US	Fraser River			
YEAR	AABM	AABM		ISBM	AABM		ISBM	ISBM				ISBM	ISBM			TOTAL
	All gear	Troll	Sport	All gear	Troll	Sport	All gear	JDFSPT	JSTSP	GSTSP	Other	All gear	Comm. GN	FRSPT	FN NET	
2007	0.0%	0.0%	0.0%	0.0%	6.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.3%	0.0%	21.7%	31.2%	60.5%
2008	0.0%	1.4%	0.6%	0.0%	0.0%	0.0%	0.0%	1.4%	0.0%	2.6%	0.0%	3.0%	0.0%	3.5%	11.4%	24.0%
2009	0.0%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	8.2%	0.0%	0.0%	0.0%	7.2%	0.0%	20.1%	18.8%	54.6%
2010	0.4%	1.5%	0.2%	0.0%	0.0%	0.1%	0.0%	0.6%	0.7%	0.5%	0.0%	1.2%	0.0%	0.0%	4.6%	9.8%
2011	0.0%	0.9%	0.0%	0.0%	0.0%	0.4%	0.0%	2.5%	0.7%	1.2%	0.0%	3.8%	0.4%	2.5%	3.8%	16.3%
2012	0.0%	0.6%	0.8%	0.0%	0.0%	0.0%	0.0%	1.8%	1.2%	1.1%	0.0%	8.7%	0.6%	0.8%	17.2%	32.8%
2013	0.0%	1.2%	0.0%	0.0%	0.2%	0.0%	0.0%	3.5%	0.0%	1.2%	0.0%	4.6%	0.5%	0.0%	1.6%	13.0%
2014	0.0%	0.0%	0.0%	0.0%	2.1%	0.0%	0.0%	0.9%	0.0%	0.0%	0.0%	1.6%	1.6%	0.9%	9.2%	16.3%
2015	0.0%	0.3%	0.0%	0.0%	0.3%	0.0%	0.0%	2.6%	0.3%	0.5%	0.0%	1.9%	0.9%	0.0%	10.0%	16.9%
2016	0.2%	1.7%	0.0%	0.0%	0.9%	0.0%	0.0%	7.6%	2.1%	0.5%	0.0%	1.0%	0.7%	0.0%	10.1%	24.9%
2017	0.0%	1.0%	0.0%	0.0%	1.2%	0.0%	0.0%	1.8%	0.0%	1.6%	0.0%	1.8%	0.2%	0.0%	7.6%	15.3%
2018	0.0%	0.0%	0.0%	0.0%	1.0%	0.0%	0.0%	3.3%	0.5%	1.2%	0.0%	1.6%	1.2%	0.0%	17.1%	26.2%

Table I - 2. Estimated exploitation rate (total mortality) of the Dome CWT Indicator Stock (Fraser Spring 5_2), CTC ERA.

	Alaska	North/Central BC			WCVI			Southern BC				S. US	Fraser River			
YEAR	AABM	AABM		ISBM	AABM		ISBM	ISBM				ISBM	ISBM			TOTAL
	All gear	Troll	Sport	All gear	Troll	Sport	All gear	JDFSPT	JSTSP	GSTSP	Other	All gear	Comm. GN	FRSPT	FN NET	
1990	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	15.2%	15.2%
1991	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.6%	3.9%	3.9%	0.0%	19.4%	0.0%	3.2%	3.9%	36.8%
1992	0.0%	0.0%	0.0%	0.0%	4.4%	0.0%	0.0%	3.1%	2.5%	3.1%	3.1%	7.5%	0.0%	0.0%	45.0%	68.8%
1993	0.0%	0.0%	1.4%	0.0%	1.7%	0.0%	0.0%	2.3%	1.1%	2.6%	0.0%	1.7%	0.0%	5.7%	49.6%	66.1%
1994	0.7%	0.0%	0.0%	0.0%	2.0%	0.0%	0.0%	1.3%	0.0%	0.0%	0.0%	0.0%	0.0%	2.4%	26.3%	32.7%
1995	0.0%	1.0%	0.0%	0.0%	1.5%	0.0%	0.0%	4.2%	0.0%	1.5%	0.0%	1.9%	0.0%	3.0%	20.6%	33.7%
1996	0.0%	0.6%	0.0%	0.0%	0.3%	0.0%	0.0%	5.8%	1.1%	0.0%	0.0%	2.2%	0.0%	4.4%	36.7%	51.1%
1997	0.0%	0.0%	0.0%	0.0%	0.6%	0.3%	0.0%	6.9%	0.0%	0.0%	0.0%	2.5%	0.0%	0.0%	38.4%	48.7%
1998	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	5.7%	0.0%	2.2%	0.0%	0.0%	0.0%	7.4%	40.4%	55.7%
1999	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	17.6%	0.0%	0.0%	0.0%	11.8%	25.5%	54.9%
2000	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	18.2%	0.0%	0.0%	0.0%	3.0%	0.0%	0.0%	39.4%	60.6%
2001	0.0%	0.0%	0.0%	0.0%	2.0%	0.0%	0.0%	8.8%	0.7%	5.9%	0.0%	0.3%	0.0%	2.9%	58.3%	78.8%
2002	0.0%	14.5%	0.0%	0.0%	10.9%	0.0%	0.0%	11.6%	0.0%	0.0%	0.0%	3.6%	0.0%	0.0%	18.8%	59.4%
2003	0.0%	5.8%	0.0%	0.0%	0.0%	7.8%	0.0%	12.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	59.1%	85.1%
2004	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	20.0%	40.0%	60.0%
2005	0.0%	4.1%	0.0%	0.0%	0.0%	0.0%	0.0%	2.3%	0.0%	1.4%	0.0%	0.0%	0.0%	7.3%	59.5%	74.5%
2006	0.0%	0.0%	0.0%	0.0%	8.4%	0.0%	0.0%	4.2%	0.0%	2.1%	0.0%	1.1%	0.0%	0.0%	34.7%	50.5%
2007	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	42.1%	0.0%	0.0%	26.3%	68.4%

Table I - 3. Estimated marine survival rate for the Fraser Spring 4_2 CWT indicator stock, brood years 1985 to 2015. 2014 and 2015 brood years are incomplete therefore estimates are preliminary.

Stock Management Unit	CWT Indicator	Brood Year	MSR
Fraser Spring 4_2	Nicola	1985	3.1%
Fraser Spring 4_2	Nicola	1986	0.6%
Fraser Spring 4_2	Nicola	1987	2.6%
Fraser Spring 4_2	Nicola	1988	1.3%
Fraser Spring 4_2	Nicola	1989	2.7%
Fraser Spring 4_2	Nicola	1990	7.7%
Fraser Spring 4_2	Nicola	1991	5.5%
Fraser Spring 4_2	Nicola	1992	0.1%
Fraser Spring 4_2	Nicola	1993	0.8%
Fraser Spring 4_2	Nicola	1994	1.1%
Fraser Spring 4_2	Nicola	1995	5.8%
Fraser Spring 4_2	Nicola	1996	4.6%
Fraser Spring 4_2	Nicola	1997	6.3%
Fraser Spring 4_2	Nicola	1998	12.5%
Fraser Spring 4_2	Nicola	1999	6.3%
Fraser Spring 4_2	Nicola	2000	0.8%
Fraser Spring 4_2	Nicola	2001	1.4%
Fraser Spring 4_2	Nicola	2002	1.3%
Fraser Spring 4_2	Nicola	2003	0.2%
Fraser Spring 4_2	Nicola	2004	2.0%
Fraser Spring 4_2	Nicola	2005	0.4%
Fraser Spring 4_2	Nicola	2006	3.9%
Fraser Spring 4_2	Nicola	2007	1.1%
Fraser Spring 4_2	Nicola	2008	1.3%
Fraser Spring 4_2	Nicola	2009	1.9%
Fraser Spring 4_2	Nicola	2010	0.5%
Fraser Spring 4_2	Nicola	2011	1.8%
Fraser Spring 4_2	Nicola	2012	1.2%
Fraser Spring 4_2	Nicola	2013	1.5%
Fraser Spring 4_2	Nicola	*2014*	*1.4%*
Fraser Spring 4_2	Nicola	*2015*	*0.6%*

Table I - 4. Estimated marine survival rate for the Fraser Spring 5_2 CWT indicator stock, brood years 1986 to 2002.

Stock Management Unit	CWT Indicator	Brood Year	MSR
Fraser Spring 5_2	Dome	1986	0.4%
Fraser Spring 5_2	Dome	1987	1.1%
Fraser Spring 5_2	Dome	1988	2.0%
Fraser Spring 5_2	Dome	1989	0.8%
Fraser Spring 5_2	Dome	1990	2.5%
Fraser Spring 5_2	Dome	1991	1.7%
Fraser Spring 5_2	Dome	1992	1.8%
Fraser Spring 5_2	Dome	1993	2.4%
Fraser Spring 5_2	Dome	1994	0.1%
Fraser Spring 5_2	Dome	1995	0.3%
Fraser Spring 5_2	Dome	1996	0.9%
Fraser Spring 5_2	Dome	1997	1.4%
Fraser Spring 5_2	Dome	1998	1.3%
Fraser Spring 5_2	Dome	1999	n/a
Fraser Spring 5_2	Dome	2000	0.3%
Fraser Spring 5_2	Dome	2001	0.4%
Fraser Spring 5_2	Dome	2002	0.4%

*Table I - 5. **Observed** CWT recoveries of the Nicola CWT Indicator stock by fishery, 1988 to 2018.*

	Alaska	North/Central BC			WCVI			Southern BC				S. US	Fraser River			
YEAR	AABM	AABM		ISBM	AABM		ISBM	ISBM				ISBM	ISBM			TOTAL
	All gear	Troll	Sport	All gear	Troll	Sport	All gear	JDFSPT	JSTSP	GSTSP	Other	All gear	Comm. GN	FRSPT	FN NET	
1988	-	-	-	-	2	-	-	-	-	7	4	6	10	18	-	47
1989	-	2	2	1	3	-	-	11	-	8	1	12	64	23	-	127
1990	-	-	-	-	2	-	-	2	-	-	1	2	-	32	4	43
1991	2	-	1	2	14	-	-	11	-	3	3	16	-	90	52	194
1992	-	6	-	5	7	2	-	7	-	5	2	15	-	50	9	108
1993	-	4	-	5	15	1	-	13	-	13	4	32	-	41	44	172
1994	-	1	1	1	15	2	-	18	-	4	-	5	-	178	7	232
1995	-	1	3	1	8	2	-	14	-	8	-	5	-	46	5	93
1996	-	-	-	1	-	-	-	2	-	-	-	1	-	2	5	11
1997	-	-	-	1	-	-	-	2	-	-	-	3	-	12	1	19
1998	-	-	1	-	-	-	-	1	-	1	-	10	-	57	3	73
1999	-	-	-	-	-	-	-	2	-	1	-	8	-	8	6	25
2000	-	-	1	-	-	-	-	7	-	4	-	2	-	72	1	87
2001	-	-	-	3	2	-	-	9	-	1	-	8	-	59	11	93
2002	-	7	1	1	10	-	-	5	-	2	-	9	-	49	8	92
2003	1	7	-	-	2	1	-	3	-	5	-	3	-	60	2	84
2004	-	4	-	-	4	-	-	1	-	1	-	3	-	-	4	17
2005	1	2	-	-	3	-	-	3	-	2	-	2	-	10	-	23
2006	-	3	-	-	2	-	-	1	-	-	-	2	-	24	-	32
2007	-	-	-	-	3	-	-	-	-	-	-	1	-	7	-	11
2008	-	6	1	-	-	-	-	1	-	4	-	8	-	15	-	35

YEAR	Alaska	North/Central BC			WCVI			Southern BC				S. US	Fraser River			TOTAL
	AABM	AABM		ISBM	AABM		ISBM	ISBM				ISBM	ISBM			
	All gear	Troll	Sport	All gear	Troll	Sport	All gear	JDFSPT	JSTSP	GSTSP	Other	All gear	Comm. GN	FRSPT	FN NET	
2009	-	1	-	-	-	-	-	2	-	-	-	6	-	13	-	22
2010	2	9	1	3	-	1	-	2	3	-	-	13	-	-	15	49
2011	-	2	-	2	-	1	-	4	2	1	-	9	1	2	1	25
2012	-	1	2	2	-	-	-	2	2	-	-	20	4	2	12	47
2013	-	4	1	-	1	-	-	4	1	2	-	20	3	-	7	43
2014	1	-	-	-	2	-	-	1	-	-	-	1	4	1	-	10
2015	-	2	1	1	1	-	-	5	2	-	-	10	13	-	5	40
2016	1	3	-	2	3	-	-	6	1	-	-	10	7	-	2	35
2017	-	2	-	-	3	-	-	4	4	2	-	5	2	-	3	25
2018	-	-	1	1	3	-	-	2	1	-	-	-	4	-	3	15

Table I - 6. Catch-sample ratios used to expand CWT recoveries of the Nicola CWT Indicator Stock (MRP data), 1988 to 2018.

	Alaska	North/Central BC			WCVI			Southern BC				S. US	Fraser River		
YEAR	AABM	AABM		ISBM	AABM		ISBM	ISBM				ISBM	ISBM		
	All gear	Troll	Sport	All gear	Troll	Sport	All gear	JDFSPT	JSTSP	GSTSP	Other	All gear	Comm. GN	FRSPT	FN NET
1988	-	-	-	-	4.16	-	-	-	-	6.34	2.85	3.54	1.56	1.77	-
1989	-	3.68	6.97	1.84	3.56	-	-	8.24	-	6.19	3.75	4.19	2.14	1.76	-
1990	-	-	-	-	5.15	-	-	4.22	-	-	2.34	6.78	-	1.23	9.87
1991	2.44	-	2.90	3.28	3.84	-	-	6.18	-	2.85	4.74	3.95	-	1.50	5.46
1992	-	5.63	-	4.53	5.79	5.60	-	3.54	-	4.37	2.97	4.31	-	1.43	7.18
1993	-	7.51	-	2.81	4.29	13.41	-	2.71	-	4.31	4.95	2.21	-	2.07	4.31
1994	-	3.90	2.31	3.84	4.54	8.14	-	3.73	-	3.34	-	1.71	-	1.14	6.86
1995	-	2.56	5.18	2.72	3.79	4.25	-	3.07	-	2.55	-	3.08	-	2.27	17.36
1996	-	-	-	2.83	-	-	-	3.56	-	-	-	0.00	-	1.07	10.48
1997	-	-	-	1.50	-	-	-	5.27	-	-	-	3.88	-	1.07	3.65
1998	-	-	12.35	-	-	-	-	4.83	-	5.00	-	0.00	-	1.19	13.88
1999	-	-	-	-	-	-	-	6.07	-	3.60	-	2.01	-	6.27	27.79
2000	-	-	27.14	-	-	-	-	8.37	-	2.63	-	0.00	-	1.23	13.56
2001	-	-	-	2.55	1.36	-	-	8.04	-	5.21	-	1.91	-	1.57	13.90
2002	-	4.04	6.18	2.23	1.43	-	-	3.57	-	2.41	-	2.29	-	1.10	11.61
2003	1.85	5.51	-	-	7.98	9.22	-	9.87	-	2.59	-	2.67	-	1.91	4.84
2004	-	2.08	-	-	1.97	-	-	6.02	-	8.51	-	1.71	-	-	26.06
2005	0.00	1.90	-	-	5.10	-	-	4.54	-	4.87	-	1.22	-	5.65	-
2006	-	2.15	-	-	3.54	-	-	11.12	-	-	-	2.19	-	1.66	-
2007	-	-	-	-	2.79	-	-	-	-	-	-	2.13	-	4.58	-
2008	-	1.00	4.38	-	-	-	-	7.57	-	3.18	-	2.03	-	1.42	-

	Alaska	North/Central BC			WCVI			Southern BC				S. US	Fraser River		
YEAR	AABM	AABM		ISBM	AABM		ISBM	ISBM				ISBM	ISBM		
	All gear	Troll	Sport	All gear	Troll	Sport	All gear	JDFSPT	JSTSP	GSTSP	Other	All gear	Comm. GN	FRSPT	FN NET
2009	-	0.00	-	-	-	-	-	10.74	-	-	-	2.01	-	4.15	-
2010	3.16	2.77	3.24	3.93	-	2.23	-	6.13	3.07	-	-	1.85	-	-	7.19
2011	-	1.98	-	2.01	-	3.09	-	4.01	2.00	2.26	-	2.48	1.99	8.00	25.93
2012	-	2.63	1.92	3.71	-	-	-	4.69	3.15	-	-	2.66	1.00	3.11	10.33
2013	-	3.02	2.66	-	3.22	-	-	12.04	2.67	4.54	-	2.63	1.06	-	3.31
2014	0.00	-	-	-	3.84	-	-	4.19	-	-	-	5.88	1.03	3.60	-
2015	-	1.54	1.79	3.86	3.71	-	-	8.30	2.44	-	-	2.22	1.00	-	30.77
2016	1.61	4.39	-	2.76	3.23	-	-	11.88	4.37	-	-	1.50	1.00	-	-
2017	-	3.71	-	-	3.52	-	-	5.29	2.24	4.00	-	5.80	-	-	-
2018	-	-	6.01	7.11	2.89	-	-	11.03	7.23	-	-		1.02	-	-

Table I - 7. ***Estimated*** *CWT recoveries of the Nicola CWT Indicator stock by fishery used in the CTC analysis, 1988 to 2018. These data include stratum for which auxiliary data were used to approximate CWT recoveries for un-sampled stratum or for stratum for which catch data were unavailable.*

	Alaska	North/Central BC			WCVI			Southern BC				S. US	Fraser River			
YEAR	AABM	AABM		ISBM	AABM		ISBM	ISBM				ISBM	ISBM			TOTAL
	All gear	Troll	Sport	All gear	Troll	Sport	All gear	JDFSPT	JSTSP	GSTSP	Other	All gear	Comm. GN	FRSPT	FN NET	
1988	-	-	-	-	4	-	-	-	-	44	3	21	10	18	-	100
1989	-	6	14	-	11	-	-	91	-	50	4	46	156	30	-	406
1990	-	-	-	-	5	-	-	6	-	-	0	14	-	36	39	100
1991	5	2	3	-	47	-	-	57	4	4	14	30	-	106	178	450
1992	-	33	-	-	24	-	-	25	8	9	6	53	-	37	35	230
1993	-	32	-	-	57	13	-	23	12	31	17	41	-	61	120	407
1994	-	4	-	-	63	8	4	52	-	13	-	6	-	155	28	333
1995	-	3	10	-	19	9	-	27	3	20	-	8	-	64	63	225
1996	-	-	-	-	-	-	-	-	-	-	-	-	-	-	13	13
1997	-	-	-	-	-	-	2	11	-	-	-	12	-	13	4	40
1998	-	-	12	-	-	-	-	5	-	5	-	-	-	68	42	132
1999	-	-	-	-	-	-	-	12	-	4	-	16	-	50	174	256
2000	-	-	27	-	-	-	-	59	-	11	-	-	-	89	140	325
2001	-	-	-	-	3	-	-	72	8	5	-	15	-	93	153	349
2002	-	26	6	-	14	-	2	18	-	5	-	21	-	54	93	238
2003	2	39	-	-	16	9	-	30	-	13	-	8	-	114	10	240
2004	-	8	-	-	8	-	-	6	-	9	-	4	-	-	104	139
2005	-	4	-	-	15	-	-	14	-	10	-	2	-	57	61	162
2006	-	6	-	-	7	-	-	11	-	-	-	4	-	40	60	129
2007	-	-	-	-	8	-	-	-	-	-	-	2	-	32	50	93
2008	-	6	4	-	-	-	-	8	-	13	-	16	-	21	71	140
2009	-	1	-	-	-	-	-	21	-	-	-	12	-	54	55	144
2010	-6	25	3	-	-	2	-	12	12	9	-	22	-	-	108	200
2011	-	4	-	-	-	3	-	16	4	6	-	21	2	16	26	98
2012	-	3	4	-	-	-	-	11	7	6	-	49	4	6	124	215
2013	-	12	-	-	3	-	3	48	-	13	-	53	3	-	23	158
2014	-	-	-	-	8	-	-	4	-	-	-	6	4	4	40	65
2015	-	3	2	-	4	-	-	42	4	5	-	22	13	-	154	248
2016	2	13	-	-	10	-	-	71	13	4	-	9	7	-	98	226
2017	-	7	-	-	11	-	-	19	-	14	-	16	2	-	82	151
2018	-	-	2	-	9	-	-	28	4	8	-	14	4	-	157	225

Table I - 8. Stratum with values for which auxiliary data were used to approximate CWT recoveries for the Nicola CWT Indicator Stock.

	Alaska	North/Central BC			WCVI			Southern BC				S. US	Fraser River		
YEAR	AABM	AABM		ISBM	AABM		ISBM	ISBM				ISBM	ISBM		
	All gear	Troll	Sport	All gear	Troll	Sport	All gear	JDFSPT	JSTSP	GSTSP	Other	All gear	Comm. GN	FRSPT	FN NET
1988	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-
1989	-	-	-	-	-	-	-	-	-	-	-	-	30	-	-
1990	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1991	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1992	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1993	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1994	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1995	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1996	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1997	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1998	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1999	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7
2000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	127
2001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	61
2006	-	-	-	-	-	-	-	-	-	-	-	-	-	-	60
2007	-	-	-	-	-	-	-	-	-	-	-	-	-	-	50
2008	-	-	-	-	-	-	-	-	-	-	-	-	-	-	71
2009	-	1	-	-	-	-	-	-	-	-	-	-	-	-	55
2010	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2011	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2012	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2013	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2014	-	-	-	-	-	-	-	-	-	-	-	-	-	-	40
2015	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2017	-	-	-	-	-	-	-	-	-	-	-	-	-	-	12
2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	25

*Table I - 9. **Observed** CWT recoveries of the Dome CWT Indicator stock by fishery, 1990 to 2007.*

	Alaska	North/Central BC			WCVI			Southern BC				S. US	Fraser River			
YEAR	AABM	AABM		ISBM	AABM		ISBM	ISBM				ISBM	ISBM			TOTAL
	All gear	Troll	Sport	All gear	Troll	Sport	All gear	JDFSPT	JSTSP	GSTSP	Other	All gear	Comm. GN	FRSPT	FN NET	
1990	-	-	-	-	-	-	-	-	-	-	-	1	-	-	1	2
1991	-	-	-	1	-	-	-	1	-	1	-	4	-	1	1	9
1992	-	-	-	1	2	-	-	3	-	-	1	4	-	-	10	21
1993	-	-	1	1	1	-	-	3	-	2	-	4	-	5	12	29
1994	1	-	-	-	1	-	-	1	-	-	-	2	-	3	8	16
1995	-	1	-	-	2	-	-	7	-	3	-	2	-	2	6	23
1996	-	-	-	1	-	-	-	4	-	-	-	2	-	1	13	21
1997	-	-	-	-	1	1	-	4	-	-	-	7	-	-	8	21
1998	1	-	-	-	-	-	-	3	-	1	-	1	-	5	8	19
1999	-	-	-	-	-	-	-	-	-	1	-	-	-	1	-	2
2000	-	-	-	-	1	-	-	2	-	-	-	2	-	-	-	5
2001	-	-	-	1	3	-	-	5	-	2	-	2	-	1	9	23
2002	-	5	-	-	5	-	-	4	-	-	-	2	-	-	4	20
2003	-	1	-	-	-	1	-	2	-	-	-	-	-	-	9	13
2004	-	-	-	-	-	-	-	-	-	-	-	1	-	1	-	2
2005	-	4	-	-	-	-	-	1	-	1	-	1	-	1	3	11
2006	-	-	-	-	2	-	-	1	-	1	-	1	-	-	-	5
2007	-	-	-	-	-	-	-	1	-	-	-	2	-	-	-	3

Table I - 10. Catch-sample expansions for the Dome CWT Indicator Stock (MRP data), 1990 to 2007.

	Alaska	North/Central BC			WCVI			Southern BC				S. US	Fraser River		
YEAR	AABM	AABM		ISBM	AABM		ISBM	ISBM				ISBM	ISBM		
	All gear	Troll	Sport	All gear	Troll	Sport	All gear	JDFSPT	JSTSP	GSTSP	Other	All gear	Comm. GN	FRSPT	FN NET
1990	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.51
1991	-	-	-	5.21	-	-	-	3.64	-	4.54	-	5.58	-	5.14	5.71
1992	-	-	-	3.82	3.23	-	-	3.36	-	-	3.74	2.77	-		7.15
1993	-	-	4.04	3.64	4.89	-	-	2.69	-	4.34	-	1.15	-	3.80	14.52
1994	2.46	-	-	-	5.26	-	-	3.94		-	-	0.00	-	2.31	9.88
1995	-	2.56	-	-	2.78	-	-	2.82	-	2.30	-	3.56	-	7.51	17.94
1996	-	-	-	2.72	-	-	-	4.74	-	-	-	2.47	-	15.38	10.14
1997	-	-	-	-	2.00	1.03	-	4.94	-	-	-	1.11	-	-	15.34
1998	0.00	-	-	-	-	-	-	3.89	-	5.00	-	-	-	3.27	11.57
1999	-	-	-	-	-	-	-	-	-	8.43	-	-	-	6.29	-
2000	-	-	-	-	0.00	-	-	8.31	-	-	-	1.51	-	-	-
2001	-	-	-	2.20	2.17	-	-	6.86	-	3.21	-	0.65	-	7.69	19.90
2002	-	3.39	-	-	3.17	-	-	3.74	-	-	-	2.51	-	-	6.60
2003	-	7.71	-	-	-	9.22	-	9.19	-	-	-	-	-	-	10.05
2004	-	-	-	-	-	-	-	-	-	-	-	-	-	1.40	-
2005	-	1.90	-	-	-	-	-	5.04	-	2.92	-	-	-	14.87	43.68
2006	-	-	-	-	3.54	-	-	3.98	-	2.22	-	1.43	-	-	-
2007	-	-	-	-	-	-	-	3.22	-	-	-	3.51	-	-	-

Table I - 11. ***Estimated*** *CWT recoveries used for the CTC ERA analysis for the Dome CWT Indicator Stock, 1990 to 2007. These data include stratum for which auxiliary data were used to approximate CWT recoveries for un-sampled stratum or for stratum for which catch data were unavailable.*

	Alaska	North/Central BC			WCVI			Southern BC				S. US	Fraser River			
YEAR	AABM	AABM		ISBM	AABM		ISBM	ISBM				ISBM	ISBM			TOTAL
	All gear	Troll	Sport	All gear	Troll	Sport	All gear	JDFSPT	JSTSP	GSTSP	Other	All gear	Comm. GN	FRSPT	FN NET	
1990	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	5
1991	-	-	-	-	-	-	-	4	5.21	4.54	-	22.31	-	5.14	6	47
1992	-	-	-	-	6.45	-	-	5	3.82	4.69	3.74	11.06	-	-	71	107
1993	-	-	4.04	-	4.89	-	-	8	3.64	8.67	-	4.60	-	18.98	174	227
1994	2.46	-	-	-	5.26	-	-	4	-	-	-		-	6.93	79	98
1995	-	2.56	-	-	5.56	-	-	20	-	6.90	-	7.12	-	15.02	108	165
1996	-	-	-	-	-	-	-	19	2.72	-	-	4.93	-	15.38	132	174
1997	-	-	-	-	2.00	1.03	-	20	-	-	-	7.75	-	-	123	153
1998	-	-	-	-	-	-	-	12	-	5.00	-		-	16.34	93	126
1999	-	-	-	-	-	-	-	-	-	8.43	-		-	6.29	15	29
2000	-	-	-	-	-	-	-	17	-	-	-	3.02	-	-	39	58
2001	-	-	-	-	6.51	-	-	25	2.20	15.82	-	1.29	-	7.69	179	238
2002	-	16.95	-	-	15.77	-	-	15	-	-	-	5.01	-	-	26	79
2003	-	7.71	-	-	-	9.22	-	18	-	-	-		-	-	90	126
2004	-	-	-	-	-	-	-	-	-	-	-		-	1.40	2	4
2005	-	7.60	-	-	-	-	-	5	-	2.92	-		-	14.87	145	176
2006	-	-	-	-	7.08	-	-	4	-	2.22	-	1.43	-	-	32	47
2007	-	-	-	-	-	-	-	-	-	-	-	5.86	-	-	5	11

Table I - 12. Stratum for which auxiliary data were used to approximate CWT recoveries for the Dome CWT Indicator Stock.

	Alaska	North/Central BC			WCVI			Southern BC				S. US	Fraser River		
YEAR	AABM	AABM		ISBM	AABM		ISBM	ISBM				ISBM	ISBM		
	All gear	Troll	Sport	All gear	Troll	Sport	All gear	JDFSPT	JSTSP	GSTSP	Other	All gear	Comm. GN	FRSPT	FN NET
1990	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1991	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1992	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1993	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1994	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1995	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1996	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1997	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1998	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1999	-	-	-	-	-	-	-	-	-	-	-	-	-	-	14.63
2000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	38.73
2001	-		-	-	-	-	-	-	-	-	-	-	-	-	-
2002	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
2003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.44
2005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	14.12
2006	-	-	-	-	-	-	-	-	-	-	-	-	-	-	31.89
2007	-		-	-	-	-	-	-	-	-	-	-	-	-	5.22

Table I - 13. Release mortality rates applied in the CTC model (and ERA analysis). In the most recent model formulation, rates in some fisheries change over time, in accordance with changes in management regulations (CTC 2018b).

Fishery	Sublegal Rate	Legal Rate	Drop-off	Applicable Years
Alaska T	0.255	0.211	0.008	All
North T	0.255	0.211	0.017	1979-1995
North T	0.22	0.185	0.016	1996-curr.
Centr T	0.225	0.211	0.017	1979-1995
Centr T	0.22	0.185	0.016	1996-curr.
WCVI T	0.225	0.211	0.017	1979-1997
WCVI T	0.22	0.185	0.016	1998-curr.
WA/OR T	0.255	0.211	0.017	1979-1983
WA/OR T	0.22	0.185	0.016	1984-curr.
Str of Geo T	225	0.211	0.017	1979-1985, 1987-1996
Str of Geo T	0.22	0.185	0.016	1986, 1998-curr.
Alaska N	0.9	0.9	0	All
North N	0.9	0.9	0	All
Centr N	0.9	0.9	0	All
WCVI N	0.9	0.9	0	All
J De F N	0.9	0.9	0	All
PgtNth N	0.9	0.9	0	All
PgtSth N	0.9	0.9	0	All
WashCst N	0.9	0.9	0	All
Col R N	0.9	0.9	0	All
John St N	0.9	0.9	0	All
Fraser N	0.9	0.9	0	All
Alaska S	0.123	0.123	0.036	All
Nor/Cen S	0.123	0.123	0.036	All
WCVI S	0.123	0.123	0.069	All
WashOcn S	0.123	0.123	0.069	All
PgtNth S	0.123	0.123	0.145	All
PgtSth S	0.123	0.123	0.145	All
Str of Geo S	0.322	0.322	0.069	1979-1981
Str of Geo S	0.123	0.123	0.069	1982-curr.
Col R S	0.123	0.123	0.069	All

APPENDIX J: 2018 FRASER RUN RECONSTRUCTION MODEL RESULTS

Table J - 1. Estimated return to the river, catch, and harvest rate for stream-type Fraser Chinook stock management units, estimated using the Fraser Chinook run reconstruction model. Note that these results come from the 2018 DFO version of the Run Reconstruction model (folder name = 1979-2018_Run Reconstruction V15_ 06Mar2019 ; Nicole Trouton, DFO, Kamloops, BC, pers. comm.) rather than our updated version for this review, and therefore, only represent landed catch.

Year	Spring 4_2			Spring 5_2			Summer 5_2		
	Catch	Return	HR	Catch	Return	HR	Catch	Return	HR
1979	10,655	14,162	75.2%	20,468	35,367	57.9%	11,754	24,234	48.5%
1980	4,129	11,660	35.4%	6,071	23,958	25.3%	6,427	22,953	28.0%
1981	3,862	7,634	50.6%	7,340	18,998	38.6%	8,060	23,885	33.7%
1982	4,418	11,069	39.9%	9,316	24,052	38.7%	18,056	35,844	50.4%
1983	2,197	5,482	40.1%	8,087	30,801	26.3%	6,761	26,503	25.5%
1984	1,823	10,039	18.2%	7,583	37,452	20.2%	11,010	27,902	39.5%
1985	2,400	14,477	16.6%	7,575	51,868	14.6%	12,337	35,165	35.1%
1986	2,614	16,385	16.0%	6,165	60,617	10.2%	10,192	49,025	20.8%
1987	2,370	9,462	25.0%	8,661	61,874	14.0%	6,747	40,554	16.6%
1988	1,742	8,243	21.1%	6,844	52,968	12.9%	5,427	43,243	12.6%
1989	2,811	11,938	23.5%	9,855	43,696	22.6%	6,415	26,589	24.1%
1990	1,824	7,232	25.2%	7,511	49,940	15.0%	10,945	49,561	22.1%
1991	4,015	11,442	35.1%	10,232	39,994	25.6%	8,666	42,189	20.5%
1992	3,914	13,836	28.3%	7,322	44,501	16.5%	4,550	48,763	9.3%
1993	6,578	20,197	32.6%	11,960	49,582	24.1%	6,984	31,543	22.1%
1994	7,136	24,388	29.3%	11,104	65,443	17.0%	6,282	33,688	18.6%
1995	7,586	26,566	28.6%	7,677	49,260	15.6%	7,429	42,041	17.7%
1996	9,412	37,296	25.2%	6,781	39,783	17.0%	7,690	57,531	13.4%
1997	9,630	32,309	29.8%	8,652	46,489	18.6%	11,539	60,205	19.2%
1998	4,841	10,461	46.3%	12,875	45,710	28.2%	6,713	48,660	13.8%
1999	6,301	18,444	34.2%	7,085	29,175	24.3%	9,241	38,505	24.0%
2000	11,677	28,078	41.6%	10,363	37,115	27.9%	8,254	46,451	17.8%
2001	12,548	31,518	39.8%	12,245	43,513	28.1%	8,487	51,599	16.4%
2002	8,700	33,696	25.8%	7,970	50,388	15.8%	7,667	47,300	16.2%
2003	14,621	43,875	33.3%	12,184	63,573	19.2%	9,441	67,254	14.0%
2004	16,271	37,126	43.8%	14,725	48,697	30.2%	18,078	64,001	28.2%
2005	7,687	17,156	44.8%	9,281	31,767	29.2%	6,473	35,858	18.1%
2006	6,778	16,978	39.9%	8,539	31,358	27.2%	6,916	45,072	15.3%
2007	2,022	4,677	43.2%	4,835	17,315	27.9%	4,984	21,140	23.6%
2008	6,033	18,229	33.1%	5,357	22,646	23.7%	7,666	34,478	22.2%
2009	1,888	4,403	42.9%	10,940	39,127	28.0%	8,931	40,572	22.0%
2010	3,251	13,139	24.7%	4,412	23,562	18.7%	4,774	31,176	15.3%
2011	2,620	8,048	32.6%	4,007	16,509	24.3%	10,170	33,677	30.2%
2012	3,844	15,494	24.8%	3,592	15,816	22.7%	6,836	19,920	34.3%
2013	1,160	8,507	13.6%	2,032	20,242	10.0%	2,268	20,027	11.3%
2014	6,569	31,531	20.8%	6,500	42,707	15.2%	6,755	38,875	17.4%
2015	2,534	14,048	18.0%	3,416	29,086	11.7%	4,069	47,206	8.6%
2016	2,014	11,325	17.8%	2,340	17,895	13.1%	1,990	16,339	12.2%
2017	1,240	6,714	18.5%	1,409	11,163	12.6%	1,152	11,061	10.4%
2018	1,339	3,711	36.1%	3,135	13123	23.9%	1,530	10508	14.6%

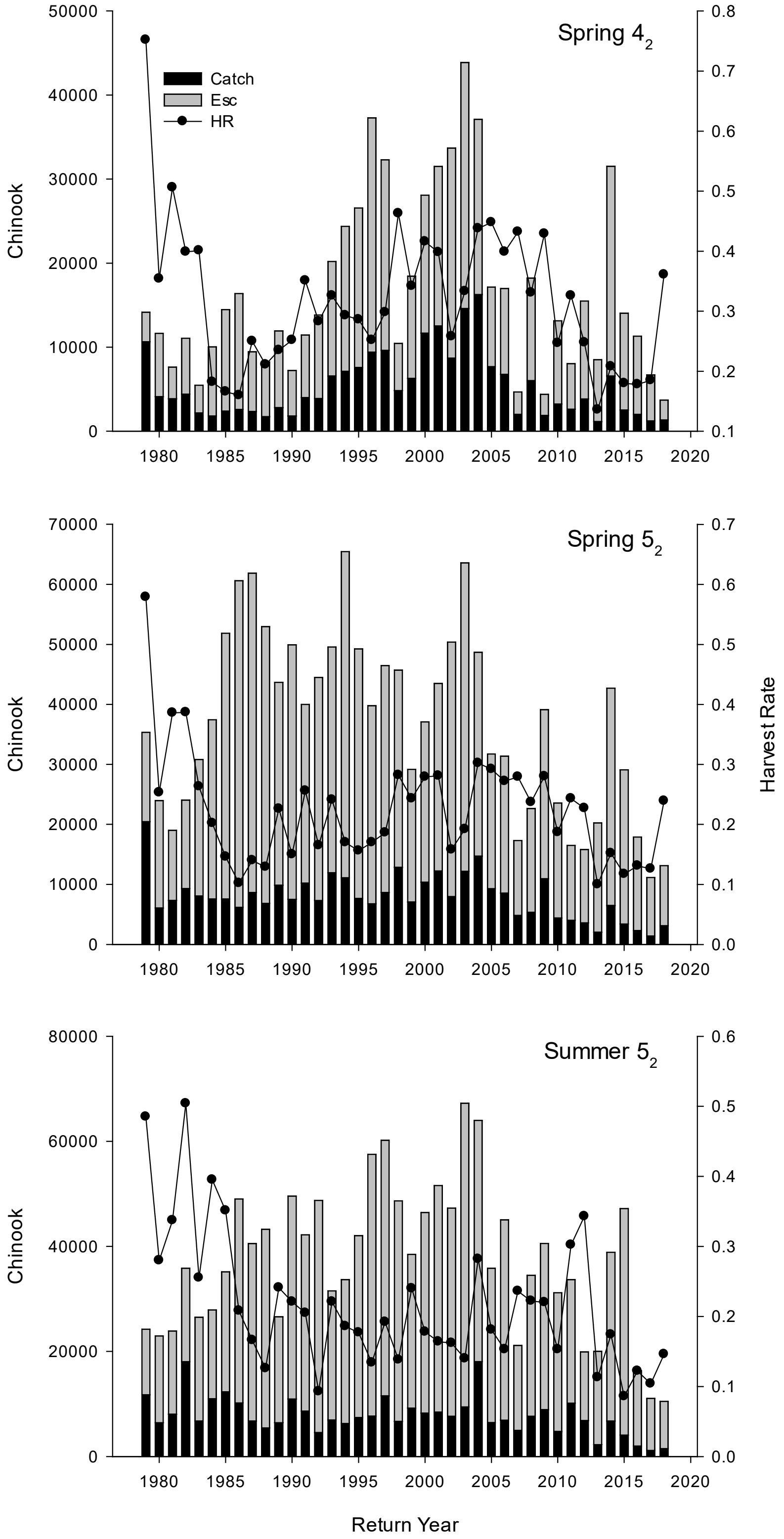


Figure J - 1. Estimated total annual harvest rates from all Fraser River fisheries on stream-type Fraser stock management units. Note that these results come from the 2018 DFO version of the Run Reconstruction model rather than our revised version for this review, and therefore, only represent landed catch.

Table J - 2. Estimated Fraser River FSC catch and harvest rates for stream-type stock management units from the Fraser Chinook run reconstruction. Note that these results come from the 2018 DFO version of the Run Reconstruction model rather than our revised version for this review, and therefore, only represent landed catch.

Year	Spring 4_2			Spring 5_2			Summer 5_2		
	Catch	Return	HR	Catch	Return	HR	Catch	Return	HR
1979	2,360	14,162	16.7%	4,394	35,367	12.4%	2,346	24,234	9.7%
1980	2,546	11,660	21.8%	3,886	23,958	16.2%	2,055	22,953	9.0%
1981	2,995	7,634	39.2%	4,137	18,998	21.8%	1,901	23,885	8.0%
1982	4,100	11,069	37.0%	8,477	24,052	35.2%	13,015	35,844	36.3%
1983	1,961	5,482	35.8%	7,187	30,801	23.3%	3,454	26,503	13.0%
1984	1,366	10,039	13.6%	5,175	37,452	13.8%	4,042	27,902	14.5%
1985	1,965	14,477	13.6%	4,669	51,868	9.0%	1,820	35,165	5.2%
1986	2,361	16,385	14.4%	5,188	60,617	8.6%	3,734	49,025	7.6%
1987	1,863	9,462	19.7%	6,060	61,874	9.8%	2,752	40,554	6.8%
1988	1,319	8,243	16.0%	4,882	52,968	9.2%	2,231	43,243	5.2%
1989	1,094	11,938	9.2%	2,901	43,696	6.6%	861	26,589	3.2%
1990	1,426	7,232	19.7%	6,108	49,940	12.2%	4,066	49,561	8.2%
1991	2,588	11,442	22.6%	6,391	39,994	16.0%	3,832	42,189	9.1%
1992	3,393	13,836	24.5%	6,126	44,501	13.8%	2,117	48,763	4.3%
1993	5,841	20,197	28.9%	9,521	49,582	19.2%	2,117	31,543	6.7%
1994	6,263	24,388	25.7%	9,249	65,443	14.1%	2,467	33,688	7.3%
1995	4,985	26,566	18.8%	4,529	49,260	9.2%	4,217	42,041	10.0%
1996	7,569	37,296	20.3%	4,817	39,783	12.1%	2,894	57,531	5.0%
1997	8,085	32,309	25.0%	6,697	46,489	14.4%	1,897	60,205	3.2%
1998	3,406	10,461	32.6%	9,302	45,710	20.4%	2,497	48,660	5.1%
1999	6,028	18,444	32.7%	6,683	29,175	22.9%	8,268	38,505	21.5%
2000	9,771	28,078	34.8%	8,516	37,115	22.9%	3,522	46,451	7.6%
2001	9,488	31,518	30.1%	9,159	43,513	21.0%	2,597	51,599	5.0%
2002	7,788	33,696	23.1%	6,480	50,388	12.9%	4,581	47,300	9.7%
2003	11,667	43,875	26.6%	8,642	63,573	13.6%	3,498	67,254	5.2%
2004	13,502	37,126	36.4%	11,153	48,697	22.9%	6,912	64,001	10.8%
2005	6,368	17,156	37.1%	7,641	31,767	24.1%	3,240	35,858	9.0%
2006	4,565	16,978	26.9%	6,145	31,358	19.6%	2,886	45,072	6.4%
2007	1,650	4,677	35.3%	4,319	17,315	24.9%	3,436	21,140	16.3%
2008	5,335	18,229	29.3%	4,603	22,646	20.3%	4,743	34,478	13.8%
2009	1,643	4,403	37.3%	9,019	39,127	23.1%	5,529	40,572	13.6%
2010	2,960	13,139	22.5%	3,804	23,562	16.1%	3,132	31,176	10.0%
2011	2,497	8,048	31.0%	3,685	16,509	22.3%	8,039	33,677	23.9%
2012	3,577	15,494	23.1%	3,262	15,816	20.6%	5,541	19,920	27.8%
2013	1,064	8,507	12.5%	1,784	20,242	8.8%	1,536	20,027	7.7%
2014	6,019	31,531	19.1%	5,320	42,707	12.5%	4,312	38,875	11.1%
2015	2,377	14,048	16.9%	2,830	29,086	9.7%	2,769	47,206	5.9%
2016	1,902	11,325	16.8%	2,127	17,895	11.9%	1,276	16,339	7.8%
2017	1,196	6,714	17.8%	1,337	11,163	12.0%	998	11,061	9.0%
2018	1,251	3,711	33.7%	2910	13,123	22.2%	1155	10,508	11.0%

Table J - 3. Estimated Fraser River Recreational catch and harvest rates for stream-type stock management units from the Fraser Chinook run reconstruction. Note that these results come from the 2018 DFO version of the Run Reconstruction model rather than our revised version for this review, and therefore, only represent landed catch.

Year	**Spring 4_2**			**Spring 5_2**			**Summer 5_2**		
	Catch	**Return**	**HR**	**Catch**	**Return**	**HR**	**Catch**	**Return**	**HR**
1979	1,337	14,162	9.4%	1,250	35,367	3.5%	392	24,234	1.6%
1980	-	11,660	0.0%	-	23,958	0.0%	3	22,953	0.0%
1981	-	7,634	0.0%	-	18,998	0.0%	1	23,885	0.0%
1982	-	11,069	0.0%	-	24,052	0.0%	3	35,844	0.0%
1983	-	5,482	0.0%	-	30,801	0.0%	6	26,503	0.0%
1984	-	10,039	0.0%	-	37,452	0.0%	4	27,902	0.0%
1985	-	14,477	0.0%	8	51,868	0.0%	72	35,165	0.2%
1986	2	16,385	0.0%	29	60,617	0.0%	101	49,025	0.2%
1987	198	9,462	2.1%	1,001	61,874	1.6%	702	40,554	1.7%
1988	194	8,243	2.4%	589	52,968	1.1%	857	43,243	2.0%
1989	502	11,938	4.2%	841	43,696	1.9%	407	26,589	1.5%
1990	201	7,232	2.8%	185	49,940	0.4%	827	49,561	1.7%
1991	290	11,442	2.5%	75	39,994	0.2%	384	42,189	0.9%
1992	197	13,836	1.4%	200	44,501	0.4%	598	48,763	1.2%
1993	162	20,197	0.8%	200	49,582	0.4%	230	31,543	0.7%
1994	354	24,388	1.5%	450	65,443	0.7%	480	33,688	1.4%
1995	2,119	26,566	8.0%	2,278	49,260	4.6%	1,057	42,041	2.5%
1996	1,107	37,296	3.0%	1,087	39,783	2.7%	1,473	57,531	2.6%
1997	527	32,309	1.6%	347	46,489	0.7%	1,036	60,205	1.7%
1998	1,246	10,461	11.9%	2,807	45,710	6.1%	2,146	48,660	4.4%
1999	93	18,444	0.5%	53	29,175	0.2%	350	38,505	0.9%
2000	1,531	28,078	5.5%	1,134	37,115	3.1%	2,420	46,451	5.2%
2001	2,157	31,518	6.8%	1,805	43,513	4.1%	3,201	51,599	6.2%
2002	423	33,696	1.3%	631	50,388	1.3%	1,214	47,300	2.6%
2003	1,926	43,875	4.4%	2,110	63,573	3.3%	3,256	67,254	4.8%
2004	1,960	37,126	5.3%	2,230	48,697	4.6%	3,594	64,001	5.6%
2005	1,222	17,156	7.1%	1,444	31,767	4.5%	2,958	35,858	8.2%
2006	2,094	16,978	12.3%	2,148	31,358	6.8%	3,170	45,072	7.0%
2007	360	4,677	7.7%	434	17,315	2.5%	1,307	21,140	6.2%
2008	556	18,229	3.1%	488	22,646	2.2%	2,310	34,478	6.7%
2009	204	4,403	4.6%	1,445	39,127	3.7%	2,789	40,572	6.9%
2010	72	13,139	0.5%	193	23,562	0.8%	930	31,176	3.0%
2011	46	8,048	0.6%	141	16,509	0.9%	1,476	33,677	4.4%
2012	139	15,494	0.9%	182	15,816	1.2%	969	19,920	4.9%
2013	22	8,507	0.3%	55	20,242	0.3%	487	20,027	2.4%
2014	238	31,531	0.8%	683	42,707	1.6%	1,440	38,875	3.7%
2015	10	14,048	0.1%	249	29,086	0.9%	740	47,206	1.6%
2016	18	11,325	0.2%	20	17,895	0.1%	427	16,339	2.6%
2017	-	6,714	0.0%	-	11,163	0.0%	79	11,061	0.7%
2018	48	3,711	1.3%	66	13123	0.5%	199	10508	1.9%

Table J - 4. Estimated Fraser River Commercial (including FN EO) catch and harvest rates for stream-type stock management units from the Fraser Chinook run reconstruction. Note that these results come from the 2018 DFO version of the Run Reconstruction model rather than our revised version for this review, and therefore, only represent landed catch. .

Year	Spring 4_2			Spring 5_2			Summer 5_2		
	Catch	Return	HR	Catch	Return	HR	Catch	Return	HR
1979	6,958	14,162	49.1%	14,824	35,367	41.9%	9,016	24,234	37.2%
1980	1,583	11,660	13.6%	2,185	23,958	9.1%	4,369	22,953	19.0%
1981	867	7,634	11.4%	3,203	18,998	16.9%	6,158	23,885	25.8%
1982	318	11,069	2.9%	839	24,052	3.5%	5,038	35,844	14.1%
1983	236	5,482	4.3%	900	30,801	2.9%	3,301	26,503	12.5%
1984	457	10,039	4.6%	2,408	37,452	6.4%	6,964	27,902	25.0%
1985	435	14,477	3.0%	2,898	51,868	5.6%	10,445	35,165	29.7%
1986	251	16,385	1.5%	948	60,617	1.6%	6,357	49,025	13.0%
1987	309	9,462	3.3%	1,600	61,874	2.6%	3,293	40,554	8.1%
1988	229	8,243	2.8%	1,373	52,968	2.6%	2,339	43,243	5.4%
1989	1,215	11,938	10.2%	6,113	43,696	14.0%	5,147	26,589	19.4%
1990	197	7,232	2.7%	1,218	49,940	2.4%	6,052	49,561	12.2%
1991	1,137	11,442	9.9%	3,766	39,994	9.4%	4,450	42,189	10.5%
1992	324	13,836	2.3%	996	44,501	2.2%	1,835	48,763	3.8%
1993	575	20,197	2.8%	2,239	49,582	4.5%	4,637	31,543	14.7%
1994	519	24,388	2.1%	1,405	65,443	2.1%	3,335	33,688	9.9%
1995	482	26,566	1.8%	870	49,260	1.8%	2,155	42,041	5.1%
1996	736	37,296	2.0%	877	39,783	2.2%	3,323	57,531	5.8%
1997	1,018	32,309	3.2%	1,608	46,489	3.5%	8,606	60,205	14.3%
1998	189	10,461	1.8%	766	45,710	1.7%	2,070	48,660	4.3%
1999	180	18,444	1.0%	349	29,175	1.2%	623	38,505	1.6%
2000	375	28,078	1.3%	713	37,115	1.9%	2,312	46,451	5.0%
2001	903	31,518	2.9%	1,281	43,513	2.9%	2,689	51,599	5.2%
2002	489	33,696	1.5%	859	50,388	1.7%	1,872	47,300	4.0%
2003	1,028	43,875	2.3%	1,432	63,573	2.3%	2,687	67,254	4.0%
2004	809	37,126	2.2%	1,342	48,697	2.8%	7,572	64,001	11.8%
2005	97	17,156	0.6%	196	31,767	0.6%	275	35,858	0.8%
2006	119	16,978	0.7%	246	31,358	0.8%	860	45,072	1.9%
2007	12	4,677	0.3%	82	17,315	0.5%	241	21,140	1.1%
2008	142	18,229	0.8%	266	22,646	1.2%	613	34,478	1.8%
2009	41	4,403	0.9%	476	39,127	1.2%	613	40,572	1.5%
2010	219	13,139	1.7%	415	23,562	1.8%	712	31,176	2.3%
2011	77	8,048	1.0%	181	16,509	1.1%	655	33,677	1.9%
2012	128	15,494	0.8%	148	15,816	0.9%	326	19,920	1.6%
2013	74	8,507	0.9%	193	20,242	1.0%	245	20,027	1.2%
2014	312	31,531	1.0%	497	42,707	1.2%	1,003	38,875	2.6%
2015	147	14,048	1.0%	337	29,086	1.2%	560	47,206	1.2%
2016	94	11,325	0.8%	193	17,895	1.1%	287	16,339	1.8%
2017	44	6,714	0.7%	72	11,163	0.6%	75	11,061	0.7%
2018	40	3,711	1.1%	159	13123	1.2%	176	10508	1.7%

APPENDIX K: SELECT INPUTS TO THE REVISED RUN RECONSTRUCTION MODEL FOR CURRENT REVIEW

Table K - 1. Run reconstruction residence time (in days) by in-river area used for our parameterization of the run reconstruction model. Note that although we have added three additional areas, we have adjusted residence times so that cumulative residence time is approximately similar to the 2018 DFO version. 'Trib. Time' is the number of days between leaving the final fishery area and entering the spawning grounds. Note that four fisheries included in this table are located in a portion of other fishery areas (e.g., Area 29B fishery occurs within the Steveston – Deas Island fishing area). When this occurs, the cumulative residence time (i.e., number of days between tributary and each fishery) that is used to calculate the number of fish available to the fishery is adjusted according to the footnote given in column headings below. See English et al. 2007 for a description of how residence time is used to calculate the number of fish available to each fishery. Footnotes are defined at the end of table.

Stock Name	Timing Group	Trib Time	AREA29.B	AREA29.E	Stev-Deas	Deas-Mission	Albion	Mission-Harrison	Harrison-Hope	Hope-Sawmill	Qualark	Sawmill-Thompson	Thompson-Texas	Texas-Kelly	Kelly-Dead	Dead-Chil	Chil-Quesnel	Quesnel-Naver	Naver-Salmon	Tete Juene	Nechako	Stuart	Chilcotin	Thompson-Bonaparte	Bonaparte-Kamloops	North Thompson	Kamloops-Shuswap	Shuswap River
Swift	Spring 5.2	23	1	3	1	2	1	2	3	2	1	3	2	4	4	4	8	2	4	4	-	-	-	-	-	-	-	-
Fraser	Spring 5.2	22	1	3	1	2	1	2	3	2	1	3	2	4	4	4	8	2	4	4	-	-	-	-	-	-	-	-
Horsey	Spring 5.2	21	1	3	1	2	1	2	3	2	1	3	2	4	4	4	8	2	4	4	-	-	-	-	-	-	-	-
Nevin	Spring 5.2	20	1	3	1	2	1	2	3	2	1	3	2	4	4	4	8	2	4	4	-	-	-	-	-	-	-	-
Holmes	Spring 5.2	20	1	3	1	2	1	2	3	2	1	3	2	4	4	4	8	2	4	4	-	-	-	-	-	-	-	-
McKale	Spring 5.2	19	1	3	1	2	1	2	3	2	1	3	2	4	4	4	8	2	4	4	-	-	-	-	-	-	-	-
Twin	Spring 5.2	19	1	3	1	2	1	2	3	2	1	3	2	4	4	4	8	2	4	4	-	-	-	-	-	-	-	-
Goat	Spring 5.2	18	1	3	1	2	1	2	3	2	1	3	2	4	4	4	8	2	4	4	-	-	-	-	-	-	-	-
Morkill	Spring 5.2	17	1	3	1	2	1	2	3	2	1	3	2	4	4	4	8	2	4	4	-	-	-	-	-	-	-	-
Walker	Spring 5.2	16	1	3	1	2	1	2	3	2	1	3	2	4	4	4	8	2	4	4	-	-	-	-	-	-	-	-
Torpy	Spring 5.2	16	1	3	1	2	1	2	3	2	1	3	2	4	4	4	8	2	4	4	-	-	-	-	-	-	-	-
Dome	Spring 5.2	16	1	3	1	2	1	2	3	2	1	3	2	4	4	4	8	2	4	4	-	-	-	-	-	-	-	-
Slim	Spring 5.2	16	1	3	1	2	1	2	3	2	1	3	2	4	4	4	8	2	4	4	-	-	-	-	-	-	-	-
Bowron	Spring 5.2	15	1	3	1	2	1	2	3	2	1	3	2	4	4	4	8	2	4	4	-	-	-	-	-	-	-	-
McGregor	Spring 5.2	15	1	3	1	2	1	2	3	2	1	3	2	4	4	4	8	2	4	4	-	-	-	-	-	-	-	-
Willow	Spring 5.2	10	1	3	1	2	1	2	3	2	1	3	2	4	4	4	8	2	4	4	-	-	-	-	-	-	-	-
Salmon	Spring 5.2	10	1	3	1	2	1	2	3	2	1	3	2	4	4	4	8	2	4	-	-	-	-	-	-	-	-	-
Stuart	Summer 5.2	2	1	3	1	2	1	2	3	2	1	3	2	4	4	4	8	2	4	-	2	2	-	-	-	-	-	-
Nechako	Summer 5.2	2	1	3	1	2	1	2	3	2	1	3	2	4	4	4	8	2	4	-	2	-	-	-	-	-	-	-
Stellako	Summer 5.2	4	1	3	1	2	1	2	3	2	1	3	2	4	4	4	8	2	4	-	2	-	-	-	-	-	-	-
Endako	Spring 5.2	4	1	3	1	2	1	2	3	2	1	3	2	4	4	4	8	2	4	-	4	-	-	-	-	-	-	-
Chilako	Spring 5.2	2	1	3	1	2	1	2	3	2	1	3	2	4	4	4	8	2	4	-	4	-	-	-	-	-	-	-
Blackwater	Spring 5.2	1	1	3	1	2	1	2	3	2	1	3	2	4	4	4	8	1	-	-	-	-	-	-	-	-	-	-
Cottonwood	Spring 5.2	1	1	3	1	2	1	2	3	2	1	3	2	4	4	4	8	1	-	-	-	-	-	-	-	-	-	-

Stock Name	Timing Group	Trib Time	AREA29.B	AREA29.E	Stev-Deas	Deas-Mission	Albion	Mission-Harrison	Harrison-Hope	Hope-Sawmill	Qualark	Sawmill-Thompson	Thompson-Texas	Texas-Kelly	Kelly-Dead	Dead-Chil	Chil-Quesnel	Quesnel-Naver	Naver-Salmon	Tete Juene	Nechako	Stuart	Chilcotin	Thompson-Bonaparte	Bonaparte-Kamloops	North Thompson	Kamloops-Shuswap	Shuswap River
Quesnel	Summer 5.2	4	1	3	1	2	1	2	3	2	1	3	2	4	4	4	8	-	-	-	-	-	-	-	-	-	-	-
Cariboo	Summer 5.2	4	1	3	1	2	1	2	3	2	1	3	2	4	4	4	8	-	-	-	-	-	-	-	-	-	-	-
Horsefly	Spring 5.2	10	1	3	1	2	1	2	3	2	1	3	2	4	4	4	8	-	-	-	-	-	-	-	-	-	-	-
Chilko	Summer 5.2	10	1	3	1	2	1	2	3	2	1	3	2	4	4	4	-	-	-	-	-	-	14	-	-	-	-	-
Chilcotin Upper	Spring 5.2	52	1	3	1	2	1	2	3	2	1	3	2	4	4	4	-	-	-	-	-	-	20	-	-	-	-	-
Chilcotin Lower	Spring 5.2	5	1	3	1	2	1	2	3	2	1	3	2	4	4	4	-	-	-	-	-	-	20	-	-	-	-	-
Elkin	Summer 5.2	10	1	3	1	2	1	2	3	2	1	3	2	4	4	4	-	-	-	-	-	-	20	-	-	-	-	-
Taseko	Summer 5.2	10	1	3	1	2	1	2	3	2	1	3	2	4	4	4	-	-	-	-	-	-	20	-	-	-	-	-
Bridge	Spring 5.2	30	1	3	1	2	1	2	3	4	1	5	5	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Portage	Summer 5.2	2	1	3	1	2	1	2	3	2	1	3	2	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Seton	Summer 5.2	1	1	3	1	2	1	2	3	2	1	3	2	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mahood	Summer 5.2	20	1	3	1	2	1	2	3	2	1	2	0	-	-	-	-	-	-	-	-	-	-	6	4	10	-	-
Clearwater	Summer 5.2	20	1	3	1	2	1	2	3	2	1	2	0	-	-	-	-	-	-	-	-	-	-	6	4	10	-	-
Finn	Spring 5.2	-	1	3	1	2	1	5	5	4	1	3	0	-	-	-	-	-	-	-	-	-	-	6	4	10	-	-
Raft	Summer 5.2	20	1	3	1	2	1	2	3	2	1	2	0	-	-	-	-	-	-	-	-	-	-	6	4	10	-	-
Barriere	Summer 5.2	20	1	3	1	2	1	2	3	2	1	2	0	-	-	-	-	-	-	-	-	-	-	6	4	10	-	-
Louis	Spring 4.2	-	1	3	1	2	1	5	5	4	1	3	0	-	-	-	-	-	-	-	-	-	-	20	8	10	-	-
North Thompson	Summer 5.2	20	1	3	1	2	1	2	3	2	1	2	0	-	-	-	-	-	-	-	-	-	-	3	2	5	-	-
Bessette	Spring 4.2	-	1	3	1	2	1	2	3	3	1	2	0	-	-	-	-	-	-	-	-	-	-	6	4	-	4	8
Middle Shuswap	Summer 4.1	30	1	3	1	2	1	2	3	2	1	2	0	-	-	-	-	-	-	-	-	-	-	3	2	-	2	8
Lower Shuswap	Summer 4.1	30	1	3	1	2	1	2	3	2	1	2	0	-	-	-	-	-	-	-	-	-	-	3	2	-	2	3
Eagle	Spring 5.2	15	1	3	1	2	1	5	5	4	1	3	0	-	-	-	-	-	-	-	-	-	-	6	4	-	10	-
Salmon	Spring 5.2	15	1	3	1	2	1	5	5	4	1	3	0	-	-	-	-	-	-	-	-	-	-	6	4	-	10	-
Adams	Summer 4.1	30	1	3	1	2	1	2	3	2	1	2	0	-	-	-	-	-	-	-	-	-	-	3	2	-	2	-
Little	Summer 4.1	30	1	3	1	2	1	2	3	2	1	2	0	-	-	-	-	-	-	-	-	-	-	3	2	-	2	-
South Thompson	Summer 4.1	30	1	3	1	2	1	2	3	2	1	2	0	-	-	-	-	-	-	-	-	-	-	3	2	-	2	-
Lower Thompson	Summer 4.1	30	1	3	1	2	1	2	3	2	1	2	0	-	-	-	-	-	-	-	-	-	-	3	2	-	-	-
Deadman	Spring 4.2	30	1	3	1	2	1	5	5	4	1	3	0	-	-	-	-	-	-	-	-	-	-	15	15	-	-	-
Bonaparte	Spring 4.2	30	1	3	1	2	1	5	5	4	1	3	0	-	-	-	-	-	-	-	-	-	-	30	-	-	-	-
Coldwater	Spring 4.2	60	1	3	1	2	1	5	5	4	1	3	0	-	-	-	-	-	-	-	-	-	-	30	-	-	-	-
Spius	Spring 4.2	60	1	3	1	2	1	5	5	4	1	3	0	-	-	-	-	-	-	-	-	-	-	30	-	-	-	-
Nicola	Spring 4.2	20	1	3	1	2	1	5	5	4	1	3	0	-	-	-	-	-	-	-	-	-	-	30	-	-	-	-
Nahatlatch	Spring 5.2	40	1	3	1	2	1	2	2	3	1	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Maria Slough	Summer 4.1	50	1	3	1	2	1	1	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Birkenhead	Spring 5.2	70	1	3	1	2	1	1	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Harrison	Fall	25	1	3	1	2	1	1	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Stock Name	Timing Group	Trib Time	AREA29.B	AREA29.E	Stev-Deas	Deas-Mission	Albion	Mission-Harrison	Harrison-Hope	Hope-Sawmill	Qualark	Sawmill-Thompson	Thompson-Texas	Texas-Kelly	Kelly-Dead	Dead-Chil	Chil-Quesnel	Quesnel-Naver	Naver-Salmon	Tete Juene	Nechako	Stuart	Chilcotin	Thompson-Bonaparte	Bonaparte-Kamloops	North Thompson	Kamloops-Shuswap	Shuswap River
Chilliwack	Fall	25	1	3	1	2	1	1	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pitt	Spring 5.2	20	1	1	1	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Blue	Spring 5.2	-	1	3	1	2	1	5	5	4	1	3	0	-	-	-	-	-	-	-	-	-	-	6	4	10	-	-
Lemieux	Summer 5.2	20	1	3	1	2	1	2	3	2	1	2	0	-	-	-	-	-	-	-	-	-	-	6	4	10	-	-
Upper Adams	Summer 4.1	30	1	3	1	2	1	2	3	2	1	2	0	-	-	-	-	-	-	-	-	-	-	3	2	-	2	-
Scotch	Spring 5.2	15	1	3	1	2	1	5	5	4	1	3	0	-	-	-	-	-	-	-	-	-	-	6	4	-	10	-
Seymour	Spring 5.2	30	1	3	1	2	1	5	5	4	1	3	0	-	-	-	-	-	-	-	-	-	-	6	4	-	10	-
Stave	Fall	20	1	3	1	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Baker	Spring 5.2	30	1	3	1	2	1	2	3	2	1	3	2	4	4	4	8	-	-	-	-	-	-	-	-	-	-	-
Big Silver	Summer 5.2	30	1	3	1	2	1	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chilliwack Su	Summer 5.2	30	1	3	1	2	1	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Douglas	Summer 5.2	30	1	3	1	2	1	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Holliday	Spring 5.2	15	1	3	1	2	1	2	3	2	1	3	2	4	4	4	8	2	4	4	-	-	-	-	-	-	-	-
Kazchek	Summer 5.2	5	1	3	1	2	1	2	3	2	1	3	2	4	4	4	8	2	4	-	2	6	-	-	-	-	-	-
Kuzkwa	Summer 5.2	5	1	3	1	2	1	2	3	2	1	3	2	4	4	4	8	2	4	-	2	6	-	-	-	-	-	-
Narcosli	Spring 5.2	30	1	3	1	2	1	2	3	2	1	3	2	4	4	4	8	-	-	-	-	-	-	-	-	-	-	-
Naver	Spring 5.2	30	1	3	1	2	1	2	3	2	1	3	2	4	4	4	8	2	-	-	-	-	-	-	-	-	-	-
Pinchi	Summer 5.2	5	1	3	1	2	1	2	3	2	1	3	2	4	4	4	8	2	4		2	4	-	-	-	-	-	-
Sloquet	Summer 5.2	30	1	3	1	2	1	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Small	Spring 5.2	15	1	3	1	2	1	2	3	2	1	3	2	4	4	4	8	2	4	4	-	--	-	-	-	-	-	-
Tipella	Summer 5.2	30	1	3	1	2	1	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Wap	Summer 4.1	30	1	3	1	2	1	2	3	2	1	2	0	-	-	-	-	-	-	-	-	-	-	3	2	-	2	8
McKinley	Spring 5.2	10	1	3	1	2	1	2	3	2	1	3	2	4	4	4	8	-	-	-	-	-	-	-	-	-	-	-
Chehalis	Summer 5.2	30	1	3	1	2	1	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

[1] Area 29-B cumulative residence time is set to be the same as the Steveston-Deas cumulative residence time as these fisheries overlap geographically.

[2] Area 29-E cumulative residence time is set to be the same as the Deas-Mission cumulative residence time as these fisheries overlap geographically.

[3] Albian cumulative residence time is set to be the same as the Deas-Mission cumulative residence time as these fisheries overlap geographically.

[4] Qualark cumulative residence time is set to be the same as the Hope-Sawmill cumulative residence time as these fisheries overlap geographically.

Table K - 2. Spawn timing parameters used in our parameterization of the Fraser Chinook run reconstruction model.

Stock Name	Agg. Name	Duration	Spawn Start Day	Spawn Peak Day	Spawn End Day
Swift	Spring 5.2	70	196	231	266
Fraser	Spring 5.2	70	214	249	284
Horsey	Spring 5.2	70	194	229	264
Nevin	Spring 5.2	70	197	232	267
Holmes	Spring 5.2	70	198	233	268
McKale	Spring 5.2	70	196	231	266
Twin	Spring 5.2	70	196	231	266
Goat	Spring 5.2	70	195	230	265
Morkill	Spring 5.2	70	193	228	263
Walker	Spring 5.2	70	195	230	265
Torpy	Spring 5.2	70	193	228	263
Dome	Spring 5.2	70	198	233	268
Slim	Spring 5.2	70	206	241	276
Bowron	Spring 5.2	70	206	241	276
McGregor	Spring 5.2	70	196	231	266
Willow	Spring 5.2	70	202	237	272
Salmon (PG)	Spring 5.2	70	203	238	273
Stuart	Summer 5.2	48	232	256	280
Nechako	Summer 5.2	62	216	247	278
Stellako	Summer 5.2	62	216	247	278
Endako	Spring 5.2	66	194	227	260
Chilako	Spring 5.2	76	134	172	210
Blackwater	Spring 5.2	132	133	199	265
Cottonwood	Spring 5.2	76	133	171	209
Quesnel	Summer 5.2	50	244	269	294
Cariboo	Summer 5.2	80	210	250	290
Horsefly	Spring 5.2	70	205	240	275
Chilko	Summer 5.2	76	204	242	280
Chilcotin Upper	Spring 5.2	76	186	224	262
Chilcotin Lower	Spring 5.2	70	205	240	275
Elkin	Summer 5.2	70	217	252	287
Taseko	Summer 5.2	50	227	252	277
Bridge	Spring 5.2	50	224	249	274
Portage	Summer 5.2	50	281	306	331
Seton	Summer 5.2	50	284	309	334
Mahood	Summer 5.2	46	242	265	288
Clearwater	Summer 5.2	54	238	265	292
Finn	Spring 5.2	62	207	238	269
Raft	Summer 5.2	46	235	258	281
Barriere	Summer 5.2	46	235	258	281
Louis	Spring 4.2	78	156	195	234
North Thompson	Summer 5.2	88	208	252	296
Bessette	Spring 4.2	110	172	227	282
Middle Shuswap	Summer 4.1	68	223	257	291
Lower Shuswap	Summer 4.1	74	232	269	306
Eagle	Spring 5.2	68	215	249	283
Salmon (ST)	Spring 5.2	62	201	232	263
Adams	Summer 4.1	60	249	279	309

Stock Name	Agg. Name	Duration	Spawn Start Day	Spawn Peak Day	Spawn End Day
Little River	Summer 4.1	76	249	287	325
South Thompson	Summer 4.1	76	249	287	325
Lower Thompson	Summer 4.1	76	263	301	339
Deadman	Spring 4.2	120	186	246	306
Bonaparte	Spring 4.2	120	186	246	306
Coldwater	Spring 4.2	100	190	240	290
Spius	Spring 4.2	100	190	240	290
Nicola	Spring 4.2	82	202	243	284
Nahatlatch	Spring 5.2	60	214	244	274
Maria Slough	Summer 4.1	50	258	283	308
Birkenhead	Spring 5.2	100	116	166	216
Harrison	Fall	92	264	310	356
Chilliwack	Fall	92	264	310	356
Pitt	Spring 5.2	46	214	237	260
Blue	Spring 5.2	62	207	238	269
Lemieux	Summer 5.2	88	205	249	293
Upper Adams	Summer 4.1	74	228	265	302
Scotch	Spring 5.2	65	205	238	270
Seymour	Spring 5.2	65	220	253	285
Stave	Fall	69	268	303	337
Baker	Spring 5.2	76	161	199	237
Big Silver	Summer 5.2	46	234	257	280
Chilliwack Su	Summer 5.2	46	234	257	280
Douglas	Summer 5.2	46	234	257	280
Holliday	Spring 5.2	70	192	227	262
Kazchek	Summer 5.2	46	238	261	284
Kuzkwa	Summer 5.2	46	238	261	284
Narcosli	Spring 5.2	76	161	199	237
Naver	Spring 5.2	76	163	201	239
Pinchi	Summer 5.2	46	236	259	282
Sloquet	Summer 5.2	46	234	257	280
Small	Spring 5.2	69	305	340	374
Tipella	Summer 5.2	46	234	257	280
Wap	Summer 4.1	68	223	257	291
McKinley	Spring 5.2	70	205	240	275
Chehalis	Summer 5.2	46	234	257	280

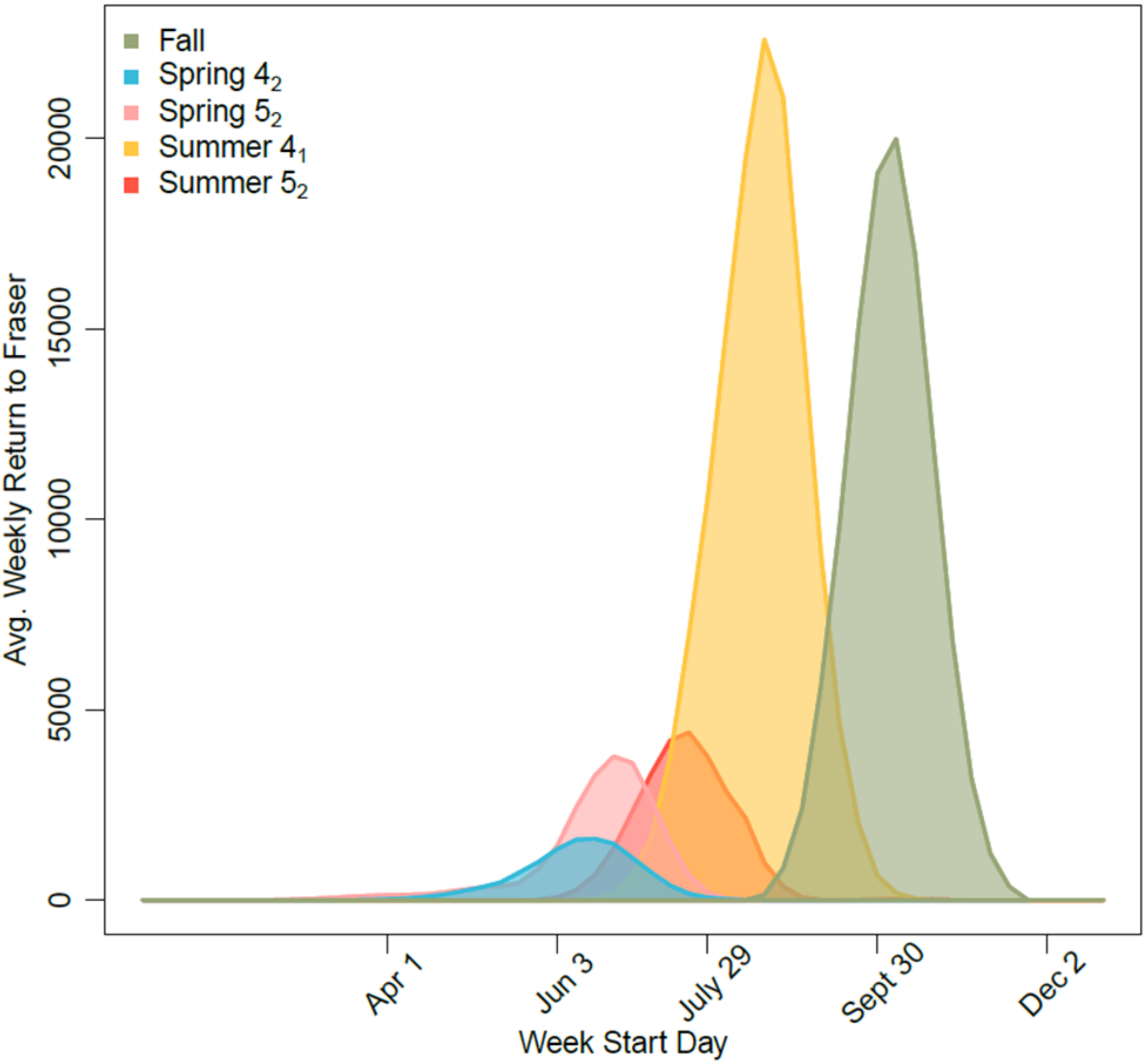


Figure K - 1. Run timing of stock aggregates included in the Fraser run reconstruction, based on our parameterization of the model. Timing is being represented as average weekly return to the mouth of the river.

Table K - 2. Rationale behind parameterization of release and drop-off mortality in our parameterization of the run reconstruction model. All references cited in this table are provided in Section 9.

Fishery Location	Fishery Type	Gear	Base Scenario	IFMP Scenario
Fraser and Trib.	Sport	Assume hook and line	**Release Mortality 12.3%** - *CTC (2004) Table 11 gives values of 12.3% for fish greater than 33cm (both barbed and barbless) and 32.2% for fish smaller than 33cm. We have used 12.3% because we assume all fish caught in the Fraser are mature.* **Drop-off 6.9%** - *CTC (1997) average drop-off rates between SEAK (3.6%), Puget Sound(14.5%), and Oregon (2.7%).*	**Release Mortality 15%** - *2018/2019 IFMP (DFO 2018a) Table 7.3-1 gives both recreational with troll and mooching gear values of 15%.*
Fraser	FN and Commercial	Gillnet	**Release Mortality 90%** - *Sublegal and legal incidental mortality are estimated to be 90% in both CTC documents.* **Drop-off 8%** - *CTC (2004) Table 13 suggests a drop-off rate of 8% for gillnet fisheries.*	**Release Mortality 60%** - *2018/2019 IFMP (DFO 2018a) Table 7.3-1 gives 60% release mortality rates for both FN and commercial (provisions for rates as low as 40% where techniques warrant)*
Fraser	FN and Commercial	Purse Seine	**Release Mortality 40%** – *CTC (2004) Table 12 estimates total mortality (immediate and delayed) for all fish sizes at 72.0%, however for terminal fisheries (<60d to spawning) gave values of 63.9, 51.6, and 29.1% for small, medium, and large Chinook, respectively. Assuming all fish caught in Fraser are mature; we took the average of the medium/large fish (>53 cm) less than 60d to spawning.* **Drop-off 8%** - *No values are given by CTC, so used gillnet rate; gillnet and seine mixed in CTC model.*	**Release Mortality 25%** - *2018/2019 IFMP (DFO 2018a) Table 7.3-1 gives value of 25% for "seine" for Johnstone Strait and all areas for Sockeye.*
Fraser	FN and Commercial	Beach Seine	**Release Mortality 5%** - *In the absence of CTC values, we used the rate given in the IFMP (DFO 2018a) for Sockeye and Coho for in-river fisheries.* **Dropoff 0%** - *With consultation from the technical working group, we chose a drop-off value of 0 due to low rates of escaping from gear with injury.*	**Release Mortality 5%** - *2018/2019 IFMP (DFO 2018a) Table 7.3-1 gives value of 5% for Sockeye/Coho for in-river fisheries.* **Dropoff 0%** - *Consultation with technical working group, led to a drop-off value of*

Fishery Location	**Fishery Type**	**Gear**	**Base Scenario**	**IFMP Scenario**
				0 due to low rates of escaping from gear with injury.
Fraser	FN and Commercial	Fish Wheel/ Dip Net	**Release Mortality 5%** – *No clear CTC recommendation. 2018/2019 IFMP (DFO 2018a) Table 7.3-1 states 5% for fishwheel for Sockeye and Coho in-river. No data for dip net.* **Drop-off 0%** - *Based on pers. comm. with field staff, the likelihood of drop-off mortality is very low, since both methods are very non-invasive, and have low rates of fish escaping from gear.*	**Release Mortality 5%** – 2018/2019 *IFMP (DFO 2018a) Table 7.3-1 states 5% for fishwheel for Sockeye and Coho in-river. No data for dip net.*
Tributary	FN	Assume Gillnet	**Release Mortality 90%** - *No Value given in either CTC report, therefore use FN and commercial values above.*	**Release Mortality 60%** - *No value given, therefore use gillnet value above.*
Marine	Commercial Troll	Unknown	**Release Mortality 20% -** *CTC (2004). For WCVI troll: 18.5% (legal size Chinook) and 22.0% (sub-legal size Chinook) caught with barbless hooks; 21.1% and 25.5% for legal and sublegal caught with barbed. We have used an average of 18.5 and 22.0. Assuming all fish are mature, use the average of the legal-sized mortalities (between barbed and barbless hooks). No values given for T'aaq-wiihak, Northern; used WCVI values for all.* **Drop-off 1.7%** - *CTC (2004) assumed 1.7% drop-off for legal/sublegal, barbed, barbless.*	**Release Mortality 15%** - *2018/2019 IFMP (DFO 2018a) Table 7.3-1. Commercial troll – all areas.*
Marine	All Recreational	Unknown	**Release Mortality 10%, Drop-off 15%** - *CTC (2004) uses 10% release + 15% drop-off for WCVI and JDF. For Northern BC it cites the 2001 domestic management plan that uses 15% release mortality, with no adjustments for drop-off. We have chosen to use the same value for all three marine rec. fisheries.*	**Release Mortality 15%** - *2018/2019 IFMP (DFO 2018a) Table 7.3-1. Recreational with troll and mooching gear both given value of 15%.*

APPENDIX L: GSI DATA

Table L - 1. Estimated proportion of Spring 4_2, Spring 5_2 and Summer 5_2 Chinook in the Northern Troll (Area F) fishery from GSI samples.

Year	Month	DNA stock composition				Total Effort, Kept Catch and Releases (Rel)			
		n	*Sample Rate*	Spring 4_2	Spring & Summer 5_2	Effort	Kept	Rel (legal)	Rel (sublegal)
2002	ALL	*934*	*0.9%*	0.00%	6.3%	*4,169*	103,037	5,109	2,737
2003	ALL	*1775*	*1.3%*	0.00%	5.5%	*5,056*	137,357	11,798	1,869
2004	ALL	*1911*	*1.1%*	0.03%	6.9%	*5,545*	167,508	31,460	3,094
2005	ALL	*2496*	*1.4%*	0.36%	4.0%	*5,788*	174,806	20,414	1,127
2006	ALL	*2522*	*1.7%*	0.13%	4.9%	*5,665*	151,485	818	10,001
2007	ALL	*1326*	*1.6%*	0.04%	3.3%	*4,452*	83,235	1,896	9,527
2008	ALL	*1569*	*3.0%*	0.05%	4.2%	*4,297*	52,147	1,707	4,417
2009	ALL	*2129*	*2.8%*	0.13%	3.4%	*5,324*	75,470	3,470	9,159
2010	ALL	*1875*	*2.1%*	0.14%	2.4%	*4,958*	90,213	5,635	7,993
2011	ALL	*1734*	*2.3%*	0.00%	1.5%	*3,600*	74,660	31,994	4,480
2012	ALL	*2875*	*3.6%*	0.09%	1.8%	*5,462*	80,256	3,901	11,186
2013	ALL	*1337*	*1.9%*	0.00%	1.5%	*5,135*	69,264	29,994	8,565
2014	ALL	*2155*	*1.3%*	0.16%	1.8%	*5,141*	172,001	6,679	13,937
2015	ALL	*1897*	*1.8%*	0.30%	1.8%	*3,670*	106,703	17,961	7,036
2016	ALL	*2271*	*1.5%*	0.05%	1.1%	*5,220*	147,381	3,838	14,326
2017	ALL	*2071*	*2.1%*	0.00%	1.6%	*5,369*	97,730	10,706	23,412
2018	ALL	*1931*	*2.7%*	0.00%	1.2%	*2,420*	72,276	5,732	15,946

Table L-2. Estimated mortalities of Spring 4_2, Spring 5_2 and Summer 5_2 Chinook in the Northern Troll (Area F) fishery from GSI samples.

Year	Estimated Spring 4_2 Encounters			Estimated Spring & Summer 5_2 Encounters		
	Kept	**Rel (legal)**	**Rel (sublegal)**	**Kept**	**Rel (legal)**	**Rel (sublegal)**
2002	0	0	0	6,467	321	172
2003	0	0	0	7,508	645	102
2004	55	10	1	11,616	2,182	215
2005	633	74	4	6,935	810	45
2006	196	1	13	7,471	40	493
2007	29	1	3	2,726	62	312
2008	26	1	2	2,183	71	185
2009	101	5	12	2,597	119	315
2010	129	8	11	2,172	136	192
2011	3	1	0	1,087	466	65
2012	72	3	10	1,484	72	207
2013	1	0	0	1,072	464	133
2014	269	10	22	3,123	121	253
2015	321	54	21	1,917	323	126
2016	71	2	7	1,691	44	164
2017	0	0	0	1,544	169	370
2018	0	0	0	862	68	190

Table L - 3. Estimated proportion of Spring 4_2, Spring 5_2 and Summer 5_2 Chinook in the Northern Recreational (AABM) fishery from GSI samples.

Year	**Month**	**DNA stock composition**				**Total Effort, Kept Catch and Releases (Rel)**			
		n	***Sample Rate***	**Spring 4_2**	**Spring &Summer 5_2**	**Effort**	**Kept**	**Rel (legal)**	**Rel (sublegal)**
2002	ALL	*0*	-	-	-	-	47,100	42,275	-
2003	ALL	*225*	*0.4%*	0.02%	1.1%	-	54,300	47,575	-
2004	ALL	*597*	*0.8%*	0.11%	2.6%	-	74,000	116,809	-
2005	ALL	*684*	*1.0%*	0.00%	2.2%	-	68,800	61,283	-
2006	ALL	*874*	*1.4%*	0.04%	2.7%	-	64,500	32,582	-
2007	ALL	*1020*	*1.7%*	0.01%	2.2%	-	61,000	35,688	-
2008	ALL	*642*	*1.5%*	0.08%	1.7%	-	43,500	10,691	-
2009	ALL	*576*	*1.7%*	0.01%	3.0%	-	34,000	17,531	-
2010	ALL	*769*	*1.7%*	0.11%	1.5%	-	46,400	32,117	-
2011	ALL	*798*	*1.7%*	0.02%	1.5%	-	48,000	46,453	-
2012	ALL	*504*	*1.3%*	0.00%	1.9%	-	40,050	22,235	-
2013	ALL	*535*	*1.1%*	0.00%	1.1%	-	46,650	47,931	-
2014	ALL	*524*	*1.2%*	0.00%	1.8%	-	44,900	36,920	-
2015	ALL	*523*	*1.0%*	0.01%	0.7%	-	52,200	72,749	-
2016	ALL	*525*	*1.2%*	0.47%	0.8%	-	42,800	29,711	-
2017	ALL	*541*	*1.2%*	0.21%	0.8%	-	45,600	28,724	-
2018	ALL	557	*1.5%*	0.00%	1.1%	-	36,700	-	-

Table L- 4. Estimated mortalities of Spring 4_2, Spring 5_2 and Summer 5_2 Chinook in the Northern Recreational (AABM) fishery from GSI samples.

Year	**Estimated Spring 4_2 Encounters**			**Estimated Spring & Summer 5_2 Encounters**		
	Kept	**Rel (legal)**	**Rel (sublegal)**	**Kept**	**Rel (legal)**	**Rel (sublegal)**
2002	-	-	-	-	-	-
2003	11	10	-	586	514	-
2004	84	133	-	1,910	3,015	-
2005	-	-	-	1,539	1,371	-
2006	26	13	-	1,772	895	-
2007	8	5	-	1,316	770	-
2008	36	9	-	720	177	-
2009	4	2	-	1,015	523	-
2010	51	35	-	704	487	-
2011	9	8	-	718	695	-
2012	0	0	-	762	423	-
2013	0	0	-	509	523	-
2014	-	-	-	794	653	-
2015	5	7	-	357	497	-
2016	202	140	-	337	234	-
2017	96	61	-	346	218	-
2018	-	-	-	411	-	-

Table L - 5. Estimated proportion of Spring 4_2, Spring 5_2 and Summer 5_2 Chinook in the WCVI Troll (Area G) fishery from GSI samples.

Year	Month	Area	DNA stock composition					Total Effort, Kept Catch and Releases (Rel)			
			n	***Sample Rate***	**Spring 4_2**	**Spring 5_2**	**Summer 5_2**	**Effort**	**Kept**	**Rel (legal)**	**Rel (sublegal)**
2007	JAN	NWVI	*187*	*4%*	0.0%	0.0%	0.0%	207	4,740	616	-
2007	FEB	NWVI	*100*	*6%*	0.0%	1.0%	0.0%	113	1,543	223	-
2007	MAR	NWVI	*100*	*8%*	0.0%	0.0%	0.1%	108	1,182	98	-
2007	APR	NWVI	*100*	*5%*	1.0%	3.0%	0.0%	245	1,995	64	-
2007	MAY	NWVI	*99*	*2%*	0.4%	3.2%	1.2%	448	5,164	118	-
2007	JUN	NWVI	*251*	*2%*	0.0%	3.2%	0.2%	406	12,709	529	-
2007	SEP	NWVI	*95*	*9%*	0.0%	0.0%	1.1%	96	1,046	125	-
2007	OCT	NWVI	*81*	*8%*	0.0%	0.0%	0.0%	39	1,072	157	-
2007	SEP	NWVI	*199*	*19%*	0.0%	0.0%	1.1%	96	1,046	125	-
2007	JAN	SWVI	*99*	*14%*	0.0%	0.0%	0.0%	64	700	155	-
2007	FEB	SWVI	*100*	*10%*	0.0%	0.0%	0.0%	101	1,044	226	-
2007	MAR	SWVI	*104*	*10%*	0.0%	0.0%	0.0%	85	1,074	284	-
2007	APR	SWVI	*126*	*4%*	0.5%	0.0%	0.0%	272	3,334	229	-
2007	MAY	SWVI	*369*	*2%*	0.0%	0.0%	0.5%	775	18,805	1,475	-
2007	JUN	SWVI	*250*	*2%*	0.0%	0.9%	0.1%	422	13,033	742	-
2007	SEP	SWVI	*100*	*2%*	0.0%	0.0%	0.0%	162	4,936	1,820	-
2007	OCT	SWVI	*100*	*5%*	0.0%	0.0%	0.0%	69	2,065	1,307	-
2008	JAN	NWVI	*106*	*9%*	0.0%	0.0%	0.0%	125	1,170	142	-
2008	FEB	NWVI	*102*	*9%*	0.0%	0.0%	0.0%	125	1,095	84	-
2008	APR	NWVI	*397*	*23%*	0.3%	0.9%	0.0%	243	1,735	38	-
2008	MAY	NWVI	*214*	*6%*	0.9%	2.5%	0.0%	416	3,500	21	-
2008	JUN	NWVI	*205*	*7%*	1.4%	2.2%	0.0%	235	2,852	20	-
2008	AUG	NWVI	*125*	*25%*	0.0%	0.0%	0.8%	26	509	3	-
2008	OCT	NWVI	*0*	-	-	-	-	21	617	76	-
2008	NOV	NWVI	*0*	-	-	-	-	16	1,025	86	-
2008	DEC	NWVI	*199*	*19%*	0.0%	0.0%	0.0%	19	1,055	109	-
2008	SEP	NWVI	*0*	-	-	-	-	196	3,642	341	-
2008	JAN	SWVI	*100*	*22%*	0.0%	0.1%	0.2%	58	464	108	-

Year	Month	Area	DNA stock composition					Total Effort, Kept Catch and Releases (Rel)			
			n	***Sample Rate***	**Spring 4_2**	**Spring 5_2**	**Summer 5_2**	**Effort**	**Kept**	**Rel (legal)**	**Rel (sublegal)**
2008	FEB	SWVI	*100*	*12%*	0.0%	0.2%	0.2%	85	854	194	-
2008	APR	SWVI	*0*	-	-	-	-	11	11	3	-
2008	MAY	SWVI	*196*	*2%*	1.7%	0.0%	0.0%	552	8,004	125	-
2008	JUN	SWVI	*197*	*2%*	1.0%	0.5%	0.1%	408	13,092	342	-
2008	AUG	SWVI	*153*	*2%*	0.0%	1.8%	0.0%	144	8,590	171	-
2008	SEP	SWVI	*798*	*2%*	0.0%	0.0%	0.0%	587	41,515	4,242	-
2008	OCT	SWVI	*0*	-	-	-	-	33	1,265	682	-
2008	NOV	SWVI	*0*	-	-	-	-	11	184	71	-
2008	DEC	SWVI	*0*	-	-	-	-	7	52	27	-
2009	JAN	NWVI	*200*	*7%*	0.0%	0.0%	0.0%	231	2,933	260	-
2009	FEB	NWVI	*200*	*15%*	0.0%	0.5%	0.0%	207	1,310	111	-
2009	MAR	NWVI	*200*	*39%*	0.0%	0.0%	0.1%	108	519	9	-
2009	APR	NWVI	*200*	*6%*	0.0%	1.1%	0.2%	288	3,327	68	-
2009	MAY	NWVI	*400*	*13%*	0.0%	2.6%	2.8%	356	3,068	80	-
2009	JUN	NWVI	*298*	*8%*	0.4%	3.1%	1.5%	156	3,873	617	-
2009	AUG	NWVI	*201*	*9%*	0.0%	1.0%	0.2%	71	2,198	92	-
2009	JAN	SWVI	*0*	-	-	-	-	86	461	91	-
2009	FEB	SWVI	*0*	-	-	-	-	58	230	23	-
2009	MAR	SWVI	*0*	-	-	-	-	18	67	4	-
2009	APR	SWVI	*0*	-	-	-	-	34	289	19	-
2009	MAY	SWVI	*380*	*3%*	0.0%	0.3%	0.0%	492	14,994	1,064	-
2009	JUN	SWVI	*298*	*4%*	0.4%	0.5%	0.3%	332	8,292	552	-
2009	AUG	SWVI	*201*	*3%*	0.1%	0.0%	1.8%	137	7,432	709	-
2009	SEP	SWVI	*0*	-	-	-	-	5	-	470	-
2010	APR	NWVI	*238*	*3%*	0.0%	0.8%	0.0%	245	8,141	249	-
2010	MAY	NWVI	*399*	*2%*	0.3%	0.0%	0.0%	528	16,926	844	-
2010	JUN	NWVI	*199*	*4%*	0.0%	0.4%	0.1%	150	4,927	297	-
2010	AUG	NWVI	*199*	*8%*	0.0%	0.0%	0.0%	62	2,574	208	-
2010	SEP	NWVI	*0*	-	-	-	-	42	2,292	104	-

Year	Month	Area	DNA stock composition					Total Effort, Kept Catch and Releases (Rel)			
			n	***Sample Rate***	**Spring 4_2**	**Spring 5_2**	**Summer 5_2**	**Effort**	**Kept**	**Rel (legal)**	**Rel (sublegal)**
2010	APR	SWVI	*0*					42	412	21	-
2010	MAY	SWVI	*400*	*3%*	0.0%	0.0%	0.0%	481	14,370	505	-
2010	JUN	SWVI	*353*	*2%*	0.0%	0.0%	0.0%	314	18,725	2,017	-
2010	AUG	SWVI	*164*	*2%*	0.0%	0.2%	0.3%	153	9,068	329	-
2010	SEP	SWVI	*95*	*6%*	0.0%	0.0%	0.0%	65	1,688	693	-
2011	FEB	NWVI	*0*	-	-	-	-	71	1,402	34	-
2011	MAR	NWVI	*184*	*23%*	0.0%	0.0%	0.0%	49	796	24	-
2011	APR	NWVI	*131*	*2%*	0.0%	0.0%	1.6%	232	8,392	170	-
2011	MAY	NWVI	*375*	*1%*	0.0%	0.3%	0.2%	1,808	25,994	572	-
2011	JUN	NWVI	*224*	*2%*	0.7%	0.6%	0.0%	166	11,289	298	-
2011	JUL	NWVI	*310*	*2%*	0.0%	0.0%	2.9%	300	15,620	477	-
2011	AUG	NWVI	*119*	*2%*	0.0%	0.0%	1.8%	95	6,070	73	-
2011	NOV	NWVI	*0*	-	-	-	-	7	53	3	-
2011	DEC	NWVI	*0*	-	-	-	-	10	95	6	-
2011	FEB	SWVI	*0*	-	-	-	-	46	447	27	-
2011	MAR	SWVI	*0*	-	-	-	-	14	79	14	-
2011	APR	SWVI	*0*	-	-	-	-	19	293	4	-
2011	MAY	SWVI	*86*	*1%*	0.0%	0.0%	0.0%	511	15,322	612	-
2011	JUN	SWVI	*461*	*2%*	0.2%	0.4%	0.0%	336	23,106	2,795	-
2011	AUG	SWVI	*330*	*2%*	0.0%	0.2%	0.0%	170	15,213	614	-
2011	SEP	SWVI		-	-	-	-	4	-	562	-
2011	NOV	SWVI	*0*	-	-	-	-	8	4	21	-
2011	DEC	SWVI	*0*	-	-	-	-	21	93	24	-
2012	JAN	NWVI	*0*	-	-	-	-	7	84	-	-
2012	FEB	NWVI	*105*	*35%*	0.0%	0.1%	3.4%	22	300	4	-
2012	MAR	NWVI	*32*	*16%*	0.0%	0.0%	0.0%	26	200	1	-
2012	APR	NWVI	*208*	*2%*	0.0%	1.2%	0.1%	253	10,154	163	-
2012	MAY	NWVI	*150*	*1%*	0.0%	0.8%	0.0%	585	20,250	641	-
2012	AUG	NWVI	*301*	*38%*	0.0%	0.3%	0.0%	17	787	18	-

Year	Month	Area	DNA stock composition					Total Effort, Kept Catch and Releases (Rel)			
			n	*Sample Rate*	Spring 4_2	Spring 5_2	Summer 5_2	Effort	Kept	Rel (legal)	Rel (sublegal)
2012	OCT	NWVI	*0*	-	-	-	-	6	152	23	-
2012	NOV	NWVI	*0*	-	-	-	-	2	59	2	-
2012	DEC	NWVI	*0*	-	-	-	-	9	60	12	-
2012	SEP	NWVI	*58*	*1%*	0.0%	0.0%	0.0%	115	4,121	728	-
2012	JAN	SWVI	*0*	-	-	-	-	14	45	21	-
2012	FEB	SWVI	*0*	-	-	-	-	29	242	62	-
2012	MAR	SWVI	*0*	-	-	-	-	7	43	15	-
2012	APR	SWVI	*0*	-	-	-	-	24	339	42	-
2012	MAY	SWVI	*100*	*5%*	0.1%	0.0%	0.0%	172	2,084	119	-
2012	AUG	SWVI	*110*	*3%*	0.2%	0.4%	0.0%	35	3,493	218	-
2012	SEP	SWVI	*263*	*2%*	0.0%	0.0%	0.0%	224	13,143	3,280	-
2012	OCT	SWVI	*80*	*3%*	0.0%	0.0%	0.0%	33	3,192	971	-
2012	NOV	SWVI	*50*	*29%*	0.0%	0.0%	0.0%	20	171	63	-
2012	DEC	SWVI	*32*	*13%*	0.0%	0.0%	0.0%	23	252	85	-
2013	JAN	NWVI	*48*	*6%*	0.0%	0.0%	0.0%	48	772	89	-
2013	FEB	NWVI	*79*	*23%*	0.0%	0.0%	0.0%	31	341	13	-
2013	MAR	NWVI	*0*	-	-	-	-	53	452	17	-
2013	APR	NWVI	*25*	*2%*	0.0%	0.0%	0.0%	175	1,063	20	-
2013	MAY	NWVI	*13*	*0%*	0.0%	0.0%	0.0%	218	2,723	34	-
2013	JAN	SWVI	*0*	-	-	-	-	42	246	76	-
2013	FEB	SWVI	*0*	-	-	-	-	11	17	34	-
2013	MAR	SWVI	*32*	*63%*	0.0%	0.0%	0.0%	11	51	7	-
2013	APR	SWVI	*0*	-	-	-	-	13	141	20	-
2013	MAY	SWVI	*9*	*0%*	0.0%	0.0%	0.0%	489	22,943	2,814	-
2013	OCT	SWVI	*92*	*4%*	0.0%	0.0%	0.0%	47	2,358	282	-
2013	NOV	SWVI	*0*	-	-	-	-	13	28	24	-
2013	DEC	SWVI	*0*	-	-	-	-	13	25	23	-
2014	FEB	NWVI	*0*	-	-	-	-	10	427	2	-
2014	MAR	NWVI	*375*	*34%*	0.8%	0.8%	0.9%	36	1,117	7	-

Year	Month	Area	DNA stock composition					Total Effort, Kept Catch and Releases (Rel)			
			n	*Sample Rate*	Spring 4_2	Spring 5_2	Summer 5_2	Effort	Kept	Rel (legal)	Rel (sublegal)
2014	APR	NWVI	*441*	*3%*	0.0%	0.7%	0.7%	397	13,268	224	-
2014	MAY	NWVI	*643*	*2%*	1.7%	0.5%	0.9%	1,350	37,218	2,323	-
2014	JUL	NWVI	*528*	*2%*	0.0%	0.0%	1.4%	419	26,494	1,095	-
2014	AUG	NWVI	*135*	*1%*	0.0%	0.3%	0.5%	160	9,371	302	-
2014	SEP	NWVI	*22*	*1%*	0.0%	0.0%	0.0%	265	2,875	321	-
2014	NOV	NWVI	*0*	-	-	-	-	8	24	12	-
2014	SEP	NWVI	*94*	*3%*	0.0%	0.0%	0.0%	265	2,875	321	-
2014	JAN	SWVI	*0*	-	-	-	-	15	49	31	-
2014	FEB	SWVI	*0*	-	-	-	-	10	159	26	-
2014	MAR	SWVI	*251*	*82%*	0.0%	0.0%	0.0%	24	305	83	-
2014	APR	SWVI	*0*	-	-	-	-	11	77	6	-
2014	MAY	SWVI	*99*	*3%*	0.0%	0.0%	0.0%	161	3,118	542	-
2014	AUG	SWVI	*0*	-	-	-	-	42	631	52	-
2014	SEP	SWVI	*76*	*1%*	0.0%	0.0%	0.0%	271	12,276	1,563	-
2014	OCT	SWVI	*0*	-	-	-	-	39	213	92	-
2014	NOV	SWVI	*0*	-	-	-	-	6	32	22	-
2015	JAN	NWVI	*0*	-	-	-	-	10	67	5	-
2015	FEB	NWVI	*0*	-	-	-	-	13	70	11	-
2015	MAR	NWVI	*205*	*48%*	0.0%	0.3%	0.2%	34	426	48	-
2015	APR	NWVI	*188*	*5%*	0.0%	0.0%	0.0%	274	3,803	223	-
2015	MAY	NWVI	*451*	*2%*	1.1%	1.4%	0.1%	1,068	22,285	787	-
2015	AUG	NWVI	*299*	*2%*	0.0%	0.1%	0.0%	70	12,552	99	-
2015	JAN	SWVI	*0*	-	-	-	-	11	119	28	-
2015	FEB	SWVI	*0*	-	-	-	-	33	542	176	-
2015	MAR	SWVI	*106*	*35%*	0.0%	0.0%	0.0%	28	305	84	-
2015	APR	SWVI	*0*	-	-	-	-	2	38	9	-
2015	MAY	SWVI	*196*	*4%*	0.0%	0.0%	0.0%	433	5,120	372	-
2015	AUG	SWVI	*43*	*3%*	0.1%	0.0%	0.0%	28	1,401	57	-
2015	SEP	SWVI	*124*	*2%*	0.0%	0.0%	0.0%	176	6,358	356	-

Table L – 6. Estimated mortality of Spring 4_2, Spring 5_2 and Summer 5_2 Chinook in the WCVI Troll (Area G) fishery from GSI samples

Year	Month	Area	Estimated Spring 4_2 Encounters			Estimated Spring 5_2 Encounters			Estimated Summer 5_2 Encounters		
			Kept	Rel (legal)	Rel (sublegal)	Kept	Rel (legal)	Rel (sublegal)	Kept	Rel (legal)	Rel (sublegal)
2007	JAN	NWVI	0	0	-	0	0	-	1	0	-
2007	FEB	NWVI	0	0	-	15	2	-	0	0	-
2007	MAR	NWVI	0	0	-	0	0	-	1	0	-
2007	APR	NWVI	20	1	-	60	2	-	0	0	-
2007	MAY	NWVI	19	0	-	166	4	-	60	1	-
2007	JUN	NWVI	1	0	-	400	17	-	29	1	-
2007	SEP	NWVI	-	-	-	-	-	-	-	-	-
2007	OCT	NWVI	-	-	-	0	0	-	0	0	-
2007	SEP	NWVI	-	-	-	0	0	-	11	1	-
2007	JAN	SWVI	0	0	-	-	-	-	-	-	-
2007	FEB	SWVI	-	-	-	0	0	-	-	-	-
2007	MAR	SWVI	0	0	-	0	0	-	0	0	-
2007	APR	SWVI	18	1	-	0	0	-	0	0	-
2007	MAY	SWVI	-	-	-	2	0	-	96	8	-
2007	JUN	SWVI	6	0	-	118	7	-	10	1	-
2007	SEP	SWVI	0	0	-	0	0	-	-	-	-
2007	OCT	SWVI	-	-	-	0	0	-	0	0	-
2008	JAN	NWVI	0	0	-	0	0	-	0	0	-
2008	FEB	NWVI	-	-	-	0	0	-	0	0	-
2008	APR	NWVI	5	0	-	15	0	-	0	0	-
2008	MAY	NWVI	33	0	-	89	1	-	1	0	-
2008	JUN	NWVI	39	0	-	64	0	-	1	0	-
2008	AUG	NWVI	0	0	-	0	0	-	4	0	-
2008	OCT	NWVI	-	-	-	-	-	-	-	-	-
2008	NOV	NWVI	-	-	-	-	-	-	-	-	-
2008	DEC	NWVI	0	0	-	0	0	-	0	0	-
2008	SEP	NWVI	-	-	-	-	-	-	-	-	-
2008	JAN	SWVI	-	-	-	0	0	-	1	0	-

Year	Month	Area	Estimated Spring 4_2 Encounters			Estimated Spring 5_2 Encounters			Estimated Summer 5_2 Encounters		
			Kept	Rel (legal)	Rel (sublegal)	Kept	Rel (legal)	Rel (sublegal)	Kept	Rel (legal)	Rel (sublegal)
2008	FEB	SWVI	-	-	-	2	0	-	1	0	-
2008	APR	SWVI	-	-	-	-	-	-	-	-	-
2008	MAY	SWVI	138	2	-	-	-	-	0	0	-
2008	JUN	SWVI	136	4	-	67	2	-	9	0	-
2008	AUG	SWVI	0	0	-	151	3	-	4	0	-
2008	SEP	SWVI	0	0	-	1	0	-	1	0	-
2008	OCT	SWVI	-	-	-	-	-	-	-	-	-
2008	NOV	SWVI	-	-	-	-	-	-	-	-	-
2008	DEC	SWVI	-	-	-	-	-	-	-	-	-
2009	JAN	NWVI	0	0	-	0	0	-	0	0	-
2009	FEB	NWVI	0	0	-	7	1	-	0	0	-
2009	MAR	NWVI	0	0	-	0	0	-	0	0	-
2009	APR	NWVI	0	0	-	37	1	-	5	0	-
2009	MAY	NWVI	0	0	-	78	2	-	85	2	-
2009	JUN	NWVI	14	2	-	122	19	-	60	10	-
2009	AUG	NWVI	0	0	-	23	1	-	3	0	-
2009	JAN	SWVI	-	-	-	-	-	-	-	-	-
2009	FEB	SWVI	-	-	-	-	-	-	-	-	-
2009	MAR	SWVI	-	-	-	-	-	-	-	-	-
2009	APR	SWVI	-	-	-	-	-	-	-	-	-
2009	MAY	SWVI	3	0	-	44	3	-	0	0	-
2009	JUN	SWVI	34	2	-	41	3	-	28	2	-
2009	AUG	SWVI	5	0	-	2	0	-	133	13	-
2009	SEP	SWVI	-	-	-	-	-	-	-	-	-
2010	APR	NWVI	0	0	-	66	2	-	0	0	-
2010	MAY	NWVI	52	3	-	0	0	-	0	0	-
2010	JUN	NWVI	0	0	-	19	1	-	5	0	-
2010	AUG	NWVI	0	0	-	0	0	-	0	0	-
2010	SEP	NWVI	-	-	-	-	-	-	-	-	-

Year	Month	Area	Estimated Spring 4_2 Encounters			Estimated Spring 5_2 Encounters			Estimated Summer 5_2 Encounters		
			Kept	Rel (legal)	Rel (sublegal)	Kept	Rel (legal)	Rel (sublegal)	Kept	Rel (legal)	Rel (sublegal)
2010	APR	SWVI	-	-	-	-	-	-	-	-	-
2010	MAY	SWVI	0	0	-	0	0	-	1	0	-
2010	JUN	SWVI	0	0	-	1	0	-	0	0	-
2010	AUG	SWVI	0	0	-	14	1	-	29	1	-
2010	SEP	SWVI	0	0	-	0	0	-	0	0	-
2011	FEB	NWVI	-	-	-	-	-	-	-	-	-
2011	MAR	NWVI	0	0	-	0	0	-	0	0	-
2011	APR	NWVI	1	0	-	1	0	-	134	3	-
2011	MAY	NWVI	1	0	-	88	2	-	56	1	-
2011	JUN	NWVI	77	2	-	67	2	-	0	0	-
2011	JUL	NWVI	0	0	-	5	0	-	448	14	-
2011	AUG	NWVI	2	0	-	2	0	-	107	1	-
2011	NOV	NWVI	-	-	-	-	-	-	-	-	-
2011	DEC	NWVI	-	-	-	-	-	-	-	-	-
2011	FEB	SWVI	-	-	-	-	-	-	-	-	-
2011	MAR	SWVI	-	-	-	-	-	-	-	-	-
2011	APR	SWVI	-	-	-	-	-	-	-	-	-
2011	MAY	SWVI	-	-	-	-	-	-	-	-	-
2011	JUN	SWVI	56	7	-	102	12	-	0	0	-
2011	AUG	SWVI	0	0	-	31	1	-	1	0	-
2011	SEP	SWVI	-	-	-	-	-	-	-	-	-
2011	NOV	SWVI	-	-	-	-	-	-	-	-	-
2011	DEC	SWVI	-	-	-	-	-	-	-	-	-
2012	JAN	NWVI	-	-	-	-	-	-	-	-	-
2012	FEB	NWVI	-	-	-	0	0	-	10	0	-
2012	MAR	NWVI	-	-	-	-	-	-	0	0	-
2012	APR	NWVI	0	0	-	124	2	-	10	0	-
2012	MAY	NWVI	0	0	-	159	5	-	6	0	-
2012	AUG	NWVI	0	0	-	2	0	-	0	0	-

Year	Month	Area	Estimated Spring 4_2 Encounters			Estimated Spring 5_2 Encounters			Estimated Summer 5_2 Encounters		
			Kept	Rel (legal)	Rel (sublegal)	Kept	Rel (legal)	Rel (sublegal)	Kept	Rel (legal)	Rel (sublegal)
2012	OCT	NWVI	-	-	-	-	-	-	-	-	-
2012	NOV	NWVI	-	-	-	-	-	-	-	-	-
2012	DEC	NWVI	-	-	-	-	-	-	-	-	-
2012	SEP	NWVI	0	0	-	0	0	-	0	0	-
2012	JAN	SWVI	-	-	-	-	-	-	-	-	-
2012	FEB	SWVI	-	-	-	-	-	-	-	-	-
2012	MAR	SWVI	-	-	-	-	-	-	-	-	-
2012	APR	SWVI	-	-	-	-	-	-	-	-	-
2012	MAY	SWVI	1	0	-	0	0	-	1	0	-
2012	AUG	SWVI	8	1	-	15	1	-	0	0	-
2012	SEP	SWVI	0	0	-	0	0	-	0	0	-
2012	OCT	SWVI	-	-	-	1	0	-	0	0	-
2012	NOV	SWVI	-	-	-	0	0	-	0	0	-
2012	DEC	SWVI	-	-	-	0	0	-	-	-	-
2013	JAN	NWVI	0	0	-	-	-	-	0	0	-
2013	FEB	NWVI	0	0	-	0	0	-	0	0	-
2013	MAR	NWVI	-	-	-	-	-	-	-	-	-
2013	APR	NWVI	0	0	-	0	0	-	-	-	-
2013	MAY	NWVI	0	0	-	0	0	-	1	0	-
2013	JAN	SWVI	-	-	-	-	-	-	-	-	-
2013	FEB	SWVI	-	-	-	-	-	-	-	-	-
2013	MAR	SWVI	-	-	-	-	-	-	-	-	-
2013	APR	SWVI	-	-	-	-	-	-	-	-	-
2013	MAY	SWVI	-	-	-	-	-	-	-	-	-
2013	OCT	SWVI	0	0	-	0	0	-	0	0	-
2013	NOV	SWVI	-	-	-	-	-	-	-	-	-
2013	DEC	SWVI	-	-	-	-	-	-	-	-	-
2014	FEB	NWVI	-	-	-	-	-	-	-	-	-
2014	MAR	NWVI	9	0	-	8	0	-	11	0	-

Year	Month	Area	Estimated Spring 4_2 Encounters			Estimated Spring 5_2 Encounters			Estimated Summer 5_2 Encounters		
			Kept	Rel (legal)	Rel (sublegal)	Kept	Rel (legal)	Rel (sublegal)	Kept	Rel (legal)	Rel (sublegal)
2014	APR	NWVI	0	0	-	89	2	-	99	2	-
2014	MAY	NWVI	645	40	-	191	12	-	341	21	-
2014	JUL	NWVI	0	0	-	12	1	-	367	15	-
2014	AUG	NWVI	1	0	-	24	1	-	50	2	-
2014	SEP	NWVI	-	-	-	0	0	-	-	-	-
2014	NOV	NWVI	-	-	-	-	-	-	-	-	-
2014	SEP	NWVI	-	-	-	0	0	-	-	-	-
2014	JAN	SWVI	-	-	-	-	-	-	-	-	-
2014	FEB	SWVI	-	-	-	-	-	-	-	-	-
2014	MAR	SWVI	-	-	-	0	0	-	0	0	-
2014	APR	SWVI	-	-	-	-	-	-	-	-	-
2014	MAY	SWVI	1	0	-	1	0	-	0	0	-
2014	AUG	SWVI	-	-	-	-	-	-	-	-	-
2014	SEP	SWVI	0	0	-	1	0	-	1	0	-
2014	OCT	SWVI	-	-	-	-	-	-	-	-	-
2014	NOV	SWVI	-	-	-	-	-	-	-	-	-
2015	JAN	NWVI	-	-	-	-	-	-	-	-	-
2015	FEB	NWVI	-	-	-	-	-	-	-	-	-
2015	MAR	NWVI	0	0	-	1	0	-	1	0	-
2015	APR	NWVI	2	0	-	0	0	-	-	-	-
2015	MAY	NWVI	250	9	-	320	11	-	30	1	-
2015	AUG	NWVI	1	0	-	17	0	-	4	0	-
2015	JAN	SWVI	-	-	-	-	-	-	-	-	-
2015	FEB	SWVI	-	-	-	-	-	-	-	-	-
2015	MAR	SWVI	-	-	-	-	-	-	0	0	-
2015	APR	SWVI	-	-	-	-	-	-	-	-	-
2015	MAY	SWVI	-	-	-	0	0	-	-	-	-
2015	AUG	SWVI	1	0	-	0	0	-	0	0	-
2015	SEP	SWVI	-	-	-	0	0	-	0	0	-

Table L – 7. Estimated proportion of Spring 4_2, Spring 5_2 and Summer 5_2 Chinook in the T'aaq-wiihak EO fishery from GSI samples.

Year	Month	DNA stock composition					Total Effort, Kept Catch and Releases (Rel)			
		n	***Sample Rate***	**Spring 4_2**	**Spring 5_2**	**Summer 5_2**	**Effort**	**Kept**	**Rel (legal)**	**Rel (sublegal)**
2012	ALL	*984*	*16%*	0.0%	0.3%	0.1%	-	6,292	-	-
2013	ALL	*494*	*6%*	0.0%	0.9%	0.3%	-	7,650	-	-
2014	ALL	*481*	*3%*	0.2%	1.2%	3.9%	-	17,126	-	-
2015	ALL	*279*	*4%*	0.0%	0.0%	2.8%	-	6,234	-	-
2016	ALL	*0*	-	-	-	-	-	6,184	25	1,663
2017	ALL	*0*	-	-	-	-	-	6,877	-	305
2018	ALL	*0*	-	-	-	-	-	9,667	12	487

Table L – 8. Estimated mortalities of Spring 4_2, Spring 5_2 and Summer 5_2 Chinook in the T'aaq-wiihak EO fishery from GSI samples.

Year	Month	Estimated Spring 4_2 Encounters			Estimated Spring 5_2 Encounters			Estimated Summer 5_2 Encounters		
		Kept	**Rel (legal)**	**Rel (sublegal)**	**Kept**	**Rel (legal)**	**Rel (sublegal)**	**Kept**	**Rel (legal)**	**Rel (sublegal)**
2012	ALL	0	-	-	19	-	-	9	-	-
2013	ALL	1	-	-	66	-	-	20	-	-
2014	ALL	37	-	-	200	-	-	662	-	-
2015	ALL	2	-	-	1	-	-	172	-	-
2016	ALL	-	-	-	-	-	-	-	-	-
2017	ALL	-	-	-	-	-	-	-	-	-
2018	ALL	-	-	-	-	-	-	-	-	-

Table L - 9. Estimated proportions of Spring 4_2, Spring 5_2 and Summer 5_2 Chinook in the WCVI AABM recreational fishery from GSI samples.

Year	**Month**	**Area**	**DNA stock composition**					**Total Effort, Kept Catch and Releases (Rel)**			
			n	***Rate***	**Spring 4_2**	**Spring 5_2**	**Summer 5_2**	**Effort**	**Kept**	**Rel (legal)**	**Rel (sublegal)**
2008	MAY	NWVI	*0*	-	-	-	-	-	-	-	-
2008	MAY	SWVI	*0*	-	-	-	-	590	48	-	-
2008	JUN	NWVI	*0*	-	-	-	-	679	732	3	3
2008	JUN	SWVI	*0*	-	-	-	-	2,365	2,712	661	162
2008	JUL	NWVI	*104*	*3.2%*	0.00%	1.96%	0.43%	3,220	5,267	632	71
2008	JUL	SWVI	*184*	*4.3%*	0.00%	0.11%	0.05%	4,301	9,959	3,038	434
2008	AUG	NWVI	*160*	*3.4%*	0.00%	0.00%	0.18%	4,746	8,271	1,462	651
2008	AUG	SWVI	*214*	*3.4%*	0.01%	0.03%	0.95%	6,241	14,160	6,945	4,770
2008	SEP	NWVI	*0*	-	-	-	-	-	-	-	-
2008	SEP	SWVI	*0*	-	-	-	-	1,446	2,187	436	628
2009	MAY	NWVI	*0*	-	-	-	-	-	-	-	-
2009	MAY	SWVI	*0*	-	-	-	-	-	-	-	-
2009	JUN	NWVI	*0*	-	-	-	-	333	389	37	169
2009	JUN	SWVI	*0*	-	-	-	-	1,933	7,075	4,588	3,427
2009	JUL	NWVI	*75*	*2.1%*	0.00%	0.00%	3.85%	3,494	6,582	621	1,107
2009	JUL	SWVI	*187*	*3.6%*	0.03%	0.00%	0.00%	5,127	18,379	5,425	6,448
2009	AUG	NWVI	*109*	*2.7%*	0.00%	0.00%	0.00%	4,007	7,491	736	744
2009	AUG	SWVI	*109*	*2.0%*	0.00%	0.09%	0.89%	5,569	15,724	1,794	5,227
2009	SEP	NWVI	*0*	-	-	-	-	-	-	-	-
2009	SEP	SWVI	*0*	-	-	-	-	881	2,225	852	535
2010	MAY	NWVI	*0*	-	-	-	-	-	-	-	-
2010	MAY	SWVI	*0*	-	-	-	-	-	-	-	-
2010	JUN	SWVI 123/124	*21*	*1.0%*	0.00%	0.00%	0.01%	2,040	4,970	2,613	753
2010	JUN	SWVI 21/121	*23*	*13.6%*	14.81%	6.87%	0.01%	169	305	9	9
2010	JUL	NWVI	*17*	*0.6%*	0.00%	0.00%	0.00%	3,062	6,121	6,696	1,238
2010	JUL	SWVI 123/124	*47*	*1.5%*	0.07%	0.00%	0.00%	3,105	11,469	6,577	2,336
2010	JUL	SWVI 21/121	*64*	*11.6%*	0.00%	1.01%	2.17%	554	1,534	583	138

Year	Month	Area	DNA stock composition					Total Effort, Kept Catch and Releases (Rel)			
			n	***Rate***	**Spring 4_2**	**Spring 5_2**	**Summer 5_2**	**Effort**	**Kept**	**Rel (legal)**	**Rel (sublegal)**
2010	AUG	NWVI	*11*	*0.3%*	0.00%	0.00%	0.00%	3,222	5,655	8,425	1,320
2010	AUG	SWVI 123/124	*71*	*1.6%*	0.00%	0.01%	0.00%	4,569	14,540	7,589	799
2010	AUG	SWVI 21/121	*59*	*6.2%*	0.04%	0.04%	0.02%	956	1,767	449	39
2010	SEP	NWVI	*0*	-	-	-	-	26	97	250	9
2010	SEP	SWVI	*0*	-	-	-	-	964	2,172	1,856	145
2011	MAY	NWVI	*0*	-	-	-	-	-	-	-	-
2011	MAY	SWVI	*0*	-	-	-	-	-	-	-	-
2011	JUN	NWVI	*0*	-	-	-	-	244	365	68	39
2011	JUN	SWVI	*0*	-	-	-	-	1,762	5,470	1,608	1,147
2011	JUL	NWVI	*45*	*1.7%*	0.01%	0.00%	0.00%	2,608	5,627	808	299
2011	JUL	SWVI	*84*	*1.7%*	0.46%	0.00%	2.41%	4,849	18,459	7,922	5,096
2011	AUG	NWVI	*64*	*1.5%*	0.08%	0.02%	0.00%	4,169	10,205	518	577
2011	AUG	SWVI	*80*	*1.1%*	0.01%	0.01%	0.02%	7,423	23,852	8,924	2,077
2011	SEP	NWVI	*0*	-	-	-	-	118	156	27	21
2011	SEP	SWVI	*0*	-	-	-	-	1,560	4,236	1,206	512
2011	**Total**	**WCVI REC**	***273***	***1.2%***	-	-	-	**22,733**	**68,370**	**21,081**	**9,768**
2012	MAY	NWVI	*0*	-	-	-	-	-	-	-	-
2012	MAY	SWVI	*0*	-	-	-	-	37	41	-	-
2012	JUN	NWVI	*0*	-	-	-	-	1,130	2,707	4,206	59
2012	JUN	SWVI	*0*	-	-	-	-	1,812	4,384	1,375	686
2012	JUL	NWVI	*0*	-	-	-	-	3,222	6,826	6,786	2,020
2012	JUL	SWVI	*0*	-	-	-	-	5,092	16,058	6,546	4,589
2012	AUG	NWVI	*58*	*1.3%*	0.03%	0.01%	0.00%	4,552	10,040	4,546	1,207
2012	AUG	SWVI	*65*	*1.1%*	0.00%	0.03%	0.00%	5,904	15,416	8,615	5,237
2012	SEP	NWVI	*0*	-	-	-	-	74	34	4	-
2012	SEP	SWVI	*0*	-	-	-	-	863	983	210	595
2013	MAY	NWVI	*0*	-	-	-	-	-	-	-	-
2013	MAY	SWVI	*0*	-	-	-	-	-	-	-	-
2013	JUN	NWVI	*0*	-	-	-	-	792	2,206	1,168	296

Year	Month	Area	DNA stock composition					Total Effort, Kept Catch and Releases (Rel)			
			n	***Rate***	**Spring 4_2**	**Spring 5_2**	**Summer 5_2**	**Effort**	**Kept**	**Rel (legal)**	**Rel (sublegal)**
2013	JUN	SWVI	*0*	-	-	-	-	2,408	7,677	2,639	2,280
2013	JUL	NWVI	*97*	*3.4%*	0.87%	0.12%	0.64%	2,837	6,059	2,109	856
2013	JUL	SWVI 123/124	*62*	*2.4%*	1.19%	0.34%	0.05%	2,544	11,635	8,864	3,978
2013	JUL	SWVI 21/121	*28*	*3.8%*	0.00%	3.52%	0.01%	728	3,329	1,768	1,108
2013	AUG	NWVI	*52*	*1.5%*	0.00%	0.00%	0.00%	3,401	7,494	1,303	983
2013	AUG	SWVI 123/124	*41*	*1.1%*	0.00%	0.00%	0.29%	3,638	10,862	10,467	2,314
2013	AUG	SWVI 21/121	*19*	*1.6%*	0.00%	0.04%	0.00%	1,209	4,706	2,350	680
2013	SEP	NWVI	*0*	-	-	-	-	-	-	-	-
2013	SEP	SWVI	*0*	-	-	-	-	653	1,856	742	423
2014	MAY	NWVI	*0*	-	-	-	-	-	-	-	-
2014	MAY	SWVI	*0*	-	-	-	-	-	-	-	-
2014	JUN	NWVI	*18*	*13.2%*	0.00%	0.00%	0.00%	136	177	-	3
2014	JUN	SWVI 123/124	*81*	*5.5%*	0.22%	0.05%	1.11%	1,480	4,891	7,478	950
2014	JUN	SWVI 21/121	*41*	*8.1%*	0.00%	0.00%	0.00%	507	1,549	1,341	830
2014	JUL	NWVI	*128*	*4.0%*	0.12%	2.80%	0.07%	3,176	6,772	3,577	1,434
2014	JUL	SWVI 123/124	*110*	*3.9%*	0.54%	1.25%	0.36%	2,812	8,671	9,696	2,750
2014	JUL	SWVI 21/121	*62*	*6.2%*	0.01%	0.05%	1.65%	1,005	5,221	4,743	576
2014	AUG	NWVI	*126*	*3.5%*	0.01%	0.02%	0.01%	3,551	6,646	3,181	1,151
2014	AUG	SWVI 123/124	*117*	*5.9%*	0.01%	0.22%	0.93%	1,999	6,228	7,893	3,098
2014	AUG	SWVI 21/121	*44*	*5.1%*	0.00%	0.00%	2.27%	866	2,878	1,244	277
2014	SEP	NWVI	*0*	-	-	-	-	35	44	10	-
2014	SEP	SWVI	*0*	-	-	-	-	613	1,019	1,560	201
2015	MAY	NWVI	*0*	-	-	-	-	4	11	16	-
2015	MAY	SWVI	*0*	-	-	-	-	-	-	-	-
2015	JUN	NWVI	*90*	*15.2%*	4.56%	0.89%	3.66%	594	1,539	792	66

Year	Month	Area	DNA stock composition					Total Effort, Kept Catch and Releases (Rel)			
			n	***Rate***	**Spring 4_2**	**Spring 5_2**	**Summer 5_2**	**Effort**	**Kept**	**Rel (legal)**	**Rel (sublegal)**
2015	JUN	SWVI 123/124	*72*	*5.1%*	0.04%	3.12%	1.03%	1,409	3,578	1,234	240
2015	JUN	SWVI 21/121	*25*	*6.9%*	0.00%	0.00%	0.00%	360	1,460	995	245
2015	JUL	NWVI	*107*	*4.4%*	0.00%	0.00%	0.00%	2,457	5,055	3,019	1,161
2015	JUL	SWVI 123/124	*278*	*10.9%*	0.00%	1.14%	0.73%	2,545	8,314	2,711	1,589
2015	JUL	SWVI 21/121	*74*	*7.4%*	0.00%	0.01%	0.03%	1,000	5,066	3,739	533
2015	AUG	NWVI	*119*	*4.9%*	0.01%	0.01%	0.01%	2,433	5,017	1,949	595
2015	AUG	SWVI	*294*	*8.3%*	0.00%	0.02%	0.59%	3,550	11,735	3,695	1,416
2015	SEP	NWVI	*0*	-	-	-	-	34	43	8	-
2015	SEP	SWVI	*0*	-	-	-	-	522	284	26	43

Table L - 10. Estimated mortalities of Spring 4_2, Spring 5_2 and Summer 5_2 Chinook in the WCVI AABM recreational fishery from GSI samples.

Year	Month	Area	Estimated Spring 4_2 Encounters			Estimated Spring 5_2 Encounters			Estimated Summer 5_2 Encounters		
			Kept	Rel(legal)	Rel (sublegal)	Kept	Rel(legal)	Rel (sublegal)	Kept	Rel(legal)	Rel (sublegal)
2008	MAY	NWVI	-	-	-	-	-	-	-	-	-
2008	MAY	SWVI	-	-	-	-	-	-	-	-	-
2008	JUN	NWVI	-	-	-	-	-	-	-	-	-
2008	JUN	SWVI	-	-	-	-	-	-	-	-	-
2008	JUL	NWVI	0	0	0	103.20	12.38	1.39	22.53	2.70	0.30
2008	JUL	SWVI	0	0	0	10.47	3.19	0.46	4.72	1.44	0.21
2008	AUG	NWVI	0	0	0	0.24	0.04	0.02	15.12	2.67	1.19
2008	AUG	SWVI	1	1	0	4.06	1.99	1.37	134.02	65.73	45.15
2008	SEP	NWVI	-	-	-	-	-	-	-	-	-
2008	SEP	SWVI	-	-	-	-	-	-	-	-	-
2009	MAY	NWVI	-	-	-	-	-	-	-	-	-
2009	MAY	SWVI	-	-	-	-	-	-	-	-	-
2009	JUN	NWVI	-	-	-	-	-	-	-	-	-
2009	JUN	SWVI	-	-	-	-	-	-	-	-	-
2009	JUL	NWVI	-	-	-	0.09	0.01	0.01	253.57	23.92	42.65
2009	JUL	SWVI	6.39	1.89	2	0.45	0.13	0.16	0.29	0.08	0.10
2009	AUG	NWVI	0.01	0.00	0	0.23	0.02	0.02	0.10	0.01	0.01
2009	AUG	SWVI	0.01	0.00	0	13.60	1.55	4.52	139.31	15.89	46.31
2009	SEP	NWVI	-	-	-	-	-	-	-	-	-
2009	SEP	SWVI	-	-	-	-	-	-	-	-	-
2010	MAY	NWVI	-	-	-	-	-	-	-	-	-
2010	MAY	SWVI	-	-	-	-	-	-	-	-	-
2010	JUN	SWVI 123/124	-	-	-	0.19	0.10	0.03	0.62	0.32	0.09
2010	JUN	SWVI 21/121	45.17	1.33	1	20.95	0.62	0.62	0.03	0.00	0.00
2010	JUL	NWVI	-	-	-	-	-	-	-	-	-

Year	Month	Area	Estimated Spring 4_2 Encounters			Estimated Spring 5_2 Encounters			Estimated Summer 5_2 Encounters		
			Kept	Rel(legal)	Rel (sublegal)	Kept	Rel(legal)	Rel (sublegal)	Kept	Rel(legal)	Rel (sublegal)
2010	JUL	SWVI 123/124	8.44	4.84	2	0.54	0.31	0.11	0.24	0.14	0.05
2010	JUL	SWVI 21/121	-	-	-	15.49	5.89	1.39	33.33	12.67	3.00
2010	AUG	NWVI	-	-	-	-	-	-	-	-	-
2010	AUG	SWVI 123/124	-	-	-	1.39	0.73	0.08	0.45	0.24	0.02
2010	AUG	SWVI 21/121	0.63	0.16	0	0.66	0.17	0.01	0.42	0.11	0.01
2010	SEP	NWVI	-	-	-	-	-	-	-	-	-
2010	SEP	SWVI	-	-	-	-	-	-	-	-	-
2011	MAY	NWVI	-	-	-	-	-	-	-	-	-
2011	MAY	SWVI	-	-	-	-	-	-	-	-	-
2011	JUN	NWVI	-	-	-	-	-	-	-	-	-
2011	JUN	SWVI	-	-	-	-	-	-	-	-	-
2011	JUL	NWVI	0.30	0.04	0	-	-	-	-	-	-
2011	JUL	SWVI	85.00	36.48	23	0.22	0.09	0.06	444.99	190.98	122.85
2011	AUG	NWVI	7.78	0.39	0	1.64	0.08	0.09	0.08	0.00	0.00
2011	AUG	SWVI	2.59	0.97	0	2.50	0.94	0.22	3.88	1.45	0.34
2011	SEP	NWVI	-	-	-	-	-	-	-	-	-
2011	SEP	SWVI	-	-	-	-	-	-	-	-	-
2012	MAY	NWVI	-	-	-	-	-	-	-	-	-
2012	MAY	SWVI	-	-	-	-	-	-	-	-	-
2012	JUN	NWVI	-	-	-	-	-	-	-	-	-
2012	JUN	SWVI	-	-	-	-	-	-	-	-	-
2012	JUL	NWVI	-	-	-	-	-	-	-	-	-
2012	JUL	SWVI	-	-	-	-	-	-	-	-	-
2012	AUG	NWVI	2.65	1.20	0	0.74	0.34	0.09	0.40	0.18	0.05
2012	AUG	SWVI	-	-	-	4.39	2.45	1.49	0.24	0.13	0.08
2012	SEP	NWVI	-	-	-	-	-	-	-	-	-

Year	Month	Area	Estimated Spring 4_2 Encounters			Estimated Spring 5_2 Encounters			Estimated Summer 5_2 Encounters		
			Kept	Rel(legal)	Rel (sublegal)	Kept	Rel(legal)	Rel (sublegal)	Kept	Rel(legal)	Rel (sublegal)
2012	SEP	SWVI	-	-	-	-	-	-	-	-	-
2013	MAY	NWVI	-	-	-	-	-	-	-	-	-
2013	MAY	SWVI	-	-	-	-	-	-	-	-	-
2013	JUN	NWVI	-	-	-	-	-	-	-	-	-
2013	JUN	SWVI	-	-	-	-	-	-	-	-	-
2013	JUL	NWVI	52.92	18.42	7	7.43	2.59	1.05	38.94	13.55	5.50
2013	JUL	SWVI 123/124	138.61	105.60	47	40.03	30.50	13.69	5.46	4.16	1.87
2013	JUL	SWVI 21/121	-	-	-	117.01	62.15	38.95	0.19	0.10	0.06
2013	AUG	NWVI	-	-	-	0.20	0.04	0.03	-	-	-
2013	AUG	SWVI 123/124	-	-	-	0.50	0.49	0.11	31.34	30.20	6.68
2013	AUG	SWVI 21/121	-	-	-	1.73	0.87	0.25	-	-	-
2013	SEP	NWVI	-	-	-	-	-	-	-	-	-
2013	SEP	SWVI	-	-	-	-	-	-	-	-	-
2014	MAY	NWVI	-	-	-	-	-	-	-	-	-
2014	MAY	SWVI	-	-	-	-	-	-	-	-	-
2014	JUN	NWVI	-	-	-	-	-	-	-	-	-
2014	JUN	SWVI 123/124	10.91	16.68	2	2.31	3.53	0.45	54.38	83.14	10.56
2014	JUN	SWVI 21/121	0.03	0.03	0	0.01	0.01	0.01	0.07	0.06	0.04
2014	JUL	NWVI	8.07	4.26	2	189.59	100.14	40.15	5.07	2.68	1.07
2014	JUL	SWVI 123/124	46.71	52.23	15	108.12	120.90	34.29	30.78	34.42	9.76
2014	JUL	SWVI 21/121	0.66	0.60	0	2.77	2.52	0.31	85.90	78.04	9.48
2014	AUG	NWVI	0.36	0.17	0	1.33	0.64	0.23	0.73	0.35	0.13
2014	AUG	SWVI 123/124	0.39	0.50	0	13.71	17.38	6.82	57.97	73.47	28.84

Year	Month	Area	Estimated Spring 4_2 Encounters			Estimated Spring 5_2 Encounters			Estimated Summer 5_2 Encounters		
			Kept	Rel(legal)	Rel (sublegal)	Kept	Rel(legal)	Rel (sublegal)	Kept	Rel(legal)	Rel (sublegal)
2014	AUG	SWVI 21/121	-	-	-	0.10	0.05	0.01	65.33	28.24	6.29
2014	SEP	NWVI	-	-	-	-	-	-	-	-	-
2014	SEP	SWVI	-	-	-	-	-	-	-	-	-
2015	MAY	NWVI	-	-	-	-	-	-	-	-	-
2015	MAY	SWVI	-	-	-	-	-	-	-	-	-
2015	JUN	NWVI	70.17	36.11	3	13.66	7.03	0.59	56.27	28.96	2.41
2015	JUN	SWVI 123/124	1.51	0.52	0	111.78	38.55	7.50	36.87	12.72	2.47
2015	JUN	SWVI 21/121	-	-	-	-	-	-	-	-	-
2015	JUL	NWVI	-	-	-	-	-	-	0.02	0.01	0.01
2015	JUL	SWVI 123/124	0.06	0.02	0	94.62	30.85	18.08	60.68	19.79	11.60
2015	JUL	SWVI 21/121	-	-	-	0.60	0.44	0.06	1.59	1.17	0.17
2015	AUG	NWVI	0.25	0.10	0	0.74	0.29	0.09	0.70	0.27	0.08
2015	AUG	SWVI	0.24	0.08	0	2.89	0.91	0.35	68.83	21.67	8.31
2015	SEP	NWVI	-	-	-	-	-	-	-	-	-
2015	SEP	SWVI	-	-	-	-	-	-	-	-	-

Table L –11. Estimated proportion of Spring 4_2, Spring 5_2 and Summer 5_2 Chinook in the Juan de Fuca Recreation fishery from GSI samples.

Year	**Month**	**DNA stock composition**					**Total Effort, Kept Catch and Releases (Rel)**			
		n	***Sample Rate***	**Spring 4_2**	**Spring 5_2**	**Summer 5_2**	**Effort**	**Kept**	**Rel (legal)**	**Rel (sublegal)**
2009	Jan	*37*	*6%*	0.0%	0.0%	0.0%	*968*	589	12	167
2009	Feb	*14*	*4%*	0.0%	0.0%	0.0%	*777*	327	3	42
2009	March	*2*	*3%*	0.0%	0.0%	0.0%	*903*	63	3	20
2009	April	*4*	*4%*	0.0%	0.0%	0.0%	*1,970*	95	10	24
2009	May	*13*	*4%*	12.3%	20.3%	0.2%	*5,700*	313	112	269
2009	June	*109*	*2%*	4.3%	41.1%	16.8%	*9,745*	4,742	389	1,461
2009	July	*120*	*4%*	5.8%	10.5%	20.2%	*10,258*	3,286	588	3,199
2009	Aug	*160*	*2%*	0.0%	0.3%	5.1%	*15,045*	7,991	502	13,060
2009	Sept	*68*	*2%*	1.5%	0.0%	0.0%	*7,434*	3,575	236	13,902
2009	Oct	*69*	*4%*	0.0%	0.0%	0.0%	*2,302*	1,831	225	5,736
2009	Nov	*41*	*7%*	0.1%	0.2%	0.1%	*997*	624	186	693
2009	Dec	*37*	*2%*	0.0%	0.0%	0.0%	*1,839*	2,149	1,467	1,860
2010	March	*27*	*9%*	0.0%	0.0%	0.0%	*1,420*	300	33	85
2010	April	*19*	*3%*	0.0%	0.0%	0.0%	*2,687*	624	457	108
2010	May	*18*	*5%*	0.0%	0.0%	0.0%	*2,838*	367	114	43
2010	June	*40*	*2%*	7.0%	12.1%	1.2%	*6,016*	1,724	318	147
2010	July	*40*	*3%*	0.0%	7.1%	15.1%	*9,076*	1,331	80	49
2010	Aug	*75*	*3%*	0.0%	0.3%	0.4%	*10,486*	2,425	276	705
2010	Sept	*43*	*3%*	0.0%	0.0%	0.0%	*5,259*	1,691	442	1,019
2014	Feb	*21*	*8%*	0.0%	0.0%	0.0%	*449*	280	136	130
2014	March	*20*	*4%*	0.0%	0.0%	0.0%	*1,517*	483	278	271
2014	April	*8*	*2%*	0.0%	0.0%	0.0%	*1,880*	457	94	117
2014	May	*34*	*1%*	5.8%	2.2%	0.8%	*4,674*	2,447	997	228
2014	June	*35*	*1%*	4.6%	30.3%	16.7%	*6,095*	2,997	844	157
2014	July	*37*	*1%*	6.8%	9.7%	0.8%	*8,452*	3,781	1,042	4,157
2014	Aug	*23*	*1%*	0.0%	0.1%	4.6%	*12,151*	4,027	499	1,995
2014	Sept	*11*	*1%*	0.0%	0.0%	0.0%	*6,797*	995	403	374
2016	March	*19*	*4%*	0.0%	0.0%	0.0%	*2,070*	430	390	579

Year	**Month**	**DNA stock composition**					**Total Effort, Kept Catch and Releases (Rel)**			
		n	***Sample Rate***	**Spring 4_2**	**Spring 5_2**	**Summer 5_2**	**Effort**	**Kept**	**Rel (legal)**	**Rel (sublegal)**
2016	April	*10*	*1%*	0.0%	0.0%	0.0%	*3,222*	852	423	982
2016	May	*18*	*1%*	0.0%	0.0%	0.0%	*4,935*	1,613	473	68
2016	June	*28*	*2%*	3.8%	12.8%	4.1%	*5,423*	1,317	626	660
2016	July	*33*	*1%*	3.3%	6.4%	14.8%	*7,444*	3,356	1,064	4,627
2016	Aug	*72*	*1%*	0.0%	0.0%	9.7%	*11,067*	6,036	1,562	4,900
2016	Sept	*42*	*2%*	0.0%	0.0%	2.3%	*7,705*	2,721	1,412	1,648
2017	March	*33*	*6%*	0.0%	0.0%	0.0%	*1,024*	577	8	69
2017	April	*46*	*6%*	0.0%	0.0%	0.0%	*1,780*	764	331	439
2017	May	*54*	*9%*	0.0%	1.8%	0.0%	*2,243*	573	59	185
2017	June	*149*	*9%*	1.3%	12.8%	5.1%	*3,418*	1,660	801	576
2017	July	*170*	*7%*	2.4%	6.0%	6.9%	*4,836*	2,336	417	3,987
2017	Aug	*289*	*3%*	0.0%	0.0%	1.8%	*11,842*	8,503	1,721	8,008
2017	Sept	*40*	*1%*	0.0%	2.5%	0.0%	*10,382*	3,470	1,455	3,292
2017	Oct	*33*	*9%*	0.0%	0.2%	0.0%	*1,283*	372	203	1,452
2018	Jan	*7*	*2%*	0.0%	0.0%	0.0%	-	424	2,201	-
2018	Feb	*29*	*6%*	0.0%	0.0%	0.0%	*524*	505	217	827
2018	March	*50*	*11%*	0.0%	0.0%	0.0%	*1,021*	471	156	284
2018	April	*35*	*6%*	0.0%	0.0%	0.0%	*1,318*	547	34	100
2018	May	*52*	*4%*	0.3%	1.0%	0.7%	*3,280*	1,352	448	202
2018	June	*72*	*3%*	1.5%	8.8%	2.0%	*6,122*	2,216	729	752
2018	July	*232*	*4%*	0.0%	5.0%	7.3%	*9,176*	5,584	1,771	12,868
2018	Aug	*285*	*3%*	0.0%	0.1%	1.3%	*11,241*	9,432	3,399	12,673
2018	Sept	*91*	*4%*	0.0%	0.0%	0.0%	*8,046*	2,271	311	4,451
2018	Oct	*37*	*3%*	0.0%	0.0%	0.0%	*4,191*	1,203	868	1,342

Table L – 12. Estimated mortalty of Spring 4_2, Spring 5_2 and Summer 5_2 Chinook in the Juan de Fuca Recreation fishery from GSI samples.

Year	Month	Estimated Spring 4_2 Encounters			Estimated Spring 5_2 Encounters			Estimated Summer 5_2 Encounters		
		Kept	Rel (legal)	Rel (sublegal)	Kept	Rel (legal)	Rel (sublegal)	Kept	Rel (legal)	Rel (sublegal)
2009	Jan	-	-	-	0	0	0	-	-	-
2009	Feb	-	-	-	-	-	-	-	-	-
2009	Mar	-	-	-	-	-	-	-	-	-
2009	April	-	-	-	-	-	-	-	-	-
2009	May	39	14	33	64	23	55	1	0	1
2009	June	205	17	63	1948	160	600	797	65	246
2009	July	191	34	186	346	62	337	663	119	645
2009	Aug	1	0	1	22	1	36	408	26	667
2009	Sept	53	3	205	0	0	2	0	0	1
2009	Oct	-	-	-	0	0	0	-	-	-
2009	Nov	1	0	1	1	0	1	0	0	0
2009	Dec	-	-	-	0	0	0	-	-	-
2010	Mar	-	-	-	-	-	-	-	-	-
2010	April	-	-	-	-	-	-	-	-	-
2010	May	-	-	-	-	-	-	-	-	-
2010	June	121	22	10	208	38	18	21	4	2
2010	July	0	0	0	95	6	3	201	12	7
2010	Aug	0	0	0	8	1	2	10	1	3
2010	Sept	-	-	-	0	0	0	0	0	0
2014	Feb	-	-	-	-	-	-	-	-	-
2014	Mar	-	-	-	-	-	-	-	-	-
2014	April	-	-	-	-	-	-	-	-	-
2014	May	142	58	13	54	22	5	19	8	2
2014	June	137	39	7	908	256	48	501	141	26
2014	July	258	71	283	366	101	403	31	9	34
2014	Aug	0	0	0	3	0	2	187	23	93

Year	Month	Estimated Spring 4_2 Encounters			Estimated Spring 5_2 Encounters			Estimated Summer 5_2 Encounters		
		Kept	Rel (legal)	Rel (sublegal)	Kept	Rel (legal)	Rel (sublegal)	Kept	Rel (legal)	Rel (sublegal)
2014	Sept	-	-	-	-	-	-	-	-	-
2016	Mar	-	-	-	-	-	-	-	-	-
2016	April	-	-	-	-	-	-	-	-	-
2016	May	-	-	-	-	-	-	-	-	-
2016	June	50	24	25	169	80	84	53	25	27
2016	July	110	35	152	214	68	295	498	158	686
2016	Aug	-	-	-	1	0	1	586	152	476
2016	Sept	-	-	-	-	-	-	61	32	37
2017	Mar	-	-	-	-	-	-	-	-	-
2017	April	-	-	-	-	-	-	-	-	-
2017	May	-	-	-	11	1	3	-	-	-
2017	June	22	11	8	212	102	74	84	41	29
2017	July	55	10	95	141	25	240	161	29	275
2017	Aug	1	0	1	1	0	1	151	31	143
2017	Sept	-	-	-	87	37	83	-	-	-
2017	Oct	-	-	-	1	0	3	-	-	-
2018	Jan	-	-	-	-	-		-	-	
2018	Feb	-	-	-	-	-		-	-	
2018	Mar	5	1	1	13	4	2	10	3	1
2018	April	33	11	11	194	64	66	45	15	15
2018	May	0	0	0	281	89	648	406	129	935
2018	June	0	0	0	6	2	8	122	44	164
2018	July	0	0	0	0	0	0	0	0	0
2018	Aug	0	0	0	0	0	0	0	0	0
2018	Sept	5	1	1	13	4	2	10	3	1
2018	Oct	33	11	11	194	64	66	45	15	15

Table L – 13. Estimated proportion of Spring 4_2, Spring 5_2 and Summer 5_2 Chinook in the Strait of Georgia (NORTH) fishery from GSI samples.

Year	**Month**	**DNA stock composition (kept)**					**DNA stock composition (sublegal)**					**Total Effort, Kept Catch and Releases (Rel)**			
		n	***Rate***	**SP 4_2**	**SP 5_2**	**SU 5_2**	***n***	***Rate***	**SP 4_2**	**SP 5_2**	**SU 5_2**	**Effort**	**Kept**	**Rel (legal)**	**Rel (sublegal)**
2013	Jan	*5*	-	0%	0%	0%	*6*	-	0%	0%	0%	-	-	-	-
2013	Feb	*1*	-	0%	0%	0%	-	-	-	-	-	-	-	-	-
2013	March	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2013	April	-	-	-	-	-	*1*		0%	0%	0%	*4,501*	1,017	296	-
2013	May	*6*	0.1%	0%	0%	0%	-	-	-	-	-	*16,029*	9,088	1,781	14,033
2013	June	*10*	0.2%	0%	0%	0%	-	-	-	-	-	*14,655*	5,419	246	11,329
2013	July	*6*	0.1%	0%	0%	0%	-	-	-	-	-	*17,965*	6,743	709	18,408
2013	Aug	*2*	0.1%	0%	0%	0%	-	-	-	-	-	*9,301*	1,875	593	3,307
2013	Sep	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2013	Oct	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2013	Nov	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2013	Dec	*7*	-	0%	0%	0%	*3*	-	0%	0%	0%	-	-	-	-
2014	Jan	*7*	-	0%	0%	0%	*6*	-	0%	0%	0%	-	-	-	-
2014	Feb	*2*	-	0%	0%	0%	*3*	-	0%	0%	0%	-	-	-	-
2014	March	*14*	-	0%	0%	0%	*20*	-	5%	0%	0%	-	-	-	-
2014	April	*9*	-	0%	0%	0%	*16*	-	0%	0%	0%	-	-	-	-
2014	May	*19*	1.3%	0%	0%	0%	*4*	-	0%	0%	0%	*4,074*	1,469	586	-
2014	June	*56*	0.7%	0%	0%	0%	*21*	-	0%	0%	0%	*7,398*	8,128	1,252	6,514
2014	July	*68*	0.6%	0%	0%	0%	*22*	-	0%	0%	0%	*13,719*	11,030	1,563	6,073
2014	Aug	*37*	0.4%	0%	0%	0%	*10*	0.1%	10%	0%	0%	*21,435*	9,947	1,337	10,676
2014	Sep	*7*	0.2%	0%	0%	0%	*7*	-	0%	0%	0%	*8,937*	4,418	1,185	2,917
2014	Oct	-	0.0%	-	-	-	-	0.0%	-	-	-	*1,172*	108	1	385
2014	Nov	*1*	-	0%	0%	0%	*2*	-	0%	0%	0%	-	-	-	-
2014	Dec	*9*	-	0%	0%	0%	*6*	-	0%	0%	0%	-	-	-	-
2015	Jan	*43*	-	0%	0%	0%	*1*	-	0%	0%	0%	-	-	-	-
2015	Feb	*14*	2.5%	0%	0%	0%	*5*	0.5%	0%	0%	0%	*990*	551	28	1,009
2015	March	*19*	-	0%	0%	0%	*7*	3.8%	0%	0%	0%	*482*	39	1	185

Year	**Month**	**DNA stock composition (kept)**					**DNA stock composition (sublegal)**					**Total Effort, Kept Catch and Releases (Rel)**			
		n	***Rate***	**SP 4_2**	**SP 5_2**	**SU 5_2**	***n***	***Rate***	**SP 4_2**	**SP 5_2**	**SU 5_2**	**Effort**	**Kept**	**Rel (legal)**	**Rel (sublegal)**
2015	April	*5*	-	0%	0%	0%	*3*	-	0%	0%	0%	-	-	-	-
2015	May	*74*	5.5%	0%	0%	0%	*3*	-	0%	0%	0%	*2,884*	1,343	159	-
2015	June	*41*	0.4%	0%	0%	0%	*10*	0.2%	0%	0%	10%	*12,607*	9,398	995	5,353
2015	July	*59*	0.6%	2%	12%	3%	*4*	0.1%	0%	0%	0%	*15,481*	9,223	341	6,565
2015	Aug	*67*	0.4%	0%	0%	0%	*4*	0.0%	0%	0%	0%	*19,462*	15,377	1,955	10,060
2015	Sep	*10*	0.1%	0%	0%	0%	*2*	0.1%	0%	0%	0%	*8,698*	7,178	1,043	2,299
2015	Oct	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Nov	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2015	Dec	*1*	-	0%	0%	0%	-	-	-	-	-	-	-	-	-
2016	Jan	*6*	-	0%	0%	0%	*5*	-	0%	0%	0%	-	-	-	-
2016	Feb	*4*	-	0%	0%	0%	*10*	-	0%	0%	0%	-	-	-	-
2016	March	*2*	-	0%	0%	0%	*11*	-	0%	0%	0%	-	-	-	-
2016	April	*1*	-	0%	0%	0%	*1*	-	0%	0%	0%	-	-	-	-
2016	May	*24*	0.6%	0%	0%	0%	*8*	0.1%	0%	0%	0%	*7,873*	3,978	254	7,276
2016	June	*38*	0.6%	0%	0%	0%	*16*	0.1%	0%	0%	0%	*9,548*	6,450	570	12,690
2016	July	*46*	0.6%	9%	11%	0%	*18*	0.2%	0%	6%	6%	*16,458*	8,021	547	11,135
2016	Aug	*24*	0.2%	0%	0%	4%	*14*	0.2%	0%	0%	0%	*15,188*	10,679	709	7,693
2016	Sep	*6*	0.2%	0%	0%	0%	*6*	0.1%	0%	0%	0%	*11,267*	3,842	170	5,802
2016	Oct	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Nov	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Dec	*4*	-	0%	0%	0%	-	-	-	-	-	-	-	-	-
2017	Jan	*14*	-	0%	0%	0%	*3*	-	0%	0%	0%	-	-	-	-
2017	Feb	*1*	-	0%	0%	0%	-	-	0%	0%	0%	-	-	-	-
2017	March	*4*	-	0%	0%	0%	-	-	0%	0%	0%	-	-	-	-
2017	April	*18*	-	0%	0%	0%	*7*	-	0%	5%	0%	-	-	-	-
2017	May	*50*	1.7%	0%	0%	0%	*25*	0.9%	0%	6%	2%	*5,747*	2,979	306	2,817
2017	June	*34*	0.3%	0%	0%	0%	*44*	0.7%	3%	0%	0%	*12,318*	10,520	688	6,649
2017	July	*28*	0.3%	0%	4%	0%	*53*	0.6%	0%	0%	0%	*24,147*	9,770	1,003	8,672
2017	Aug	*44*	0.3%	0%	0%	2%	*39*	0.2%	-	-	-	*21,599*	15,207	1,326	24,506

Year	Month	DNA stock composition (kept)					DNA stock composition (sublegal)					Total Effort, Kept Catch and Releases (Rel)			
		n	***Rate***	**SP 4_2**	**SP 5_2**	**SU 5_2**	***n***	***Rate***	**SP 4_2**	**SP 5_2**	**SU 5_2**	**Effort**	**Kept**	**Rel (legal)**	**Rel (sublegal)**
2017	Sep	*3*	0.1%	0%	0%	0%	*9*	0.1%	-	-	-	*10,803*	3,679	318	8,919
2017	Oct	-	0.0%	-	-	-	-	0.0%	-	-	-	*1,393*	22	-	175
2017	Nov	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2017	Dec	*7*	-	0%	0%	0%	*7*	-	0%	0%	0%	-	-	-	-
2018	Jan	*4*	-	0%	0%	0%	-	-	-	-	-	-	-	-	-
2018	Feb	*7*	-	0%	0%	0%	-	-	-	-	-	-	-	-	-
2018	March	*26*	-	0%	4%	0%	-	-	-	-	-	-	-	-	-
2018	April	*4*	-	0%	0%	0%	-	-	-	-	-	-	-	-	-
2018	May	*34*	0%	0%	0%	0%	-	-	-	-	-	*6,308*	8,156	296	-
2018	June	*178*	2%	0%	0%	1%	-	-	-	-	-	*11,082*	10,914	4,044	8,157
2018	July	*194*	1%	0%	0%	2%	-	-	-	-	-	*19,684*	13,504	4,687	9,314
2018	Aug	*152*	1%	0%	0%	1%	-	-	-	-	-	*25,124*	15,015	2,151	15,337
2018	Sep	*42*	3%	0%	0%	2%	-	-	-	-	-	*6,500*	1,596	64	2,941
2018	Oct	*4*	1%	0%	0%	0%	-	-	-	-	-	*2,154*	340	-	886
2018	Nov	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Dec	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table L – 14. Estimated mortality of Spring 4_2, Spring 5_2 and Summer 5_2 Chinook in the Strait of Georgia (NORTH) fishery from GSI samples.

Year	Month	Estimated Spring 4_2 Encounters			Estimated Spring 5_2 Encounters			Estimated Summer 5_2 Encounters		
		Kept	**Rel (legal)**	**Rel (sublegal)**	**Kept**	**Rel (legal)**	**Rel (sublegal)**	**Kept**	**Rel (legal)**	**Rel (sublegal)**
2014	Jan	-	-	-	-	-	-	-	-	-
2014	Feb	-	-	-	-	-	-	-	-	-
2014	March	-	-	-	-	-	-	-	-	-
2014	April	-	-	-	-	-	-	-	-	-
2014	May	-	-	-	-	-	-	-	-	-
2014	June	-	-	-	-	-	-	-	-	-
2014	July	-	-	-	-	-	-	-	-	-
2014	Aug	-	-	1,068	-	-	-	-	-	-

Year	Month	Estimated Spring 4_2 Encounters			Estimated Spring 5_2 Encounters			Estimated Summer 5_2 Encounters		
		Kept	Rel (legal)	Rel (sublegal)	Kept	Rel (legal)	Rel (sublegal)	Kept	Rel (legal)	Rel (sublegal)
2014	Sep	-	-	-	-	-	-	-	-	-
2014	Oct	-	-	-	-	-	-	-	-	-
2014	Nov	-	-	-	-	-	-	-	-	-
2014	Dec	-	-	-	-	-	-	-	-	-
2015	Jan	-	-	-	-	-	-	-	-	-
2015	Feb	-	-	-	-	-	-	-	-	-
2015	March	-	-	-	-	-	-	-	-	-
2015	April	-	-	-	-	-	-	-	-	-
2015	May	-	-	-	-	-	-	-	-	-
2015	June	-	-	-	-	-	-	-	-	535
2015	July	156	6	-	1,094	40	-	313	12	-
2015	Aug	-	-	-	-	-	-	-	-	-
2015	Sep	-	-	-	-	-	-	-	-	-
2015	Oct	-	-	-	-	-	-	-	-	-
2015	Nov	-	-	-	-	-	-	-	-	-
2015	Dec	-	-	-	-	-	-	-	-	-
2016	Jan	-	-	-	-	-	-	-	-	-
2016	Feb	-	-	-	-	-	-	-	-	-
2016	March	-	-	-	-	-	-	-	-	-
2016	April	-	-	-	-	-	-	-	-	-
2016	May	-	-	-	-	-	-	-	-	-
2016	June	-	-	-	-	-	-	-	-	-
2016	July	697	48	-	872	59	619	-	-	619
2016	Aug	-	-	-	-	-	-	445	30	-
2016	Sep	-	-	-	-	-	-	-	-	-
2016	Oct	-	-	-	-	-	-	-	-	-
2016	Nov	-	-	-	-	-	-	-	-	-
2016	Dec	-	-	-	-	-	-	-	-	-
2017	Jan	-	-	-	-	-	-	-	-	-

Year	Month	Estimated Spring 4_2 Encounters			Estimated Spring 5_2 Encounters			Estimated Summer 5_2 Encounters		
		Kept	Rel (legal)	Rel (sublegal)	Kept	Rel (legal)	Rel (sublegal)	Kept	Rel (legal)	Rel (sublegal)
2017	Feb	-	-	-	-	-	-	-	-	-
2017	March	-	-	-	-	-	-	-	-	-
2017	April	-	-	-	-	-	-	-	-	-
2017	May	-	-	-	-	-	159	-	-	53
2017	June	-	-	170	-	-	-	-	-	-
2017	July	-	-	-	349	36	-	-	-	-
2017	Aug	-	-	-	-	-	-	346	30	-
2017	Sep	-	-	-	-	-	-	-	-	-
2017	Oct	-	-	-	-	-	-	-	-	-
2017	Nov	-	-	-	-	-	-	-	-	-
2017	Dec	-	-	-	-	-	-	-	-	-
2018	Jan	-	-	-	-	-	-	-	-	-
2018	Feb	-	-	-	-	-	-	-	-	-
2018	March	-	-	-	-	-	-	-	-	-
2018	April	-	-	-	-	-	-	-	-	-
2018	May	-	-	-	-	-	-	-	-	-
2018	June	-	-	-	0	0	0	120	44	90
2018	July	-	-	-	0	0	0	270	94	186
2018	Aug	-	-	-	-	-	-	105	15	107
2018	Sep	-	-	-	2	0	3	37	1	68
2018	Oct	-	-	-	-	-	-	-	-	-
2018	Nov	-	-	-	-	-	-	-	-	-
2018	Dec	-	-	-	-	-	-	-	-	-

Table L –15. Estimated proportion of Spring 4_2, Spring 5_2 and Summer 5_2 Chinook in the Strait of Georgia (SOUTH) fishery from GSI samples.

Year	Month	DNA stock composition (kept)					DNA stock composition (sublegal)					Total Effort, Kept Catch and Releases (Rel)			
		n	***rate***	**SP 4_2**	**SP5_2**	**SU 5_2**	***n***	***rate***	**SP 4_2**	**SP5_2**	**SU 5_2**	**Effort**	**Kept**	**Rel (legal)**	**Rel (sublegal)**
2012	Nov	*2*	-	0%	0%	0%	*22*	-	0%	12%	0%	-	-	-	-
2012	Dec	*1*	-	0%	0%	0%	*16*	-	0%	6%	0%	-	-	-	-
2013	Jan	*34*	-	0%	0%	0%	*22*	-	0%	0%	0%	-	-	-	-
2013	Feb	*15*	-	0%	0%	0%	*1*	-	0%	0%	0%	-	-	-	-
2013	Mar	*15*	-	0%	0%	0%	*5*	-	0%	0%	0%	*120*	-	-	-
2013	April	*25*	0.7%	0%	0%	0%	*12*	-	7%	13%	0%	*6,686*	3,787	4,603	-
2013	May	*24*	1.2%	0%	0%	0%	*30*	0.2%	3%	3%	0%	*7,636*	2,004	574	16,469
2013	June	*1*	0.1%	0%	0%	0%	*13*	0.4%	0%	0%	0%	*7,841*	672	79	3,660
2013	July	*5*	0.3%	0%	0%	0%	*15*	0.4%	0%	0%	0%	*10,410*	1,555	121	4,086
2013	Aug	-	-	-	-	-	*5*	-	0%	0%	0%	*6,030*	957	338	-
2013	Sep	-	-	-	-	-	-	-	-	-	-	*51*	-	-	-
2013	Oct	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2013	Nov	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2013	Dec	*1*	-	0%	0%	0%	-	-	-	-	-	-	-	-	-
2014	Jan	*5*	-	0%	0%	0%	*17*	-	0%	0%	0%	-	-	-	-
2014	Feb	*3*	-	0%	0%	0%	*3*	-	0%	0%	0%	*8*	1	-	-
2014	Mar	*17*	-	0%	0%	0%	*25*	-	4%	0%	0%	*20*	2	-	-
2014	April	*61*	-	0%	0%	0%	*43*	-	6%	4%	0%	*85*	-	-	-
2014	May	*95*	2.0%	0%	0%	0%	*38*	-	0%	0%	3%	*6,041*	4,779	9,100	-
2014	June	*67*	3.5%	4%	1%	0%	*18*	-	0%	0%	0%	*4,592*	1,903	1,673	-
2014	July	*41*	3.3%	0%	0%	0%	*12*	-	0%	0%	7%	*8,041*	1,247	1,134	-
2014	Aug	*30*	1.5%	3%	0%	3%	*5*	0.2%	0%	0%	0%	*22,645*	1,980	131	2,260
2014	Sep	*25*	2.0%	0%	0%	0%	*5*	5.6%	0%	0%	0%	*8,716*	1,236	284	89
2014	Oct	*5*	-	0%	0%	0%	*1*	-	0%	0%	0%	*31*	-	-	-
2014	Nov	*4*	-	0%	0%	0%	*1*	-	0%	0%	0%	-	-	-	-
2015	Jan	*18*	-	0%	0%	0%	*12*	-	0%	0%	0%	-	-	-	-
2015	Feb	*13*	-	0%	0%	0%	*11*	-	0%	0%	0%	*21*	-	-	-

Year	Month	DNA stock composition (kept)					DNA stock composition (sublegal)					Total Effort, Kept Catch and Releases (Rel)			
		n	***rate***	**SP 4$_2$**	**SP5$_2$**	**SU 5$_2$**	***n***	***rate***	**SP 4$_2$**	**SP5$_2$**	**SU 5$_2$**	**Effort**	**Kept**	**Rel (legal)**	**Rel (sublegal)**
2015	Mar	*23*	-	0%	0%	0%	*6*	-	0%	14%	0%	*88*	17	-	-
2015	April	*45*	-	0%	0%	0%	*24*	-	0%	0%	0%	*107*	1	-	-
2015	May	*100*	1.8%	0%	1%	0%	*17*	0.9%	0%	0%	0%	*8,523*	5,516	447	1,939
2015	June	*47*	4.5%	0%	0%	0%	*10*	0.5%	0%	0%	0%	*4,139*	1,041	235	2,050
2015	July	*41*	2.1%	2%	0%	0%	*22*	-	0%	0%	0%	*9,199*	1,947	735	
2015	Aug	*65*	1.4%	0%	0%	3%	*10*	0.7%	0%	0%	0%	*12,674*	4,657	454	1,361
2015	Sep	*39*	1.4%	0%	0%	0%	*4*	0.5%	0%	0%	0%	*6,262*	2,884	153	778
2015	Oct	*4*	1.3%	0%	0%	0%	*1*	1.4%	0%	0%	0%	*1,774*	304	-	74
2015	Nov	*1*	-	0%	0%	0%	*1*	-	0%	0%	0%	-	-	-	-
2015	Dec	*7*	-	0%	0%	0%	*25*	-	0%	0%	0%	-	-	-	-
2016	Jan	*7*	-	0%	0%	0%	*46*	-	0%	0%	0%	-	-	-	-
2016	Feb	*9*	-	0%	0%	0%	*50*	-	0%	0%	0%	-	-	-	-
2016	Mar	*20*	-	0%	0%	0%	*79*	-	1%	0%	0%	*38*	9	-	21
2016	April	*37*	40.7%	3%	3%	0%	*43*	23.6%	0%	0%	0%	*121*	91	-	182
2016	May	*65*	1.5%	2%	0%	0%	*57*	0.6%	0%	0%	0%	*8,663*	4,434	351	9,817
2016	June	*27*	1.6%	0%	0%	0%	*22*	-	0%	0%	0%	*6,119*	1,731	146	-
2016	July	*42*	3.4%	2%	2%	0%	*24*	-	0%	0%	0%	*10,334*	1,219	205	-
2016	Aug	*48*	2.9%	0%	0%	0%	*11*	-	0%	10%	0%	*10,558*	1,644	143	-
2016	Sep	*14*	0.5%	0%	0%	0%	*16*	-	0%	0%	0%	*8,055*	2,556	622	-
2016	Oct	*1*		0%	0%	0%	*20*	-	0%	0%	0%	-	-	-	-
2016	Nov	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2016	Dec	*15*	-	0%	0%	0%	*37*	-	0%	0%	0%	-	-	-	-
2017	Jan	*10*	-	0%	0.0%	0.0%	*30*	-	0%	0.0%	0.0%	-	-	-	-
2017	Feb	*6*	-	0%	0.0%	0.0%	*16*	-	0%	0.0%	0.0%	-	-	-	-
2017	Mar	*9*	36.0%	0%	0.0%	0.0%	*18*	29.0%	0%	0.0%	0.0%	*190*	25	-	62
2017	April	*70*	93.3%	0%	0.0%	0.0%	*47*	63.5%	0%	0.0%	0.0%	*560*	75	175	74
2017	May	*64*	1.4%	0%	0.0%	0.0%	*35*	0.7%	0%	0.0%	2.8%	*10,391*	4,452	308	5194
2017	June	*44*	3.2%	0%	2.3%	2.3%	*25*	1.1%	0%	0.0%	0.0%	*6,857*	1,396	219	2226

Year	**Month**	**DNA stock composition (kept)**					**DNA stock composition (sublegal)**					**Total Effort, Kept Catch and Releases (Rel)**			
		n	***rate***	**SP 4_2**	**SP5_2**	**SU 5_2**	***n***	***rate***	**SP 4_2**	**SP5_2**	**SU 5_2**	**Effort**	**Kept**	**Rel (legal)**	**Rel (sublegal)**
2017	July	*62*	4.1%	0%	1.6%	0.0%	*20*	0.3%	0%	8.7%	0.0%	*10,066*	1,499	575	6254
2017	Aug	*73*	1.7%	0%	0.0%	1.4%	*9*	0.3%	0%	0.0%	0.0%	*15,739*	4,361	753	3092
2017	Sep	*25*	0.5%	0%	0.0%	0.0%	*8*	0.2%	0%	9.1%	9.1%	*12,104*	5,377	190	3548
2017	Oct	-	0.0%	-	-	-	*7*	2.4%	0%	0.0%	0.0%	*691*	53	-	290
2017	Nov	-	-	-	-	-	*1*	-	0%	50.0%	0.0%	-	-	-	-
2017	Dec	*9*	-	0.0%	0.0%	0.0%	*60*	-	0%	0.0%	0.0%	-	-	-	-
2018	Jan	*13*		0%	1%	1%	-	-	-	-	-	-	-	-	-
2018	Feb	*16*	41.0%	0%	0%	0%	-	-	-	-	-	*74*	39	43	67
2018	March	*66*	6.7%	0%	0%	0%	-	-	-	-	-	*2,862*	988	56	2,924
2018	April	*169*	-	0%	0%	0%	-	-	-	-	-	*373*	21	-	-
2018	May	*145*	1.4%	0%	1%	0%	-	-	-	-	-	*11,695*	10,533	795	107
2018	June	*77*	5.7%	1%	0%	0%	-	-	-	-	-	*6,263*	1,361	9	4,042
2018	July	*69*	5.2%	0%	0%	2%	-	-	-	-	-	*8,241*	1,318	185	3,015
2018	Aug	*56*	1.9%	0%	0%	0%	-	-	-	-	-	*16,006*	2,883	280	4,920
2018	Sept	*17*	1.7%	0%	0%	0%	-	-	-	-	-	*13,264*	1,023	33	979
2018	Oct	*3*	2.9%	0%	0%	0%	-	-	-	-	-	*251*	105	112	66
2018	Nov	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	Dec	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table L - 16. Estimated mortalities of Spring 4_2, Spring 5_2 and Summer 5_2 Chinook in the Strait of Georgia (SOUTH) fishery from GSI samples.

Year	Month	Estimated Spring 4_2 Encounters			Estimated Spring 5_2 Encounters			Estimated Summer 5_2 Encounters		
		Kept	Rel (legal)	Rel (sublegal)	Kept	Rel (legal)	Rel (sublegal)	Kept	Rel (legal)	Rel (sublegal)
2013	Jan	-	-	-	-	-	-	-	-	-
2013	Feb	-	-	-	-	-	-	-	-	-
2013	Mar	-	-	-	-	-	-	-	-	-
2013	April	-	-	-	-	-	-	-	-	-
2013	May	-	-	515	-	-	515	-	-	-
2013	June	-	-	-	-	-	-	-	-	-
2013	July	-	-	-	-	-	-	-	-	-
2013	Aug	-	-	-	-	-	-	-	-	-
213	Sep	-	-	-	-	-	-	-	-	-
2013	Oct	-	-	-	-	-	-	-	-	-
2013	Nov	-	-	-	-	-	-	-	-	-
2013	Dec	-	-	-	-	-	-	-	-	-
2014	Jan	-	-	-	-	-	-	-	-	-
2014	Feb	-	-	-	-	-	-	-	-	-
2014	Mar	-	-	-	-	-	-	-	-	-
2014	April	-	-	-	-	-	-	-	-	-
2014	May	-	-	-	-	-	-	-	-	-
2014	June	85	75	-	28	25	-	-	-	-
2014	July	-	-	-	-	-	-	-	-	-
2014	Aug	66	4	-	-	-	-	66	4	-
2014	Sep	-	-	-	-	-	-	-	-	-
2014	Oct	-	-	-	-	-	-	-	-	-
2014	Nov	-	-	-	-	-	-	-	-	-
2014	Dec	-	-	-	-	-	-	-	-	-
2015	Jan	-	-	-	-	-	-	-	-	-

Year	Month	Estimated Spring 4_2 Encounters			Estimated Spring 5_2 Encounters			Estimated Summer 5_2 Encounters		
		Kept	Rel (legal)	Rel (sublegal)	Kept	Rel (legal)	Rel (sublegal)	Kept	Rel (legal)	Rel (sublegal)
2015	Feb	-	-	-	-	-	-	-	-	-
2015	Mar	-	-	-	-	-	-	-	-	-
2015	April	-	-	-	-	-	-	-	-	-
2015	May	-	-	-	55	4	-	-	-	-
2015	June	-	-	-	-	-	-	-	-	-
2015	July	47	18	-	-	-	-	-	-	-
2015	Aug	-	-	-	-	-	-	143	14	-
2015	Sep	-	-	-	-	-	-	-	-	-
2015	Oct	-	-	-	-	-	-	-	-	-
2015	Nov	-	-	-	-	-	-	-	-	-
2015	Dec	-	-	-	-	-	-	-	-	-
2016	Jan	-	-	-	-	-	-	-	-	-
2016	Feb	-	-	-	-	-	-	-	-	-
2016	Mar	-	-	0	-	-	-	-	-	-
2016	April	2	-	-	2	-	-	-	-	-
2016	May	68	5	-	-	-	-	-	-	-
2016	June	-	-	-	-	-	-	-	-	-
2016	July	29	5	-	29	5	-	-	-	-
2016	Aug	-	-	-	-	-	-	-	-	-
2016	Sep	-	-	-	-	-	-	-	-	-
2016	Oct	-	-	-	-	-	-	-	-	-
2016	Nov	-	-	-	-	-	-	-	-	-
2016	Dec	-	-	-	-	-	-	-	-	-
2017	Jan	-	-	-	-	-	-	-	-	-
2017	Feb	-	-	-	-	-	-	-	-	-
2017	Mar	-	-	-	-	-	-	-	-	-

Year	Month	Estimated Spring 4_2 Encounters			Estimated Spring 5_2 Encounters			Estimated Summer 5_2 Encounters		
		Kept	Rel (legal)	Rel (sublegal)	Kept	Rel (legal)	Rel (sublegal)	Kept	Rel (legal)	Rel (sublegal)
2017	April	-	-	-	-	-	-	-	-	-
2017	May	-	-	-	-	-	-	-	-	144
2017	June	-	-	-	32	5	-	32	5	-
2017	July	-	-	-	24	9	544	-	-	-
2017	Aug	-	-	-	-	-	-	60	10	-
2017	Sep	-	-	-	-	-	323	-	-	323
2017	Oct	-	-	-	-	-	-	-	-	-
2017	Nov	-	-	-	-	-	-	-	-	-
2017	Dec	-	-	-	-	-	-	-	-	-
2018	Jan	-	-	-	-	-	-	-	-	-
2018	Feb	-	-	-	-	-	-	-	-	-
2018	March	-	-	-	-	-	-	-	-	-
2018	April	-	-	-	-	-	-	-	-	-
2018	May	-	-	-	74	6	-	-	-	-
2018	June	18	0	-	-	-	-	-	-	-
2018	July	-	-	-	1	0	-	22	3	-
2018	Aug	-	-	-	-	-	-	-	-	-
2018	Sept	-	-	-	-	-	-	-	-	-
2018	Oct	-	-	-	-	-	-	-	-	-
2018	Nov	-	-	-	-	-	-	-	-	-
2018	Dec	-	-	-	-	-	-	-	-	-

APPENDIX M: MARINE CATCH ESTIMATION USING GSI

The level of stratification used to estimate catch and release of Fraser River Spring 4_2, Spring 5_2, and Summer 5_2 Chinook SMUs from genetic stock identification (GSI) varied among fisheries as a function of available data and sample sizes. In addition, infilling of stock composition estimates was required in a subset of years for several of the marine fisheries represented in the Run Reconstruction Model-based ERI estimation routine. The methods used to calculate SMU-level catch and release estimates based on GSI data, as well as infilling assumptions, are described for each fishery below. Because genetic samples are not routinely collected from released catch, we assumed for each fishery that that the SMU proportions in released catch were equal to the proportions observed in landed catch samples.

WCVI TROLL FISHERY (AREA G)

DNA sampling of catch composition for the WCVI (Area G) commercial troll fishery was conducted between 2007 and 2015, which allowed us to estimate annual catch specific to each of the three Fraser stream-type SMUs (Spring 4_2, Spring 5_2, Summer 5_2). Completing the estimated SMU-specific catch series up to 2018 required infilling SMU proportions for 2016, 2017, and 2018, when no DNA sampling was done.

Catch composition estimates were stratified by month and region (Northwest Vancouver Island [NWVI] vs. Southwest Vancouver Island [SWVI]) to calculate SMU-level catch and release numbers as follows:

Eq. M - 1
$$\hat{C}_{y,s} = \sum_{r=1}^{2} \sum_{m=1}^{m=12} C_{y,r,m} P_{y,m,r,s}$$

Eq. M - 2
$$\hat{R}_{y,s} = \sum_{r=1}^{2} \sum_{m=1}^{m=12} R_{y,r,m} P_{y,m,r,s}$$

where, $\hat{C}_{y,s}$ and $\hat{R}_{y,s}$ are the catch and release estimates for SMU *s* in year *y* respectively, $C_{y,r,m}$ and $R_{y,r,m}$ are the total observed catch and release of Chinook salmon by the fishery in region *r* in month m of year *y*. $P_{y,m,r,s}$ is the estimated proportion of the total landed fishery catch attributed to each SMU in region *r* in month *m* of year *y* using GSI methods.

Infilling of 2016, 2017, and 2018 proportions for Fraser Spring 4_2, Spring 5_2, and Summer 5_2 SMUs was done by replacing the $P_{y,m,r,s}$ term in equations M-1 and M-2, and Eq. M - 2 with the average proportion of catch attributed to SMU *s* in month *m* and region *r*, calculated from 2009 to 2015, $\bar{P}_{m,r,s}$.

Annual estimates of $P_{y,m,r,s}$, as well as the values of $\bar{P}_{m,r,s}$ used for infilling are shown in Figures Figure M - 1 and Figure M - 2. The final time series of catch and release estimates that were used as inputs to the exploitation rate estimation routine are show in Table M - 1.

Table M - 1. Catch and release values for the WCVI Troll Fishery used as inputs to the Run Reconstruction Model approach to ERI estimation. Values shown in bold italics indicate infilling.

Year	Spring 4_2		Spring 5_2		Summer 5_2	
	Catch	Release	Catch	Release	Catch	Release
2009	56	***5***	354	***30***	316	***27***
2010	52	***3***	101	***4***	36	***1***
2011	137	***9***	296	***18***	748	***19***
2012	11	***1***	303	***8***	28	***1***
2013	1	***0***	0	***0***	1	***0***
2014	657	***40***	326	***15***	869	***40***
2015	253	***9***	338	***12***	35	***1***
2016	***146***	***4***	***307***	***10***	***240***	***8***
2017	***105***	***12***	***226***	***25***	***349***	***24***
2018	***50***	***4***	***103***	***8***	***86***	***7***

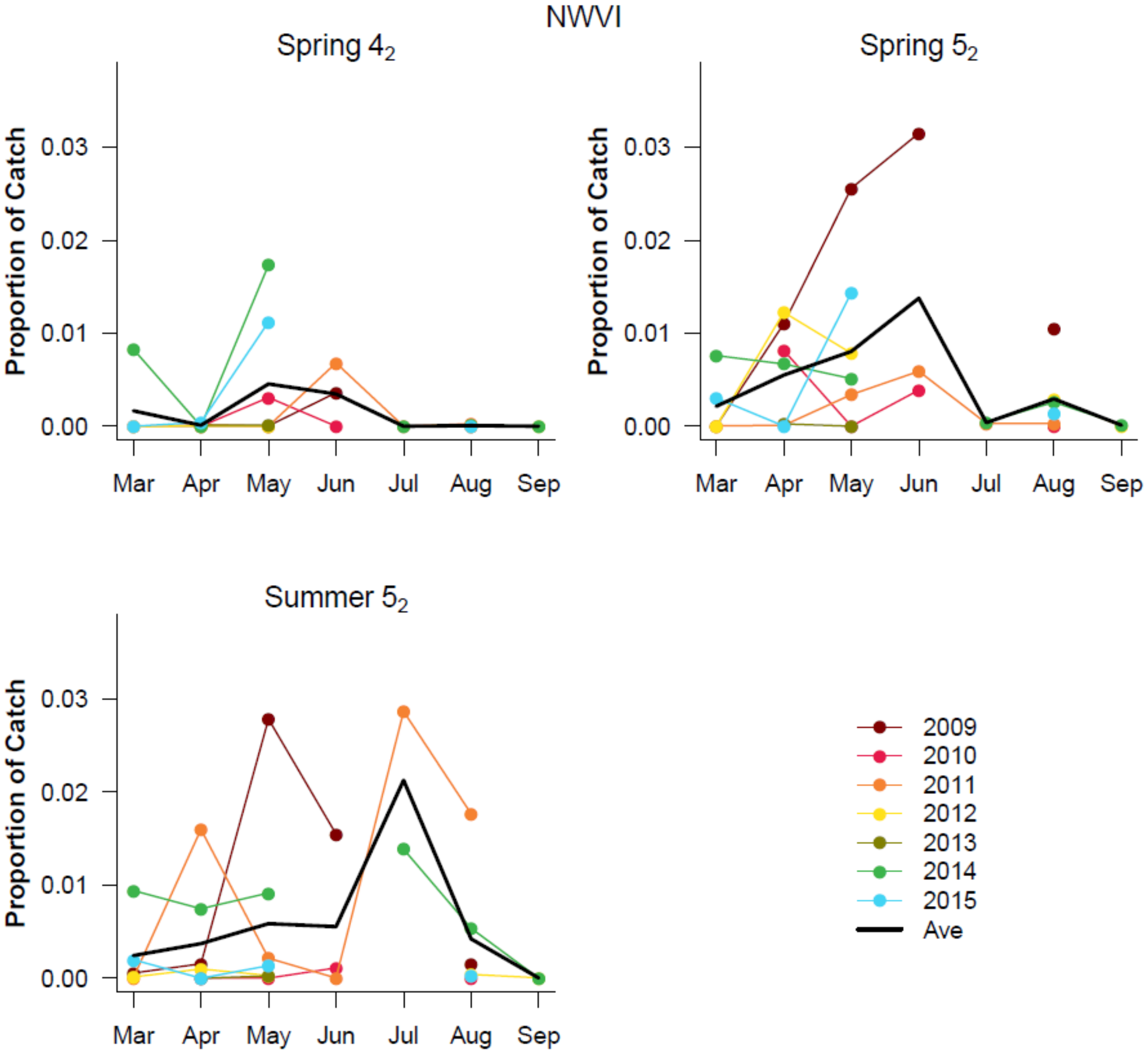


Figure M - 1. Monthly proportions of total WCVI troll fishery catch from the NWVI region attributed to each Fraser Chinook SMU based on GSI catch composition estimates shown by year. The thick black line shows the average among years that was used for infilling missing data in 2016 - 2018.

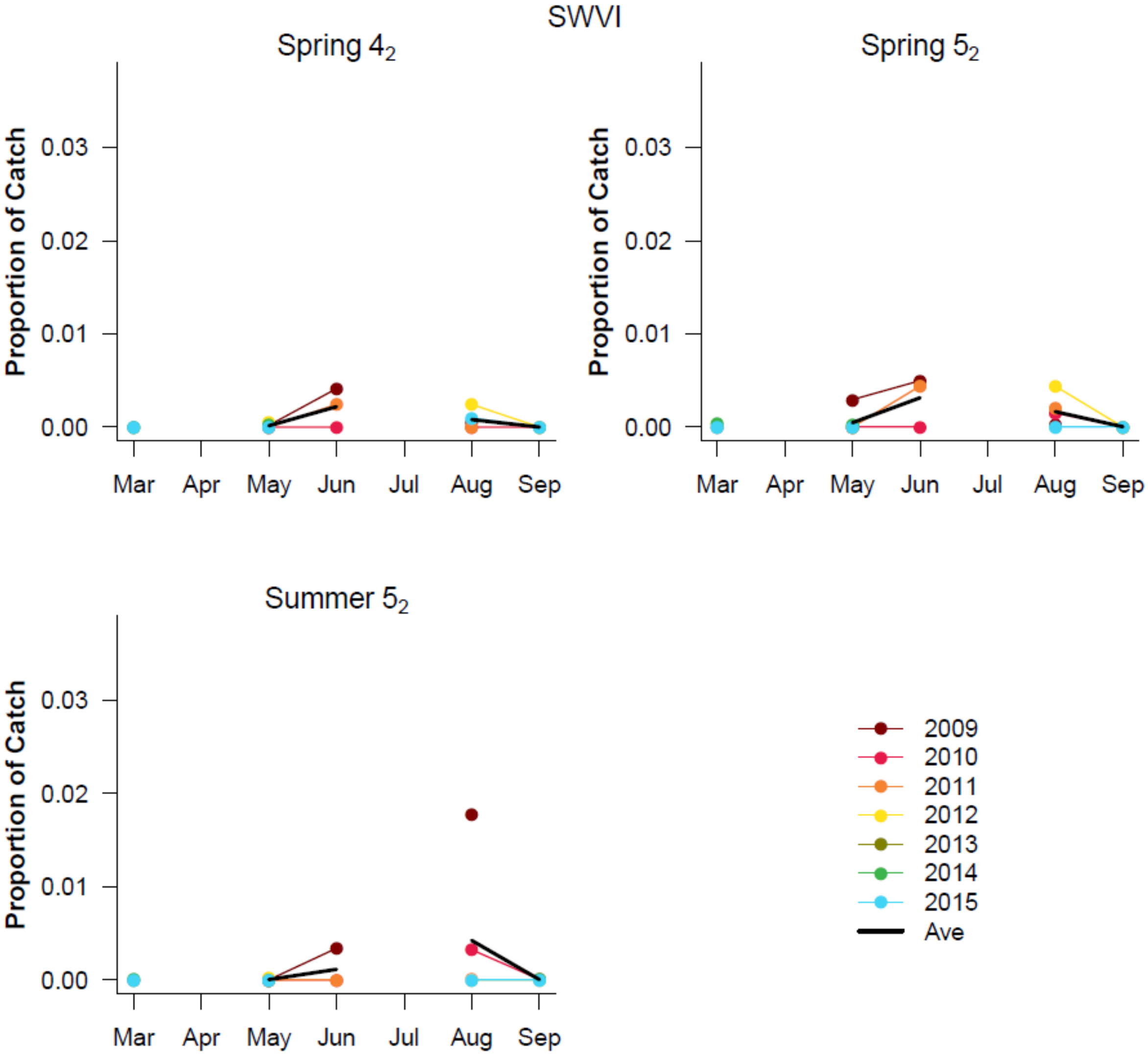


Figure M - 2. Monthly proportions of total WCVI troll fishery catch from the SWVI region attributed to each Fraser Chinook SMU based on DNA catch composition estimates shown by year. The thick black line shows the average among years that was used for infilling missing data in 2016 -2018.

WCVI AABM RECREATIONAL FISHERY

DNA sampling of catch composition for the WCVI AABM recreational fishery was conducted between 2007 and 2015; however, we excluded samples from 2012 due to missing samples during summer months. Infilling for 2012, 2016, and 2017 were required to complete estimated SMU-specific catch series for this fishery.

As with the WCVI Troll fishery, catch composition estimates were stratified by month and region (NWVI vs. SWVI) to calculate SMU-level catch and release numbers using equations M - 1 and M - 2.

Infilling of 2012, 2016 and 2017 catch proportions for Fraser Spring 4_2, Spring 5_2, and Summer 5_2 SMUs was done by replacing the $P_{y,m,r,s}$ term in equations M - 1 and M – 2 with $\bar{P}_{m,r,s}$, which for this fishery represented the average proportion of catch attributed to SMU s in month m and region r, calculated over the years 2009-2011 and 2013-2015.

The months used to estimate SMU catch proportions for this fishery were limited to June through September. While relatively high proportions of catch attributed to stream-type SMUs were apparent in June in some years (Figures M-3 and M-4) suggest that these SMUs may have been present in catches in May, recreational sampling data are not available for May. In the absence of sampling, catch attributed to these SMUs in May is assumed to be zero. Additional infilling was required for the month of June in 2009, 2011, and 2013 as GSI sampling was not conducted in June in these years. In this case, the value of $\bar{P}_{m,r,s}$ from all years with sampling in June was applied to estimates of total catch and release in June.

Annual estimates of $P_{y,m,r,s}$, as well as the values of $\bar{P}_{m,r,s}$ used for infilling are shown in Figures M - 3 and M - 4. The final time series of catch and release estimates that were used as inputs to the exploitation rate estimation routine are show in Table M - 2.

Table M - 2. Catch and release values for the Offshore (AABM) WCVI Recreational fishery used as inputs to the Run Reconstruction Model approach to ERI estimation. Values shown in bold italics indicate infilling.

	Spring 4_2		**Spring 5_2**		**Summer 5_2**	
Year	**Catch**	**Release**	**Catch**	**Release**	**Catch**	**Release**
2009	73	***100***	81	***38***	509	***133***
2010	12	***5***	3	***1***	2	***1***
2011	190	***54***	87	***17***	628	***237***
2012	***147***	***136***	***189***	***106***	***328***	***222***
2013	311	***159***	112	***57***	171	***72***
2014	106	***109***	409	***321***	244	***253***
2015	73	***37***	355	***161***	319	***131***
2016	138	***23***	171	***33***	275	***50***
2017	149	***36***	187	***60***	319	***88***
2018	86	***12***	140	***28***	212	***42***

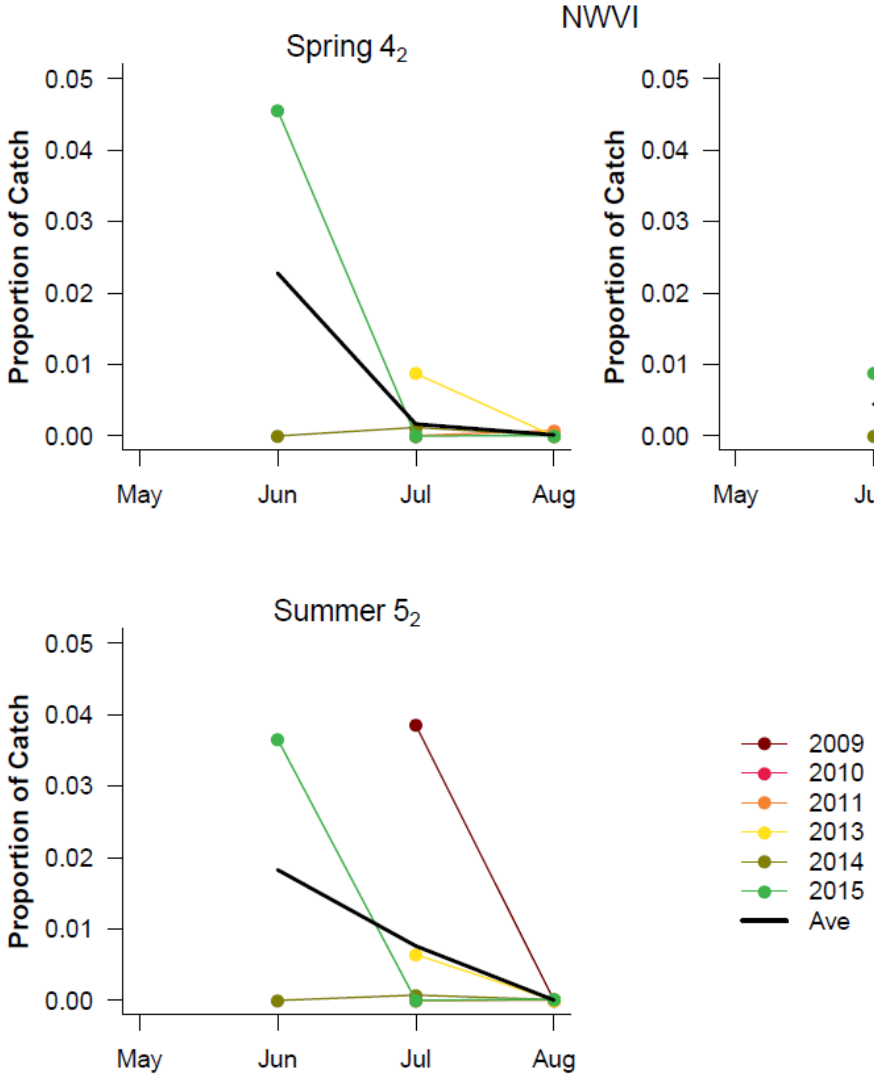


Figure M - 3. Monthly proportions of total WCVI recreational fishery catch from the NWVI region attributed to each Fraser Chinook SMU based on DNA catch composition estimates shown by year. The thick black line shows the average among years that was used for infilling missing data in 2012 and 2016 - 2018.

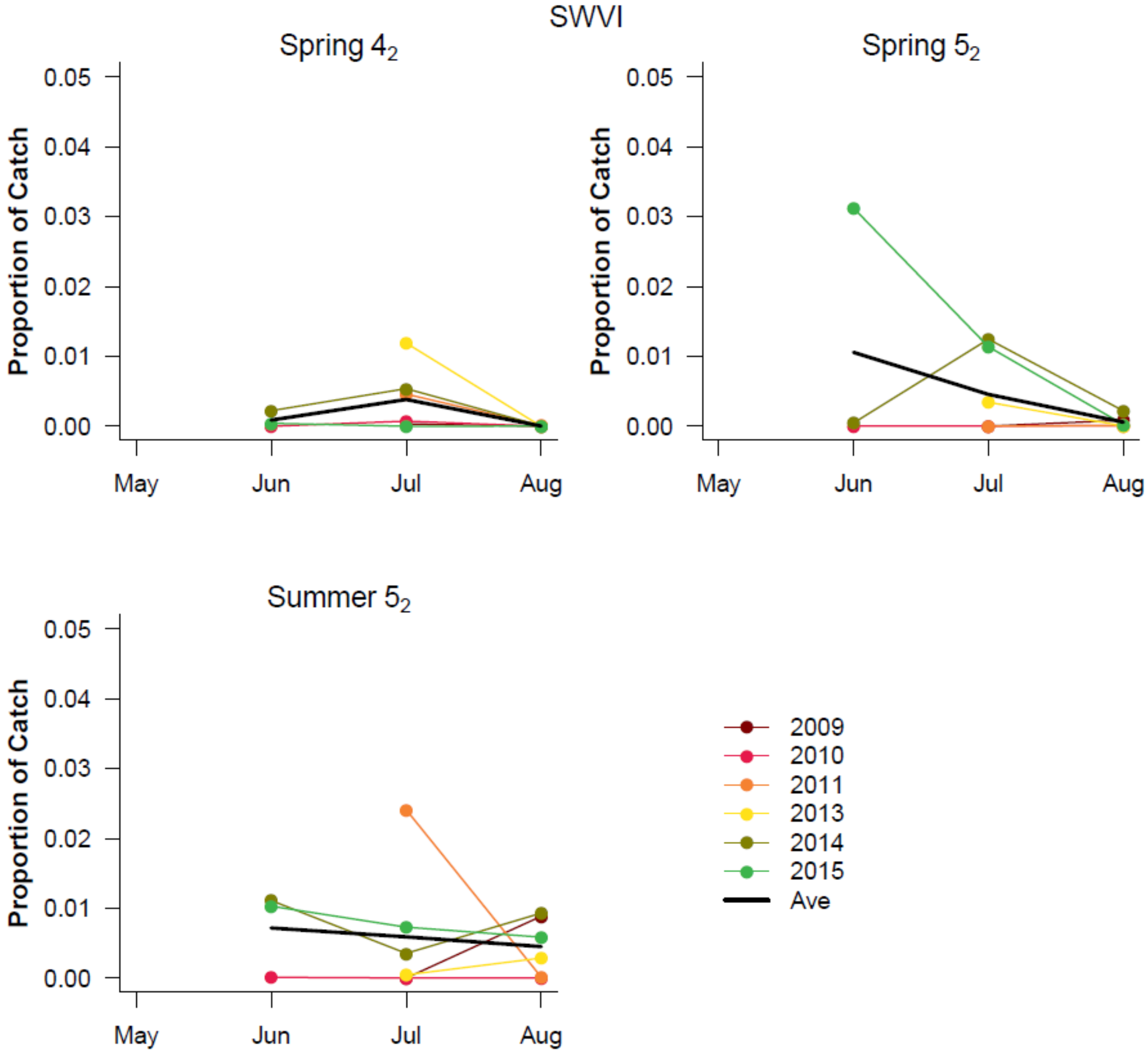


Figure M - 4. Monthly proportions of total WCVI recreational fishery catch from the SWVI region attributed to each Fraser Chinook SMU based on DNA catch composition estimates shown by year. The thick black line shows the average among years that was used for infilling missing data in 2012 and 2016 - 2018.

JDF RECREATIONAL FISHERY

DNA sampling of catch composition for the JDF Recreational fishery was conducted in 2009, 2010, 2014, and 2016 - 2018, therefore infilling was required for 2011-2013, and 2015 to complete estimated SMU-specific catch series for this fishery.

For years with DNA sampling, catch and release values were estimated using the following equations:

Eq. M - 3 $$\hat{C}_{y,s} = \sum_{m=1}^{m=12} C_{y,m} P_{y,m,s}$$

Eq. M - 4 $$\hat{R}_{y,s} = \sum_{m=1}^{m=12} R_{y,m} P_{y,m,s}$$

Where the notation is the same as that described for equations M-1 and M-2, but without the region subscript.

For years in which infilling was required, an additional stratification of $P_{y,m,s}$ estimates was applied in order to separate out years according to the annual management zone applied for Spring 5_2 and Summer 5_2 SMUs (i.e., Zone 1 management vs. Zone 2 management). Stratification by management zone was required for this fishery because size limits are used to reduce impacts on Fraser Spring 5_2 and Summer 5_2 SMUs. The five-year-old fish that dominate the Fraser Spring 5_2 and Summer 5_2 runs tend to have larger body sizes than four-year-old fish from other stocks that are caught concurrently. As a result, restrictions on the retention of large fish are greater from mid-June to mid-July in Zone 1 years, compared to Zone 2 years, to allow a larger portion of Fraser Spring 5_2 and Summer 5_2 stocks to escape JDF Rec fisheries (Appendix B). Catch composition is therefore expected to differ among years according to management zone. Infilling for Zone 2 years without DNA sampling (2011-2012 and 2015), was done using the average $P_{y,m,s}$ calculated over Zone 2 years with sampling (2010, 2014). Infilling for the only Zone 1 year without genetic catch composition samples (2013) was done using estimated $P_{y,m,s}$ from other Zone 1 years (2016, 2017). Note that 2009 and 2018 were not classified as belonging to a zone; 2009 was before the start of Zone management in 2010 and 2018 had additional management restrictions in place to protect Southern Resident Killer Whales.

The JDF recreational fishery uses a combination of slot-based size limits and reduced bag limits on larger fish that are aimed at limiting the retention of Fraser River Spring 5_2 and Summer 5_2 fish. As a result, the assumption of equal proportions of Spring 5_2 and Summer 5_2 fish in released and retained catch is expected to be inappropriate. However, in the absence of direct estimates of stock composition from released fish, we have continued to rely on this assumption. As a result, release estimated from these SMUs are likely under-estimates. We examine the potential impacts of this assumption using sensitivity analyses (see section 5.4 in main document).

In addition, we assume that the proportion of the catch sampled from each size category is proportional to the total retained catch from each size category. While size-based stratification of stock composition estimates would be a more appropriate and could potentially reduce uncertainty, we did not attempt to do so at this time.

Annual estimates of $P_{y,m,s}$ are shown in Figure M - 5. The final time series of catch and release estimates that were used as inputs to the exploitation rate estimation routine are show in Table M - 3.

Table M - 3. Catch and release values for the JDF recreational fishery used for input to the exploitation rate estimation routine. Values shown in bold italics indicate infilling.

Year	Spring 4_2		Spring 5_2		Summer 5_2	
	Catch	**Release**	**Catch**	**Release**	**Catch**	**Release**
2009	488	***68***	2379	***246***	1869	***210***
2010	121	***22***	311	***45***	232	***17***
2011	***180***	***35***	***511***	***104***	***462***	***61***
2012	***286***	***54***	***765***	***164***	***585***	***86***
2013	***229***	***51***	***828***	***167***	***1328***	***306***
2014	537	***168***	1331	***379***	738	***180***
2015	***533***	***102***	***1482***	***320***	***1253***	***222***
2016	160	***59***	383	***148***	1198	***367***
2017	78	***21***	452	***165***	397	***100***
2018	38	***12***	495	***160***	583	***191***

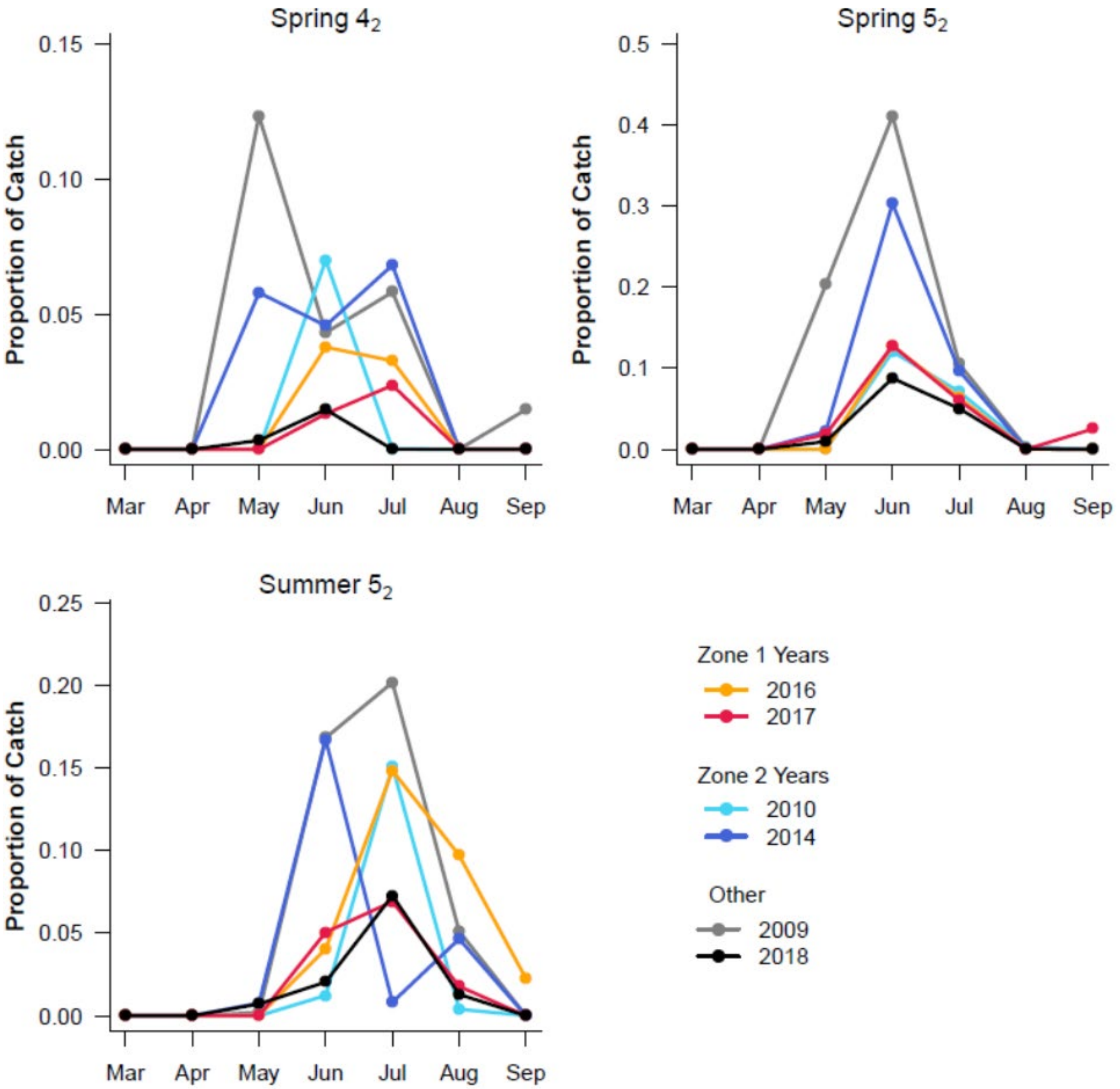


Figure M - 5. Monthly proportions of total JDF catch attributed to each Fraser Chinook SMU based on DNA catch composition estimates, shown by year. The management zone used to guide in-season management each year is indicated in the legend.

T’AAQ-WIIHAK FISHERY INFILLING

GSI sampling of catch composition for the T’aaq-wiihak fishery was conducted between 2012 (the first year of operation) and 2015. Therefore infilling of SMU-specific catch was required for 2016 – 2018, and based on only 4 years of data.

DNA sample sizes for this fishery were considered insufficient to support stratification by month. As a result, calculation of SMU-level catch and release was based on annual catch composition estimates. An assumption of this approach is that monthly trends in catch composition remain constant among years (rather than by month, as assumed in the previous fisheries). Given that there have been no changes in catch restrictions in this fishery since 2012, any changes in monthly catch composition would be driven by changes in relative abundance of Fraser stocks relative to other stocks in a given month or changes in fisher behavior that are independent of management measures.

Catch and release values for years with DNA sampling were calculated as:

Eq. M - 5 $$\hat{C}_{y,s} = C_y P_{y,s}$$

Eq. M - 6 $$\hat{R}_{y,s} = R_y P_{y,s}$$

where, $\hat{C}_{y,s}$ and $\hat{R}_{y,s}$ are the catch and release estimates for SMU s in year *y*. C_y and R_y are the total observed catch and release of Chinook salmon by the fishery in year y, and $P_{y,s}$ is the estimated proportion of the total landed fishery catch attributed to each SMU in year *y* using GSI methods. Infilling of 2016 and 2017 catch and releases from each SMU was done by replacing $P_{y,s}$ in Equations Eq. M - 5 and Eq. M - 6with the average $P_{y,s}$ values over the years 2012-2015, $\bar{P}_s$.

Estimated values of $\bar{P}_s$ used to infill 2016 - 2018, as well as the annual estimates of $P_{y,s}$ from which $\bar{P}_s$ was calculated are shown in Figure M - 6. The final time series of catch and release estimates that were used as inputs to the exploitation rate estimation routine are show in Table M - 4.

Table M - 4. Catch and release values for the T’aaq-wiihak fishery used for input to the exploitation rate estimation routine. Values shown in bold italics indicate infilling.

Year	Spring 4_2		Spring 5_2		Summer 5_2	
	Catch	Release	Catch	Release	Catch	Release
2012	0	***0***	20	***0***	9	***0***
2013	1	***0***	66	***0***	20	***0***
2014	37	***0***	200	***0***	662	***0***
2015	2	***0***	1	***0***	172	***0***
2016	***4***	***0***	***37***	***0***	***108***	***0***
2017	***4***	***0***	***41***	***0***	***121***	***0***
2018	***6***	***0***	***57***	***0***	***170***	***0***

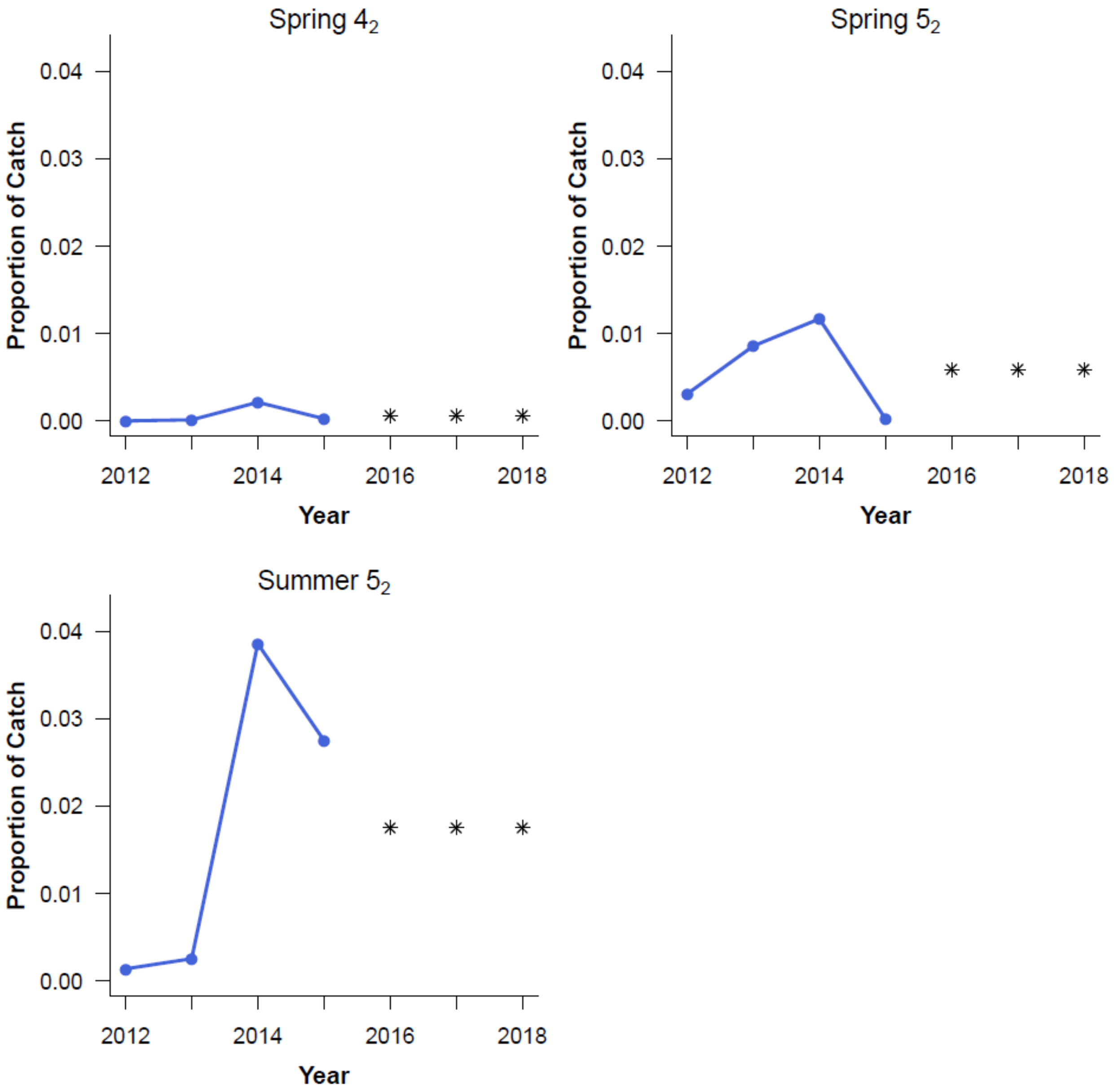


Figure M - 6. Annual proportions of total T'aaq-wiihak fishery catch attributed to each Fraser Chinook SMU based on DNA catch composition estimates. Blue points annual estimates based on DNA sampling of catch composition while black stars show the scalars that were used for infilling in 2016 - 2018 (i.e., $\overline{\boldsymbol{P}}_y$).

NORTHERN BC TROLL AND RECREATIONAL FISHERIES

GSI data are available from 2009 to 2018 for both of these fisheries, so no infilling of missing years was required. As with the T'aaq-wiihak fishery, calculation of SMU-level catch and release was based on annual catch composition estimates using equations Eq. M - 5 and Eq. M - 6. Readily available GSI data summaries from these fisheries did not separate out Spring 5_2 and Summer 5_2 SMUs; proportions of catch attributed to these two SMUs were combined. To separate out these SMUs in our input catch and release data, we made the assumption that annual ratio of Spring 5_2 to Summer 5_2 abundance in both landed and released catch was equal to the ratio estimated at the mouth of the Fraser using run reconstruction model. We test the potential impacts of this assumption using sensitivity analyses that introduced a constant negative or positive bias to the estimated ratio used in all years.

The final time series of catch and release estimates that were used as inputs to the exploitation rate estimation routine for the NBC Troll and NBC Recreational fisheries are show in Table M - 5 and Table M - 6, respectively.

Table M - 5. Catch and release values for the Northern BC AABM troll fishery used for input to the exploitation rate estimation routine. Values shown in bold italics indicate infilling

Year	Spring 4_2		Spring 5_2		Summer 5_2	
	Catch	Release	Catch	Release	Catch	Release
2009	101	***5***	1292	***59***	1304	***60***
2010	129	***8***	937	***59***	1238	***77***
2011	3	***1***	367	***157***	724	***310***
2012	72	***3***	672	***33***	812	***39***
2013	1	***0***	545	***236***	529	***229***
2014	269	***10***	1660	***64***	1471	***57***
2015	321	***54***	737	***124***	1183	***199***
2016	71	***2***	893	***23***	802	***21***
2017	0	***0***	778	***85***	766	***84***
2018	0	***0***	377	***30***	483	***38***

Table M - 6. Catch and release values for the Northern BC recreational fishery used for input to the exploitation rate estimation routine. Values shown in bold italics indicate infilling.

Year	Spring 4_2		Spring 5_2		Summer 5_2	
	Catch	Release	Catch	Release	Catch	Release
2009	4	***2***	504	***260***	509	***262***
2010	51	***35***	304	***210***	401	***278***
2011	9	***8***	242	***234***	478	***463***
2012	0	***0***	345	***191***	416	***231***
2013	0	***0***	258	***265***	250	***257***
2014	0	***0***	421	***346***	373	***307***
2015	5	***7***	136	***190***	219	***305***
2016	202	***140***	178	***124***	160	***111***
2017	96	***61***	175	***110***	172	***108***
2018	0	***0***	180	***197***	231	***252***