

**Genetic Analyses of samples collected in the  
Recreational Chinook Salmon Fisheries in  
Northern British Columbia 2016**

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**CONTENTS**

List of Tables .....	iii
List of Figures .....	iii
List of Appendices .....	iii
Abstract .....	iv
Introduction.....	1
Methods.....	2
Results.....	3
Discussion.....	4
Acknowledgements.....	5
References.....	6
Tables.....	7
Figures.....	14
Appendices.....	16

**LIST OF TABLES**

Table 1. Chinook salmon catch by stock group for the 2016 Area 1 Recreational fishery. ....	7
Table 2. Chinook stock proportions observed in monthly samples from 2016 Area 1 Recreational catches. ....	8
Table 3. Chinook catch composition from 2016 Area 1 Recreational fisheries by month. ....	9
Table 4. Chinook stock proportions observed in monthly samples from 2016 Areas 3 and 4 Recreational fishery catches. ....	10
Table 5. Chinook catch composition from 2016 Area 3 Recreational fisheries by month. ....	11
Table 6. Chinook catch composition from 2015 Area 4 Recreational fisheries by month. ....	12
Table 7. Chinook salmon catch by stock group for the 2016 Recreational fishery in Areas 3 and 4.....	13

**LIST OF FIGURES**

Figure 1. The North Coast of British Columbia showing Pacific Fishery Management Areas 1 to 10, 101 to 110, 130 and 142.....	14
Figure 2. Chinook model-generated stock composition of actual landed catch for the North / Central BC Sport model fishery, 1979-2013. ....	15

**LIST OF APPENDICES**

Appendix 1. Scale sampling instructions for Chinook salmon caught in the 2016 Northern British Columbia, Area 1 Recreational fishery.....	16
Appendix 2. Baseline samples used in the mixture analyses.....	18

**ABSTRACT**

Winther, I. 2016. Genetic analyses of samples collected in the recreational Chinook salmon fisheries in northern British Columbia 2016. Unpublished report for the Pacific Salmon Commission Northern Boundary and Transboundary Rivers Restoration and Enhancement Fund 2016. File # NF-2016-I-34: iv + 20 p.

The stock compositions of Chinook salmon (*Oncorhynchus tshawytscha*) caught in recreational fisheries in Northern British Columbia (NBC) were examined using genetic analyses of scale samples from fish caught near Langara Island and in Chatham Sound. Microsatellite DNA based stock identification techniques have been used to address stock specific management in mixed stock fisheries in NBC since 2002. Chinook salmon stock compositions were estimated for the 2016 NBC recreational fisheries in the waters of Chatham Sound and the waters around Langara Island and Graham Island. Stock compositions were applied to catch to provide region specific estimates of the impact of the fisheries on the Chinook stock groups encountered.

## INTRODUCTION

Chinook salmon (*Oncorhynchus tshawytscha*) stock compositions were estimated for Northern British Columbia (NBC) recreational fisheries from 2016. Funding for the genetic analyses was provided by the Pacific Salmon Commission's (PSC) Northern Boundary and Transboundary Rivers Restoration and Enhancement Fund (Northern Fund). The results are part of a continuing project to examine the genetics of Chinook salmon caught in mixed stock fisheries in NBC. This document fulfills the reporting requirements for the 2016 Northern Fund project but is not an exhaustive presentation of the data available. Costs to the Northern Fund consisted of the genetic analyses alone as sampling costs and other components of the project were funded by Fisheries & Oceans Canada and through volunteer efforts by sport fishing lodges.

Sport fisheries in Canada receive priority access to Chinook salmon over commercial fisheries. Two of the largest sport fisheries in NBC occur in Haida Gwaii and Chatham Sound. NBC Sport fisheries experienced significant growth until 2005 when they reached a maximum catch of 82,000 Chinook. Since then catches have moderated but remain over 40,000 Chinook salmon annually.

Scale samples were collected from Chinook salmon caught in Areas 1, 3 and 4 in 2016. Scales provide an opportunity to extract DNA for genetic analyses to identify stock specific impacts. Scales have been used successfully for genetic analyses of Chinook salmon caught in sport fisheries in previous studies (Winther, I. 2008. Northern Fund file # NF-2007-I-3).

Sport fisheries in Haida Gwaii or Pacific Fishery Management Areas 1 & 101, 2W & 142, 2E & 102 (Figure 1) are part of the PSC *Aggregate Abundance Based Management Regime* (AABM). Sport Fisheries in Chatham Sound or Areas 3 and 4 are part of the PSC *Individual Stock Based Management Regime* (ISBM). Areas 3 and 4 roughly represent the terminal areas of the Nass and Skeena Rivers respectively. The Nass and Skeena river systems are PSC escapement indicator stocks that drain into Chatham Sound.

Within the 25 fisheries currently defined in the Pacific Salmon Treaty (PST) Chinook model, recreational fisheries in northern British Columbia have been modeled as the North and Central BC (NCBC) Sport fishery which represents an aggregate of all Canadian sport fisheries north of Cape Caution. An issue known to the Chinook technical committee (CTC) is that the Chinook stocks from northern BC are over-represented in most of the modeled fisheries where they are encountered, but especially in the NCBC Sport fishery (Figure 2). Further, the current model fishery representing NCBC sport fisheries doesn't fit the AABM and ISBM area boundaries defined in 1999. The AABM model fishery for NBC includes NBC Troll fisheries in Areas 1 to 10 and QCI Sport fisheries in Areas 1 and 2. Sport fisheries in areas 3 through 10 are designated as ISBM fisheries. Proposed model improvements include separation of the AABM and ISBM components and correcting the over-representation of NCBC stocks in the model fisheries. The genetic samples proposed for analyses in this project represent the two largest components of the NCBC Sport model fishery. The Haida Gwaii sport and the Chatham Sound sport fisheries are scheduled to be separated in future model improvements. Examination of actual stock mixes encountered by the fishery can guide model improvements to better represent contributions to modeled fisheries.

Genetic data have been used to estimate fishery impacts on Chinook stocks and used to manage fisheries to avoid stocks of concern (Winther and Beacham 2006, 2009). Stock definition is essential to assessing fishery impacts. Genetic data are useful for the assignment of Chinook mortalities for the purposes of specific stock management (e.g. WCVI Chinook or local concerns for Kwinamass and Khutzeymateen River Chinook) and for accounting of Nisga'a

Treaty entitlements. Genetic data supplement cwt data to estimate fishery impacts on stocks of concern. The project reports stock specific data for Chinook catches in NBC sport fisheries and general stock composition data for weak stock considerations and support of treaty accounting.

The sport fisheries in Haida Gwaii and Chatham Sound are mixed stock fisheries and migrating stocks of Chinook salmon originating from Alaska to California are encountered. Stock identification is essential to the objective of defining fishery impacts and productivity estimates. Understanding stock compositions in fisheries has broad benefits to understanding the status of Chinook salmon.

The primary objective of this study was to estimate stock components within NBC recreational fisheries in Areas 1, 3 and 4 in 2016. Stock identification is a key component in the management of mixed stock salmon fisheries. The application of DNA-level markers for stock identification, particularly microsatellites, has provided much greater resolution among Chinook salmon populations than was possible with previous genetic markers (Beacham et al. 1996; Banks et al. 2000; Beacham et al. 2003). If the baseline used to estimate stock composition is adequate, microsatellites can be applied successfully on a local basis to provide information on stock composition even when there is a complex mixture of populations in the catch (Beacham et al. 2006). We used microsatellite variation in Chinook salmon to examine the stock compositions of NBC recreational fisheries.

## METHODS

Stock specific catch estimates were generated from genetic samples and catch data. Area specific genetic samples were grouped monthly and weighted to the catch for the month and area sampled. In Area 3 the months of July and August were pooled due to small sample size in August (3 fish).

Two programs provided accounting of Chinook salmon caught in NBC recreational fisheries; lodge logbook programs and creel surveys. Lodge dock tallies or logbooks are essentially a census of the Chinook salmon caught at the lodge. All of the lodges in Areas 1 and Area 3 participated in the 2016 logbook program. There are no lodges in Area 4. Catches in Areas 1 through 3 were estimated using a combination of catch data from logbooks and creel surveys. Catches in Area 4 were estimated from creel surveys alone. Creel survey data are preliminary.

Scale samples provided the source of genetic material from each fish. Lodge samples collected from Area 1 consisted of a random sample of scales from 5 fish per day through the entire season from May to September. Creel survey crews from Prince Rupert sampled fishery landings from Chatham Sound, Areas 3 and 4. Individual Chinook salmon were sampled for nose-fork length, gender and scales. Gender could not be determined for fish that were landed after being dressed. Scale collections were matched to data on the area fished and date caught (Appendix 1).

A large fish sample was collected from Langara Island. All Chinook salmon over 40 pounds (18 kg) were sampled for size, gender and scales. This sample was kept independent from the random sample.

Scale samples were collected onto scale books, five scales per fish, as described by MacLellan (1999). Data on the geographic location, date, and sampler accompanied each sample. Samples were forwarded to the Fisheries & Oceans Canada, Molecular Genetics Laboratory at the Pacific Biological Station in Nanaimo.

Chinook salmon collections were compared against genetic baselines from 296 Chinook salmon populations from Southeast Alaska through Canada and the lower United States of

America (Appendix 2). Samples were analyzed for 15 microsatellite loci using methods of DNA extraction, PCR reaction, electrophoresis, and allele scoring described by Candy et al. (2002) and Beacham et al. (2006).

The Molecular Genetics Laboratory provided the sample analysis. A new version of the computer program as outlined by Pella and Masuda (2001) was developed and used for the analyses presented here. The program CBAYES (Neaves et al 2005) can be downloaded from the Molecular Genetics Laboratory website (Fisheries & Oceans Canada, Molecular Genetics Laboratory, Pacific Biological Station, Nanaimo). The model output presented includes the Bayesian probability estimates for the 5 most probable populations for each sample.

## RESULTS

Recreational catches of Chinook salmon from Area 1 were estimated at 26,100 in 2016 and the Area 1 fishery was sampled at Langara Island. Samples were collected from 150 fish in June, and 155 fish in each month of July and August. Samples from the end of May included 40 fish and 25 fish were sampled from the beginning of September. The smaller sample sizes in May and September reflect catches from 8 and 5 days when the lodges began and concluded operations respectively. The scales samples from Langara Island represented 2.0% of the annual catch in Area 1 (Table 1, Table 2 and Table 3).

Concerns for WCVI Chinook salmon have been the major driver for the management of NBC fisheries so the pattern of abundance is of particular interest. WCVI Chinook made up a large proportion (40.1%) of the samples collected in May even though the sample size was small. The proportion of WCVI Chinook in the sample dropped to 21.9% in July but increased in August to 29.8% (Table 2). The proportion of WCVI Chinook at the beginning of September was 20.0%. The highest proportions of fish from the Upper Columbia Summer / fall group were apparent in August at 34.2%.

Two stock groups dominated the samples of fish over 40 pounds sampled at Langara Island; the Skeena and Northern Mainland (NOMN) stock groups. Among the 28 fish over 40 pounds that were sampled, 26 of them (93%) came from the two major stock groups (Table 2). Fish from the Skeena stock group made up 32% of the sample and the NOMN stock group made up 61% of the sample. A single fish was from the East Coast of Vancouver Island (ECVI) and another was from the Lower Fraser Spring stock group. When the specific stocks within the groups were examined we found that most of the fish over 40 pounds were from the Wannock River (16) in the NOMN stock group and from the Kitsumkalum River (9) in the Skeena stock group. The three remaining fish were from the Atnarko River, in the NOMN stock group, the Quinsam River in the ECVI stock group and the Big Silver River in the Lower Fraser Spring stock group. These large fish samples were dramatically different from the random samples where the Northern Mainland and Skeena stock groups contributed 9.8% and 5.5% to the catch respectively (Tables 1 and 2).

Chinook from the Skeena River stock group formed the largest component of the catch at 28.2% of the fish caught in Chatham Sound, Areas 3 and 4. Skeena Chinook formed the main component of the samples collected in Area 3 and 4 in all months except for Area 4 in August (Table 4). The second largest component in the Area 3 and 4 catch was from the West Coast of Vancouver Island (WCVI) at 16.2%. Fish from the Skeena stock group made up most of the Area 3 (Table 5) catch but the largest stock group in the Area 4 catch was from WCVI (Table 6). Large contributions were also made by South Thompson (SOTH) fish at 9.4% and Upper Columbia Summer / Fall fish at 9.4% (Table 7). The Nass River drains into Area 3 and has a large Chinook population but it made up only 5.9% and 2.9% of the Area 3 and Area 4 catches

respectively. The total contribution to the Chatham Sound fishery was 469 Nass Chinook (Table 5, Table 6 and Table 7).

## DISCUSSION

This report summarizes the results of genetic analyses of samples collected from 2016 recreational Chinook salmon fisheries in NBC to meet the reporting requirements for the PSC Northern Fund project. As a basic presentation of the findings it reports the stock components determined from the genetic analyses of scale samples and applies them to preliminary catch estimates. A number of items precluded a final report at the time of writing. Catch estimates from Areas 3 and 4 have not been finalized from the 2016 creel survey so the stock specific impacts presented remain preliminary. Size and age information were collected but have not been analyzed or presented.

There were no management constraints on recreational fisheries for Chinook in the North Coast in 2016. Fisheries in Areas 1 through 10 operated under the maximum daily bag, possession and annual limits offered under the current allocation policy: Sport fishing for Chinook salmon was open with a daily limit of two per day, a possession limit of four, and an annual limit of 30 Chinook salmon. A minimum size limit of 45 cm was in effect and barbless hooks were mandatory. An estimated 42,800 chinook were caught in the Haida Gwaii sport fishery and 10,043 were caught in Chatham Sound.

The stock proportions observed in the samples from Langara Island were applied to the catch estimates for Area 1 (PFMA's 1 and 101). The samples were collected from a single location on Langara Island and although the lodge fleet commonly ranges east and southwest through much of PFMA's 1 and 101 the samples are not a random selection of Chinook catch across all areas. Langara and Graham Islands represent obstacles to fish passage that the north to south Chinook salmon migration flows around. The continuous sample of fish as they move around the islands probably represents the broader spatial area, especially when considered for longer periods like a month. Further, the application of the samples to catch data assists in understanding relative contributions to the fishery. For this reason I've applied the stock compositions to the total monthly catch from Area 1. In addition, most of the Area 1 catch comes from lodges on or near Langara Island.

Recreational fisheries have priority access to Chinook salmon in British Columbia so management actions for weak stocks have been undertaken by commercial fisheries. The shares within the AABM allowable catch are determined pre-season by forecasting the recreational catch and providing the remainder to the commercial troll fishery. Reaching the AABM catch is attempted by the commercial fishery once domestic management constraints have been met. Typically the AABM allowable catch for NBC is not attained (preliminary catch estimate of 147,381 out of a total allowable catch of 207,000).

Summer troll fisheries have been excluded from areas around Langara Island and the north end of Graham Island since 1997 to avoid conflicts with the sport fishery. The ribbon boundary that keeps the troll fishery away from the shore has assisted in the objective of avoiding WCVI Chinook stocks since those fish tend to migrate closer to the shore (Winther and Beacham, 2006 & 2009).

The combination of Chinook salmon abundance and high proportions of WCVI fish made troll and recreational fishery impacts on WCVI stocks most significant in August (Winther and Beacham, 2006 & 2009). That pattern was also expressed in the 2016 data for Area 1 recreational fisheries. Although the WCVI component was highest in May the low catch during that month make the impacts low. The timing differential between WCVI Chinook salmon and



abundant stocks in the Fraser and Columbia Rivers provided opportunities to minimize impacts on WCVI stocks by having commercial troll fisheries in June and July.

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## REFERENCES

- Banks, M.A., Blouin, M.S., Baldwin, B.A., Rashbrook, V.K, Fitzgerald, H.A., Blankenship, S.M., and Hedgecock, D. 1999. Isolation and inheritance of novel microsatellites in Chinook salmon (*Oncorhynchus tshawytscha*). *Journal of Heredity* 90: 281-288.
- Beacham, T.D., Withler, R.E., and Stevens, T.A. 1996. Stock identification of Chinook salmon (*Oncorhynchus tshawytscha*) using minisatellite DNA variation. *Canadian Journal of Fisheries and Aquatic Sciences* 53: 380-394.
- Beacham, T.D., Supernault, K.J., Wetklo, M., Deagle, B., Labaree, K., Irvine, J., Candy, J.R., Miller, K.M., Nelson, R.J., and Withler, R.E. 2003b. The geographic basis of population structure of Fraser River chinook salmon, *Oncorhynchus tshawytscha*. *Fishery Bulletin* 101: 229-242.
- Beacham, T.D., Candy, J.R., Jonsen, K.L., Supernault, J., Wetklo, M., Deng, L., Miller, K.M., Withler, R.E., and Varnavskaya, N.V. 2006. Estimation of stock composition and individual identification of Chinook salmon across the Pacific Rim using microsatellite variation. *Transactions of the American Fisheries Society* 135: In press.
- Candy, J.R., Irvine, J.R., Parken, C.K., Lemke, S.L., Bailey, R.E., Wetklo, M., and Jonsen, K. 2002. A discussion paper on possible new stock grouping (Conservation Units) for Fraser River Chinook salmon. *Can. Science Advisory Secretariat Res. Doc. 2002/085*. Available from CSAS, 200 Kent St. Ontario, K1A 0E6, Canada or <http://www.dfp-mpo.gc.ca/csas/>.
- MacLellan, S.E. 1999. Guide for sampling structures used in age determination of Pacific salmon. Fisheries & Oceans Canada, Stock Assessment Branch, Pacific Biological Station, Nanaimo, British Columbia.
- Pacific Salmon Commission. 2000. Pacific Salmon Treaty, 1999 Revised Annexes, Memorandum of Understanding (1985), Exchanges of Notes.
- Pacific Salmon Commission Joint Chinook Technical Committee Report. 2014. 2013 Exploitation Rate Analysis and Model Calibration, Volume 2 – Appendix Supplement. Report TCChinook (14)-1 V. 2. Pacific Salmon Commission.
- Pella, J., and Masuda, M. 2001. Bayesian methods for analysis of stock mixtures from genetic characters. *Fish. Bull.* 99: 151-167.
- Winther, I., and Beacham, T.D. 2006. The application of Chinook salmon stock composition data to management of the Queen Charlotte Islands troll fishery, 2002 to 2005. *Can. Tech. Rep. Fish. Aquat. Sci.* 2665: vii + 88 p.
- Winther, I., and T. D. Beacham. 2009. Application of Chinook salmon stock composition data for management of the Northern British Columbia troll fishery, 2006. Pages 977 - 1004 in C. C. Krueger, and C. E. Zimmerman, editors. *Pacific Salmon: ecology and management of western Alaska's populations*. American Fisheries Society, Symposium 70, Bethesda, Maryland.

**TABLES**

Table 1. Chinook salmon catch by stock group for the 2016 Area 1 Recreational fishery.  
Standard deviations (STD) appear in brackets. N = 525.

Code	Region	Proportion	STD	Catch	STD
1	Upper Fraser (UPFR)	0.0	(0.1)	5	(31)
2	Middle-Upper Fraser (MUFR)	0.0	(0.1)	3	(33)
3	Lower Fraser Fall (LWFR-F)	0.0	(0.0)	0	(10)
4	North Thompson (NOTH)	0.5	(0.3)	143	(84)
5	South Thompson (SOTH)	10.4	(1.4)	2,723	(355)
6	Lower Thompson (LWTH)	0.5	(0.3)	123	(88)
7	East Coast Vancouver Island (ECVI)	2.7	(0.8)	710	(197)
8	West Coast Vancouver Island (WCVI)	25.6	(2.0)	6,684	(520)
9	Southern BC Mainland (SOMN)	1.3	(0.6)	339	(151)
10	Northern BC Mainland (NOMN)	9.8	(1.4)	2,558	(368)
11	Nass	1.1	(0.6)	295	(155)
12	Lower Fraser Spring (LWFR-Sp)	0.2	(0.2)	54	(56)
13	Lower Fraser Summer (LWFR-Su)	0.0	(0.0)	0	(10)
14	Haida Gwaii (QCI)	2.3	(0.7)	602	(173)
15	Alaska	0.0	(0.1)	13	(28)
17	Taku	0.0	(0.1)	5	(28)
18	Stikine	0.1	(0.2)	22	(63)
19-23	Skeena	5.5	(1.4)	1,442	(374)
24	Alsek	0.0	(0.1)	0	(14)
50	Puget Sound	0.7	(0.4)	185	(115)
51	Juan de Fuca	0.0	(0.0)	0	(7)
52	Coastal Washington	5.3	(1.1)	1,378	(279)
53	Lower Columbia	1.0	(0.5)	265	(118)
54	Upper Columbia Spring	0.0	(0.0)	0	(13)
55	Upper Columbia Summer/Fall	25.6	(2.0)	6,691	(531)
56	Snake Spring/Summer	0.0	(0.1)	0	(25)
57	Snake Fall	0.3	(0.6)	75	(147)
58	North & Central Oregon	4.9	(1.0)	1,291	(254)
59	South Oregon Coastal	0.3	(0.3)	83	(80)
61	Klamath/Trinity	0.0	(0.0)	0	(11)
62	Middle Columbia Spring	0.0	(0.1)	1	(19)
63	Upper Willamette	1.2	(0.5)	303	(137)
64	Central Valley Fall	0.4	(0.3)	99	(84)
65	Central Valley Spring	0.0	(0.1)	6	(28)
66	Coastal California	0.0	(0.0)	0	(8)
	TOTAL	100.0		26,100	

Table 2. Chinook stock proportions observed in monthly samples from 2016 Area 1 Recreational catches.

Composition presented as % of the sample N. Standard deviations appear in brackets.

	Year	2016		2016		2016		2016		2016		2016	
	Month	May		June		July		August		September		May-Sep	
	Sample type	Random		Random		Random		Random		Random		Large fish	
	N	40		150		155		155		25		28	
Code	Region	%	STD	%	STD	%	STD	%	STD	%	STD	%	STD
1	Upper Fraser (UPFR)	0.0	(0.7)	0.1	(0.3)	0.0	(0.1)	0.0	(0.2)	0.0	(0.9)	0.0	(1.1)
2	Middle-Upper Fraser (MUFR)	0.0	(0.5)	0.0	(0.2)	0.0	(0.2)	0.0	(0.2)	0.0	(1.1)	0.0	(0.9)
3	Lower Fraser Fall (LWFR-F)	0.0	(0.2)	0.0	(0.1)	0.0	(0.1)	0.0	(0.1)	0.0	(0.4)	0.0	(0.2)
4	North Thompson (NOTH)	0.0	(0.4)	0.0	(0.1)	1.2	(0.9)	0.6	(0.6)	0.0	(0.7)	0.0	(0.6)
5	South Thompson (SOTH)	2.5	(2.4)	8.6	(2.2)	18.8	(3.2)	6.5	(2.0)	0.0	(0.7)	0.8	(2.0)
6	Lower Thompson (LWTH)	0.0	(0.3)	1.3	(1.0)	0.0	(0.1)	0.0	(0.1)	0.0	(0.6)	0.0	(0.5)
7	East Coast Vancouver Island (ECVI)	2.0	(2.4)	1.5	(1.0)	2.5	(1.3)	4.5	(1.7)	0.0	(0.7)	3.6	(3.5)
8	West Coast Vancouver Island (WCVI)	40.1	(7.3)	24.4	(3.6)	21.9	(3.4)	29.8	(3.7)	20.0	(7.7)	0.0	(1.3)
9	Southern BC Mainland (SOMN)	0.4	(1.5)	1.6	(1.1)	2.5	(1.5)	0.0	(0.1)	0.0	(0.5)	0.0	(0.6)
10	Northern BC Mainland (NOMN)	0.1	(0.9)	9.8	(2.6)	11.6	(2.8)	8.7	(2.2)	11.8	(6.3)	60.9	(8.7)
11	Nass	2.5	(2.3)	3.1	(1.7)	0.0	(0.1)	0.0	(0.2)	0.0	(1.1)	0.0	(0.7)
12	Lower Fraser Spring (LWFR-Sp)	0.0	(0.3)	0.0	(0.1)	0.0	(0.1)	0.6	(0.7)	0.0	(0.6)	2.8	(3.2)
13	Lower Fraser Summer (LWFR-Su)	0.0	(0.2)	0.0	(0.1)	0.0	(0.1)	0.0	(0.1)	0.0	(0.4)	0.0	(0.5)
14	Haida Gwaii (QCI)	2.5	(2.5)	3.3	(1.4)	3.9	(1.5)	0.0	(0.0)	0.0	(0.0)	0.0	(0.1)
15	Alaska	1.5	(2.2)	0.0	(0.1)	0.1	(0.3)	0.0	(0.1)	0.0	(0.4)	0.0	(0.4)
17	Taku	0.0	(0.5)	0.0	(0.2)	0.0	(0.3)	0.0	(0.1)	0.0	(0.9)	0.1	(0.9)
18	Stikine	0.5	(1.6)	0.2	(0.6)	0.0	(0.2)	0.0	(0.1)	0.0	(0.3)	0.0	(0.5)
19-23	Skeena	6.7	(4.8)	12.2	(3.8)	3.9	(1.9)	0.0	(0.2)	0.0	(1.3)	31.8	(8.3)
24	Alsek	0.0	(0.3)	0.0	(0.1)	0.0	(0.1)	0.0	(0.1)	0.0	(0.5)	0.0	(0.5)
50	Puget Sound	2.6	(2.7)	1.9	(1.2)	0.0	(0.2)	0.0	(0.1)	0.0	(0.6)	0.0	(0.6)
51	Juan de Fuca	0.0	(0.1)	0.0	(0.0)	0.0	(0.0)	0.0	(0.0)	0.0	(0.3)	0.0	(0.1)
52	Coastal Washington	0.0	(0.5)	4.3	(1.7)	5.5	(2.1)	5.5	(2.0)	17.4	(7.7)	0.0	(0.4)
53	Lower Columbia	4.0	(3.6)	0.0	(0.2)	1.6	(1.1)	1.5	(1.0)	0.0	(0.3)	0.0	(0.6)
54	Upper Columbia Spring	0.0	(0.2)	0.0	(0.1)	0.0	(0.1)	0.0	(0.1)	0.0	(0.4)	0.0	(0.4)
55	Upper Columbia Summer/Fall	22.3	(6.4)	21.6	(3.6)	22.0	(3.4)	34.2	(3.9)	16.3	(6.9)	0.0	(0.4)
56	Snake Spring/Summer	0.0	(0.6)	0.0	(0.2)	0.0	(0.2)	0.0	(0.1)	0.0	(0.9)	0.0	(0.9)
57	Snake Fall	0.0	(0.1)	0.7	(1.5)	0.1	(0.6)	0.0	(0.2)	0.2	(1.2)	0.0	(0.1)
58	North & Central Oregon	0.0	(0.3)	2.5	(1.4)	2.6	(1.4)	7.4	(2.2)	34.3	(9.5)	0.0	(0.5)
59	South Oregon Coastal	3.7	(3.3)	0.0	(0.1)	0.9	(1.0)	0.0	(0.1)	0.0	(0.5)	0.0	(0.5)
61	Klamath/Trinity	0.0	(0.5)	0.0	(0.1)	0.0	(0.1)	0.0	(0.1)	0.0	(0.5)	0.0	(0.5)
62	Middle Columbia Spring	0.0	(0.4)	0.0	(0.1)	0.0	(0.2)	0.0	(0.1)	0.0	(0.6)	0.0	(0.3)
63	Upper Willamette	8.6	(4.8)	2.8	(1.4)	0.0	(0.3)	0.0	(0.1)	0.0	(0.3)	0.0	(0.6)
64	Central Valley Fall	0.0	(0.5)	0.0	(0.2)	0.7	(0.8)	0.6	(0.7)	0.0	(0.7)	0.0	(0.9)
65	Central Valley Spring	0.0	(0.3)	0.0	(0.1)	0.1	(0.4)	0.0	(0.1)	0.0	(0.5)	0.0	(0.3)
66	Coastal California	0.0	(0.1)	0.0	(0.1)	0.0	(0.0)	0.0	(0.0)	0.0	(0.1)	0.0	(0.1)

8

Table 3. Chinook catch composition from 2016 Area 1 Recreational fisheries by month.

Catch composition presented in numbers of fish. Standard deviations appear in brackets.

	Year	2016		2016		2016		2016		2016	
	Date	May		June		July		August		September	
	Catch	500		9,200		7,300		8,400		700	
	Sample size (N)	40		150		155		155		25	
Code	Region	Catch	STD	Catch	STD	Catch	STD	Catch	STD	Catch	STD
1	Upper Fraser (UPFR)	0	(3)	5	(25)	0	(11)	0	(13)	0	(6)
2	Middle-Upper Fraser (MUFR)	0	(3)	1	(20)	1	(18)	1	(17)	0	(8)
3	Lower Fraser Fall (LWFR-F)	0	(1)	0	(5)	0	(5)	0	(6)	0	(3)
4	North Thompson (NOTH)	0	(2)	0	(11)	89	(65)	54	(52)	0	(5)
5	South Thompson (SOTH)	12	(12)	794	(205)	1371	(233)	545	(172)	0	(5)
6	Lower Thompson (LWTH)	0	(2)	123	(87)	0	(7)	0	(6)	0	(4)
7	East Coast Vancouver Island (ECVI)	10	(12)	139	(92)	180	(96)	381	(145)	0	(5)
8	West Coast Vancouver Island (WCVI)	200	(37)	2241	(334)	1598	(245)	2505	(307)	140	(54)
9	Southern BC Mainland (SOMN)	2	(8)	151	(104)	186	(108)	0	(11)	0	(4)
10	Northern BC Mainland (NOMN)	1	(5)	901	(237)	847	(205)	727	(188)	82	(44)
11	Nass	13	(12)	282	(153)	1	(11)	0	(13)	0	(8)
12	Lower Fraser Spring (LWFR-Sp)	0	(1)	0	(7)	0	(7)	54	(55)	0	(4)
13	Lower Fraser Summer (LWFR-Su)	0	(1)	0	(5)	0	(7)	0	(5)	0	(3)
14	Haida Gwaii (QCI)	13	(12)	307	(132)	283	(110)	0	(3)	0	(0)
15	Alaska	7	(11)	0	(9)	5	(24)	0	(6)	0	(3)
17	Taku	0	(3)	2	(16)	3	(20)	0	(8)	0	(6)
18	Stikine	2	(8)	17	(60)	2	(16)	0	(8)	0	(2)
19-23	Skeena	34	(24)	1123	(345)	286	(142)	0	(17)	0	(9)
24	Alsek	0	(2)	0	(10)	0	(6)	0	(8)	0	(4)
50	Puget Sound	13	(13)	170	(112)	1	(16)	0	(9)	0	(4)
51	Juan de Fuca	0	(1)	0	(4)	0	(3)	0	(4)	0	(2)
52	Coastal Washington	0	(2)	394	(155)	401	(152)	461	(167)	122	(54)
53	Lower Columbia	20	(18)	1	(14)	118	(80)	126	(84)	0	(2)
54	Upper Columbia Spring	0	(1)	0	(10)	0	(5)	0	(6)	0	(3)
55	Upper Columbia Summer/Fall	111	(32)	1991	(330)	1603	(250)	2871	(327)	114	(48)
56	Snake Spring/Summer	0	(3)	0	(18)	0	(12)	0	(12)	0	(6)
57	Snake Fall	0	(0)	63	(139)	10	(47)	1	(13)	1	(8)
58	North & Central Oregon	0	(1)	234	(125)	193	(103)	624	(184)	240	(66)
59	South Oregon Coastal	19	(17)	0	(13)	64	(76)	1	(12)	0	(3)
61	Klamath/Trinity	0	(2)	0	(7)	0	(4)	0	(6)	0	(3)
62	Middle Columbia Spring	0	(2)	0	(8)	1	(15)	0	(5)	0	(4)
63	Upper Willamette	43	(24)	259	(133)	1	(18)	0	(7)	0	(2)
64	Central Valley Fall	0	(2)	2	(17)	50	(57)	47	(58)	0	(5)
65	Central Valley Spring	0	(1)	0	(7)	6	(26)	0	(6)	0	(4)
66	Coastal California	0	(0)	0	(7)	0	(2)	0	(3)	0	(1)

Table 4. Chinook stock proportions observed in monthly samples from 2016 Areas 3 and 4 Recreational fishery catches. Composition presented as % of the sample N. Standard deviations appear in brackets.

	Year	2016		2016		2016		2016		2016	
	Area	3		3		4		4		4	
	Month	June		July & August		June		July		August	
	N	73		29		209		125		37	
Code	Region	%	STD	%	STD	%	STD	%	STD	%	STD
1	Upper Fraser (UPFR)	0.0	(0.4)	0.0	(1.0)	0.0	(0.1)	0.0	(0.2)	0.0	(0.7)
2	Middle-Upper Fraser (MUFR)	0.0	(0.4)	0.0	(1.0)	0.1	(0.3)	0.0	(0.2)	0.0	(0.6)
3	Lower Fraser Fall (LWFR-F)	1.3	(1.4)	0.0	(0.3)	1.0	(0.8)	0.4	(0.6)	5.4	(3.6)
4	North Thompson (NOTH)	0.0	(0.2)	0.0	(0.5)	0.0	(0.1)	0.0	(0.1)	0.0	(0.4)
5	South Thompson (SOTH)	11.3	(3.7)	5.6	(4.5)	6.9	(1.7)	9.9	(2.7)	16.3	(5.9)
6	Lower Thompson (LWTH)	0.0	(0.2)	0.0	(0.6)	0.0	(0.1)	0.0	(0.1)	0.0	(0.5)
7	East Coast Vancouver Island (ECVI)	1.4	(1.7)	13.8	(6.2)	5.0	(1.6)	4.9	(1.9)	10.8	(4.8)
8	West Coast Vancouver Island (WCVI)	7.6	(3.2)	21.0	(6.8)	11.7	(2.2)	33.7	(4.1)	16.2	(5.7)
9	Southern BC Mainland (SOMN)	1.2	(1.6)	3.0	(2.2)	3.9	(1.5)	0.9	(0.9)	0.0	(0.5)
10	Northern BC Mainland (NOMN)	11.5	(4.3)	8.8	(5.3)	19.0	(2.9)	8.2	(2.6)	8.9	(5.4)
11	Nass	7.8	(3.3)	2.2	(3.4)	4.1	(1.5)	2.6	(1.7)	0.1	(0.8)
12	Lower Fraser Spring (LWFR-Sp)	0.0	(0.2)	0.0	(0.5)	0.0	(0.1)	0.0	(0.1)	0.0	(0.2)
13	Lower Fraser Summer (LWFR-Su)	0.0	(0.1)	0.0	(0.4)	0.0	(0.0)	0.0	(0.0)	0.0	(0.1)
14	Haida Gwaii (QCI)	0.0	(0.1)	0.0	(0.2)	0.0	(0.0)	0.0	(0.0)	0.0	(0.1)
15	Alaska	0.0	(0.2)	0.0	(0.7)	0.0	(0.1)	0.0	(0.2)	0.0	(0.4)
17	Taku	0.0	(0.4)	0.8	(2.6)	0.1	(0.5)	0.0	(0.2)	0.1	(0.7)
18	Stikine	0.1	(0.6)	2.9	(5.6)	0.0	(0.2)	0.0	(0.2)	0.1	(0.6)
19-23	Skeena	36.1	(7.6)	30.5	(11.6)	24.0	(4.2)	18.1	(5.3)	9.7	(6.3)
24	Alsek	0.0	(0.2)	0.0	(0.6)	0.0	(0.1)	0.0	(0.1)	0.0	(0.3)
50	Puget Sound	6.4	(3.1)	0.0	(0.6)	5.8	(1.7)	7.2	(2.6)	0.0	(0.5)
51	Juan de Fuca	0.0	(0.1)	0.0	(0.3)	0.0	(0.0)	0.0	(0.1)	0.0	(0.3)
52	Coastal Washington	3.6	(2.7)	0.0	(0.6)	0.2	(0.4)	0.7	(0.8)	0.0	(0.3)
53	Lower Columbia	0.0	(0.1)	0.1	(0.7)	0.6	(0.8)	0.8	(0.8)	0.0	(0.4)
54	Upper Columbia Spring	0.0	(0.1)	0.0	(0.5)	0.0	(0.0)	0.0	(0.1)	0.0	(0.4)
55	Upper Columbia Summer/Fall	8.0	(3.4)	7.2	(4.6)	13.3	(2.6)	4.9	(3.7)	29.5	(7.2)
56	Snake Spring/Summer	0.0	(0.3)	0.0	(0.8)	0.0	(0.1)	0.0	(0.2)	0.0	(0.6)
57	Snake Fall	0.1	(0.7)	0.0	(0.3)	2.3	(1.7)	7.5	(3.6)	0.2	(1.1)
58	North & Central Oregon	0.0	(0.3)	3.5	(3.2)	0.2	(0.5)	0.0	(0.1)	0.0	(0.4)
59	South Oregon Coastal	0.1	(0.7)	0.0	(0.8)	0.5	(0.7)	0.0	(0.1)	0.0	(0.3)
61	Klamath/Trinity	0.0	(0.1)	0.0	(0.7)	0.0	(0.0)	0.0	(0.1)	0.0	(0.2)
62	Middle Columbia Spring	0.0	(0.2)	0.0	(0.7)	0.0	(0.1)	0.0	(0.1)	0.0	(0.4)
63	Upper Willamette	0.0	(0.1)	0.0	(0.5)	1.3	(1.0)	0.0	(0.1)	2.7	(2.6)
64	Central Valley Fall	3.3	(2.2)	0.3	(1.5)	0.0	(0.1)	0.0	(0.1)	0.0	(0.5)
65	Central Valley Spring	0.0	(0.4)	0.2	(1.2)	0.0	(0.0)	0.0	(0.1)	0.0	(0.3)
66	Coastal California	0.0	(0.0)	0.0	(0.3)	0.0	(0.0)	0.0	(0.0)	0.0	(0.1)

Table 5. Chinook catch composition from 2016 Area 3 Recreational fisheries by month.

Catch composition presented in numbers of fish. Standard deviations appear in brackets. Catch estimates are preliminary.

	Year	2016		2016		2016 Total		2016 Total	
	Area	3		3		3		3	
	Date	June		July & August		June-August		June-August	
	Catch	3,849		2,067		5,916		%	
	N	73		29		102		102	
Code	Region	Catch	STD	Catch	STD	Catch	STD	%	STD
1	Upper Fraser (UPFR)	0	(14)	0	(22)	0	(26)	0.0	(0.4)
2	Middle-Upper Fraser (MUFR)	0	(16)	0	(21)	0	(26)	0.0	(0.4)
3	Lower Fraser Fall (LWFR-F)	51	(53)	0	(6)	51	(54)	0.9	(0.9)
4	North Thompson (NOTH)	0	(8)	0	(10)	0	(13)	0.0	(0.2)
5	South Thompson (SOTH)	436	(143)	116	(92)	552	(170)	9.3	(2.9)
6	Lower Thompson (LWTH)	0	(8)	0	(12)	0	(14)	0.0	(0.2)
7	East Coast Vancouver Island (ECVI)	53	(67)	285	(128)	339	(144)	5.7	(2.4)
8	West Coast Vancouver Island (WCVI)	292	(124)	434	(141)	725	(188)	12.3	(3.2)
9	Southern BC Mainland (SOMN)	47	(61)	62	(45)	109	(76)	1.8	(1.3)
10	Northern BC Mainland (NOMN)	442	(167)	183	(109)	625	(199)	10.6	(3.4)
11	Nass	302	(127)	46	(70)	347	(145)	5.9	(2.5)
12	Lower Fraser Spring (LWFR-Sp)	0	(6)	0	(10)	0	(12)	0.0	(0.2)
13	Lower Fraser Summer (LWFR-Su)	0	(5)	0	(9)	0	(10)	0.0	(0.2)
14	Haida Gwaii (QCI)	0	(4)	0	(5)	0	(6)	0.0	(0.1)
15	Alaska	0	(8)	0	(14)	0	(16)	0.0	(0.3)
17	Taku	2	(17)	16	(53)	18	(56)	0.3	(0.9)
18	Stikine	4	(22)	60	(116)	64	(118)	1.1	(2.0)
19-23	Skeena	1389	(293)	631	(241)	2020	(379)	34.1	(6.4)
24	Alsek	0	(7)	0	(13)	0	(15)	0.0	(0.3)
50	Puget Sound	247	(118)	0	(13)	247	(118)	4.2	(2.0)
51	Juan de Fuca	0	(4)	0	(5)	0	(7)	0.0	(0.1)
52	Coastal Washington	139	(102)	0	(13)	139	(103)	2.3	(1.7)
53	Lower Columbia	0	(6)	1	(15)	1	(16)	0.0	(0.3)
54	Upper Columbia Spring	0	(4)	0	(10)	0	(11)	0.0	(0.2)
55	Upper Columbia Summer/Fall	308	(130)	149	(95)	457	(161)	7.7	(2.7)
56	Snake Spring/Summer	0	(11)	0	(17)	0	(20)	0.0	(0.3)
57	Snake Fall	3	(27)	0	(7)	3	(28)	0.1	(0.5)
58	North & Central Oregon	1	(10)	72	(66)	72	(67)	1.2	(1.1)
59	South Oregon Coastal	5	(25)	0	(16)	5	(30)	0.1	(0.5)
61	Klamath/Trinity	0	(5)	0	(14)	0	(14)	0.0	(0.2)
62	Middle Columbia Spring	0	(6)	0	(13)	0	(15)	0.0	(0.2)
63	Upper Willamette	0	(4)	0	(10)	0	(10)	0.0	(0.2)
64	Central Valley Fall	127	(84)	7	(31)	134	(89)	2.3	(1.5)
65	Central Valley Spring	2	(15)	5	(25)	7	(30)	0.1	(0.5)
66	Coastal California	0	(2)	0	(5)	0	(5)	0.0	(0.1)

Table 6. Chinook catch composition from 2015 Area 4 Recreational fisheries by month.

Catch composition presented in numbers of fish. Standard deviations appear in brackets. Catch estimates are preliminary.

	Year	2016		2016		2016		2016 Total		2016 Total	
	Area	4		4		4		4		4	
	Date	June		July		August		June-August		June-August	
	Catch	1,829		1,775		523		4,127		%	
	N	209		125		37		371		371	
Code	Region	Catch	STD	Catch	STD	Catch	STD	Catch	STD	%	STD
1	Upper Fraser (UPFR)	0	(3)	0	(4)	0	(4)	0	(6)	0.0	(0.1)
2	Middle-Upper Fraser (MUFR)	1	(6)	0	(4)	0	(3)	1	(7)	0.0	(0.2)
3	Lower Fraser Fall (LWFR-F)	18	(14)	6	(11)	28	(19)	52	(26)	1.3	(0.6)
4	North Thompson (NOTH)	0	(1)	0	(3)	0	(2)	0	(3)	0.0	(0.1)
5	South Thompson (SOTH)	125	(32)	176	(48)	85	(31)	387	(65)	9.4	(1.6)
6	Lower Thompson (LWTH)	0	(1)	0	(2)	0	(3)	0	(4)	0.0	(0.1)
7	East Coast Vancouver Island (ECVI)	92	(29)	88	(33)	57	(25)	236	(51)	5.7	(1.2)
8	West Coast Vancouver Island (WCVI)	213	(41)	599	(73)	85	(30)	897	(89)	21.7	(2.2)
9	Southern BC Mainland (SOMN)	71	(27)	16	(16)	0	(3)	87	(31)	2.1	(0.8)
10	Northern BC Mainland (NOMN)	348	(54)	146	(47)	46	(28)	540	(77)	13.1	(1.9)
11	Nass	76	(28)	45	(29)	0	(4)	122	(41)	2.9	(1.0)
12	Lower Fraser Spring (LWFR-Sp)	0	(1)	0	(2)	0	(1)	0	(3)	0.0	(0.1)
13	Lower Fraser Summer (LWFR-Su)	0	(1)	0	(1)	0	(0)	0	(1)	0.0	(0.0)
14	Haida Gwaii (QCI)	0	(1)	0	(0)	0	(1)	0	(1)	0.0	(0.0)
15	Alaska	0	(2)	0	(3)	0	(2)	0	(4)	0.0	(0.1)
17	Taku	3	(9)	0	(3)	0	(4)	3	(10)	0.1	(0.2)
18	Stikine	0	(4)	0	(4)	0	(3)	1	(6)	0.0	(0.1)
19-23	Skeena	439	(76)	322	(93)	51	(33)	811	(125)	19.7	(3.0)
24	Alsek	0	(2)	0	(1)	0	(1)	0	(3)	0.0	(0.1)
50	Puget Sound	106	(31)	128	(45)	0	(3)	234	(55)	5.7	(1.3)
51	Juan de Fuca	0	(0)	0	(1)	0	(2)	0	(2)	0.0	(0.0)
52	Coastal Washington	4	(8)	12	(15)	0	(1)	16	(16)	0.4	(0.4)
53	Lower Columbia	12	(14)	14	(14)	0	(2)	26	(20)	0.6	(0.5)
54	Upper Columbia Spring	0	(1)	0	(2)	0	(2)	0	(3)	0.0	(0.1)
55	Upper Columbia Summer/Fall	243	(48)	88	(65)	154	(38)	485	(89)	11.7	(2.2)
56	Snake Spring/Summer	0	(2)	0	(3)	0	(3)	0	(5)	0.0	(0.1)
57	Snake Fall	43	(31)	134	(65)	1	(6)	177	(72)	4.3	(1.7)
58	North & Central Oregon	3	(9)	0	(2)	0	(2)	3	(9)	0.1	(0.2)
59	South Oregon Coastal	10	(12)	0	(3)	0	(2)	10	(13)	0.2	(0.3)
61	Klamath/Trinity	0	(1)	0	(2)	0	(1)	0	(2)	0.0	(0.1)
62	Middle Columbia Spring	0	(1)	0	(2)	0	(2)	0	(3)	0.0	(0.1)
63	Upper Willamette	23	(18)	0	(2)	14	(14)	38	(22)	0.9	(0.5)
64	Central Valley Fall	0	(2)	0	(2)	0	(3)	0	(4)	0.0	(0.1)
65	Central Valley Spring	0	(1)	0	(1)	0	(1)	0	(2)	0.0	(0.1)
66	Coastal California	0	(0)	0	(1)	0	(0)	0	(1)	0.0	(0.0)



Table 7. Chinook salmon catch by stock group for the 2016 Recreational fishery in Areas 3 and 4.

Standard deviations (STD) appear in brackets. Catch estimates are preliminary.

	Year	2016	2016	2016	2016
	Areas	3 & 4	3 & 4	3 & 4	3 & 4
	Date	Jun-Aug	Jun-Aug	Jun-Aug	Jun-Aug
	Sample N or Catch	N= 473		10,043	
Code	Region	%	STD	Catch	STD
1	Upper Fraser (UPFR)	0.0	(0.3)	0	(27)
2	Middle-Upper Fraser (MUFR)	0.0	(0.3)	2	(27)
3	Lower Fraser Fall (LWFR-F)	1.0	(0.6)	103	(60)
4	North Thompson (NOTH)	0.0	(0.1)	0	(13)
5	South Thompson (SOTH)	9.4	(1.8)	939	(182)
6	Lower Thompson (LWTH)	0.0	(0.1)	0	(15)
7	East Coast Vancouver Island (ECVI)	5.7	(1.5)	575	(153)
8	West Coast Vancouver Island (WCVI)	16.2	(2.1)	1,622	(208)
9	Southern BC Mainland (SOMN)	1.9	(0.8)	195	(82)
10	Northern BC Mainland (NOMN)	11.6	(2.1)	1,164	(214)
11	Nass	4.7	(1.5)	469	(151)
12	Lower Fraser Spring (LWFR-Sp)	0.0	(0.1)	0	(12)
13	Lower Fraser Summer (LWFR-Su)	0.0	(0.1)	0	(10)
14	Haida Gwaii (QCI)	0.0	(0.1)	0	(6)
15	Alaska	0.0	(0.2)	0	(16)
17	Taku	0.2	(0.6)	21	(57)
18	Stikine	0.6	(1.2)	65	(119)
19-23	Skeena	28.2	(4.0)	2,831	(399)
24	Alek	0.0	(0.2)	0	(16)
50	Puget Sound	4.8	(1.3)	481	(131)
51	Juan de Fuca	0.0	(0.1)	0	(7)
52	Coastal Washington	1.5	(1.0)	155	(104)
53	Lower Columbia	0.3	(0.3)	27	(26)
54	Upper Columbia Spring	0.0	(0.1)	0	(11)
55	Upper Columbia Summer/Fall	9.4	(1.8)	942	(184)
56	Snake Spring/Summer	0.0	(0.2)	0	(21)
57	Snake Fall	1.8	(0.8)	181	(77)
58	North & Central Oregon	0.8	(0.7)	76	(68)
59	South Oregon Coastal	0.1	(0.3)	15	(33)
61	Klamath/Trinity	0.0	(0.1)	0	(14)
62	Middle Columbia Spring	0.0	(0.1)	0	(15)
63	Upper Willamette	0.4	(0.2)	38	(25)
64	Central Valley Fall	1.3	(0.9)	134	(89)
65	Central Valley Spring	0.1	(0.3)	7	(30)
66	Coastal California	0.0	(0.1)	0	(6)
	TOTAL	100%		10,043	

## FIGURES

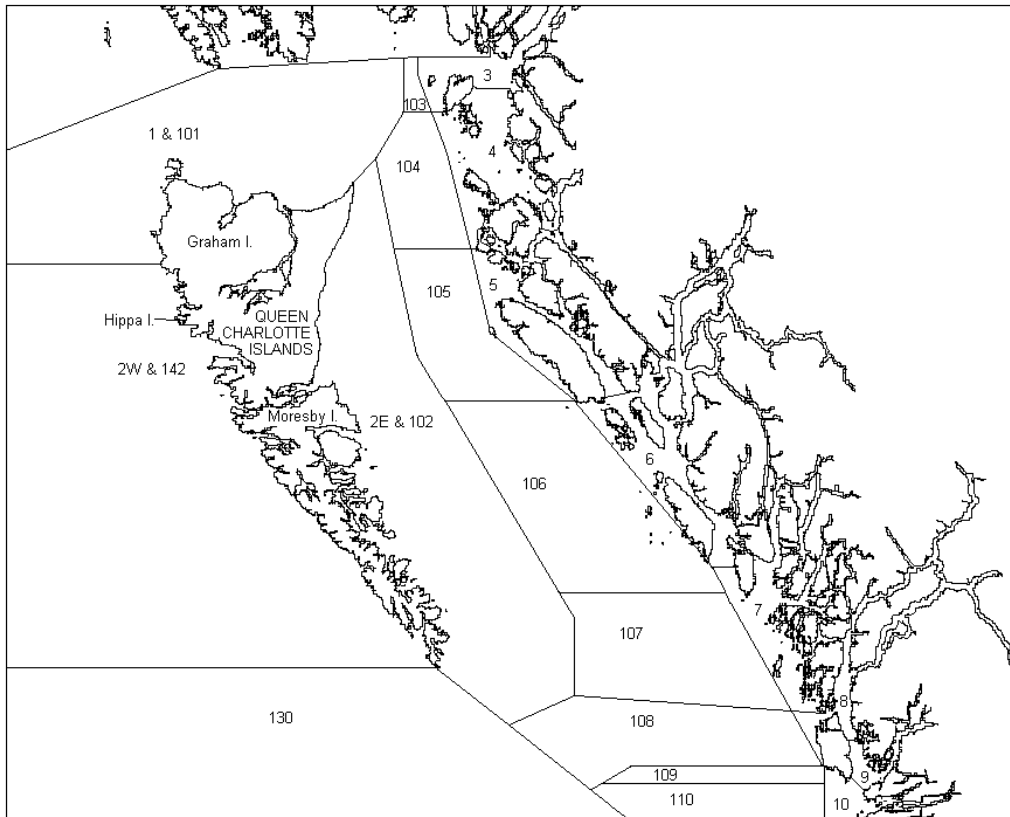
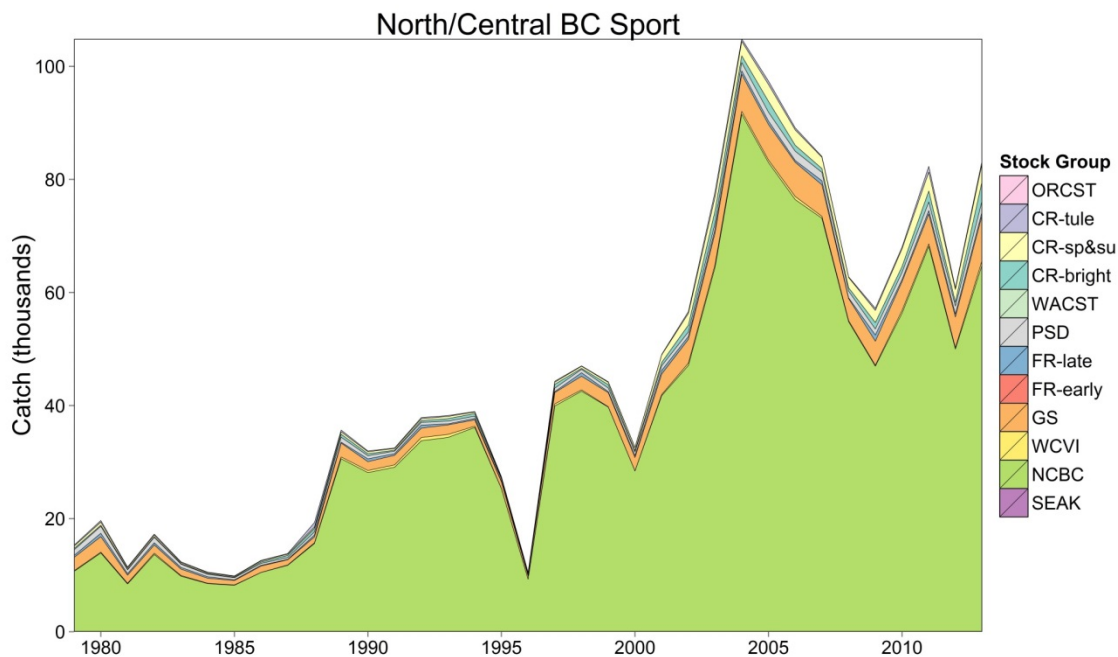


Figure 1. The North Coast of British Columbia showing Pacific Fishery Management Areas 1 to 10, 101 to 110, 130 and 142.



Appendix E19 Chinook Model estimates of landed catch stock composition for North/Central BC Sport 1979-2013

(Pacific Salmon Commission Joint Chinook Technical Committee Report, 2014)

Figure 2. Chinook model-generated stock composition of actual landed catch for the North / Central BC Sport model fishery, 1979-2013.

## APPENDICES

Appendix 1. Scale sampling instructions for Chinook salmon caught in the 2016 Northern British Columbia, Area 1 Recreational fishery.

### 2016 FISHING LODGE CHINOOK SAMPLE INSTRUCTIONS

The sample data will consist of date, length and sex information matched to scales. Scales will be collected onto scale books and the age information and DNA will be extracted from the scales. Please sample 5 Chinook salmon each day that the lodge operates according to the following protocol:

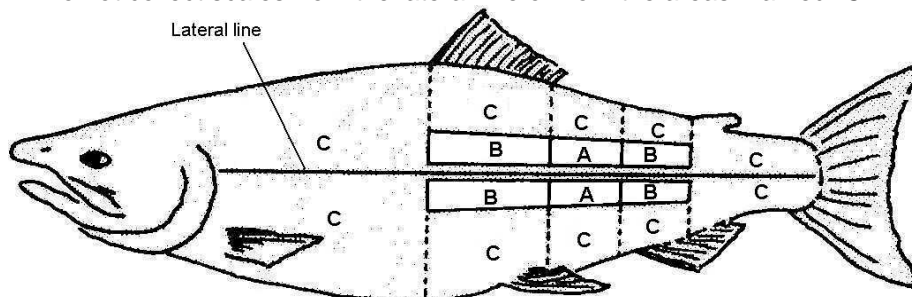
- 75 scale books have been provided. Each book holds 50 scales for 10 fish sampled at 5 scales per fish.
- Please collect samples from 5 Chinook salmon per day. You can modify this procedure so long as you set up a program in advance and stick to it.
- On days where you can't sample 5 fish, simply collect those samples from the catch on the following day.
- It's important that you collect a random sample and not select fish. You might sample the first 5 fish that arrive at the dock each day (or use some other way to ensure that you randomize the sample).
- Collect 5 scales from each fish as noted below.
- The scale books are individually numbered and the number must be entered on the data sheet.
- Note the date sampled on the back of this sheet. Use dittos or arrows for fish sampled on the same day.
- Record the length to the nearest cm and determine the sex for each fish sampled.

If you have a special fish that you want sampled, like a huge Chinook or a derby winner, collect the scale sample as above in a separate scale book and put a note at the bottom of the sample sheet describing why it's special. Other valuable data would be the date, length, sex and whether the chinook had an adipose fin clip or not. In the past you have collected samples from all the fish over 40 pounds. Thanks. It would be great if you could continue to collect this fascinating sample. If you have any questions feel free to call or email.

Please return all data and samples to: Ivan Winther, Fisheries & Oceans Canada  
417 West 2<sup>nd</sup> Avenue  
Prince Rupert, B.C. V8J-1G8  
(250) 627-3459      Ivan.Winther@dfo-mpo.gc.ca

### SCALE SAMPLES:

- Record the scale book number on the data sheet.
- Collect 5 scales from the chinook salmon as follows:
- Scale samples must come from preferred locations on the fish as indicated by an "A" in the diagram below.
- Avoid collecting scales near scars, wounds or net marks. To avoid scars you may have to collect scales from the locations marked "B" in the diagram below.
- Do not collect scales from the lateral line or from the areas marked "C".



- Using forceps, remove a scale from the preferred location.

- Check the scale to ensure the rings extend all the way to the center of the scale. If not, discard the scale and select another. Regenerated scales have a clear spot in the center of the scale that is missing the rings necessary to determine the age of the fish.
- Wipe off the scale and add it to the scale book on the appropriate numbered square.
- Do not turn the scale over. The scale should be mounted in the book with the same side up as it was on the fish.
- Select 5 scales from the fish, 3 from one side and 2 from the other.
- The 5 scales are applied to the numbered squares in the book from top to bottom starting at the column with numbers 1, 11, 21, 31 & 41. Scales from the second fish are applied to squares 2, 12, 22, 32 & 42. etc.
- THE SCALES in the SCALE BOOKS MUST MATCH THE NUMBERS ON THE DATA SHEETS.
- Keep the scale books dry.
- Once the book is full, fill out the information on the back of the page bearing the scales. Let the books dry out completely then store in a dry location.

Sport Chinook Salmon scale samples

**Scale Book # \_\_\_\_\_**

DATE	Length (cm)	SEX (M / F)	SCALE #
		M / F	1 to 41
		M / F	2 to 42
		M / F	3 to 43
		M / F	4 to 44
		M / F	5 to 45
		M / F	6 to 46
		M / F	7 to 47
		M / F	8 to 48
		M / F	9 to 49
		M / F	10 to 50

**Scale Book # \_\_\_\_\_**

DATE	Length (cm)	SEX (M / F)	SCALE #
		M / F	1 to 41
		M / F	2 to 42
		M / F	3 to 43
		M / F	4 to 44
		M / F	5 to 45
		M / F	6 to 46
		M / F	7 to 47
		M / F	8 to 48
		M / F	9 to 49
		M / F	10 to 50

**Scale Book # \_\_\_\_\_**

		M / F	1 to 41
		M / F	2 to 42
		M / F	3 to 43
		M / F	4 to 44
		M / F	5 to 45
		M / F	6 to 46
		M / F	7 to 47
		M / F	8 to 48
		M / F	9 to 49
		M / F	10 to 50

Notes:

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## Appendix 2. Baseline samples used in the mixture analyses.

#	Region	Population	N	#	Region	Population	N
1	UPFR	Bowron	250	6	LWTH	U_Coldwat_SP	221
1	UPFR	Dome	382	6	LWTH	U_Spius_SP	175
1	UPFR	Fontoniko	63	7	ECVI	Big_Qualicum	365
1	UPFR	Goat	76	7	ECVI	Chemainus	261
1	UPFR	Holliday_Cr	29	7	ECVI	Cowichan	680
1	UPFR	Holmes	219	7	ECVI	L_Qualicum	305
1	UPFR	Horsey	47	7	ECVI	Nanaimo_F	523
1	UPFR	Indianpoint	47	7	ECVI	Nanaimo_SP	95
1	UPFR	James	58	7	ECVI	Nanaimo_SU	459
1	UPFR	Kenneth_Cr	98	7	ECVI	NanaimoSu_BackX	135
1	UPFR	McGregor	125	7	ECVI	Nimpkish	316
1	UPFR	Morkill	208	7	ECVI	Puntledge_BackX	1025
1	UPFR	Nevin_Cr	50	7	ECVI	Puntledge_F	652
1	UPFR	Ptarmigan	32	7	ECVI	Puntledge_Su	1120
1	UPFR	Salmon@PG	263	7	ECVI	Quatse	30
1	UPFR	Slim_C	240	7	ECVI	Quinsam	503
1	UPFR	Swift	448	7	ECVI	Woss_Lake	31
1	UPFR	Tete_Jaune	475	8	WCVI	Burman	315
1	UPFR	Torpy	174	8	WCVI	Colonial_Cay	58
1	UPFR	Walker	45	8	WCVI	Conuma	455
1	UPFR	Willow_R	117	8	WCVI	Gold_R	227
2	MUFR	Baezaeko	82	8	WCVI	Kaouk_R	196
2	MUFR	Baker_Cr	31	8	WCVI	Kennedy	383
2	MUFR	Bridge	424	8	WCVI	Marble@NVI	512
2	MUFR	Chilako	45	8	WCVI	Megin_R	90
2	MUFR	Chilko	425	8	WCVI	Moyeha_R	57
2	MUFR	Cottonwood	176	8	WCVI	Nahmint	411
2	MUFR	Elkin_R	248	8	WCVI	Nitinat	346
2	MUFR	Endako	207	8	WCVI	Robertson	388
2	MUFR	Horsefly	80	8	WCVI	San_Juan	202
2	MUFR	Kuzkwa_Cr	93	8	WCVI	Sarita	429
2	MUFR	L_Cariboo	104	8	WCVI	Sooke	58
2	MUFR	L_Chilcoti	236	8	WCVI	Stamp	299
2	MUFR	Nazko	194	8	WCVI	Tahsis	355
2	MUFR	Nechako	562	8	WCVI	Thornton	522
2	MUFR	Portage_C	286	8	WCVI	Tlupana	66
2	MUFR	Quesnel	562	8	WCVI	Toquart	87
2	MUFR	Stuart	545	8	WCVI	Tranquil	395
2	MUFR	Taseko	205	8	WCVI	Zeballos	199
2	MUFR	U_Cariboo	171	9	SOMN	Bute	66
2	MUFR	U_Chilcotin	276	9	SOMN	Capilano	126
2	MUFR	Westroad	104	9	SOMN	Cheakamus	50
3	LWFR-F	Chilliwac@Stav	381	9	SOMN	Cheakamus_F	114
3	LWFR-F	Chilliwack_F	696	9	SOMN	Cheakamus_Su	40
3	LWFR-F	Harrison	686	9	SOMN	Devereux	325
4	NOTH	Barriere	55	9	SOMN	Homathko	51
4	NOTH	Blue	84	9	SOMN	Klinaklini	472
4	NOTH	Clearwater	281	9	SOMN	Mamquam	35
4	NOTH	Finn	211	9	SOMN	Phillips	641
4	NOTH	Lemieux_Cr	153	9	SOMN	Squamish_R	161
4	NOTH	N_Thom@Main	116	10	NOMN	Ashlulm	66
4	NOTH	Raft_R	457	10	NOMN	Atnarko	275
5	SOTH	Bessette	164	10	NOMN	Chuckwalla	315
5	SOTH	Duteau_Cr	73	10	NOMN	Dean	219
5	SOTH	Eagle_R	331	10	NOMN	Dean@Main	25
5	SOTH	L_Adams	340	10	NOMN	Docee	126
5	SOTH	L_Shus@U_Adams	46	10	NOMN	Hirsch	474
5	SOTH	L_Shuswap	389	10	NOMN	Kateen	244
5	SOTH	L_Thompson	229	10	NOMN	Kibella	196
5	SOTH	Little_R	254	10	NOMN	Kildala	441
5	SOTH	M_Shuswap	375	10	NOMN	Kitimat	483
5	SOTH	Salmon@SA	215	10	NOMN	Kitlope	201
5	SOTH	Seymour@Thomp	44	10	NOMN	Kwinamass	362
5	SOTH	South_Thom	266	10	NOMN	LowAtnarko	50
6	LWTH	Bonaparte	344	10	NOMN	Marble@CC	41
6	LWTH	Coldwater	274	10	NOMN	Neechanze	57
6	LWTH	Deadman	492	10	NOMN	Nusatsum	103
6	LWTH	Louis	618	10	NOMN	Saloompt	138
6	LWTH	Nicola	433	10	NOMN	Takia	63
6	LWTH	Spius	137	10	NOMN	U_Atnarko	200

#	Region	Population	N	#	Region	Population	N
10	NOMN	U_Dean	203	23	Skeena Lower	Kitsumkalum_R	810
10	NOMN	Wannock_R	506	23	Skeena Lower	Thomas_Cr	117
11	NASS	Cranberry	175	23	Skeena Lower	Zymogotitz_R	120
11	NASS	Damdochax	273	24	Alsek	Blanchard	381
11	NASS	Ishkheenickh	199	24	Alsek	Goat_Cr	134
11	NASS	Kincolith	286	24	Alsek	Klukshu	433
11	NASS	Kiteen	59	24	Alsek	Kudwat_Cr	70
11	NASS	Kwinageese	266	24	Alsek	Takhanne	218
11	NASS	Meziadin	194	24	Alsek	Tatshenshi	24
11	NASS	Owegee	235	50	Puget Sound	Green@Kendal_F	50
11	NASS	Seaskinnish	99	50	Puget Sound	Green_F@Soos	100
11	NASS	Snowbank	51	50	Puget Sound	Nooksack_SP@Ke	200
11	NASS	Teigen	30	50	Puget Sound	Serpentine	46
11	NASS	Tseax	244	50	Puget Sound	Skagit_Su	310
12	LWFR-Sp	Big_Silver	210	50	Puget Sound	Skykomish_Su	114
12	LWFR-Sp	Birkenhead	347	50	Puget Sound	Snohomish_R	306
12	LWFR-Sp	BlueCr_UpPitt	50	50	Puget Sound	Soos_Cr_H	183
12	LWFR-Sp	Sloquet_Cr	35	50	Puget Sound	StillaguamishS	87
12	LWFR-Sp	Upper_Pitt	235	50	Puget Sound	White_F	252
13	LWFR-Su	Maria_Slough	366	51	Juan de Fuca	Elwha_F	99
13	LWFR-Su	Nahatlatch_R	26	52	Coastal Wash	Hoh_River_SP_S	59
14	QCI	Yakoun	211	52	Coastal Wash	Queets	138
15	Alaska	Big_Boulder_C	144	52	Coastal Wash	Quinault_F	100
15	Alaska	Chickamin	259	52	Coastal Wash	Solduc_F	98
15	Alaska	King_Salmon	266	52	Coastal Wash	Willapa_Cr	261
15	Alaska	Situk	132	53	Low Col	Abernathy_F	100
15	Alaska	Tahini	142	53	Low Col	Coweman	195
15	Alaska	Unuk	336	53	Low Col	Cowlitz_H_Sp	138
17	Taku	Dudidontu	352	54	Up Col-Sp	Chewuch_SP	100
17	Taku	Hackett_r	233	54	Up Col-Sp	Chiwawa_SP	100
17	Taku	Kowatua	379	54	Up Col-Sp	Entiat_SP	142
17	Taku	Little_Tatsam	698	54	Up Col-Sp	Twisp_SP	227
17	Taku	Nahlin	303	55	Up Col-Su/F	Deschutes-F	230
17	Taku	Nakina	480	55	Up Col-Su/F	Hanford_Reach	617
17	Taku	Tatsamenie	38	55	Up Col-Su/F	Okanagan	132
17	Taku	Tseta	327	55	Up Col-Su/F	Osoyoos_Resid	35
17	Taku	Yeth_Cr	53	55	Up Col-Su/F	Silmilkameen_S	370
18	Stikine	Andrew_Cr	144	55	Up Col-Su/F	Wenatchee_Su	235
18	Stikine	Christina	240	56	Snake-Sp/Su	Frenchman-SP	61
18	Stikine	Craig	114	56	Snake-Sp/Su	Imnaha	239
18	Stikine	Johnny_Tashoot	99	56	Snake-Sp/Su	Johnson_Cr	240
18	Stikine	Little_Tahltan	745	56	Snake-Sp/Su	Marsh_Cr	220
18	Stikine	Shakes_Cr	225	56	Snake-Sp/Su	McCall	32
18	Stikine	Tahltan_R	212	56	Snake-Sp/Su	McCall_Hat	41
18	Stikine	Verrett	854	56	Snake-Sp/Su	Minam_Cr	144
19	Skeena Upper	Bear	270	56	Snake-Sp/Su	Rapid_Sp	363
19	Skeena Upper	Kluatantan	38	56	Snake-Sp/Su	Salmon_E_Fork	53
19	Skeena Upper	Kluayaz_Cr	165	56	Snake-Sp/Su	Secech	277
19	Skeena Upper	Kuldo_C	171	56	Snake-Sp/Su	Snake_S	36
19	Skeena Upper	Otsi_Cr	276	56	Snake-Sp/Su	Tucannon_SP	274
19	Skeena Upper	Sicintine_R	319	56	Snake-Sp/Su	Up_Salmon-SP	165
19	Skeena Upper	Slamgeesh	129	56	Snake-Sp/Su	Upper_Valley	77
19	Skeena Upper	Squingula_R	271	56	Snake-Sp/Su	Valley_Cr	43
19	Skeena Upper	Sustut	509	56	Snake-Sp/Su	Wenaha	89
20	Skeena Babine	Babine	198	57	Snake-F	Lyon's_Ferry_F	370
21	Skeena Bulkley	Bulkley_Early	567	58	North & Central Oregon	Cle_Elm_Hatch	95
21	Skeena Bulkley	Morice_R	243				
21	Skeena Bulkley	Suskwa	111	58	North & Central Oregon	Elk	206
22	Skeena Mid	Kispiox	197				
22	Skeena Mid	Kitseguecla_R	260	58	North & Central Oregon	Euchre_Cr	57
22	Skeena Mid	Kitwanga	284				
22	Skeena Mid	Nangeese_R	32	58	North & Central Oregon	Nehalem	327
22	Skeena Mid	Shegunia_R	132				
22	Skeena Mid	Sweetin	245				
23	Skeena Lower	Cedar_Early	116	58	North & Central Oregon	Siuslaw	258
23	Skeena Lower	Ecstall	367				
23	Skeena Lower	Exchamsiks	116	58	North & Central Oregon	Trask_hat_F	236
23	Skeena Lower	Extew_R	140				
23	Skeena Lower	Fiddler_Cr	113	58	North & Central Oregon	Trask_hat_SP	48
23	Skeena Lower	Gitnadoix	245				
23	Skeena Lower	Kasiks_R	63	58	North & Central Oregon	Umpqua_Smith	229
23	Skeena Lower	Khyex_R	37				

#	Region	Population	N
59	South Oregon coastal	Cole	188
59	South Oregon coastal	Hunter_Cr	96
59	South Oregon coastal	Lobster_Cr	49
59	South Oregon coastal	Nestucca_F	153
59	South Oregon coastal	Pistol	98
59	South Oregon coastal	Umpqua_Sp	136
59	South Oregon coastal	Winchuk	80
61	Klamath/Trinity	Blue_Cr	94
61	Klamath/Trinity	Salmon_Cal	28
61	Klamath/Trinity	Trinity_F	244
61	Klamath/Trinity	Trinity_SP	100
62	Mid Col-Sp	Granite	93
62	Mid Col-Sp	John_Day_main	228
62	Mid Col-Sp	John_Day_Mid	40
62	Mid Col-Sp	John_Day_N	40
62	Mid Col-Sp	Naches_Sp	109
62	Mid Col-Sp	Spring_Cr_H	137
63	Up Willamette	Clackamas_N	79
63	Up Willamette	North_Santiam	236
63	Up Willamette	Sandy	208
64	Cent Val-F	American	69
64	Cent Val-F	Battle_Cr	183
64	Cent Val-F	Butte_F	49
64	Cent Val-F	Feather_F	272
64	Cent Val-F	Merced	200
64	Cent Val-F	Mokelumne	95
64	Cent Val-F	Sacr_F	129
64	Cent Val-F	Sacr_LF	211
64	Cent Val-F	Stanislaus	101
64	Cent Val-F	Toulumne	34
64	Cent Val-F	Yuba	50
65	Cent Val-Sp	Butte_Sp	186
65	Cent Val-Sp	Feather_Sp	226
65	Cent Val-Sp	Yuba_Sp	32
66	Coastal California	Eel_F	279



