

**Stock Composition of Chinook Salmon caught  
in the Queen Charlotte Islands Sport Fishery  
in 2007**

Ivan Winther

Fisheries & Oceans Canada  
Science Branch, Pacific Region  
417-2<sup>nd</sup> Avenue West  
Prince Rupert, British Columbia  
V8J-1G8

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**ABSTRACT**

Winther, I. 2008. Stock composition of Chinook salmon caught in the Queen Charlotte Islands sport fishery in 2007. Unpublished report for the Pacific Salmon Commission Northern Boundary and Transboundary Rivers Restoration and Enhancement Fund 2007. File # NF-2007-I-3: v + 17 p.

Chinook salmon (*Oncorhynchus tshawytscha*) stock compositions were generated for the 2007 Queen Charlotte Islands sport fishery using microsatellite deoxyribonucleic acid (DNA) based analyses. The stock compositions were applied to catch and incidental mortality estimates to provide estimates of the impact of the sport fishery on the stock groups encountered.

## INTRODUCTION

Funding for this project was provided by the Northern Boundary and Transboundary Rivers Restoration and Enhancement Fund for the microsatellite deoxyribonucleic acid (DNA) analyses of Chinook salmon (*Oncorhynchus tshawytscha*) scales collected from the Queen Charlotte Islands' (QCI) sport fishery in 2007. The stock composition of Chinook salmon caught by the sport fishery is important in this particular fishery because has the second largest impact on Chinook salmon in the North Coast. The QCI sport fishery is one of two fisheries defined within the aggregate abundance based management (AABM) regime implemented by the Pacific Salmon Treaty (2000) for the North Coast of British Columbia. The other fishery within the AABM is the northern British Columbia (NBC) troll fishery. Chinook salmon stock compositions for the NBC troll fisheries are detailed by Winther and Beacham (2006) and Winther (2007).

Canada's allocation policy is described in the document "An Allocation Policy for Pacific Salmon" (Anon. 1999). Chinook salmon are allocated within the following context: "*After conservation needs are met, and priority access for First Nations . . . is addressed, recreational anglers will be provided ... priority to directed fisheries on chinook ...*" There have been no explicit numerical constraints to the QCI sport catch. Implementation of the current allocation policy is consistent with the needs of the recreational fishery where fishing time and the opportunity to fish are more important than an explicit amount of fish. In 2007 the QCI sport fishery was offered full access to Chinook salmon as defined within the current policy (maximum retention of 2 Chinook salmon per day, 4 in possession and 30 annually per angler).

The area around QCI has a long history of commercial fisheries for Chinook salmon. By comparison, the sport fishery has relatively recent beginnings with the inception of fishing lodges and catered sport opportunities occurring in the late 1980's. The sport fishery has experienced considerable growth since its inception, particularly since 1998. The growth hasn't remained steady. A closure of the chinook fishery in 1996 to conserve chinook stocks from the west coast of Vancouver Island and management measures to conserve upper Skeena coho in the late 1990's restrained the growth of the sport fishery. Recently catches have declined (Table 1.).

The sport fishery in 2007 consisted of over 15 lodges and a number of charter companies. Lodges include land based operations and floating barge or ship based operations. Lodges were located at Naden Harbour, Langara Island, Port Louis, Nesto Inlet, Kano Inlet, Douglas Inlet and Tasu Sound. A number of charter companies also operated out of Masset, Queen Charlotte City and Rennel Sound. Major sport fishing locations around the QCI are indicated in Figure 1.

A British Columbia tidal water sport fishing licence was required to harvest Chinook salmon in the sport fishery. It allowed anglers to fish any marine areas on the coast of British Columbia that were open to fishing. The number of sport licences issued was not limited. The number of resident licences issued has fluctuated between 228,000 and 259,000 since 1999. Data for the 2007/8 licence year was not complete at the time of printing but, to print date, a total of 232,285 resident licences were issued for the 2007/8 season. The total number of nonresident licences issued annually has declined from 86,605 in 1999/2000 to 67,568 in 2007/8. Licenses were not area specific so the actual number of licensed anglers that fished the Queen Charlotte Islands was unknown. The licence year began April 1 each year with "annual" licences expiring the March 31 following the date of issue. Licences for 1 day, 3 days and 5 days were also available. Anglers were required to purchase a "Salmon conservation stamp" in order to harvest any species of salmon. Over 220,000 salmon conservation stamps were issued to anglers in 2007/8. The cost of an annual licence and stamp was \$30 for residents of Canada and \$115 for

non-residents in 2007. Additional information on sport fishing licences is available on the Fisheries & Oceans, Pacific Region, Sport Fishing Homepage ([http://www.pac.dfo-mpo.gc.ca/recfish/Licensing/statistics\\_e.htm](http://www.pac.dfo-mpo.gc.ca/recfish/Licensing/statistics_e.htm)).

The size limit for Chinook salmon caught in the QCI sport fishery was 45 cm fork length. Very few Chinook salmon less than the legal size are encountered by anglers in QCI. In 2007 sport anglers could retain 2 Chinook salmon per day, have 4 in possession, and were restricted to an annual limit of 30 Chinook salmon. Barbless hooks were mandatory. Anglers were permitted to fish any number of rods and the number of Chinook salmon that anglers could release was unlimited.

The QCI sport fishery was monitored through a creel survey combined with a logbook system incorporated by the fishing lodges. In-season estimates were derived from the creel survey and post-season estimates were generated using a combination of creel survey and logbook data. Creel surveys were conducted from June to early September covering the period of most of the recreational chinook catch. Logbooks cover the entire year that the lodges were in operation, most operated within the season mid May to mid September. QCI sport catch and release data appear in Table 1.

For the purposes of Pacific Salmon Treaty (PST) accounting, incidental mortalities were estimated using rates recommended by the CTC (1997). A hook and release mortality rate of 12.3% was applied to chinook releases and a drop-off rate of 6.9% was applied to the total number of encounters, catch and release estimates combined. The CTC recommended release mortality rate of 32.2% for chinook less than 33 cm was not applied because fish less than 33 cm are extremely rare in the QCI sport fishery and size specific data on chinook releases are not available. Further details on incidental mortalities defined by the PST were detailed by the CTC (2004). Domestically, Canada applied a mortality rate of 15% to chinook releases without a factor for drop-off (Fisheries & Oceans Canada, 2001).

Genetic stock identification methods can be used to determine stock composition of fisheries and stock specific catch estimates. Accurate stock identification from mixed stock samples requires complete baselines for estimating relative contribution by each component stock. As the current baselines are still under development the results presented represent analysis relative to the 268 stock baseline as it existed in 2007 (Appendix 3).

## METHODS

Scale samples were collected by West Coast Resorts staff in the vicinity of Englefield Bay; by Langara Fishing Lodge staff in the vicinity of Langara Island; and by the Haida Creel Survey program in the vicinity of Naden Harbour. Stratified random samples of 30 Chinook salmon were sampled each week for scales at each site. Sample collection instructions for lodge staff and Haida Creel Survey staff appear as Appendices 1 and 2 respectively. An objective of 1500 samples was based on the funding available for analyses.

Scale samples were collected on to 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.

Catch and release data were supplied by the Haida Creel survey (Gary Searing, LGL Limited, Sidney B.C., unpublished data) and the Fisheries & Oceans Canada log book program (Victor Fradette, Fisheries & Oceans Canada, Queen Charlotte City, unpublished data).

Chinook salmon samples were compared against genetic baselines from 268 Chinook salmon populations from Southeast Alaska south through Canada and the lower United States of

America (Appendices 3 & 4). Samples were analyzed for 13 microsatellite loci using methods of DNA extraction, PCR reaction, electrophoresis, and allele scoring described by Candy et. al. (2002) and Beacham et. al. (2006).

The Molecular Genetics Laboratory provided the sample analyses. A new version of the computer program as outlined by Pella and Masuda (2001) was developed and used for the results presented here. This program called “c-BAYES” is available upon request from the Fisheries & Oceans Canada, Molecular Genetics Laboratory at the Pacific Biological Station in Nanaimo. The model output presented includes the Bayesian probability estimates for the 5 most probable populations for each sample (J. R. Candy, Fisheries & Oceans Canada, pers. comm.).

## RESULTS

A total of 1830 scale samples were collected from the QCI sport fishery for the purpose of DNA analyses. West Coast Resorts collected scale samples from 395 Chinook salmon caught near Englefield Bay from May 17 to September 9, 2007. Langara Fishing Lodge collected scale samples from 630 Chinook salmon from May 15 to September 15, 2007. The Haida Creel Survey program collected scale samples from 445 Chinook salmon at Naden Harbour from June 7 to August 31, 2007. The creel program also collected scale samples from 360 Chinook salmon caught in the vicinity of Langara Island that were not submitted for analysis because the data collections were incomplete. DNA analyses were completed for 1411 samples; 391 samples from Englefield Bay, 622 samples from Langara Island and 398 samples from Naden Harbour. Sample collections covered most of the period of lodge operations in these areas. Exceptions to sample coverage included the end of May and early September in fisheries operated out of Naden Harbour.

Lodge based sport catches from Langara Island and the west coast of QCI are presented by week in Table 2.

Stock proportions in the sport catch samples are presented by region in Table 3. The largest contributions were from WCVI, South Thompson and Upper Columbia summer and fall timed stocks. The regional contributions to the catch and to incidental mortalities are presented in Tables 4 and 5 respectively.

## DISCUSSION

An estimated 85,279 Chinook salmon were encountered by the sport fishery in the Queen Charlotte Islands in 2007. Encounters include estimates of 54,000 landed catch and 31,279 releases. The fishery has declined since record numbers of Chinook salmon were encountered in 2004 (Table 1). Incidental mortality in the 2006 QCI sport fishery was estimated at 9,732 Chinook salmon (PST accounting) for a total mortality estimate of 63,732 Chinook salmon. Catch, encounter and incidental mortality estimates provided in the tables of stock composition data do not include estimates from Area 2E/102 of 500 catch, 114 releases and 56 incidental mortalities of Chinook salmon. Catch from Area 2E was not sampled.

The total catch estimate of 31,000 Chinook salmon for Area 1 (the north end of Graham Island including Langara Island and Naden Harbour) represents a preliminary estimate that is subject to revision. When compared to lodge logbook catch estimates it appears that the creel survey may have underestimated Area 1 catch by as much as 20%. Total catch for the QCI Sport



fishery in 2007 could exceed 60,000 Chinook salmon. Calibration of the creel survey estimates has been proposed but it's unclear when these results may be available.

The funding available allowed for the analysis of Chinook salmon representing ~2.8% of the landed catch or ~1.8% of total Chinook salmon encounters. Langara Island samples were assigned to catch from the portion of Area 1/101 around Langara Island. Naden Harbour samples were assigned to catch from Naden Harbour and Masset. Englefield Bay samples were assigned to catch from all of Area 2W. The limited number of area strata in the sample collection may lead to bias in the catch estimates for specific stock groups, especially for smaller components of the catch.

Sampling design in the sport fishery was spread across 4 months to reflect the continuous nature of the fishery in the summer. Sport fishing mortalities were relatively steady throughout the season. Sampling relative to the amount of catch was a simple matter of sampling equally for the duration of the season. The relatively stable catches from June through August 2006 essentially represent the capacity of the lodges. There was very little "tail out" at the beginning or end of the year (Table 2) and the tails reflect spring start up and fall closure of the various fishing operations rather than abundance of chinook. Monthly samples were applied to the catch and incidental mortality estimated for each area and month.

### **ACKNOWLEDGEMENTS**

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## TABLES

Table 1. Chinook salmon catch and release estimates for the QCI Sport fishery from 1985 to 2007.

Year	CATCH				RELEASES				Total Encounters
	Area 1	Area 2E	Area 2W	Total	Area 1	Area 2E	Area 2W	Total	
1985	500	100		600					
1986	800	53	300	1,153					
1987	2,000	244	400	2,644					
1988	5,889	170	1,000	7,059					
1989	16,452	200	4,000	20,652					
1990	12,209	510	4,108	16,827					
1991	11,940	200	2,907	15,047					
1992	17,460	435	3,463	21,358					
1993	20,822	708	3,767	25,297					
1994	21,845	1,658	5,470	28,973					
1995	17,414	450	4,667	22,531	9,888	0	776	10,664	33,195
1996	594	76	0	670	15,223	0	740	15,963	16,633
1997	23,025	150	4,563	27,738	30,404	25	1,148	31,577	59,315
1998	31,082	100	2,948	34,130	30,027	16	601	30,644	64,774
1999	25,018	200	5,009	30,227	15,493	5	326	15,824	46,051
2000	18,800	200	3,100	22,100	24,036	8	529	24,573	46,673
2001	20,800	300	9,300	30,400	27,929	33	2,560	30,522	60,922
2002	31,200	300	15,600	47,100	38,054	31	4,141	42,226	89,326
2003	34,350	300	19,650	54,300	44,415	22	3,112	47,549	101,849
2004	52,000	250	21,750	74,000	105,828	57	10,856	116,741	190,741
2005	44,800	1,000	23,000	68,800	47,418	282	13,287	60,987	129,787
2006	35,500	1,000	28,000	64,500	26,050	123	6,307	32,480	96,980
2007	31,000	500	22,500	54,000	18,810	144	12,355	31,279	85,279

1995 to 2007 data incorporate creel survey data and harvest log data. Catch estimates prior to 1995 are Fishery Officer estimates. 2007 Catch data are preliminary.

Table 2. 2007 Sport fishing effort and Chinook salmon catch by week from lodges on Langara Island, Naden Harbour and on the west coast of the Queen Charlotte Islands.

Week ending date	Langara Island lodges		Naden Harbour lodges		West Coast QCI lodges	
	Effort (angler days)	Catch	Effort (angler days)	Catch	Effort (angler days)	Catch
20-May	432	121	0	0	734	266
27-May	700	319	0	0	770	333
3-Jun	1598	711	447	284	931	452
10-Jun	1868	1168	957	804	1246	776
17-Jun	1858	1263	1027	1011	1234	639
24-Jun	1903	1378	998	887	1220	868
1-Jul	1921	1316	1188	936	1204	882
8-Jul	1899	1254	1313	922	1176	894
15-Jul	1920	1077	1223	720	1216	894
22-Jul	1863	773	1192	527	1215	792
29-Jul	1920	1040	1268	468	1242	715
5-Aug	1957	1228	1252	664	1190	681
12-Aug	1920	1241	1295	783	1219	717
19-Aug	1889	1200	1246	746	1203	745
26-Aug	1875	1144	1097	622	1186	497
2-Sep	1859	766	1035	290	1006	308
9-Sep	1463	793	376	179	749	327
16-Sep	1049	481	140	69	585	188
23-Sep	295	166	0	0	0	0
Totals	30,189	17,439	16,054	9,912	19,326	10,974

Table 3. Stock composition of Chinook salmon sampled from Englefield Bay, Langara Island, and Naden Harbour sport fisheries in 2007 by month.

Standard deviations appear in brackets. Stock groups are organized approximately north to south. Abbreviations are described in Appendix 4.

Area	2W		2W		2W		2W		2W		1/101		1/101		1/101		1/101		1/101	
Month	May		Jun		Jul		Aug		Sept		May		Jun		Jul		Aug		Sep	
Location	Englefield		Englefield		Englefield		Englefield		Englefield		Langara		Langara		Langara		Langara		Langara	
N	58		110		79		110		34		87		149		147		159		80	
Alaska	0.0	(0.2)	0.0	(0.2)	0.0	(0.2)	0.0	(0.1)	0.0	(0.3)	0.0	(0.2)	0.0	(0.1)	0.0	(0.1)	0.0	(0.1)	0.0	(0.2)
Alsek	0.0	(0.2)	0.0	(0.1)	0.0	(0.1)	0.0	(0.1)	0.0	(0.4)	0.0	(0.1)	0.0	(0.1)	0.0	(0.1)	0.0	(0.1)	0.0	(0.1)
Taku	0.0	(0.3)	0.5	(1.3)	0.0	(0.2)	0.0	(0.1)	0.0	(0.5)	0.1	(0.4)	0.0	(0.3)	0.0	(0.1)	0.1	(0.4)	0.3	(1.0)
Stikine	1.6	(3.3)	1.5	(1.7)	0.0	(0.3)	0.1	(0.4)	0.0	(0.4)	0.1	(0.8)	3.2	(1.9)	0.5	(1.0)	0.0	(0.3)	0.9	(1.7)
Unuk	0.0	(0.2)	0.4	(1.4)	0.1	(0.5)	0.0	(0.1)	0.0	(0.0)	0.3	(1.3)	0.0	(0.1)	0.0	(0.1)	0.0	(0.2)	0.0	(0.1)
QCI	0.0	(0.1)	0.0	(0.1)	0.0	(0.1)	0.0	(0.1)	0.0	(0.1)	1.2	(1.2)	1.3	(0.9)	8.2	(2.3)	1.9	(1.1)	0.0	(0.1)
NASS	10.6	(5.0)	3.4	(2.0)	0.0	(0.4)	0.0	(0.2)	0.0	(0.6)	3.0	(2.3)	2.9	(1.6)	0.0	(0.2)	0.0	(0.2)	0.1	(0.5)
Skeena	19.3	(10.7)	1.4	(2.8)	0.7	(1.3)	0.0	(0.4)	0.0	(0.9)	22.4	(10.5)	16.5	(3.7)	16.2	(3.4)	0.4	(0.7)	2.3	(3.2)
NOMN	15.3	(5.3)	10.1	(3.4)	2.3	(2.3)	3.7	(1.9)	0.0	(0.7)	18.8	(5.0)	5.6	(2.1)	1.3	(1.1)	7.1	(2.1)	0.8	(1.4)
WCVI	10.6	(4.1)	15.9	(3.6)	25.5	(4.9)	37.1	(4.6)	17.6	(6.3)	24.8	(4.7)	12.1	(2.7)	9.3	(2.5)	27.1	(3.6)	3.7	(2.1)
ECVI	5.2	(2.9)	1.7	(1.6)	1.3	(1.3)	0.2	(0.7)	0.0	(0.6)	1.2	(1.6)	0.0	(0.2)	2.5	(1.8)	4.3	(1.7)	0.1	(0.5)
SOMN	0.0	(0.4)	0.2	(0.6)	0.0	(0.2)	0.0	(0.3)	0.0	(0.5)	1.5	(1.6)	1.1	(1.1)	1.1	(1.0)	0.0	(0.1)	0.0	(0.2)
UPFR	4.9	(2.9)	1.5	(1.3)	0.3	(0.9)	0.0	(0.3)	0.3	(1.5)	0.1	(0.6)	3.3	(1.5)	0.0	(0.2)	0.0	(0.2)	0.0	(0.3)
MUFR	0.0	(0.5)	3.3	(2.2)	0.0	(0.5)	0.9	(1.0)	0.0	(0.7)	0.0	(0.4)	0.0	(0.3)	0.1	(0.6)	0.6	(0.7)	0.0	(0.4)
NOTH	3.7	(2.6)	0.1	(0.6)	0.0	(0.2)	1.7	(1.3)	0.0	(0.4)	0.0	(0.3)	0.0	(0.2)	3.2	(1.8)	0.0	(0.1)	0.0	(0.2)
SOTH	5.3	(2.9)	29.8	(4.6)	26.1	(4.9)	11.9	(3.3)	3.0	(3.1)	11.3	(3.6)	31.6	(3.9)	28.7	(4.0)	14.4	(2.9)	5.0	(3.1)
LWTH	0.0	(0.3)	0.0	(0.1)	0.0	(0.2)	0.0	(0.2)	0.0	(0.5)	0.1	(0.5)	0.0	(0.2)	0.0	(0.1)	0.0	(0.1)	0.1	(0.5)
LWFR-Sp	0.0	(0.2)	0.0	(0.1)	0.0	(0.2)	0.0	(0.1)	0.0	(0.3)	1.2	(1.1)	0.0	(0.1)	0.0	(0.2)	0.0	(0.1)	0.0	(0.2)
LWFR-Su	0.0	(0.1)	0.0	(0.1)	0.0	(0.1)	0.0	(0.0)	0.0	(0.2)	0.0	(0.1)	0.0	(0.0)	0.0	(0.0)	0.6	(0.6)	0.0	(0.1)
LWFR-F	0.0	(0.3)	0.0	(0.1)	0.4	(1.0)	0.0	(0.1)	0.0	(0.2)	0.1	(0.7)	0.3	(0.6)	0.2	(0.5)	0.0	(0.1)	0.0	(0.4)
Puget Sound	0.0	(0.3)	0.6	(1.0)	0.1	(0.7)	0.2	(0.7)	0.0	(0.7)	0.4	(0.9)	0.1	(0.5)	0.2	(0.6)	0.0	(0.2)	0.3	(0.8)
Juan de Fuca	0.0	(0.1)	0.0	(0.1)	0.0	(0.1)	0.0	(0.1)	0.0	(0.1)	0.0	(0.1)	0.0	(0.0)	0.7	(0.7)	0.0	(0.0)	0.0	(0.1)
Coastal Wash	0.5	(1.3)	3.3	(2.1)	15.6	(4.3)	12.3	(3.6)	32.5	(8.4)	2.1	(2.0)	3.4	(1.6)	4.7	(2.2)	11.0	(2.7)	28.1	(6.3)
Up Col-Sp	0.0	(0.2)	0.0	(0.1)	0.0	(0.2)	0.0	(0.2)	0.0	(0.3)	0.1	(0.4)	0.0	(0.1)	0.0	(0.1)	0.0	(0.1)	0.0	(0.1)
Up Col-Su/F	13.6	(4.4)	6.9	(3.6)	10.9	(3.6)	18.6	(3.9)	25.4	(7.4)	3.7	(2.6)	4.1	(1.6)	9.3	(2.8)	17.0	(3.3)	7.5	(3.6)
Snake-Sp/Su	0.0	(0.4)	0.0	(0.2)	0.0	(0.3)	0.0	(0.3)	0.0	(0.7)	0.1	(0.5)	0.0	(0.2)	0.0	(0.3)	0.4	(1.1)	0.0	(0.3)
Snake-F	0.0	(0.4)	1.6	(3.3)	0.0	(0.1)	0.0	(0.2)	0.1	(0.8)	0.5	(1.5)	0.0	(0.1)	2.0	(2.2)	0.2	(1.1)	5.8	(3.5)
Mid Col-Sp	0.0	(0.3)	1.6	(1.4)	1.9	(1.8)	0.0	(0.2)	0.0	(0.5)	0.9	(1.3)	0.0	(0.1)	0.3	(0.6)	0.0	(0.1)	0.0	(0.2)
Up Willamette	3.6	(2.5)	0.0	(0.1)	1.7	(1.7)	0.3	(0.8)	0.0	(0.2)	0.0	(0.2)	0.7	(0.7)	1.1	(1.3)	0.0	(0.1)	0.0	(0.1)
Low Col	3.7	(2.6)	0.3	(0.9)	0.0	(0.3)	0.7	(1.1)	0.0	(0.2)	0.7	(1.3)	0.0	(0.3)	1.0	(1.3)	2.1	(1.6)	0.4	(1.3)
N. & Central Or	0.7	(1.5)	11.9	(3.7)	12.4	(3.9)	11.2	(3.5)	11.4	(6.6)	3.6	(2.9)	7.4	(2.6)	4.8	(2.3)	12.0	(3.0)	29.5	(7.4)
S. Oregon coas	1.3	(1.9)	4.2	(2.6)	0.6	(1.3)	0.7	(1.3)	9.7	(6.0)	1.6	(2.5)	5.9	(2.2)	4.1	(1.9)	0.6	(1.0)	15.0	(5.2)
Klamath/Trinity	0.0	(0.3)	0.0	(0.1)	0.0	(0.1)	0.0	(0.2)	0.0	(0.2)	0.1	(0.6)	0.1	(0.3)	0.0	(0.1)	0.0	(0.1)	0.1	(0.5)
Cent Val-Sp	0.0	(0.2)	0.0	(0.2)	0.0	(0.2)	0.0	(0.2)	0.0	(0.5)	0.0	(0.3)	0.0	(0.1)	0.1	(0.5)	0.0	(0.1)	0.0	(0.1)
Cent Val-F	0.0	(0.3)	0.0	(0.2)	0.0	(0.3)	0.1	(0.5)	0.0	(0.7)	0.0	(0.3)	0.0	(0.1)	0.4	(0.7)	0.0	(0.1)	0.0	(0.2)
Coastal Cal.	0.0	(0.2)	0.0	(0.1)	0.0	(0.1)	0.0	(0.1)	0.0	(0.1)	0.0	(0.1)	0.0	(0.0)	0.0	(0.0)	0.0	(0.1)	0.0	(0.1)

Table 3 continued.

Area	1/101		1/101		1/101	
Month	Jun		Jul		Aug	
Location	Naden		Naden		Naden	
N	133		109		156	
Alaska	0.1	(0.4)	0.0	(0.2)	0.0	(0.1)
Alsek	0.0	(0.1)	0.0	(0.1)	0.0	(0.1)
Taku	0.0	(0.3)	0.0	(0.2)	0.0	(0.1)
Stikine	1.5	(2.2)	0.0	(0.3)	0.1	(0.4)
Unuk	0.0	(0.2)	0.0	(0.1)	0.0	(0.1)
QCI	2.3	(1.3)	8.3	(2.6)	0.0	(0.0)
NASS	0.8	(1.4)	0.1	(0.4)	0.0	(0.3)
Skeena	22.1	(5.1)	10.6	(3.6)	0.8	(1.4)
NOMN	10.4	(3.2)	5.1	(2.2)	4.8	(1.7)
WCVI	22.2	(3.7)	39.7	(4.7)	48.1	(4.1)
ECVI	3.0	(1.6)	3.7	(2.0)	2.9	(1.5)
SOMN	0.2	(0.6)	5.3	(2.3)	0.0	(0.1)
UPFR	1.4	(1.2)	0.0	(0.3)	0.0	(0.2)
MUFR	0.3	(0.7)	0.0	(0.4)	0.6	(0.9)
NOTH	0.0	(0.2)	0.0	(0.1)	0.0	(0.1)
SOTH	17.5	(3.4)	18.4	(3.8)	10.3	(2.7)
LWTH	0.0	(0.2)	0.0	(0.2)	0.0	(0.1)
LWFR-Sp	0.0	(0.1)	0.0	(0.1)	0.6	(0.6)
LWFR-Su	0.0	(0.1)	0.0	(0.1)	0.0	(0.0)
LWFR-F	0.0	(0.2)	0.0	(0.1)	2.1	(1.3)
Puget Sound	0.2	(0.5)	0.0	(0.2)	0.0	(0.1)
Juan de Fuca	0.0	(0.0)	0.0	(0.1)	0.0	(0.0)
Coastal Wash	3.2	(1.7)	0.3	(0.8)	10.1	(2.7)
Up Col-Sp	0.0	(0.1)	0.0	(0.1)	0.0	(0.1)
Up Col-Su/F	5.8	(2.1)	4.0	(2.0)	9.5	(2.4)
Snake-Sp/Su	0.0	(0.3)	0.0	(0.2)	0.0	(0.2)
Snake-F	0.1	(0.3)	0.0	(0.2)	0.1	(0.5)
Mid Col-Sp	0.0	(0.1)	0.0	(0.1)	0.0	(0.1)
Up Willamette	0.0	(0.1)	0.0	(0.1)	0.0	(0.1)
Low Col	0.8	(0.7)	0.0	(0.1)	1.3	(0.9)
N. & Central Or	6.1	(3.4)	4.4	(2.1)	5.6	(2.2)
S. Oregon coast	2.0	(2.6)	0.0	(0.2)	2.8	(1.5)
Klamath/Trinity	0.0	(0.2)	0.0	(0.1)	0.1	(0.4)
Cent Val-Sp	0.0	(0.1)	0.0	(0.1)	0.0	(0.1)
Cent Val-F	0.0	(0.2)	0.0	(0.2)	0.0	(0.2)
Coastal California	0.0	(0.1)	0.0	(0.1)	0.0	(0.0)

Table 4. Stock composition from Langara Island, Naden Harbour and Englefield Bay sport catches applied to total 2007 Chinook salmon catch estimates for Areas 1/101 and 2W.

Stock Groups are organized approximately from north to south. Abbreviations are described in Appendix 6.

2007	Langara & Naden		Englefield Bay		Total	
	Area 1/101		Area 2W		Catch	STD
	Catch	STD	Catch	STD		
Alaska	3	(169)	0	(110)	3	(202)
Aisek	0	(78)	0	(102)	0	(128)
Taku	23	(401)	24	(331)	46	(520)
Stikine	246	(1135)	142	(853)	389	(1419)
Unuk	13	(430)	21	(335)	33	(545)
QCI	898	(1285)	0	(51)	898	(1286)
NASS	268	(1015)	631	(1219)	900	(1587)
Skeena	3,541	(4249)	961	(2519)	4,502	(4940)
NOMN	2,085	(2290)	1,410	(1568)	3,495	(2776)
WCVI	7,247	(3187)	4,801	(2408)	12,048	(3995)
ECVI	687	(1300)	379	(833)	1,066	(1544)
SOMN	358	(1002)	10	(219)	367	(1025)
UPFR	186	(669)	314	(814)	500	(1053)
MUFR	70	(505)	191	(580)	260	(769)
NOTH	125	(591)	249	(677)	374	(899)
SOTH	5,321	(3039)	3,426	(1937)	8,748	(3604)
LWTH	6	(235)	0	(150)	6	(279)
LWFR-Sp	70	(415)	0	(89)	70	(424)
LWFR-Su	24	(195)	0	(56)	24	(203)
LWFR-F	108	(546)	20	(236)	127	(595)
Puget Sound	49	(501)	42	(368)	90	(621)
Juan de Fuca	28	(226)	0	(47)	28	(231)
Coastal Wash	2,435	(2596)	2,888	(2352)	5,323	(3503)
Up Col-Sp	3	(155)	0	(101)	4	(185)
Up Col-Su/F	2,361	(2305)	3,393	(2418)	5,754	(3341)
Snake-Sp/Su	20	(419)	2	(220)	22	(473)
Snake-F	338	(1408)	76	(774)	414	(1607)
Mid Col-Sp	50	(457)	158	(528)	208	(698)
Up Willamette	70	(468)	254	(713)	324	(853)
Low Col	245	(950)	215	(662)	460	(1158)
N. & Central Or	2,844	(3180)	2,143	(2092)	4,987	(3806)
S. Oregon coast	1,235	(2226)	742	(1594)	1,977	(2738)
Klamath/Trinity	18	(301)	1	(99)	20	(316)
Cent Val-Sp	7	(196)	2	(130)	9	(235)
Cent Val-F	17	(262)	6	(208)	23	(335)
Coastal California	0	(50)	0	(55)	0	(75)
Total	31,000		22,500		53,500	

Table 5. Stock composition from Langara Island, Naden Harbour and Englefield Bay sport catches applied to Chinook salmon incidental mortality estimates for Areas 1/101 and 2W.

Stock Groups are organized approximately from north to south. Abbreviations are described in Appendix 6.

2006	Langara & Naden		Englefield Bay		Total	
	Area 1/101		Area 2W		Incidental Mortality	STD
	Incidental Mortality	STD	Incidental Mortality	STD		
Alaska	1	(31)	0	(19)	1	(37)
Alsek	0	(15)	0	(18)	0	(23)
Taku	4	(74)	4	(58)	8	(94)
Stikine	46	(210)	25	(149)	70	(258)
Unuk	2	(80)	4	(58)	6	(99)
QCI	167	(238)	0	(9)	167	(238)
NASS	50	(188)	110	(213)	160	(284)
Skeena	657	(788)	168	(439)	824	(902)
NOMN	387	(425)	246	(273)	633	(505)
WCVI	1,344	(591)	837	(420)	2,182	(725)
ECVI	127	(241)	66	(145)	194	(281)
SOMN	66	(186)	2	(38)	68	(190)
UPFR	35	(124)	55	(142)	89	(189)
MUFR	13	(94)	33	(101)	46	(138)
NOth	23	(110)	43	(118)	67	(161)
SOTH	987	(564)	598	(338)	1,585	(657)
LWTH	1	(44)	0	(26)	1	(51)
LWFR-Sp	13	(77)	0	(16)	13	(79)
LWFR-Su	5	(36)	0	(10)	5	(37)
LWFR-F	20	(101)	3	(41)	23	(109)
Puget Sound	9	(93)	7	(64)	16	(113)
Juan de Fuca	5	(42)	0	(8)	5	(43)
Coastal Wash	452	(482)	504	(410)	956	(633)
Up Col-Sp	1	(29)	0	(18)	1	(34)
Up Col-Su/F	438	(428)	592	(422)	1,030	(601)
Snake-Sp/Su	4	(78)	0	(38)	4	(87)
Snake-F	63	(261)	13	(135)	76	(294)
Mid Col-Sp	9	(85)	28	(92)	37	(125)
Up Willamette	13	(87)	44	(124)	57	(152)
Low Col	45	(176)	37	(115)	83	(211)
N. & Central Or	528	(590)	374	(365)	901	(694)
S. Oregon coast	229	(413)	129	(278)	359	(498)
Klamath/Trinity	3	(56)	0	(17)	4	(58)
Cent Val-Sp	1	(36)	0	(23)	2	(43)
Cent Val-F	3	(49)	1	(36)	4	(61)
Coastal California	0	(9)	0	(10)	0	(13)
Total	5,751		3,925		9,675	



12  
**FIGURES**

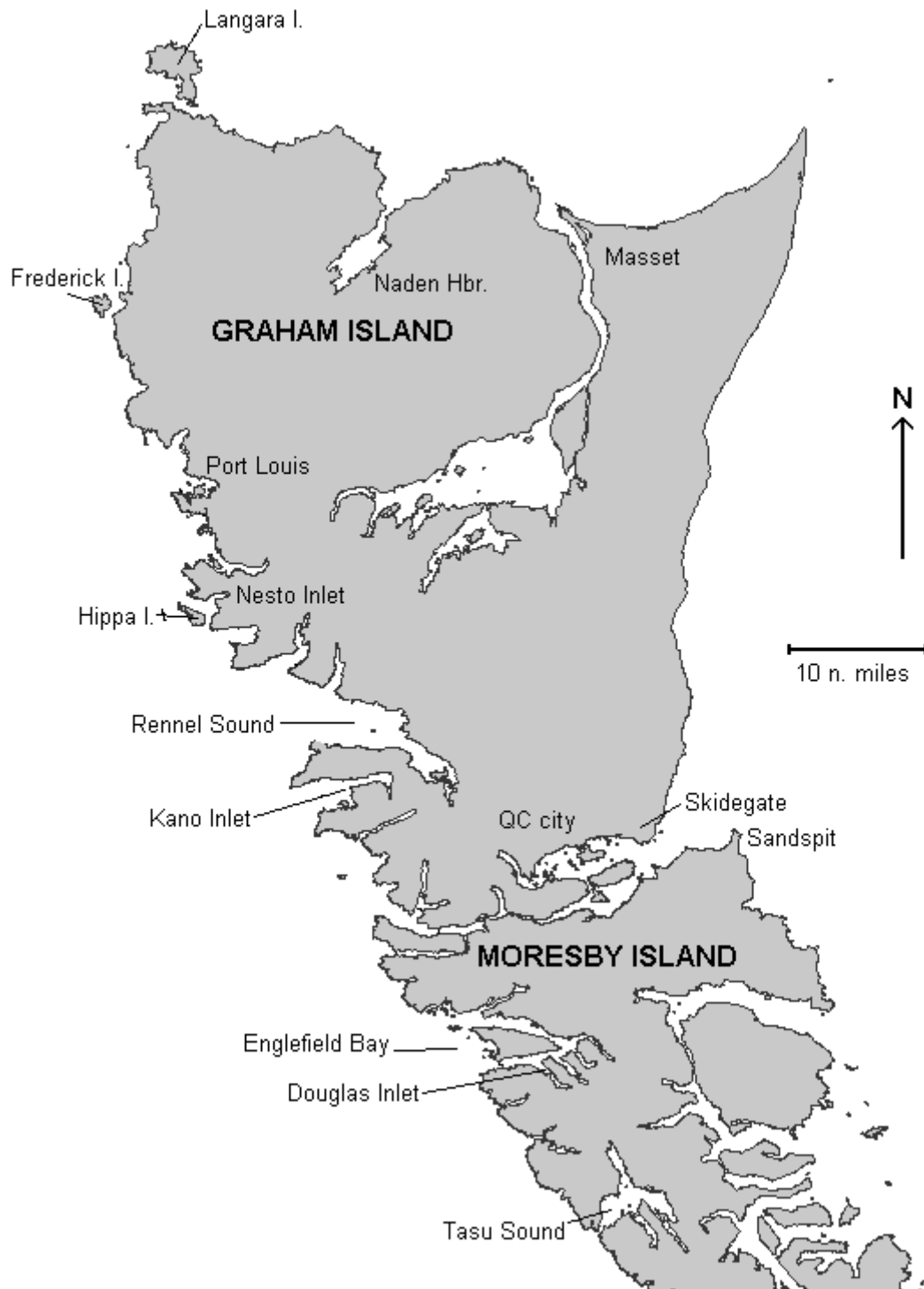


Figure 1. The northern portion of the Queen Charlotte Islands.

## APPENDICES

### Appendix 1. 2007 Chinook Sample Instructions for volunteer sample collections.

The following describes the scale sampling procedure for Chinook salmon caught in the sport fishery at Englefield Bay and Langara Island.

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 30 Chinook salmon each week that the lodge operates according to the following protocol:

- 60 scale books have been provided. Each book holds 50 scales for 10 fish sampled at 5 scales per fish.
- Fill 3 books of scales and 1 data page each week (30 chinook).
- I suggest collecting samples from 5 chinook per day, 6 days a week. You can modify this procedure so long as you set up a program in advance and stick to it. If you have 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 randomise 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 ditto or arrows for fish sampled on the same day.
- Record the length to the nearest cm and determine the sex for each fish sampled.

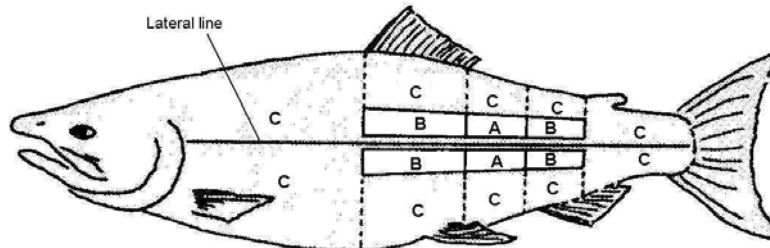
If you have a special fish that you want sampled, like a huge chinook or a derby winner, collect the scale sample as above in a separate scale book and put a note at the bottom of the sample sheet describing why it's special. Other valuable data would be the date, length, sex and whether the chinook had an adipose fin clip or not. 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 wintheriv@pac.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.

## Appendix 2. 2007 Haida Creel Survey Chinook DNA Sample Instructions

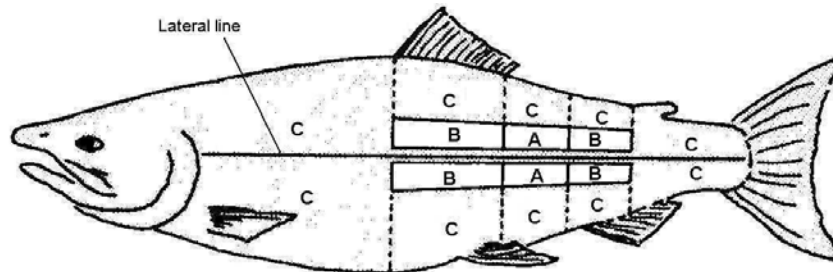
Chinook salmon will be scale sampled from the sport fishery at **Langara Island, Masset** and **Naden Harbour**. These samples are in addition to the normal protocol.

At each site sample 30 Chinook salmon each week during normal interviews for the creel survey program. Sample between 6 and 10 Chinook per day. Sample every 3<sup>rd</sup> fish encountered until you have sampled the fish for the day. If there aren't enough fish to sample on a particular day you can collect extra samples on the following day. Each fish will be checked for adipose fin clips and sampled for scales, length and sex according to the following protocol:

- 60 scale books have been provided for each site (45 plus 15 extras). Fill 3 books each week (30 fish).
- Record the site and the samplers' names at the top of each page.
- Record the scale book number in the space provided above every 10<sup>th</sup> fish.
- Record the date for each fish (you can use dittos or arrows for fish sampled on the same day).
- Record the site code for the sampling site (lodge).
- Measure the fish from the tip of the nose to the fork of the tail using a tape measure and record the length in cm on the data sheet.
- Check the fish for an adipose fin clip. In the "Marked" column circle Y for adipose fin missing or N for adipose fin intact.
- Collect 5 scales from each fish as noted below.
- **MAKE SURE THE NUMBERS ON THE DATA SHEETS MATCH THE NUMBERS ON THE SCALE BOOKS.**
- Note the sex of the fish as it is dressed and indicate the sex by circling M for male or F for female on the data sheet.

### Scale Samples:

- Record the scale book number on the data sheet. Each book will contain scales from 10 fish. Start a new book at the beginning of each new box of vials each week.
- 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, collect 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; leave the scale with the same side up as it is 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.
- Keep the scale books dry.
- Once the book is full, fill out all of the information on the back of the page bearing the scales.
- **THE LOCATION OF THE SCALES IN THE BOOKS MUST MATCH THE NUMBERS ON THE DATA SHEETS.**

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  
 wintheriv@pac.dfo-mpo.gc.ca

## Appendix 3: Baseline samples from 268 populations used in the mixture analyses.

#	Region	Population	N
1	UPFR	Bowron__	217
1	UPFR	Dome_____	385
1	UPFR	Fontoniko	63
1	UPFR	Goat_____	77
1	UPFR	Holmes_____	216
1	UPFR	Horsey_____	46
1	UPFR	Indianpoint	47
1	UPFR	James_____	57
1	UPFR	Kenneth_Cr	86
1	UPFR	McGregor_____	126
1	UPFR	Morkill_River	208
1	UPFR	Nevin_Creek	46
1	UPFR	R_Chehalis	127
1	UPFR	R_Chilliwack	163
1	UPFR	Salmon@PG	263
1	UPFR	Slim_____	204
1	UPFR	Swift_____	411
1	UPFR	Tete_Jaune	488
1	UPFR	Torpy_River	170
1	UPFR	Walker_____	42
1	UPFR	Willow_____	116
2	MUFR	Baezaeko	82
2	MUFR	Bridge_____	425
2	MUFR	Chilako_____	45
2	MUFR	Chilcotin_mix	47
2	MUFR	Chiiko_____	270
2	MUFR	Cottonwood	101
2	MUFR	Elkin_____	235
2	MUFR	Endako_____	87
2	MUFR	Horsefly_____	59
2	MUFR	L_Cariboo	33
2	MUFR	L_Chilcoti	232
2	MUFR	Nazko_____	194
2	MUFR	Nechako_____	577
2	MUFR	Portage_____	234
2	MUFR	Quesnel_____	565
2	MUFR	Stuart_____	555
2	MUFR	Taseko_____	200
2	MUFR	U_Cariboo	171
2	MUFR	U_Chilcotin	277
2	MUFR	Westroad	39
2	MUFR	Chilliwac@Stav	377
3	LWFR-F	Harrison	603
3	LWFR-F	W_Chilliwack	481
4	NOTH	Barriere	55
4	NOTH	Blue_River	64
4	NOTH	Clearwater	262
4	NOTH	Finn_____	171
4	NOTH	Lemieux_Creek	133
4	NOTH	N_Thom@Main	115
4	NOTH	Raft_____	248
5	SOTH	Bessette	110
5	SOTH	Duteau_Cr	49
5	SOTH	Eagle_____	144
5	SOTH	L_Adams_____	208
5	SOTH	L_Shuswap	356
5	SOTH	L_Thompson	173
5	SOTH	L_Shus@U_Adams	45
5	SOTH	Little_____	158
5	SOTH	M_Shuswap	376
5	SOTH	Salmon@SA	214
5	SOTH	South_Thom	267
6	LWTH	Bonaparte	308
6	LWTH	Coldwater	279
6	LWTH	Deadman_____	299
6	LWTH	Louis_____	577

#	Region	Population	N
6	LWTH	Nicola_____	468
6	LWTH	Spius_____	136
6	LWTH	U_Coldwat_SP	186
6	LWTH	U_Spius_SP	131
7	ECVI	Big_Qualicum	374
7	ECVI	BigQul@Lang	293
7	ECVI	Chemainus	261
7	ECVI	Cowichan	684
7	ECVI	L_Qualicum	209
7	ECVI	Nanaimo_F	546
7	ECVI	Nanaimo_SP	99
7	ECVI	Nanaimo_SU	281
7	ECVI	NanaimoUpper	118
7	ECVI	Nimpkish	127
7	ECVI	Puntled_SU	1350
7	ECVI	Puntledge_F	716
7	ECVI	Quatse_____	38
7	ECVI	Quinsam_____	457
7	ECVI	Woss_Lake	31
8	WCVI	Burman_____	273
8	WCVI	Colonial_Cay	58
8	WCVI	Conuma_____	456
8	WCVI	Gold(83-86)	93
8	WCVI	Kennedy_____	239
8	WCVI	Marble@NVI	507
8	WCVI	Nahmint_____	412
8	WCVI	Nitinat_____	346
8	WCVI	Robertson	386
8	WCVI	San_Juan	196
8	WCVI	Sarita_____	415
8	WCVI	Sooke_____	58
8	WCVI	Stamp_____	303
8	WCVI	Tahsis_____	310
8	WCVI	Thornton_____	518
8	WCVI	Tlupana	66
8	WCVI	Toquart_River	87
8	WCVI	Tranquil	394
8	WCVI	Zeballos_____	80
9	SOMN	Bute_____	72
9	SOMN	Capilano	126
9	SOMN	Devereux	329
9	SOMN	Homathko	52
9	SOMN	Klinaklini	448
9	SOMN	Phillips	213
9	SOMN	Porteau_Cove	357
9	SOMN	Squamish	157
10	NOMN	Ashlulm_____	65
10	NOMN	Atnarko	275
10	NOMN	Chuckwalla	312
10	NOMN	Dean_River	210
10	NOMN	Docee_____	107
10	NOMN	Hirsch_____	474
10	NOMN	Kateen	134
10	NOMN	Kilbella	196
10	NOMN	Kildala_____	441
10	NOMN	Kitimat	482
10	NOMN	Kitlope	201
10	NOMN	Kwinamass	362
10	NOMN	Neechanze	58
10	NOMN	Nusatsum	43
10	NOMN	Saloompt	96
10	NOMN	Takia_River	62
10	NOMN	U_Atnarko	155
10	NOMN	U_Dean	203
10	NOMN	Wannock_____	510
11	NASS	Cranberry	164

#	Region	Population	N
11	NASS	Damdochax	257
11	NASS	Ishkheenickh	199
11	NASS	Kincolith	287
11	NASS	Kiteen	59
11	NASS	Kwinageese	299
11	NASS	Meziadin	195
11	NASS	Owegee__	220
11	NASS	Seaskinnish	99
11	NASS	Snowbank_	54
11	NASS	Teigen__	30
11	NASS	Tseax__	192
12	LWFR-Sp	Big_Silver	167
12	LWFR-Sp	Birkenhead	267
12	LWFR-Sp	Sloquet_Creek	30
12	LWFR-Sp	Upper_Pitt	128
13	LWFR-Su	Maria_Slough	318
14	QCI	Yakoun__	201
15	Alaska	Big_Boulder_C	144
15	Alaska	Chickamin	116
15	Alaska	King_Salmon	200
15	Alaska	Situk_R	114
15	Alaska	Tahini_R	142
15	Alaska	Unuk__	193
17	Taku	Dudidontu_R	240
17	Taku	Kowatua	301
17	Taku	Little_Tatsam.	314
17	Taku	Nahlin__	256
17	Taku	Nakina	421
18	Stikine	Andrew_Creek	144
18	Stikine	Christina	217
18	Stikine	Craig_River	113
18	Stikine	Little_Tahitan	615
18	Stikine	Shakes_Creek	170
18	Stikine	Verrett	467
19	Skeena Upper	Bear_____	182
19	Skeena Upper	Slamgeesh	49
19	Skeena Upper	Sustut__	520
20	Skeena Babine	Babine__	266
21	Skeena Bulkley	Bulkley	585
21	Skeena Bulkley	Morice__	228
22	Skeena Mid	Kispiox_	195
22	Skeena Mid	Kitwanga	288
22	Skeena Mid	Skeena@Terrace	37
22	Skeena Mid	Sweetin_River	54
23	Skeena Lower	Cedar__	116
23	Skeena Lower	Ecstall__	293
23	Skeena Lower	Gitnadoix	42
23	Skeena Lower	L_Kalum	457
23	Skeena Lower	L_Kalum@AC	190
24	Alesek	Blanchard	381
24	Alesek	Klukshu_	432
24	Alesek	Takhanne	187
25	Unuk River	Cripple_Cr	140
50	Puget Sound	Green@Kendal_F	50
50	Puget Sound	Green_F@Soos	100
50	Puget Sound	LittleCampbell	90
50	Puget Sound	Nooksack_SP@Ke	100
50	Puget Sound	Serpentine	46
50	Puget Sound	Skagit_Su	282
50	Puget Sound	Skykomish_Su	75
50	Puget Sound	Soos_Cr_H	94
50	Puget Sound	StillaguamishS	87
50	Puget Sound	White_F_	100
51	Juan de Fuca	Elwha_F_	99
52	Coastal Wash	Hoh_River_SP_S	59
52	Coastal Wash	Queets__	57
52	Coastal Wash	Quinault_F	64
52	Coastal Wash	Solduc_F	98

#	Region	Population	N
53	Low Col	Abernathy_F	100
53	Low Col	Coweeman_	77
53	Low Col	Cowlitz_H_Sp	134
54	Up Col-Sp	Chewuch_SP	100
54	Up Col-Sp	Chiwawa_SP	100
54	Up Col-Sp	Entiat_Sp	64
54	Up Col-Sp	Twisp_SP	100
55	Up Col-Su/F	Deschutes-F	100
55	Up Col-Su/F	Hanford_Reach	270
55	Up Col-Su/F	Okanagan_R	74
55	Up Col-Su/F	Silmilkameen_S	369
55	Up Col-Su/F	Wenatchee_Su	100
56	Snake-Sp/Su	Frenchman-SP	61
56	Snake-Sp/Su	Imnaha__	239
56	Snake-Sp/Su	Johnson_Cr	96
56	Snake-Sp/Su	Marsh_Creek	220
56	Snake-Sp/Su	McCall_Hat	41
56	Snake-Sp/Su	McCall_River	32
56	Snake-Sp/Su	Minam_Creek	143
56	Snake-Sp/Su	Rapid_Sp	220
56	Snake-Sp/Su	Salmon_E.Fork	53
56	Snake-Sp/Su	Secech_R	138
56	Snake-Sp/Su	Snake_S	62
56	Snake-Sp/Su	Tucannon_SP	100
56	Snake-Sp/Su	Up_Salmon-SP	165
56	Snake-Sp/Su	Upper_Valley	77
56	Snake-Sp/Su	Valley_Creek	43
56	Snake-Sp/Su	Wenaha__	43
57	Snake-F	Lyon's_Ferry_F	208
58	North & Central O	Elk_River	70
58	North & Central O	Euchre_Creek	57
58	North & Central O	Nehalem__	53
58	North & Central O	Siuslaw__	37
58	North & Central O	Trask_hat_F	98
58	North & Central O	Trask_hat_SP	48
58	North & Central O	Umpqua_Smith	93
59	South Oregon coas	Cole_River	49
59	South Oregon coas	Hunter_Creek	96
59	South Oregon coas	Lobster_Creek	49
59	South Oregon coas	Nestucca_F	91
59	South Oregon coas	Pistol_River	95
59	South Oregon coas	Umpqua_Sp	136
59	South Oregon coas	Winchuk__	80
61	Klamath/Trinity	Blue_Creek	94
61	Klamath/Trinity	Trinity_F	100
61	Klamath/Trinity	Trinity_SP	100
62	Mid Col-Sp	John_Day_main	36
62	Mid Col-Sp	John_Day_mid	40
62	Mid Col-Sp	John_Day_north	40
62	Mid Col-Sp	Naches_Sp	30
62	Mid Col-Sp	Spring_Creek_H	135
63	Up Willamette	Clackamas_No	79
63	Up Willamette	North_Santiam	97
63	Up Willamette	Sandy__	89
64	Cent Val-F	American_River	69
64	Cent Val-F	Battle_Creek	40
64	Cent Val-F	Butte_F	49
64	Cent Val-F	Feather_F	128
64	Cent Val-F	Merced__	200
64	Cent Val-F	Mokelumne	94
64	Cent Val-F	Sacr_F__	136
64	Cent Val-F	Sacr_LF__	96
64	Cent Val-F	Toulumne__	34
64	Cent Val-F	Yuba__	50
65	Cent Val-Sp	Butte_Sp	166
65	Cent Val-Sp	Feather_Sp	82
65	Cent Val-Sp	Yuba_Sp__	32
66	Coastal Californi	Eel_River_F	143

## Appendix 4. Abbreviations used to describe regions.

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