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Mixed Stock Analysis of Sublegal Chinook Salmon Encountered In The Southeast Alaska Troll Fishery, 2004-2007

by

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Alaska Department of Fish and Game **Divisions of Sport Fish and Commercial Fisheries**

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Weights and measures (metric)

centimeter	cm
deciliter	dL
gram	g
hectare	ha
kilogram	kg
kilometer	km
liter	L
meter	m
milliliter	mL
millimeter	mm

Weights and measures (English)

cubic feet per second	ft^3/s
foot	ft
gallon	gal
inch	in
mile	mi
nautical mile	nmi
ounce	oz
pound	lb
quart	qt
yard	yd

Time and temperature

day	d
degrees Celsius	°C
degrees Fahrenheit	°F
degrees kelvin	K
hour	h
minute	min
second	s

Physics and chemistry

all atomic symbols	
alternating current	AC
ampere	A
calorie	cal
direct current	DC
hertz	Hz
horsepower	hp
hydrogen ion activity (negative log of)	pH
parts per million	ppm
parts per thousand	ppt, ‰
volts	V
watts	W

General

Alaska Administrative Code	AAC
all commonly accepted abbreviations	e.g., Mr., Mrs., AM, PM, etc.
all commonly accepted professional titles	e.g., Dr., Ph.D., R.N., etc.
at	@
compass directions:	
east	E
north	N
south	S
west	W
copyright	©
corporate suffixes:	
Company	Co.
Corporation	Corp.
Incorporated	Inc.
Limited	Ltd.
District of Columbia	D.C.
et alii (and others)	et al.
et cetera (and so forth)	etc.
exempli gratia (for example)	e.g.
Federal Information Code	FIC
id est (that is)	i.e.
latitude or longitude	lat. or long.
monetary symbols (U.S.)	$, ¢
months (tables and figures): first three letters	Jan,...,Dec
registered trademark	®
trademark	™
United States (adjective)	U.S.
United States of America (noun)	USA
U.S.C.	United States Code
U.S. state	use two-letter abbreviations (e.g., AK, WA)

Measures (fisheries)

fork length	FL
mideye-to-fork	MEF
mideye-to-tail-fork	METF
standard length	SL
total length	TL

Mathematics, statistics

all standard mathematical signs, symbols and abbreviations	
alternate hypothesis	H_A
base of natural logarithm	*e*
catch per unit effort	CPUE
coefficient of variation	CV
common test statistics	(F, t, χ^2, etc.)
confidence interval	CI
correlation coefficient (multiple)	R
correlation coefficient (simple)	r
covariance	cov
degree (angular)	°
degrees of freedom	df
expected value	*E*
greater than	>
greater than or equal to	≥
harvest per unit effort	HPUE
less than	<
less than or equal to	≤
logarithm (natural)	ln
logarithm (base 10)	log
logarithm (specify base)	$\log_2$, etc.
minute (angular)	'
not significant	NS
null hypothesis	H_O
percent	%
probability	P
probability of a type I error (rejection of the null hypothesis when true)	α
probability of a type II error (acceptance of the null hypothesis when false)	β
second (angular)	"
standard deviation	SD
standard error	SE
variance	
population	Var
sample	var

FISHERY DATA SERIES NO. 12-34

MIXED STOCK ANALYSIS OF SUBLEGAL CHINOOK SALMON ENCOUNTERED IN THE SOUTHEAST ALASKA TROLL FISHERY, 2004-2007

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ABSTRACT

Southeast Alaska troll permit holders harvest Chinook salmon originating from Alaska, British Columbia, and the west coast of the United States. Only individuals larger than 711 mm may be retained by fishermen; smaller individuals must be released. These encounters with sublegal-sized Chinook salmon are not recorded and the subsequent mortality is unknown. Beginning in 1998, studies were conducted to estimate the rate at which sublegal-sized Chinook salmon are encountered by this fishery. As part of these studies tissue samples were taken from sublegal-sized individuals for estimation of stock composition using mixed stock analysis with genetic information. The estimation of stock composition of tissue samples taken during 2004–2007 is described in this report. Results indicate that the largest contributors to the annual sublegal harvest are the Southern Southeast, Andrew Creek, East Vancouver Island, West Vancouver Island, Upper Columbia River (Summer/Fall), and Central British Columbia Coast stock groups. When each of the seasonal fisheries was considered the composition was more variable, but the same groups remain important contributors.

Key words: Chinook salmon, *Oncorhynchus tshawytscha*, Southeast Alaska, troll fishery, mixed stock analysis, microsatellite

INTRODUCTION

Chinook salmon in the Southeast Alaska commercial troll fishery are harvested in waters east of Cape Suckling and north of Dixon Entrance (Figure 1). The commercial troll fishery harvests mixed stocks[a] of Chinook salmon, including salmon originating from Alaska, British Columbia, and the west coast of the United States and is therefore under the jurisdiction of the 1985 Pacific Salmon Treaty (PST). The treaty provides for cooperative management and research on fisheries harvesting Chinook salmon from populations in Canada and the United States. The PST Annexes and Related Agreements provide for the management of the troll fishery under a quota specified by the Pacific Salmon Commission. This quota depends on the projected abundance of Chinook salmon forecasted by the Chinook Technical Committee (CTC) of the Pacific Salmon Commission using the Chinook salmon model (CTC 2001; Skannes et al. 2011). The Chinook salmon model applies catch, escapement, coded wire tag recovery, and recruitment information to forecast the relative abundance of salmon in treaty fisheries (CTC 2001). Projected abundances rely on estimates of total mortality, which is calculated from both landed mortality and incidental mortality (salmon that are released but die as result of encountering fishing gear). While landed mortality can be estimated by direct observation of harvested salmon, incidental mortality must be obtained by estimating the number of Chinook salmon encountered and their post-release mortality rate. The Alaska Board of Fisheries allocates the harvest quota of Chinook salmon among gear and user groups (Skannes et al. 2011). Since the commercial troll fishery receives the bulk of the harvest quota, effective management of the troll harvest is essential to achieving the Pacific Salmon Treaty objectives (Pryor et al. 2009).

In 1998 the Alaska Department of Fish and Game (ADF&G) initiated a study to estimate the encounter rates for Chinook salmon in Southeast Alaska troll fisheries (Bloomquist et al. 1999). Biological samples were collected from Chinook salmon in the four mixed-district quadrants of Southeast Alaska (Figure 1) and encounter rates (incidental hook and release) were monitored using a new logbook and observer program beginning in July of 1998. These results have been used to update estimates of incidental mortality. In the troll fishery, Chinook salmon larger than

[a] In this report, a "populations" refers to a locally interbreeding group of salmon that is distinguished by a distinct combination of genetic, phenotypic, life history, and habitat characteristics, and a "stock" refers to an aggregation of two or more populations which occur in the same geographic area and are managed as a unit.

711 mm (28 inches) may be kept and sold during periods when retention is allowed, while smaller Chinook salmon are released. During Chinook salmon nonretention periods, both legal-sized and nonlegal sized (sublegal) Chinook must be released. As part of studies to estimate incidental mortality, tissues were sampled from sublegal-sized Chinook salmon for the purpose of genetically estimating stock composition (e.g. Bloomquist et al. 1999, Stopha et al. 2000, Bloomquist and Carlile 2002).

Mixed stock analysis (MSA) uses the genetic stock structure of a species (baseline) to estimate the contribution of each stock to a mixture given the frequency of genetic marks in the baseline populations and the genotypes in the mixture. Between 1998 and 2003, ADF&G used MSA based on a coastwide allozyme database (Teel et al. 1999) to estimate the composition of the commercial troll fishery harvest (Crane et al. 2000; Templin et al. 2011) from 28 reporting regions. More recently the CTC explored the inclusion of MSA estimates as part of the decision-making process. To make this possible, the Genetic Analysis of Pacific Salmonids, a cooperative project among ten laboratories, was funded to develop a standardized DNA database for stock identification of Chinook salmon using new genetic markers (microsatellites) which provided greater resolution than the allozyme data. This process began in 2002, and a standardized baseline was available during the summer of 2005 (Moran et al. 2005; Seeb et al. 2007). At the same time, samples were collected from sublegal-sized Chinook salmon encountered in the summer troll fishery, providing important information for evaluating assumptions of stock-specific survival rates. It has been assumed for management purposes that sublegal stock compositions were similar to those of legal-sized fish, however, initial estimates demonstrated that the stock composition of the sublegal and legal encounters were different (Bloomquist and Carlile 2002; Templin et al. 2012).

Here we present estimates of the stock composition of samples taken from sublegal-sized Chinook salmon encountered during the troll fisheries in Southeast Alaska from accounting years[b] (AY) 2004 to 2007. The study reported here continued the use of mixed stock analysis begun in 1998 (Templin et al. 2012), but switched to using the recently developed baseline of microsatellites to provide independent estimates of the stock composition of the sublegal catch in the 2004–2007 Southeast Alaska troll fishery. These samples were collected as part of a series of studies designed to provide direct measures of encounter rates for the CTC Chinook cohort analysis model (e.g. Bloomquist et al. 1999, Stopha et al. 2000, Bloomquist and Carlile 2002).

OBJECTIVES

The goal of the mixed stock analysis reported here was to estimate the stock composition of sublegal-sized Chinook salmon encountered in the Southeast Alaska commercial troll fisheries during AY 2004-2007. To accomplish this task, the following objectives were to be met:

1. Assay Chinook salmon sampled from encounters the Southeast Alaska troll fishery for individual genotypes at the 13 microsatellite loci in the coastwide baseline.
2. Estimate the relative contribution of each stock group to samples from the 2004–2007 troll fisheries.

[b] The PST accounting year begins with the start of the winter fishery on October 11 of the previous calendar year and ends the following September; e.g. AY 2004 is October 2003 through September 2004.

METHODS

FISHERY SAMPLING

The tissue samples used in this analysis were taken from sublegal-sized Chinook salmon encountered in the Southeast Alaska troll fishery (Figure 1). During the 2004–2007 seasons, a subset of the participants in the troll logbook program retained sublegal Chinook salmon for biological sampling and delivered these fish in ports that possessed an adequate cold storage facility to keep fish cold until they could be processed. This program was continued through the spring season of AY 2007. Port samplers in Yakutat, Pelican, Petersburg, Port Alexander, Hoonah, Sitka, Craig, Wrangell, Juneau and Ketchikan handed out sublegal logbooks and processed sublegals retained by participants. An axillary process was dissected from each of the sampled Chinook salmon, placed in a 2 ml cryovial, and preserved in at least 95% denatured ethanol. At the end of the season, samples were shipped back to the ADF&G Gene Conservation Laboratory in Anchorage for analysis.

Target sample sizes were set for each fishing period and port to estimate the stock composition of the harvest at acceptable levels of accuracy and precision given the potential availability of samples. Thompson (1987) demonstrated that under a worst-case scenario with no prior information, multinomial proportions could be estimated to within 5% of the true value 90% of the time with a sample size of approximately 400. Under the same assumptions, multinomial proportions can be estimated to within 7% of the true value 90% of the time with a sample size of approximately 200. The overall sampling goals per fishery and per port are listed in Table 2.

Observers were deployed only during the summer troll fishery of AY 2004 and 2005 in District 113, where a large portion of the Chinook salmon catch was taken. The project allowed about 80 days at sea for observers. All encountered sublegal Chinook salmon were retained for coded wire tag, MSA, and scale sampling. The preseason goal for observer MSA sampling was 150 sublegal Chinook salmon (Table 2).

LABORATORY ANALYSIS

Samples were assayed for DNA loci developed by the Genetic Analysis of Pacific Salmonids group for use in Treaty fisheries (Table 3). DNA was extracted from fin clips using DNeasy 96 tissue kits (QIAGEN, Valencia CA). Polymerase chain reaction (PCR) was carried out in 10 ul reaction volumes (10 mM Tris-HCl, 50 mM KCl, 0.2 mM each dNTP, 0.5 units Taq DNA polymerase (Promega, Madison, WI)) using Dual 384-Well GeneAmp Thermal Cyclers (Applied Biosystems, Foster City, CA). Primer concentrations, $MgCl_2$ concentrations and the corresponding annealing temperature for each primer are presented in Table 3. PCR fragment analysis was done on an AB 3730 capillary DNA sequencer, where 0.5 ul PCR product was loaded into a 96 well reaction plate along with 0.5 ul of GS500LIZ (AB) internal lane size standard and 9.0 ul of Hi-Di (AB). PCR bands were visualized and separated into bin sets using AB GeneMapper software v3.7 (Applied Biosystems). All laboratory analyses followed protocols accepted by the CTC.

Genetic data were collected as individual multilocus genotypes for the 13 microsatellite loci currently included in the CTC standardized baseline (Seeb et al. 2007). According to the convention implemented by the CTC, at each locus, a standardized allele is one that has a recognized holotype specimen from which the standardized allele can be reproduced using

commonly applied fragment analysis techniques. By the process of sizing the alleles from the holotype specimens, any individual laboratory should be able to convert allele sizes obtained in the laboratory to standardized allele names.

Genotype data were stored as GeneMapper (*.fsa) files on a network drive that was backed up nightly. Long term storage of the data was in the Gene Conservation Laboratory's Oracle database (LOKI) on a network drive maintained by ADF&G computer services.

For quality control, the following measures were implemented to ensure the quality and consistency of data produced by laboratory procedures:

1) Each individual was assigned a unique accession identifier. When DNA was extracted or analyzed from each individual, a sample sheet was created that linked each individual's code to a specific well in a uniquely numbered 96-well plate. This sample sheet accompanied the individual through all phases of a project, minimizing the risk of misidentification of samples.

2) Genotypes were assigned to individuals using a double-scoring system. Two researchers independently designated allele scores for each individual. Discrepancies between the two sets of scores were then resolved with one of three possible outcomes: 1) one score was accepted and the other rejected, 2) both scores were rejected and the score was blanked, or 3) the sample was rerun.

3) Approximately 8% of the individuals, eight samples from each 96-well DNA extraction plate, were reanalyzed for all loci. This ensured that the data are reproducible and any errors created from the processing of individual plates were corrected.

4) Any individual missing data at five or more loci was removed from the data set.

5) The final data were checked for duplicated multilocus genotypes for indication of errors caused prior to extraction of the DNA. When duplicate genotypes were found, the genotype was attributed to the first individual and subsequent individuals with the same genotype were removed from the analysis to ensure that any given individual did not appear more than once in the baseline.

STOCK COMPOSITION ANALYSIS

Stock composition estimates for each of the 44 stock groups (Table 1), were identified by analysis generated using BAYES (Pella and Masuda 2001). BAYES employs a Bayesian algorithm to separate stocks in a mixture. Individual population or stock contributions to the mixture were first estimated and then summed into reporting regions. Three independent Monte Carlo Markov chains of 15,000 iterations were run to estimate stock composition. Initial starting values were randomly generated for each population for each chain. A flat prior distribution was used, in which each reporting group was given equal contribution and populations had equal contributions to the region. The sum of the prior parameters was set to one (prior weight), which is equivalent to adding one fish to each mixture (Pella and Masuda 2001), thus minimizing the overall influence of the prior distribution. The chains were run until convergence was reached when the shrink factor was < 1.2 for the three chains (Pella and Masuda 2001). The first half of each chain was discarded in order to dispose of the influence of the initial values and the remaining half from each chain was combined with the others and treated as the posterior distribution of the stock composition estimates. The means, standard deviations, and 90%

credibility indices were calculated from the posterior distribution as estimates of stock composition.

REPORTING RESULTS

For ease of interpretation, the 44 reporting groups were condensed into 17 fine-scale reporting groups for all figures. The 17 reporting groups included 16 individual reporting groups, each of which were estimated to have contributed at least 5%, and an additional "Other" group composed of the remaining 28 reporting groups. Comparisons between microsatellite (this report) and allozymes (Templin et al. 2011) must be interpreted cautiously as both the number of populations and reporting groups changed between the studies. Templin et al. (2011) included 252 populations with 28 reporting groups while CTC Version 2.1 baseline includes 176 populations and 44 reporting groups. In several cases reporting groups from Templin et al. (2011) were split into additional reporting groups as a result of the increased discrimination resulting from microsatellites: Mid/North Oregon Coastal to Mid Oregon Coast and North Oregon Coast; Lower Columbia River to Lower Columbia River (Spring) and Lower Columbia River (Fall); Upper Colombia River (Summer/Fall) and Snake River (Fall) to Upper Columbia River (Summer/Fall) and Snake River (Fall); Puget Sound to South Puget Sound and North Puget Sound; Thompson River to Lower Thompson River, South Thompson River and North Thompson River; Skeena River to Lower Skeena River and Upper Skeena River; and Alaska/British Columbia Transboundary to Upper Stikine River, Taku River, and Andrews Creek.

RESULTS

PST ACCOUNTING YEAR 2004

Fishery Sample Collection

A total of 1,100 sublegal-size Chinook salmon were sampled during troll fisheries in AY 2004 (Table 2). Sample goals for overall seasonal troll fisheries were not met. However goals were met for some individual ports.

Laboratory Results

Samples of sublegal-size Chinook salmon from the AY 2004 troll fisheries were assayed for genotypes for the 13 microsatellite loci in the CTC standardized baseline. The average genotyping failure rate across all samples was 6%. Two collections (Wrangell and Hoonah) from the 2004 spring fishery had very high failure rates (53% for Wrangell, and 23% for Hoonah), probably due to poor tissue quality. During quality control procedures a total of 94 fish were reanalyzed for all markers for a total of 1,222 comparisons. No inconsistencies were found in the mixture data.

Stock Composition

Based on the mixed stock analysis estimates, the largest portion of the sublegal-sized Chinook salmon encountered during the AY 2004 early winter fishery was from the Southern Southeast Alaska stock group (19%; Figure 2, Appendix A2). The East Coast Vancouver Island, West Coast Vancouver Island, Andrew Creek and Upper Columbia River (Summer/Fall) stock groups

all comprised approximately equal proportions (11–14%). The Willamette River stock group comprised 7% of the early winter sublegal encounters.

The largest portion to the late winter samples was the West Coast Vancouver Island stock group (27%; Figure 3, Appendix A2), followed by the Southern Southeast Alaska stock group (15%), Upper Columbia River (Summer/Fall) stock group (12%), and Andrew Creek stock group (10%). East Coast Vancouver Island, Willamette River, Upper Stikine River, and Lower Skeena stock groups each comprised 5–8% of the late winter samples.

The Andrew Creek stock group made up the majority of the spring fishery samples (52%; Figure 4, Appendix A2), with the remainder composed primarily of the Southern Southeast Alaska (17%) and West Coast Vancouver Island (15%) stock groups.

The largest portion of the summer fishery sample was the Upper Columbia River (Summer/Fall) stock group (23%; Figure 5, Appendix A2), followed by the West Coast Vancouver Island (14%) and Southern Southeast Alaska (10%) stock groups. The East Coast Vancouver Island, Andrew Creek, and South Thompson River stock groups each comprised approximately 6–9% of the summer sublegal sample.

PST ACCOUNTING YEAR 2005

Fishery Sample Collection

A total of 1,455 sublegal-size Chinook salmon were sampled during troll fisheries in AY 2005 (Table 2). Sample goals for the early winter, late winter, and spring troll fisheries were not met. This was due primarily to fewer permit holders participating in the fishery and a lack of sublegal-size Chinook salmon available for sampling. Sample goals for the 2005 summer troll fishery were met or exceeded at all ports.

Laboratory Results

Sublegal-size Chinook from the AY 2005 troll fisheries were assayed for genotypes for the 13 microsatellite loci in the CTC standardized baseline. The average genotyping failure rate across all samples was 2%. During quality control procedures a total of 113 fish were reanalyzed for all markers for a total of 1,469 comparisons. An inconsistency rate of 1% was found in the mixture data due to scoring errors.

Stock Composition

Based on the mixed stock analysis estimates, the largest portion of the samples from the early winter fishery were the Andrew Creek (25%) and Southern Southeast Alaska (16%) stock group (Figure 2, Appendix A3) followed by the East Coast Vancouver Island (14%) and West Coast Vancouver Island (9%) stock groups. Upper Columbia River (Summer/Fall) and Central British Columbia Coast stock groups comprised much of the remainder (7–8% each).

The largest portion of the sample from the late winter fishery were the Andrew Creek (30%) and West Coast Vancouver Island (23%) stock groups (Figure 3, Appendix A3), followed by the East Coast Vancouver Island stock group (10%). The Upper Columbia River (Summer/Fall), Northern Puget Sound, Southern Southeast Alaska, and Central British Columbia Coast stock groups each contributed 6–7% of the total.

In the spring fishery, Andrew Creek (36%) and Southern Southeast Alaska (27%) stock groups were again prevalent, followed by the Central British Columbia Coast stock group (12%; Figure 4, Appendix A3).

The largest portions of the sample from the summer fishery were the Upper Columbia River (Summer/Fall; 13%), Southern Southeast Alaska (12%), and Central British Columbia Coast (10%) stock groups (Figure 5, Appendix A3). The South Thompson River, Andrew Creek, West Coast Vancouver Island, East Coast Vancouver Island, and Washington Coast stock groups comprised most of the remainder (6–9% each).

PST ACCOUNTING YEAR 2006

Fishery Sample Collection

A total of 1,127 sublegal-size Chinook salmon were sampled during troll fisheries in AY 2006 (Table 2). Sample goals for overall seasonal troll fisheries were not met. However goals were met for some individual ports.

Laboratory Results

Sublegal-size Chinook from the AY 2006 troll fisheries were assayed for genotypes for the 13 microsatellite loci in the CTC standardized baseline. The average genotyping failure rate across all samples was 5%. During quality control procedures a total of 101 fish were reanalyzed for all markers for a total of 1,313 comparisons. Initial error rates for some summer fishery collections were due to incorrect collection sorting in identification maps during original runs. These errors were corrected. A few other errors were due to contaminated samples, and one sample was incorrectly identified as a Chinook salmon.

Stock Composition

Based on the mixed stock analysis estimates, the largest portion of the samples from the early winter fishery was the Southern Southeast Alaska stock group (22%; Figure 2, Appendix A4) followed by the East Coast Vancouver Island (16%), Andrew Creek (13%), Central British Columbia Coast (12%), and West Coast Vancouver Island (10%) stock groups. The King Salmon River stock group comprised 5% of the samples.

The largest portion of the sample from the late winter fishery was the Andrew Creek stock group (32%; Figure 3, Appendix A4), followed by the East Coast Vancouver Island (17%) and Southern Southeast Alaska (11%) stock groups. Much of the remainder was comprised of the West Coast Vancouver Island and Central British Columbia Coast stock groups (7% each).

In the spring fishery, Andrew Creek (29%) and Southern Southeast Alaska (26%) stock groups were again prevalent (Figure 4, Appendix A4), followed by the Central British Columbia Coast stock group (11%). East and West Coast Vancouver Island stock groups comprised much of the remainder (5–7% each).

Similar to other 2006 fisheries, the largest portion of the sample from the summer fishery were the Andrew Creek (14%) and Southern Southeast Alaska (18%) stock groups (Figure 5, Appendix A4), followed by the Central British Columbia Coast (13%), West Coast Vancouver Island (11%), and East Coast Vancouver Island (10%) stock groups. The Upper Columbia River (Summer/Fall) and South Thompson River comprised much of the remainder (5–8% each).

PST ACCOUNTING YEAR 2007

Fishery Sample Collection

A total of 682 sublegal-size Chinook salmon were sampled during troll fisheries in AY 2007 (Table 2). Samples were not collected for the summer fishery, and sublegal sampling was discontinued after the AY 2007 spring troll fishery. Sample goals for overall seasonal troll fisheries were not met. However goals were met for some individual ports.

Laboratory Results

Sublegal-size Chinook from the AY 2007 troll fisheries were assayed for genotypes for the 13 microsatellite loci in the CTC standardized baseline. The average genotyping failure rate across all samples was 9%. During quality control procedures a total of 60 fish were reanalyzed for all markers for a total of 780 comparisons. High failure rates for two collections were due to poor sample quality and 13 individuals that were not Chinook salmon.

Stock Composition

Based on the mixed stock analysis estimates, the largest portion of the samples from the early winter fishery were the Andrew Creek (25%) and Southern Southeast Alaska (22%) stock groups (Figure 2, Appendix A5) followed by the East Coast Vancouver Island stock group (19%). Contributions of Upper Columbia River (Summer/Fall), North Puget Sound, and Central British Columbia Coast stock groups were also important (5–7% each).

The largest portions of the sample from the late winter fishery were the Southern Southeast Alaska (20%) and Andrew Creek (17%) stock groups (Figure 3, Appendix A5). The Upper Columbia River (Summer/Fall), South Thompson, East Coast Vancouver Island, West Coast Vancouver Island, Central British Columbia Coast, and Lower Skeena stock groups comprised much of the remainder (5–10% each).

In the spring fishery, Andrew Creek (45%) and Southern Southeast Alaska (27%) stock groups were again prevalent, followed by the Central British Columbia Coast stock group (6%; Figure 4, Appendix A5).

DISCUSSION

Mixed stock analysis based on the microsatellite baseline for Chinook salmon was used to estimate the stock composition of sublegal samples from troll fishery harvests in Southeast Alaska in AY 2004 through 2007. The estimates indicate that the largest contributors to the annual sublegal incidental encounters are the Southern Southeast, Andrew Creek, East Vancouver Island, West Vancouver Island, Upper Columbia (Summer/Fall), and Central British Columbia Coast stock groups (60–91% combined in each fishery sample in all years). When each of the seasonal fisheries is considered, the composition is more variable, but these stock groups remain important contributors.

Stock-specific estimates indicate that the largest portion of sublegals encountered in both winter fishery seasons (AY 2004–2007) were the Southern Southeast and Andrew Creek stock groups (31–47% combined in early winter, 25–43% in late winter), and East and West Vancouver Island stocks groups (23–26% combined in early winter, 13–34% in late winter). The contribution from the Vancouver Island stock groups in the late winter decreased each year.

The largest contributors to samples from the spring fisheries AY 2004 through 2007 were the Andrew Creek and Southern Southeast Alaska stock groups (54–72% combined). This might result from concentrating harvest on Alaska stocks during the spring fisheries. An additional 10–23% of the AY 2004 through 2007 sublegal sample came from the Central British Columbia and Vancouver Island stock groups.

A large portion of the summer sublegal samples from AY 2004 through 2006 was from the Upper Columbia River (Summer/Fall) stock group (8–23% of the harvest). The Southern Southeast Alaska stock group contributed more than 10% in all summer samples. The Andrew Creek stock group contributed 6–14% to the summer samples. An additional 25–33% of the AY 2004 through 2006 sublegal sample came from the Central British Columbia and Vancouver Island stock groups. These results are consistent with those reported for the AY 1998–2003 sublegal stock composition in which Upper Columbia River, West Coast Vancouver Island and Southern Southeast Alaska (including Andrew Creek) are dominant (Templin et al. 2012).

These results demonstrate the continued successful application of MSA to estimate the stock composition of the sublegal-sized Chinook salmon encountered in the Southeast Alaska troll fisheries. Comparison of these results with estimates based on coded-wire tags and the Pacific Salmon Commission Chinook model will require additional analysis, but already information is available on the harvest of stocks of Chinook salmon that were not observable under previous methods.

CONCLUSIONS

1. The major stocks present in samples from sublegal-sized Chinook salmon encountered in the Southeast Alaska troll fisheries on an annual basis are the Southern Southeast, Andrew Creek, East Vancouver Island, West Vancouver Island, Central British Columbia Coast and Upper Columbia (Summer/Fall) stock groups.
2. During the winter and spring fisheries, sublegal-sized Chinook salmon encountered are mainly composed of stocks from southern Southeast Alaska and Vancouver Island.
3. During the summer, sublegal-sized Chinook salmon from the Upper Columbia, Vancouver Island, and Southeast Alaska are the main portion of the samples taken.

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TABLES AND FIGURES

Table 1.–Broad-scale reporting regions for the Chinook salmon coastwide baseline (Seeb et al. 2007) used to report stock composition of Southeast Alaska troll fishery harvests. Population numbers are listed in Appendix A1.

	Reporting regions	Population numbers
1	Central Valley Fall	1-4
2	Central Valley Spring	5-8
3	Central Valley Winter	9
4	California Coast	10-11
5	Klamath River	12-14
6	N California/S Oregon Coast	15
7	Rogue River	16-17
8	Mid Oregon Coast	18-26
9	North Oregon Coast	27-36
10	Lower Columbia River Spring	37-39
11	Lower Columbia River Fall	40-42
12	Willamette River	43-44
13	Mid Columbia River Fall	45
14	Mid and Upper Columbia River Spring	46-51
15	Deschutes River Fall	52-53
16	Upper Columbia River Summer/Fall	54-57
17	Snake River Fall	58
18	Snake River Spring/Summer	59-66
19	Washington Coast	67-74
20	Hood Canal	75-76
21	South Puget Sound	77-82
22	North Puget Sound	83-97
23	Jaun de Fuca	98-100
24	Lower Fraser River	101-103
25	Lower Thompson River	104-105
26	South Thompson River	106-108
27	North Thompson River	109-112
28	Mid Fraser River	113-117
29	Upper Fraser River	118-121
30	East Vancouver Island	122-126
31	West Vancouver Island	127-133
32	South BC Mainland	134-135
33	Central BC Coast	136-138
34	Lower Skeena River	139-140
35	Upper Skeena River	141-143
36	Nass River	144-147
37	Upper Stikine River	148
38	Taku River	149-152
39	Southern Southeast Alaska	153-158
40	Andrews Creek	159-162
41	N. Southeast Alaska	163
42	Chilkat River	164-165
43	Alsek River	166
44	Situk River	167

Table 2.–Sample sizes by port for collections of sublegal Chinook salmon encountered in the Southeast Alaska troll fishery, AY 2004-2007.

			AY 2004		AY 2005		AY 2006		AY 2007	
Fishery	Port		Goal	Actual	Goal	Actual	Goal	Actual	Goal	Actual
Winter	Early - Oct to Dec 31									
	Sitka		190	93	150	114	150	70	200	62
	Yakutat		30	11	30	0	30	15	40	15
	Juneau		30	11	30	12	30	25	40	19
	Ketchikan		30	26	30	0	30	30	40	39
	Craig		0	0	0	45	0	0	40	21
	Petersburg		30	27	30	29	30	26	40	27
		Total	310	168	270	200	270	166	400	183
	Late - Jan to Apr 15									
	Sitka		130	130	190	154	190	150	200	70
	Yakutat		45	22	30	26	30	1	40	6
	Juneau		0	0	30	3	30	20	40	1
	Ketchikan		0	0	30	0	30	40	40	40
	Craig		0	0	30	38	30	10	40	14
	Petersburg		0	0	30	19	30	24	40	14
		Total	175	158	340	240	340	245	400	145
Spring	Apr 22 to Jun 30									
	Sitka		165	80	165	145	160	83	160	165
	Hoonah		45	29	45	45	40	27	40	8
	Petersburg		45	17	45	15	40	38	40	45
	Wrangell		45	33	45	10	40	10	40	16
	Ketchikan		115	26	115	103	100	100	100	100
	Juneau		20	20	20	29	20	20	20	20
		Total	435	205	435	347	400	278	400	354
Summer	All retention periods – Jul 1 to Sep 20									
	Sitka		300	338	300	339	500	224		
	Yakutat		30	13	30	65	50	31		
	Pelican		30	58	30	46	50	36		
	Hoonah		30	39	30	30	50	38		
	Ketchikan		30	17	30	30	50	50		
	Craig		40	56	40	60	50	47		
	Petersburg		30	14	30	30	50	12		
	Sitka - observers		150	34	150	68				
		Total	640	569	640	668	800	438		

Table 3.–Microsatellite loci developed by the Genetic Analysis of Pacific Salmonids group for use in Pacific Salmon Treaty fisheries. Observed numbers of alleles at each locus are given for baseline Version 2.1.

Locus	Reference	Primer concentration (µM)	Annealing temperature (°C)	$MgCl_2$ (mM)	Observed no. of alleles
Ogo2	Olsen et al. 1998	0.2	60	1.75	27
Ogo4	Olsen et al. 1998	0.06	60	1.75	20
Oki100	DFO unpublished	0.4	52	1.75	47
Omm1080	Rexroad et al. 2001	0.25	54	2.25	72
Ots201b	Grieg et al. 2003	0.125	60	1.75	53
Ots208b	Grieg et al. 2003	0.2	60	1.75	57
Ots211	Grieg et al. 2003	0.1	60	1.75	45
Ots212	Grieg et al. 2003	0.1	60	1.75	36
Ots213	Grieg et al. 2003	0.15	54	2.25	52
Ots3M	Grieg and Banks 1999	0.4	48	1.75	19
Ots9	Banks et al. 1999	0.4	62	1.75	9
OtsG474	Williamson et al. 2002	0.1	60	1.75	19
Ssa408	Cairney et al. 2000	0.275	60	1.75	39

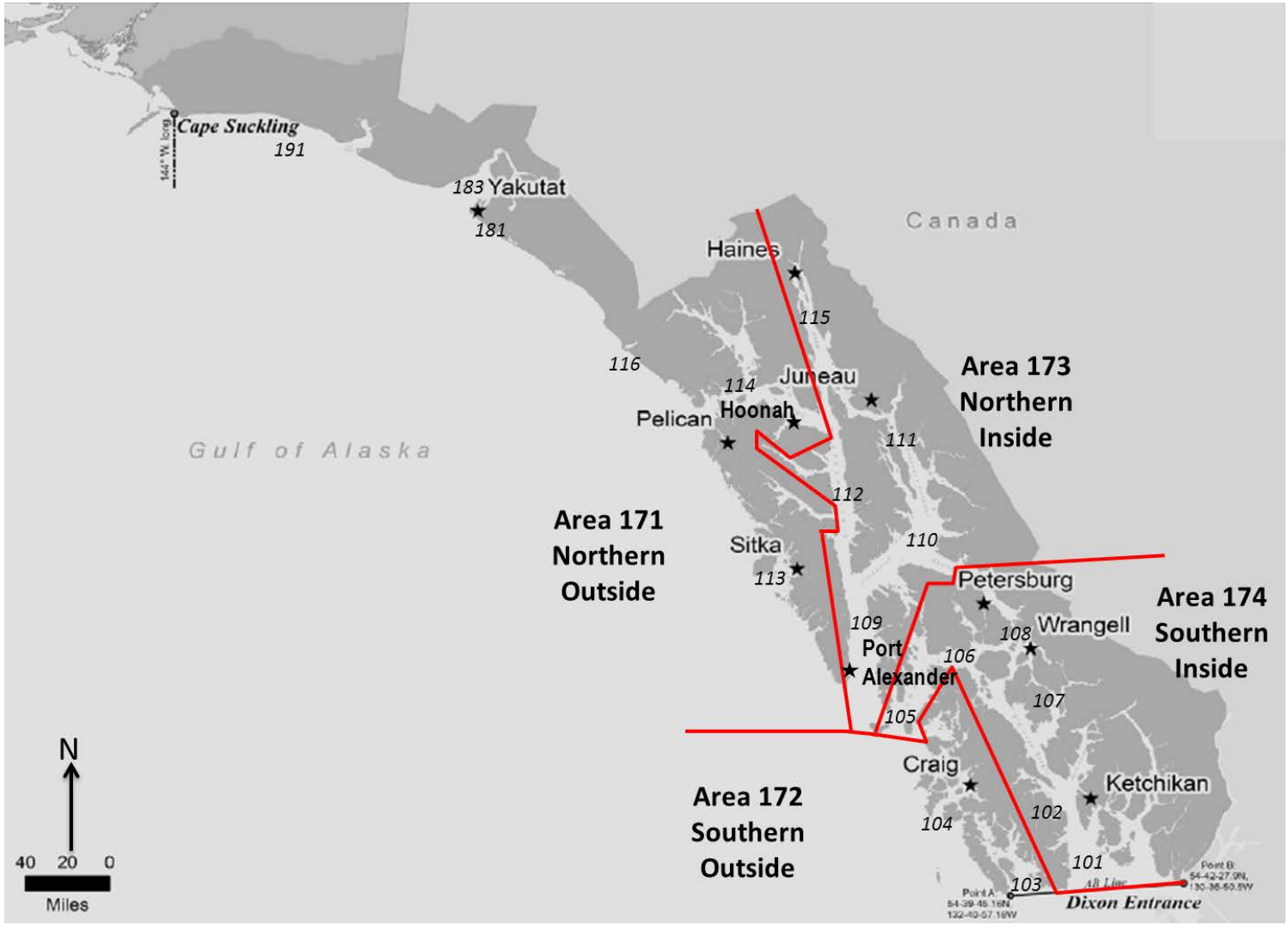

Figure 1.–Location of Southeast Alaska troll fishing quadrants and ports**.**

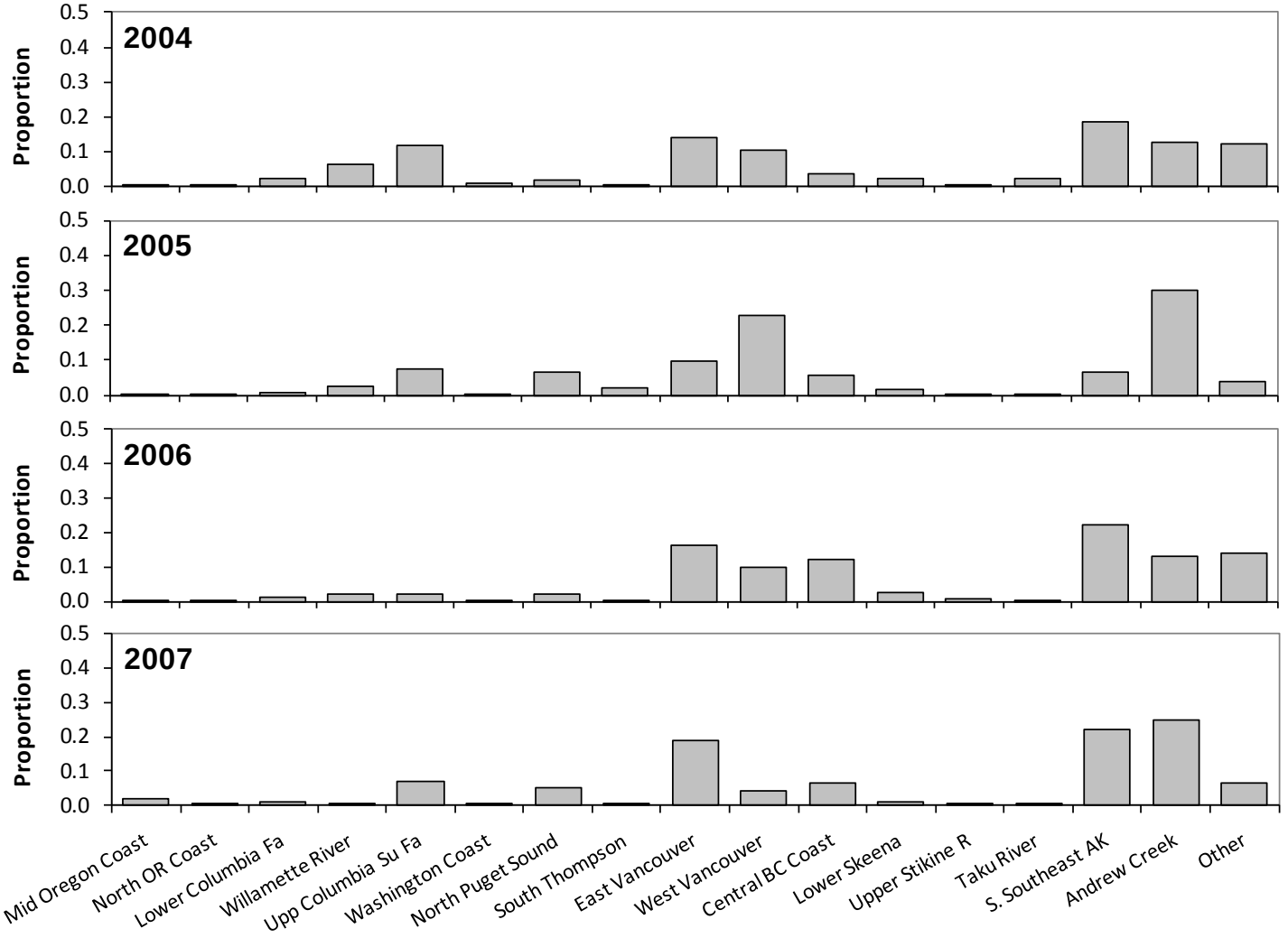

Figure 2.– Estimated contributions and 90% confidence intervals of 17 stock groups to collections of sublegal Chinook salmon encountered in the early winter troll fishery in Southeast Alaska 2004–2007.

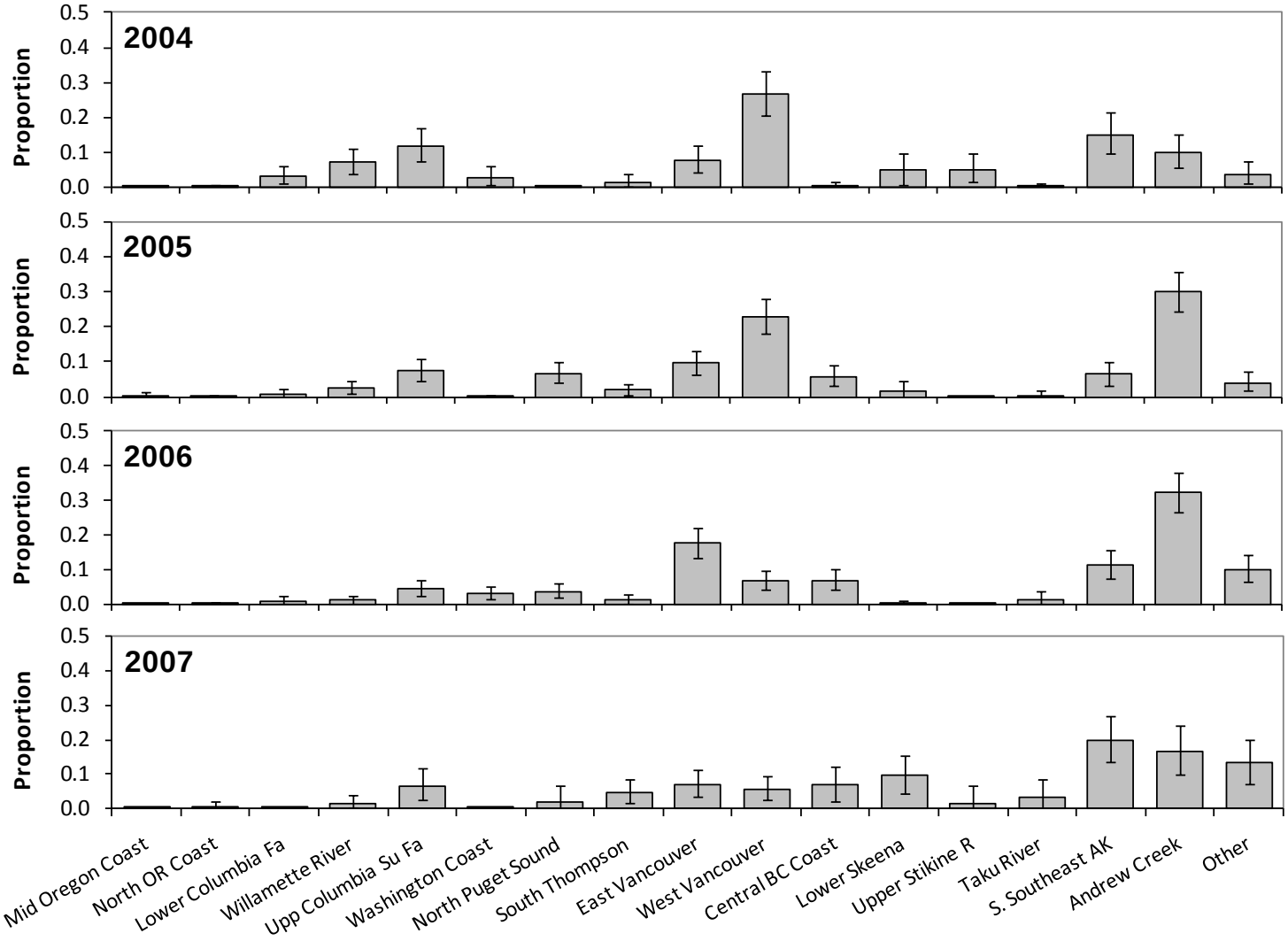

Figure 3.–Estimated contributions and 90% confidence intervals of 17 stock groups to collections of sublegal Chinook salmon encountered in the late winter troll fishery in Southeast Alaska 2004–2007.

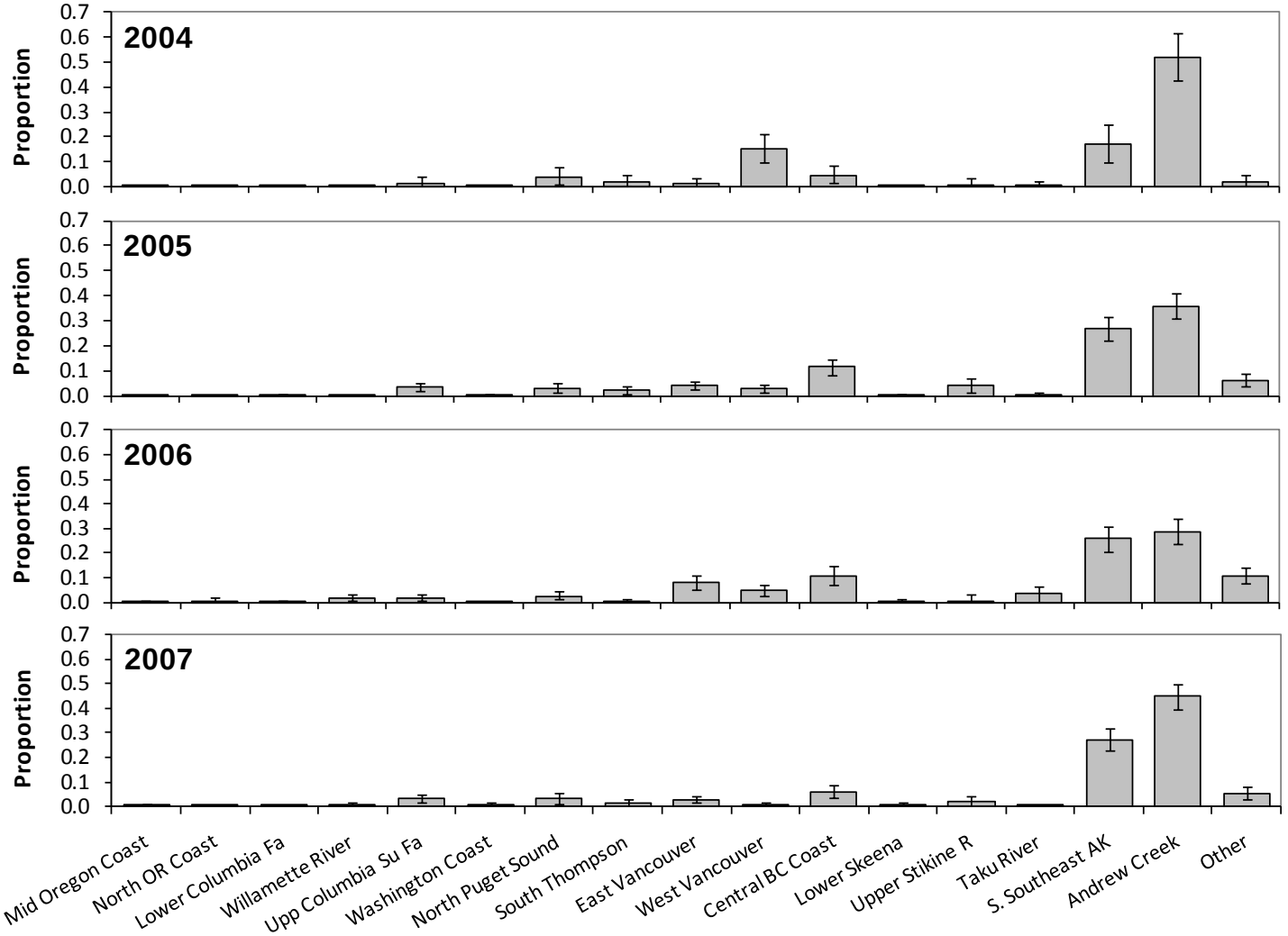

Figure 4.–Estimated contributions and 90% confidence intervals of 17 stock groups to collections of sublegal Chinook salmon encountered in the spring troll fishery in Southeast Alaska 2004–2007.

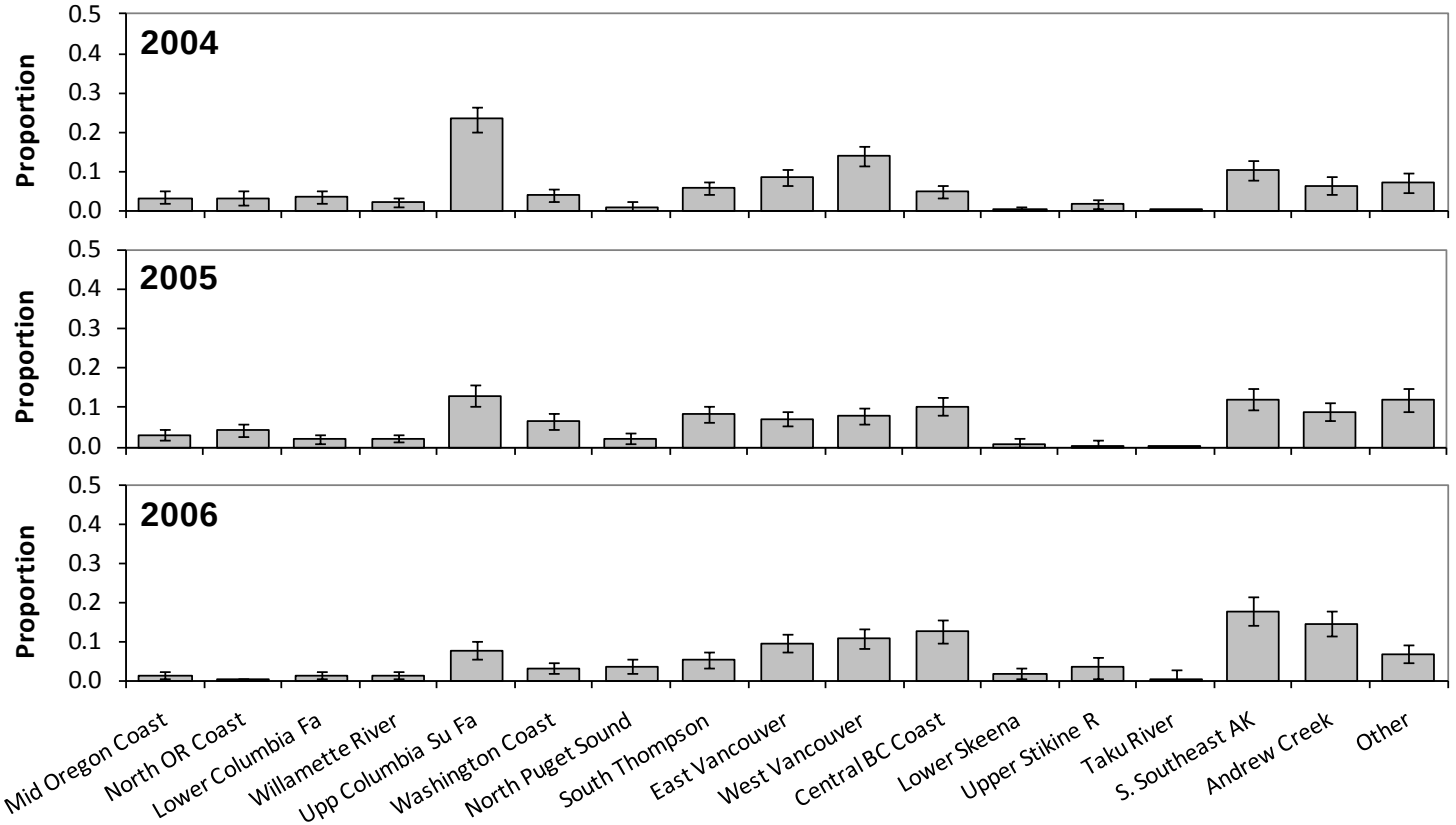

Figure 5.–Estimated contributions and 90% confidence intervals of 17 stock groups to collections of sublegal Chinook salmon encountered in the summer troll fishery in Southeast Alaska 2004–2007.

APPENDICES

Appendix A1.–Location and collection details for each population of Chinook salmon included in the coastwide baseline of microsatellite data**.** Population numbers given correspond to the population numbers referenced in Table 2.

Region #	Region	Population #	Population	Run time	Origin	Life Stage	Collection Date
1	Central Valley (Fall)	1	Battle Creek	Fa	W	Adult	2002, 2003
		2	Butte Creek	Fa	W	Adult	2002, 2003
		3	Feather Hatchery fall	Fa	H	Adult	2003
		4	Stanislaus River	Fa	W	Adult	2002
2	Central Valley (Spring)	5	Butte Creek	Sp	W	Adult	2002, 2003
		6	Deer Creek	Sp	W	Adult	2002
		7	Feather Hatchery	Sp	H	Adult	2003
		8	Mill Creek	Sp	W	Adult	2002, 2003
3	Central Valley (Winter)	9	Sacramento River winter	Wi	W/H	Adult	1992, 1993, 1994, 1995, 1997, 1998, 2001, 2003, 2004
4	California Coast	10	Eel River	Fa	W	Adult	2000, 2001
		11	Russian River	Fa	W	Juvenile	2001
5	Klamath River	12	Klamath River	Fa	W	Adult	2004
		13	Trinity Hatchery	Fa	H	Adult	1992
		14	Trinity Hatchery	Sp	H	Adult	1992
6	N California/S Oregon	15	Chetco	Fa	W	Adult	2004
7	Rogue River	16	Applegate	Fa	W	Adult	2004
		17	Cole Rivers Hatchery	Sp	H	Adult	2004
8	Mid Oregon Coast	18	Coos Hatchery	Fa	H	Adult	2005
		19	South Coos	Fa	W, H	Adult	2000, 2005
		20	Coquille	Fa	W	Adult	2000
		21	Elk River	Fa	H	Adult	2004
		22	Millicoma River	Fa	W	Adult	2000
		23	Sixes River	Fa	W	Adult	2000, 2005
		24	Siuslaw	Fa	W	Adult	2001
		25	South Umpqua	Fa	H,W	Adult	2002
		26	Umpqua	Sp	W	Adult	2004
9	North Oregon Coast	27	Alsea	Fa	W	Adult	2004
		28	Nehalem	Fa	W	Adult	2000, 2002-1, 2002-2
		29	Kilchis River	Fa	Unk	Adult	2000, 2005
		30	Necanicum Hatchery	Fa	H,W	Adult	2005
		31	Nestucca Hatchery	Fa	H	Adult	2004, 2005
		32	Salmon River	Fa	Unk	Adult	2003
		33	Trask River	Fa	W	Adult	2005

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Region #	Region	Population #	Population	Run time	Origin	Life Stage	Collection Date
9	North Oregon Coast	34	Wilson River	Fa	W	Adult	2005
		35	Yaquina River	Fa	W	Adult	2005
		36	Siletz	Fa	W	Adult	2000
10	Lower Columbia River (Spring)	37	Cowlitz H. spring	Sp	H		2004
		38	Kalama H. spring	Sp	H		2004
		39	Lewis H. spring	Sp	H		2004
11	Lower Columbia River (Fall)	40	Cowlitz H. fall	Fa	H		2004
		41	Lewis fall	Fa	W	Adult	2003
		42	Sandy	Fa	W	Adult	2002, 2004
12	Willamette River	43	McKenzie	Sp	H	Adult	2002, 2004
		44	North Santiam	Sp	H	Adult	2002, 2004-1, 2004-2
13	Mid Columbia River Tule (Fall)	45	Spring Creek	Fa	H		2001, 2002
14	Mid and Upper Columbia River (Spring)	46	Carson H.	Sp	H		2001, 2004
		47	John Day	Sp	W	Juvenile, Adult	2000-1, 2000-2, 2000-3, 2000-4, 2000-5, 2000-6, 2004
		48	Upper Yakima	Sp	H	Adult, Mixed	1998, 2003
		49	Warm Springs Hatchery	Sp	H		2002, 2003
		50	Wenatchee Hatchery	Sp	H	Adult	1998, 2000
		51	Wenatchee River	Sp	W	Adult	1993, 1998, 2000
15	Deschutes River (Fall)	52	Upper Deschutes River	Su/Fa	W	Juvenile	1998, 1999, 2002
		53	Lower Deschutes R.	Fa	W		1999-1, 1999-2, 2001, 2002
16	Upper Columbia River (Summer/Fall)	54	Hanford Reach CR	Su/Fa	W	Adult, ?	1999, 2000-1, 2000-2, 2000-3, 2001-1,
		55	Methow R. summer	Su/Fa	W		1992, 1993, 1994
		56	Wells Dam	Su/Fa	H		1993-1, 1993-2
		57	Wenatchee River	Su/Fa	W	Adult	1993-1, 1993-2
17	Snake River (Fall)	58	Lyons Ferry	Fa	W	Adult	2002-1, 2002-2, 2003-1, 2003-2
18	Snake River (Spring/Summer)	59	Imnaha R.	Sp/Su	W		1998, 2002, 2003
		60	Minam R.	Sp/Su	W		1994, 2002, 2003
		61	Newsome Creek	Sp/Su	W	Adult	2001, 2002
		62	Rapid River H.	Sp/Su	H		1997, 1999, 2002
		63	Sesech R.	Sp/Su	W		2001, 2002, 2003
		64	Tucannon	Sp/Su	W	Adult	2003-1, 2003-2
		65	Tucannon	Sp/Su	H	Adult	2003

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Region #	Region	Population #	Population	Run time	Origin	Life Stage	Collection Date
18	Snake River (Spring/Summer)	66	West Fork Yankee Fork	Sp/S	W		2005
19	Washington Coast	67	Forks Creek	Fa	H	Adult	2005
		68	Hoh River	Fa	W	Adult	2004, 2005
		69	Humptulips	Fa	H	Adult	1990
		70	Makah Hatchery	Fa	H	Adult	2001, 2003
		71	Queets	Fa	W	Adult	1996, 1997
		72	Quillayute/ Bogachiel	Fa	W	Adult	1995-1, 1995-2, 1995-3, 1996-1, 1996-2
		73	Quinault Hatchery	Fa	H	Adult	2006
		74	Sol Duc	Sp	H	Adult	2003
20	Hood Canal	75	George Adams Hatchery	Fa	H	Adult	2005
		76	Hamma Hamma River	Fa	W	Adult	1999, 2000, 2001
21	South Puget Sound	77	Clear Creek	Fa	H	Adult	2005
		78	Hupp Sp Hatchery	Sp	H	Adult	2002
		79	South Prairie Creek	Fa	W	Adult	1998, 1999, 2002
		80	Soos Creek	Fa	H	Adult	1998-1, 1998-2, 2004
		81	Voights Hatchery	Fa	H	Adult	1998
		82	White River	Sp	H	Adult	1998-1, 1998-2, 2002
22	North Puget Sound	83	L. Sauk River	Su	W		1998
		84	Marblemount Hatchery	Sp	H		1997
		85	Marblemount Hatchery	Su	H		1997
		86	NF Nooksack	Sp	H,W	Adult	1999
		87	NF Stilliguamish	Su	H,W	Adult	1996, 2001-1, 2001-2
		88	Samish Hatchery	Fa	H	Adult	1998
		89	Skagit summer	Su	W	Adult	1994, 1995
		90	Suiattle (Skagit)	Sp	W	Adult	1989, 1998, 1999
		91	Skykomish River		W		2004, 2005
		92	Snoqualmie River		W		2005
		93	Stillaguamish Hatchery	Su	H	Adult	2004
		94	Upper Cascade River	Sp	W		1998
		95	Upper Sauk River	Sp	W		1998
		96	Upper Skagit River	Su	W		1998
		97	Wallace Hatchery	Su	H		2004, 2005
23	Jaun de Fuca	98	Dungeness River		W	Adult	2004-1, 2004-2
		99	Elwha Hatchery	Fa	H	Adult/Juv	1996-1, 1996-2, 2004

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Region #	Region	Population #	Population	Run time	Origin	Life Stage	Collection Date
23	Jaun de Fuca	100	Elwha River		W	Adult/Juv	2004-1, 2004-2
24	Lower Fraser River	101	Birkenhead River	Sp	H	Adult	1996, 1997, 1999, 2001, 2002, 2003
		102	Maria Slough	Su	W	Adult	1999, 2000, 2001
		103	West Chilliwack Hatchery	Fa	H	Adult	1998, 1999
25	Lower Thompson River	104	Nicola	Sp	H		1998, 1999
		105	Spius River	Sp	H	Adult	1996, 1997, 1998
26	South Thompson River	106	Lower Adams	Fa	H	Adult	1996
		107	Lower Thompson	Fa	W	Adult	2001
		108	M.Shuswap	Fa	H	Adult	1997
27	North Thompson River	109	Clearwater	Fa	W	Adult	1997
27	North Thompson River	110	Deadman Hatchery	Sp	H	Adult	1996, 1997, 1998, 1999
		111	Louis River	Fa	W	Adult	2001
		112	Raft River	Su	W	Adult	2001, 2002
28	Mid Fraser River	113	Chilko	Fa	W	Adult	1995, 1996, 1999, 2002
		114	Nechako	Fa	W	Adult	1996
		115	Quesnel	Fa	W	Adult	1996
		116	Stuart	Fa	W	Adult	1996
		117	Upper Chilcotin River	Sp	W	Adult	2001
29	Upper Fraser River	118	Morkill River	Fa	W	Adult	2001
		119	Salmon River (Fraser)	Sp	W	Adult	1997
		120	Swift	Fa	W	Adult	1996
		121	Torpy River	Fa	W	Adult	2001
30	East Vancouver Island	122	Big Qualicum	Fa	H	Adult	1996
		123	Cowichan Hatchery	Fa	H	Adult	1999, 2000
		124	Nanaimo Hatchery	Fa	H	Adult	1998, 2002
		125	Puntledge Hatchery	Fa	H	Adult	2000, 2001
		126	Quinsam	Fa	H	Adult	1996, 1998
31	West Vancouver Island	127	Conuma	Fa	H	Adult	1997, 1998
		128	Marble at Northern Vancouver Island	Fa	H	Adult	1996, 1999, 2000
		129	Nitinat	Fa	H	Adult	1996
		130	Robertson	Fa	H	Adult	1996, 2003
		131	Sarita	Fa	H	Adult	1997, 2001
		132	Tahsis River	Fa	W	Adult	1996, 2002, 2003
		133	Tranquil River	Fa	W	Adult	1996, 1999

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Region #	Region	Population #	Population	Run time	Origin	Life Stage	Collection Date
32	S BC Mainland	134	Klinaklini	Fa	W	Adult	1997
		135	Porteau Cove	Fa	H	Adult	2003
33	Central BC Coast	136	Atnarko	Fa	H	Adult	1996
		137	Kitimat	Fa	H	Adult	1997
		138	Wannock	Fa	H	Adult	1996
34	Lower Skeena River	139	Ecstall	Fa	W	Adult	2000, 2001, 2002
		140	Lower Kalum	Fa	W	Adult	2001
35	Upper Skeena River	141	Babine	Fa	H	Adult	1996
		142	Bulkley	Fa	W	Adult	1999
		143	Sustut	Fa	W	Adult	2001
36	Nass River	144	Damdochax	Fa	W	Adult	1996
		145	Kincolith	Fa	W	Adult	1996
		146	Kwinageese	Fa	W	Adult	1996
36	Nass River	147	Owegee	Fa	W	Adult	1996
37	Upper Stikine River	148	Little Tahltan River		W	Adult	1989, 1990
38	Taku River	149	Kowatua Creek		W	Adult	1989, 1990
		150	Nakina River		W	Adult	1989, 1990
		151	Tatsatua Creek		W	Adult	1989, 1990
		152	Upper Nahlin River		W	Adult	1989, 1990, 2004
39	Southern Southeast Alaska	153	Chickamin River		W	Adult	1990, 1993
		154	Chickamin River – Whitman		H	Adult	2005
		155	Clear Creek (Unuk River)		W	Adult	1989, 2003, 2004
		156	Cripple Creek (Unuk River)		W	Adult	1988, 2003
		157	Keta River		W	Adult	1989, 2003
		158	King Creek		W	Adult	2003
40	Andrews Creek	159	Andrews Creek		W	Adult	1989, 2004
		160	Andrews Creek – Crystal		H	Adult	2005
		161	Andrews Creek – MaCaulay		H	Adult	2005
		162	Andrews Creek – Medvejie		H	Adult	2005
41	N. Southeast Alaska	163	King Salmon River		W	Adult	1989, 1990, 1993
42	Chilkat River	164	Big Boulder Creek		W	Adult	1992, 1995, 2004
		165	Tahini River		W	Adult	1992, 2004
43	Alsek River	166	Klukshu River		W	Adult	1989, 1990
44	Situk River	167	Situk River		W	Adult	1988, 1990, 1991, 1992

Appendix A2.–Estimated contributions of 44 stock groups to samples of sublegal-sized Chinook salmon encountered in the troll fishery in Southeast Alaska during Accounting Year 2004. Run timing components are abbreviated as Sp (spring), Su (summer), Fa (fall), and Wi (winter). Sample sizes after removal of impossible genotypes are indicated (N).

		Oct-Dec 2003 N = 150 Relative Contribution			Jan-Apr 2004 N = 130 Relative Contribution			May-June 2004 N = 98 Relative Contribution			July-Sept 2004 N = 552 Relative Contribution		
	Region	Est.	SD	90% CI	Est.	SD	90% CI	Est.	SD	90% CI	Est.	SD	90% CI
1	Central Valley Fa	0.000	0.001	(0.000–0.000)	0.000	0.001	(0.000–0.001)	0.000	0.002	(0.000–0.001)	0.000	0.000	(0.000–0.000)
2	Central Valley Sp	0.000	0.001	(0.000–0.001)	0.000	0.001	(0.000–0.001)	0.000	0.001	(0.000–0.001)	0.000	0.001	(0.000–0.000)
3	Central Valley Wi	0.000	0.001	(0.000–0.000)	0.000	0.001	(0.000–0.001)	0.000	0.002	(0.000–0.001)	0.000	0.000	(0.000–0.000)
4	California Coast	0.000	0.001	(0.000–0.001)	0.000	0.001	(0.000–0.001)	0.000	0.002	(0.000–0.001)	0.000	0.000	(0.000–0.000)
5	Kalamath R Basin	0.000	0.001	(0.000–0.001)	0.001	0.004	(0.000–0.009)	0.000	0.002	(0.000–0.001)	0.000	0.000	(0.000–0.000)
6	N CA, S OR Coast	0.000	0.001	(0.000–0.001)	0.001	0.003	(0.000–0.005)	0.001	0.003	(0.000–0.002)	0.001	0.002	(0.000–0.006)
7	Rogue R	0.000	0.001	(0.000–0.001)	0.000	0.001	(0.000–0.001)	0.000	0.002	(0.000–0.001)	0.001	0.002	(0.000–0.004)
8	Mid Oregon Coast	0.000	0.002	(0.000–0.002)	0.000	0.002	(0.000–0.001)	0.000	0.002	(0.000–0.001)	0.033	0.010	(0.019–0.051)
9	N Oregon Coast	0.003	0.006	(0.000–0.017)	0.001	0.005	(0.000–0.009)	0.000	0.002	(0.000–0.001)	0.032	0.011	(0.014–0.050)
10	Lower Columbia Sp	0.008	0.011	(0.000–0.031)	0.000	0.001	(0.000–0.001)	0.000	0.002	(0.000–0.001)	0.028	0.008	(0.017–0.042)
11	Lower Columbia Fa	0.022	0.013	(0.005–0.047)	0.032	0.016	(0.010–0.062)	0.000	0.002	(0.000–0.001)	0.035	0.009	(0.022–0.050)
12	Willamette R	0.065	0.021	(0.034–0.103)	0.070	0.023	(0.037–0.111)	0.000	0.002	(0.000–0.001)	0.021	0.006	(0.012–0.032)
13	Mid Columbia Tule	0.000	0.001	(0.000–0.000)	0.000	0.001	(0.000–0.000)	0.000	0.001	(0.000–0.001)	0.000	0.000	(0.000–0.000)
14	Mid and Upp Columbia	0.007	0.007	(0.000–0.020)	0.000	0.001	(0.000–0.001)	0.000	0.002	(0.000–0.001)	0.001	0.002	(0.000–0.005)
15	Deschutes R Fa	0.000	0.001	(0.000–0.001)	0.000	0.002	(0.000–0.001)	0.001	0.004	(0.000–0.007)	0.017	0.008	(0.006–0.031)
16	Upp Columbia Su,Fa	0.118	0.027	(0.076–0.166)	0.118	0.029	(0.073–0.169)	0.015	0.014	(0.000–0.042)	0.233	0.019	(0.202–0.265)
17	Snake R Fa	0.003	0.007	(0.000–0.017)	0.005	0.010	(0.000–0.028)	0.001	0.004	(0.000–0.003)	0.001	0.003	(0.000–0.009)
18	Snake R Sp,Su	0.000	0.001	(0.000–0.000)	0.000	0.001	(0.000–0.001)	0.000	0.002	(0.000–0.001)	0.001	0.002	(0.000–0.005)
19	Washington Coast	0.009	0.009	(0.000–0.026)	0.029	0.017	(0.005–0.060)	0.000	0.002	(0.000–0.001)	0.041	0.009	(0.027–0.057)
20	Hood Canal	0.001	0.005	(0.000–0.008)	0.000	0.001	(0.000–0.001)	0.010	0.011	(0.000–0.032)	0.006	0.004	(0.001–0.014)
21	South Puget Sound	0.032	0.016	(0.009–0.062)	0.000	0.001	(0.000–0.001)	0.001	0.005	(0.000–0.010)	0.000	0.001	(0.000–0.001)
22	North Puget Sound	0.019	0.015	(0.001–0.048)	0.000	0.002	(0.000–0.001)	0.036	0.022	(0.007–0.078)	0.011	0.007	(0.003–0.024)
23	Juan de Fuca	0.007	0.007	(0.000–0.020)	0.000	0.001	(0.000–0.000)	0.000	0.002	(0.000–0.001)	0.000	0.000	(0.000–0.000)
24	Lower Fraser	0.000	0.001	(0.000–0.001)	0.008	0.008	(0.000–0.023)	0.000	0.002	(0.000–0.001)	0.002	0.002	(0.000–0.006)
25	Lower Thompson	0.000	0.001	(0.000–0.000)	0.000	0.002	(0.000–0.001)	0.000	0.001	(0.000–0.001)	0.000	0.000	(0.000–0.000)
26	South Thompson	0.000	0.001	(0.000–0.001)	0.015	0.011	(0.002–0.037)	0.020	0.014	(0.004–0.047)	0.059	0.010	(0.043–0.077)
27	North Thompson	0.000	0.001	(0.000–0.001)	0.014	0.011	(0.002–0.035)	0.000	0.002	(0.000–0.001)	0.002	0.002	(0.000–0.006)
28	Mid Fraser	0.000	0.001	(0.000–0.001)	0.000	0.002	(0.000–0.001)	0.000	0.002	(0.000–0.001)	0.001	0.001	(0.000–0.003)
29	Upper Fraser	0.002	0.005	(0.000–0.013)	0.002	0.006	(0.000–0.014)	0.000	0.002	(0.000–0.001)	0.004	0.007	(0.000–0.019)
30	East Vancouver	0.138	0.029	(0.093–0.188)	0.076	0.024	(0.041–0.118)	0.012	0.013	(0.000–0.038)	0.087	0.012	(0.068–0.108)
31	West Vancouver	0.105	0.026	(0.066–0.150)	0.266	0.039	(0.204–0.333)	0.152	0.036	(0.097–0.215)	0.140	0.015	(0.116–0.166)
32	South BC Mainland	0.002	0.005	(0.000–0.012)	0.002	0.005	(0.000–0.012)	0.000	0.002	(0.000–0.001)	0.000	0.001	(0.000–0.000)
33	Central BC Coast	0.035	0.016	(0.014–0.064)	0.002	0.007	(0.000–0.015)	0.043	0.021	(0.015–0.083)	0.048	0.011	(0.032–0.067)

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Appendix A2.–Page 2 of 2.

	Oct-Dec 2003 N = 150 Relative Contribution			Jan-Apr 2004 N = 130 Relative Contribution			May-June 2004 N = 98 Relative Contribution			July-Sept 2004 N = 552 Relative Contribution		
Region	Est.	SD	90% CI	Est.	SD	90% CI	Est.	SD	90% CI	Est.	SD	90% CI
34 Lower Skeena	0.023	0.013	(0.006–0.046)	0.049	0.027	(0.005–0.097)	0.000	0.002	(0.000–0.001)	0.005	0.004	(0.000–0.012)
35 Upper Skeena	0.000	0.002	(0.000–0.001)	0.000	0.001	(0.000–0.001)	0.000	0.002	(0.000–0.001)	0.000	0.001	(0.000–0.003)
36 Nass R	0.017	0.012	(0.003–0.041)	0.000	0.002	(0.000–0.001)	0.000	0.003	(0.000–0.001)	0.001	0.002	(0.000–0.004)
37 Upper Stikine R	0.005	0.013	(0.000–0.037)	0.052	0.026	(0.015–0.098)	0.007	0.014	(0.000–0.036)	0.019	0.007	(0.008–0.032)
38 Taku R	0.024	0.018	(0.000–0.057)	0.002	0.006	(0.000–0.013)	0.003	0.012	(0.000–0.021)	0.000	0.002	(0.000–0.003)
39 S. Southeast AK	0.187	0.035	(0.133–0.246)	0.151	0.035	(0.097–0.213)	0.170	0.046	(0.100–0.249)	0.104	0.016	(0.078–0.131)
40 Andrew Cr	0.127	0.029	(0.082–0.178)	0.100	0.029	(0.056–0.152)	0.522	0.057	(0.427–0.615)	0.063	0.014	(0.042–0.087)
41 King Salmon	0.040	0.016	(0.018–0.069)	0.000	0.001	(0.000–0.001)	0.000	0.001	(0.000–0.001)	0.000	0.000	(0.000–0.000)
42 Chilkat R	0.000	0.001	(0.000–0.001)	0.000	0.001	(0.000–0.001)	0.000	0.002	(0.000–0.001)	0.002	0.002	(0.000–0.006)
43 Alsek R	0.000	0.001	(0.000–0.000)	0.000	0.001	(0.000–0.000)	0.000	0.002	(0.000–0.001)	0.000	0.000	(0.000–0.000)
44 Situk R	0.000	0.001	(0.000–0.001)	0.000	0.001	(0.000–0.001)	0.000	0.002	(0.000–0.001)	0.001	0.002	(0.000–0.005)

Appendix A3.–Estimated contributions of 44 stock groups to samples of sublegal-sized Chinook salmon encountered in the troll fishery in Southeast Alaska during the Accounting Year 2005. Run timing components are abbreviated as Sp (spring), Su (summer), Fa (fall), and Wi (winter). Sample sizes after removal of impossible genotypes are indicated (N).

		Oct-Dec 2004 N = 181 Relative Contribution			Jan-Apr 2005 N = 210 Relative Contribution			May-June 2005 N = 338 Relative Contribution			July-Sept 2005 N = 589 Relative Contribution		
	Region	Est.	SD	90% CI	Est.	SD	90% CI	Est.	SD	90% CI	Est.	SD	90% CI
1	Central Valley Fa	0.003	0.005	(0.000–0.014)	0.000	0.001	(0.000–0.000)	0.000	0.001	(0.000–0.001)	0.000	0.000	(0.000–0.000)
2	Central Valley Sp	0.003	0.006	(0.000–0.017)	0.000	0.001	(0.000–0.000)	0.000	0.001	(0.000–0.001)	0.000	0.001	(0.000–0.001)
3	Central Valley Wi	0.000	0.001	(0.000–0.000)	0.000	0.001	(0.000–0.000)	0.000	0.001	(0.000–0.000)	0.000	0.000	(0.000–0.000)
4	California Coast	0.000	0.001	(0.000–0.000)	0.000	0.001	(0.000–0.000)	0.000	0.001	(0.000–0.000)	0.000	0.000	(0.000–0.000)
5	Kalamath R Basin	0.000	0.001	(0.000–0.000)	0.000	0.001	(0.000–0.000)	0.000	0.000	(0.000–0.000)	0.000	0.000	(0.000–0.000)
6	N CA, S OR Coast	0.000	0.001	(0.000–0.000)	0.000	0.001	(0.000–0.001)	0.000	0.001	(0.000–0.000)	0.000	0.000	(0.000–0.000)
7	Rogue R	0.000	0.001	(0.000–0.000)	0.000	0.001	(0.000–0.000)	0.000	0.001	(0.000–0.000)	0.000	0.001	(0.000–0.001)
8	Mid Oregon Coast	0.005	0.007	(0.000–0.019)	0.002	0.005	(0.000–0.012)	0.000	0.001	(0.000–0.001)	0.031	0.009	(0.018–0.047)
9	N Oregon Coast	0.001	0.004	(0.000–0.007)	0.001	0.002	(0.000–0.003)	0.000	0.001	(0.000–0.000)	0.041	0.010	(0.026–0.058)
10	Lower Columbia Sp	0.014	0.010	(0.002–0.034)	0.002	0.005	(0.000–0.013)	0.007	0.005	(0.001–0.016)	0.042	0.010	(0.027–0.058)
11	Lower Columbia Fa	0.015	0.011	(0.002–0.036)	0.008	0.008	(0.000–0.023)	0.002	0.003	(0.000–0.009)	0.020	0.007	(0.010–0.032)
12	Willamette R	0.006	0.006	(0.000–0.017)	0.024	0.011	(0.009–0.044)	0.000	0.000	(0.000–0.000)	0.022	0.006	(0.013–0.034)
13	Mid Columbia Tule	0.000	0.001	(0.000–0.000)	0.000	0.001	(0.000–0.001)	0.000	0.000	(0.000–0.000)	0.000	0.000	(0.000–0.000)
14	Mid and Upp Columbia	0.002	0.004	(0.000–0.010)	0.000	0.001	(0.000–0.000)	0.000	0.001	(0.000–0.000)	0.001	0.002	(0.000–0.006)
15	Deschutes R Fa	0.000	0.001	(0.000–0.001)	0.000	0.001	(0.000–0.000)	0.000	0.001	(0.000–0.000)	0.000	0.000	(0.000–0.000)
16	Upp Columbia Su,Fa	0.077	0.021	(0.045–0.114)	0.073	0.019	(0.045–0.107)	0.032	0.010	(0.017–0.050)	0.130	0.015	(0.106–0.157)
17	Snake R Fa	0.000	0.002	(0.000–0.001)	0.001	0.004	(0.000–0.007)	0.000	0.001	(0.000–0.000)	0.016	0.007	(0.005–0.029)
18	Snake R Sp,Su	0.001	0.004	(0.000–0.009)	0.000	0.001	(0.000–0.000)	0.000	0.001	(0.000–0.000)	0.006	0.004	(0.000–0.013)
19	Washington Coast	0.031	0.015	(0.008–0.059)	0.001	0.003	(0.000–0.006)	0.001	0.003	(0.000–0.007)	0.064	0.011	(0.047–0.084)
20	Hood Canal	0.003	0.008	(0.000–0.020)	0.002	0.005	(0.000–0.012)	0.000	0.002	(0.000–0.001)	0.001	0.003	(0.000–0.009)
21	South Puget Sound	0.002	0.005	(0.000–0.012)	0.003	0.005	(0.000–0.012)	0.001	0.004	(0.000–0.011)	0.013	0.005	(0.006–0.023)
22	North Puget Sound	0.047	0.018	(0.021–0.078)	0.067	0.019	(0.039–0.100)	0.031	0.011	(0.015–0.051)	0.021	0.008	(0.010–0.036)
23	Juan de Fuca	0.015	0.010	(0.002–0.035)	0.006	0.006	(0.000–0.017)	0.006	0.004	(0.001–0.014)	0.000	0.001	(0.000–0.001)
24	Lower Fraser	0.000	0.001	(0.000–0.000)	0.000	0.001	(0.000–0.000)	0.009	0.005	(0.003–0.020)	0.000	0.000	(0.000–0.000)
25	Lower Thompson	0.000	0.001	(0.000–0.000)	0.004	0.005	(0.000–0.013)	0.000	0.000	(0.000–0.000)	0.002	0.002	(0.000–0.005)
26	South Thompson	0.012	0.008	(0.002–0.028)	0.019	0.009	(0.007–0.037)	0.021	0.008	(0.010–0.035)	0.082	0.012	(0.063–0.103)
27	North Thompson	0.000	0.001	(0.000–0.000)	0.003	0.005	(0.000–0.014)	0.000	0.001	(0.000–0.000)	0.001	0.002	(0.000–0.004)
28	Mid Fraser	0.000	0.002	(0.000–0.002)	0.000	0.001	(0.000–0.000)	0.000	0.001	(0.000–0.001)	0.004	0.003	(0.000–0.010)
29	Upper Fraser	0.000	0.001	(0.000–0.000)	0.000	0.001	(0.000–0.001)	0.000	0.001	(0.000–0.001)	0.000	0.001	(0.000–0.001)
30	East Vancouver	0.138	0.026	(0.097–0.183)	0.096	0.021	(0.065–0.132)	0.041	0.011	(0.024–0.060)	0.069	0.011	(0.052–0.088)
31	West Vancouver	0.088	0.021	(0.057–0.125)	0.228	0.029	(0.183–0.278)	0.029	0.009	(0.016–0.046)	0.078	0.011	(0.061–0.098)
32	South BC Mainland	0.025	0.012	(0.008–0.049)	0.014	0.009	(0.003–0.031)	0.000	0.001	(0.000–0.001)	0.008	0.004	(0.002–0.016)
33	Central BC Coast	0.074	0.021	(0.043–0.110)	0.059	0.018	(0.032–0.090)	0.115	0.019	(0.085–0.148)	0.103	0.015	(0.080–0.128)

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Appendix A3.–Page 2 of 2.

		Oct-Dec 2004 N = 181 Relative Contribution			Jan-Apr 2005 N = 210 Relative Contribution			May-June 2005 N = 338 Relative Contribution			July-Sept 2005 N = 589 Relative Contribution		
	Region	Est.	SD	90% CI	Est.	SD	90% CI	Est.	SD	90% CI	Est.	SD	90% CI
34	Lower Skeena	0.000	0.001	(0.000–0.001)	0.017	0.015	(0.000–0.044)	0.003	0.003	(0.000–0.009)	0.006	0.008	(0.000–0.021)
35	Upper Skeena	0.000	0.001	(0.000–0.000)	0.003	0.006	(0.000–0.016)	0.000	0.001	(0.000–0.000)	0.012	0.012	(0.000–0.032)
36	Nass R	0.000	0.002	(0.000–0.002)	0.001	0.003	(0.000–0.007)	0.008	0.006	(0.001–0.019)	0.005	0.006	(0.000–0.016)
37	Upper Stikine R	0.011	0.017	(0.000–0.046)	0.000	0.001	(0.000–0.001)	0.039	0.018	(0.012–0.071)	0.003	0.007	(0.000–0.019)
38	Taku R	0.000	0.001	(0.000–0.001)	0.003	0.007	(0.000–0.018)	0.001	0.004	(0.000–0.010)	0.000	0.001	(0.000–0.001)
39	S. Southeast AK	0.160	0.031	(0.111–0.214)	0.064	0.021	(0.033–0.100)	0.266	0.028	(0.221–0.313)	0.121	0.017	(0.095–0.150)
40	Andrew Cr	0.249	0.036	(0.191–0.310)	0.299	0.034	(0.245–0.355)	0.358	0.031	(0.308–0.408)	0.089	0.014	(0.067–0.113)
41	King Salmon	0.011	0.008	(0.002–0.026)	0.000	0.001	(0.000–0.000)	0.000	0.001	(0.000–0.000)	0.000	0.000	(0.000–0.000)
42	Chilkat R	0.005	0.006	(0.000–0.016)	0.000	0.001	(0.000–0.000)	0.027	0.009	(0.014–0.043)	0.006	0.003	(0.002–0.012)
43	Alsek R	0.000	0.001	(0.000–0.000)	0.000	0.001	(0.000–0.000)	0.000	0.000	(0.000–0.000)	0.000	0.000	(0.000–0.000)
44	Situk R	0.000	0.001	(0.000–0.000)	0.000	0.001	(0.000–0.000)	0.000	0.000	(0.000–0.000)	0.001	0.002	(0.000–0.005)

Appendix A4.–Estimated contributions of 44 stock groups to samples of sublegal-sized Chinook salmon encountered in the troll fishery in Southeast Alaska during the Accounting Year 2006. Run timing components are abbreviated as Sp (spring), Su (summer), Fa (fall), and Wi (winter). Sample sizes after removal of impossible genotypes are indicated (N).

		Oct-Dec 2005 N = 149 Relative Contribution			Jan-Apr 2006 N = 220 Relative Contribution			May-June 2006 N = 269 Relative Contribution			July-Sept 2006 N = 423 Relative Contribution		
	Region	Est.	SD	90% CI	Est.	SD	90% CI	Est.	SD	90% CI	Est.	SD	90% CI
1	Central Valley Fa	0.000	0.001	(0.000–0.001)	0.000	0.001	(0.000–0.000)	0.000	0.001	(0.000–0.000)	0.000	0.000	(0.000–0.000)
2	Central Valley Sp	0.000	0.001	(0.000–0.000)	0.000	0.001	(0.000–0.000)	0.000	0.001	(0.000–0.000)	0.000	0.000	(0.000–0.000)
3	Central Valley Wi	0.000	0.001	(0.000–0.001)	0.000	0.001	(0.000–0.000)	0.000	0.001	(0.000–0.000)	0.000	0.000	(0.000–0.000)
4	California Coast	0.000	0.001	(0.000–0.000)	0.000	0.001	(0.000–0.000)	0.000	0.001	(0.000–0.000)	0.000	0.000	(0.000–0.000)
5	Kalamath R Basin	0.000	0.001	(0.000–0.000)	0.000	0.001	(0.000–0.000)	0.000	0.001	(0.000–0.000)	0.000	0.000	(0.000–0.000)
6	N CA, S OR Coast	0.000	0.001	(0.000–0.001)	0.000	0.001	(0.000–0.000)	0.000	0.001	(0.000–0.000)	0.000	0.000	(0.000–0.000)
7	Rogue R	0.000	0.002	(0.000–0.001)	0.000	0.001	(0.000–0.000)	0.000	0.001	(0.000–0.000)	0.000	0.000	(0.000–0.000)
8	Mid Oregon Coast	0.002	0.006	(0.000–0.015)	0.000	0.001	(0.000–0.000)	0.001	0.003	(0.000–0.005)	0.012	0.007	(0.003–0.025)
9	N Oregon Coast	0.000	0.002	(0.000–0.001)	0.001	0.002	(0.000–0.005)	0.007	0.006	(0.000–0.018)	0.001	0.002	(0.000–0.004)
10	Lower Columbia Sp	0.002	0.006	(0.000–0.014)	0.010	0.009	(0.000–0.027)	0.000	0.001	(0.000–0.000)	0.008	0.005	(0.002–0.018)
11	Lower Columbia Fa	0.014	0.012	(0.000–0.037)	0.007	0.008	(0.000–0.023)	0.002	0.004	(0.000–0.009)	0.013	0.006	(0.005–0.025)
12	Willamette R	0.022	0.013	(0.006–0.045)	0.011	0.007	(0.002–0.025)	0.018	0.008	(0.007–0.033)	0.013	0.006	(0.005–0.024)
13	Mid Columbia Tule	0.000	0.001	(0.000–0.001)	0.000	0.001	(0.000–0.000)	0.000	0.002	(0.000–0.002)	0.002	0.002	(0.000–0.007)
14	Mid and Upp Columbia	0.000	0.001	(0.000–0.001)	0.000	0.001	(0.000–0.000)	0.000	0.001	(0.000–0.000)	0.000	0.000	(0.000–0.000)
15	Deschutes R Fa	0.001	0.005	(0.000–0.006)	0.000	0.002	(0.000–0.002)	0.000	0.001	(0.000–0.001)	0.003	0.003	(0.000–0.009)
16	Upp Columbia Su,Fa	0.023	0.016	(0.000–0.052)	0.044	0.015	(0.023–0.070)	0.018	0.009	(0.006–0.035)	0.076	0.014	(0.055–0.101)
17	Snake R Fa	0.018	0.014	(0.000–0.045)	0.000	0.001	(0.000–0.000)	0.000	0.001	(0.000–0.000)	0.011	0.007	(0.000–0.024)
18	Snake R Sp,Su	0.000	0.001	(0.000–0.000)	0.000	0.001	(0.000–0.000)	0.000	0.001	(0.000–0.000)	0.000	0.000	(0.000–0.000)
19	Washington Coast	0.000	0.002	(0.000–0.001)	0.030	0.012	(0.013–0.051)	0.000	0.001	(0.000–0.001)	0.031	0.009	(0.018–0.047)
20	Hood Canal	0.020	0.014	(0.000–0.047)	0.006	0.009	(0.000–0.023)	0.001	0.003	(0.000–0.005)	0.006	0.009	(0.000–0.024)
21	South Puget Sound	0.004	0.011	(0.000–0.029)	0.010	0.011	(0.000–0.031)	0.029	0.013	(0.010–0.051)	0.016	0.011	(0.000–0.034)
22	North Puget Sound	0.019	0.017	(0.000–0.051)	0.037	0.014	(0.017–0.062)	0.025	0.011	(0.010–0.046)	0.032	0.011	(0.016–0.053)
23	Juan de Fuca	0.008	0.008	(0.000–0.024)	0.002	0.005	(0.000–0.014)	0.000	0.001	(0.000–0.001)	0.000	0.000	(0.000–0.000)
24	Lower Fraser	0.014	0.010	(0.002–0.033)	0.009	0.006	(0.001–0.021)	0.000	0.001	(0.000–0.001)	0.001	0.003	(0.000–0.007)
25	Lower Thompson	0.000	0.002	(0.000–0.001)	0.003	0.004	(0.000–0.012)	0.000	0.001	(0.000–0.000)	0.000	0.000	(0.000–0.000)
26	South Thompson	0.003	0.006	(0.000–0.016)	0.012	0.008	(0.002–0.028)	0.003	0.004	(0.000–0.011)	0.051	0.011	(0.034–0.071)
27	North Thompson	0.000	0.001	(0.000–0.000)	0.002	0.003	(0.000–0.008)	0.000	0.001	(0.000–0.000)	0.000	0.001	(0.000–0.001)
28	Mid Fraser	0.000	0.001	(0.000–0.000)	0.000	0.001	(0.000–0.000)	0.000	0.001	(0.000–0.000)	0.000	0.000	(0.000–0.000)
29	Upper Fraser	0.000	0.001	(0.000–0.001)	0.000	0.001	(0.000–0.001)	0.000	0.001	(0.000–0.000)	0.000	0.001	(0.000–0.001)
30	East Vancouver	0.163	0.031	(0.114–0.217)	0.175	0.026	(0.134–0.219)	0.077	0.017	(0.051–0.107)	0.094	0.015	(0.072–0.120)
31	West Vancouver	0.100	0.025	(0.063–0.143)	0.068	0.017	(0.043–0.098)	0.046	0.013	(0.027–0.070)	0.106	0.015	(0.082–0.133)
32	South BC Mainland	0.022	0.015	(0.004–0.051)	0.020	0.010	(0.006–0.038)	0.025	0.011	(0.010–0.046)	0.001	0.003	(0.000–0.007)
33	Central BC Coast	0.123	0.031	(0.077–0.178)	0.068	0.019	(0.041–0.101)	0.109	0.022	(0.074–0.148)	0.125	0.018	(0.096–0.156)

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Appendix A4.–Page 2 of 2.

		Oct-Dec 2005 **N =** 149			Jan-Apr 2006 N = 220			May-June 2006 N = 269			July-Sept 2006 N = 423		
		Relative Contribution			Relative Contribution			Relative Contribution			Relative Contribution		
	Region	Est.	SD	90% CI	Est.	SD	90% CI	Est.	SD	90% CI	Est.	SD	90% CI
34	Lower Skeena	0.026	0.015	(0.007–0.055)	0.002	0.004	(0.000–0.010)	0.004	0.004	(0.000–0.012)	0.016	0.009	(0.003–0.032)
35	Upper Skeena	0.000	0.001	(0.000–0.001)	0.014	0.009	(0.002–0.032)	0.000	0.001	(0.000–0.000)	0.000	0.001	(0.000–0.001)
36	Nass R	0.000	0.002	(0.000–0.001)	0.016	0.010	(0.003–0.035)	0.024	0.011	(0.009–0.044)	0.000	0.001	(0.000–0.001)
37	Upper Stikine R	0.008	0.016	(0.000–0.044)	0.000	0.002	(0.000–0.001)	0.005	0.012	(0.000–0.035)	0.036	0.016	(0.007–0.062)
38	Taku R	0.004	0.007	(0.000–0.019)	0.013	0.013	(0.000–0.037)	0.034	0.018	(0.000–0.064)	0.004	0.009	(0.000–0.026)
39	S. Southeast AK	0.224	0.042	(0.156–0.295)	0.111	0.025	(0.073–0.154)	0.257	0.032	(0.206–0.310)	0.177	0.023	(0.141–0.217)
40	Andrew Cr	0.130	0.035	(0.075–0.192)	0.322	0.034	(0.268–0.379)	0.288	0.032	(0.236–0.340)	0.144	0.020	(0.113–0.178)
41	King Salmon	0.047	0.017	(0.022–0.078)	0.000	0.001	(0.000–0.000)	0.004	0.004	(0.000–0.011)	0.000	0.000	(0.000–0.000)
42	Chilkat R	0.000	0.001	(0.000–0.000)	0.003	0.004	(0.000–0.012)	0.022	0.009	(0.010–0.039)	0.017	0.006	(0.008–0.029)
43	Alsek R	0.000	0.001	(0.000–0.001)	0.000	0.001	(0.000–0.000)	0.000	0.001	(0.000–0.001)	0.000	0.001	(0.000–0.000)
44	Situk R	0.000	0.001	(0.000–0.000)	0.004	0.005	(0.000–0.013)	0.000	0.001	(0.000–0.000)	0.000	0.000	(0.000–0.000)

Appendix A5.–Estimated contributions of 44 stock groups to samples of sublegal-sized Chinook salmon encountered in the troll fishery in Southeast Alaska during the Accounting Year 2007. Run timing components are abbreviated as Sp (spring), Su (summer), Fa (fall), and Wi (winter). Sample sizes after removal of impossible genotypes are indicated (N). Sublegal sampling was discontinued after June 2007.

		Oct-Dec 2006 N = 153 Relative Contribution			Jan-Apr 2007 N = 122 Relative Contribution			May-June 2007 N = 334 Relative Contribution		
	Region	Est.	SD	90% CI	Est.	SD	90% CI	Est.	SD	90% CI
1	Central Valley Fa	0.000	0.001	(0.000–0.000)	0.001	0.004	(0.000–0.005)	0.000	0.001	(0.000–0.000)
2	Central Valley Sp	0.000	0.001	(0.000–0.000)	0.000	0.002	(0.000–0.001)	0.000	0.001	(0.000–0.000)
3	Central Valley Wi	0.000	0.001	(0.000–0.000)	0.000	0.001	(0.000–0.001)	0.000	0.000	(0.000–0.000)
4	California Coast	0.000	0.001	(0.000–0.000)	0.000	0.001	(0.000–0.001)	0.000	0.000	(0.000–0.000)
5	Kalamath R Basin	0.000	0.001	(0.000–0.000)	0.000	0.001	(0.000–0.001)	0.000	0.000	(0.000–0.000)
6	N CA, S OR Coast	0.000	0.001	(0.000–0.000)	0.000	0.001	(0.000–0.001)	0.000	0.001	(0.000–0.000)
7	Rogue R	0.000	0.001	(0.000–0.001)	0.000	0.001	(0.000–0.001)	0.000	0.000	(0.000–0.000)
8	Mid Oregon Coast	0.019	0.011	(0.005–0.041)	0.001	0.004	(0.000–0.006)	0.002	0.003	(0.000–0.009)
9	N Oregon Coast	0.000	0.001	(0.000–0.000)	0.003	0.009	(0.000–0.023)	0.000	0.001	(0.000–0.000)
10	Lower Columbia Sp	0.001	0.003	(0.000–0.006)	0.000	0.003	(0.000–0.001)	0.001	0.003	(0.000–0.006)
11	Lower Columbia Fa	0.009	0.008	(0.000–0.025)	0.001	0.003	(0.000–0.004)	0.000	0.001	(0.000–0.002)
12	Willamette R	0.007	0.007	(0.000–0.020)	0.017	0.012	(0.003–0.039)	0.006	0.004	(0.001–0.015)
13	Mid Columbia Tule	0.001	0.002	(0.000–0.002)	0.000	0.001	(0.000–0.001)	0.002	0.003	(0.000–0.007)
14	Mid and Upp Columbia	0.007	0.007	(0.000–0.020)	0.000	0.001	(0.000–0.001)	0.000	0.001	(0.000–0.001)
15	Deschutes R Fa	0.000	0.001	(0.000–0.001)	0.009	0.016	(0.000–0.044)	0.000	0.001	(0.000–0.001)
16	Upp Columbia Su,Fa	0.069	0.021	(0.038–0.107)	0.067	0.028	(0.025–0.116)	0.032	0.010	(0.017–0.050)
17	Snake R Fa	0.000	0.002	(0.000–0.001)	0.011	0.018	(0.000–0.049)	0.000	0.001	(0.000–0.000)
18	Snake R Sp,Su	0.007	0.007	(0.000–0.020)	0.000	0.001	(0.000–0.001)	0.001	0.002	(0.000–0.005)
19	Washington Coast	0.000	0.001	(0.000–0.000)	0.000	0.001	(0.000–0.001)	0.007	0.007	(0.000–0.020)
20	Hood Canal	0.000	0.001	(0.000–0.001)	0.024	0.022	(0.000–0.064)	0.001	0.004	(0.000–0.009)
21	South Puget Sound	0.000	0.001	(0.000–0.001)	0.013	0.021	(0.000–0.057)	0.003	0.005	(0.000–0.013)
22	North Puget Sound	0.052	0.019	(0.024–0.086)	0.020	0.023	(0.000–0.066)	0.032	0.013	(0.013–0.054)
23	Juan de Fuca	0.000	0.001	(0.000–0.001)	0.000	0.002	(0.000–0.001)	0.000	0.001	(0.000–0.000)
24	Lower Fraser	0.000	0.001	(0.000–0.000)	0.000	0.001	(0.000–0.001)	0.003	0.003	(0.000–0.009)
25	Lower Thompson	0.000	0.001	(0.000–0.000)	0.000	0.001	(0.000–0.001)	0.000	0.001	(0.000–0.000)
26	South Thompson	0.000	0.001	(0.000–0.000)	0.049	0.021	(0.019–0.088)	0.017	0.009	(0.005–0.033)
27	North Thompson	0.000	0.001	(0.000–0.000)	0.024	0.015	(0.005–0.053)	0.002	0.003	(0.000–0.009)
28	Mid Fraser	0.000	0.001	(0.000–0.000)	0.012	0.012	(0.001–0.036)	0.000	0.001	(0.000–0.000)
29	Upper Fraser	0.000	0.001	(0.000–0.001)	0.002	0.006	(0.000–0.014)	0.000	0.001	(0.000–0.000)
30	East Vancouver	0.189	0.032	(0.139–0.243)	0.072	0.024	(0.038–0.115)	0.028	0.009	(0.015–0.045)
31	West Vancouver	0.042	0.016	(0.019–0.072)	0.057	0.021	(0.027–0.095)	0.010	0.005	(0.003–0.020)
32	South BC Mainland	0.003	0.007	(0.000–0.019)	0.028	0.016	(0.007–0.058)	0.010	0.007	(0.001–0.023)
33	Central BC Coast	0.066	0.025	(0.029–0.111)	0.069	0.031	(0.022–0.124)	0.062	0.016	(0.038–0.091)

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		Oct-Dec 2006 N = 153 Relative Contribution			Jan-Apr 2007 N = 122 Relative Contribution			May-June 2007 N = 334 Relative Contribution		
	Region	Est.	SD	90% CI	Est.	SD	90% CI	Est.	SD	90% CI
34	Lower Skeena	0.011	0.010	(0.000–0.030)	0.095	0.034	(0.045–0.155)	0.009	0.006	(0.001–0.020)
35	Upper Skeena	0.000	0.001	(0.000–0.000)	0.003	0.009	(0.000–0.021)	0.002	0.005	(0.000–0.015)
36	Nass R	0.013	0.010	(0.001–0.031)	0.002	0.007	(0.000–0.014)	0.007	0.005	(0.000–0.016)
37	Upper Stikine R	0.002	0.007	(0.000–0.010)	0.016	0.025	(0.000–0.069)	0.019	0.013	(0.000–0.042)
38	Taku R	0.000	0.001	(0.000–0.001)	0.035	0.027	(0.000–0.086)	0.001	0.003	(0.000–0.006)
39	S. Southeast AK	0.220	0.039	(0.158–0.287)	0.199	0.042	(0.135–0.271)	0.272	0.028	(0.228–0.319)
40	Andrew Cr	0.248	0.039	(0.187–0.314)	0.167	0.043	(0.100–0.240)	0.449	0.031	(0.399–0.500)
41	King Salmon	0.033	0.014	(0.013–0.059)	0.000	0.001	(0.000–0.001)	0.000	0.001	(0.000–0.000)
42	Chilkat R	0.000	0.001	(0.000–0.000)	0.000	0.001	(0.000–0.001)	0.021	0.008	(0.009–0.036)
43	Alsek R	0.000	0.001	(0.000–0.000)	0.000	0.001	(0.000–0.001)	0.000	0.001	(0.000–0.000)
44	Situk R	0.000	0.001	(0.000–0.000)	0.000	0.001	(0.000–0.001)	0.000	0.000	(0.000–0.000)