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Mixed Stock Analysis of Chinook Salmon Harvested in Southeast Alaska Commercial Troll Fisheries, 2015

by

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

Symbols and Abbreviations

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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)

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. 17-41

MIXED STOCK ANALYSIS OF CHINOOK SALMON HARVESTED IN SOUTHEAST ALASKA COMMERCIAL TROLL FISHERIES, 2015

by

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Note: Product names used in this publication are included for completeness but do not constitute an endorsement.

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ABSTRACT

The Southeast Alaska (SEAK) troll fishery harvests Chinook salmon originating from Alaska, British Columbia, and the Pacific Northwest. Owing to its mixed stock nature, the overall SEAK Chinook salmon fishery is managed as 1 of 3 such fisheries under provisions of the Pacific Salmon Treaty (PST) Agreement. The Alaska Department of Fish and Game has used genetic mixed stock analysis to estimate the stock composition of Chinook salmon harvests in the SEAK commercial troll fishery since 2004 based on a genetic baseline developed by the Genetic Analysis of Pacific Salmonids group for use in PST fisheries. Genetic methods allow direct estimation of the major stock groups contributing to fisheries. This project estimated the relative stock composition of seasonal troll fishery harvests from fishery accounting year 2015 (Oct. 1, 2014 – Sept. 30, 2015). The major contributors to the Southeast Alaska troll fisheries from largest to smallest were the *Interior Columbia River (Summer/Fall)*, *Southeast Alaska/Transboundary River*, *North/Central British Columbia*, *Oregon Coast*, *South Thompson*, *Washington Coast,* and *West Vancouver* reporting groups. Collectively, these 7 stock aggregates accounted for 91% of the harvest and are referred to as *driver stocks*. Results indicate considerable temporal and spatial variation in the composition of troll harvests in accounting year 2015, but consistent patterns of composition across years. Stock composition data from this and other stock assessments are being used to provide fisheries information, including stock-specific run reconstructions and forecasting of run sizes to transboundary rivers, determining the origin of catches in the SEAK troll fishery by age to assist in evaluation of the Pacific Salmon Commission Chinook Model, and estimating some terminal run sizes of stocks in the PST area that drive the SEAK fishery.

Key words: Chinook salmon, Southeast Alaska, troll fishery, mixed stock analysis, microsatellite, Pacific Salmon Treaty

INTRODUCTION

Chinook salmon *Oncorhynchus tshawytscha* are commercially harvested in Southeast Alaska (SEAK) and Yakutat troll fisheries in State of Alaska and Federal Exclusive Economic Zone waters east of Cape Suckling and north of Dixon Entrance (Skannes et al. 2016). This area is divided into 4 quadrants for stock assessment purposes: Northern Outside (NO), Northern Inside (NI), Southern Outside (SO), and Southern Inside (SI; Figure 1). The troll fishery harvests mixed stocks[1] of Chinook salmon, including salmon originating from Alaska, British Columbia (BC), and the Pacific Northwest, and is therefore under the jurisdiction of the Pacific Salmon Treaty (PST). The principles of the PST call for cooperative management and research on fisheries harvesting Chinook salmon from populations in Canada and the U.S., and variable annual Chinook harvest ceilings to limit interceptions of Chinook salmon in SEAK and 2 other mixed stock fisheries along the North American coast as per PST Annexes and related Agreements (CTC 2017).

The annual all-gear harvest limit for Chinook salmon in SEAK is specified in Chapter 3, Annex IV of the PST. The majority of the PST harvest limit is allocated to the commercial troll fishery under State of Alaska management plans (i.e., the purse seine fishery is allocated 4.3% of the harvest, the gillnet fishery is allocated 2.9% of the harvest, and the setnet fishery is allocated 1,000 fish; the remaining portion of the annual ceiling is allocated 80% to the troll fishery and 20% to the sport fishery). Thus, careful monitoring of the troll harvest throughout seasonal fisheries is essential to prevent exceeding the annual ceiling (Pryor et al. 2009; Skannes et al. 2016).

[1] In this report, *population* refers to a locally interbreeding group of salmon that is distinguished by a distinct combination of genetic, phenotypic, life history, and habitat characteristics, and *stock* refers to an aggregation of one or more populations that occur in the same geographic area and are managed as a unit. *Reporting groups* refers to an aggregation of one or more stocks that can be identified using genetic mixed stock analysis.

The annual SEAK troll harvest of Chinook salmon occurs over 3 seasonal fisheries: winter, spring, and summer. The winter fishery occurs from October 11 to April 30 of the following year, or until the guideline harvest level of 45,000 non-Alaska hatchery-produced Chinook salmon is reached. The fishery is split into *early winter* (October 11–December 31) and *late winter* (January 1–April 30) components, and the open fishing area is restricted to within the troll boundary of the outer coast surf line. The spring troll fishery (May 1 or earlier, through June 30) is managed to target Chinook salmon from SEAK hatcheries, many of which are exempt from the annual ceiling. The summer troll fishery accounts for the majority of the annual Chinook salmon harvest. The summer fishery is closely monitored and managed to prevent exceeding the troll portion of the annual ceiling by allowing retention of Chinook salmon during 2 or more periods in most years. The first summer troll fishery opening, commencing on July 1, allows harvest in the waters of frequent high Chinook salmon abundance and is intended to not exceed 70% of the remaining troll portion of the annual ceiling. Once the July fishery is closed, Chinook salmon retention by the troll fleet is not allowed unless it is determined that additional openings will not result in exceeding the annual ceiling. August (and sometimes September) openings are conducted in most years to allow troll retention if it is determined that the annual ceiling will not be exceeded; if these openings occur, the waters of frequent high Chinook salmon abundance remain closed to troll gear.

The annual PST Chinook salmon ceiling for SEAK depends on the projected abundance of Chinook salmon forecasted by the Chinook Technical Committee (CTC) using the Pacific Salmon Commission (PSC) Chinook Model (CTC 2017; Skannes et al. 2016). The PSC Chinook Model uses catch, escapement, coded wire tag (CWT) recovery, and recruitment information to forecast relative abundance of stocks in PST fisheries. Relative stock proportion information is an important component of the PSC Chinook Model, and currently CWT data are used for this purpose. However, reliance on stock composition estimates solely from CWT data can be problematic because CWTs are only applied to a subset of indicator stocks contributing to the fishery, most are hatchery stocks, and the resulting estimates of escapement and terminal run size of important stocks—and particularly wild stocks—are often not available or are poorly determined. Genetic mixed stock analysis (MSA) provides a complementary set of stock composition estimates for major contributors to the fishery.

Genetic MSA has been used extensively to estimate the contribution of genetic aggregates of Chinook salmon to mixed stock fisheries occurring throughout the PST area (Blankenship et al. 2007;[2] Hess et al. 2011; Templin et al. 2011; Beacham et al. 2012). This method uses the genetic variation in allele frequencies at multiple loci among populations (baseline) to estimate the contribution of each stock to a mixture given the multilocus genotypes of fish in the mixture. Since 1999, the State of Alaska Department of Fish and Game (ADF&G) has used MSA based on coastwide baselines (allozymes: Teel et al. 1999; microsatellites: Seeb et al. 2007) to estimate the composition of Chinook salmon harvested in the commercial troll fishery (Crane et al. 2000; Templin et al. 2011; Gilk-Baumer et al. 2013, *In prep*[a]). Genetic MSA is possible for PST fisheries due to the CTC-funded Genetic Analysis of Pacific Salmonids (GAPS) project, a cooperative project among 10 laboratories with the goal of developing a standardized DNA

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[2] Blankenship, S., K. I. Warheit, J. Von Bargen, and D. A. Milward. Unpublished WDFW molecular genetics laboratory report submitted to the Pacific Salmon Commission-Chinook Technical Committee. 2007. Genetic stock identification determines inter-annual variation in stock composition for legal and sub-legal Chinook captured in the Washington Area-2 non-treaty troll fishery. Draft available from http://fish-tools.com/reports/2011/Blankenship_et-al_Area-2_fishery080211.pdf

baseline for stock identification of Chinook salmon (Moran et al. 2004). This process began in 2002, and a standardized baseline was available during the summer of 2005 (Seeb et al. 2007). The baseline can be used, with acceptable accuracy and precision, to identify 44 reporting groups in mixtures (Seeb et al. 2007). For the SEAK fisheries, these were combined into 26 reporting groups based on management needs and stock presence (Table 1). This baseline continues to be improved through the addition of populations; the current baseline (version 3.0) contains allele frequencies from 357 populations contributing to PSC fisheries, ranging from the Situk River in Alaska to the Central Valley of California (Appendix A1).

The expectation behind investment in genetic capabilities was that genetic MSA could be integrated into a coordinated coastwide management system—the subject of workshops held by the PSC (PSC 2008). One conclusion at the workshop was that an important advantage of genetic MSA (over CWT-based methods) is the complete coverage of all stocks and all individuals in the stocks (PSC 2008). Coded wire tags have been used for cohort analysis of individual release groups and are an integral part of the PSC Chinook Model. However, CWT-based assessments are based upon the assumption that the release of juvenile Chinook salmon with a CWT (usually of hatchery origin) will provide valid surrogates for a stock of interest, typically a Chinook salmon stock of wild origin. Often these critical assumptions are unverified and multiple studies have demonstrated that hatchery-origin fish mature and survive at rates different than their wild counterparts due to differences in growth rates, release locations, and release sizes (CTC 2015; Peterson et al. 2016). On the other hand, CWT methods are one of the only ways of detecting and estimating stocks of Chinook salmon that are minor contributors to a fishery because the numeric tags minimize the problem of misclassification and more catch is sampled for CWTs on a coastwide basis (~20%) to recover these tags. By contrast, genetic MSA is best suited for estimating contributions of major stocks, i.e., those making up relatively large proportions (≥5%) of the sample.

Stocks of Chinook salmon originating from streams and hatcheries along the Southeast Alaska, Northern/Central British Columbia, West Vancouver Island, Washington, and Oregon coasts, and in the South Thompson and Upper Columbia[3] rivers consistently contribute more than 5% to the troll harvest in SEAK, and consequently are important stocks that help drive catch allocations under the PST (Table 1; CTC 2017). Collectively these 7 aggregate stocks compose a large proportion (typically >90%; Gilk-Baumer et al. 2017) of all Chinook salmon annually harvested in SEAK troll fisheries, and thus genetic MSA is the preferred method for providing accurate and precise stock composition estimates for these *driver stocks* in SEAK fisheries (PSC 2008).

The information reported herein are the results of genetic MSA based on the most recent standardized baseline of microsatellites (GAPS version 3.0) to provide independent estimates of the stock composition of Chinook salmon harvested in the SEAK troll fishery in Accounting Year[4] (AY) 2015. Results focus primarily on the 7 driver stocks important for SEAK fisheries managed under the PST, although broad- and fine-scale information is also provided for context.

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[3] All summer and fall Chinook salmon transiting Bonneville Dam from June 1 through November 15, 2015, are destined for areas above McNary Dam and the Deschutes River.

[4] 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 2015 is October 1, 2014, through September 30, 2015.

OBJECTIVES

The goal of this genetic MSA program was to estimate the stock composition of Chinook salmon harvested in SEAK commercial troll fisheries during AY 2015. Project objectives were as follows:

1. Sample Chinook salmon from the SEAK troll fishery harvests in a representative manner to provide stock composition estimates of the harvest within 5% of the true value 90% of the time.
2. Survey Chinook salmon sampled from the SEAK troll fishery for individual genotypes at the 13 microsatellite loci in the coastwide baseline (GAPS version 3.0).
3. Estimate the relative contribution of 26 fine-scale reporting groups for the following fisheries in AY 2015:
    a. Early winter (October–December) and late winter (January–April) troll fisheries in the NO quadrant, and across all quadrants;
    b. Spring troll fisheries (May–June) with separate estimates for Chinook salmon harvested in the NO, NI, and SI quadrants; and
    c. Summer troll fisheries (July–September) with separate estimates for the first Chinook salmon opening and subsequent openings combined for Chinook salmon harvested across all quadrants and in the NO quadrant alone.

METHODS

FISHERY SAMPLING

Traditionally, sample sizes for the estimation of stock composition have been set at 400 individuals per stratum for fishery samples from highly mixed locations where many stocks contribute to the harvest (e.g., Seeb et al. 2000). According to sampling theory, under the worst-case scenario (3 stocks contributing equal proportions) a sample of this size should provide estimates of relative proportions within 5% of the true value 90% of the time (Thompson 1987) when stocks are genetically identifiable. The same statistical approach indicates that under worst-case conditions a sample of 200 will be within approximately 7% of the true value 90% of the time. Thus, given these levels of precision and accuracy, the need to balance costs of fisheries sampling and costs of laboratory analysis, and the resolution of stock composition information needed to support fishery management, sample sizes were set to target a minimum of 400 samples per stratum for the following strata:

1. Early winter fishery (October–December)
    a. NO quadrant
    b. Regionwide
2. Late winter fishery (January–April)
    a. NO quadrant
    b. Regionwide
3. Spring fishery (April–June)
    a. NO quadrant
    b. NI quadrant
    c. SI quadrant

4. Summer fishery (July–September)
    a. First retention period (July)
        i. NO quadrant
        ii. Regionwide
    b. Second and subsequent retention periods (August–September)
        i. NO quadrant
        ii. Regionwide

When necessary, sample goals were moved between ports within a stratum to achieve minimum sample sizes for some strata (Table 2). Sample sizes in the NO quadrant were set so that stock contributions to the harvest in this quadrant could be estimated for each of the time periods in addition to an all-quadrant estimate. Goals varied among ports depending on expectations for deliveries (processor availability), availability of port samplers, and the vagaries of each seasonal fishery.

Details regarding port sampling procedures are outlined in Buettner et al. (2017). In short, Chinook salmon were targeted for collection from landings at processors at various ports in SEAK (Table 2 and Table 3; Figure 1). Fish were selected for sampling without regard to size, sex, presence of an adipose fin, or position in the vessel hold or tote, and sampling was conducted in such a manner to be as representative as possible of that week's commercial catch. Axillary processes (the modified and elongated structure found at the anterior base of the pelvic fin) were excised from each fish and placed in a 2 ml cryovial in at least 95% denatured ethanol or dried on Whatman paper. Troll fishermen were interviewed to determine the quadrant (NO, NI, SO, or SI) from which the Chinook salmon were harvested. At the end of the season, samples were shipped air cargo back to the ADF&G Gene Conservation Laboratory in Anchorage for analysis. Associated data were archived as part of the age-sex-length database maintained by ADF&G.

MIXED STOCK ANALYSIS

Laboratory Analysis

Samples were assayed for 13 microsatellite loci developed by the GAPS group for use in Treaty fisheries (CTC standardized baseline loci; Seeb et al. 2007). Genomic DNA was extracted from tissue samples using a NucleoSpin 96 Tissue Kit by Macherey-Nagel (Düren, Germany). 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 an Applied Biosystems (AB; Foster City, CA) thermocycler. Primer concentrations, $MgCl_2$ concentrations, and the corresponding annealing temperature for each primer are available in Seeb et al. 2007. PCR fragment analysis was done on an AB 3730 capillary DNA sequencer. A 96-well reaction plate was loaded with 0.5 ul PCR product 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 v4.0. All laboratory analyses followed protocols accepted by the CTC.

Genetic data were collected as individual multilocus genotypes. 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

ADF&G 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 an *Oracle* database (*LOKI*) on a network drive maintained by ADF&G computer services.

Several measures were implemented to ensure the quality of data produced. First, each individual tissue sample was assigned a unique accession identifier. At the time DNA was extracted or analyzed from each sample, a sample sheet was created that linked each individual sample's code to a specific well number in a uniquely numbered 96-well plate. This sample sheet then followed the sample through all phases of the project, minimizing the risk of misidentification of samples through human-induced errors. Second, genotypes were assigned to individuals using a system in which 2 people score the genotype data independently. Discrepancies between the 2 sets of scores were then resolved with 1 of 2 possible outcomes: (1) 1 score was accepted and the other rejected, or (2) both scores were rejected and no score was retained. Lastly, approximately 8% of the individuals, 8 samples from each 96-well DNA extraction plate, were reanalyzed for all loci. This enabled detection and correction of laboratory mistakes and allowed estimation of genotyping error rates. Error rates were calculated as the number of conflicting genotypes divided by the total number of genotypes examined.

Statistical Analysis

Mixture Subsampling

Representative mixtures of individuals for MSA were created by subsampling individuals from the collected tissue samples in proportion to harvest by quadrant. The harvest of Chinook salmon in each quadrant for a given troll fishery opening was obtained from the ADF&G Mark, Tag, and Age Laboratory website (https://mtalab.adfg.alaska.gov/CWT/reports/default.aspx) using the criteria in Table 4. The relative proportion of the total period harvest that was caught in each quadrant was then calculated for each fishery opening.

Typically 11 mixtures are necessary to generate stock composition estimates for the strata described above; however, in 2015 only 9 mixtures were necessary because only 1 retention period occurred for the summer troll fishery. For regionwide (all quadrant) estimates, separate mixtures were made for the (1) NO quadrant and (2) all other quadrants combined, and then pooled into regionwide estimates by weighting by each quadrant's harvest (Templin et al. 2011). For each fishery and quadrant, individual samples were randomly selected from the entire set of samples available from each quadrant such that the contribution of each quadrant to the sample mixture reflected the composition of the harvest. When sufficient samples were available, the target sample size for each mixture was 400. In some cases, fewer than 400 individuals were available; in these cases, a minimum sample size was set at 200. In addition, in some cases fewer than 200 individuals were available to generate an estimate. Although a sample size below 200 did not meet objectives for precision and accuracy, strata with sample sizes of 100–200 were deemed useful over the option of no information; thus estimates were generated, but only to the 4 broad-scale reporting groups outlined in Table 1. No estimates were generated for sample sizes less than 100.

BAYES Analysis

The stock composition of fishery mixtures was estimated using the program BAYES (Pella and Masuda 2001). The Bayesian method of MSA is used to estimate the proportion of stocks caught within each fishery using 4 pieces of information: (1) a baseline of allele frequencies for each population, (2) the grouping of populations into the reporting groups desired for MSA, (3) prior information about the stock proportions of the fishery, and (4) the genotypes of fish sampled from the fishery.

The baseline of allele frequencies for Chinook salmon populations was obtained from the GAPS database (v3.0; http://www.nwfsc.noaa.gov/research/divisions/cb/genetics/standardization.cfm). Results from 100% proof tests indicate that the 26 fine-scale reporting groups used herein can be identified in mixtures with a 91% correct allocation or better (Gilk-Baumer et al. *In prep*[a]).

The choice of prior information about stock proportions in a fishery (the prior probability distribution hereafter referred to as the *prior*) is important for increasing MSA accuracy (Habicht et al. 2012a). In this analysis, the estimated stock proportions from the previous year in a given stratum were used as the prior for that stratum (i.e., 2014 estimates were used as prior parameters when generating 2015 estimates). The prior information about stock proportions was incorporated in the form of a Dirichlet probability distribution. The sum of all prior parameters was set to 1 (prior weight), which is equivalent to adding 1 fish to each mixture (Pella and Masuda 2001).

For each fishery mixture, 5 independent Markov Chain Monte Carlo chains of 40,000 iterations were run with different starting values and the first 20,000 iterations were discarded to remove the influence of the start values. In order to assess the among-chain convergence, the Gelman-Rubin shrink factors computed for all stock groups in BAYES were examined (Gelman and Rubin 1992). If a shrink factor for any stock group in a mixture was greater than 1.2, the mixture was reanalyzed with 80,000 iterations. If a mixture still had a shrink factor greater than 1.2 after the reanalysis, results from the 5 chains were averaged and a note was made in the results. We combined the second half of the 5 chains to form the posterior distribution and tabulated mean estimates, 90% credibility intervals, and standard deviations from a total of 100,000 iterations. In addition, we report the marginal median of the posterior distribution as a measure of central tendency for stock proportions (Pella and Masuda 2001). Misallocations to reporting groups that are either absent or at low proportions within mixtures can occur in MSA when the discriminant methods do not produce perfect identifiability (Pella and Milner 1987; Pella and Masuda 2001). Previous work has shown that the posterior distribution of these misallocations can be highly skewed and the mean is much more sensitive to extreme values than the median (e.g., Habicht et al. 2012b).

For regionwide estimates for the winter and summer fisheries, estimates from (1) the NO quadrant and (2) all other quadrants combined were pooled into total-area estimates by weighting each quadrant's estimate by their respective harvests (stratified estimator). This approach to analysis is described in detail in Templin et al. (2011).

In order to better describe annual trends across a longer time frame for those stocks that make up the largest proportion of harvest in SEAK Chinook salmon fisheries (i.e., driver stocks), the 26 fine-scale reporting groups were condensed into 8 reporting groups that consisted of 7 driver stocks and an *Other* group (Table 1). Where feasible, these reporting groups were aligned with stock groups used by the CTC for the PSC Chinook Model, and these groups perform well in genetic MSA. Further, the fine-scale groups were combined into 4 broad-scale reporting groups for describing trends on a large geographic scale (Table 1). When reporting groups were combined, credibility intervals were calculated from the raw BAYES output using the new groupings in order to accurately reflect the uncertainty in the estimates.

These reporting groups are large and in some situations do not provide the desired resolution. To enable accurate and precise investigation at a finer scale, proportional contributions are also provided graphically for a subset of the fine-scale reporting groups estimated to consistently contribute at least 5% to the harvest in at least 1 seasonal fishery per year. Again, all other stocks are included in an additional *Other* group.

RESULTS

FISHERY SAMPLING

A total of 4,281 tissue samples were collected across all fisheries for AY 2015, which is slightly less than the original sampling goal of 4,495. Goals were generally met for all fishery periods, but missed at some ports (Table 2). This was primarily caused by reduced fishing effort or less intensive harvest sampling during portions of the harvest season.

In AY 2015, sampling of Chinook salmon during the winter fisheries began with the early winter opening on October 11, 2014, and continued until the late winter fishery closed March 25, 2015. The sampling goals for winter fisheries by port are heavily weighted towards Sitka (70%) where the vast majority of the fishing effort is concentrated (typically 70–75%). A total of 531 samples (sampling goal: 545) were collected from the early winter troll fisheries, and 569 samples (sampling goal: 580) were collected from the late winter troll fisheries. Goals were met for every port except Ketchikan in the early winter and Craig in the late winter.

Sampling of Chinook salmon during the spring troll fishery occurred between April 16 and June 30. Sample goals were met for every port except Yakutat (Table 2). The sample size was only 184 from the NI quadrant; therefore, estimates were generated to the broad-scale reporting groups only (Table 1).

Sampling of Chinook salmon during the first retention period of the summer troll fishery occurred July 1–8; no second retention period occurred in AY 2015. Sample goals were met for every port except Elfin Cove where no samples were collected, and exceeded in Ketchikan and Sitka (Table 2). The total sample size of 1,558 was sufficient to generate estimates to the fine-scale reporting groups.

MIXED STOCK ANALYSIS

Laboratory Analysis

Quality control demonstrated a low error rate for the samples that were analyzed. A total of 258 fish were examined for quality control, or 3,354 genotype comparisons. The discrepancy rate was 1.67%.

Statistical Analysis

Early Winter Troll Fishery

For broad-scale reporting groups, the *US South* group (stocks originating from Washington, Oregon, and California) was the highest contributor during the early winter troll fishery of AY 2015 (54%), followed by *Canada* (33%) and *Alaska* (12%). The *Transboundary* group had a low contribution (<1%; Appendix B1).

For driver stock reporting groups, the largest contributor to the regionwide early winter troll fishery was the *Interior Columbia Su/F* group (44%), followed by the *NCBC* (23%), *Other*

(16%), and *SEAK/TBR* (12%) groups (Figure 2). Results for driver stock reporting groups are available in Appendix B2.

For fine-scale reporting groups the largest contributors to the regionwide early winter troll fishery were the *Interior Columbia Su/F* (44%), *BC Coast/Haida Gwaii* (22%), *S Southeast Alaska* (8.5%), *Puget Sound* (6%), and *East Vancouver* (5%) reporting groups (Figure 3). Results for fine-scale reporting groups are available in Appendix B3.

When considering harvest from the NO quadrant only, the contributions for driver stock reporting groups were similar with the *Interior Columbia Su/F* group being the largest contributor (51%), followed by the *NCBC* group (20%; Figure 2). Results for driver stock reporting groups are available in Appendix B2; results for fine-scale reporting groups are available in Figure 3 and Appendix B3.

Late Winter Troll Fishery

For broad-scale reporting groups, the *US South* group was the highest contributor during the late winter troll fishery (49%), followed by *Canada* (39%) and *Alaska* (11%). The *Transboundary* group had a low contribution (<2%; Appendix B1).

For driver stock reporting groups, the largest contributor to the regionwide late winter troll fishery was the *Interior Columbia Su/F* group (32%), followed by the *NCBC*, *Other*, and *West Vancouver* reporting groups (each 17%; Figure 2). *SEAK/TBR* contributed 12% in this fishery. Results for driver stock reporting groups are available in Appendix B2.

When considering fine-scale reporting groups, the largest contributor to the regionwide late winter fishery was the *Interior Columbia River Su/F* reporting group (32%) followed by the *West Vancouver* (17%), *BC Coast/Haida Gwaii* (15%), *Willamette* (10%) and *S Southeast Alaska* (6%) reporting groups (Figure 4). Results for fine-scale reporting groups are available in Appendix B4.

When considering harvest from the NO quadrant only, contributions for driver stock reporting groups were similar to regionwide estimates with the *Interior Columbia Su/F* reporting groups as the largest contributor (39%), followed by the *West Vancouver* and *Other* groups (each 18%; Figure 2). Results for driver stock reporting groups are available in Appendix B2; results for fine-scale reporting groups are available in Figure 4 and Appendix B4.

Spring Troll Fishery

During the spring troll fisheries, the contributions of the broad-scale reporting groups were highly variable across the 3 quadrants analyzed. In the NO quadrant, the *US South* group was the highest contributor (41%), followed by the *Alaska* group (36%) and the *Canada* group (23%; Appendix B1). In the SI quadrant, the *Alaska* group contributed the majority of the harvest (63%) followed by the *Canada* group (26%) and the *US South* group (9%). Conversely, the *Canada* broad-scale reporting group was the largest contributor to the harvest in the NI quadrant (41%) followed by the *Alaska* group (39%) and the *US South* group (15%; Appendix B1). The *Transboundary* group had a low contribution across all quadrants (range: <1–4%).

For the driver stock reporting groups, contributions were also variable amongst quadrants during the spring troll fisheries. The largest contributor to the NO quadrant harvest was the *SEAK/TBR* reporting group (36%), followed by the *Interior Columbia Su/F* (24%), *Other* (16%), and *West Vancouver* (11%) groups (Figure 2). In the SI quadrant, the largest contributor was also the

SEAK/TBR reporting group (66%), followed by the NCBC group (17%). Results for driver stock reporting groups are available in Appendix B2.

At fine-scale reporting groups, similar variability between quadrants was observed. In the NO quadrant, the highest proportion of Chinook salmon was from the *Andrew* reporting group (31%), which includes production from hatcheries which use Andrew Creek broodstock (Figure 5), followed by the *Interior Columbia Su/Fa* group (24%). The *Canada* group contribution was dominated by *West Vancouver* stocks (11%) followed by *BC Coast/Haida Gwaii* (7%). In the SI quadrant, the *Alaska* reporting group was the largest contributor with harvests dominated by the *S Southeast Alaska* reporting group (36%), followed by the *Andrew* reporting group (27%; Figure 5). The *BC Coast/Haida Gwaii* group was the next highest contributor (14%). Results for fine-scale reporting groups are available in Appendix B5.

In the NI quadrant, estimates are not available for either the driver stock reporting groups or fine-scale reporting groups because sample sizes were insufficient.

Summer Troll Fishery, First Retention Period

The stock composition of the summer troll fishery tends to be the most varied of the seasonal fisheries with greater representation of non-Alaska stocks. At the broad-scale reporting groups during the first retention period, the *US South* reporting group accounted for the vast majority of the regionwide harvest (71%), followed by *Canada* (23%), and *Alaska* (6%). The *Transboundary* group had a low contribution (<1%; Appendix B1).

For driver stock reporting groups, the greatest contributor to the regionwide harvest during the first retention of the summer troll fishery was the *Interior Columbia Su/F* reporting group (45%), followed by the *Oregon Coast* (12%) and *South Thompson* (11%) reporting groups (Figure 2). Results for driver stock reporting groups are available in Appendix B2.

At the fine-scale, the first retention period of the summer troll regionwide fishery was dominated by the *Interior Columbia Su/F* reporting group (45%). The *South Thompson*, *Washington Coast* and *North Oregon Coast* reporting groups contributed approximately equal proportions to the regionwide harvest (~10%; Figure 6). Results for fine-scale reporting groups are available in Appendix B6.

Stock compositions in the NO quadrant during the first retention period were similar to estimates for the entire area at the driver stock reporting groups, with harvests dominated by the *Interior Columbia Su/F* reporting group (48%; Figure 2). The *Oregon Coast* (14%), *Washington Coast* (10%), and *South Thompson* (9%) reporting groups were also substantial contributors. Results for driver stock reporting groups are available in Appendix B2.

Summer Troll Fishery, Second Retention Period

Fishing effort and catch rates were unusually high during the first retention period and the PST harvest quota was reached in early July. Consequently, no second retention period occurred in 2015.

DISCUSSION

Genetic MSA has been successfully used to estimate the composition of the commercial troll fishery harvest since 1999 (e.g., Gilk-Baumer et al. 2013; *In prep*[a]). Because the 7 aggregate driver stocks make up the vast majority (>90%) of all Chinook salmon annually harvested in

SEAK fisheries, these stock aggregates drive the SEAK fisheries and their catch allocations under the PST (Gilk-Baumer et al. 2013, *In prep*[a]). Genetic MSA is the preferred method to provide accurate and precise harvest estimates for these large aggregates of driver stocks. These estimates indicate that the composition of the harvest varies spatially and by seasonal fishery, but the same constituent stocks are present year to year (Gilk-Baumer et al. *In prep*[a]).

INTRA-ANNUAL VARIABILITY

Comparison of the composition of harvests among seasonal fisheries in AY 2015 shows considerable variability. The composition of early and late winter fisheries includes a mixture of more stocks than other seasonal fisheries; the 7 driver stocks account for 84% of the early winter harvest and 82% of the late winter harvest. By contrast, during the spring troll fishery, when fishing effort is directed at harvesting SEAK-origin hatchery stocks, the contribution of *Alaska* stocks (47%) was considerably higher than at other times of the year. More than 90% of the spring harvest composition was accounted for by the 7 driver stocks. The summer troll catch composition was heavily dominated by *Interior Columbia Su/F* stocks (45%) and 94% was contributed by driver stocks.

Although the 7 driver stocks accounted for the vast majority of the harvests in AY 2015, the proportional contribution of each stock varied across seasons. The *SEAK/TBR*, *NCBC*, and *West Vancouver* stocks were larger contributors to winter and spring fisheries, and less prevalent during the summer (Figure 2). *Interior Columbia Su/F* stocks accounted for large proportions of the harvest in all seasonal fisheries in AY 2015 and were particularly large contributors during winter and summer fisheries (Figure 2). Stocks originating from the *South Thompson*, *Washington Coast*, and *Oregon Coast* were small contributors to winter and spring fisheries (<3%), but contributed substantially to the summer troll fishery particularly in the NO quadrant. Because the majority of the annual harvest limit was taken during the summer troll fishery in AY 2015, these 3 stocks still contributed more than 7% each to the annual harvest.

Variation in stock composition also occurs spatially among the fishery quadrants. In general, stock contribution estimates based on samples from the NO quadrant had the most diverse stock compositions and the highest proportion of stocks originating south of Alaska. In the spring fishery, the SI quadrant had the highest proportion of *Alaska* and *Transboundary* stocks, which made up 2/3 of the harvest, whereas the proportions of those stocks in outside quadrants were 36–39%. For summer fisheries, stock contribution estimates based on samples from the NO quadrant were similar to estimates based on samples from all quadrants. This likely reflects the high proportion of fish harvested in this quadrant relative to the other quadrants.

INTERANNUAL TRENDS

Some interesting trends can be observed for the composition of SEAK troll fisheries under the current PST fishing regime with the data reported herein and similar studies dating back to AY 2009 (Gilk-Baumer et al. 2013; *In prep*[a]; Appendix B7). In general, there has been an increasing trend in recent years in the prevalence of *US South* stocks and a decreasing prevalence of *Alaska* stocks across most fisheries. This is most obvious in NO quadrant fisheries (Gilk-Baumer et al. *In prep*[a]). These trends correspond with an increase in productivity of the *Interior Columbia Su/F* reporting group, which accounted for 37% of the annual regionwide harvest in AY 2015 (Appendix B7). This increase was mirrored by a decrease in productivity for *SEAK/TBR* stocks (Figure 7). Stocks originating from *West Vancouver* and *South Thompson* were also harvested in below average proportions in AY 2015. The contribution from *Washington Coast* and *Oregon Coast* stocks remained more consistent from AY 2009 to AY 2015.

At the fine-scale, the decreasing trend observed by Gilk-Baumer et al. (*In prep*[a]) in harvests of the *N Southeast Alaska* stock group in the NI quadrant across years continued in AY 2015, which corresponds to decreases in escapements, terminal run sizes, and decreased productivity for the constituent stocks (CTC 2017). Similarly, a decreasing trend across years was observed for the presence of the *S Southeast Alaska* stock group harvested in the SI quadrant, which mirrors recent lower escapements to Unuk, Keta, Blossom, and Chickamin rivers, a decrease in productivity of these wild stocks, and decreased survival of hatchery stocks of Chinook salmon in the southern portion of Southeast Alaska (CTC 2017). Consequently, special management actions were taken in the SI Quadrant during the spring troll fishery in AY 2015 in the form of time and area closures to protect these stocks.

Specific comparisons between analyses using the most recent microsatellite baseline (GAPS version 3.0; Gilk-Baumer et al. *In prep*[a]; and this report) versus those using older microsatellite baselines (GAPS version 2.2; 2004–2009; Gilk-Baumer et al. 2013) and those using allozyme baselines (1999–2003; Templin et al. 2011) can be made, but must be interpreted carefully as both the number of populations and reporting groups changed between the studies. Because of these changes in the genetic baselines, comparisons across years prior to 2010 are more reliable at the broad-scale than at finer scale levels.

APPLICATIONS TO THE PACIFIC SALMON TREATY

These results present a comprehensive assessment using MSA to estimate the stock composition of Chinook salmon harvested in the SEAK troll fishery. Stock composition data from this program are currently being used in several other studies with a broad array of applications:

1. These MSA stock composition estimates have already proven considerably valuable for fishery management in terminal and near-terminal areas and are being used in run reconstructions to generate better forecasts of run strength for transboundary rivers under Chapter 1 of the PST.

2. These MSA stock composition estimates are being combined with individual assignment, otolith mark, CWT, age, and harvest information to provide independent abundance estimates of some PSC Chinook Model stocks to assist in evaluation of the PSC Chinook Model. The PSC Chinook Model may not reliably determine the composition of the harvest in SEAK because (1) it does not include fish originating from transboundary rivers (i.e., Taku, Stikine, Alsek rivers), (2) only 1 of its 30 model stocks originates from SEAK and it only represents a small proportion of the natural production of SEAK Chinook salmon, and (3) the model is based on *treaty Chinook* which excludes nearly all of the Southeast Alaska hatchery-produced Chinook salmon harvested in SEAK fisheries. For domestic applications, the preferred way to estimate the composition of the SEAK Chinook salmon harvest is to apply fishery stock composition data from MSA to harvest data. This approach has been successfully applied to the SEAK commercial troll fishery from 1999 through 2014 (Templin et al. 2011; Gilk-Baumer et al. 2013, *In prep*[a]) and SEAK sport fishery from 2004 through 2015 (Gilk-Baumer et al. *In prep*[b]).

3. Bernard et al. (2014) investigated using genetic analysis in combination with CWTs to estimate terminal run size of Chinook salmon in 2011 from 4 large stock groups that are major contributors to SEAK troll and sport fisheries-West Coast Vancouver Island, Washington Coast, North Oregon Coast, and Upper Columbia River Falls. This driver stock method has proven successful for estimating the terminal run size of several of the stocks that are major contributors to the SEAK fishery and has resulted in an on-going annual effort.

CONCLUSIONS

1. The 7 driver stocks-*SEAK/TBR*, *NCBC*, *South Thompson*, *West Vancouver*, *Washington Coast*, *Interior Columbia Su/F*, and *Oregon Coast*-collectively contributed 91% to the regionwide troll harvest in AY 2015.
2. The fine-scale reporting groups that contributed the highest proportion of fish to the SEAK troll fisheries in AY 2015 were *Interior Columbia Su/F, North Oregon Coast, Washington Coast*, *South Thompson*, *West Vancouver*, and *Andrew*. Other reporting groups, such as *S Southeast Alaska* and *BC Coast*/*Haida Gwaii*, were also major contributors during some of the seasonal fisheries.
3. Stocks from *Alaska* and *Transboundary* reporting groups were the largest contributors to the spring troll fishery, though overall contributions decreased from previous years. These stock groups were most prevalent in the SI quadrant.
4. Summer- and fall-run Chinook salmon originating from the Upper Columbia River were the largest contributors overall to the regionwide harvest in AY 2015.

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TABLES AND FIGURES

Table 1.–Relationship between populations and reporting groups for Chinook salmon used to report stock composition of SEAK troll fishery harvests.

	Population	Fine-scale	Driver stocks [a]	Broad-scale
1	1	*Situk*	*SEAK/TBR*	*Alaska*
2	2-5	*Alsek*	*SEAK/TBR*	*Transboundary*
3	6-10	*N Southeast Alaska*	*SEAK/TBR*	*Alaska*
4	11-17	*Taku*	*SEAK/TBR*	*Transboundary*
5	18-21	*Andrew*	*SEAK/TBR*	*Alaska*
6	22-28	*Stikine*	*SEAK/TBR*	*Transboundary*
7	29-42	*S Southeast Alaska*	*SEAK/TBR*	*Alaska*
8	43-51	*Nass*	*NCBC*	*Canada*
9	52-78	*Skeena*	*NCBC*	*Canada*
10	79-97	*BC Coast/Haida Gwaii*	*NCBC*	*Canada*
11	98-113	*West Vancouver*	*West Vancouver*	*Canada*
12	114-123	*East Vancouver*	*Other*	*Canada*
13	124-157	*Fraser*	*Other*	*Canada*
14	158-166	*Lower Thompson*	*Other*	*Canada*
15	167-172	*North Thompson*	*Other*	*Canada*
16	173-180	*South Thompson*	*South Thompson*	*Canada*
17	181-212	*Puget Sound*	*Other*	*US South*
18	213-223	*Washington Coast*	*Washington Coast*	*US South*
19	224-226	*West Cascades Sp*	*Other*	*US South*
20	227-240	*Lower Columbia F*	*Other*	*US South*
21	241-246	*Willamette Sp*	*Other*	*US South*
22	247-302	*Columbia Sp*	*Other*	*US South*
23	303-320	*Interior Columbia Su/F*	*Interior Columbia Su/F*	*US South*
24	321-331	*North Oregon Coast*	*Oregon Coast*	*US South*
25	332-339	*Mid Oregon Coast*	*Oregon Coast*	*US South*
26	340-357	*S Oregon/California*	*Other*	*US South*

Note: Population numbers are listed in Appendix A1. Populations were combined into (1) 26 fine-scale reporting groups, (2) 8 driver stock reporting groups, and (3) 4 broad-scale reporting groups.

[a] Driver stocks are aggregate stocks that consistently make up a large proportion (>5%) of all Chinook salmon harvested annually in Southeast Alaska fisheries, and thus are important stocks that help drive catch allocations under the Pacific Salmon Treaty.

Table 2.–Sampling goals and numbers of fish sampled from troll-caught Chinook salmon landings at processors at ports in SEAK for mixed stock analysis, 2015.

Fishery	Port	Quadrants Represented[a]	AY 2015 Goal	AY 2015 Actual
Winter (October–April)				
Early Winter				
	Craig	SO, SI, NI	20	20
	Juneau	NI, NO	30	31
	Ketchikan	SI	40	26
	Petersburg	NI, SI	25	25
	Sitka	NO	430	430
			545	532
Late Winter				
	Craig	SO, SI, NI	50	39
	Juneau	NI, NO	60	60
	Ketchikan	SI	80	80
	Petersburg	NI, SI	40	40
	Sitka	NO	350	350
			580	569
Spring (May–June)				
	Craig	SO	100	100
	Juneau	NI, NO	200	206
	Ketchikan	SI, NI	300	300
	Petersburg	NI, SI	100	100
	Sitka	NO	300	300
	Wrangell	SI, NI	300	300
	Yakutat	NO	600	320
			1,900	1,626
Summer (July–September)				
Retention Period 1				
	Craig	SO	350	350
	Elfin Cove	NO	50	0
	Hoonah	NO	40	40
	Juneau	NO	0	0
	Ketchikan	SI, SO	100	240
	Pelican	NO	60	60
	Petersburg	NI, SI	150	150
	Port Alexander	NI	100	60
	Sitka	NO	510	550
	Wrangell	SI, NI	60	60
	Yakutat	NO	50	50
			1,470	1,560
Retention Period 2				
			No fishery	

Note: No summer troll second retention period occurred in 2015.

[a] Quadrant names are abbreviated as follows: Northern Outside (NO), Northern Inside (NI), Southern Outside (SO), and Southern Inside (SI).

Table 3.–Samples collected by quadrant in SEAK for each seasonal troll fishery, 2015.

	Quadrant				
Fishery	NO	SO	NI	SI	Total
Early Winter	442	20	31	39	532
Late Winter	402	39	26	102	569
Spring	770	100	190	566	1,626
Summer					
Retention Period 1	660	440	250	210	1,560
Retention Period 2		*No fishery*			

Note: No summer troll second retention period occurred in 2015.

Table 4.–Selection criteria used to generate the Commercial Harvest Expansion Report on the ADF&G Mark, Tag, and Age Laboratory website.

Criteria	Values
Years	2014, 2015
Species	410
Gear Class Codes	5
Harvest Codes	11, 13
Time Code	P
Time Value Range	1, 54
Area Code	Q- Quadrants
Districts	ALL
Quadrants	NE, NW, SE, SW (correspond to NI, NO, SI, and SO, respectively)
Stat Area Values	ALL

Note: Data are available at https://mtalab.adfg.alaska.gov/CWT/reports/default.aspx

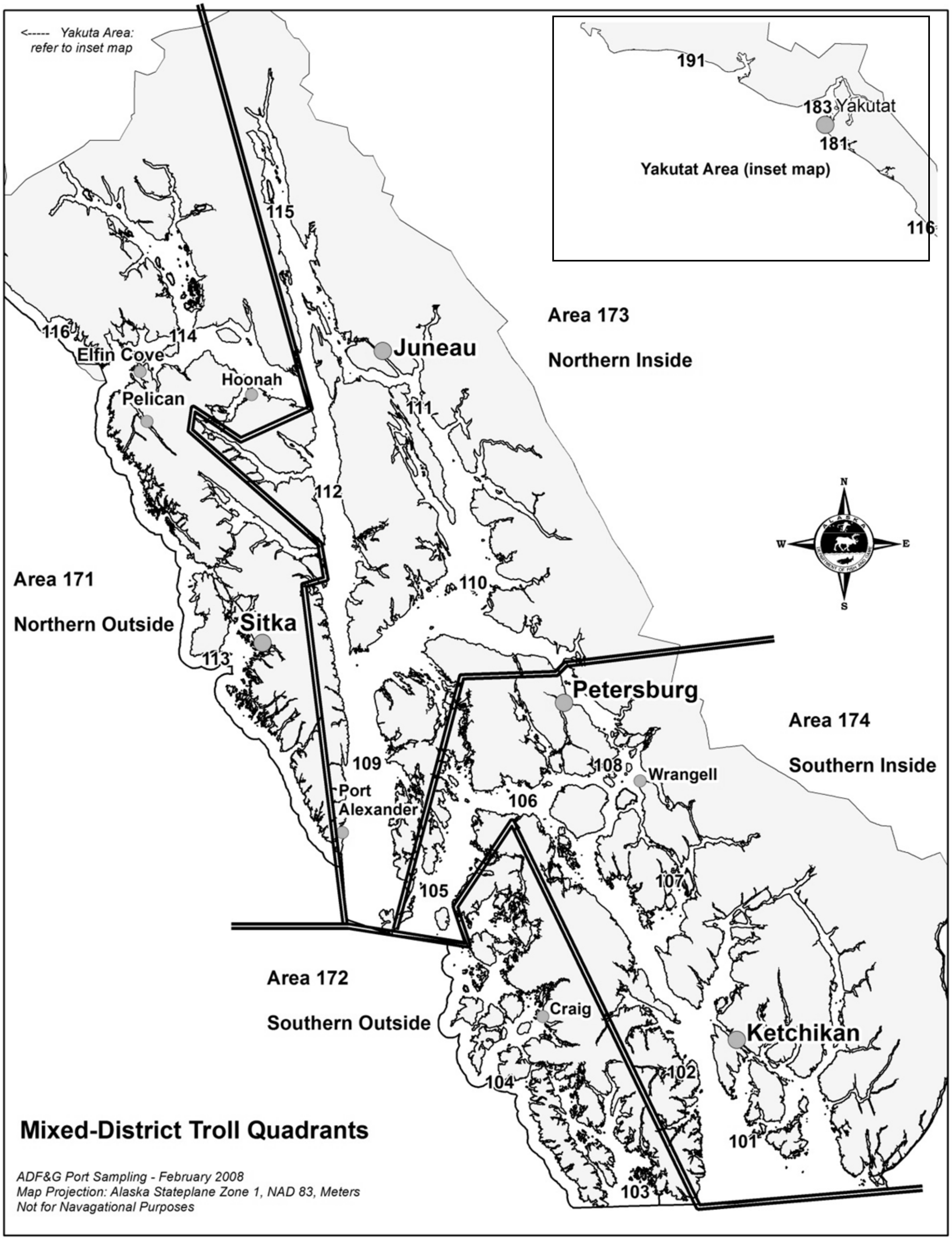

Figure 1.–Location of Southeast Alaska troll fishing quadrants and ports.

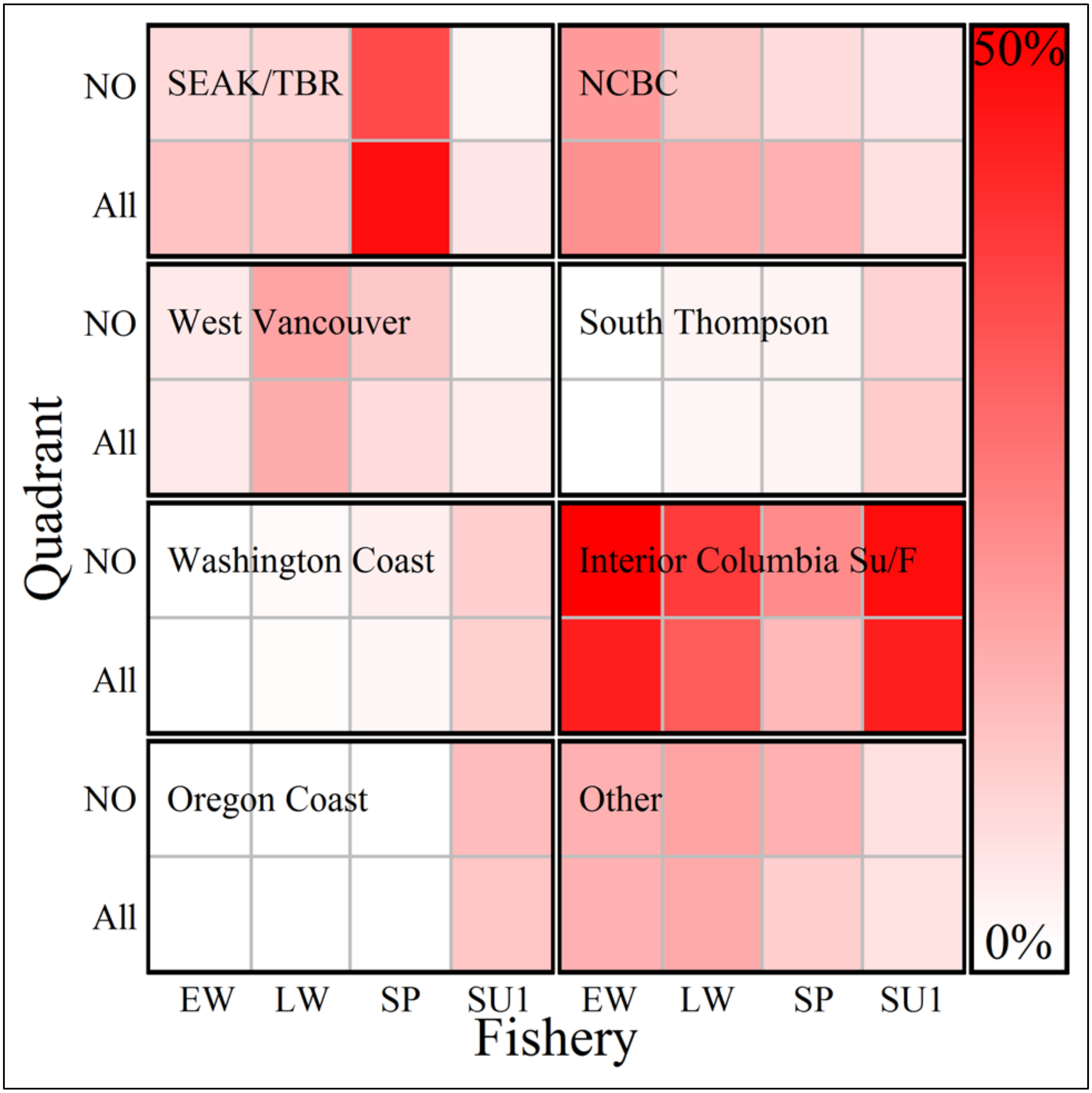

Figure 2.–Mean estimated contributions of driver stock reporting groups of Chinook salmon to the troll fishery harvest in SEAK by quadrant and seasonal fishery, AY 2015.

Note: Reporting groups are described in Table 1. Driver stocks are aggregate stocks that consistently make up a large proportion (>5%) of all Chinook salmon harvested annually in Southeast Alaska fisheries, and thus are important stocks that help drive catch allocations under the Pacific Salmon Treaty.

Note: Quadrant names are abbreviated as follows: Northern Outside (NO) and Regionwide (All).

Note: Fishery names are abbreviated as follows: Early Winter (EW), Late Winter (LW), Spring (SP), and Summer retention period 1 (SU1).

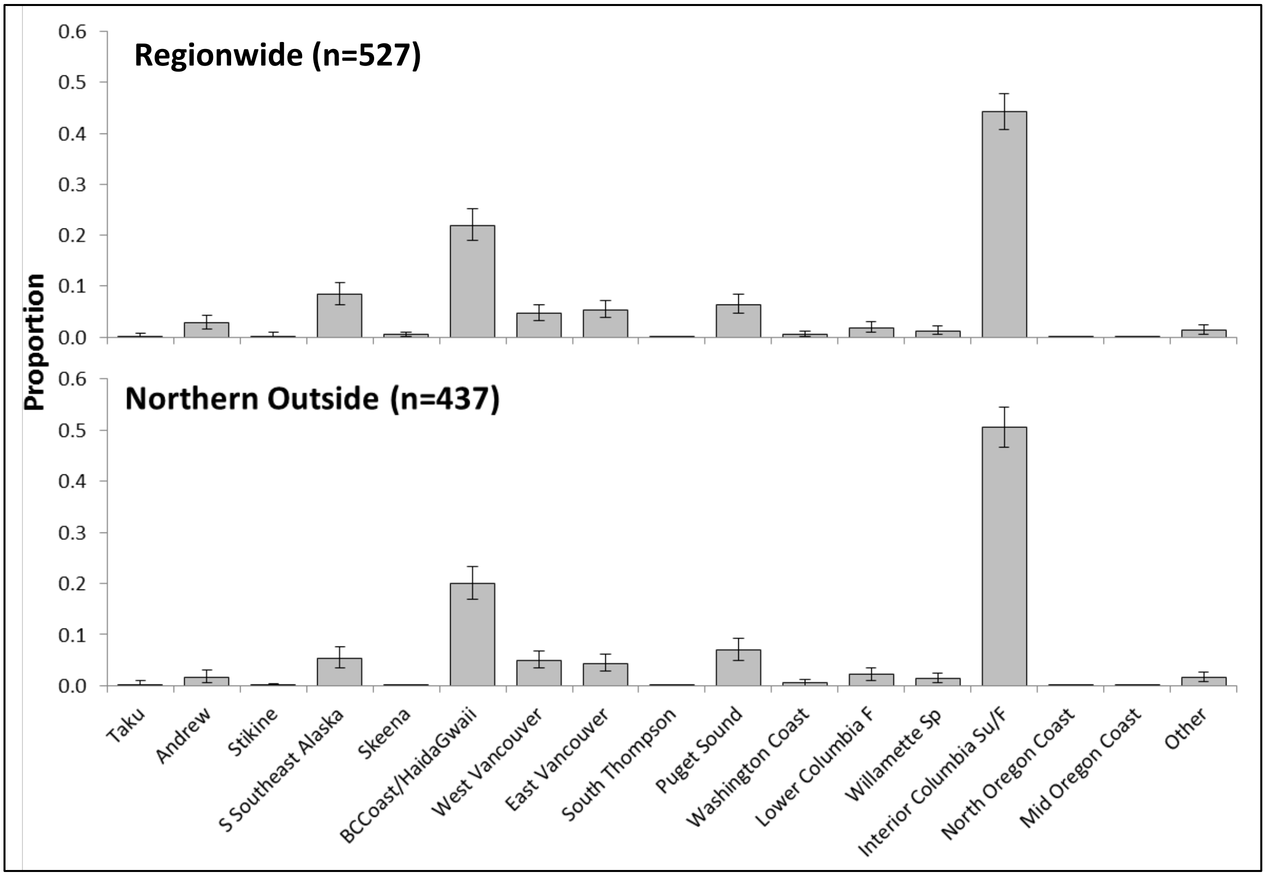

Figure 3.–Estimated contributions and 90% credibility intervals of fine-scale reporting groups of Chinook salmon to the regionwide (upper) and Northern Outside quadrant (lower) early winter troll fishery harvest in SEAK, AY 2015.

Note: Reporting groups are described in Table 1. The *Other* group includes those reporting groups that do not contribute more than 5% in any seasonal fisheries.

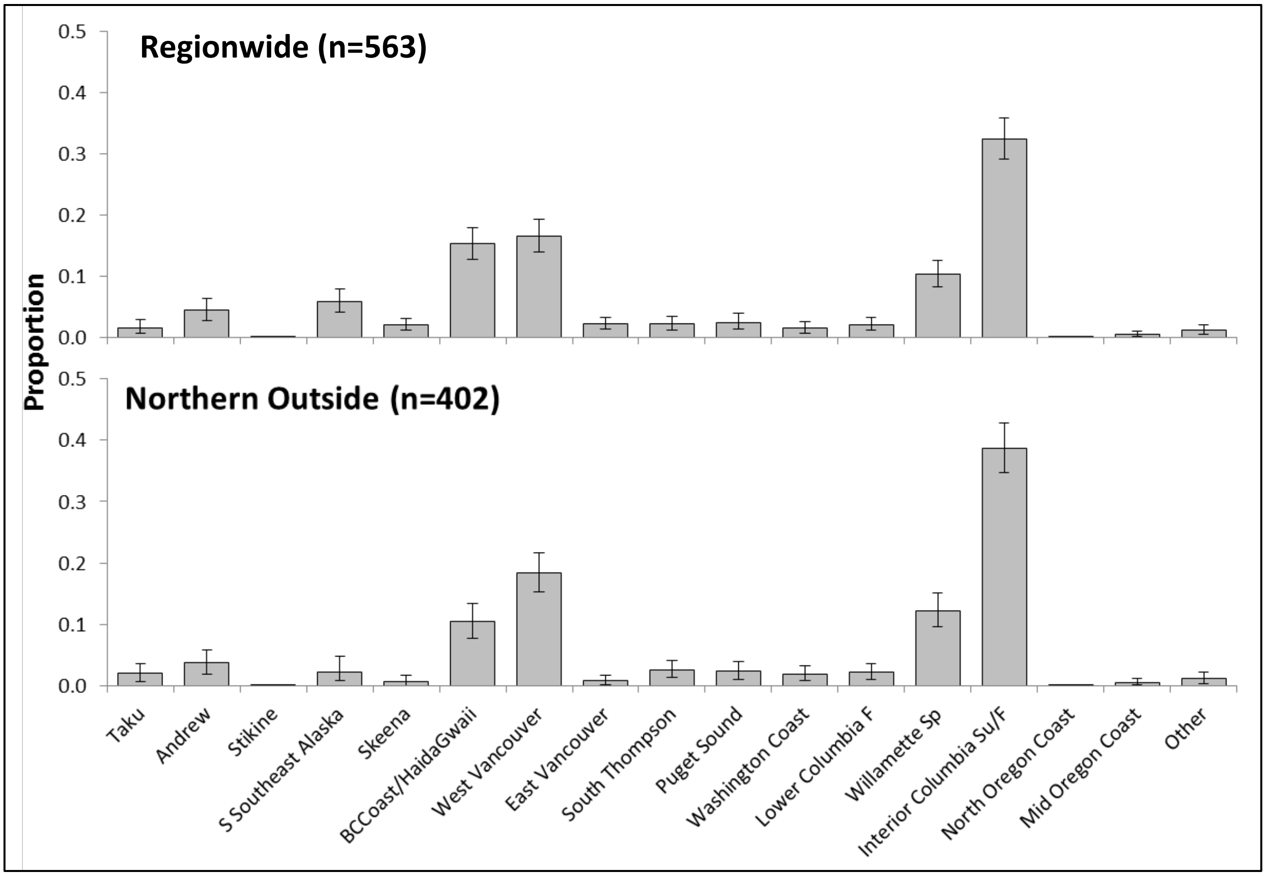

Figure 4.–Estimated contributions and 90% credibility intervals of fine-scale reporting groups of Chinook salmon to the regionwide (upper) and Northern Outside quadrant (lower) late winter troll fishery harvest in SEAK, AY 2015.

Note: Reporting groups are described in Table 1. The *Other* group includes those reporting groups that do not contribute more than 5% in any seasonal fisheries.

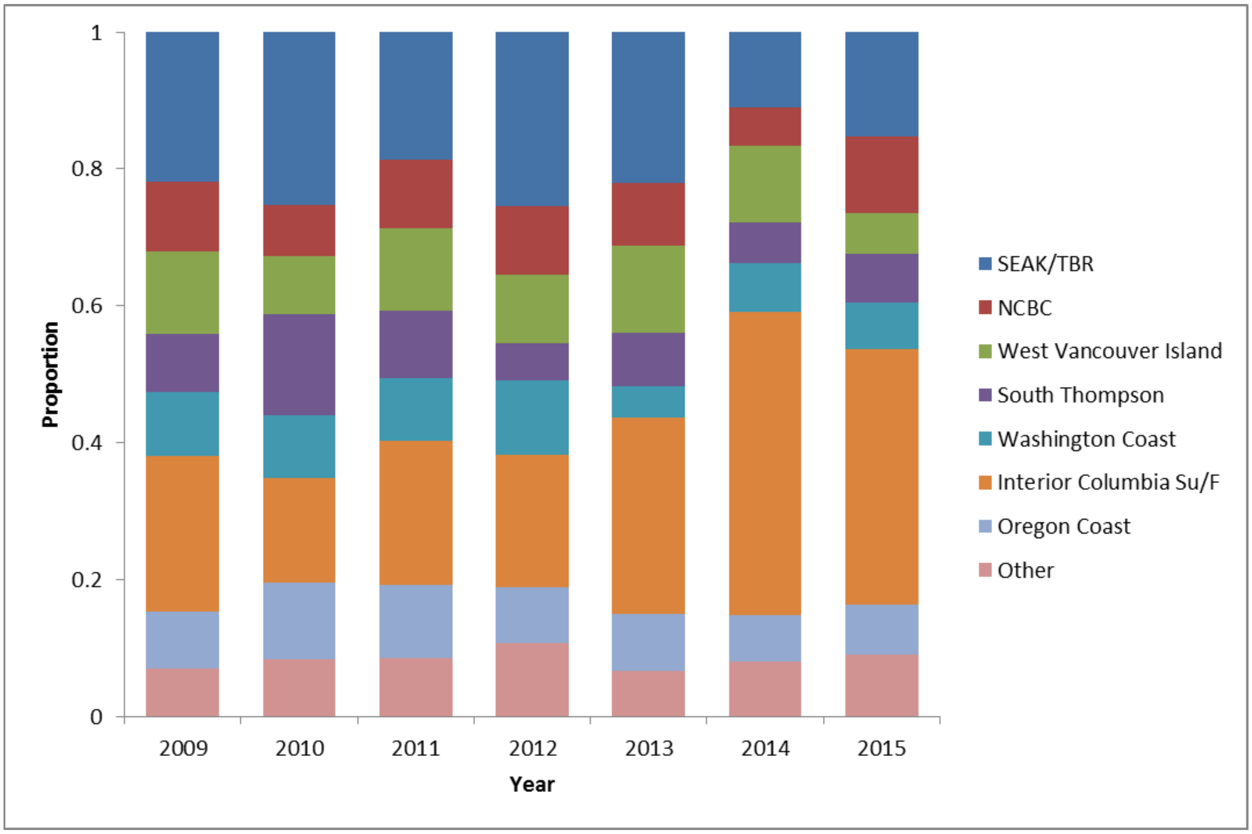

Figure 7.–Mean contributions of driver stock reporting groups of Chinook salmon to the annual regionwide troll fishery harvest in SEAK, AY 2010–2015.

Note: Reporting groups are described in Table 1. Driver stocks are aggregate stocks that consistently make up a large proportion (>5%) of all Chinook salmon harvested annually in Southeast Alaska fisheries, and thus are important stocks that help drive catch allocations under the Pacific Salmon Treaty.

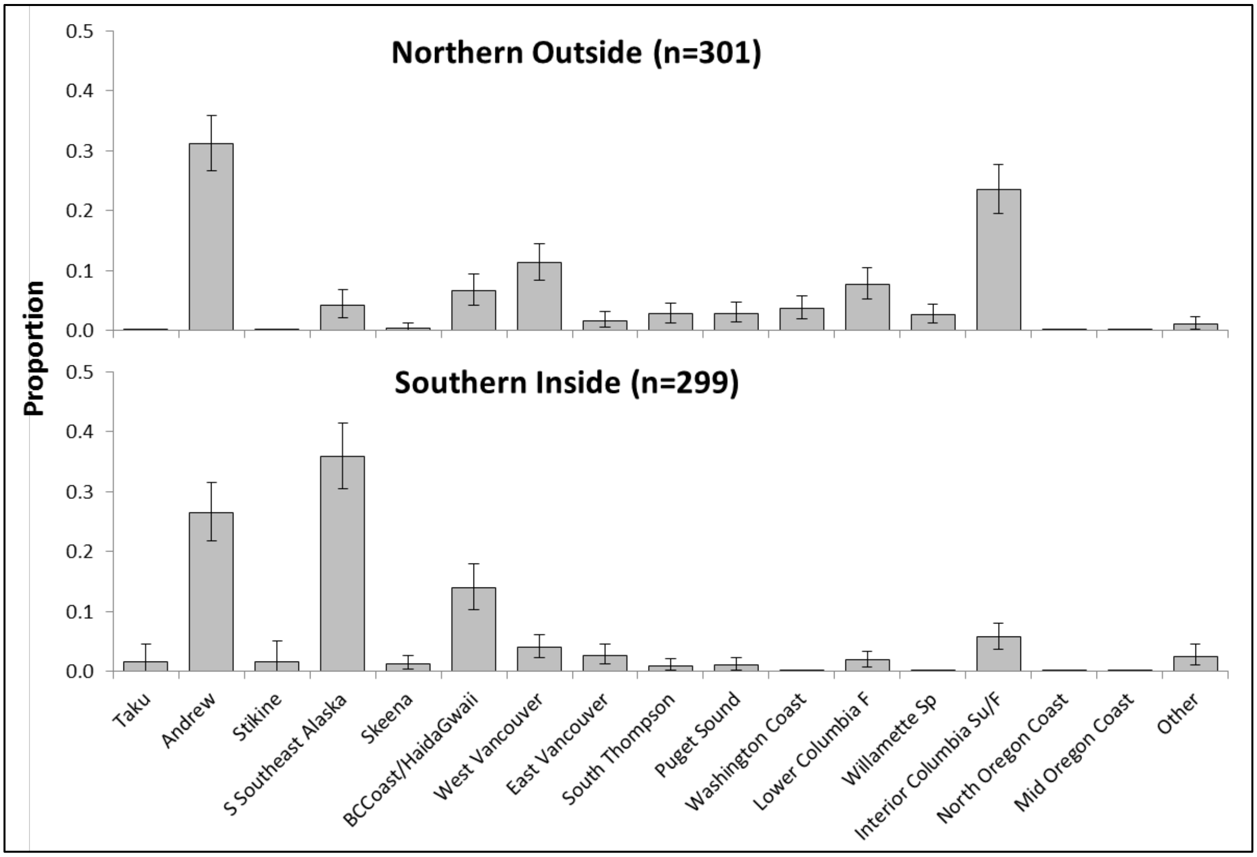

Figure 5.–Estimated contributions and 90% credibility intervals of fine-scale reporting groups of Chinook salmon to the spring troll fishery harvest in the Northern Outside and Southern Inside quadrants of SEAK, AY 2015.

Note: Reporting groups are described in Table 1. The *Other* group includes those reporting groups that do not contribute more than 5% in any seasonal fisheries.

Note: Inadequate sample sizes precluded estimating stock compositions for Spring troll Northern Inside quadrant for fine-scale reporting groups.

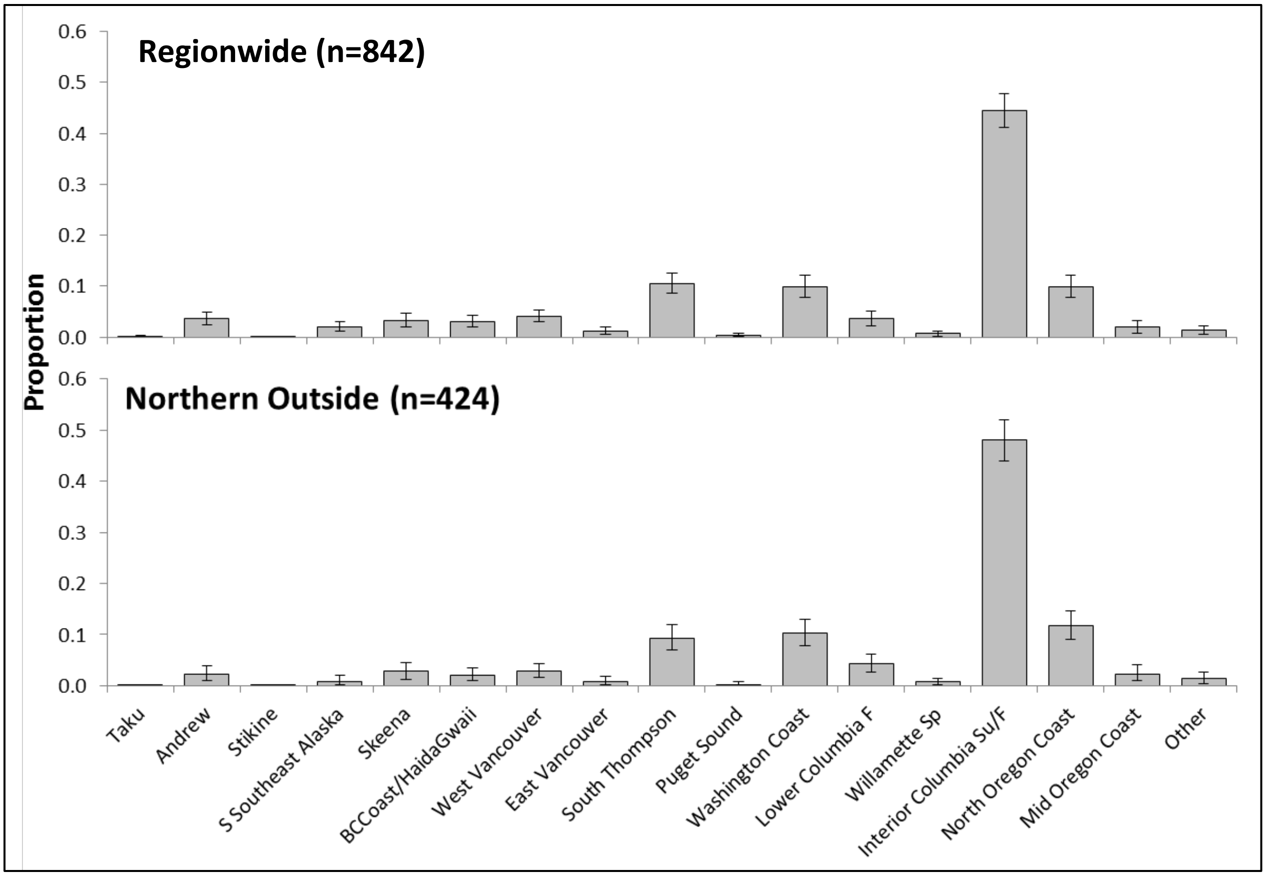

Figure 6.–Estimated contributions and 90% credibility intervals of fine-scale reporting groups of Chinook salmon to the regionwide (upper) and Northern Outside quadrant (lower) first retention period of the summer troll fishery harvest in SEAK, AY 2015.

Note: Reporting groups are described in Table 1. The *Other* group includes those reporting groups that do not contribute more than 5% in any seasonal fisheries.

APPENDIX A: BASELINE POPULATIONS

Appendix A1.–Location and collection details for each population of Chinook salmon included in the coastwide baseline of microsatellite data (GAPS version 3.0).

	Fine-scale Reporting Group	Pop No.[a]	Population	N	Run time[b]	Origin[c]	Life Stage	Collection Date
1	*Situk*	1	Situk River	127		W	Adult	1988, 1990, 1991, 1992
2	*Alsek*	2	Blanchard River	349		W	Adult	2000, 2001, 2002, 2003
		3	Goat Creek	62		W	Adult	2007, 2008
		4	Klukshu River	238		W	Adult	1987, 1989, 1990, 1991, 2000, 2001
		5	Takhanne River	196		W	Adult	2000, 2001, 2002, 2003, 2008
3	*N Southeast Alaska*	6	Big Boulder Creek	138		W	Adult	1992, 1995, 2004
		7	Tahini River--Macaulay Hatchery	77		H	Adult	2005
		8	Tahini River	119		W	Adult	1992, 2004
		9	Kelsall River	153		W	Adult	2004
		10	King Salmon River	143		W	Adult	1989, 1990, 1993
4	*Taku*	11	Dudidontu River	233		W	Adult	2002, 2004, 2005, 2006
		12	Kowatua Creek	288		W	Adult	1989, 1990, 2005
		13	Little Tatsamenie River	684		W	Adult	1999, 2005, 2006, 2007
		14	Little Trapper River	74		W	Adult	1999
		15	Upper Nahlin River	132		W	Adult	1989, 1990, 2004
		16	Nakina River	428		W	Adult	1989, 1990, 2004, 2005, 2006, 2007
		17	Tatsatua Creek	171		W	Adult	1989, 1990
5	*Andrew*	18	Andrew Creek	131		W	Adult	1989, 2004
		19	Andrew Creek–Crystal Hatchery	207		H	Adult	2005
		20	Andrew Creek–Macaulay Hatchery	135		H	Adult	2005
		21	Andrew Creek–Medvejie Hatchery	177		H	Adult	2005
6	*Stikine*	22	Christina River	164		W	Adult	2000, 2001, 2002
		23	Craig River	96		W	Adult	2001
		24	Johnny Tashoots Creek	62		W	Adult	2001, 2004, 2005, 2008
		25	Little Tahltan River	126		W	Adult	2001. 2004
		26	Shakes Creek	164		W	Adult	2000, 2001, 2002, 2007
		27	Tahltan River	80		W	Adult	2008
		28	Verrett River	482		W	Adult	2000, 2002, 2003, 2007
7	*S Southeast Alaska*	29	Chickamin River	126		W	Adult	1990, 2003
		30	King Creek	136		W	Adult	2003
		31	Butler Creek	190		W	Adult	2004
		32	Leduc Creek	43		W	Adult	2004
		33	Humpy Creek	124		W	Adult	2003
		34	Chickamin River–Little Port Walter H.	218		H	Adult	1993, 2005
		35	Chickamin River–Whitman Hatchery	193		H	Adult	2005
		36	Clear Creek	134		W	Adult	1989, 2003, 2004

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	Fine-scale Reporting Group	Pop No.[a]	Population	N	Run time[b]	Origin[c]	Life Stage	Collection Date
7	*Southeast Alaska (cont.)*	37	Cripple Creek	141		W	Adult	1988, 2003
		38	Gene's Lake	92		W	Adult	1989, 2003, 2004
		39	Kerr Creek	151		W	Adult	2003, 2004
		40	Unuk River–Little Port Walter H.	149		H	Adult	2005
		41	Keta River	200		W	Adult	1989, 2003, 2004
		42	Blossom River	190		W	Adult	2004
8	*Nass*	43	Cranberry River	158		W	Adult	1996, 1997
		44	Damdochax River	63	Su	W	Adult	1996
		45	Ishkheenickh River	192			Adult	2004, 2006
		46	Kincolith River	220	Su	W	Adult	1996, 1999
		47	Kiteen River	54			Adult	2006
		48	Kwinageese River	67	Su	W	Adult	1996, 1997
		49	Meziadin River	45			Adult	1996
		50	Oweegie Creek	147	Su	W	Adult	1996, 1997, 2004
		51	Tseax River	198			Adult	1995, 1996, 2002, 2006, 2008
9	*Skeena*	52	Cedar River	112	Su	W	Adult	1996
		53	Ecstall River	149	Su	W	Adult	2000, 2001, 2002
		54	Exchamsiks River	106			Adult	1995, 2009
		55	Exstew River	140			Adult	2009
		56	Gitnadoix River	170			Adult	1995, 2009
		57	Kitsumkalum River (Lower)	449	Su	W	Adult	1996, 1998, 2001, 2009
		58	Kasiks River	60			Adult	2006
		59	Zymagotitz River	119			Adult	2006, 2009
		60	Zymoetz River (Upper)	54			Adult	1995, 2004, 2009
		61	Kispiox River	88			Adult	1995, 2004, 2006, 2008
		62	Kitseguecla River	258			Adult	2009
		63	Kitwanga River	169			Adult	1996, 2002, 2003
		64	Shegunia River	78			Adult	2009
		65	Sweetin River	60			Adult	2004, 2005, 2008
		66	Bear River	99			Adult	1991, 1995, 1996, 2005
		67	Kluakaz Creek	98			Adult	2007, 2008, 2009
		68	Kluayaz Creek	144			Adult	2007, 2008, 2009
		69	Kuldo Creek	170			Adult	2008, 2009
		70	Osti Creek	90			Adult	2009
		71	Sicintine River	105		W	Adult	2009
		72	Slamgeesh River	125			Adult	2004, 2005, 2006, 2007, 2008, 2009
		73	Squingala River	259			Adult	2008, 2009

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	Fine-scale Reporting Group	Pop No.[a]	Population	N	Run time[b]	Origin[c]	Life Stage	Collection Date
9	*Skeena (cont.)*	74	Sustut River	337	Su	W	Adult	1995, 1996, 2001, 2002, 2005, 2006
		75	Babine River	105	Su	H	Adult	1996
		76	Bulkley River (Upper)	206	Su	W	Adult	1991, 1998, 1999
		77	Morice River	105			Adult	1991, 1995, 1996
		78	Suskwa River	85			Adult	2004, 2005, 2009
10	*BC Coast/Haida Gwaii*	79	Yakoun River	131			Adult	1989, 1996, 2001
		80	Atnarko Creek	142	Su	H	Adult	1996
		81	Chuckwalla River	46			Adult	1999, 2001, 2005
		82	Dean River	175			Adult	2002, 2003, 2004, 2006
		83	Dean River (Upper)	176			Adult	2001, 2002, 2003, 2004, 2006
		84	Docee River	42			Adult	1999, 2002, 2007
		85	Kateen River	128			Adult	2004, 2005
		86	Kilbella River	50			Adult	2001, 2005
		87	Kildala River	197			Adult	1999, 2000
		88	Kitimat River	135	Su	H	Adult	1997
		89	Kitlope River	181			Adult	2004, 2006
		90	Takia River	46			Adult	2002, 2003, 2006
		91	Wannock River	129	F	H	Adult	1996
		92	Capilano River	75			Adult	1999
		93	Cheakamus River	54	F		Adult	2006, 2007, 2008
		94	Devereux River	148	F	W	Adult	1997, 2000
		95	Klinaklini River	198	F	W	Adult	1997, 1998, 2002
		96	Phillips River	287			Adult	2000, 2004, 2006, 2007, 2008
		97	Squamish River	181	F	H	Adult	2003
11	*West Vancouver*	98	Burman River	218			Adult	1985, 1989, 1990, 1991, 1992, 2000, 2002, 2003
		99	Conuma River	140	F	H	Adult	1997
		100	Gold River	258			Adult	1983, 1985, 1986, 1987, 1992, 2002
		101	Kennedy River (Lower)	320			Adult	2005, 2007, 2008
		102	Marble River	136	F	H	Adult	1996, 1999, 2000
		103	Nahmint River	43			Adult	2002, 2003
		104	Nitinat River	125	F	H	Adult	1996
		105	Robertson Creek	124	F	H	Adult	1996, 2003
		106	San Juan River	175			Adult	2001, 2002
		107	Sarita River	137	F	H	Adult	1997, 2001
		108	Tahsis River	174	F	W	Adult	1996, 2002, 2003
		109	Thornton Creek	158			Adult	2001
		110	Tlupana River	58			Adult	2002, 2003

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	Fine-scale Reporting Group	Pop No.[a]	Population	N	Run time[b]	Origin[c]	Life Stage	Collection Date
11	*West Vancouver (cont.)*	111	Toquart River	68			Adult	1999, 2000
		112	Tranquil Creek	227	F	W	Adult	1996, 1999, 2004
		113	Zeballos River	148			Adult	2002, 2005, 2006, 2007, 2008
12	*East Vancouver*	114	Chemainus River	202			Adult	1996, 1999
		115	Nanaimo River (Fall)	122	F	H	Adult	1996, 2002
		116	Nanaimo River (Summer)	166	Su	H	Adult	1996, 2002
		117	Nanaimo River (Spring)	94	Sp	W	Adult	1998
		118	Nanaimo River (Upper)	114			Adult	2003, 2004
		119	Nimpkish River	68			Adult	2004
		120	Puntledge River (Fall)	279	F	H	Adult	2000, 2001
		121	Puntledge River (Summer)	255	Su	H	Adult	1998, 2000, 2006
		122	Qualicum River	79	F	H	Adult	1996
		123	Quinsam River	143	F	H	Adult	1996, 1998
13	*Fraser*	124	Harrison River	216	F		Adult	1999, 2002
		125	Big Silver Creek	54	Sp	W	Adult	2004, 2005, 2006, 2007, 2008
		126	Birkenhead River	154	Sp	W	Adult	1998, 1999, 2001, 2002, 2005, 2006
		127	Pitt River (Upper)	65	Sp	W	Adult	2004, 2005, 2006, 2007, 2008
		128	Maria Slough	271	Su	W	Adult	1999, 2000, 2001, 2002, 2005
		129	Baezaeko River	80			Adult	1984, 1985
		130	Bridge River	157			Adult	1996
		131	Cariboo River	76	Su	W	Adult	1996, 2007, 2008
		132	Cariboo River (Upper)	166	Sp	W	Adult	2001
		133	Chilcotin River	201	Sp	W	Adult	1996, 1997, 1998, 2001
		134	Chilcotin River (Lower)	173	Sp	W	Adult	1996, 2000, 2001
		135	Chilko River	144	Sp	W	Adult	1995, 1999, 2001, 2002
		136	Cottonwood River (Upper)	118			Adult	2004, 2007, 2008
		137	Elkin Creek	190	Su	W	Adult	1996
		138	Endako River	42			Adult	1997, 1998, 2000
		139	Nazko River	179			Adult	1983, 1984, 1985
		140	Nechako River	128	Su	W	Adult	1992, 1996
		141	Portage Creek	138			Adult	2002, 2004, 2005, 2006, 2008
		142	Quesnel River	119	Su	W	Adult	1996, 1997
		143	Stuart River	125	Su	W	Adult	1996
		144	Taseko River	120			Adult	1997, 1998, 2002
		145	Bowron River	78	Sp	W	Adult	1997, 1998, 2001, 2003
		146	Fontoniko Creek	46			Adult	1996
		147	Goat River	46			Adult	1997, 2000, 2001, 2002

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	Fine-scale Reporting Group	Pop No.[a]	Population	N	Run time[b]	Origin[c]	Life Stage	Collection Date
13	*Fraser (cont.)*	148	Holmes River	100			Adult	1996, 1999, 2000, 2001, 2002
		149	James Creek	53			Adult	1984, 1988
		150	McGregor River	119			Adult	1997
		151	Morkill River	152	Su	W	Adult	2001
		152	Salmon River (Fraser)	153	Sp	W	Adult	1996, 1997
		153	Slim Creek	113	Sp	W	Adult	1996, 1998, 2001
		154	Swift Creek	120	Sp	W	Adult	1996, 2000
		155	Fraser River above Tete Jaune	183			Adult	2001
		156	Torpy River	135	F	W	Adult	2001
		157	Willow River	37	Sp	W	Adult	1997, 2002, 2004
14	*Lower Thompson*	158	Coldwater River	109			Adult	1995, 1997, 1998, 1999
		159	Coldwater River (Upper)	69			Adult	2004, 2005, 2006
		160	Deadman River	256	Sp	H	Adult	1997, 1998, 1999, 2006
		161	Lois River	259	Sp	W	Adult	1997, 1999, 2001, 2006, 2008
		162	Nicola Hatchery	135	Sp	H	Adult	1998, 1999
		163	Nicola River	88			Adult	1998, 1999
		164	Spius Creek	52			Adult	1998, 1999
		165	Spius Creek (Upper)	82			Adult	2001, 2006
		166	Spius Hatchery	95	Sp	H	Adult	1996, 1997, 1998
15	*North Thompson*	167	Blue River	57			Adult	2001, 2002, 2003, 2004, 2006, 2007
		168	Clearwater River	112	Su	W	Adult	1997
		169	Finn Creek	174			Adult	1996, 1998, 2002, 2006, 2008
		170	Lemieux Creek	56			Adult	2001, 2002, 2004, 2006
		171	North Thompson River	77			Adult	2001
		172	Raft River	105	Su	W	Adult	2001, 2002, 2006, 2008
16	*South Thompson*	173	Adams River	76	Su	H	Adult	1996, 2001, 2002
		174	Bessette Creek	103			Adult	1998, 2002, 2003, 2004, 2006, 2008
		175	Eagle River	76			Adult	2003, 2004
		176	Shuswap River (Lower)	93			Adult	1996, 1997
		177	Shuswap River (Middle)	149	Su	H	Adult	1997, 2001
		178	South Thompson River	73			Adult	1996, 2001
		179	Salmon River	126			Adult	1997, 1998, 1999
		180	Thompson River (Lower)	175	F	W	Adult	2001, 2008
17	*Puget Sound*	181	Dungeness River	123		W	Adult	2004
		182	Elwha Hatchery	209	F	H	Adult/Juv	1996, 2004
		183	Elwha River	139		W	Adult/Juv	2004, 2005
		184	Upper Cascade River	43	Sp	W	Adult	1998, 1999

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	Fine-scale Reporting Group	Pop No.[a]	Population	N	Run time[b]	Origin[c]	Life Stage	Collection Date
17	*Puget Sound (cont.)*	185	Marblemount Hatchery	91	Sp	H	Adult	2006
		186	North Fork Nooksack River	137	Sp	H,W	Adult	1998, 1999
		187	North Fork Stilliguamish River	290	Su	H,W	Adult	1996, 2001, 2004
		188	Samish Hatchery	74	F	H	Adult	1998
		189	Upper Sauk River	120	Sp/Su	W	Adult	1994, 1998, 1999, 2006
		190	Skagit River (Summer)	99	Su	W	Adult	1994, 1995
		191	Skagit River (Lower; Fall)	95	F	W	Adult	1998, 2006
		192	Skagit River (Upper)	53	Su	W		1998
		193	Skykomish River	73	Su	W	Adult	1996, 2000
		194	Snoqualmie River	49		W		2005
		195	Suiattle River	122	Sp	W	Adult	1989, 1998, 1999
		196	Wallace Hatchery	191	Su	H	Adult	1996, 2004, 2005
		197	Bear Creek	204	Su/F	W	Adult	1998, 1999, 2003, 2004
		198	Cedar River	170	Su/F	W	Adult	1994, 2003, 2004
		199	Nisqually River–Clear Creek Hatchery	132	F	H	Adult	2005
		200	Grovers Creek Hatchery	95	Su/F	H	Adult	2004
		201	Hupp Springs Hatchery	90	Sp	H	Adult	2002
		202	Issaquah Creek	166	Su/F	H,W	Adult	1999, 2004
		203	Nisqually River	94	Su/F	W	Adult	1998, 1999, 2000, 2006
		204	South Prairie Creek	78	F	W	Adult	1998, 1999, 2002
		205	Soos Creek	178	F	H	Adult	1998, 2004
		206	Univ of Washington Hatchery	125	Su/F	H	Adult	2004
		207	Voights Hatchery	93	F	H	Adult	1998
		208	White River	146	Sp	H	Adult	1998
		209	George Adams Hatchery	131	F	H	Adult	2005
		210	Hamma Hamma River	128	F	W	Adult	1999, 2000, 2001
		211	North Fork Skokomish River	87	F	W	Adult	1998, 1999, 2000, 2004, 2005, 2006
		212	South Fork Skokomish River	96	Su/F	H,W	Adult	2005, 2006
18	*Washington Coast*	213	Forks Creek Hatchery	140	F	H	Adult	2005
		214	Hoh River (Fall)	115	F	W	Adult	2004, 2005
		215	Hoh River (Spring/Summer)	138	Sp/Su	W	Adult	1995, 1996, 1997, 1998, 2005, 2006
		216	Hoko Hatchery	73	F	H,W	Adult	2004, 2006
		217	Humptulips Hatchery	60	F	H	Adult	1990
		218	Makah Hatchery	128	F	H	Adult	2001, 2003
		219	Queets River	53	F	W	Adult	1996, 1997
		220	Quillayute River	52	F	W	Adult	1995, 1996
		221	Quinault River	54	F	W	Adult	1995, 1997, 1998

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	Fine-scale Reporting Group	Pop No.[a]	Population	N	Run time[b]	Origin[c]	Life Stage	Collection Date
18	*Washington Coast (cont.)*	222	Quinault Hatchery	82	F	H	Adult	2001, 2006
		223	Sol Duc Hatchery	94	Sp	H	Adult	2003
19	*West Cascades Sp*	224	Cowlitz Hatchery (Spring)	124	Sp	H		2004
		225	Kalama Hatchery	133	Sp	H		2004
		226	Lewis Hatchery	116	Sp	H		2004
20	*Lower Columbia F*	227	Abernathy Creek	89	F	W	Adult	1995, 1997, 1998, 2000
		228	Abernathy Hatchery	91	F	H	Adult	1995
		229	Coweeman River	109	F	W	Adult	1996, 2006
		230	Cowlitz Hatchery (Fall)	116	F	H		2004
		231	Elochoman River	88	F	W	Adult	1995, 1997
		232	Green River	55	F	W	Adult	2000
		233	Lewis River (Fall)	79	F	W	Adult	2003
		234	Lewis River (Lower; Summer)	83	F	W	Adult	2004
		235	Lewis River (Summer)	128	F	W	Adult	2004
		236	Sandy River (Fall)	106	F	W	Adult	2002, 2004
		237	Washougal River	108	F	W	Adult	1995, 1996, 2006
		238	Big Creek Hatchery	95	F	H	Juvenile	2004
		239	Elochoman Hatchery	94	F	H	Juvenile	2004
		240	Spring Creek	194	F	H	Juvenile	2001, 2002, 2006
21	*Willamette Sp*	241	Sandy River (Spring)	63	Sp	W	Adult	2006
		242	McKenzie Hatchery	127	Sp	H	Adult	2002, 2004
		243	McKenzie River	90	Sp	W	Juvenile	1997
		244	North Fork Clackamas River	62	Sp	W	Juvenile	1997
		245	North Santiam Hatchery	125	Sp	H	Adult	2002, 2004
		246	North Santiam River	83	Sp	W	Juvenile	1997
22	*Columbia Sp*	247	Klickitat Hatchery	82	Sp	H	Adult	2002, 2006
		248	Klickitat River (Spring)	40	Sp	W	Adult	2005
		249	Shitike Creek	127	Sp	H	Juvenile	2003, 2004
		250	Warm Springs Hatchery	127	Sp	H		2002, 2003
		251	Granite Creek	54	Sp	W	Adult	2005, 2006
		252	John Day River (upper mainstem)`	65	Sp	W	Adult	2004, 2005, 2006
		253	Middle Fork John Day River	83	Sp	W	Adult	2004, 2005, 2006
		254	North Fork John Day River	105	Sp	W	Adult	2004, 2005, 2006
		255	American River	116	Sp	W	Adult	2003
		256	Upper Yakima Hatchery	179	Sp	H	Adult	1998
		257	Little Naches River	73	Sp	W	Adult	2004
		258	Yakima River (Upper)	46	Sp	W	Adult	1992, 1997
		259	Naches River	64	Sp	W	Adult	1989, 1993

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	Fine-scale Reporting Group	Pop No.[a]	Population	N	Run time[b]	Origin[c]	Life Stage	Collection Date
22	*Columbia Sp (cont.)*	260	Carson Hatchery	168	Sp	H		2001, 2004, 2006
		261	Entiat Hatchery	127	Sp	H	Juvenile	2002
		262	Little White Salmon Hatchery (Spring)	93	Sp	H	Juvenile	2005
		263	Methow River (Spring)	85	Sp	H	Juvenile	1998, 2000
		264	Twisp River	122	Sp	W	Adult	2001, 2005
		265	Wenatchee Hatchery	43	Sp	H	Adult	1998, 2000
		266	Wenatchee River	62	Sp	W	Adult	1993
		267	Tucannon River	112	Sp/Su	W	Adult	2003
		268	Chamberlain Creek	45	Sp/Su	W	Juvenile	2006
		269	Crooked Fork Creek	100	Sp/Su	W	Juvenile	2005, 2006
		270	Dworshak Hatchery	81	Sp/Su	H	Adult	2005
		271	Lochsa River	125	Sp/Su	H	Adult	2005
		272	Lolo Creek	92	Sp/Su	W	Adult/Juv	2001, 2002
		273	Newsome Creek	75	Sp/Su	W	Adult	2001, 2002
		274	Rapid River Hatchery	136	Sp/Su	H		1997, 1999, 2002
		275	Rapid River Hatchery	46	Su	H	Juvenile	2001, 2002
		276	Red River/South Fork Clearwater	172	Sp/Su	H	Adult	2005
		277	Catherine Creek	111	Sp/Su	W	Adult	2002, 2003
		278	Lookingglass Hatchery	188	Sp/Su	H	Juvenile	1994, 1995, 1998
		279	Minam River	136	Sp/Su	W		1994, 2002, 2003
		280	Wenaha Creek	46	Sp/Su	W	Juvenile	2002
		281	Imnaha River	132	Sp/Su	W		1998, 2002, 2003
		282	Bear Valley Creek	45	Sp/Su	W	Juvenile	2006
		283	Johnson Creek	186	Sp/Su	W	Adult/Juv	2001, 2002, 2003
		284	Johnson Hatchery	92	Sp/Su	H	Juvenile	2002, 2003, 2004
		285	Knox Bridge	90	Su	W	Juvenile	2001, 2002
		286	McCall Hatchery	80	Su	H	Juvenile	1999, 2001
		287	Poverty Flat	88	Su	W	Juvenile	2001, 2002
		288	Sesech River	115	Sp/Su	W		2001, 2002, 2003
		289	Stolle Meadows	91	Su	W	Juvenile	2001, 2002
		290	Big Creek	142	Sp/Su	W	Adult	2001, 2002, 2003
		291	Big Creek (Lower)	74	Su	W	Juvenile	1999, 2002
		292	Big Creek (Upper)	87	Su	W	Juvenile	1999, 2002
		293	Camas Creek	42	Sp/Su	W	Juvenile	2006
		294	Capehorn Creek	51	Sp/Su	W	Juvenile	2006
		295	Marsh Creek	95	Su	W	Juvenile	2001, 2002
		296	Decker Flat	78	Su	W	Juvenile	1999, 2002
		297	Valley Creek (Lower)	94	Su	W	Juvenile	1999, 2002

-continued-

	Fine-scale Reporting Group	Pop No.[a]	Population	N	Run time[b]	Origin[c]	Life Stage	Collection Date
22	*Columbia Sp (cont.)*	298	Valley Creek (Upper)	95	Su	W	Juvenile	1999, 2002
		299	East Fork Salmon River	141	Sp/Su	W	Adult	2004, 2005
		300	Pahsimeroi River	71	Sp/Su	W	Adult	2002
		301	Sawtooth Hatchery	260	Sp/Su	H	Adult/Juv	2002, 2003, 2005, 2006
		302	West Fork Yankee Fork	59	Sp/Su	W	Juvenile	2005
23	*Interior Columbia Su/F*	303	Hanford Reach	163	Su/F	W		1999, 2000, 2001
		304	Klickitat River (Summer/Fall)	149	Su/F	W	Adult	1994, 2005
		305	Little White Salmon Hatchery (Fall)	94	Su/F	H	Juvenile	2006
		306	Marion Drain	131	Su/F	W	Adult	1989, 1992
		307	Methow River (Summer)	115	Su/F	W		1992, 1993, 1994
		308	Okanagan River	72	Su/F	W	Adult	2000, 2002, 2003, 2004, 2006, 2007, 2008
		309	Priest Rapids Hatchery	181	Su/F	H	Juvenile	1998, 1999, 2000, 2001
		310	Priest Rapids Hatchery	67	Su/F	H	Adult	1998
		311	Umatilla Hatchery	90	F	H	Adult	2006
		312	Umatilla Hatchery	94	Su/F	H	Adult	2003
		313	Wells Dam Hatchery	128	Su/F	H		1993
		314	Wenatchee River	119	Su/F	W	Adult	1993
		315	Yakima River (Lower)	102	Su/F	W	Adult	1990, 1993, 1998
		316	Deschutes River (Lower)	101	F	W		1999, 2001, 2002
		317	Deschutes River (Upper)	128	Su/F	W	Juvenile	1998, 1999, 2002
		318	Clearwater River	88	F	W	Adult	2000, 2001, 2002
		319	Lyons Ferry	185	F	H	Adult	2002, 2003
		320	Nez Perce Tribal Hatchery	123	F	H	Adult	2003, 2004
24	*North Oregon Coast*	321	Alsea River	108	F	W	Adult	2004
		322	Kilchis River	44	F	Unk	Adult	2000, 2005
		323	Necanicum Hatchery	50	F	H,W	Adult	2005
		324	Nehalem River	131	F	W	Adult	2000, 2002
		325	Nestucca Hatchery	119	F	H	Adult	2004, 2005
		326	Salmon River	83	F	Unk	Adult	2003
		327	Siletz River	107	F	W	Adult	2000
		328	Trask River	123	F	W	Adult	2005
		329	Wilson River	120	F	W	Adult	2005
		330	Yaquina River	113	F	W	Adult	2005
		331	Siuslaw River	105	F	W	Adult	2001
25	*Mid Oregon Coast*	332	Coos Hatchery	58	F	H	Adult	2005
		333	Coquille River	118	F	W	Adult	2000
		334	Elk River	129	F	H	Adult	2004
		335	South Coos Hatchery	73	F	H	Adult	2005

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	Fine-scale Reporting Group	Pop No.[a]	Population	N	Run time[b]	Origin[c]	Life Stage	Collection Date
25	*Mid Oregon Coast (cont.)*	336	South Coos River	45	F	W	Adult	2000
		337	South Umpqua Hatchery	128	F	H,W	Adult	2002
		338	Sixes River	107	F	W	Adult	2000, 2005
		339	Umpqua Hatchery	132	Sp	W	Adult	2004
26	*S Oregon/California*	340	Applegate Creek	110	F	W	Adult	2004
		341	Cole Rivers Hatchery	126	Sp	H	Adult	2004
		342	Klaskanine Hatchery	96	F	H	Juvenile	2009
		343	Chetco River	136	F	W	Adult	2004
		344	Klamath River	111	F	W	Adult	2004
		345	Trinity Hatchery (Fall)	144	F	H	Adult	1992
		346	Trinity Hatchery (Spring)	127	Sp	H	Adult	1992
		347	Eel River	122	F	W	Adult	2000, 2001
		348	Russian River	142	F	W	Juvenile	2001
		349	Battle Creek	99	F	W	Adult	2002, 2003
		350	Butte Creek	61	F	W	Adult	2002, 2003
		351	Feather Hatchery (Fall)	129	F	H	Adult	2003
		352	Stanislaus River	61	F	W	Adult	2002
		353	Butte Creek	101	Sp	W	Adult	2002, 2003
		354	Deer Creek	42	Sp	W	Adult	2002
		355	Feather Hatchery (Spring)	144	Sp	H	Adult	2003
		356	Mill Creek	76	Sp	W	Adult	2002, 2003
		357	Sacramento River (Winter)	95	Wi	W, H	Adult	1992, 1993, 1994, 1995, 1997, 1998, 2001, 2003, '04

[a] Population numbers given correspond to the population numbers referenced in Table 1.

[b] Run timing components are abbreviated as Sp (spring), Su (summer), F (fall), and W (winter).

[c] Origin categories are abbreviated as H (hatchery), and W (wild).

APPENDIX B: ESTIMATED CONTRIBUTION

Appendix B1.–Estimated contributions of broad-scale reporting groups of Chinook salmon to the SEAK troll fishery harvest, AY 2015.

Fishery	Quadrant[a]	Reporting Group	Mean	SD	Median	90% CI 5%	90% CI 95%
Early Winter	All	*Alaska*	0.119	0.015	0.096	0.119	0.144
		TBR	0.004	0.005	0.000	0.002	0.014
		Canada	0.333	0.021	0.298	0.333	0.369
		US South	0.544	0.021	0.509	0.544	0.578
	NO	*Alaska*	0.077	0.014	0.077	0.055	0.102
		TBR	0.002	0.004	0.000	0.000	0.011
		Canada	0.303	0.023	0.303	0.266	0.341
		US South	0.618	0.024	0.618	0.578	0.656
Late Winter	All	*Alaska*	0.106	0.014	0.084	0.106	0.131
		TBR	0.016	0.007	0.006	0.015	0.029
		Canada	0.387	0.022	0.352	0.387	0.423
		US South	0.490	0.021	0.456	0.490	0.525
	NO	*Alaska*	0.066	0.015	0.065	0.043	0.093
		TBR	0.020	0.009	0.019	0.007	0.037
		Canada	0.335	0.025	0.335	0.295	0.377
		US South	0.578	0.025	0.578	0.537	0.620
Spring	NI	*Alaska*	0.392	0.039	0.392	0.328	0.457
		TBR	0.042	0.018	0.040	0.017	0.075
		Canada	0.413	0.039	0.412	0.349	0.478
		US South	0.153	0.028	0.152	0.110	0.201
	NO	*Alaska*	0.358	0.028	0.358	0.312	0.405
		TBR	0.000	0.002	0.000	0.000	0.002
		Canada	0.230	0.025	0.229	0.189	0.272
		US South	0.412	0.029	0.411	0.365	0.459
	SI	*Alaska*	0.625	0.031	0.625	0.572	0.676
		TBR	0.032	0.014	0.030	0.012	0.056
		Canada	0.256	0.028	0.255	0.212	0.303
		US South	0.088	0.017	0.087	0.062	0.117
	SO	*Alaska*	0.393	0.058	0.392	0.299	0.491
		TBR	0.011	0.020	0.000	0.000	0.057
		Canada	0.534	0.062	0.534	0.431	0.635
		US South	0.063	0.024	0.060	0.028	0.107
Summer Retention 1	All	*Alaska*	0.056	0.009	0.043	0.056	0.072
		TBR	0.002	0.001	0.000	0.001	0.004
		Canada	0.234	0.017	0.207	0.233	0.262
		US South	0.708	0.017	0.679	0.708	0.736
	NO	*Alaska*	0.032	0.010	0.031	0.017	0.049
		TBR	0.000	0.001	0.000	0.000	0.001
		Canada	0.193	0.021	0.193	0.161	0.228
		US South	0.775	0.021	0.775	0.739	0.808

Note: Standard deviation (SD) and 90% credibility intervals are provided.

[a] Quadrant names are abbreviated as follows: Northern Outside (NO), Northern Inside (NI), Southern Outside (SO), and Southern Inside (SI)

Appendix B2.–Estimated contributions of driver stock reporting groups of Chinook salmon to the SEAK troll fishery harvest by season and quadrant, AY 2015.

	Early Winter Regionwide (*n* = 527)					Early Winter Northern Outside (*n* = 437)				
				90% CI					90% CI	
Reporting Group[a]	Mean	SD	Median	5%	95%	Mean	SD	Median	5%	95%
SEAK/TBR	0.123	0.015	0.123	0.100	0.148	0.080	0.014	0.079	0.057	0.104
NCBC	0.225	0.019	0.224	0.194	0.256	0.200	0.020	0.200	0.168	0.234
West Vancouver	0.047	0.009	0.046	0.033	0.064	0.050	0.011	0.049	0.034	0.068
South Thompson	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Washington Coast	0.005	0.003	0.004	0.000	0.011	0.005	0.004	0.004	0.000	0.013
Interior Columbia Su/F	0.443	0.021	0.443	0.408	0.478	0.506	0.024	0.506	0.465	0.546
Oregon Coast	0.000	0.001	0.000	0.000	0.001	0.000	0.001	0.000	0.000	0.000
Other	0.157	0.017	0.157	0.130	0.185	0.159	0.018	0.159	0.130	0.190

	Late Winter Regionwide (*n* = 563)					Early Winter Northern Outside (*n* = 402)				
SEAK/TBR	0.123	0.015	0.122	0.099	0.149	0.086	0.016	0.085	0.061	0.115
NCBC	0.174	0.016	0.173	0.147	0.201	0.112	0.018	0.111	0.084	0.142
West Vancouver	0.165	0.016	0.165	0.139	0.192	0.184	0.019	0.184	0.153	0.217
South Thompson	0.022	0.007	0.021	0.012	0.034	0.026	0.008	0.025	0.014	0.040
Washington Coast	0.015	0.006	0.014	0.006	0.025	0.018	0.007	0.017	0.008	0.032
Interior Columbia Su/F	0.324	0.020	0.323	0.291	0.357	0.387	0.025	0.387	0.347	0.428
Oregon Coast	0.004	0.003	0.003	0.001	0.010	0.005	0.004	0.004	0.001	0.012
Other	0.174	0.017	0.174	0.147	0.203	0.181	0.020	0.180	0.149	0.216

	Spring Regionwide (*n* = 884)					Spring Northern Outside (*n* = 301)				
SEAK/TBR	0.476	0.018	0.476	0.446	0.505	0.359	0.028	0.358	0.313	0.406
NCBC	0.156	0.014	0.156	0.134	0.179	0.071	0.016	0.070	0.046	0.100
West Vancouver	0.072	0.009	0.072	0.057	0.088	0.113	0.018	0.113	0.085	0.145
South Thompson	0.027	0.006	0.027	0.018	0.038	0.028	0.010	0.027	0.014	0.045
Washington Coast	0.020	0.006	0.020	0.012	0.030	0.037	0.012	0.036	0.020	0.058
Interior Columbia Su/F	0.144	0.013	0.144	0.124	0.165	0.235	0.025	0.234	0.195	0.277
Oregon Coast	0.004	0.003	0.003	0.001	0.009	0.000	0.002	0.000	0.000	0.001
Other	0.101	0.011	0.100	0.083	0.120	0.157	0.022	0.156	0.123	0.193

	Spring Southern Inside (*n* =299)				
SEAK/TBR	0.656	0.030	0.657	0.607	0.704
NCBC	0.171	0.025	0.170	0.132	0.214
West Vancouver	0.040	0.012	0.039	0.023	0.061
South Thompson	0.010	0.006	0.009	0.003	0.021
Washington Coast	0.000	0.002	0.000	0.000	0.003
Interior Columbia Su/F	0.057	0.014	0.056	0.037	0.081
Oregon Coast	0.000	0.001	0.000	0.000	0.000
Other	0.064	0.015	0.063	0.041	0.091

	Summer 1 Regionwide (*n* = 842)					Summer 1 Northern Outside (*n* = 424)				
SEAK/TBR	0.058	0.009	0.058	0.044	0.074	0.032	0.010	0.031	0.017	0.049
NCBC	0.069	0.011	0.069	0.052	0.088	0.057	0.013	0.056	0.037	0.080
West Vancouver	0.041	0.007	0.041	0.031	0.054	0.029	0.008	0.028	0.017	0.043
South Thompson	0.106	0.012	0.105	0.087	0.126	0.094	0.015	0.093	0.071	0.119
Washington Coast	0.099	0.013	0.099	0.079	0.121	0.103	0.016	0.103	0.078	0.131
Interior Columbia Su/F	0.445	0.020	0.445	0.412	0.477	0.480	0.025	0.480	0.439	0.521
Oregon Coast	0.119	0.014	0.118	0.096	0.142	0.139	0.018	0.139	0.111	0.170
Other	0.063	0.011	0.063	0.047	0.081	0.066	0.013	0.065	0.046	0.089

Note: Sample sizes (*n*), standard deviation (SD), and 90% credibility intervals are provided.

Note: Reporting groups are described in Table 1.

Appendix B3.–Estimated contributions of fine-scale reporting groups of Chinook salmon to the harvest for the early winter troll fishery regionwide and in the Northern Outside quadrant of SEAK, AY 2015.

		Regionwide (n = 527)					Northern Outside Quadrant (n = 437)				
					90% CI					90% CI	
	Reporting Group[a]	Mean	SD	Median	5%	95%	Mean	SD	Median	5%	95%
1	*Situk*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2	*Alsek*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
3	*N Southeast Alaska*	0.006	0.004	0.005	0.001	0.013	0.007	0.004	0.006	0.002	0.015
4	*Taku*	0.002	0.003	0.000	0.000	0.008	0.002	0.003	0.000	0.000	0.009
5	*Andrew*	0.028	0.009	0.027	0.015	0.043	0.016	0.008	0.015	0.006	0.031
6	*Stikine*	0.002	0.004	0.000	0.000	0.010	0.001	0.002	0.000	0.000	0.004
7	*S Southeast Alaska*	0.085	0.013	0.084	0.064	0.108	0.054	0.013	0.053	0.034	0.076
8	*Nass*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
9	*Skeena*	0.005	0.003	0.004	0.001	0.010	0.000	0.001	0.000	0.000	0.000
10	*BC Coast/Haida Gwaii*	0.220	0.019	0.219	0.189	0.251	0.200	0.020	0.200	0.168	0.234
11	*West Vancouver*	0.047	0.009	0.046	0.033	0.064	0.050	0.011	0.049	0.034	0.068
12	*East Vancouver*	0.054	0.010	0.053	0.038	0.071	0.044	0.010	0.043	0.028	0.061
13	*Fraser*	0.006	0.003	0.005	0.001	0.012	0.007	0.004	0.006	0.002	0.014
14	*Lower Thompson*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
15	*North Thompson*	0.002	0.002	0.001	0.000	0.006	0.002	0.002	0.001	0.000	0.007
16	*South Thompson*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
17	*Puget Sound*	0.064	0.012	0.064	0.046	0.085	0.070	0.013	0.070	0.050	0.093
18	*Washington Coast*	0.005	0.003	0.004	0.000	0.011	0.005	0.004	0.004	0.000	0.013
19	*West Cascades Sp*	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000
20	*Lower Columbia F*	0.019	0.006	0.018	0.009	0.031	0.022	0.007	0.021	0.011	0.035
21	*Willamette Sp*	0.013	0.005	0.012	0.005	0.022	0.015	0.006	0.014	0.006	0.025
22	*Columbia Sp*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
23	*Interior Columbia Su/F*	0.443	0.021	0.443	0.408	0.478	0.506	0.024	0.506	0.465	0.546
24	*North Oregon Coast*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
25	*Mid Oregon Coast*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
26	*S Oregon/California*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Note: Sample sizes (n), standard deviation (SD), and 90% credibility intervals are provided.

[a] Run timing components are abbreviated as Sp (spring), Su (summer), and F (fall).

Appendix B4.–Estimated contributions of fine-scale reporting groups of Chinook salmon to the harvest for the late winter troll fishery regionwide and in the Northern Outside quadrant of SEAK, AY 2015.

		Regionwide (*n* = 563)					Northern Outside Quadrant (*n* = 402)				
					90% CI					90% CI	
	Reporting Group[a]	Mean	SD	Median	5%	95%	Mean	SD	Median	5%	95%
1	*Situk*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2	*Alsek*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
3	*N Southeast Alaska*	0.005	0.003	0.004	0.001	0.011	0.006	0.004	0.005	0.001	0.013
4	*Taku*	0.016	0.007	0.015	0.006	0.029	0.020	0.009	0.019	0.007	0.036
5	*Andrew*	0.044	0.011	0.044	0.028	0.063	0.038	0.012	0.037	0.019	0.059
6	*Stikine*	0.000	0.001	0.000	0.000	0.001	0.000	0.001	0.000	0.000	0.000
7	*S Southeast Alaska*	0.058	0.012	0.056	0.040	0.080	0.023	0.012	0.020	0.008	0.047
8	*Nass*	0.001	0.002	0.000	0.000	0.006	0.000	0.002	0.000	0.000	0.000
9	*Skeena*	0.020	0.006	0.019	0.011	0.030	0.007	0.005	0.007	0.000	0.017
10	*BC Coast/Haida Gwaii*	0.153	0.016	0.152	0.128	0.179	0.104	0.017	0.104	0.078	0.133
11	*West Vancouver*	0.165	0.016	0.165	0.140	0.193	0.184	0.019	0.184	0.153	0.217
12	*East Vancouver*	0.022	0.006	0.021	0.013	0.032	0.008	0.005	0.007	0.002	0.017
13	*Fraser*	0.005	0.003	0.005	0.001	0.011	0.005	0.004	0.004	0.001	0.012
14	*Lower Thompson*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
15	*North Thompson*	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000
16	*South Thompson*	0.022	0.007	0.021	0.012	0.034	0.026	0.008	0.025	0.014	0.040
17	*Puget Sound*	0.024	0.008	0.023	0.013	0.038	0.023	0.009	0.022	0.010	0.040
18	*Washington Coast*	0.015	0.006	0.014	0.006	0.025	0.018	0.007	0.017	0.008	0.032
19	*West Cascades Sp*	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000
20	*Lower Columbia F*	0.020	0.007	0.020	0.011	0.032	0.022	0.008	0.021	0.011	0.036
21	*Willamette Sp*	0.103	0.013	0.102	0.082	0.126	0.122	0.017	0.122	0.096	0.151
22	*Columbia Sp*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
23	*Interior Columbia Su/F*	0.324	0.020	0.324	0.291	0.358	0.387	0.025	0.387	0.347	0.428
24	*North Oregon Coast*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
25	*Mid Oregon Coast*	0.004	0.003	0.003	0.001	0.010	0.005	0.004	0.004	0.001	0.012
26	*S Oregon/California*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Note: Sample sizes (*n*), standard deviation (SD), and 90% credibility intervals are provided.

[a] Run timing components are abbreviated as Sp (spring), Su (summer), and F (fall).

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Appendix B5.–Estimated contributions of fine-scale reporting groups of Chinook salmon to the harvest for the spring troll fishery regionwide and in the Northern Outside and Southern Inside quadrants of SEAK, AY 2015.

		Regionwide (*n* = 884)					Northern Outside Quadrant (*n* = 301)					Southern Inside Quadrant (*n* = 299)				
					90% CI					90% CI					90% CI	
	Reporting Group[a]	Mean	SD	Median	5%	95%	Mean	SD	Median	5%	95%	Mean	SD	Median	5%	95%
1	*Situk*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2	*Alsek*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
3	*N Southeast Alaska*	0.001	0.001	0.001	0.000	0.004	0.003	0.003	0.002	0.000	0.010	0.000	0.000	0.000	0.000	0.000
4	*Taku*	0.009	0.007	0.007	0.001	0.021	0.000	0.001	0.000	0.000	0.000	0.016	0.017	0.012	0.000	0.047
5	*Andrew*	0.269	0.018	0.269	0.240	0.298	0.312	0.028	0.312	0.267	0.359	0.266	0.030	0.265	0.217	0.316
6	*Stikine*	0.012	0.008	0.012	0.000	0.026	0.000	0.002	0.000	0.000	0.001	0.016	0.019	0.003	0.000	0.051
7	*S Southeast Alaska*	0.184	0.015	0.184	0.160	0.209	0.043	0.015	0.041	0.021	0.069	0.359	0.033	0.359	0.305	0.414
8	*Nass*	0.006	0.003	0.006	0.002	0.012	0.000	0.001	0.000	0.000	0.000	0.018	0.009	0.017	0.006	0.035
9	*Skeena*	0.011	0.004	0.010	0.005	0.019	0.004	0.004	0.003	0.000	0.012	0.014	0.007	0.013	0.005	0.027
10	*BC Coast/Haida Gwaii*	0.139	0.013	0.139	0.118	0.161	0.067	0.016	0.066	0.043	0.095	0.140	0.023	0.138	0.104	0.180
11	*West Vancouver*	0.072	0.009	0.072	0.057	0.088	0.113	0.018	0.113	0.085	0.145	0.040	0.012	0.039	0.023	0.061
12	*East Vancouver*	0.028	0.006	0.027	0.019	0.038	0.017	0.008	0.016	0.007	0.031	0.027	0.010	0.026	0.013	0.045
13	*Fraser*	0.003	0.002	0.002	0.000	0.007	0.001	0.002	0.000	0.000	0.004	0.007	0.006	0.006	0.001	0.018
14	*Lower Thompson*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
15	*North Thompson*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
16	*South Thompson*	0.027	0.006	0.027	0.018	0.038	0.028	0.010	0.027	0.014	0.045	0.010	0.006	0.009	0.003	0.021
17	*Puget Sound*	0.017	0.005	0.016	0.010	0.026	0.028	0.010	0.027	0.014	0.047	0.010	0.006	0.009	0.002	0.022
18	*Washington Coast*	0.020	0.006	0.020	0.012	0.030	0.037	0.012	0.036	0.020	0.058	0.000	0.002	0.000	0.000	0.003
19	*West Cascades Sp*	0.003	0.002	0.003	0.000	0.007	0.007	0.005	0.006	0.000	0.017	0.000	0.001	0.000	0.000	0.000
20	*Lower Columbia F*	0.039	0.007	0.038	0.028	0.051	0.077	0.016	0.076	0.052	0.105	0.019	0.008	0.018	0.008	0.034
21	*Willamette Sp*	0.011	0.004	0.011	0.006	0.018	0.027	0.009	0.025	0.013	0.044	0.000	0.000	0.000	0.000	0.000
22	*Columbia Sp*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
23	*Interior Columbia Su/F*	0.144	0.013	0.144	0.124	0.165	0.235	0.025	0.234	0.195	0.277	0.057	0.014	0.056	0.037	0.081
24	*North Oregon Coast*	0.003	0.003	0.003	0.000	0.008	0.000	0.002	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000
25	*Mid Oregon Coast*	0.000	0.001	0.000	0.000	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
26	*S Oregon/California*	0.000	0.001	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.002

Note: Sample sizes (*n*), standard deviation (SD), and 90% credibility intervals are provided.

[a] Run timing components are abbreviated as Sp (spring), Su (summer), and F (fall).

Appendix B6.–Estimated contributions of fine-scale reporting groups of Chinook salmon to the harvest for the first retention period of the summer troll fishery regionwide and in the Northern Outside quadrant of SEAK, AY 2015.

		Regionwide (*n* = 842)					Northern Outside Quadrant (*n* = 424)				
					90% CI					90% CI	
	Reporting Group[a]	Mean	SD	Median	5%	95%	Mean	SD	Median	5%	95%
1	*Situk*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2	*Alsek*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
3	*N Southeast Alaska*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4	*Taku*	0.002	0.001	0.001	0.000	0.004	0.000	0.001	0.000	0.000	0.000
5	*Andrew*	0.036	0.008	0.036	0.024	0.050	0.023	0.009	0.022	0.009	0.039
6	*Stikine*	0.000	0.001	0.000	0.000	0.001	0.000	0.001	0.000	0.000	0.000
7	*S Southeast Alaska*	0.020	0.005	0.020	0.013	0.030	0.009	0.006	0.008	0.002	0.020
8	*Nass*	0.007	0.004	0.006	0.001	0.015	0.009	0.006	0.007	0.002	0.019
9	*Skeena*	0.033	0.008	0.032	0.020	0.047	0.028	0.010	0.027	0.013	0.046
10	*BC Coast/Haida Gwaii*	0.030	0.007	0.029	0.020	0.042	0.021	0.008	0.020	0.010	0.035
11	*West Vancouver*	0.041	0.007	0.041	0.031	0.054	0.029	0.008	0.028	0.017	0.043
12	*East Vancouver*	0.012	0.004	0.011	0.006	0.019	0.009	0.005	0.008	0.002	0.018
13	*Fraser*	0.005	0.003	0.004	0.001	0.011	0.005	0.004	0.004	0.001	0.013
14	*Lower Thompson*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
15	*North Thompson*	0.001	0.001	0.000	0.000	0.002	0.000	0.001	0.000	0.000	0.000
16	*South Thompson*	0.106	0.012	0.105	0.087	0.126	0.094	0.015	0.093	0.071	0.119
17	*Puget Sound*	0.004	0.002	0.003	0.001	0.008	0.003	0.003	0.002	0.000	0.008
18	*Washington Coast*	0.099	0.013	0.099	0.079	0.121	0.103	0.016	0.103	0.078	0.131
19	*West Cascades Sp*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
20	*Lower Columbia F*	0.036	0.009	0.035	0.023	0.051	0.042	0.011	0.042	0.026	0.062
21	*Willamette Sp*	0.007	0.003	0.006	0.002	0.013	0.007	0.004	0.006	0.002	0.015
22	*Columbia Sp*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
23	*Interior Columbia Su/F*	0.445	0.020	0.445	0.412	0.477	0.480	0.025	0.480	0.439	0.521
24	*North Oregon Coast*	0.099	0.013	0.099	0.079	0.122	0.117	0.017	0.116	0.090	0.146
25	*Mid Oregon Coast*	0.019	0.007	0.018	0.008	0.033	0.023	0.010	0.022	0.009	0.040
26	*S Oregon/California*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Note: Sample sizes (*n*), standard deviation (SD), and 90% credibility intervals are provided.

[a] Run timing components are abbreviated as Sp (spring), Su (summer), and F (fall).

Appendix B7.–Estimated contributions of driver stock reporting groups of Chinook salmon to the annual SEAK troll fishery harvest, AY 2009–2015.

	AY 2009 (*n* = 1,629)					AY 2010 (*n* = 3,197)				
				90% CI					90% CI	
Reporting Group[a]	Mean	SD	Median	5%	95%	Mean	SD	Median	5%	95%
SEAK/TBR	0.219	0.009	0.219	0.204	0.234	0.252	0.008	0.252	0.238	0.266
NCBC	0.101	0.008	0.101	0.089	0.115	0.075	0.006	0.075	0.066	0.085
West Vancouver	0.121	0.008	0.121	0.108	0.136	0.085	0.006	0.085	0.076	0.094
South Thompson	0.085	0.008	0.084	0.071	0.099	0.148	0.008	0.148	0.135	0.161
Washington Coast	0.094	0.009	0.094	0.080	0.110	0.092	0.007	0.092	0.081	0.104
Interior Columbia Su/F	0.226	0.012	0.226	0.206	0.246	0.152	0.008	0.152	0.139	0.165
Oregon Coast	0.084	0.009	0.083	0.069	0.099	0.112	0.007	0.112	0.100	0.125
Other	0.070	0.007	0.070	0.058	0.083	0.084	0.006	0.083	0.074	0.094

	AY 2011 (*n* = 5,198)					AY 2012 (*n* = 3,288)				
				90% CI					90% CI	
Reporting Group[a]	Mean	SD	Median	5%	95%	Mean	SD	Median	5%	95%
SEAK/TBR	0.186	0.006	0.186	0.177	0.196	0.255	0.009	0.255	0.241	0.269
NCBC	0.101	0.005	0.101	0.093	0.110	0.099	0.007	0.099	0.088	0.111
West Vancouver	0.121	0.005	0.121	0.113	0.129	0.100	0.006	0.100	0.091	0.109
South Thompson	0.097	0.005	0.097	0.090	0.105	0.055	0.005	0.055	0.048	0.063
Washington Coast	0.092	0.005	0.092	0.085	0.100	0.109	0.007	0.108	0.097	0.120
Interior Columbia Su/F	0.210	0.006	0.210	0.200	0.220	0.194	0.008	0.194	0.181	0.208
Oregon Coast	0.107	0.005	0.107	0.099	0.114	0.080	0.006	0.080	0.070	0.091
Other	0.086	0.004	0.086	0.078	0.093	0.108	0.006	0.108	0.098	0.119

	AY 2013 (*n* = 2,095)					AY 2014 (*n* = 3,465)				
				90% CI					90% CI	
Reporting Group[a]	Mean	SD	Median	5%	95%	Mean	SD	Median	5%	95%
SEAK/TBR	0.221	0.010	0.221	0.205	0.238	0.110	0.006	0.109	0.100	0.120
NCBC	0.091	0.008	0.091	0.079	0.104	0.056	0.005	0.056	0.049	0.064
West Vancouver	0.127	0.008	0.127	0.114	0.141	0.113	0.007	0.113	0.102	0.125
South Thompson	0.078	0.008	0.078	0.065	0.091	0.059	0.006	0.059	0.050	0.069
Washington Coast	0.047	0.007	0.046	0.036	0.058	0.071	0.008	0.071	0.059	0.085
Interior Columbia Su/F	0.287	0.012	0.287	0.267	0.308	0.443	0.013	0.443	0.422	0.464
Oregon Coast	0.083	0.009	0.083	0.069	0.098	0.067	0.008	0.067	0.055	0.080
Other	0.066	0.007	0.066	0.056	0.077	0.081	0.007	0.081	0.069	0.093

	AY 2015 (*n* = 2,816)				
				90% CI	
Reporting Group[a]	Mean	SD	Median	5%	95%
SEAK/TBR	0.154	0.007	0.154	0.143	0.165
NCBC	0.111	0.008	0.111	0.099	0.124
West Vancouver	0.060	0.005	0.060	0.052	0.069
South Thompson	0.072	0.007	0.072	0.060	0.085
Washington Coast	0.067	0.008	0.066	0.054	0.080
Interior Columbia Su/F	0.373	0.013	0.373	0.352	0.393
Oregon Coast	0.074	0.009	0.073	0.060	0.088
Other	0.090	0.007	0.090	0.079	0.102

Note: Sample sizes (*n*), standard deviation (SD), and 90% credibility intervals are provided.
Note: Reporting groups are described in Table 1.