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Genetic Stock Composition of the Commercial Harvest of Sockeye Salmon in Southeastern District Mainland, Alaska Peninsula Management Area, 2010–2012

by

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

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Weights and measures (metric)

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

Weights and measures (English)

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

Time and temperature

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

Physics and chemistry

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

General

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

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

SPECIAL PUBLICATION NO. 12-31

GENETIC STOCK COMPOSITION OF THE COMMERCIAL HARVEST OF SOCKEYE SALMON IN SOUTHEASTERN DISTRICT MAINLAND, ALASKA PENINSULA MANAGEMENT AREA, 2010–2012

by

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ABSTRACT

The Southeastern District Mainland (SEDM) commercial salmon fishery occurs in the Alaska Peninsula Management Area, Westward Region, is regulated based upon a board-approved management plan, and has allocative constraints between June 1 and July 25 based upon the abundance of Chignik River sockeye salmon. Significant controversy has persisted between SEDM and Chignik Management Area fishermen concerning the estimate of Chignik-bound sockeye salmon harvested in the fishery. Western Alaska Salmon Stock Identification Program used mixed stock analysis (MSA) to determine stock of origin of sockeye (and chum salmon) in commercial and subsistence fisheries throughout Western Alaska from 2006 to 2009. As a result of low returns to the Chignik River during these years, the SEDM fishery was often closed and few samples were collected for analysis. This study was designed to fill in those holes and estimate stock proportions and stock-specific harvests of sockeye salmon sampled from the SEDM fishery. Genetic samples were collected from the fishery over a three-year period (2010–2012). A total of 17,078 sockeye salmon tissue samples were collected from three locations in SEDM. Of these, 8,357 samples were ultimately genotyped to represent 21 area-temporal strata. An updated baseline with an important local stock defined as a separate reporting group (stock) performed well for MSA. Chignik River sockeye salmon dominated catches during 2010–2012, contributing 65%, 67%, and 66% of the annual SEDM harvests sampled for MSA (excluding some Northwest Stepovak Section harvests in July). These percentages were less than the expectation in regulation, and the local Orzinski Lake stock also contributed less than expected to SEDM harvests sampled for MSA. These results provide the most comprehensive estimates of stock composition and stock-specific harvests of sockeye salmon in the SEDM area, supplement previous studies, and should inform fishery management and regulatory decision makers.

Key words: Southeastern District Mainland, SEDM, mixed stock analysis, MSA, Western Alaska Salmon Stock Identification Program, WASSIP, genetic baseline, sockeye salmon

INTRODUCTION

The Southeastern District Mainland (SEDM) commercial salmon fishery occurs in the Alaska Peninsula Management Area (Area M; Figures 1 and 2), is regulated based on a board-approved management plan (5 AAC 09.360. Southeastern District Mainland Salmon Management Plan), and has allocative constraints between June 1 and July 25. This management plan allows fishery openings primarily based on Chignik River sockeye salmon escapement and Chignik Management Area (CMA) harvests through which a specific allocation percentage is targeted, but openings can also occur on local stocks during specific times and areas.

Significant controversy has persisted for many years between fishermen from the Alaska Peninsula and Chignik management areas concerning the management of the SEDM fishery and the estimate of Chignik-bound sockeye salmon harvested in the fishery. The Western Alaska Salmon Stock Identification Program (WASSIP) was initiated in 2006 and was intended to use mixed stock analysis (MSA) to determine stock of origin of sockeye and chum salmon in commercial and subsistence fisheries throughout Western Alaska, including the Chignik and Alaska Peninsula management areas. SEDM sockeye salmon commercial harvests were included in the analysis plan for the three years (2006–2008) of WASSIP. However, low Chignik River sockeye salmon runs during these years resulted in very little fishing time during the allocation portion of the SEDM fishery and very few samples were collected (Eggers et al. 2011).

The department agreed to continue collecting genetic samples from the SEDM commercial fishery based on a continued desire by Alaska Peninsula and CMA fishermen expressed at the Area M Board of Fisheries (board) meeting in 2010 to determine updated stock-of-origin estimates of sockeye salmon. SEDM sampling was planned to continue during the 2010–2012 seasons so that three consecutive years of analyses could be completed prior to the 2013 Area M Board of Fisheries meeting. Funding for a portion of the 2010 sampling was provided by the department with the remainder of funding to be generated through test fishery revenues.

Funding for sampling in subsequent years' and for analysis of the genetic samples was to be generated by stakeholders.

In order to avoid the lack of samples that occurred during the WASSIP years (as a result of few commercial fisheries openings), sampling during 2010 through 2012 was to include scheduled test fisheries using chartered fishing boats. This was designed to ensure that samples from the area would be collected when the commercial fishery was closed and allow for a comparison between test fishery samples and commercial fishery samples when the commercial fishery was opened.

SEDM BACKGROUND

Southeastern District Mainland includes the East Stepovak, Stepovak Flats, Northwest Stepovak, Southwest Stepovak, Balboa Bay, and Beaver Bay sections (Figure 2). The SEDM Management Plan was established in 1974 and underwent many weekly fishing schedule and harvest ceiling changes from 1974 through 1984, with specific allocation criteria adopted in 1985 (Appendix A). The current SEDM Management Plan is in effect from June 1 through July 25 (allocation timeframe). Only set gillnet gear is permitted in SEDM through July 10; beginning July 11 seine and set gillnet gear are permitted.

Prior to any opening in SEDM, several criteria related to Chignik sockeye salmon abundance must be met. During years that the Chignik River sockeye salmon early and late runs are expected to exceed 600,000 fish, the runs appear to be strong as predicted, and escapement goals for the runs are being met, a fishery may be allowed in the SEDM such that the number of harvested fish which are destined for the Chignik River approaches as near as possible 7.6% of the CMA harvest. During June, 80% of the sockeye salmon harvested in all sections of the SEDM are considered to be bound for the Chignik River. Beginning on July 1, 100% of the sockeye salmon harvested in the Northwest Stepovak Section (NWSS) are considered to be local (0% Chignik River), while 80% of the sockeye salmon harvested in the remainder of the sections within the SEDM are considered to be bound for the Chignik River. Additionally, from June 26 through July 8 (overlap period), the strength of the Chignik second run is difficult to determine, so the department is bound by regulation to severely restrict commercial fishing in the SEDM during this time period.

The allocation criterion (80% of sockeye salmon harvested in SEDM are considered Chignik bound) is based on a tagging study conducted in eastern SEDM in 1961 in which 8 out of 10 tag recoveries were recovered in Chignik Lagoon.[1] Updated stock composition estimates in SEDM fisheries that quantify the Chignik contribution to the SEDM sockeye salmon harvests and the seasonal and interannual variability of those contributions are desirable as SEDM regulations are defined by the abundance and harvests of Chignik sockeye salmon.

WASSIP BACKGROUND

Collection of genetic samples for WASSIP was attempted in 2006 through 2009, but low sockeye salmon runs to Chignik during these years resulted in very few commercial fishery openings from June 1 through July 25 in the SEDM. Since sockeye salmon harvested in the

[1] Lall, D. F., and D. P. Hennick, Alaska Department of Fish and Game, Kodiak; 1961, memorandum. Alaska Peninsula Southern District 1961 salmon tagging summary.

NWSS are considered local beginning July 1, there were some openings in the NWSS after July 1 during the WASSIP years and some samples were collected.

For WASSIP collections, three geographic locations were selected for SEDM sampling. The East Stepovak and Stepovak Flats sections constituted one region that covered the eastern portion of the fishery. The NWSS was selected as a region on its own since specific management components are different in that region (considered 100% local beginning July 1). The Southwest Stepovak, Balboa Bay, and Beaver Bay sections constituted the third region to represent the western portion of the fishery. Two temporal strata were initially selected, one from the beginning of the season to the overlap period (June 1 through June 25) to represent the Chignik early run and one after the overlap period (July 9 through July 25) to represent the Chignik late run. After the 2006 sampling season, interest was expressed at a WASSIP Advisory Panel meeting to continue collection of samples from the SEDM area into August and a third temporal stratum from July 26 through August was added for 2007 through 2009 sampling.

WASSIP sockeye salmon samples from 2006 to 2008 were analyzed for stock of origin. Primary reporting groups (stocks) for SEDM catch samples included: East of WASSIP, Black Lake and Chignik Lake within the Chignik reporting group, South Peninsula, North Peninsula, Bristol Bay, Kuskokwim Bay and Norton Sound (Dann et al. 2012a).

2006

In 2006, the Chignik run was weak and there was only one short opening in the SEDM fishery during the allocation timeframe. Samples were collected from the East Stepovak Section as well as the Southwest Stepovak, Balboa Bay, and Beaver Bay sections group, but collections only represented the late portion of the second stratum and no samples were collected from the early stratum (Table 1). Due to a low local sockeye salmon run at Orzinski Lake (located in the NWSS), no openings were permitted in July in the NWSS and no samples were collected in 2006.

In 2006, East Stepovak and Stepovak Flats sections harvest was 145,484 fish, most of which took place after July 25. The Chignik reporting group harvest was 82,576 fish and the East of WASSIP reporting group harvest was 62,486 fish (Habicht et al. 2012a). Harvests from all other reporting groups were relatively small. Harvest rate on the Chignik reporting group was 3.6% with no other measurable harvest rates.

No Northwest Stepovak Section samples were taken in 2006, therefore reporting group harvest estimates that occurred after July 25 and harvest rates in WASSIP reporting were based on stock compositions estimated from 2008 samples.

The Southwest Stepovak, Balboa Bay, and Beaver Bay sections harvest was 88,943 fish, most of which took place after July 25. The Chignik reporting group harvest was 45,269 fish, followed by the East of WASSIP reporting group with 43,399 fish. No other reporting group contributed a large amount to harvests. The harvest rate on the Chignik reporting group was 2.0% and was the only reporting group harvested that had a harvest rate above 0.1%.

2007

In 2007, the Chignik run was again weak, no SEDM harvest occurred and no samples were collected during the allocation timeframe (Table 1). Samples were collected from all three areas

during August after the SEDM management is independent of the Chignik run strength and openings are based on local pink, chum, and coho salmon stocks.

In 2007, East Stepovak and Stepovak Flats sections harvest was 72,315 fish, all of which occurred after the allocation timeframe. The East of WASSIP reporting group was the dominant reporting group harvested with 45,437 fish, followed by the Chignik reporting group harvest of 26,876 fish (Habicht et al. 2012a). There were no other large reporting group harvests in the East Stepovak and Stepovak Flats sections and the only harvest rate above 0% was from the Chignik reporting group with 1.6%.

No Northwest Stepovak Section samples were taken in 2007, therefore reporting group harvest estimates and harvest rates in WASSIP reporting were based on stock compositions estimated from 2008 samples.

The Southwest Stepovak, Balboa Bay, and Beaver Bay sections harvest was 73,512 fish. The East of WASSIP reporting group contributed 45,638 fish to the harvest while the Chignik reporting group contributed 27,291 fish to the harvest. Harvests from all other reporting groups were relatively small. A harvest rate of 1.7% on the Chignik reporting group was the only measurable harvest rate.

2008

The Chignik run was weak in 2008 as well and no SEDM samples were collected during the allocation timeframe (Table 1). The Orzinski Lake sockeye salmon run was strong enough to permit a commercial fishery in the NWSS and samples were collected during July. Sample collections were made from all three areas during August.

In 2008, the East Stepovak and Stepovak Flats sections harvest was 61,811 fish, all of which occurred after July 25. Dominant harvest again came from the East of WASSIP reporting group with 32,892 fish, followed by the Chignik reporting group with 28,117 fish (Habicht et al. 2012a). Harvests from all other reporting groups were relatively small. The only measurable harvest rate was on the Chignik reporting group with 1.8%.

The Northwest Stepovak Section harvest was 41,914 fish, including 21,826 fish from the Chignik reporting group, 12,191 fish from the South Peninsula reporting group, and 6,817 fish from the East of WASSIP reporting group. Harvest rate on South Peninsula reporting group was 5.6% and on Chignik reporting group was 1.4%.

The Southwest Stepovak, Balboa Bay, and Beaver Bay sections harvest was 46,093 fish, all of which occurred after July 25. Chignik reporting group harvests were the largest with 23,742 fish followed by the East of WASSIP reporting group harvest of 16,390 fish. The North Peninsula reporting group harvest was 3,142 fish and all other harvests were small. The harvest rate on Chignik area fish was 1.5% and the South Peninsula harvest rate was 0.8% with no other reporting groups with harvest rates above 0.1%

2009

A stronger Chignik late run in 2009 allowed some sampling during July; however, sockeye salmon samples from WASSIP were analyzed from 2006 through 2008 only (Table 1). Sampling was also completed in the NWSS during July and in all 3 locations during August.

POST WASSIP

At the 2010 Area M (Alaska Peninsula Management Area) Board of Fisheries meeting, the board was informed that the WASSIP samples did not adequately represent the SEDM fishery. The board considered liberalizing criteria in the SEDM in an effort to ensure genetic sample collection for MSA. Ultimately, the board decided not to liberalize criteria, but as a result, the board, Area M set gillnetters, and CMA fishermen expressed mutual interest in making an effort to obtain SEDM samples prior to the next board meeting. Several Area M fishermen spoke with the Division of Commercial Fisheries director as well as many other department staff to set up sampling and a test fishery to ensure that samples would be collected whether a fishery occurred or not. The department agreed to pay for personnel during June of 2010 to get the project started with the understanding that stakeholders would pay for July sampling, for all additional years of sampling, and for all analyses. Sampling would be required for three consecutive years during 2010 through 2012 and results would be available prior to the 2013 board meeting.

Initial funding was provided by the department to allow sampling to begin in June of 2010. Repeated requests for funding to continue sampling in 2010 were directed to the Aleutians East Borough and Lake and Peninsula Borough. However, funding was not in place during 2010 and the department was able to fund the remainder of July sampling, largely with revenue generated from the test fishery. In the spring of 2011, the Aleutians East Borough agreed to provide funding for sample collection during 2011 and 2012 and for sample and statistical analysis and reporting. The Aleutians East Borough also agreed to take over the logistics of chartering test boats to alleviate some of the difficulties encountered during the 2010 season.

The genetic baseline used to estimate stock compositions of these samples is identical to the baseline used for WASSIP (Dann et al. 2012a) with one key difference: additional samples from Orzinski Lake (local stock in the SEDM area) were incorporated to allow that population to be defined as a separate reporting group in MSA of SEDM samples. Orzinski Lake sockeye salmon have particular importance in the SEDM fishery as escapement to the lake is used to manage the NWSS fishery between July 1 and 25. The Gene Conservation Laboratory adopted standards for the definition of reporting groups for WASSIP analyses based upon stakeholder interest, genetic distinction, adequate representation in the baseline (in terms of genetic diversity and numbers of fish and collections), and the expected contribution to catch samples of putative reporting groups (Habicht et al. 2012b). For WASSIP, the Orzinski Lake population of sockeye salmon was represented by 93 fish collected in 2000, well below the desired 400 fish minimum goal for a separate reporting group, and was included in the South Peninsula regional reporting group. Additional fish were collected to meet these standards and allow for an Orzinski subregional reporting group for SEDM analyses.

STUDY OBJECTIVE

The purpose of this project was to estimate stock proportions and stock-specific harvests of sockeye salmon sampled from commercial and test fisheries in the SEDM. Genetic samples were collected over a three-year period (2010 through 2012) and all data were analyzed in 2012. Each year, samples were collected from the commercial fishery (when the fishery was open) and from a test fishery (during fishery closures to supplement commercial samples and to provide comparison). Samples were collected from three locations in SEDM prior to July 9 and from two locations after July 8 from both commercial and test fisheries.

DEFINITIONS

To reduce confusion associated with the methods, results, and interpretation of this study, basic definitions of commonly used genetic and salmon management terms are offered here.

Allele. Alternative form of a given gene or DNA sequence.

Credibility Interval. In Bayesian statistics, a credibility interval is a posterior probability interval. Credibility intervals differ from the confidence intervals in frequentist statistics in that they are a direct statement of probability: i.e., a 90% credibility interval has a 90% chance of containing the true answer.

District. Waters open to commercial salmon fishing. Commercial fishing districts, subdistricts and sections in WASSIP commercial fishing areas are defined in statutes listed below under *Salmon administrative area*.

Escapement. The annual estimated size of the spawning salmon stock (5 AAC 39.222(f)).

F_{ST}. Fixation index, estimates the reduction in heterozygosity due to random genetic drift among populations; the proportion of the variation at a locus attributable to divergence among populations.

Genetic Marker. A known DNA sequence that can be identified by a simple assay.

Genotype. The set of alleles for one or more loci for an individual.

Harvest. The number of salmon taken of a run from a specific stock.

Harvest Rate. The fractional harvest from a stock taken in a fishery.

Locus (Loci, plural). A fixed position or region on a chromosome that may contain more than 1 genetic marker.

Mixed Stock Analysis (MSA). Method using allele frequencies from populations and genotypes from mixture samples to estimate stock compositions of mixtures.

Posterior Probability Distribution. The distribution of an unknown quantity, treated as a random variable, conditional on the evidence obtained from an experiment or survey.

Prior Probability Distribution. The distribution that expresses uncertainty and information of an unknown quantity before taking into account data.

Reporting Group. A group of populations in a genetic baseline to which portions of a mixture are allocated during mixed stock analyses; constructed based on a combination of stakeholder needs and genetic distinction and approved by the WASSIP Technical Committee and Advisory Panel. For the purposes of SEDM sockeye salmon analyses, reporting groups were defined into regional and subregional groups as follows:

1) Region: Norton Sound Subregions: None
2) Region: Kuskokwim Bay Subregions: Kuskokwim River, Kanektok, Goodnews
3) Region: Bristol Bay Subregions: Togiak, Igushik, Wood, Nushagak, Kvichak, Alagnak, Naknek, Egegik, Ugashik
4) Region: North Peninsula Subregions: Cinder, Meshik, Ilnik, Sandy, Bear, Nelson, Northwestern District-Black Hills
5) Region: South Peninsula Subregions: Orzinski, Non-Orzinski South Peninsula

6) Region: Chignik Subregions: Black Lake, Chignik Lake
7) Region: East of WASSIP Subregions: None

Run. The total number of salmon in a stock surviving to adulthood and returning to the vicinity of the natal stream in any calendar year, composed of both the harvest of adult salmon plus the escapement; the annual run in any calendar year. The run is composed of several age classes of mature fish from the stock, derived from the spawning of a number of previous brood years (from 5 AAC 39.222(f)).

Salmon Administrative Area (Area). Geographic areas used to administer the registration of commercial salmon fishing permits (from 20 AAC 05.230). Commercial salmon fishing areas are designated by letter code and are defined by the following Alaska administrative code: Chignik (Area L; 5 AAC 15.100); Aleutian Islands and Alaska Peninsula (Area M; 5 AAC 12.100, 5 AAC 09.100, and 5 AAC 11.101); Bristol Bay (Area T; 5 AAC 06.100); and Kuskokwim (Area W; 5 AAC 07.100). Districts and subdistricts within areas are used to aid management are further defined by administrative code.

Salmon Stock. A locally interbreeding group of salmon that is distinguished by a distinct combination of genetic, phenotypic, life history, and habitat characteristics or an aggregation of 2 or more interbreeding groups, which occur in the same geographic area and is managed as a unit (from 5 AAC 39.222(f)). For purposes of this study, a sockeye stock is a composite of all populations that spawn within the 16 major rivers and 9 adjacent geographic regions defined as *reporting groups* above.

Single nucleotide polymorphism (SNP). DNA sequence variation occurring when a single nucleotide (A, T, C, or G) differs among individuals or within an individual between paired chromosomes.

Stock composition estimate. The estimated contribution of a reporting group to a catch sample; usually generated by mixed stock analysis and presented as percent of the catch sample.

METHODS

EXPERIMENTAL DESIGN

The geographic locations to be sampled within the SEDM for this study were identical to those selected for WASSIP including: 1) East Stepovak and Stepovak Flats sections, 2) Northwest Stepovak Section, and 3) Southwest, Balboa Bay, and Beaver Bay sections (Figure 2). Initially, temporal strata were structured to be very similar to the intended WASSIP strata so that there was an early stratum (June 1 through June 25) prior to the overlap period and a late stratum after the overlap period (July 9 through July 25). There are slight differences in the temporal strata however, when compared to the WASSIP study. Some strata were altered in the WASSIP study to maximize the information that could be derived from samples that fell short of sampling goals as a result of fishery closures.

Samples were collected during 2010 using these strata. However, after 2010 several Area M fishermen expressed interest in the stock composition of fish moving through the SEDM during the June 26 through July 8 overlap period. As a result the overlap period was added as a third temporal stratum for 2011 and 2012 sampling.

Since there was some sampling of the Northwest Stepovak Section July harvests during WASSIP, it was decided that there would be no sampling during the July 9 through July 25 stratum in this study.

Sample goals in each geographic location and during each temporal stratum were set at 400 such that multinomial proportions could be estimated to within 5% of the true value 90% of the time (Thompson 1987). Efforts were made to collect additional fish to the 400 fish goal when possible so that the samples selected for analysis could be weighted from the day that they were collected relative to the commercial harvest on that day.

To meet these goals during periods when the commercial fishery was closed, samples were taken from test fisheries. In order to determine if the test fishery samples constituted similar stock compositions as the commercial fishery samples for the same periods, sampling of both fisheries occurred within some temporal strata.

TISSUE SAMPLING

Baseline

Department staff at the Orzinski River weir collected axillary processes from sockeye salmon escapement in 2012 and preserved them in a 250 mL bottle of ethanol.

Commercial Fishery

A department technician located in Sand Point coordinated sampling among department staff and acted as the lead sampler. Samples from the commercial fishery were collected from fishing and tender vessels, primarily at the seafood processing facility. Upon delivery to the processor, tender operators were interviewed to assure the location at which the load of fish was caught. As the tender unloaded at the processor, samples were randomly selected and an axillary process was collected and preserved in a 250 mL bottle of ethanol.

Test Fishery

Commercial fishing vessels were chartered to fish in the East Stepovak, Southwest Stepovak and Northwest Stepovak sections. Three commercial fishing vessels were chartered concurrently to fish the three areas simultaneously. Test fishing occurred in the Northwest Stepovak Section during June and early July only. Department staff boarded test vessels either in Sand Point, or boarded tender vessels during a commercial fishery opening to travel to the fishing grounds to board the test fishing vessels, reducing travel time required by test vessels.

Test fishery samples were collected on the grounds by onboard department observers. Specific fishing sites were selected for each section and the same sites were fished during each test fishery. Ideally two locations were fished by each test vessel; however, weather often prevented fishing in both locations and only one location was fished.

Test fishery dates were selected to avoid commercial openings in the area to encourage participation; fishermen would usually opt to not participate in test fishery charters if a commercial fishery opening was concurrent to the test fishery. Some test fishery dates were also selected to be as near to a commercial opening as possible so that a comparison between the commercial fishery samples and the test fishery samples could be made. The purpose of the comparison was to validate the assumption that samples collected from one location in a test

fishery were a reasonable representation of a commercial fishery which contained a mixture of locations within a sample area.

SELECTING TISSUE SAMPLES FOR ANALYSIS

For each stratum, a subset of the total samples collected was selected for analysis. The 400-sample goal was selected from the commercial fishery samples in proportion to the harvest that occurred on the day of the sample. If the proportion of the 400-sample goal was not available on a given sample day, all of the samples available were used and the proportion available from the rest of the sample days was used to select additional samples until the 400-sample goal was achieved. Samples used for analysis were randomly selected from sample bottles. If sample goals could not be reached with commercial fishery samples, test fishery samples were used to achieve the 400-sample goal per stratum.

Additional test fishery samples were selected for the comparative analysis to examine how well the test fishery samples represented the commercial fishery samples. Test fishery samples were collected as near, temporally, commercial fishery effort as logistics and weather allowed to minimize the effect of temporal sampling on stock composition estimates. An effort was also made to select comparisons to represent early and late portions of the fishery allocation period and from each of the 3 areas. Test fishery samples used in these comparison analyses were not included the estimation of stock compositions of the commercial catch, but were compared to commercial fishery samples that were used in both analyses.

LABORATORY ANALYSIS

Assaying Genotypes

DNA extraction and genotyping generally followed the methods in Seeb et al. (2009) and are described in detail in Dann et al. (2012a). Briefly, we extracted genomic DNA from tissue samples using a DNeasy® 96 Tissue Kit by QIAGEN® (Valencia, CA). We screened 96 SNP markers using Fluidigm® 96.96 Dynamic Arrays (http://www.fluidigm.com). The Dynamic Arrays were read on a Fluidigm® EP1™ System or BioMark™ System after amplification and scored using Fluidigm® SNP Genotyping Analysis software. Assays that failed to amplify on the Fluidigm system were reanalyzed on the Applied Biosystems platform. The plates were scanned on an Applied Biosystems Prism 7900HT Sequence Detection System after amplification and scored using Applied Biosystems' Sequence Detection Software version 2.2.

Genotypes produced on both platforms were imported and archived in the Gene Conservation Laboratory Oracle database, LOKI.

Laboratory Quality Control

We conducted a quality control analysis (QC) to identify laboratory errors and to measure the background discrepancy rate of our genotyping process. The QC analyses were performed by staff not involved in the original genotyping. We applied the *New* QC method described in Dann et al. (2012a). Briefly, the method consists of re-extracting 8% of project fish and genotyping them for the same SNPs assayed in the original genotyping process. Discrepancy rates were calculated as the number of conflicting genotypes, divided by the total number of genotypes compared. These rates describe the difference between original project data and QC data for all SNPs and are capable of identifying extraction, assay plate, and genotyping errors. Assuming that discrepancies among analyses were due equally to errors during the original genotyping and

during quality control, error rates in the original genotyping can be estimated as half the rate of discrepancies.

STATISTICAL ANALYSIS

Baseline

We retrieved genotypes from LOKI and imported them into *R* (R Development Core Team 2010). All subsequent analyses were performed in *R* unless otherwise noted. We applied the baseline analysis methods described by Dann et al. (2012a) to the new baseline collection. Briefly, we performed statistical quality control analyses to confirm the quality of the data used (see below); tested observed genotype frequencies for conformance to HWE; tested for differences in allele frequencies between pairs of collections and, when appropriate, pooled collections into populations; and tested populations for conformance to HWE and linkage equilibrium. After defining final populations, we tested reporting groups that differed from WASSIP (Orzinski and non-Orzinski South Peninsula) for adequate identifiability for MSA with *100% proof tests*.

Data Retrieval and Genotype Quality Control

We retrieved genotypes from LOKI and imported them into *R* (R Development Core Team 2010). All subsequent analyses were performed in *R* unless otherwise noted. Prior to MSA, we conducted three statistical quality control analyses to ensure that only quality genotypic data was included in the estimation of stock compositions. First, we removed individuals that were missing substantial genotypic data from further analyses. We used what we refer to as the *80% rule* which excludes individuals missing genotypes for 20% or more of loci, because these individuals likely have poor-quality DNA. The inclusion of individuals with poor-quality DNA might introduce genotyping errors into the catch samples and reduce the accuracies and precision of MSA.

Secondly, we identified individuals that appeared to be the wrong species. Individuals that amplified well, but displayed signature patterns for other species in their scatter plot distributions across selected loci were identified as nonsockeye. We were able to determine that the sample represented a nonsockeye because we analyzed Atlantic and Pacific salmon (chum, Chinook, pink, and coho salmon) on the 96 markers to identify these species-specific signatures in scatter plot distributions. We only noted that the sample was nonsockeye and did not report the species.

Thirdly, we identified individuals with duplicate genotypes and removed them from further analyses. Duplicate genotypes can occur as a result of sampling or extracting the same individual twice, and were defined as pairs of individuals sharing the same genotype in 95% of markers screened. The individual with the most missing data from each duplicate pair was removed from further analyses.

The number of sockeye salmon initially selected for analysis, the number genotyped in the laboratory, the numbers excluded for the three statistical quality control analyses, and the final number included in MSA were tabulated for each catch sample.

Estimating Stock Compositions and Stock-Specific Harvests

The stock compositions of SEDM fishery harvests were estimated using a Bayesian approach to genetic MSA, the Pella-Masuda Model (*BAYES*; Pella and Masuda 2001). The Bayesian method

of MSA estimates the proportion of stocks caught within each fishery using four 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 sockeye salmon populations and the groups into which the populations were combined are described in Dann et al. (2012a), but also included the additional Orzinski baseline collection.

BAYES Protocol

We ran five independent Markov Chain Monte Carlo (MCMC) chains of 40,000 iterations with different starting values and discarded the first 20,000 iterations to remove the influences of the initial start values. We defined the starting values for the first chain such that the first $1/5^{th}$ of the baseline populations summed to 0.9 and the remaining populations summed to 0.1. Each chain had a different combination of $1/5^{th}$ of baseline populations summing to 0.9. We combined the second halves of these chains to form the posterior distribution and tabulated median and mean estimates, 90% credibility intervals, the probability of an estimate being equal to zero, and standard deviations from a total of 100,000 iterations. For each tabulated measure, summary statistics were based upon the raw posterior, which was calculated out to six significant digits.

We also assessed the within- and among-chain convergence of these estimates using the Raftery-Lewis (within-chain) and Gelman-Rubin (among-chain) diagnostics. These values measure the convergence of each chain to stable estimates (Raftery and Lewis 1996), as well as measure the variation of estimates within a chain to the total variation among chains (Gelman and Rubin 1992), respectively. If the Gelman-Rubin diagnostic for any stock group estimate was greater than 1.2 we reanalyzed the mixture with 80,000-iteration chains following the same protocol. If the Gelman-Rubin diagnostic for any stock group estimate was greater than 1.2 after this reanalysis, we analyzed the mixture with the program *HWLER* (Pella and Masuda 2006). *HWLER* is similar to *BAYES* in that it estimates stock compositions based upon a Bayesian model, but differs in that it incorporates information about the effect of assigning mixture individuals to baseline populations with respect to the Hardy-Weinberg and linkage equilibria conditions observed in the baseline populations. In doing so it allows for the identification of extra-baseline individuals that contravene these equilibria conditions, but contribute to the mixture in question. We incorporated this information into the definition of the posterior for those mixtures that failed to converge after reanalysis with 80,000-iteration chains in *BAYES*.

Comparison of Commercial and Test Fishery Samples

To ensure that estimates of stock composition of test fishery samples adequately represented the commercial harvest in a given area-temporal stratum, we estimated stock compositions of paired commercial and test fishery samples collected from similar dates in the same section. We used test fishery samples that were independent of those samples used to apply stock compositions to commercial harvests. We tabulated measures of central tendency (mean and median) and variation (SD and 90% credibility interval; CI) and depicted posterior distributions as box plots to visually compare estimates of stock composition between the two sample types.

Prior Choice

There were too few strata in the comparison of commercial and test fishery samples to apply the sequential priors method (see below), so instead we used a flat prior (each reporting group is given an equal weight) for the estimation of stock composition of all comparison samples.

Fishery Samples

Prior Choice

It was demonstrated during WASSIP that the choice of prior information about the stock proportions in a fishery, or the prior probability distribution (referred to hereafter as a *prior*) is important to the outcome of the MSA (Habicht et al. 2012c). There is not a universally standard method for the selection of a prior in these types of analyses. We predicted the prior effect to be greater with weakly structured baseline stocks, making prior selection especially important for those stocks. Based on WASSIP Technical Committee input, we developed a novel approach for defining priors based upon 4 steps: 1) within each fishery, determine whether variation is lower within years across time strata or across years within time strata using F_{ST} (Weir and Cockerham 1984); 2) estimate stock composition estimates for the combined strata groups with the lesser interstrata variability using the program *SPAM* (Debevec et al. 2000), excluding the first stratum for each set; 3) use these estimates for the priors in the first stratum for each set; and 4) use the posterior from the first stratum as the prior for the next most similar stratum (across time strata within years or across years within time strata based on F_{ST} results) and continue using the posterior of the previous stratum for prior of the following stratum until all strata are analyzed. We termed this the *sequential priors* method (Jasper et al. 2012).

This method for defining priors was applicable when more than one stratum from a fishery was available to develop a prior, but cannot be applied to unassociated strata. Unassociated strata are those with no adjacent sampled strata within a fishery, either across time strata within years or across years within time strata. As an example, a fishery that was sampled in only a single temporal stratum in only one of the three years would represent an unassociated stratum. Where these unassociated strata occurred, they were either excluded from further analyses or a prior was determined on a case-by-case basis using expert opinion.

The prior information about stock proportions was incorporated in the form of a Dirichlet probability distribution in which the sum of the prior Dirichlet parameters sum to K and can be interpreted as adding K individuals to the fishery sample known as the *prior count*. While K can be assigned any positive value, it is typically held at 1 (Pella and Masuda 2001), which is what we assigned it to.

Applying Stock Compositions to Harvests

We calculated stock-specific harvests in the manner described by Dann et al. (2009). Briefly, median and mean harvest estimates, credibility intervals and standard deviations for each temporal stratum were calculated by multiplying the harvest from that stratum by its unrounded reporting group stock proportion estimates. Temporal strata were combined within sections into annual estimates by weighting them by their respective harvests. Confidence intervals for the overall harvest of each stock in a section was estimated via Monte Carlo by resampling 100,000 draws of the posterior output from each of the constituent temporal strata and applying the harvest to the draws. These annual estimates for each section were combined into annual estimates for the SEDM in the same manner.

Final Baseline Proofing

To further validate MSA results of the SEDM fishery, we conducted additional tests of the updated baseline. We constructed mixed composition proof tests to further evaluate the SEDM baseline's ability to accurately and precisely estimate stock compositions of SEDM reporting groups in proportions similar to those observed in the fishery. We did this by sampling without replacement 400 individuals from reporting groups in proportions similar to those observed in the fishery. We estimated the stock compositions of these mixed composition proof tests following the *BAYES* protocol described above, except that we used a flat prior, and compared these estimates to the true proportions. To account for sampling error, we replicated this procedure four times for a total of five mixed composition proof tests in a manner similar to Habicht and Dann (2012).

RESULTS

TISSUE SAMPLING

Baseline

A total of 400 Orzinski sockeye salmon were sampled in June, 2012 and stored in ethanol.

Commercial and Test Fisheries

East Stepovak and Stepovak Flats sections

During 2010 through 2012, seven of eight sampling strata goals were met from the commercial fishery in the East Stepovak and Stepovak Flats sections (Table 2). Low harvest rates during the second stratum in 2012 limited sampling opportunity and only 200 samples were collected toward the goal of 400.

Goals were met in five of the eight sampling strata for the test fishery in the East Stepovak and Stepovak Flats sections during 2010 through 2012 (Table 2). In 2010, both sampling goals were met, but in 2011, no test fishery vessels were available during the first two strata due to continuous commercial fishing. The third stratum goal was met in 2011. Nearly continuous fishing during the first stratum in 2012 also limited availability of test fishery vessels and no test fisheries were conducted; however, the second two strata goals were met.

Northwest Stepovak Section

Sampling goals were met in four of the five sampling strata in the Northwest Stepovak Section commercial fishery (Table 2). Low harvests during the second stratum in 2012 resulted in 154 samples of the 400-sample goal being collected.

Only one of the five sampling strata goals were met for the Northwest Stepovak Section test fishery (Table 2). The single sampling stratum in the sampling plan during 2010 was achieved. During the first and second strata during 2011, continuous commercial fishing precluded availability of test fishery vessels and test fishery samples were not collected. During 2012, continuous commercial fishing eliminated the opportunity for a test fishery in the first stratum and a low harvest rate during the test fishery in the second stratum resulted in only 200 samples of the 400-sample goal being collected.

Southwest Stepovak, Balboa Bay, and Beaver Bay sections

Sampling goals were met in five of the eight sampling strata in the Southwest Stepovak, Balboa Bay, and Beaver Bay sections commercial fishery (Table 2). In 2010, the sampling goal was met in the first stratum, but only 357 samples toward the 400-sample goal were collected in the third stratum. In 2011, goals were met in the first two strata; however, only 360 samples were collected in the third stratum because few samples were available due to limited fishing time and low harvests. In 2012, the first and third strata goals were met, but only two days of commercial fishing during the second stratum limited availability of samples and only 200 samples were collected.

A total of four of the eight sampling strata goals were met from the test fishery in the Southwest Stepovak, Balboa Bay, and Beaver Bay sections. Low harvest rates during the first stratum of 2010 resulted in 127 samples of the 400-sample goal being collected; however, the third stratum goal was met. Continuous commercial fishing in 2011 resulted in no test fisheries being conducted in the first two strata, but the third stratum goal was met. Extended commercial fishery openings also resulted in no test fisheries during the first stratum of 2012; however, the second two strata goals were met.

Pooling the commercial and test fishery samples allowed stock composition estimates to be made for all eight sampling strata. The second sampling stratum was not part of the sampling plan during 2010.

SELECTING TISSUE SAMPLES FOR ANALYSIS

East Stepovak and Stepovak Flats sections

Pooling of commercial fishery and test fishery samples allowed estimation of stock compositions for all eight strata (Table 2). The second stratum was not part of the sampling plan during 2010. Test fishery samples for the comparative analysis were selected from the 2010 early temporal stratum (396 fish) and the 2012 later temporal stratum (200 fish; Table 2.)

Northwest Stepovak Section

Pooling the commercial and test fishery samples allowed stock composition estimates to be made for all five sampling strata (Table 2). The second stratum was not part of the sampling plan during 2010 and the third sampling stratum was not part of the sampling plan during all years. Test fishery samples for the comparative analysis were selected from the 2010 early temporal stratum (400 fish; Table 2).

Southwest Stepovak, Balboa Bay, and Beaver Bay sections

Pooling the commercial and test fishery samples allowed stock composition estimates to be made for all eight sampling strata (Table 2). The second sampling stratum was not part of the sampling plan during 2010. Test fishery samples for the comparative analysis were selected from the 2012 late temporal stratum (400 fish; Table 2).

LABORATORY ANALYSIS

Assaying Genotypes

Of the 400 baseline samples collected in 2012, 380 were selected and successfully genotyped. A total of 7,314 fish (commercial fisheries) and 2,439 fish (test fisheries) were genotyped from 21

strata representing harvests and 4 strata comparing stock compositions of commercial and test fishery samples (Table 2). This represents 47 fewer fish than were originally selected for analysis in the Cooperative Agreement between Alaska Department of Fish and Game and Aleutians East Borough.

Laboratory Quality Control

Laboratory quality control identified errors in tissue and DNA handling. After these errors were corrected, we measured low levels of nonsystematic discrepancies between the original and QC analyses (Table 3). There were 81,984 genotypes compared between these analyses. The majority of discrepancies were between homozygote and heterozygote genotypes (0.20%), but some discrepancies between alternate homozygotes were observed (0.02%). Assuming all errors are equally likely to have occurred in the production and QC genotyping process, error rates for both error types was 0.12%. This level of error was well below the standard set by the laboratory as acceptable (1%).

STATISTICAL ANALYSIS

Baseline

Allele frequencies of the 2012 Orzinski collection did not differ from the previous collection taken in 2000 and these collections were pooled. This population differed from others in the South Peninsula, and numbered 472 fish after statistical QC, greater than the 400 minimum desired by the Gene Conservation Laboratory for reporting groups. The combined Orzinski population conformed to HWE, and exhibited patterns of linkage disequilibrium similar to other populations. As a result we included the increased sample size Orzinski population with the WASSIP baseline and followed the same protocol for linked SNPs as was done for WASSIP: two SNPs were dropped (*One_GPDH*2-1872 and *One_Tf_ex*11-750; Dann et al. 2012a), and two MHC SNPs were combined. Tests of the baseline's new reporting groups (Orzinski and non-Orzinski South Peninsula) suggested these groups were highly identifiable (correct allocation 99.3% and 98.9%, respectively; Table 4).

Data Retrieval and Genotype Quality Control

Of the 9,753 fish genotyped, 67 were excluded from analysis because they were missing genotypes for more than 20% of loci, zero were excluded because they were identified as the wrong species, and four were excluded because they appeared to represent duplicate individuals (Appendix B). In the end, a total of 8,304 fish were used to produce stock composition estimates for 21 strata. Average sample size of strata was 395 fish with a minimum of 387 fish and a maximum of 400 fish. Of the 1,396 fish genotyped to compare stock compositions of commercial and test fishery samples in four paired strata, 1,378 were used in final analyses.

Stock Composition and Stock-Specific Harvest Estimates

BAYES Protocol

All samples analyzed had chains that converged to stable estimates after 40,000-iteration analysis.

Comparison of Commercial and Test Fishery Samples

Prior Choice

Priors used to compare estimates of stock composition of commercial and test fishery samples and for baseline evaluation tests were defined as flat priors.

Two comparisons between test and commercial fishery samples were made in the East Stepovak and Stepovak Flats sections, one in 2010 and one in 2012. In 2010, samples were collected from the commercial fishery on June 19 and 24 and were compared to test fishery samples collected on June 21 and 26. Chignik was the main contributor to both samples but stock compositions differed, with 73.1% in the commercial fishery and 90.7% in the test fishery. However, the top three contributors were ranked in the same order for both samples and samples were taken over seven days when temporal dynamics may impart large influence on stock compositions (Table 5; Figure 3). In 2012, the commercial fishery samples were taken on July 10 and 18 and were compared to test fishery samples collected on July 13 and 19. Stock composition results between the samples were similar with an estimate of East of WASSIP group of 50.0% in the commercial fishery and 49.3% in the test fishery (Table 6; Figure 3). The Chignik reporting group composed 45.3% of the commercial fishery sample and 46.1% in the test fishery sample. There was variability among the groups with smaller stock contributions; however, no other group composed more than 5% of either sample.

A comparison was made in the Northwest Stepovak Section between the commercial fishery and the test fishery during 2010. The commercial fishery samples were collected on June 15, 19, and 23 while the test fishery samples were collected on June 21 and 27. Stock compositions between the commercial fishery and test fishery samples were similar with 90.3% Chignik group fish in the commercial fishery and 85.9% in the test fishery (Table 7; Figure 3). The South Peninsula group represented 4.2% of the commercial fishery sample while it was 10.5% of the test fishery sample.

The samples for the comparison made between the commercial and test fishery samples in the Southwest Stepovak, Balboa Bay, and Beaver Bay sections were collected in 2012. Samples were collected from the commercial fishery on July 10, 11, 18, 21, and 23 and were compared to samples collected from the test fishery on July 13 and 19. Chignik was the largest reporting group in both samples composing 71.6% of the commercial fishery sample and 75.5% of the test fishery sample (Table 8; Figure 3). The East of WASSIP group was the second largest contributor in both samples with 20.8% of the commercial harvest and 16.9% of the test fishery sample.

Fishery Samples

Prior Choice

All priors used to estimate the stock compositions of sockeye salmon catches were defined following the F_{ST} approach.

East Stepovak and Stepovak Flats sections

In general, the Chignik reporting group dominated sockeye salmon harvests in the early stratum and decreased in the later strata with a corresponding increase in the East of WASSIP reporting group (Tables 9–19; Figures 4 and 5). During 2010, the Chignik reporting group was the largest contributor in the first stratum with 73.3% followed by the East of WASSIP reporting group with

17.4% and Bristol Bay reporting group with 8.9% (Table 9). In the third stratum, there was a decrease in the Chignik group's contribution to 50.5% and an increase in the East of WASSIP group to 45.3%. No other groups represented over 5% of the harvest (Table 10; Figure 4). For 2010, stock specific harvests in the East Stepovak and Stepovak Flats sections were estimated at 33,871 fish from the Chignik reporting group, followed by 23,406 fish from East of WASSIP, and 3,027 fish from Bristol Bay (Table 11; Figure 5).

In 2011, Chignik reporting group again dominated the early stratum with 90.6% and the East of WASSIP reporting group composed only 4.9% of the harvest (Table 12). In the second stratum, the Chignik group fish decreased to 62.6% and the East of WASSIP group increased to 32.6% (Table 13). The East of WASSIP group increased to 56.8% in the third stratum and the Chignik reporting group decreasing to 40.2% (Table 14; Figure 4). Harvests by stock during 2011 consisted of 72,290 Chignik group fish, 31,637 East of WASSIP group fish, and 2,300 Bristol Bay group fish (Table 15; Figure 5).

Stock compositions followed a similar pattern in 2012 with the Chignik reporting group consisting of 76.9% of the harvest in the first stratum, followed by the East of WASSIP group with 14.7% and the Bristol Bay reporting group with 7.7% (Table 16). In the second stratum, the Chignik reporting group decreased to 59.3% of the harvest, the East of WASSIP group increased to 26.9%, and Bristol Bay group increased to 13.2% (Table 17). In the third stratum, the East of WASSIP reporting group (48.9%) and the Chignik reporting group (48.8%) were similar and no other reporting groups contributed more than 1% of the run (Table 18; Figure 4). Harvests by stock in 2012 consisted of 52,121 Chignik fish, 34,160 East of WASSIP fish, and 3,141 Bristol Bay fish (Table 19; Figure 5).

Northwest Stepovak Section

During 2010 through 2012, the Chignik reporting group was the largest contributor to the harvest, followed by the South Peninsula, East of WASSIP, and Bristol Bay reporting groups in varying amounts (Tables 20–27; Figures 6 and 7). In 2010, during the first and only stratum collected, the Chignik reporting group composed 90.5% of the harvest with no other reporting group exceeding 5% of the harvest (Table 20; Figure 6). The total harvest of Chignik group fish during 2010 was 8,110 fish (Table 21; Figure 7).

In 2011, the Chignik group composed 81.8% of the harvest, followed by the Bristol Bay reporting group with 7.1% (Table 22). No other group composed more than 5% of the harvest. During the second stratum, the Chignik contribution decreased to 46.6% of the harvest while the South Peninsula, East of WASSIP group and Bristol Bay groups increased to 34.5% (South Peninsula), 10.6% (East of WASSIP), and 7.9% (Bristol Bay) of the harvest (Table 23; Figure 6). The harvest of the Chignik group during 2011 was 19,313 fish, the harvest of the South Peninsula group was 4,167 fish, the harvest of Bristol Bay group was 1,945 fish, and the harvest of East of WASSIP group was 1,069 fish (Table 24; Figure 7).

In 2012, the Chignik group was the largest contributor in the first stratum with 74.3% of the harvest, followed by the Bristol Bay (11.0%), East of WASSIP (8.1%), and South Peninsula (5.8%) groups (Table 25). In the second stratum, the Chignik group composed 77.7% of the harvest followed by East of WASSIP group with 9.6% and South Peninsula group with 8.6% (Table 26; Figure 6). Harvest of Chignik group in 2012 totaled 30,623 fish followed by East of WASSIP group with 3,651 fish, South Peninsula group with 3,058 fish, and Bristol Bay group with 2,308 fish (Table 27; Figure 7).

Southwest Stepovak, Balboa Bay, and Beaver Bay sections

The stock composition in the Southwest Stepovak, Balboa Bay, and Beaver Bay sections had a similar trend to that of the East Stepovak and Stepovak Flats sections with a high percentage of Chignik reporting group in early strata that generally decreased in later strata (Tables 28–38; Figures 8 and 9). During 2010, Chignik reporting group composed most of the fish harvested in the first stratum with 81.8% of the harvest followed by the East of WASSIP group with 9.7% and the Bristol Bay reporting group with 5.2% (Table 28). In the third stratum, the Chignik reporting group decreased to 70.6%, the East of WASSIP reporting group increased to 19.1% and the South Peninsula reporting group increased to 7.9% (Table 29; Figure 8). Harvest in the Southwest Stepovak, Balboa Bay, and Beaver Bay sections during 2010 was composed mostly of the Chignik reporting group with 27,750 fish harvested, followed by East of WASSIP with 5,788 fish, and South Peninsula with 2,172 fish (Table 30; Figure 9).

In 2011, the Chignik reporting group composed 88.3% of the harvest during the first stratum followed by the Bristol Bay reporting group with 8.1% of the harvest (Table 31). The percentage of Chignik reporting group fish decreased to 49.3% in the second stratum, followed by the East of WASSIP group with 31.9%, the Bristol Bay group with 11.4%, and the South Peninsula group with 6.9% (Table 32). In the third stratum, the East of WASSIP group was the largest contributor with 49.3% followed by the Chignik group with 45.3% and the South Peninsula group with 4.9% (Table 33; Figure 8). Harvest during 2011 was mostly Chignik reporting group (39,341 fish), followed by East of WASSIP group with 14,814 fish, Bristol Bay group with 4,224 fish, and South Peninsula group with 2,700 fish (Table 34; Figure 9).

In 2012, the Chignik reporting group was the largest contributor in the first stratum with 78.7% of the fish harvested, followed by the Bristol Bay group with 15.3%; no other groups composed more than 5% of the harvest (Table 35). In the second stratum, the Chignik group decreased to 70.7% while the East of WASSIP group increased to 13.4% and the Bristol Bay group increased to 12.5% (Table 36). In the third stratum, the Chignik group increased slightly to 71.9%, East of WASSIP increased to 21.2% while all other groups were below 5% of the harvest (Table 37; Figure 8). The harvest during 2012 was composed of 36,786 Chignik group fish, 8,081 East of WASSIP group fish, 2,888 Bristol Bay group fish, and 1,226 South Peninsula group fish (Table 38; Figure 9).

Southeastern District Mainland

All results for each year were combined to estimate total SEDM stock composition and stock-specific harvest summaries from June 1 through July 25. While these estimates are nearly analogous to the harvest parameters used to manage the SEDM fishery, they do not include the NWSS harvest during July 9–25 in all 3 years since those dates were not part of the sampling plan.

In 2010, the total SEDM harvest of 106,584 sockeye salmon consisted of 65.4% Chignik, 27.6% East of WASSIP, 4.2% Bristol Bay, and 2.4% South Peninsula group fish (Table 39; Figure 10). The Chignik group harvest was 69,731 fish, East of WASSIP group was 29,420 fish, Bristol Bay group was 4,454 fish, and the South Peninsula group was 2,570 fish (Figure 11). Within the South Peninsula reporting group, all fish were estimated to be from the local Orzinski Lake stock.

In 2011, the total SEDM harvest of 196,419 sockeye salmon consisted of 66.7% Chignik group fish, 24.2% East of WASSIP fish, 4.3% Bristol Bay fish, and 4.3% South Peninsula group fish (Table 40; Figure 10). The Chignik group harvest was 130,938 fish, East of WASSIP group was 47,538 fish, Bristol Bay group was 8,510 fish, and South Peninsula group was 8,395 fish (Figure 11). Within the South Peninsula reporting group, 8,343 fish were estimated to be from the Orzinski Lake stock and 19 fish were calculated to be from other South Peninsula stocks.

In 2012, the total SEDM harvest of 180,390 sockeye salmon consisted of 66.2% Chignik group fish, 25.5% East of WASSIP fish, 4.6% Bristol Bay fish, and 2.5% South Peninsula fish (Table 41; Figure 10). The Chignik group harvest was 119,505 fish, East of WASSIP group was 45,931 fish, Bristol Bay group was 8,385 fish, and South Peninsula group was 4,568 fish (Figure 11). Within the South Peninsula reporting group, 4,192 fish were estimated to be from the Orzinski Lake stock and 327 fish were calculated to be from other South Peninsula stocks.

Final baseline proofing

The mixed composition proof tests suggested that the SEDM baseline can accurately and precisely estimate stock compositions of SEDM reporting groups in proportions similar to those observed in the fishery. The Black Lake and Chignik Lake average estimates of the five replicates were 31.6% (Black Lake) and 34.4% (Chignik Lake), indicating a slight bias away from Black Lake and towards Chignik Lake (true proportion of 32.5%; Table 42; Figure 12). Taken together as a whole, the Chignik regional reporting group average estimate (66%) was very near the true proportion (65%). Average estimates for the South Peninsula reporting groups, Orzinski (2.6%) and non-Orzinski South Peninsula (2.1%), were similarly accurate compared to the true proportion (2.5%). The tests indicated a slight bias away from the East of WASSIP group (average estimate 23.3%; true proportion 25%) and towards Bristol Bay (average estimate 5.5%; true proportion 5%) and North Peninsula (average estimates 0.5%, true proportion 0%), while all other reporting groups had average estimates within 1% of the true proportion.

DISCUSSION

This project provides the most comprehensive estimates of stock composition and stock-specific harvest of sockeye salmon sampled from commercial and test fisheries in the SEDM area, and supplements information gathered over the same area from a more limited sampling effort from 2006 to 2008 (Dann et al. 2012c; Habicht et al. 2012a). Samples were collected from the three sections in SEDM prior to July 9 and from two sections in SEDM after July 8 from 2010 to 2012. Of the 17,078 sockeye salmon tissue samples collected in 21 strata, 8,400 were selected for analysis and 8,357 were ultimately genotyped. These samples were genotyped for 96 SNPs chosen specifically for WASSIP MSA (Dann et al. 2012b).

We built a baseline to estimate stock compositions of SEDM harvests as accurately and precisely as possible. This baseline was comprised of 39,584 individuals from 451 collections representing 294 populations, genotyped for SNPs chosen for WASSIP MSA. This baseline was the same as the WASSIP baseline, except that it included an additional 380 fish from Orzinski Lake that allowed for that population to represent an additional reporting group. Tests of this new reporting group and the reduced non-Orzinski South Peninsula reporting groups suggest that these groups are highly identifiable, and that MSA results for these two groups exceed accuracy and precision standards (Table 4). Further tests of simulated fishery compositions suggest that

this baseline is robust to varying stock compositions and can accurately and precisely estimate compositions similar to those observed in the SEDM fishery (Figure 12).

We compared genotypes of catch samples to allele frequencies of baseline populations to estimate the contribution of each reporting group to the catch that each sample represented. Due to the prosecution of the fishery, we included samples from the test fishery in the estimation of stock compositions of the harvest, and compared estimates of the two sample types to validate the assumption that they are equally representative of the commercial harvest. Given differences in temporal and spatial distribution in harvest between the test and commercial fisheries, stock composition estimates between these fishery samples would be expected to show some variation. The results generally supported the assumption that test fishery samples could be used as a surrogate for commercial catch.

Finally, the application of harvest estimates to the stock composition estimates reported here allows for the calculation of stock-specific harvests, and an evaluation of the fishery in context of the previously held standard of 80% Chignik-bound sockeye in regulation.

DEPARTURES FROM WASSIP METHODS

The methodology used in this report differed from WASSIP in two ways. We assumed harvests included in this study were known without error, and did not incorporate the 5% CV that was incorporated in WASSIP estimates of stock-specific catches. Incorporating error about harvest estimates has no effect on central tendency (mean or median) estimates of stock composition, but does widen the uncertainty about those estimates (90% CI and SD). Prior to WASSIP, the Gene Conservation Laboratory did not incorporate error in harvest estimates. The 5% CV used in WASSIP was based on Advisory Panel consensus of a reasonable number (based on personal experiences) and did not incorporate any empirical data. As such, future projects will likely not incorporate error in harvest estimates.

The other way in which this study differs from WASSIP is the reporting of estimates. This report provides two measures of central tendency of stock compositions: mean and median. For stocks with very small contributions to a catch sample and right-skewed posterior distributions, the median is a better estimate of central tendency due to the disproportionate effect of few observations of high contributions on the mean estimate. However, medians do not sum to the total as means do, and so medians were adjusted in the reporting of WASSIP results so that they would sum to the total within one stratum level. These adjustments were generally small (upward adjustments of 0% to 3% of the estimate) and only standardized the medians within one level (e.g., annual totals within a Section), leaving other levels wherein subcomponents did not add to the total. Therefore, this report provides both median and mean as measures of central tendency for both stock composition and stock-specific estimates without adjusting the median, which is how the Gene Conservation Laboratory will likely report results in the future. Readers should be aware that medians in this report will not sum to the total.

CHIGNIK RUN SIZE COMPARISON

The Chignik reporting group contributed the largest percentage to the SEDM harvest in all early strata. The Chignik group percentage generally decreased throughout the sampling timeframe, but remained a large component. Harvest of Chignik reporting group fish was the highest of all reporting groups in the SEDM.

During WASSIP, the SEDM was not open to commercial fishing during June, and there was very little fishing opportunity during July due to low Chignik run sizes from 2006 through 2008. Run sizes in the CMA were below average (2003–2012) during all three WASSIP years. By contrast, CMA runs during the past three seasons (2010–2012) were all above average (2003–2012).

A large difference in Chignik sockeye salmon run size would undoubtedly influence the stock composition of sockeye salmon caught in the SEDM. It is likely that, due to low Chignik run sizes encountered during the WASSIP years, the estimated stock composition of Chignik sockeye salmon in SEDM was lower than average during those years. Conversely, it is likely that, due to the high Chignik run sizes encountered during this study, the estimated stock composition of Chignik sockeye salmon in SEDM was higher than average during 2010 through 2012. Run magnitudes of other stocks would also likely influence stock composition estimates in SEDM harvests.

MANAGEMENT IMPLICATIONS

The impetus for this study was to provide an analytically sound estimate of Chignik-bound fish in the SEDM fishery. The percentage of Chignik-bound fish in the SEDM in regulation is based loosely on a tagging study conducted in the East Stepovak area in 1961 in which 8 of 10 tags were recovered in the Chignik Lagoon.[2]

Chignik Stock Composition

Current regulations assume that 80% of sockeye salmon harvested in the East Stepovak and Stepovak Flats sections from June 1 through July 25 are of Chignik origin. By comparison, MSA estimates of stock composition of Chignik fish are variable over that timeframe. During the early stratum of this study (June 1–25), estimates of Chignik stock composition varied above and below the regulatory 80% assignment in the East Stepovak and Stepovak Flats sections with 73.3% in 2010, 90.6% in 2011, and 76.9% in 2012 (Tables 9, 12, and 16). In the second stratum (June 26–July 8), the estimate of Chignik stocks decreased during the two years that samples were taken: 62.6% in 2011 and 59.3% in 2012 (Tables 13 and 17). In the third stratum (July 9–25), the Chignik contribution decreased further to 50.5% in 2010, 40.2% in 2011, and 48.8% in 2012 (Tables 10, 14, and 18).

The regulations for the Northwest Stepovak Section assume 80% of the salmon harvested during June are of Chignik origin. During the first stratum (June 1–25), MSA estimates of Chignik fish varied above and below the regulatory allocation of 80% with 90.5% in 2010, 81.8% in 2011, and 74.3% in 2012 (Tables 20, 22, and 25). A portion of the second stratum is assigned in regulation to be 80% Chignik fish (June 26–30) while the remainder of the stratum is allocated 100% to local stocks (0% Chignik fish; July 1–8). In the second stratum during the two years that samples were taken, the Chignik stock composition estimate was 46.6% in 2011, and 77.7% in 2012 (Tables 23 and 26). No samples were taken after July 8, during which regulations assign 0% of the harvest to Chignik (100% local). The Chignik stock composition estimate for an analogous stratum during 2008 in the WASSIP study was 43.5% (Dann et al. 2012c).

[2] Lall, D. F., and D. P. Hennick, Alaska Department of Fish and Game, Kodiak; 1961, memorandum. Alaska Peninsula Southern District 1961 salmon tagging summary.

The regulations in the Southwest Stepovak, Balboa Bay, and Beaver Bay sections assume 80% of the sockeye salmon harvested during June 1 through July 25 are of Chignik origin. During the first stratum (June 1–25), MSA estimates of Chignik fish varied above and below the regulatory allocation with 81.8% in 2010, 88.3% in 2011, and 78.7% in 2012 (Tables 28, 31, and 35). During the second stratum (June 26–July 8), the MSA estimates of Chignik stock composition tended to be lower than the 80% regulation with 49.3% in 2011 and 70.7% in 2012 (Tables 32 and 36; no samples taken in 2010). The third stratum MSA estimates were 70.6% in 2010, 45.3% in 2011, and 71.9% in 2012 (Tables 29, 33, and 37).

Chignik Harvest

The estimate of Chignik-bound fish provided by MSA is undoubtedly more precise than the 1961 tagging study. However, samples were not collected after July 8 in the NWSS in this study because some samples were collected from this section during July as part of WASSIP or during the overlap period (Table 2). As a result, harvests during that timeframe are not included in these estimates of Chignik-bound fish. No estimates of Chignik-bound fish were made for the catch after July 25 in any year, but the total harvest numbers for these strata were generally low from 2010 to 2012 (4,286, 21,144, and 0 fish for each year, respectively; Table 2).

During 2010, the regulatory estimate of Chignik-bound fish in the SEDM fishery through July 25 was 85,267 sockeye salmon. The MSA estimate of Chignik-bound fish was 69,731 fish, which was 65.4% of the total SEDM harvest represented by MSA sampling (Table 39). The MSA estimate does not include the unknown Chignik component of 22,631 fish harvested during July 9–25 or the 38,541 fish harvested during the June 26–July 8 overlap period in the NWSS (Table 2). The total CMA harvest through July 25 was 1,125,135 sockeye salmon, bringing the regulatory estimate of Chignik fish in the SEDM to 7.6% of CMA harvest, very close to the 7.6% allocation in regulation. In contrast, the MSA estimate of Chignik fish in the SEDM was 6.2% of CMA harvest (not including NWSS harvest after June 26).

During 2011, the regulatory estimate of Chignik-bound fish in the SEDM fishery through July 25 was 156,637 sockeye salmon. The MSA estimate of Chignik-bound fish was 130,938 fish, which was 66.7% of the total SEDM harvest represented by MSA sampling (Table 40). The MSA estimate does not include the unknown Chignik component of 26,096 fish harvested in the NWSS during July 9–25. The total CMA harvest through July 25 was 2,277,681 sockeye salmon, bringing the regulatory estimate of Chignik fish in the SEDM to 6.9% of CMA harvest, just under the 7.6% allocation in regulation. In contrast, the MSA estimate of Chignik fish in the SEDM was 5.7% of CMA harvest (not including NWSS harvest after July 8).

During 2012, the regulatory estimate of Chignik-bound fish in the SEDM fishery through July 25 was 126,083 sockeye salmon. The MSA estimate of Chignik-bound fish was 119,505 fish, which was 66.2% of the total SEDM harvest represented by MSA sampling (Table 41). The MSA estimate does not include the unknown Chignik component of 38,211 fish harvested in the NWSS during July 9–25. The total CMA harvest through July 25 was 1,640,514 sockeye salmon, bringing the regulatory estimate of Chignik fish in the SEDM to 7.7% of CMA harvest, just over the 7.6% allocation in regulation. In contrast, the MSA estimate of Chignik fish in the SEDM was 7.3% of CMA harvest, just under the 7.6% allocation (not including NWSS harvest after July 8).

Orzinski Lake Harvest

The harvest of Orzinski Lake sockeye salmon was variable among years and sections. In the East Stepovak and Stepovak Flats sections, the harvest of Orzinski fish was generally low with zero fish in 2010, 1,457 fish in 2011, and 146 fish in 2012 (Tables 11, 15, and 19).

Harvest in the Northwest Stepovak Section, where Orzinski Lake is located, was higher with 377 fish estimated in 2010, 4,148 in 2011, and 3,003 in 2012 (Tables 21, 24, and 27). Harvest estimated from the Northwest Stepovak Section did not include harvests after July 8, which is when much of the Orzinski Lake run occurs. It is also noteworthy that sampling for this study occurred on the capes in the Northwest Stepovak Section, and much of the harvest of Orzinski Lake fish occurs in Orzinski Bay (Statistical area 281-50; Figure 2) where the abundance and stock composition of Orzinski Lake fish is likely to be higher.

Harvest of Orzinski Lake sockeye salmon in the Southwest Stepovak, Balboa Bay, and Beaver Bay sections was higher than the East Stepovak and Stepovak Flats sections. Harvests in the Southwest Stepovak, Balboa Bay, and Beaver Bay sections were estimated at 2,168 fish in 2010, 2,697 fish in 2011, and 960 fish in 2012 (Tables 30, 34, and 38).

WASSIP Connection

Although this study is not part of WASSIP, it both benefited from the WASSIP process and provided complementary data that can be integrated with WASSIP results. WASSIP was a stakeholder-driven program where an Advisory Panel relied on a Technical Committee to make decisions through consensus. The Advisory Panel was made of up members from signatory organizations representing the major fishing interests in the region including the Alaska Department of Fish and Game, Aleut Corporation, Aleutians East Borough, Association of Village Council Presidents, Bering Sea Fishermen's Association, Bristol Bay Native Association, Concerned Area M Fishermen, Kawerak Incorporated, Lake and Peninsula Borough, Tanana Chiefs Conference, and Yukon River Drainage Fisheries Association. The Technical Committee was made up of four scientists with world-class scientific expertise in genetics, population dynamics, biometrics and salmon ecology and life history. The process settled on methodologies that were acceptable to all stakeholders and provided opportunities for the Advisory Panel to understand the components and decision-making process to arrive at the final product. In this report, we fill one hole in WASSIP, the SEDM catch, which was incomplete as a result of low Chignik runs and lack of fishing during the WASSIP years.

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TABLES AND FIGURES

Table 1.–Sockeye salmon, 2006–2009, Southeastern District Mainland (SEDM) area, Southeastern District, Alaska Peninsula Area, Westward Region: Summary of commercial fishery harvests and number of samples collected and selected for genetic analysis by area and temporal strata for the Western Alaska Salmon Stock Identification Project.

Area[a]	Temporal	2006				2007				2008				2009			
Stratum	Stratum	Period	Harvest	Collected	Selected	Period	Harvest	Collected	Selected	Period	Harvest	Collected	Selected	Period	Harvest	Collected	Selected
East Stepovak and	1	7/1–19	Closed	No Samples		7/1–19	Closed	No Samples		7/1–19	Closed	No Samples		7/1–8	Closed	No Samples	
Stepovak Flats	2	7/20 –21	50,823	800	400	7/20–31	Closed	No Samples		7/20–25	Closed	No Samples		7/9 –25	32,712	584	0
sections	3	7/26–8/23	94,661	300	300	8/1–20	72,315	900	401	7/26–8/20	61,811	1,083	400	7/26–8/24	49,336	1,251	0
	Late Catch	>9/1	31,272	Not in Plan		>9/1	14,150	Not in Plan		>9/1	14,287	Not in Plan		>9/1	6,545	Not in Plan	
Northwest Stepovak	1	7/1–7	Closed	No Samples		7/1–7	Closed	No Samples		7/3–5	6,616	200	200	7/1–7	44,915	200	0
Section	2	7/8–8/9	Closed	No Samples		7/8–8/5	Closed	No Samples		7/7–25	25,053	402	400	7/8–25	46,448	400	0
	3	8/10–23	5,680	No Samples		8/6–16	127	No Samples		7/26–8/20	10,245	619	400	7/26–8/23	15,507	557	0
	Late Catch	>9/1	4,590	Not in Plan		>9/1	1,584	Not in Plan		>9/1	928	Not in Plan		>9/1	916	Not in Plan	
Southwest Stepovak,	1	7/1–19	Closed	No Samples		7/1–19	Closed	No Samples		7/1–19	Closed	No Samples		7/1–8	Closed	No Samples	
Balboa Bay, and	2	7/20–21	26,690	738	400	7/20–31	Closed	No Samples		7/20–25	Closed	No Samples		7/9–25	27,690	1,000	0
Beaver Bay sections	3	7/26–8/23	62,253	300	300	8/1–20	73,512	1,100	400	7/26–8/20	46,093	1,100	400	7/26–8/23	18,701	772	0
	Late Catch	>9/1	9,732	Not in Plan		>9/1	5,610	Not in Plan		>9/1	4,146	Not in Plan		>9/1	1,217	Not in Plan	

Note: Shaded cells indicate strata not in the WASSIP analysis plan.

[a] Southeastern District Mainland (SEDM) area includes: East Stepovak and Stepovak Flats sections, combined; Northwest Stepovak; and Balboa Bay, Beaver Bay, and Southwest Stepovak sections, combined.

Table 2.– Sockeye salmon, 2010–2012, Southeastern District Mainland (SEDM) area, Southeastern District, Alaska Peninsula Area, Westward Region: Summary of commercial fishery harvests and number of samples collected and genotyped for commercial (Comm) and test (Test) fisheries by area and temporal strata. Sample goals for all strata in the plan were 400 fish.

			2010					2011					2012				
Area[a]	Temporal			Collected		Analyzed		Harvest	Collected		Analyzed		Harvest	Collected		Analyzed	
Stratum	Stratum	Period	Harvest	Comm	Test	Comm	Test		Comm	Test	Comm	Test		Comm	Test	Comm	Test
East Stepovak and	Early	6/1–6/25	14,506	400	400[b]	393	396[b,c]	41,096	1,000	0	400	0	27,343	733	0	400	0
Stepovak Flats	Overlap	6/26–7/8	0	Not in Plan				35,859	800	0	400	0	3,377	200	800	190	200
sections	Later	7/9–7/25	46,017	400	400	398	0	31,520	400	400	200	200	59,706	894	595	400	200[c,d]
	Late Catch	>7/25	1,648	Not in Plan				13,299	Not in Plan				0	Not in Plan			
Northwest Stepovak	Early	6/1–6/25	8,959	400	459[b]	395	400[b,c]	19,631	650	0	395	0	14,031	578	0	400	0
section	Overlap	6/26–7/8	38,541	Not in Plan				6,968	400	0	400	0	26,009	154	200	198	200
	Later	7/9–7/25	22,631	Not in Plan				26,096	Not in Plan				38,211	Not in Plan			
	Late Catch	>7/25	0	Not in Plan				5,039	Not in Plan				0	Not in Plan			
Southwest Stepovak,	Early	6/1–6/25	13,991	400	127	399	0	25,160	826	0	400	0	13,475	733	0	400	0
Balboa Bay, and Beaver Bay	Overlap	6/26–7/8	0	Not in Plan				18,479	805	0	400	0	2,186	200	697	198	200
sections	Later	7/9–7/25	23,111	357	400	348	43	17,706	360	400	200	200	34,263	781	729	400	400[c]
	Late Catch	>7/25	2,638	Not in Plan				2,806	Not in Plan				0	Not in Plan			

Note: Shaded cells indicate strata not in the Southeastern District Mainland (SEDM) analysis plan.

[a] SEDM area includes: East Stepovak and Stepovak Flats sections, combined; Northwest Stepovak; and Balboa Bay, Beaver Bay, and Southwest Stepovak sections, combined.

[b] These samples were collected within a day of the first temporal stratum and were included with samples from the first temporal stratum in the comparison.

[c] Test fishery samples used only for comparison to the Commercial catch stock compositions

[d] This comparison was made against the estimates based on 215 of the 400 commercially-caught fish available sampled on dates most similar to the test fishery capture dates.

Table 3.–Quality control (QC) results including the number of genotypes compared, discrepancy rates and estimated error rates of the collections genotyped for the SEDM sockeye salmon baseline and commercial and test fishery samples.

		Discrepancy rate[a]			
Collection Type	Genotypes compared	Homo-homo	Homo-het	Overall	Error Rate[b]
Baseline	3,072	0.00%	1.40%	1.40%	0.70%
Catch sample	78,912	0.02%	0.21%	0.24%	0.12%
Total	81,984	0.02%	0.20%	0.23%	0.12%

[a] Discrepancy rates include the rate due to differences of alternate homozygote genotypes (Homo-homo), of homozygote and heterozygote genotypes (Homo-het), and the total discrepancy rate.

[b] Error rate assumes that discrepancies are the result of errors that are equally likely to have occurred in the production and QC genotyping process.

Table 4.–Regional and subregional (within South Peninsula and Chignik) estimates of stock composition for 100% proof tests of the Orzinski and non-Orzinski South Peninsula subregional reporting groups included as part of the genetic baseline used to estimate stock compositions of Southeastern District Mainland harvests of sockeye salmon in 2010–2012. Estimates include median, 90% credibility interval (CI), the probability that the group estimates is equal to zero (P=0), mean and SD.

Reporting Group		Orzinski						Non-Orzinski South Peninsula					
			90% CI						90% CI				
Regional	Subregional	Median	5%	95%	P=0	Mean	SD	Median	5%	95%	P=0	Mean	SD
Norton Sound		0.0	0.0	0.1	0.71	0.0	0.1	0.0	0.0	0.1	0.71	0.0	0.1
Kuskokwim Bay		0.0	0.0	0.4	0.35	0.1	0.2	0.0	0.0	0.4	0.35	0.1	0.2
Bristol Bay		0.1	0.0	1.0	0.04	0.2	0.4	0.1	0.0	0.9	0.04	0.2	0.3
North Peninsula		0.3	0.0	1.6	0.03	0.5	0.6	0.0	0.0	1.0	0.08	0.2	0.4
South Peninsula		99.3	97.6	99.9	0.00	99.1	0.8	98.9	96.9	99.8	0.00	98.7	0.9
Chignik		0.0	0.0	0.3	0.49	0.0	0.2	0.0	0.0	0.3	0.49	0.1	0.2
East of WASSIP		0.0	0.0	0.1	0.70	0.0	0.1	0.6	0.0	2.1	0.00	0.8	0.7
South Peninsula	Orzinski	99.3	97.6	99.9	0.00	99.1	0.8	0.0	0.0	0.2	0.69	0.0	0.1
	Non-Orzinski	0.0	0.0	0.1	0.71	0.0	0.1	98.9	96.9	99.8	0.00	98.7	0.9
Chignik	Black Lake	0.0	0.0	0.1	0.71	0.0	0.1	0.0	0.0	0.2	0.69	0.0	0.1
	Chignik Lake	0.0	0.0	0.1	0.70	0.0	0.1	0.0	0.0	0.1	0.70	0.0	0.1

Note: Stock composition estimates may not sum to 100% due to rounding error.

Table 5.–Regional and subregional (within South Peninsula and Chignik) estimates of stock composition for commercial and test fishery samples for temporal stratum 1 of the East Stepovak Section, 2010. Estimates include median, 90% credibility interval (CI), the probability that the group estimate is equal to zero (*P*=0), mean and SD.

		Commercial Fishery Sample[a]						Test Fishery Sample[b]					
Reporting Group			90% CI						90% CI				
Regional	Subregional	Median	5%	95%	*P*=0	Mean	SD	Median	5%	95%	P=0	Mean	SD
Norton Sound		0	0	0.1	0.72	0	0.1	0	0	0.1	0.71	0	0.1
Kuskokwim Bay		0.1	0	1.2	0.17	0.3	0.4	0	0	0.2	0.38	0	0.1
Bristol Bay		8.8	6.5	11.6	0.00	8.9	1.5	2.1	1	3.8	0.00	2.2	0.9
North Peninsula		0.1	0	1.3	0.06	0.3	0.5	1	0.1	2.5	0.00	1.1	0.7
South Peninsula		0	0	0.7	0.31	0.2	0.3	0	0	0.2	0.51	0	0.1
Chignik		73.1	69.1	76.8	0.00	73	2.3	90.7	88	93	0.00	90.6	1.5
East of WASSIP		17.2	14	20.7	0.00	17.3	2	5.9	4.1	8.2	0.00	6	1.3
South Peninsula	Orzinski	0	0	0.6	0.44	0.1	0.2	0	0	0.1	0.72	0	0.1
	Non-Orzinski	0	0	0.2	0.70	0	0.2	0	0	0.1	0.71	0	0.1
Chignik	Black Lake	61.8	55.6	67.8	0.00	61.8	3.7	80.3	73.6	86.7	0.00	80.3	4
	Chignik Lake	11.2	6.3	16.7	0.00	11.3	3.2	10.3	4.3	16.7	0.00	10.3	3.8

Note: Stock composition estimates may not sum to 100% and stock-specific harvest estimates may not sum to the total harvest due to rounding error.

[a] June 19, n=60; June 24, n=333.

[b] June 21, n=196; June 26, n=200.

Table 6.–Regional and subregional (within South Peninsula and Chignik) estimates of stock composition for commercial and test fishery samples for temporal stratum 3 of the East Stepovak Section, 2012. Estimates include median, 90% credibility interval (CI), the probability that the group estimate is equal to zero (P=0), mean and SD.

		Commercial Fishery Sample[a]						Test Fishery Sample[b]					
Reporting Group			90% CI						90% CI				
Regional	Subregional	Median	5%	95%	P=0	Mean	SD	Median	5%	95%	P=0	Mean	SD
Norton Sound		0	0	0.1	0.71	0	0.1	0	0	0.1	0.71	0	0.1
Kuskokwim Bay		1.8	0	4	0.04	1.9	1.2	0	0	0.5	0.34	0.1	0.3
Bristol Bay		0.2	0	2	0.03	0.5	0.7	0.1	0	1.6	0.03	0.4	0.6
North Peninsula		1	0	4.1	0.03	1.4	1.4	3.6	1.5	6.7	0.00	3.8	1.6
South Peninsula		0.4	0	3.5	0.23	1	1.2	0	0	1.8	0.40	0.3	0.7
Chignik		45.3	39.4	51.3	0.00	45.3	3.6	46.1	40.2	52.1	0.00	46.1	3.6
East of WASSIP		50	44.3	55.8	0.00	50	3.5	49.3	43.3	55.4	0.00	49.3	3.7
South Peninsula	Orzinski	0	0	0.1	0.71	0	0.1	0	0	0.2	0.68	0	0.2
	Non-Orzinski	0.3	0	3.4	0.32	0.9	1.2	0	0	1.7	0.59	0.2	0.7
Chignik	Black Lake	0	0	4.3	0.44	0.8	1.5	0	0	5.5	0.40	1.3	2
	Chignik Lake	44.5	38.2	50.7	0.00	44.5	3.8	44.9	38	51.4	0.00	44.8	4

Note: Stock composition estimates may not sum to 100% and stock-specific harvest estimates may not sum to the total harvest due to rounding error.

[a] July 10, n=137; July 18, n=78.

[b] July 13, n=100; July 19, n=100.

Table 7.–Regional and subregional (within South Peninsula and Chignik) estimates of stock composition for commercial and test fishery samples for temporal stratum 1 of the Northwest Stepovak Section, 2010. Estimates include median, 90% credibility interval (CI), the probability that the group estimate is equal to zero (P=0), mean and SD.

		Commercial Fishery Sample[a]						Test Fishery Sample[b]					
Reporting Group			90% CI						90% CI				
Regional	Subregional	Median	5%	95%	P=0	Mean	SD	Median	5%	95%	P=0	Mean	SD
Norton Sound		0	0	0.1	0.72	0	0.1	0	0	0.1	0.72	0	0.1
Kuskokwim Bay		0	0	0.2	0.37	0	0.1	0	0	0.2	0.38	0	0.1
Bristol Bay		2.3	1.1	4.1	0.00	2.4	0.9	1.9	0.8	3.7	0.00	2.1	0.9
North Peninsula		0.5	0	1.7	0.01	0.7	0.6	0	0	0.9	0.08	0.2	0.3
South Peninsula		4.2	2.7	6.2	0.00	4.3	1.1	10.5	8.1	13.4	0.00	10.6	1.6
Chignik		90.3	87.5	92.7	0.00	90.3	1.6	85.9	82.7	88.7	0.00	85.9	1.8
East of WASSIP		2.1	1	4.1	0.00	2.3	1	1.1	0.4	2.3	0.00	1.2	0.6
South Peninsula	Orzinski	4.2	2.7	6.2	0.00	4.3	1.1	10.5	8	13.3	0.00	10.5	1.6
	Non-Orzinski	0	0	0.1	0.71	0	0.1	0	0	0.6	0.64	0.1	0.3
Chignik	Black Lake	84.6	79.6	89.3	0.00	84.5	2.9	67.1	60.2	74	0.00	67.1	4.2
	Chignik Lake	5.6	1.7	10.1	0.02	5.7	2.5	18.7	12.3	25.4	0.00	18.7	4

Note: Stock composition estimates may not sum to 100% and stock-specific harvest estimates may not sum to the total harvest due to rounding error.

[a] June 15 n=5; June 19, n=269; June 23, n=121.

[b] June 21, n=63; June 27, n=337.

Table 8.–Regional and subregional (within South Peninsula and Chignik) estimates of stock composition for commercial and test fishery samples for temporal stratum 3 of the Southwest Stepovak Section, 2012. Estimates include median, 90% credibility interval (CI), the probability that the group estimate is equal to zero (P=0), mean and SD.

		Commercial Fishery Sample[a]						Test Fishery Sample[b]					
Reporting Group			90% CI						90% CI				
Regional	Subregional	Median	5%	95%	P=0	Mean	SD	Median	5%	95%	P=0	Mean	SD
Norton Sound		0	0	0.1	0.73	0	0.1	0	0	0.1	0.72	0	0.1
Kuskokwim Bay		0.3	0	1.7	0.16	0.5	0.6	0	0	0.3	0.36	0.1	0.1
Bristol Bay		1.9	0.8	3.5	0.00	2	0.8	1.9	0.7	3.5	0.00	1.9	0.8
North Peninsula		2.1	1	3.8	0.00	2.2	0.9	1.8	0.6	3.6	0.00	1.9	0.9
South Peninsula		2.8	1.6	4.5	0.00	2.9	0.9	3.5	2	5.6	0.00	3.6	1.1
Chignik		71.6	67.6	75.3	0.00	71.5	2.3	75.5	71.7	79.1	0.00	75.5	2.2
East of WASSIP		20.8	17.5	24.4	0.00	20.9	2.1	16.9	13.9	20.3	0.00	17	1.9
South Peninsula	Orzinski	2.2	1.2	3.7	0.00	2.3	0.8	1.6	0.7	2.9	0.00	1.7	0.7
	Non-Orzinski	0.5	0.1	1.4	0.00	0.6	0.4	1.9	0.7	3.6	0.00	2	0.9
Chignik	Black Lake	4.4	1.7	7.7	0.01	4.5	1.8	4.9	2.3	8.2	0.00	5.1	1.8
	Chignik Lake	67.1	62.3	71.6	0.00	67	2.8	70.5	65.8	74.9	0.00	70.4	2.8

Note: Stock composition estimates may not sum to 100% and stock-specific harvest estimates may not sum to the total harvest due to rounding error.

[a] July 10, n=122; July 11, n=92; July 18, n=99; July 21, n=64; July 23, n=23.

[b] July 13, n=200; July 19 n=200.

Table 9.–Regional and subregional (within South Peninsula and Chignik) estimates of stock composition and stock-specific harvest for temporal stratum 1 (June 1–25; Harvest=14,506; n=389) of the East Stepovak Section, 2010. Estimates include median, 90% credibility interval (CI), the probability that the group estimate is equal to zero (P=0), mean and SD.

		Stock Composition						Stock-specific harvest				
Reporting Group			90% CI						90% CI			
Regional	Subregional	Median	5%	95%	P=0	Mean	SD	Median	5%	95%	Mean	SD
Norton Sound		0	0	0	0.92	0	0	0	0	0	0	4
Kuskokwim Bay		0	0	0.8	0.59	0.1	0	0	0	118	19	46
Bristol Bay		8.9	6.6	12	0.00	9	2	1,289	954	1,683	1,300	222
North Peninsula		0	0	0.6	0.50	0.1	0	0	0	85	13	38
South Peninsula		0	0	0.4	0.73	0.1	0	0	0	53	8	26
Chignik		73.3	69	77	0.00	73.3	2	10,636	10,068	11,170	10,630	335
East of WASSIP		17.4	14	21	0.00	17.5	2	2,528	2,069	3,031	2,536	293
										Total	14,506	
South Peninsula	Orzinski	0	0	0.3	0.80	0	0	0	0	45	6	22
	Non-Orzinski	0	0	0	0.91	0	0	0	0	0	2	15
Chignik	Black Lake	62.1	56	68	0.00	62.1	4	9,013	8,097	9,906	9,008	547
	Chignik Lake	11.1	6	17	0.00	11.2	3	1,606	872	2,424	1,622	471

Note: Stock composition estimates may not sum to 100% and stock-specific harvest estimates may not sum to the total harvest due to rounding error.

Table 10.–Regional and subregional (within South Peninsula and Chignik) estimates of stock composition and stock-specific harvest for temporal stratum 3 (July 9–25; Harvest=46,017; n=394) of the East Stepovak Section, 2010. Estimates include median, 90% credibility interval (CI), the probability that the group estimate is equal to zero (P=0), mean and SD.

Reporting Group		Stock Composition						Stock-specific harvest				
			90% CI						90% CI			
Regional	Subregional	Median	5%	95%	P=0	Mean	SD	Median	5%	95%	Mean	SD
Norton Sound		0	0	0	0.92	0	0	0	0	0	1	14
Kuskokwim Bay		0	0	0.1	0.77	0	0	0	0	31	9	50
Bristol Bay		3.7	2.2	5.8	0.00	3.8	1	1,720	1,000	2,665	1,761	511
North Peninsula		0	0	1.4	0.39	0.3	1	1	0	660	118	248
South Peninsula		0	0	0.1	0.84	0	0	0	0	24	10	61
Chignik		50.5	46	55	0.00	50.5	3	23,253	21,279	25,229	23,253	1,202
East of WASSIP		45.3	41	50	0.00	45.3	3	20,861	18,884	22,852	20,865	1,206
										Total	46,017	
South Peninsula	Orzinski	0	0	0	0.91	0	0	0	0	1	3	24
	Non-Orzinski	0	0	0	0.91	0	0	0	0	2	7	56
Chignik	Black Lake	33.9	28	40	0.00	33.9	4	15,578	12,952	18,293	15,593	1,623
	Chignik Lake	16.6	12	22	0.00	16.6	3	7,632	5,299	10,134	7,660	1,473

Note: Stock composition estimates may not sum to 100% and stock-specific harvest estimates may not sum to the total harvest due to rounding error.

Table 11.–Annual regional and subregional (within South Peninsula and Chignik) estimates of stock composition and stock-specific harvest for the East Stepovak Section, 2010. Estimates include median, 90% credibility interval (CI), mean and SD.

		Stock Composition					Stock-specific harvest				
Reporting Group			90% CI					90% CI			
Regional	Subregional	Median	5%	95%	Mean	SD	Median	5%	95%	Mean	SD
Norton Sound		0.0	0.0	0.0	0.0	0.0	0	0	4	2	14
Kuskokwim Bay		0.0	0.0	0.2	0.0	0.1	0	0	148	28	68
Bristol Bay		5.0	3.7	6.7	5.1	0.9	3,027	2,213	4,035	3,061	557
North Peninsula		0.0	0.0	1.1	0.2	0.4	12	0	675	131	251
South Peninsula		0.0	0.0	0.2	0.0	0.1	0	0	94	18	66
Chignik		56.0	52.6	59.4	56.0	2.1	33,871	31,824	35,927	33,882	1,247
East of WASSIP		38.7	35.3	42.1	38.7	2.0	23,406	21,361	25,453	23,401	1,239
									Total	60,523	
South Peninsula	Orzinski	0.0	0.0	0.1	0.0	0.1	0	0	57	9	33
	Non-Orzinski	0.0	0.0	0.0	0.0	0.1	0	0	17	9	58
Chignik	Black Lake	40.6	36.0	45.4	40.6	2.8	24,585	21,809	27,452	24,601	1,718
	Chignik Lake	15.3	11.2	19.7	15.3	2.6	9,260	6,786	11,898	9,281	1,550

Note: Stock composition estimates may not sum to 100% and stock-specific harvest estimates may not sum to the total harvest due to rounding error.

Table 12.–Regional and subregional (within South Peninsula and Chignik) estimates of stock composition and stock-specific harvest for temporal stratum 1 (June 1–25; Harvest=41,096; n=387) of the East Stepovak Section, 2011. Estimates include median, 90% credibility interval (CI), the probability that the group estimate is equal to zero (P=0), mean and SD.

		Stock Composition						Stock-specific harvest				
Reporting Group			90% CI						90% CI			
Regional	Subregional	Median	5%	95%	P=0	Mean	SD	Median	5%	95%	Mean	SD
Norton Sound		0	0	0	0.92	0	0	0	0	0	1	11
Kuskokwim Bay		0	0	0.1	0.77	0	0	0	0	22	5	29
Bristol Bay		3.2	1.9	5	0.00	3.3	1	1,316	766	2,062	1,352	397
North Peninsula		0	0	0.3	0.53	0.1	0	0	0	124	21	76
South Peninsula		1.1	0.4	2.3	0.00	1.2	1	438	148	935	476	246
Chignik		90.6	88	93	0.00	90.5	2	37,216	36,073	38,185	37,184	644
East of WASSIP		4.9	3.2	7.1	0.00	5	1	2,023	1,326	2,905	2,056	483
										Total	41,096	
South Peninsula	Orzinski	1	0.3	2.2	0.00	1.1	1	420	141	895	456	235
	Non-Orzinski	0	0	0.4	0.81	0	0	0	0	147	20	74
Chignik	Black Lake	90.1	87	93	0.00	89.9	2	37,046	35,535	38,101	36,962	794
	Chignik Lake	0	0	3.1	0.32	0.5	1	3	0	1,286	222	474

Note: Stock composition estimates may not sum to 100% and stock-specific harvest estimates may not sum to the total harvest due to rounding error.

Table 13.–Regional and subregional (within South Peninsula and Chignik) estimates of stock composition and stock-specific harvest for temporal stratum 2 (June 26–July 8; Harvest=35,859; n=397) of the East Stepovak Section, 2011. Estimates include median, 90% credibility interval (CI), the probability that the group estimate is equal to zero (*P*=0), mean and SD.

		Stock Composition						Stock-specific harvest				
Reporting Group			90% CI						90% CI			
Regional	Subregional	Median	5%	95%	*P*=0	Mean	SD	Median	5%	95%	Mean	SD
Norton Sound		0	0	0	0.92	0	0	0	0	1	2	17
Kuskokwim Bay		0	0	0	0.78	0	0	0	0	17	4	24
Bristol Bay		2.5	1.2	4.3	0.00	2.6	1	893	440	1,544	930	340
North Peninsula		0.4	0	2.4	0.21	0.7	1	151	0	876	259	308
South Peninsula		1.4	0.6	2.7	0.00	1.5	1	508	219	966	539	231
Chignik		62.6	58	67	0.00	62.5	3	22,436	20,905	23,928	22,429	917
East of WASSIP		32.6	29	37	0.00	32.6	3	11,684	10,219	13,213	11,695	911
										Total	35,859	
South Peninsula	Orzinski	1.4	0.6	2.7	0.00	1.5	1	507	218	963	537	231
	Non-Orzinski	0	0	0	0.92	0	0	0	0	1	2	16
Chignik	Black Lake	44.2	38	50	0.00	44.2	4	15,851	13,774	17,934	15,853	1,267
	Chignik Lake	18.3	13	24	0.00	18.3	3	6,546	4,696	8,558	6,577	1,175

Note: Stock composition estimates may not sum to 100% and stock-specific harvest estimates may not sum to the total harvest due to rounding error.

Table 14.–Regional and subregional (within South Peninsula and Chignik) estimates of stock composition and stock-specific harvest for temporal stratum 3 (July 9–25; Harvest=31,520; n=399) of the East Stepovak Section, 2011. Estimates include median, 90% credibility interval (CI), the probability that the group estimate is equal to zero (P=0), mean and SD.

		Stock Composition						Stock-specific harvest				
Reporting Group			90% CI						90% CI			
Regional	Subregional	Median	5%	95%	P=0	Mean	SD	Median	5%	95%	Mean	SD
Norton Sound		0	0	0	0.92	0	0	0	0	0	1	9
Kuskokwim Bay		0	0	0	0.78	0	0	0	0	12	3	19
Bristol Bay		0	0	0.8	0.28	0.2	0	6	0	260	56	97
North Peninsula		1.2	0.1	2.6	0.02	1.2	1	364	43	830	393	238
South Peninsula		1.5	0.6	2.9	0.00	1.6	1	476	202	908	505	218
Chignik		40.2	36	44	0.00	40.2	3	12,664	11,366	13,989	12,670	797
East of WASSIP		56.8	53	61	0.00	56.8	3	17,897	16,559	19,215	17,892	810
										Total	31,520	
South Peninsula	Orzinski	1.5	0.6	2.8	0.00	1.6	1	470	199	894	498	214
	Non-Orzinski	0	0	0	0.89	0	0	0	0	8	7	47
Chignik	Black Lake	4.6	2.3	7.8	0.00	4.8	2	1,461	711	2,467	1,509	538
	Chignik Lake	35.4	31	40	0.00	35.4	3	11,160	9,717	12,617	11,161	882

Note: Stock composition estimates may not sum to 100% and stock-specific harvest estimates may not sum to the total harvest due to rounding error.

Table 15.–Annual regional and subregional (within South Peninsula and Chignik) estimates of stock composition and stock-specific harvest for the East Stepovak Section, 2011. Estimates include median, 90% credibility interval (CI), mean and SD.

Reporting Group		Stock Composition					Stock-specific harvest				
			90% CI					90% CI			
Regional	Subregional	Median	5%	95%	Mean	SD	Median	5%	95%	Mean	SD
Norton Sound		0.0	0.0	0.0	0.0	0.0	0	0	14	4	22
Kuskokwim Bay		0.0	0.0	0.1	0.0	0.0	0	0	74	13	42
Bristol Bay		2.1	1.4	3.0	2.2	0.5	2,300	1,527	3,266	2,338	530
North Peninsula		0.6	0.1	1.3	0.6	0.4	609	144	1,416	673	396
South Peninsula		1.4	0.8	2.1	1.4	0.4	1,487	920	2,235	1,520	402
Chignik		66.6	64.5	68.7	66.6	1.3	72,290	70,003	74,539	72,284	1,378
East of WASSIP		29.2	27.2	31.2	29.2	1.2	31,637	29,512	33,818	31,644	1,312
									Total	108,475	
South Peninsula	Orzinski	1.3	0.8	2.0	1.4	0.4	1,457	905	2,184	1,491	393
	Non-Orzinski	0.0	0.0	0.2	0.0	0.1	0	0	200	29	89
Chignik	Black Lake	50.1	47.7	52.5	50.1	1.5	54,334	51,699	56,902	54,324	1,585
	Chignik Lake	16.5	14.3	19.0	16.6	1.4	17,930	15,491	20,580	17,960	1,544

Note: Stock composition estimates may not sum to 100% and stock-specific harvest estimates may not sum to the total harvest due to rounding error.

Table 16.–Regional and subregional (within South Peninsula and Chignik) estimates of stock composition and stock-specific harvest for temporal stratum 1 (June 1–25; Harvest=27,343; n=397) of the East Stepovak Section, 2012. Estimates include median, 90% credibility interval (CI), the probability that the group estimate is equal to zero (P=0), mean and SD.

		Stock Composition						Stock-specific harvest				
Reporting Group			90% CI						90% CI			
Regional	Subregional	Median	5%	95%	P=0	Mean	SD	Median	5%	95%	Mean	SD
Norton Sound		0	0	0	0.92	0	0	0	0	0	1	14
Kuskokwim Bay		0	0	0.2	0.75	0	0	0	0	45	9	45
Bristol Bay		7.7	5.5	10	0.00	7.8	2	2,109	1,491	2,834	2,128	409
North Peninsula		0.1	0	1.9	0.28	0.5	1	25	0	524	124	186
South Peninsula		0	0	1	0.74	0.1	0	0	0	279	35	116
Chignik		76.9	73	81	0.00	76.8	2	21,026	19,956	22,011	21,011	626
East of WASSIP		14.7	12	18	0.00	14.8	2	4,016	3,161	4,973	4,035	552
										Total	27,343	
South Peninsula	Orzinski	0	0	0	0.91	0	0	0	0	1	2	19
	Non-Orzinski	0	0	1	0.81	0.1	0	0	0	271	33	114
Chignik	Black Lake	66.4	61	72	0.00	66.3	3	18,146	16,566	19,665	18,135	940
	Chignik Lake	10.4	5.8	16	0.00	10.5	3	2,852	1,598	4,226	2,875	797

Note: Stock composition estimates may not sum to 100% and stock-specific harvest estimates may not sum to the total harvest due to rounding error.

Table 17.–Regional and subregional (within South Peninsula and Chignik) estimates of stock composition and stock-specific harvest for temporal stratum 2 (June 26–July 8; Harvest=3,377; n=389) of the East Stepovak Section, 2012. Estimates include median, 90% credibility interval (CI), the probability that the group estimate is equal to zero (*P*=0), mean and SD.

Reporting Group		Stock Composition						Stock-specific harvest				
			90% CI						90% CI			
Regional	Subregional	Median	5%	95%	*P*=0	Mean	SD	Median	5%	95%	Mean	SD
Norton Sound		0	0	0	0.92	0	0	0	0	0	0	1
Kuskokwim Bay		0	0	0.1	0.77	0	0	0	0	2	1	3
Bristol Bay		13.2	10	16	0.00	13.2	2	444	350	552	447	61
North Peninsula		0	0	0.2	0.54	0	0	0	0	8	1	5
South Peninsula		0.4	0.1	1.3	0.01	0.5	0	14	2	42	17	13
Chignik		59.3	55	64	0.00	59.3	3	2,003	1,859	2,145	2,003	87
East of WASSIP		26.9	23	31	0.00	26.9	2	907	780	1,041	908	79
										Total	3,377	
South Peninsula	Orzinski	0.4	0.1	1.2	0.01	0.5	0	14	2	42	17	13
	Non-Orzinski	0	0	0	0.92	0	0	0	0	0	0	2
Chignik	Black Lake	36	30	42	0.00	36	3	1,215	1,028	1,406	1,216	115
	Chignik Lake	23.2	18	29	0.00	23.3	3	784	612	971	787	109

Note: Stock composition estimates may not sum to 100% and stock-specific harvest estimates may not sum to the total harvest due to rounding error.

Table 18.–Regional and subregional (within South Peninsula and Chignik) estimates of stock composition and stock-specific harvest for temporal stratum 3 (July 9–25; Harvest=59,706; n=400) of the East Stepovak Section, 2012. Estimates include median, 90% credibility interval (CI), the probability that the group estimate is equal to zero (P=0), mean and SD.

		Stock Composition						Stock-specific harvest				
Reporting Group			90% CI						90% CI			
Regional	Subregional	Median	5%	95%	P=0	Mean	SD	Median	5%	95%	Mean	SD
Norton Sound		0	0	0	0.92	0	0	0	0	1	2	18
Kuskokwim Bay		0.3	0	2	0.37	0.6	1	163	0	1,176	349	424
Bristol Bay		0.9	0.2	2.3	0.00	1	1	533	124	1,357	611	390
North Peninsula		0	0	2	0.43	0.3	1	0	0	1,218	193	434
South Peninsula		0.2	0	1.2	0.14	0.4	0	143	0	708	218	246
Chignik		48.8	44	53	0.00	48.8	3	29,108	26,530	31,663	29,107	1,564
East of WASSIP		48.9	45	53	0.00	49	3	29,225	26,668	31,810	29,226	1,567
										Total	59,706	
South Peninsula	Orzinski	0.2	0	1	0.17	0.3	0	125	0	619	191	213
	Non-Orzinski	0	0	0.3	0.86	0	0	0	0	162	27	128
Chignik	Black Lake	0	0	3.1	0.40	0.7	1	10	0	1,871	443	669
	Chignik Lake	48	43	53	0.00	48	3	28,685	25,872	31,379	28,664	1,677

Note: Stock composition estimates may not sum to 100% and stock-specific harvest estimates may not sum to the total harvest due to rounding error.

Table 19.–Annual regional and subregional (within South Peninsula and Chignik) estimates of stock composition and stock-specific harvest for the East Stepovak Section, 2012. Estimates include median, 90% credibility interval (CI), mean and SD.

		Stock Composition					Stock-specific harvest				
Reporting Group			90% CI					90% CI			
Regional	Subregional	Median	5%	95%	Mean	SD	Median	5%	95%	Mean	SD
Norton Sound		0.0	0.0	0.0	0.0	0.0	0	0	8	3	23
Kuskokwim Bay		0.2	0.0	1.3	0.4	0.5	188	0	1,191	359	427
Bristol Bay		3.5	2.6	4.6	3.5	0.6	3,141	2,331	4,187	3,186	567
North Peninsula		0.1	0.0	1.5	0.4	0.5	124	0	1,370	318	475
South Peninsula		0.2	0.0	0.9	0.3	0.3	190	10	812	271	273
Chignik		57.6	54.6	60.7	57.6	1.9	52,121	49,341	54,885	52,120	1,688
East of WASSIP		37.8	34.8	40.8	37.8	1.8	34,160	31,437	36,897	34,169	1,666
									Total	90,426	
South Peninsula	Orzinski	0.2	0.0	0.7	0.2	0.2	146	8	639	210	215
	Non-Orzinski	0.0	0.0	0.5	0.1	0.2	0	0	422	61	168
Chignik	Black Lake	21.8	19.9	24.1	21.9	1.3	19,744	17,988	21,798	19,794	1,157
	Chignik Lake	35.8	32.4	39.1	35.7	2.1	32,345	29,263	35,370	32,326	1,865

Note: Stock composition estimates may not sum to 100% and stock-specific harvest estimates may not sum to the total harvest due to rounding error.

Table 20.–Regional and subregional (within South Peninsula and Chignik) estimates of stock composition and stock-specific harvest for temporal stratum 1 (June 1–25; Harvest=8,959; n=392) of the Northwest Stepovak Section, 2010. Estimates include median, 90% credibility interval (CI), the probability that the group estimate is equal to zero (P=0), mean and SD.

Reporting Group		Stock Composition						Stock-specific harvest				
			90% CI						90% CI			
Regional	Subregional	Median	5%	95%	P=0	Mean	SD	Median	5%	95%	Mean	SD
Norton Sound		0	0	0	0.92	0	0	0	0	0	0	3
Kuskokwim Bay		0	0	0	0.78	0	0	0	0	3	1	5
Bristol Bay		2.2	1	3.9	0.00	2.3	1	193	87	347	202	80
North Peninsula		0.3	0	1.5	0.14	0.5	1	27	0	132	41	45
South Peninsula		4.2	2.7	6.2	0.00	4.3	1	377	241	551	384	95
Chignik		90.5	88	93	0.00	90.5	2	8,110	7,864	8,322	8,104	140
East of WASSIP		2.4	1.1	4.4	0.00	2.5	1	216	95	398	227	94
										Total	8,959	
South Peninsula	Orzinski	4.2	2.7	6.1	0.00	4.3	1	376	241	550	383	95
	Non-Orzinski	0	0	0	0.92	0	0	0	0	0	0	4
Chignik	Black Lake	84.7	80	89	0.00	84.6	3	7,589	7,140	8,003	7,582	262
	Chignik Lake	5.7	1.9	10	0.01	5.8	3	512	170	911	522	226

Note: Stock composition estimates may not sum to 100% and stock-specific harvest estimates may not sum to the total harvest due to rounding error.

Table 21.–Annual regional and subregional (within South Peninsula and Chignik) estimates of stock composition and stock-specific harvest for the Northwest Stepovak Section, 2010. Estimates include median, 90% credibility interval (CI), mean and SD. Note that these annual summaries do not include the second and third strata, which account for 87% of the harvest of the first 3 strata.

Reporting Group		Stock Composition					Stock-specific harvest				
			90% CI					90% CI			
Regional	Subregional	Median	5%	95%	Mean	SD	Median	5%	95%	Mean	SD
Norton Sound		0.0	0.0	0.0	0.0	0.0	0	0	0	0	3
Kuskokwim Bay		0.0	0.0	0.0	0.0	0.1	0	0	3	1	5
Bristol Bay		2.2	1.0	3.9	2.3	0.9	193	87	347	202	80
North Peninsula		0.3	0.0	1.5	0.5	0.5	28	0	131	41	45
South Peninsula		4.2	2.7	6.2	4.3	1.1	377	241	552	384	95
Chignik		90.5	87.8	92.9	90.5	1.6	8,110	7,863	8,322	8,104	140
East of WASSIP		2.4	1.1	4.5	2.5	1.0	216	95	399	227	94
									Total	8,959	
South Peninsula	Orzinski	4.2	2.7	6.2	4.3	1.1	377	241	551	383	95
	Non-Orzinski	0.0	0.0	0.0	0.0	0.0	0	0	0	0	4
Chignik	Black Lake	84.7	79.8	89.4	84.6	2.9	7,589	7,146	8,005	7,582	261
	Chignik Lake	5.7	1.9	10.1	5.8	2.5	511	169	908	522	226

Note: Stock composition estimates may not sum to 100% and stock-specific harvest estimates may not sum to the total harvest due to rounding error.

Table 22.–Regional and subregional (within South Peninsula and Chignik) estimates of stock composition and stock-specific harvest for temporal stratum 1 (June 1–25; Harvest=19,631; n=394) of the Northwest Stepovak Section, 2011. Estimates include median, 90% credibility interval (CI), the probability that the group estimate is equal to zero (P=0), mean and SD.

		Stock Composition						Stock-specific harvest				
Reporting Group			90% CI						90% CI			
Regional	Subregional	Median	5%	95%	P=0	Mean	SD	Median	5%	95%	Mean	SD
Norton Sound		0.2	0	0.8	0.00	0.3	0	36	3	151	51	50
Kuskokwim Bay		0	0	0	0.79	0	0	0	0	6	2	10
Bristol Bay		7.1	5	9.5	0.00	7.2	1	1,387	989	1,873	1,404	271
North Peninsula		0	0	0.3	0.54	0	0	0	0	54	9	35
South Peninsula		9	6.7	12	0.00	9	2	1,758	1,308	2,284	1,771	298
Chignik		81.8	78	85	0.00	81.8	2	16,067	15,391	16,685	16,057	394
East of WASSIP		1.6	0.7	3.2	0.00	1.7	1	314	132	621	337	151
										Total	19,631	
South Peninsula	Orzinski	8.9	6.7	12	0.00	9	2	1,756	1,307	2,281	1,769	297
	Non-Orzinski	0	0	0	0.90	0	0	0	0	1	2	15
Chignik	Black Lake	81.7	78	85	0.00	81.6	2	16,037	15,310	16,668	16,020	417
	Chignik Lake	0	0	1.2	0.59	0.2	1	0	0	228	37	139

Note: Stock composition estimates may not sum to 100% and stock-specific harvest estimates may not sum to the total harvest due to rounding error.

Table 23.–Regional and subregional (within South Peninsula and Chignik) estimates of stock composition and stock-specific harvest for temporal stratum 2 (June 26–July 8; Harvest=6,968; n=400) of the Northwest Stepovak Section, 2011. Estimates include median, 90% credibility interval (CI), the probability that the group estimate is equal to zero (*P*=0), mean and SD.

Reporting Group		Stock Composition						Stock-specific harvest				
			90% CI						90% CI			
Regional	Subregional	Median	5%	95%	*P*=0	Mean	SD	Median	5%	95%	Mean	SD
Norton Sound		0	0	0.6	0.75	0.1	0	0	0	43	6	17
Kuskokwim Bay		0	0	0	0.78	0	0	0	0	3	1	4
Bristol Bay		7.9	5.7	10	0.00	8	1	549	401	727	555	99
North Peninsula		0	0	0.2	0.54	0	0	0	0	17	3	10
South Peninsula		34.5	31	39	0.00	34.5	2	2,404	2,131	2,689	2,407	170
Chignik		46.6	42	51	0.00	46.7	3	3,250	2,955	3,548	3,251	180
East of WASSIP		10.6	8.2	14	0.00	10.7	2	740	568	940	746	114
										Total	6,968	
South Peninsula	Orzinski	34.3	30	38	0.00	34.3	2	2,388	2,115	2,671	2,390	169
	Non-Orzinski	0.1	0	0.8	0.16	0.2	0	10	0	58	17	20
Chignik	Black Lake	34.3	30	39	0.00	34.3	3	2,391	2,052	2,736	2,393	207
	Chignik Lake	12.2	8.5	17	0.00	12.3	2	851	591	1,152	858	171

Note: Stock composition estimates may not sum to 100% and stock-specific harvest estimates may not sum to the total harvest due to rounding error.

Table 24.–Annual regional and subregional (within South Peninsula and Chignik) estimates of stock composition and stock-specific harvest for the Northwest Stepovak Section, 2011. Estimates include median, 90% credibility interval (CI), mean and SD. Note that these annual summaries do not include the third stratum, which accounts for 50% of the harvest of the first 3 strata.

Reporting Group		Stock Composition					Stock-specific harvest				
			90% CI					90% CI			
Regional	Subregional	Median	5%	95%	Mean	SD	Median	5%	95%	Mean	SD
Norton Sound		0.2	0.0	0.6	0.2	0.2	42	3	162	57	53
Kuskokwim Bay		0.0	0.0	0.0	0.0	0.0	0	0	13	2	11
Bristol Bay		7.3	5.7	9.2	7.4	1.1	1,945	1,509	2,456	1,959	289
North Peninsula		0.0	0.0	0.2	0.0	0.1	0	0	65	12	36
South Peninsula		15.7	13.7	17.9	15.7	1.3	4,167	3,635	4,761	4,178	343
Chignik		72.6	69.9	75.2	72.6	1.6	19,313	18,582	20,005	19,308	433
East of WASSIP		4.0	3.0	5.3	4.1	0.7	1,069	801	1,419	1,083	189
									Total	26,599	
South Peninsula	Orzinski	15.6	13.6	17.8	15.6	1.3	4,148	3,616	4,742	4,159	343
	Non-Orzinski	0.0	0.0	0.2	0.1	0.1	11	0	64	19	25
Chignik	Black Lake	69.3	66.3	72.0	69.2	1.7	18,426	17,628	19,143	18,412	465
	Chignik Lake	3.3	2.3	4.7	3.4	0.8	872	601	1,249	895	219

Note: Stock composition estimates may not sum to 100% and stock-specific harvest estimates may not sum to the total harvest due to rounding error.

Table 25.–Regional and subregional (within South Peninsula and Chignik) estimates of stock composition and stock-specific harvest for temporal stratum 1 (June 1–25; Harvest=14,031; n=399) of the Northwest Stepovak Section, 2012. Estimates include median, 90% credibility interval (CI), the probability that the group estimate is equal to zero (P=0), mean and SD.

		Stock Composition						Stock-specific harvest				
Reporting Group			90% CI						90% CI			
Regional	Subregional	Median	5%	95%	P=0	Mean	SD	Median	5%	95%	Mean	SD
Norton Sound		0	0	0	0.91	0	0	0	0	1	1	10
Kuskokwim Bay		0	0	0.4	0.69	0.1	0	0	0	57	8	27
Bristol Bay		11	8.5	14	0.00	11.1	2	1,547	1,189	1,955	1,557	233
North Peninsula		0	0	2.2	0.31	0.5	1	6	0	304	75	109
South Peninsula		5.8	4	8.1	0.00	5.9	1	814	558	1,132	825	176
Chignik		74.3	70	78	0.00	74.3	2	10,427	9,881	10,940	10,420	321
East of WASSIP		8.1	5.6	11	0.00	8.2	2	1,135	791	1,527	1,144	223
										Total	14,031	
South Peninsula	Orzinski	5.5	3.7	7.7	0.00	5.6	1	771	523	1,078	782	170
	Non-Orzinski	0.2	0	1	0.03	0.3	0	29	1	134	43	47
Chignik	Black Lake	66.3	61	71	0.00	66.3	3	9,305	8,587	9,978	9,297	423
	Chignik Lake	7.9	4.5	12	0.00	8	2	1,106	634	1,673	1,123	317

Note: Stock composition estimates may not sum to 100% and stock-specific harvest estimates may not sum to the total harvest due to rounding error.

Table 26.–Regional and subregional (within South Peninsula and Chignik) estimates of stock composition and stock-specific harvest for temporal stratum 2 (June 26–July 8; Harvest=26,009; n=397) of the Northwest Stepovak Section, 2012. Estimates include median, 90% credibility interval (CI), the probability that the group estimate is equal to zero (P=0), mean and SD.

		Stock Composition						Stock-specific harvest				
Reporting Group			90% CI						90% CI			
Regional	Subregional	Median	5%	95%	P=0	Mean	SD	Median	5%	95%	Mean	SD
Norton Sound		0	0	0	0.92	0	0	0	0	0	1	11
Kuskokwim Bay		0	0	0	0.77	0	0	0	0	13	3	18
Bristol Bay		2.9	1.6	4.6	0.00	3	1	744	416	1,205	769	243
North Peninsula		0.9	0	2.6	0.07	1	1	238	0	675	271	216
South Peninsula		8.6	6.4	11	0.00	8.7	2	2,232	1,664	2,909	2,252	380
Chignik		77.7	74	81	0.00	77.6	2	20,201	19,208	21,123	20,187	583
East of WASSIP		9.6	7.2	13	0.00	9.7	2	2,508	1,865	3,257	2,527	423
										Total	26,009	
South Peninsula	Orzinski	8.5	6.4	11	0.00	8.6	1	2,222	1,657	2,891	2,241	376
	Non-Orzinski	0	0	0.1	0.88	0	0	0	0	32	10	55
Chignik	Black Lake	45.3	39	51	0.00	45.3	4	11,785	10,197	13,365	11,783	963
	Chignik Lake	32.3	26	38	0.00	32.3	4	8,388	6,875	9,993	8,404	947

Note: Stock composition estimates may not sum to 100% and stock-specific harvest estimates may not sum to the total harvest due to rounding error.

Table 27.–Annual regional and subregional (within South Peninsula and Chignik) estimates of stock composition and stock-specific harvest for the Northwest Stepovak Section, 2012. Estimates include median, 90% credibility interval (CI), mean and SD. Note that these annual summaries do not include the third stratum, which accounts for 49% of the harvest of the first 3 strata.

		Stock Composition					Stock-specific harvest				
Reporting Group			90% CI					90% CI			
Regional	Subregional	Median	5%	95%	Mean	SD	Median	5%	95%	Mean	SD
Norton Sound		0.0	0.0	0.0	0.0	0.0	0	0	7	2	15
Kuskokwim Bay		0.0	0.0	0.2	0.0	0.1	0	0	72	11	32
Bristol Bay		5.8	4.5	7.3	5.8	0.8	2,308	1,803	2,910	2,325	337
North Peninsula		0.8	0.0	2.0	0.9	0.6	313	3	796	346	243
South Peninsula		7.6	6.0	9.5	7.7	1.0	3,058	2,420	3,794	3,077	418
Chignik		76.5	73.7	79.1	76.4	1.7	30,623	29,496	31,681	30,607	664
East of WASSIP		9.1	7.3	11.2	9.2	1.2	3,651	2,912	4,480	3,671	476
									Total	40,040	
South Peninsula	Orzinski	7.5	5.9	9.3	7.5	1.0	3,003	2,375	3,735	3,023	413
	Non-Orzinski	0.1	0.0	0.4	0.1	0.2	32	1	175	54	72
Chignik	Black Lake	52.7	48.3	57.0	52.6	2.6	21,083	19,349	22,805	21,080	1,052
	Chignik Lake	23.8	19.8	28.0	23.8	2.5	9,516	7,922	11,202	9,527	997

Note: Stock composition estimates may not sum to 100% and stock-specific harvest estimates may not sum to the total harvest due to rounding error.

Table 28.–Regional and subregional (within South Peninsula and Chignik) estimates of stock composition and stock-specific harvest for temporal stratum 1 (June 1–25; Harvest=13,991; n=397) of the Southwest Stepovak Section, 2010. Estimates include median, 90% credibility interval (CI), the probability that the group estimate is equal to zero (P=0), mean and SD.

Reporting Group		Stock Composition						Stock-specific harvest				
			90% CI						90% CI			
Regional	Subregional	Median	5%	95%	P=0	Mean	SD	Median	5%	95%	Mean	SD
Norton Sound		0	0	0	0.92	0	0	0	0	0	0	5
Kuskokwim Bay		0	0	0	0.79	0	0	0	0	4	1	7
Bristol Bay		5.2	2.9	7.7	0.00	5.2	2	721	408	1,077	729	203
North Peninsula		0.5	0	2.6	0.20	0.8	1	76	0	366	114	128
South Peninsula		2.4	1.3	3.9	0.00	2.4	1	330	177	548	342	114
Chignik		81.8	78	85	0.00	81.8	2	11,446	10,952	11,895	11,439	287
East of WASSIP		9.7	7.2	13	0.00	9.8	2	1,354	1,004	1,768	1,366	233
										Total	13,991	
South Peninsula	Orzinski	2.3	1.3	3.9	0.00	2.4	1	328	177	544	340	113
	Non-Orzinski	0	0	0	0.91	0	0	0	0	1	2	17
Chignik	Black Lake	76.3	70	82	0.00	76.3	4	10,680	9,841	11,464	10,670	492
	Chignik Lake	5.4	0.1	11	0.03	5.5	3	750	20	1,486	769	415

Note: Stock composition estimates may not sum to 100% and stock-specific harvest estimates may not sum to the total harvest due to rounding error.

Table 29.–Regional and subregional (within South Peninsula and Chignik) estimates of stock composition and stock-specific harvest for temporal stratum 3 (July 9–25; Harvest=23,111; n=388) of the Southwest Stepovak Section, 2010. Estimates include median, 90% credibility interval (CI), the probability that the group estimate is equal to zero (*P*=0), mean and SD.

		Stock Composition						Stock-specific harvest				
Reporting Group			90% CI						90% CI			
Regional	Subregional	Median	5%	95%	*P*=0	Mean	SD	Median	5%	95%	Mean	SD
Norton Sound		0	0	0	0.92	0	0	0	0	0	1	9
Kuskokwim Bay		0	0	0.1	0.78	0	0	0	0	12	3	20
Bristol Bay		2	0.8	3.8	0.00	2.1	1	468	195	874	493	209
North Peninsula		0	0	0.8	0.41	0.1	0	0	0	189	34	76
South Peninsula		7.9	5.7	11	0.00	8	2	1,827	1,322	2,426	1,846	337
Chignik		70.6	67	74	0.00	70.5	2	16,311	15,374	17,199	16,302	557
East of WASSIP		19.1	16	23	0.00	19.2	2	4,421	3,652	5,259	4,433	490
										Total	23,111	
South Peninsula	Orzinski	7.9	5.7	11	0.00	8	2	1,826	1,321	2,425	1,844	337
	Non-Orzinski	0	0	0	0.92	0	0	0	0	0	1	11
Chignik	Black Lake	39.1	33	45	0.00	39.1	4	9,028	7,628	10,457	9,033	857
	Chignik Lake	31.4	26	38	0.00	31.5	4	7,261	5,902	8,672	7,269	843

Note: Stock composition estimates may not sum to 100% and stock-specific harvest estimates may not sum to the total harvest due to rounding error.

Table 30.–Annual regional and subregional (within South Peninsula and Chignik) estimates of stock composition and stock-specific harvest for the Southwest Stepovak Section, 2010. Estimates include median, 90% credibility interval (CI), mean and SD.

Reporting Group		Stock Composition					Stock-specific harvest				
			90% CI					90% CI			
Regional	Subregional	Median	5%	95%	Mean	SD	Median	5%	95%	Mean	SD
Norton Sound		0.0	0.0	0.0	0.0	0.0	0	0	3	1	10
Kuskokwim Bay		0.0	0.0	0.1	0.0	0.1	0	0	22	4	20
Bristol Bay		3.3	2.1	4.7	3.3	0.8	1,206	771	1,732	1,222	292
North Peninsula		0.3	0.0	1.2	0.4	0.4	112	0	432	148	148
South Peninsula		5.9	4.4	7.5	5.9	1.0	2,172	1,633	2,800	2,187	355
Chignik		74.8	71.9	77.5	74.8	1.7	27,750	26,688	28,756	27,741	628
East of WASSIP		15.6	13.3	18.1	15.6	1.5	5,788	4,932	6,714	5,799	542
									Total	37,102	
South Peninsula	Orzinski	5.8	4.4	7.5	5.9	1.0	2,168	1,634	2,794	2,184	353
	Non-Orzinski	0.0	0.0	0.0	0.0	0.1	0	0	6	3	20
Chignik	Black Lake	53.1	48.7	57.5	53.1	2.7	19,704	18,081	21,334	19,703	988
	Chignik Lake	21.6	17.6	25.9	21.7	2.5	8,024	6,515	9,613	8,038	940

Note: Stock composition estimates may not sum to 100% and stock-specific harvest estimates may not sum to the total harvest due to rounding error.

Table 31.–Regional and subregional (within South Peninsula and Chignik) estimates of stock composition and stock-specific harvest for temporal stratum 1 (June 1–25; Harvest=25,160; n=397) of the Southwest Stepovak Section, 2011. Estimates include median, 90% credibility interval (CI), the probability that the group estimate is equal to zero (P=0), mean and SD.

		Stock Composition						Stock-specific harvest				
Reporting Group			90% CI						90% CI			
Regional	Subregional	Median	5%	95%	P=0	Mean	SD	Median	5%	95%	Mean	SD
Norton Sound		0	0	0	0.88	0	0	0	0	12	4	25
Kuskokwim Bay		0	0	0.7	0.47	0.2	0	0	0	189	38	71
Bristol Bay		8.1	5.9	11	0.00	8.2	2	2,045	1,480	2,704	2,062	373
North Peninsula		0.2	0	1.5	0.18	0.4	1	43	0	384	99	135
South Peninsula		2.1	1.1	3.6	0.00	2.2	1	541	284	914	562	194
Chignik		88.3	85	91	0.00	88.3	2	22,226	21,478	22,880	22,208	426
East of WASSIP		0.6	0.1	1.8	0.00	0.7	1	155	27	453	187	137
										Total	25,160	
South Peninsula	Orzinski	2.1	1.1	3.6	0.00	2.2	1	540	283	912	561	194
	Non-Orzinski	0	0	0	0.92	0	0	0	0	0	1	12
Chignik	Black Lake	87.9	84	91	0.00	87.7	2	22,118	21,182	22,823	22,075	504
	Chignik Lake	0	0	3.1	0.48	0.5	1	0	0	782	133	281

Note: Stock composition estimates may not sum to 100% and stock-specific harvest estimates may not sum to the total harvest due to rounding error.

Table 32.–Regional and subregional (within South Peninsula and Chignik) estimates of stock composition and stock-specific harvest for temporal stratum 2 (June 26–July 8; Harvest=18,479; n=398) of the Southwest Stepovak Section, 2011. Estimates include median, 90% credibility interval (CI), the probability that the group estimate is equal to zero (P=0), mean and SD.

		Stock Composition						Stock-specific harvest				
Reporting Group			90% CI						90% CI			
Regional	Subregional	Median	5%	95%	P=0	Mean	SD	Median	5%	95%	Mean	SD
Norton Sound		0	0	0	0.92	0	0	0	0	0	1	8
Kuskokwim Bay		0	0	1	0.61	0.2	0	0	0	188	30	70
Bristol Bay		11.4	8.7	15	0.00	11.5	2	2,114	1,612	2,688	2,128	327
North Peninsula		0.1	0	0.7	0.24	0.2	0	12	0	138	34	51
South Peninsula		6.9	4.9	9.3	0.00	6.9	1	1,267	900	1,710	1,281	247
Chignik		49.3	45	54	0.00	49.3	3	9,103	8,314	9,895	9,102	480
East of WASSIP		31.9	28	36	0.00	31.9	3	5,896	5,160	6,670	5,903	459
										Total	18,479	
South Peninsula	Orzinski	6.8	4.9	9.2	0.00	6.9	1	1,265	898	1,708	1,280	247
	Non-Orzinski	0	0	0	0.91	0	0	0	0	1	2	15
Chignik	Black Lake	39.7	35	45	0.00	39.7	3	7,339	6,376	8,322	7,341	591
	Chignik Lake	9.4	5.4	14	0.00	9.5	3	1,740	1,005	2,590	1,761	482

Note: Stock composition estimates may not sum to 100% and stock-specific harvest estimates may not sum to the total harvest due to rounding error.

Table 33.–Regional and subregional (within South Peninsula and Chignik) estimates of stock composition and stock-specific harvest for temporal stratum 3 (July 9–25; Harvest=17,706; n=399) of the Southwest Stepovak Section, 2011. Estimates include median, 90% credibility interval (CI), the probability that the group estimate is equal to zero (*P*=0), mean and SD.

		Stock Composition						Stock-specific harvest				
Reporting Group			90% CI						90% CI			
Regional	Subregional	Median	5%	95%	*P*=0	Mean	SD	Median	5%	95%	Mean	SD
Norton Sound		0	0	0	0.92	0	0	0	0	0	1	6
Kuskokwim Bay		0	0	0	0.78	0	0	0	0	6	2	9
Bristol Bay		0.2	0	0.9	0.08	0.3	0	31	0	159	49	55
North Peninsula		0	0	0.7	0.45	0.1	0	0	0	132	22	53
South Peninsula		4.9	3.1	7	0.00	4.9	1	860	553	1,246	874	212
Chignik		45.3	41	50	0.00	45.4	3	8,028	7,279	8,787	8,030	460
East of WASSIP		49.3	45	54	0.00	49.3	3	8,729	7,972	9,494	8,729	464
										Total	17,706	
South Peninsula	Orzinski	4.8	3.1	7	0.00	4.9	1	858	552	1,245	873	211
	Non-Orzinski	0	0	0	0.92	0	0	0	0	0	1	11
Chignik	Black Lake	3.4	1	6.4	0.00	3.5	2	596	174	1,130	618	291
	Chignik Lake	41.9	37	47	0.00	41.9	3	7,411	6,571	8,264	7,413	515

Note: Stock composition estimates may not sum to 100% and stock-specific harvest estimates may not sum to the total harvest due to rounding error.

Table 34.–Annual regional and subregional (within South Peninsula and Chignik) estimates of stock composition and stock-specific harvest for the Southwest Stepovak Section, 2011. Estimates include median, 90% credibility interval (CI), mean and SD.

Reporting Group		Stock Composition					Stock-specific harvest				
			90% CI					90% CI			
Regional	Subregional	Median	5%	95%	Mean	SD	Median	5%	95%	Mean	SD
Norton Sound		0.0	0.0	0.0	0.0	0.0	0	0	29	6	27
Kuskokwim Bay		0.0	0.0	0.5	0.1	0.2	21	0	277	69	100
Bristol Bay		6.9	5.6	8.3	6.9	0.8	4,224	3,449	5,085	4,239	497
North Peninsula		0.2	0.0	0.8	0.3	0.3	108	1	466	154	154
South Peninsula		4.4	3.5	5.5	4.4	0.6	2,700	2,117	3,365	2,718	380
Chignik		64.1	62.0	66.2	64.1	1.3	39,341	38,036	40,634	39,341	791
East of WASSIP		24.1	22.4	26.0	24.2	1.1	14,814	13,730	15,925	14,819	667
									Total	61,345	
South Peninsula	Orzinski	4.4	3.4	5.5	4.4	0.6	2,697	2,116	3,366	2,714	380
	Non-Orzinski	0.0	0.0	0.0	0.0	0.0	0	0	14	4	23
Chignik	Black Lake	49.0	46.7	51.1	49.0	1.4	30,053	28,652	31,376	30,033	829
	Chignik Lake	15.1	13.2	17.3	15.2	1.2	9,280	8,099	10,589	9,307	759

Note: Stock composition estimates may not sum to 100% and stock-specific harvest estimates may not sum to the total harvest due to rounding error.

Table 35.–Regional and subregional (within South Peninsula and Chignik) estimates of stock composition and stock-specific harvest for temporal stratum 1 (June 1–25; Harvest=13,475; n=394) of the Southwest Stepovak Section, 2012. Estimates include median, 90% credibility interval (CI), the probability that the group estimate is equal to zero (P=0), mean and SD.

Reporting Group		Stock Composition						Stock-specific harvest				
			90% CI						90% CI			
Regional	Subregional	Median	5%	95%	P=0	Mean	SD	Median	5%	95%	Mean	SD
Norton Sound		0	0	0	0.92	0	0	0	0	0	0	4
Kuskokwim Bay		0	0	0.1	0.76	0	0	0	0	15	4	18
Bristol Bay		15.3	12	19	0.00	15.3	2	2,056	1,651	2,505	2,064	259
North Peninsula		0	0	1.8	0.43	0.3	1	0	0	241	39	86
South Peninsula		1.6	0.7	3	0.00	1.7	1	220	99	406	232	95
Chignik		78.7	75	82	0.00	78.7	2	10,611	10,112	11,071	10,604	291
East of WASSIP		3.9	2.3	5.9	0.00	3.9	1	520	314	794	532	147
										Total	13,475	
South Peninsula	Orzinski	1.1	0.4	2.3	0.00	1.2	1	150	54	310	162	80
	Non-Orzinski	0.4	0.1	1.3	0.01	0.5	0	59	10	171	70	52
Chignik	Black Lake	75.4	64	81	0.00	74.2	6	10,163	8,683	10,959	10,002	735
	Chignik Lake	2.3	0	14	0.43	4.5	5	312	0	1,860	602	688

Note: Stock composition estimates may not sum to 100% and stock-specific harvest estimates may not sum to the total harvest due to rounding error.

Table 36.–Regional and subregional (within South Peninsula and Chignik) estimates of stock composition and stock-specific harvest for temporal stratum 2 (June 26–July 8; Harvest=2,186; n=397) of the Southwest Stepovak Section, 2012. Estimates include median, 90% credibility interval (CI), the probability that the group estimate is equal to zero (*P*=0), mean and SD.

		Stock Composition						Stock-specific harvest				
Reporting Group			90% CI						90% CI			
Regional	Subregional	Median	5%	95%	*P*=0	Mean	SD	Median	5%	95%	Mean	SD
Norton Sound		0	0	0	0.92	0	0	0	0	0	0	1
Kuskokwim Bay		0	0	2.9	0.66	0.4	1	0	0	64	8	21
Bristol Bay		12.5	9.4	16	0.00	12.6	2	274	206	345	275	42
North Peninsula		0.1	0	1.5	0.26	0.4	1	2	0	33	8	12
South Peninsula		2.4	1.1	4.5	0.00	2.6	1	53	24	99	56	23
Chignik		70.7	67	75	0.00	70.7	2	1,546	1,457	1,630	1,545	52
East of WASSIP		13.4	11	17	0.00	13.4	2	292	229	363	293	41
										Total	2,186	
South Peninsula	Orzinski	1.7	0.8	3.2	0.00	1.8	1	37	17	69	39	16
	Non-Orzinski	0.5	0	2.3	0.02	0.8	1	11	0	51	17	17
Chignik	Black Lake	34.3	29	40	0.00	34.3	3	749	628	873	749	74
	Chignik Lake	36.4	31	42	0.00	36.4	4	795	672	921	795	76

Note: Stock composition estimates may not sum to 100% and stock-specific harvest estimates may not sum to the total harvest due to rounding error.

Table 37.–Regional and subregional (within South Peninsula and Chignik) estimates of stock composition and stock-specific harvest for temporal stratum 3 (July 9–25; Harvest=34,263; n=400) of the Southwest Stepovak Section, 2012. Estimates include median, 90% credibility interval (CI), the probability that the group estimate is equal to zero (*P*=0), mean and SD.

		Stock Composition						Stock-specific harvest				
Reporting Group			90% CI						90% CI			
Regional	Subregional	Median	5%	95%	*P*=0	Mean	SD	Median	5%	95%	Mean	SD
Norton Sound		0	0	0	0.92	0	0	0	0	0	1	10
Kuskokwim Bay		0	0	1.5	0.51	0.3	1	0	0	509	105	184
Bristol Bay		1.6	0.7	3	0.00	1.7	1	534	224	1,035	569	251
North Peninsula		2	0.9	3.7	0.00	2.1	1	695	307	1,257	726	293
South Peninsula		2.7	1.6	4.4	0.00	2.8	1	937	534	1,491	965	294
Chignik		71.9	68	76	0.00	71.9	2	24,636	23,279	25,908	24,621	800
East of WASSIP		21.2	18	25	0.00	21.2	2	7,255	6,106	8,504	7,277	730
										Total	34,263	
South Peninsula	Orzinski	2.2	1.2	3.7	0.00	2.3	1	756	405	1,257	784	262
	Non-Orzinski	0.4	0.1	1.3	0.00	0.5	0	150	24	444	181	136
Chignik	Black Lake	4.2	1.1	7.4	0.02	4.3	2	1,447	392	2,547	1,460	646
	Chignik Lake	67.6	63	72	0.00	67.6	3	23,165	21,536	24,785	23,160	984

Note: Stock composition estimates may not sum to 100% and stock-specific harvest estimates may not sum to the total harvest due to rounding error.

Table 38.–Annual regional and subregional (within South Peninsula and Chignik) estimates of stock composition and stock-specific harvest for the Southwest Stepovak Section, 2012. Estimates include median, 90% credibility interval (CI), mean and SD.

		Stock Composition					Stock-specific harvest				
Reporting Group			90% CI					90% CI			
Regional	Subregional	Median	5%	95%	Mean	SD	Median	5%	95%	Mean	SD
Norton Sound		0.0	0.0	0.0	0.0	0.0	0	0	4	1	10
Kuskokwim Bay		0.0	0.0	1.0	0.2	0.4	11	0	521	117	186
Bristol Bay		5.8	4.7	7.1	5.8	0.7	2,888	2,345	3,532	2,907	363
North Peninsula		1.5	0.7	2.7	1.6	0.6	740	333	1,329	774	306
South Peninsula		2.5	1.6	3.6	2.5	0.6	1,226	793	1,804	1,254	309
Chignik		73.7	70.8	76.4	73.6	1.7	36,786	35,348	38,147	36,769	852
East of WASSIP		16.2	13.8	18.7	16.2	1.5	8,081	6,904	9,355	8,102	744
									Total	49,924	
South Peninsula	Orzinski	1.9	1.2	3.0	2.0	0.6	960	584	1,481	985	275
	Non-Orzinski	0.5	0.2	1.1	0.5	0.3	241	85	548	269	147
Chignik	Black Lake	24.6	21.1	27.5	24.5	2.0	12,267	10,521	13,738	12,211	982
	Chignik Lake	49.1	45.3	53.2	49.2	2.4	24,527	22,638	26,578	24,558	1,199

Note: Stock composition estimates may not sum to 100% and stock-specific harvest estimates may not sum to the total harvest due to rounding error.

Table 39.–Annual regional and subregional (within South Peninsula and Chignik) estimates of stock composition and stock-specific harvest for the Southeastern District Mainland fishery, 2010. Estimates include median, 90% credibility interval (CI), mean and SD. Note that these annual summaries do not include the second and third strata of the Northwestern Section, which accounts for 36% of the harvest of the first 3 strata in all SEDM sections.

Reporting Group		Stock Composition					Stock-specific harvest				
			90% CI					90% CI			
Regional	Subregional	Median	5%	95%	Mean	SD	Median	5%	95%	Mean	SD
Norton Sound		0.0	0.0	0.0	0.0	0.0	0	0	17	3	18
Kuskokwim Bay		0.0	0.0	0.2	0.0	0.1	3	0	161	33	71
Bristol Bay		4.2	3.3	5.2	4.2	0.6	4,454	3,500	5,576	4,485	634
North Peninsula		0.2	0.0	0.9	0.3	0.3	242	19	908	319	295
South Peninsula		2.4	1.9	3.0	2.4	0.4	2,570	2,005	3,231	2,589	374
Chignik		65.4	63.3	67.6	65.4	1.3	69,731	67,420	72,028	69,727	1,402
East of WASSIP		27.6	25.5	29.7	27.6	1.3	29,420	27,203	31,671	29,427	1,358
									Total	106,584	
South Peninsula	Orzinski	2.4	1.9	3.0	2.4	0.3	2,559	1,999	3,211	2,577	369
	Non-Orzinski	0.0	0.0	0.0	0.0	0.1	0	0	51	12	61
Chignik	Black Lake	48.7	45.6	51.8	48.7	1.9	51,877	48,613	55,186	51,885	1,998
	Chignik Lake	16.7	14.0	19.6	16.7	1.7	17,812	14,882	20,886	17,842	1,825

Note: Stock composition estimates may not sum to 100% and stock-specific harvest estimates may not sum to the total harvest due to rounding error.

Table 40.–Annual regional and subregional (within South Peninsula and Chignik) estimates of stock composition and stock-specific harvest for the Southeastern District Mainland fishery, 2011. Estimates include median, 90% credibility interval (CI), mean and SD. Note that these annual summaries do not include the third stratum of the Northwestern Section, which accounts for 12% of the harvest of the first 3 strata in all SEDM sections.

Reporting Group		Stock Composition					Stock-specific harvest				
			90% CI					90% CI			
Regional	Subregional	Median	5%	95%	Mean	SD	Median	5%	95%	Mean	SD
Norton Sound		0.0	0.0	0.1	0.0	0.0	48	4	189	66	64
Kuskokwim Bay		0.0	0.0	0.2	0.0	0.1	40	0	308	84	109
Bristol Bay		4.3	3.7	5.0	4.3	0.4	8,510	7,290	9,866	8,535	784
North Peninsula		0.4	0.1	0.8	0.4	0.2	781	251	1,629	840	426
South Peninsula		4.3	3.8	4.8	4.3	0.3	8,395	7,386	9,521	8,416	650
Chignik		66.7	65.3	68.0	66.7	0.8	130,938	128,219	133,618	130,932	1,642
East of WASSIP		24.2	23.0	25.5	24.2	0.8	47,538	45,124	49,995	47,546	1,482
									Total	196,419	
South Peninsula	Orzinski	4.2	3.7	4.8	4.3	0.3	8,343	7,340	9,459	8,364	645
	Non-Orzinski	0.0	0.0	0.1	0.0	0.0	19	0	234	52	96
Chignik	Black Lake	52.3	50.8	53.9	52.3	0.9	102,788	99,698	105,791	102,770	1,854
	Chignik Lake	14.3	12.9	15.8	14.3	0.9	28,126	25,378	31,070	28,162	1,733

Note: Stock composition estimates may not sum to 100% and stock-specific harvest estimates may not sum to the total harvest due to rounding error.

Table 41.–Annual regional and subregional (within South Peninsula and Chignik) estimates of stock composition and stock-specific harvest for the Southeastern District Mainland fishery, 2012. Estimates include median, 90% credibility interval (CI), mean and SD. Note that these annual summaries do not include the third stratum of the Northwestern Section, which accounts for 17% of the harvest of the first 3 strata in all SEDM sections.

Reporting Group		Stock Composition					Stock-specific harvest				
			90% CI					90% CI			
Regional	Subregional	Median	5%	95%	Mean	SD	Median	5%	95%	Mean	SD
Norton Sound		0.0	0.0	0.0	0.0	0.0	0	0	38	7	29
Kuskokwim Bay		0.2	0.0	0.8	0.3	0.3	389	0	1,383	487	467
Bristol Bay		4.6	4.0	5.4	4.7	0.4	8,385	7,235	9,711	8,418	755
North Peninsula		0.7	0.4	1.5	0.8	0.3	1,332	649	2,616	1,437	612
South Peninsula		2.5	2.0	3.1	2.6	0.3	4,568	3,693	5,618	4,601	588
Chignik		66.2	64.4	68.1	66.2	1.1	119,505	116,191	122,783	119,497	2,004
East of WASSIP		25.5	23.8	27.2	25.5	1.0	45,931	42,860	49,052	45,942	1,884
									Total	180,390	
South Peninsula	Orzinski	2.3	1.9	2.9	2.3	0.3	4,192	3,377	5,150	4,218	540
	Non-Orzinski	0.2	0.1	0.5	0.2	0.1	327	124	838	383	236
Chignik	Black Lake	29.4	27.7	31.1	29.4	1.0	53,071	50,055	56,137	53,085	1,849
	Chignik Lake	36.8	34.6	39.0	36.8	1.3	66,413	62,432	70,422	66,412	2,430

Note: Stock composition estimates may not sum to 100% and stock-specific harvest estimates may not sum to the total harvest due to rounding error.

Table 42.–Regional and subregional (within South Peninsula and Chignik) estimates of stock composition for 5 replicates of a simulated sockeye salmon Southeastern District Mainland fishery. Each replicate was a sample of 400 individuals removed from the genetic baseline in proportions similar to those observed in the fishery. Estimates include median, 90% credibility interval (CI), the probability that the group estimates is equal to zero (*P*=0), mean and SD.

Reporting Group		True	Replicate 1						Replicate 2					
				90% CI						90% CI				
Regional	Subregional	Proportions	Median	5%	95%	P=0	Mean	SD	Median	5%	95%	P=0	Mean	SD
Norton Sound		0.0	0.0	0.0	0.0	0.73	0.0	0.1	0.0	0.0	0.1	0.71	0.0	0.1
Kuskokwim Bay		0.0	0.0	0.0	0.2	0.38	0.0	0.1	0.0	0.0	0.4	0.35	0.1	0.2
Bristol Bay		5.0	5.5	3.7	7.6	0.00	5.5	1.2	5.0	3.3	7.1	0.00	5.1	1.2
North Peninsula		0.0	0.3	0.0	1.5	0.04	0.5	0.5	0.2	0.0	1.3	0.04	0.4	0.5
South Peninsula		5.0	4.7	3.0	6.8	0.00	4.7	1.1	3.3	1.9	5.1	0.00	3.4	1.0
Chignik		65.0	66.0	61.9	69.9	0.00	66.0	2.4	67.6	63.5	71.6	0.00	67.6	2.4
East of WASSIP		25.0	23.2	19.8	26.9	0.00	23.3	2.2	23.4	19.9	27.3	0.00	23.5	2.2
South Peninsula	Orzinski	2.5	2.6	1.4	4.1	0.00	2.6	0.8	2.7	1.5	4.5	0.00	2.8	0.9
	Non-Orzinski	2.5	2.0	1.0	3.6	0.00	2.1	0.8	0.4	0.1	1.4	0.00	0.5	0.4
Chignik	Black Lake	32.5	31.5	26.5	36.9	0.00	31.6	3.2	37.1	31.3	42.7	0.00	37.1	3.5
	Chignik Lake	32.5	34.3	29.0	39.7	0.00	34.4	3.2	30.5	25.1	36.4	0.00	30.6	3.4

Note: Stock composition estimates may not sum to 100% due to rounding error.

Table 42. Page 2 of 3.

Reporting Group		True	Replicate 3						Replicate 4					
				90% CI						90% CI				
Regional	Subregional	Proportion	Median	5%	95%	P=0	Mean	SD	Median	5%	95%	P=0	Mean	SD
Norton Sound		0.0	0.0	0.0	0.1	0.72	0.0	0.1	0.0	0.0	0.1	0.70	0.0	0.1
Kuskokwim Bay		0.0	0.0	0.0	0.2	0.38	0.0	0.1	0.0	0.0	0.4	0.34	0.1	0.2
Bristol Bay		5.0	5.2	3.3	7.4	0.00	5.2	1.3	5.8	3.9	8.0	0.00	5.8	1.3
North Peninsula		0.0	1.5	0.3	3.3	0.00	1.6	0.9	0.1	0.0	1.0	0.08	0.2	0.4
South Peninsula		5.0	4.2	2.6	6.3	0.00	4.3	1.1	4.5	2.8	6.6	0.00	4.5	1.2
Chignik		65.0	64.9	60.7	68.9	0.00	64.9	2.5	66.2	62.1	70.2	0.00	66.2	2.5
East of WASSIP		25.0	23.9	20.3	27.7	0.00	23.9	2.3	23.1	19.6	26.9	0.00	23.2	2.2
South Peninsula	Orzinski	2.5	2.1	1.0	3.7	0.00	2.2	0.8	2.4	1.2	4.0	0.00	2.5	0.8
	Non-Orzinski	2.5	2.0	1.0	3.6	0.00	2.1	0.8	2.0	0.9	3.5	0.00	2.1	0.8
Chignik	Black Lake	32.5	30.4	25.4	35.5	0.00	30.4	3.1	31.4	26.1	36.8	0.00	31.4	3.3
	Chignik Lake	32.5	34.4	29.4	39.7	0.00	34.5	3.1	34.7	29.4	40.2	0.00	34.7	3.3

Note: Stock composition estimates may not sum to 100% due to rounding error.

Table 42. Page 3 of 3.

Reporting Group		True	Replicate 5						Average of 5
				90% CI					
Regional	Subregional	Proportion	Median	5%	95%	P=0	Mean	SD	Replicates
Norton Sound		0.0	0.0	0.0	0.1	0.72	0.0	0.1	0.0
Kuskokwim Bay		0.0	0.0	0.0	0.2	0.37	0.0	0.1	0.0
Bristol Bay		5.0	5.9	4.0	8.4	0.00	6.0	1.3	5.5
North Peninsula		0.0	0.1	0.0	1.2	0.06	0.3	0.4	0.5
South Peninsula		5.0	4.5	2.9	6.5	0.00	4.6	1.1	4.7
Chignik		65.0	66.3	62.1	70.3	0.00	66.2	2.5	66.0
East of WASSIP		25.0	22.8	19.2	26.6	0.00	22.8	2.2	23.3
South Peninsula	Orzinski	2.5	2.7	1.5	4.4	0.00	2.8	0.9	2.6
	Non-Orzinski	2.5	1.7	0.8	3.1	0.00	1.8	0.7	2.1
Chignik	Black Lake	32.5	33.0	27.7	38.6	0.00	33.1	3.3	31.6
	Chignik Lake	32.5	33.1	27.8	38.7	0.00	33.2	3.3	34.4

Note: Stock composition estimates may not sum to 100% due to rounding error.

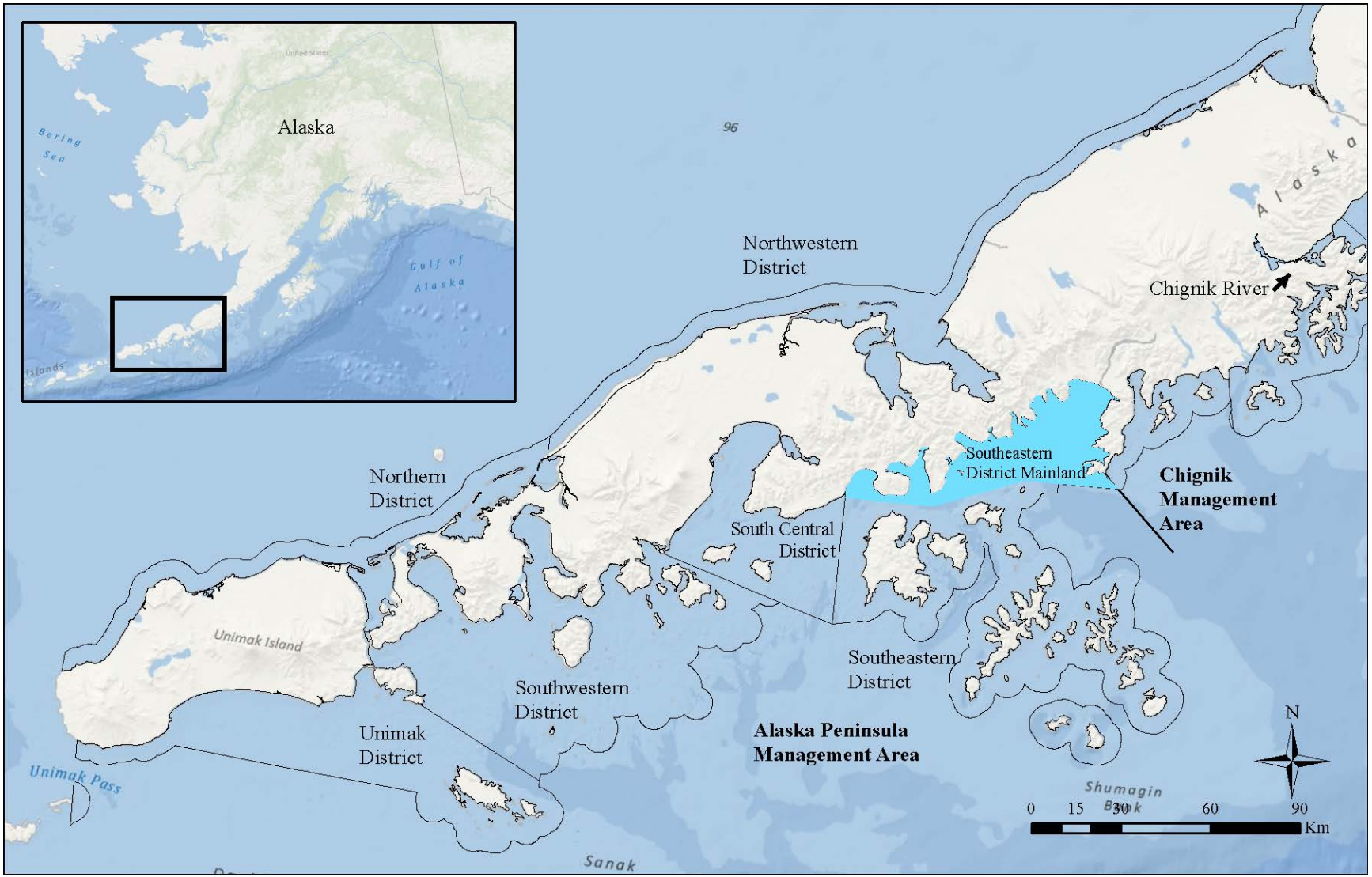

Figure 1.–The Alaska Peninsula Management Area, Westward Region, with the Southeastern District Mainland highlighted.

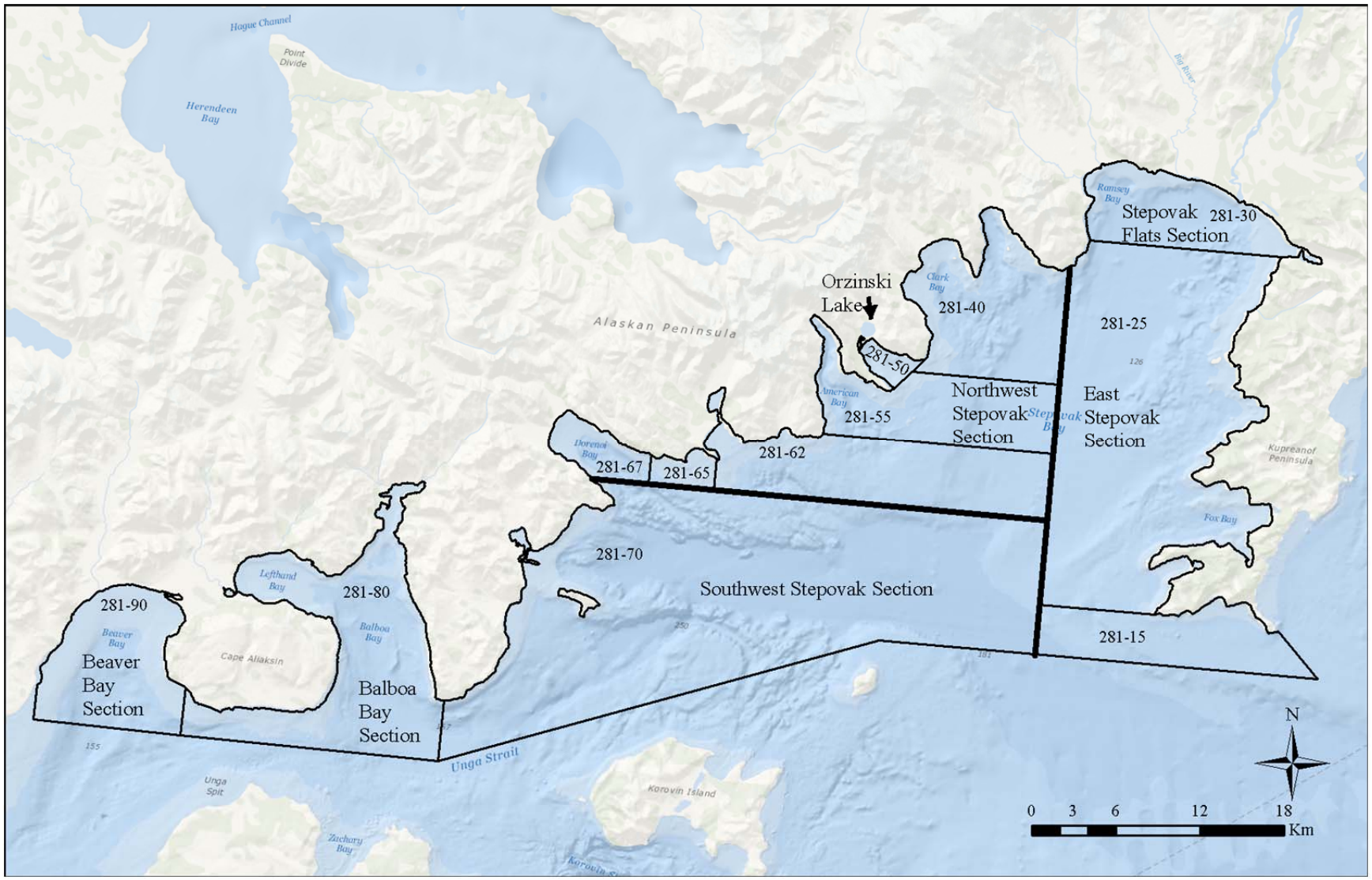

Figure 2.–The Southeastern District Mainland with sections and statistical areas labeled.

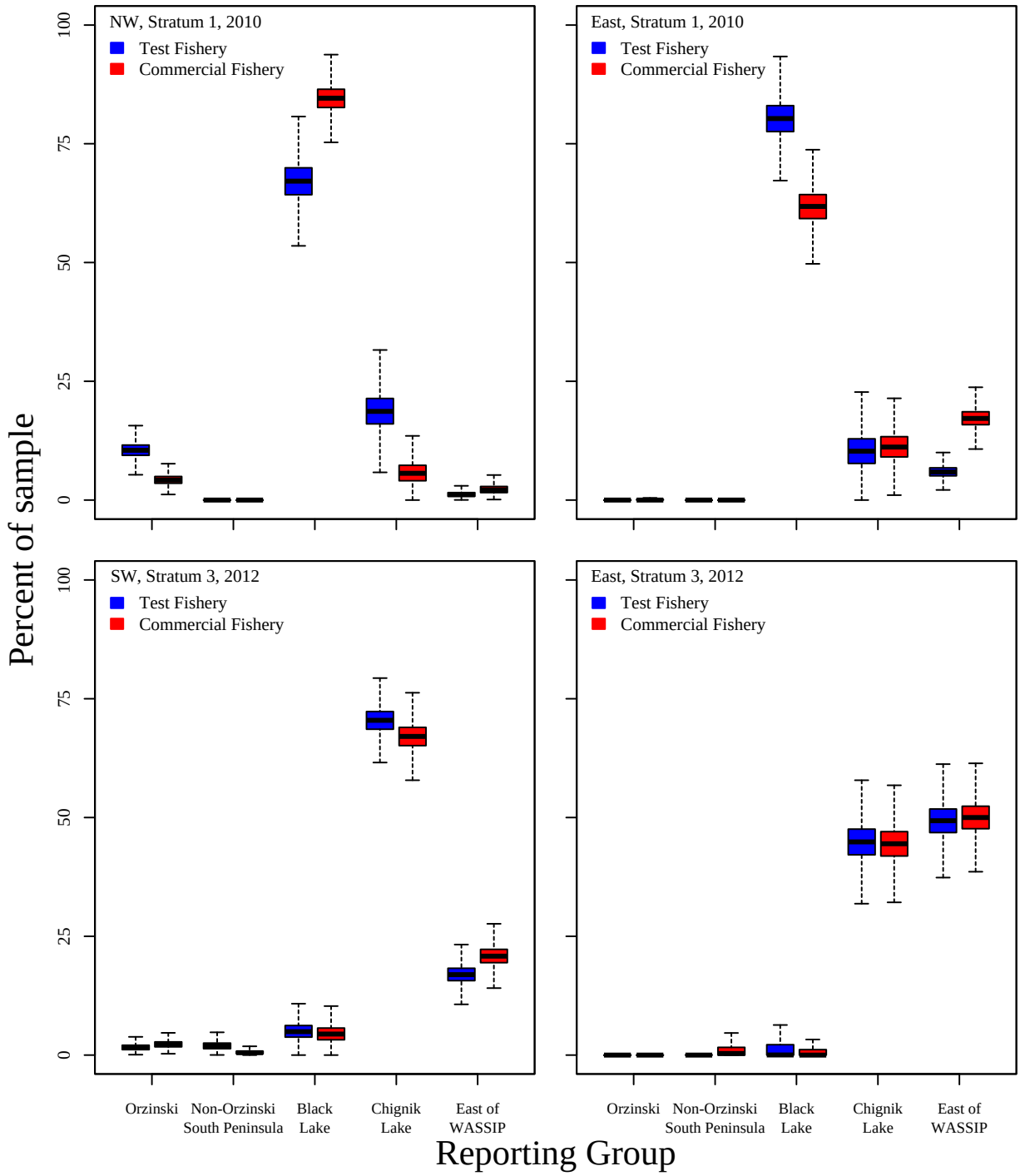

Figure 3.–Results of comparisons of stock composition estimates from samples of the test and commercial fisheries in single temporal strata from three sections of Southeastern District Mainland: Northwest Stepovak (NW); Southwest Stepovak, Balboa Bay, and Beaver Bay (SW); and East Stepovak and Stepovak Flats (East). Boxplots depict the first, second and third quartiles of the posterior distributions for five reporting groups of interest (box) and the extent of observations within 1.5 times the interquartile range (whiskers) for test (blue) and commercial (red) fishery samples.

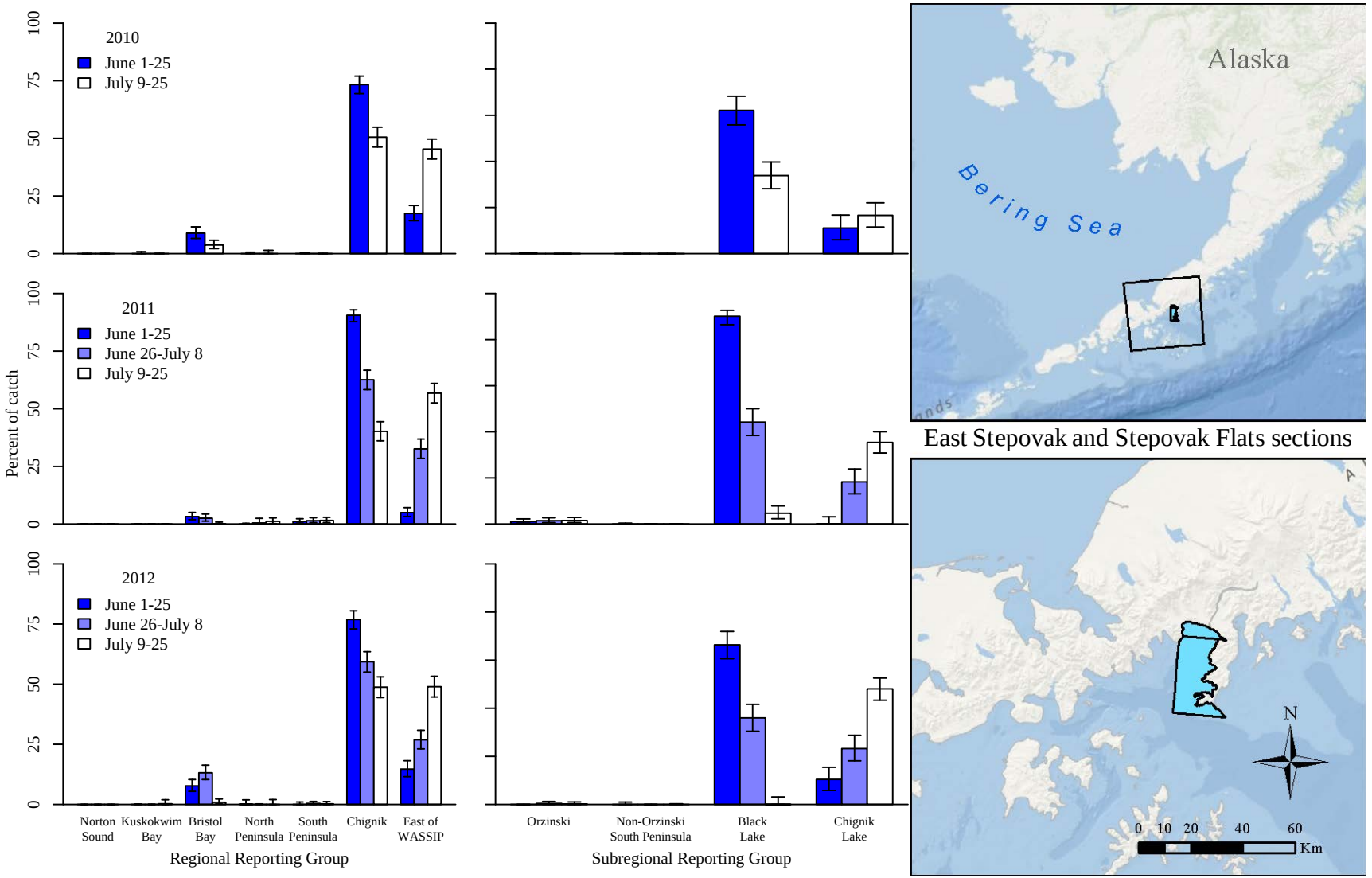

Figure 4.–Stock composition estimates (medians) and 90% credibility intervals of samples of the sockeye salmon harvests from East Stepovak and Stepovak Flats sections, Southeastern District Mainland, Alaska in 2010–2012.

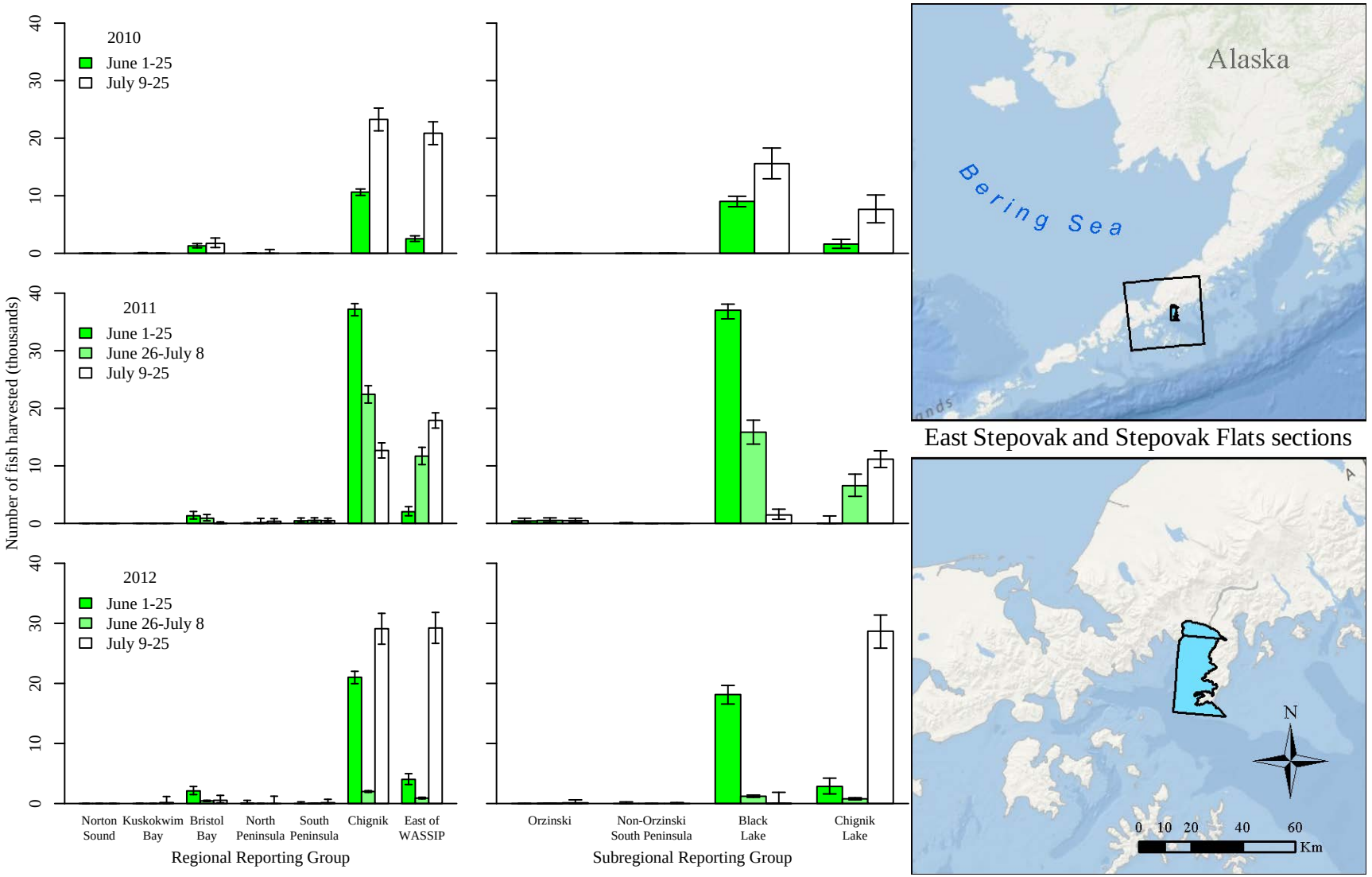

Figure 5.–Stock-specific harvest estimates (medians) and 90% credibility intervals of samples of the sockeye salmon harvests from East Stepovak and Stepovak Flats sections, Southeastern District Mainland, Alaska in 2010–2012.

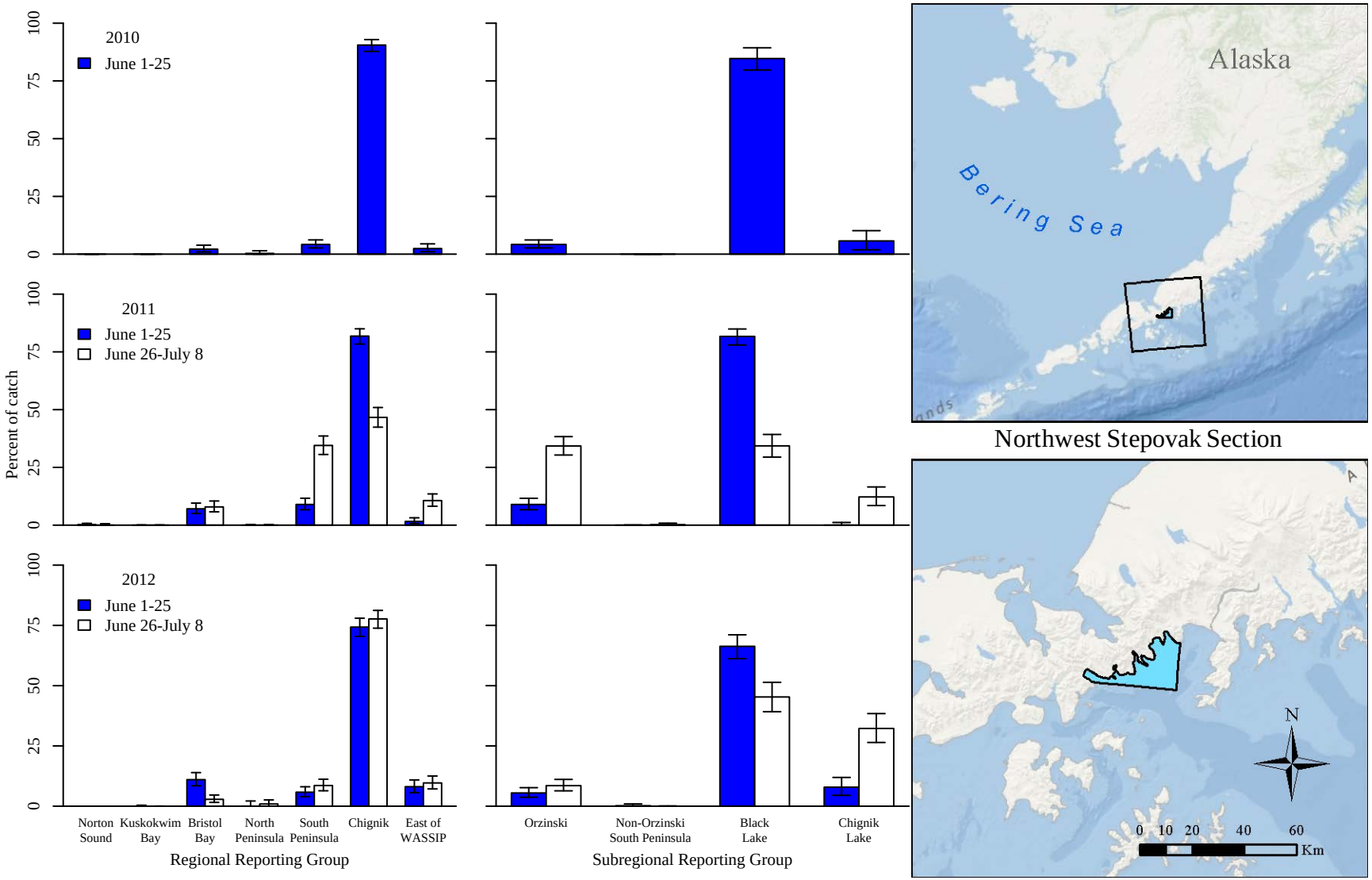

Figure 6.–Stock composition estimates (medians) and 90% credibility intervals of samples of the sockeye salmon harvests from Northwest Stepovak Section, Southeastern District Mainland, Alaska in 2010–2012.

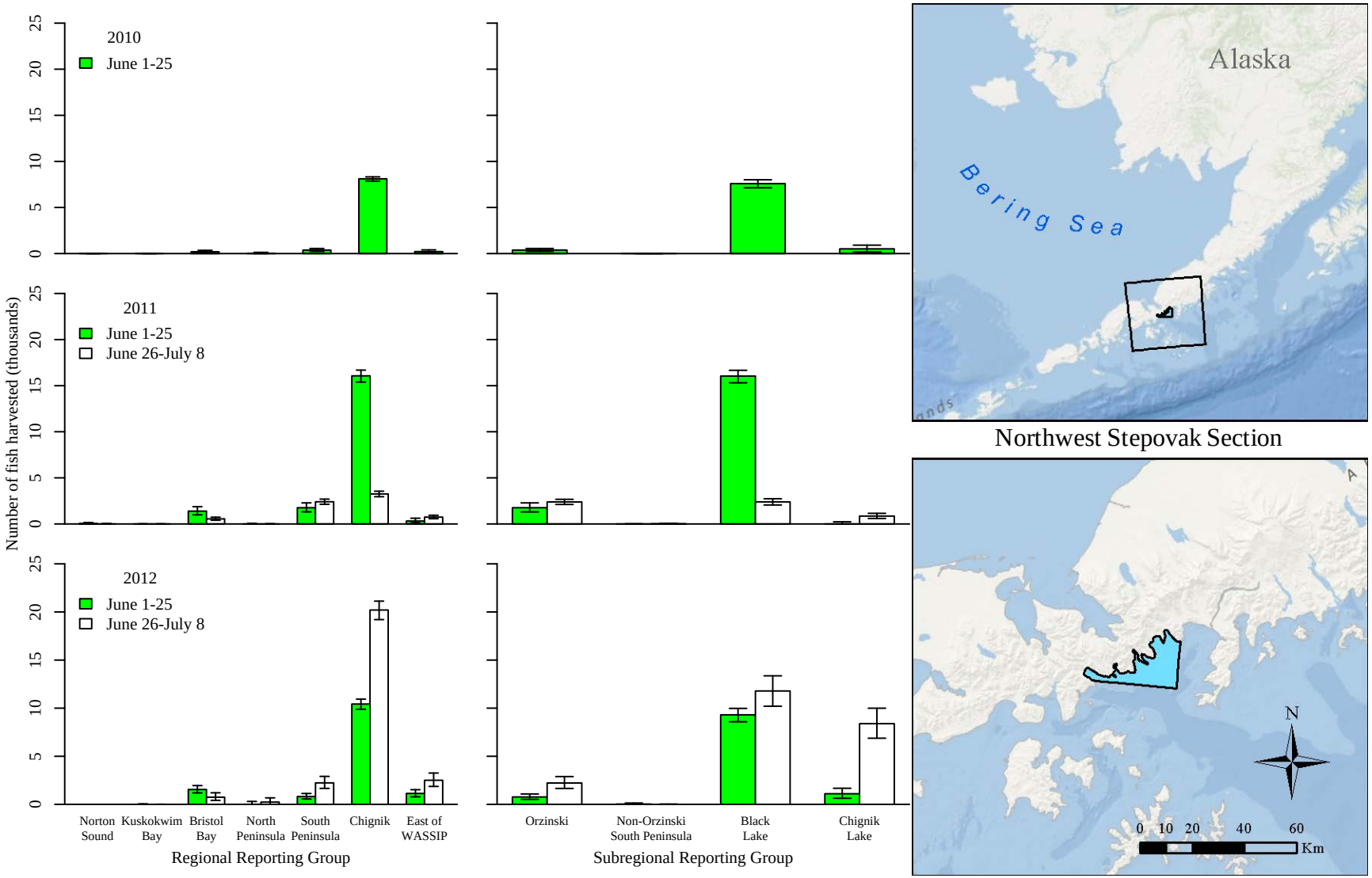

Figure 7.–Stock-specific harvest estimates (medians) and 90% credibility intervals of samples of the sockeye salmon harvests from Northwest Stepovak Section, Southeastern District Mainland, Alaska in 2010–2012.

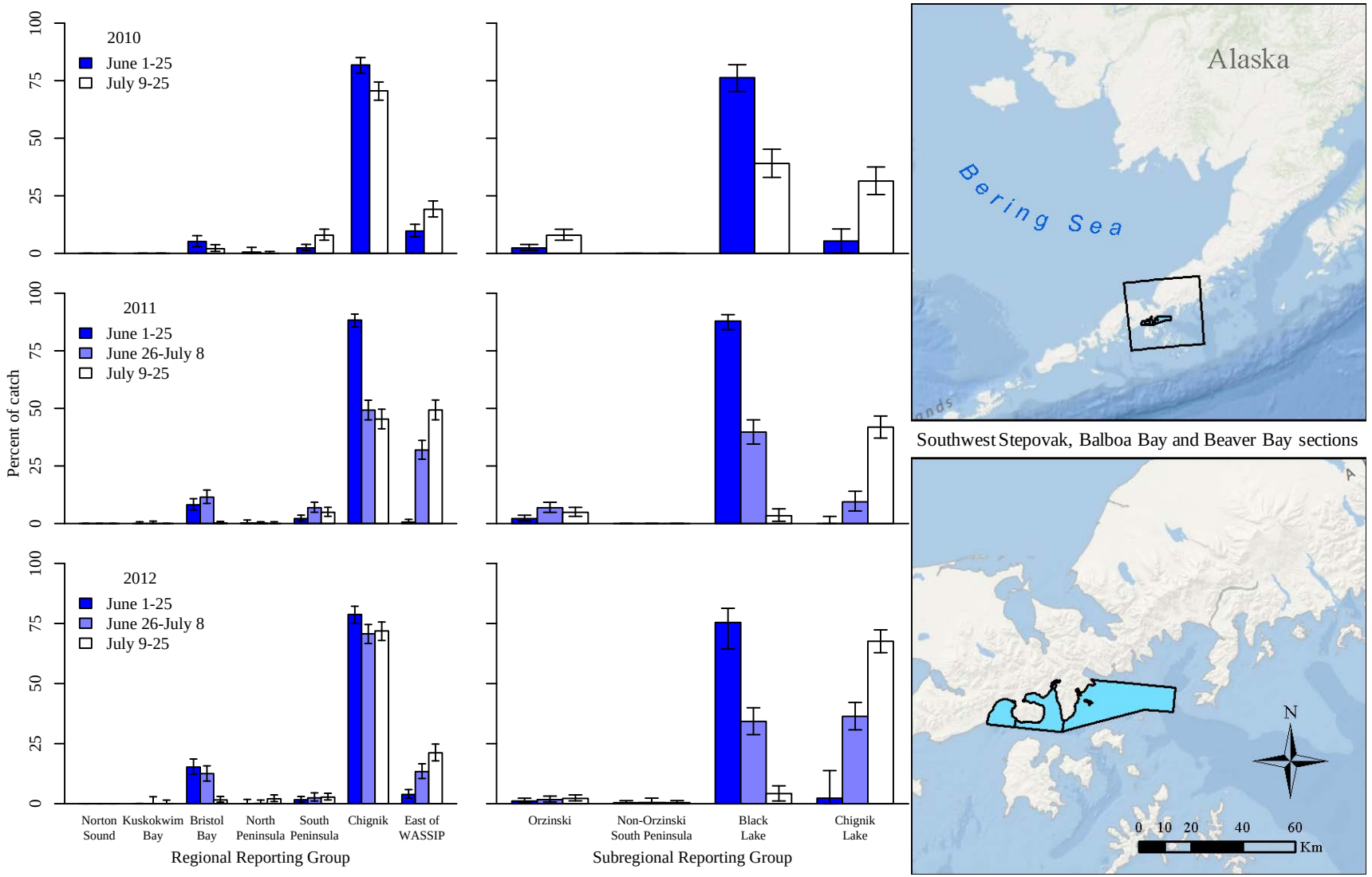

Figure 8.–Stock composition estimates (medians) and 90% credibility intervals of samples of the sockeye salmon harvests from Southwest Stepovak, Balboa Bay, and Beaver Bay sections, Southeastern District Mainland, Alaska in 2010–2012.

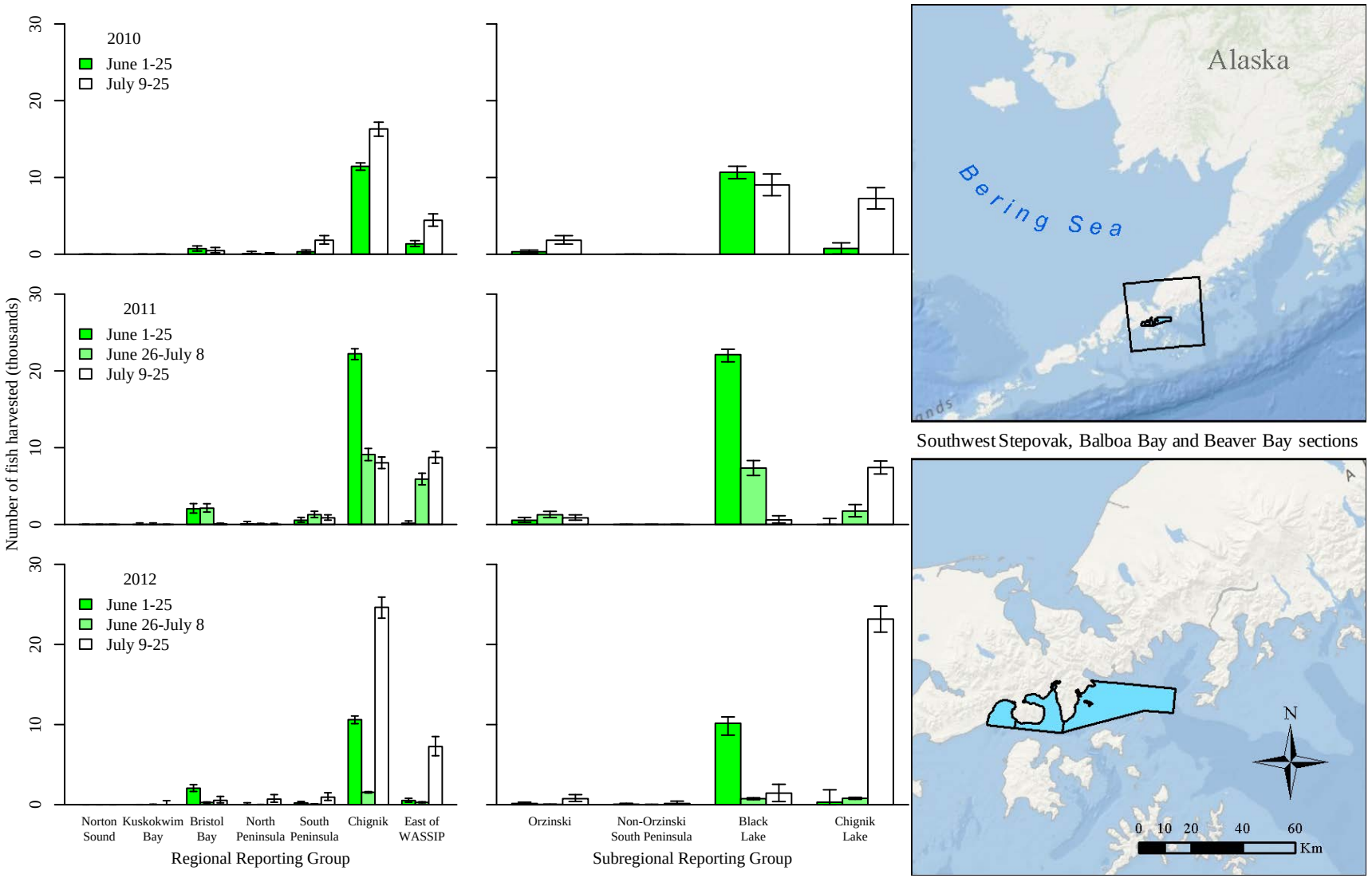

Figure 9.–Stock-specific harvest estimates (medians) and 90% credibility intervals of samples of the sockeye salmon harvests from Southwest Stepovak, Balboa Bay, and Beaver Bay sections, Southeastern District Mainland, Alaska in 2010–2012.

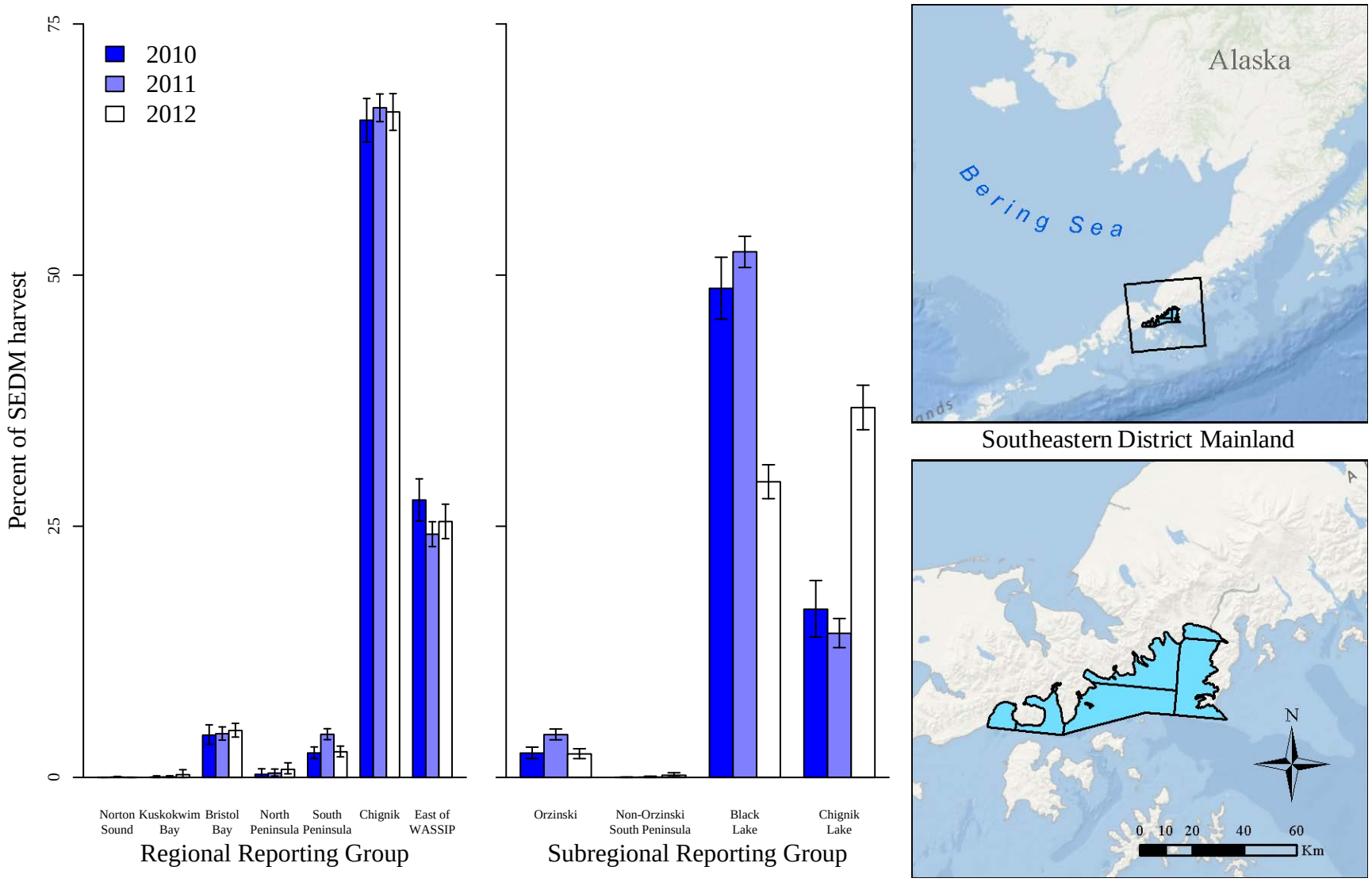

Figure 10.–Stock composition estimates (means) and 90% credibility intervals represented as the percentage of the total annual harvest of sockeye salmon from the Southeastern District Mainland, Alaska in 2010–2012.

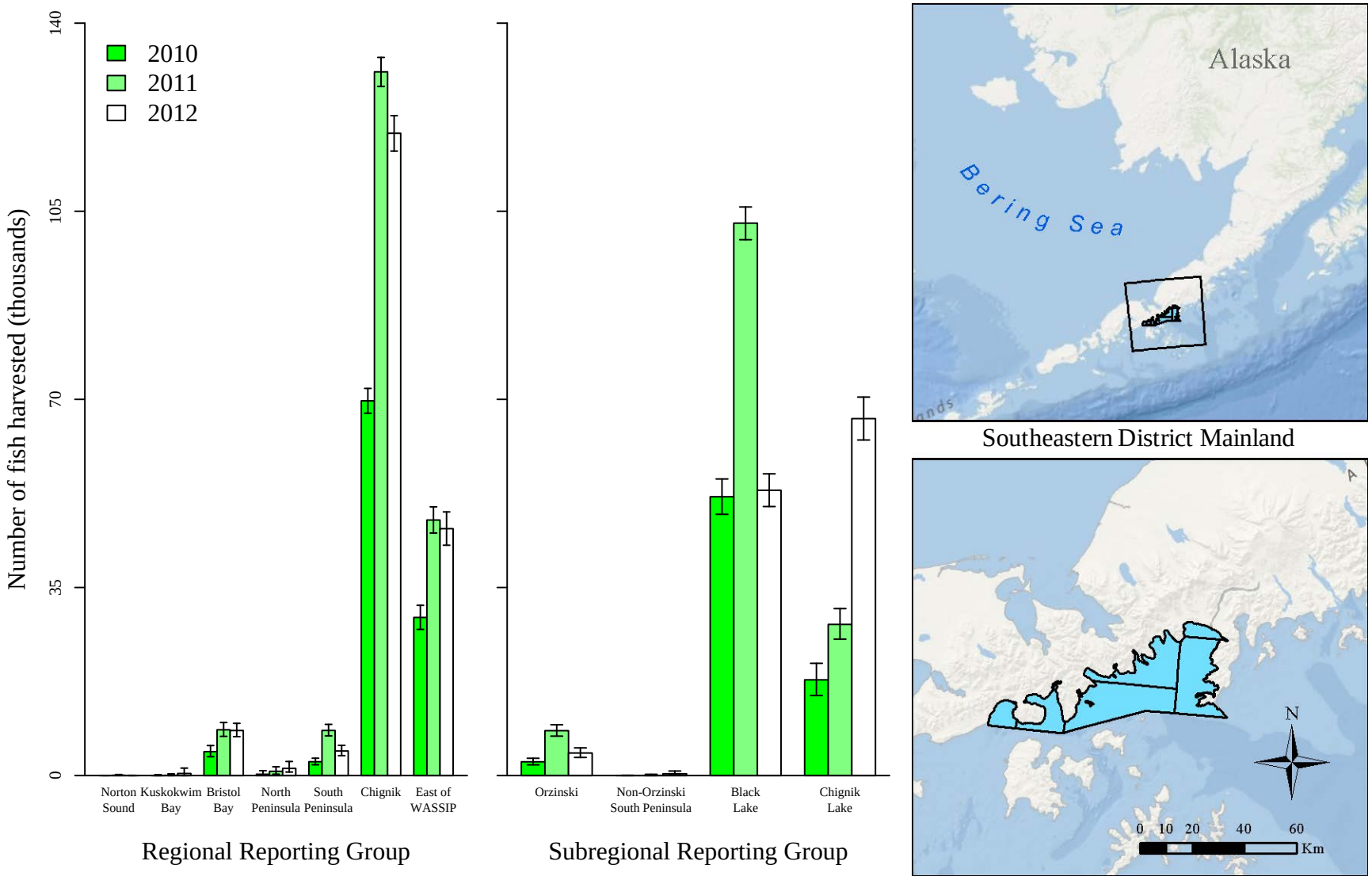

Figure 11.–Stock-specific harvest estimates (medians) and 90% credibility intervals of the total annual harvest of sockeye salmon from the Southeastern District Mainland, Alaska in 2010–2012.

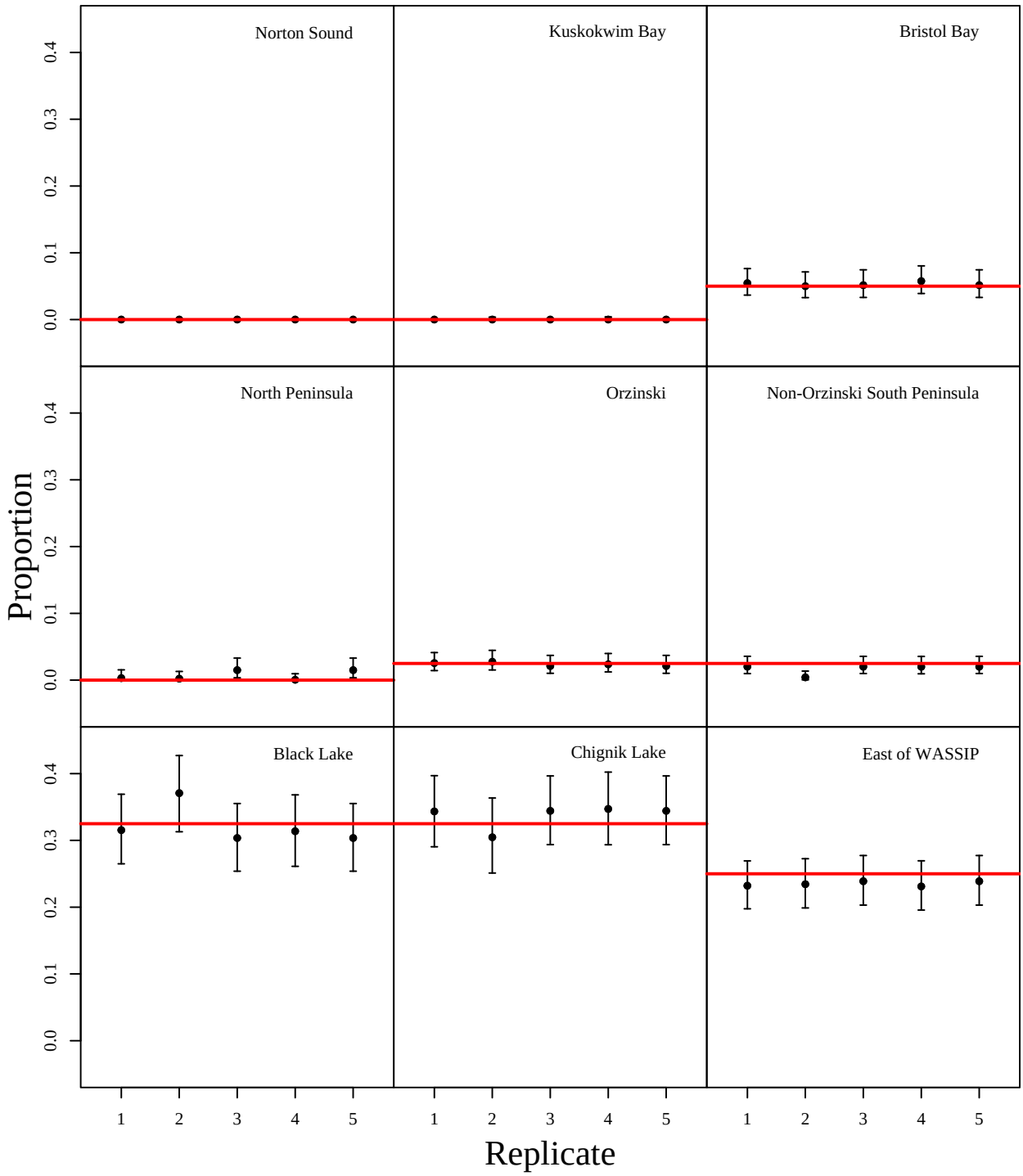

Figure 12.–Median (black points) and 90% credibility interval (vertical black lines) estimates for 5 replicates of a simulated Southeastern District Mainland fishery. Each replicate was a sample of 400 individuals removed from the baseline. Each cell represents a reporting group, the red line shows the known stock composition of the simulation, and deviations from the red line show magnitude and direction of biases for each replicate.

APPENDIX A: HISTORY OF SEDM MANAGMENET PLANS

Appendix A.–History of management plans applied to the Southeastern District Mainland fishery.

Year	Management Plan
Pre-1974	Set weekly fishing periods, usually five days per week.
1974–1978	Day for day fishing with Chignik.
1978	Three days per week, seine gear prohibited before 7/10.
1979–1984	Five days per week, 60,000 catch ceiling (until Chignik catches 1 million); after 7/10 entire SEDM managed on local stocks.
1985–1991	Assures minimum harvest in Chignik of 600,000, restricts fishing in SEDM during overlap period (6/26-7/9), allows 6% (6.2% for 1985-1987) allocation if total Chignik sockeye harvest through 7/25, permits opening in Stepovak Flats and Northwest Stepovak Sections based on local run.
1992–1995	Area managed on local sockeye runs reduced to include only Orzinski Bay (Stepovak Flats Section not affected), increased allocation of Chignik sockeye harvest from 6% to 7%.
1996–1997	Area managed on local sockeye runs increased to include Northwest Stepovak beginning 7/1, reduced allocation of Chignik sockeye harvest from 7% to 6%.
1998–2006	Beginning July 1, only Orzinski Bay was managed entirely on its local sockeye salmon run. However, all sockeye salmon caught in the Northwest Stepovak Section beginning 7/1 were considered 100% local fish and were not counted toward the 6% allocation. The remainder of the SEDM sockeye salmon harvest was allocated as 80% Chignik bound sockeye salmon. Assures minimum Chignik Management Area harvest of 300,000 sockeye salmon by 7/8 and 600,000 by 7/25. The maximum allowable fishing time in the Northwest Stepovak Section (excluding Orzinski Bay) during 7/1-25 is 4 days within a 7 day period with no more than 2 consecutive fishing days.
2007–present	Allocation changed from 6% of the total Chignik Area harvest to 7.6% of the harvest within the Chignik Management Area.

APPENDIX B: RESULTS OF STATISTICAL QUALITY CONTROL

Appendix B.–Results of the statistical quality control by area-temporal strata for sockeye salmon catch samples analyzed to estimate the stock composition of Southeastern District Mainland harvests in 2010–2012 and compare estimates of stock composition of test and commercial fishery samples. Area-temporal strata are identified by area stratum, year, temporal stratum, and stratum period. The number of fish genotyped, and excluded from statistical analysis because of missing loci, alternate species and duplicate fish, and the final number statistically analyzed are provided.

				Number of fish					
						Fish Removed			
Area Stratum	Year	Temporal stratum	Period	Selected	Genotyped	Missing Loci	Alternate Species	Duplicate	Final
East Stepovak	2010	1	6/1-6/25	400	393	4	0	0	389
East Stepovak	2010	3	7/9-7/25	400	398	3	0	1	394
East Stepovak	2011	1	6/1-6/25	400	400	13	0	0	387
East Stepovak	2011	2	6/26-7/8	400	400	3	0	0	397
East Stepovak	2011	3	7/9-7/25	400	400	1	0	0	399
East Stepovak	2012	1	6/1-6/25	400	400	3	0	0	397
East Stepovak	2012	2	6/26-7/8	400	390	1	0	0	389
East Stepovak	2012	3	7/9-7/25	400	400	0	0	0	400
Northwest Stepovak	2010	1	6/1-6/25	400	395	2	0	1	392
Northwest Stepovak	2011	1	6/1-6/25	400	395	1	0	0	394
Northwest Stepovak	2011	2	6/26-7/8	400	400	0	0	0	400
Northwest Stepovak	2012	1	6/1-6/25	400	400	1	0	0	399
Northwest Stepovak	2012	2	6/26-7/8	400	398	1	0	0	397
Southwest Stepovak	2010	1	6/1-6/25	400	399	2	0	0	397
Southwest Stepovak	2010	3	7/9-7/25	400	391	3	0	0	388
Southwest Stepovak	2011	1	6/1-6/25	400	400	3	0	0	397
Southwest Stepovak	2011	2	6/26-7/8	400	400	1	0	1	398
Southwest Stepovak	2011	3	7/9-7/25	400	400	1	0	0	399
Southwest Stepovak	2012	1	6/1-6/25	400	400	6	0	0	394
Southwest Stepovak	2012	2	6/26-7/8	400	398	1	0	0	397
Southwest Stepovak	2012	3	7/9-7/25	400	400	0	0	0	400
			Total	8,400	8,357	50	0	3	8,304

-continued-

Area Stratum	Year	Temporal stratum	Period	Number of fish					
						Fish Removed			
				Selected	Genotyped	Missing Loci	Alternate Species	Duplicate	Final
Samples used to compare commercial and test fishery stock compositions									
East Stepovak Comm	2010		6/1-6/25	400[a]	393[a]	4[a]	0	0	389[a]
East Stepovak Test	2010		6/1-6/25 & 6/26-7/8	400	396	12	0	0	384
East Stepovak Comm	2012		7/9-7/25	215[a]	215[a]	0[a]	0[a]	0[a]	215[a]
East Stepovak Test	2012		7/9-7/25	200	200	0	0	0	200
Northwest Stepovak Comm	2010		6/1-6/25	400[a]	395[a]	2[a]	0[a]	1[a]	392[a]
Northwest Stepovak Test	2010		6/1-6/25 & 6/26-7/8	400	400	5	0	0	395
Southwest Stepovak Comm	2012		7/9-7/25	400[a]	400[a]	0[a]	0[a]	0[a]	400[a]
Southwest Stepovak Test	2012		7/9-7/25	400	400	0	0	1	399
			Total	1,400	1,396	17	0	1	1,378
			Overall SEDM Total	9,800	9,753	67	0	4	9,682

[a] These samples were used in both types of analyses (MSA of SEDM harvests and comparison of stock compositions of commercial and test fishery samples) and are not included in totals.