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Age Composition of Sockeye Salmon Sampled as Part of the Western Alaska Salmon Stock Identification Program within Westward Region Commercial Fisheries, 2006-2008

by

M. Birch Foster

November 2014

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

FISHERY DATA SERIES NO. 14-46

AGE COMPOSITION OF SOCKEYE SALMON SAMPLED AS PART OF THE WESTERN ALASKA SALMON STOCK IDENTIFICATION PROGRAM WITHIN WESTWARD REGION COMMERCIAL FISHERIES, 2006-2008.

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ABSTRACT

The Western Alaska Salmon Stock Identification Program (WASSIP) was conducted to determine the stock of origin of chum salmon *Oncorhynchus keta* and sockeye salmon *O. nerka* caught in commercial salmon fisheries of western Alaska utilizing genetic stock identification (GSI). On a limited subset of the total WASSIP sockeye samples (roughly 16%), scales were also collected to estimate age composition. Stock composition estimates from GSI and reported in WASSIP from Chignik Bay District and the North Alaska Peninsula are compared to age composition estimates from the same area and temporal strata. Results are quite variable but yield some inferences about not only the age composition of particular stocks but also about the potential presence of migrating immature and mature sockeye salmon.

Key words: WASSIP, sockeye salmon, stock composition, age composition, Chignik, North Peninsula.

INTRODUCTION

The Western Alaska Salmon Stock Identification Program (WASSIP) was conducted from 2006 to 2009 to determine the stock of origin of chum salmon *Oncorhynchus keta* and sockeye salmon *O. nerka* caught in commercial salmon fisheries of western Alaska utilizing genetic stock identification (GSI; Eggers et al. 2011). Stock compositions and stock specific harvests and harvest rates were reported in 2012 (Dann et al. 2012; Habicht et al. 2012b; Munro et al. 2012; Templin et al. 2012). As part of WASSIP genetic sampling, simultaneous sampling of sockeye salmon scales was conducted on a limited portion of areas and temporal stratum from the Chignik and North Alaska Peninsula fisheries.

This report details the age composition of the WASSIP commercial fishery sampling within the Alaska Department of Fish and Game's (ADF&G) Westward Region. The age composition estimates were intended as companion data to the stock composition estimates reported by Dann et al. (2012). Regional sampling was conducted in the following ADF&G salmon management areas: Chignik Area (Area L) and Alaska Peninsula Area (Area M). While annual reporting for sockeye salmon harvest age composition during the timeframe 2006 to 2009 did occur for specific sections of the Chignik Area (Anderson 2011; Jackson et al. 2008; Stichert 2007; Stichert et al. 2009) and the Peninsula Area (Foster 2009; Foster 2011, Tschersich et al. 2007; Tschersich et al. 2008), the results of both the Chignik and Alaska Peninsula projects are completely independent of the WASSIP sampling being reported in this document.

TECHNICAL BACKGROUND

While the method of GSI used for WASSIP was proportional assignment of a mixture sample to reporting groups of interest, another approach is individual assignment of each specific fish to a population or groups of populations. Both methods have costs and benefits. Proportional assignment GSI is robust in that all fish sampled from a fishery can be included in analyses, increasing accuracy and precision of estimates. Proportional assignment is limited in that physical characteristics of individual fish sampled cannot be directly linked to individual genetic information and can only be assessed by association. In contrast, individual assignment allows for direct comparison of physical characteristics of individual fish such as age, length, weight, etc. to stock of origin. Individual assignment is limited in that each individual fish is assigned to a stock (or group of stocks) of origin with a probability for that assignment. In order to assign individuals with accuracy, a probability threshold must be defined to balance the loss of individuals defined as unassigned (probabilities below threshold) and the error rate of false assignments (probabilities above threshold, but to incorrect stock).

This threshold is dependent on the degree of genetic divergence among populations (or groups of populations) in the baseline. The best way to determine the most appropriate threshold is by testing the baseline's ability to accurately assign individuals with known mixture samples (proof tests) similar to the approach used by Griffiths et al. (2013). Because WASSIP was designed to use proportional assignment, the baselines were not tested for individual assignment capabilities, appropriate individual assignment thresholds have not been defined, and individual assignments have not been estimated for WASSIP samples.

METHODS

Genetic sampling during WASSIP predominantly consisted of bulk tissue sampling where the pelvic fin axillary process was collected from the fish caught during designated time and area stratum and then subsequently placed in a common container containing ethanol. Detailed methods of tissue sampling from the harvest and sample selection for GSI are reported in Eggers et al. (2011). Comprehensive description of the methods used for sockeye salmon GSI are reported in Dann et al. (2012). Detailed definitions of sockeye salmon reporting groups and baseline collections used to establish the groups are presented in WASSIP technical document #11 (Habicht et al 2012a).

On a limited subset of the total WASSIP samples from 2006 to 2009, paired individual sampling was conducted where a scale and an axillary process were collected and uniquely identified and preserved with the intention of conducting individual assignment at a later date. Post season, referencing the dates of sample collection and daily harvest numbers, a subsample of tissue samples was randomly selected from both bulk and paired samples to assure GSI analysis was following the established protocol of analyzing proportional to harvest. As a result the stock composition estimates by area and temporal stratum represent a very specific subset of the genetic samples that are representative of the harvest. For that reason, direct comparison of the estimated age from the paired sampling to the estimated stock is not possible with the existing analyses reported in WASSIP. Therefore, in this report, an indirect comparison will be made of age and stock composition estimates from the same area and temporal stratum with the knowledge that the scale and genetic samples are not representing identical fishery samples. However, the comparison is a fair one statistically since the underlying principle of stratification depends on partitioning (stratifying) so that units within a stratum are as similar to one another as possible. Furthermore, this indirect comparison using proportional estimates has the distinct advantage of not introducing the potential bias towards more divergent populations possible in individual assignment.

Tissue and scale sampling was conducted at 4 different fishery areas, primarily where sampling occurred at the processor and not on tenders where conditions are not conducive to paired sampling techniques. Samples from the Chignik Bay District 2006–2009 were collected at the processing facility in Chignik Bay (Figure 1). Scale samples from the North Peninsula (Bear River, Three Hills, and Ilnik sections 2006–2009, but not necessarily all sections annually) were collected at the processing facility in Port Moller or on tenders on the fishing grounds (Figure 1). Genetic stock compositions were not estimated as part of WASSIP in 2009.

Scale sampling crews obtained fish ticket information before collecting samples to determine if the fish were exclusively harvested from the section designated to be sampled. If fish ticket data were not available, the sampling crew interviewed the processing facility dock foreman or tender operator. Once fish ticket information became available, the origin of the catch was confirmed.

The scale sample size was typically between 400 and 600 fish, which enabled all age classes to be simultaneously estimated within roughly ±5% of the true proportion with 95% confidence (Thompson 1987). All scales, when possible, were collected from the preferred area of each fish following procedures outlined by the International North Pacific Fisheries Commission (INPFC 1963). Scales were mounted on scale "gum" cards and impressions were made on cellulose acetate (Clutter and Whitesel 1956). Fish ages were assigned by examining scale impressions for annual growth increments using a microfiche reader fitted with a 48X lens following designation criteria established by Mosher (1968). Ages were assigned using European notation (Koo 1962), in which a decimal separates the number of winters spent in fresh water (after emergence) from the number of winters spent in salt water. The total age of the fish includes an additional year, that is not recorded, which represents the time between egg deposition and emergence of fry.

RESULTS

SAMPLING AND LABORATORY AND STATISTICAL ANALYSIS

For comparison purposes a total of 16,962 sockeye salmon ages are reported and matched up to a total of 12,867 sockeye salmon analyzed using GSI, approximately 15.8% of the sockeye salmon catch samples analyzed for WASSIP. Detailed results of tissue sampling from the harvest and sample selection for GSI are reported in Eggers et al. (2011). Comprehensive results of the laboratory and statistical analysis and stock composition estimates from GSI are reported in Dann et al. (2012).

STOCK AND AGE COMPOSITION ESTIMATES BY FISHERY

Chignik Bay District

All of Chignik Bay District stock composition estimates reported for WASSIP had paired tissue and scale sampling from 2006 to 2008.

The Black Lake and Chignik Lake reporting groups were dominant in Chignik Bay District harvests (Tables 1–6). All other stock composition estimates were under 2%, thus comparison of ages can be assumed to be almost entirely a Chignik monoculture.

During 2006, the ages transitioned from age-1.3 dominant (74.2%) and Black Lake stock (98.6%) in Stratum 1 to age-2.3 dominant (50.1%) and Chignik Lake stock (86.0%) in Stratum 6 (Tables 1–2).

During 2007, the ages transitioned from age-1.3 dominant (41.6%) and Black Lake stock (98.5%) in Stratum 1 to age-2.3 dominant (48.1%) and Chignik Lake stock (88.7%) in Stratum 6 (Tables 3–4). However, 2007 also demonstrated rather high percentages of age-0.3 fish, especially in Strata 1 to 3. During 2008, the ages transitioned only slightly from age-1.3 dominant (69.3%) and Black Lake stock (94.1%) in Stratum 1 to age-1.3 dominant (66.9%) and Chignik Lake stock (90.8%) in Stratum 6 (Tables 5–6). Like 2007, age-0.3 fish were well represented through all strata but peaked at 26.7% in Stratum 2 during 2008.

Bear River Section

The 2006 Bear River Section stock composition estimates reported for WASSIP had paired tissue and scale sampling. The 2007 stock composition estimates were reported for the WASSIP

project but no scale sampling occurred. During 2008, Bear River section was closed due to weak runs.

The North Peninsula reporting group was dominant in Bear River Section harvests of 2006, ranging from 88.3% in Stratum 1 to 72.1% in Stratum 3 (Table 7). Within the North Peninsula reporting group, the Bear River system dominated ranging from 58.6% to 66.6% of the total, but Meshik, Sandy, and Nelson rivers were also present in significant proportions. The Bristol Bay reporting group ranged from 9.7% in Stratum 1 to 17.4% in Stratum 3. East of WASSIP reporting group was low in Stratum 1 (1.7%) but increased to 10.4% in Stratum 3.

The dominant ages were spread out between age 1.3, 2.2, 2.3, and 1.2 (Table 7). The age transition consisted of generally increasing age-1.2 and -2.2 fish toward the later Stratum 3.

Three Hills Section

The 2006 Three Hills Section stock composition estimates reported for WASSIP had paired tissue and scale sampling for Strata 2 and 3. During 2007 and 2008 no samples were collected, largely because the section was generally closed due to weak runs.

The North Peninsula reporting group was dominant in Three Hills Section harvests of 2006 ranging from 51.9% in Stratum 2 to 49.2% in Stratum 3 followed closely by Bristol Bay reporting group ranging from 44.8% to 40.8% (Table 8). Within the North Peninsula reporting group, Bear River system dominated ranging from 25.9% to 30.7% of the total, but Nelson, Meshik, Ilnik, and Sandy were present in significant proportions. The East of WASSIP reporting group was low in Stratum 2 (2.3%) but increased to 9.9% in Stratum 3.

The dominant ages were spread out between age 1.2, 1.3, 2.2, and 2.3(Table 8). The age transition from Stratum 2 to Stratum 3 consisted of increasing age-1.2 percentage accompanied by small decreases in age-1.3, -2.2, and -2.3 percentages.

Ilnik Section-SW

All of SW Ilnik area stock composition estimates reported for WASSIP had paired tissue and scale sampling from 2006 to 2008.

The Bristol Bay and North Peninsula reporting groups were dominant in SW Ilnik area harvests (Tables 9–11). East of WASSIP and Kuskokwim Bay were the only other groups present at levels greater than 5% during any one temporal stratum.

The Bristol Bay reporting group was dominant in SW Ilnik area harvests of 2006, ranging from 52.3% in Stratum 3 to 53.1% in Stratum 2, followed closely by North Peninsula, ranging from 34.6% to 43.1% (Table 9). Within the North Peninsula reporting group, Bear River system dominated, ranging from 14.7% to 23.3% of the total, but Ilnik, Nelson, Sandy, and Cinder were present in significant proportions. The East of WASSIP reporting group was low in Strata 1 and 2 (1.7% to 4.4%) but increased to 12.6% in Stratum 3. The dominant ages were spread out between age 1.3, 1.2, 2.2, and 2.3 (Table 9). The age transition from Stratum 1 to Stratum 3 consisted of decreasing age-1.3 and -2.3 percentages accompanied by increases in age-1.2, and -2.2 percentages.

The Bristol Bay reporting group was dominant in SW Ilnik area harvests of 2007, ranging from 30.2% in Stratum 1 to 72.9% in Stratum 2, followed closely by North Peninsula, ranging from 26.3% to 69.5% (Table 10). Within the North Peninsula reporting group, Bear and Ilnik system dominated ,but Nelson and Cinder were present in significant proportions. The East of WASSIP

reporting group was low in Strata 1 and 2 but increased to 9.6% in Stratum 3. The dominant ages were spread out between age 1.3, 1.2, 2.3, and 0.3 (Table 10). The age transition from Stratum 1 to Stratum 3 consisted of increasing age-1.3 and -1.2 percentages accompanied by a decreases in the age-0.3 percentage.

The Bristol Bay reporting group was dominant in SW Ilnik area harvests of 2008, ranging from 58.2% in Stratum 1 to 69.1% in Stratum 2, followed by North Peninsula ranging from 25.2% to 38.3% (Table 11). Within the North Peninsula reporting group, Meshik system dominated, but Bear, Nelson, Ilnik, and Cinder were present in significant proportions. The East of WASSIP reporting group was low in both strata, but Kuskokwim Bay was present between 3.1% and 5.5% from Stratum 1 to Stratum 2. The dominant ages were mostly age 1.3 and 0.3 (Table 11). The age transition from Stratum 1 to Stratum 2 consisted of a slight increase in age-1.3 percentage accompanied by a slight decreases in the age-0.3 percentage.

Ilnik Section-NW

The 2006 NW Ilnik area stock composition estimates reported for WASSIP had paired tissue and scale sampling. During 2007 to 2008 stock composition estimates were reported as part WASSIP but no scale sampling occurred.

The Bristol Bay reporting group was dominant in NW Ilnik area harvests of 2006, ranging from 48.1% in Stratum 1 to 81.4% in Stratum 3, followed by North Peninsula, ranging from 47.8% to 10.9% (Table 12). Within the North Peninsula reporting group, Bear and Ilnik systems dominated, but Cinder, Nelson, Sandy, and Meshik were also present in significant proportions. The East of WASSIP reporting group was low in Strata 1 and 2 (4.0% to 1.7%) but increased to 7.6% in Stratum 3. The dominant ages were spread out between age 1.3, 1.2, 2.3, and 2.2 (Table 12). The age transition from Stratum 1 to Stratum 3 consisted of increasing age-1.2 and -2.2 percentages accompanied by a decreases in the age-1.3 and -2.3 percentages.

DISCUSSION

Sockeye salmon age at maturity within the diversity of Westward Region's watersheds number no less than 21 unique ages ranging from age 0.1 to age 4.4. The age structure and morphology of a discrete population is likely in response to the unique habitat available in a particular system (Quinn et al. 2001). Age and size at maturity are heritable traits in salmon that still display the potential to adapt to changing conditions (Carlson and Seamons 2008). Such conditions could be environmental changes but could also be the selectivity imposed on migrating fish via gillnet fisheries (Kendall et al. 2014). The persistence of climate change and increasing fishing pressures create a scenario where biologically sound management of salmon would involve tracking not only the genetic stock but age composition of the harvest in both terminal and mixed-stock traditional fishing areas.

While comparisons in this report are limited due to the method of GSI utilized, they can still yield valuable information on stock-specific age compositions, presence of unique stocks or ages, and potential migrating immature fish.

The results of the stock and age composition estimates from 2006 to 2008 are consistent with the long accepted theory that the dominant age at maturity for sockeye salmon returning to Black Lake is age 1.3, while Chignik Lake fish tend to return at age 2.3 (Dahlberg et al. 1968; Witteveen and Botz 2004). However, the data presented in this report demonstrate quite clearly that age-1.3 and -2.3 fish are well represented in both Black and Chignik lakes spawning stocks

during the sampling years (Tables 1–6). While age 0.3 appear to be present in both Chignik and Black lake returning fish in 2007 and 2008, transition of age compositions suggest a greater likelihood to be of Black Lake origin.

With the strong mix of both Bristol Bay and North Peninsula fish, in addition to variable percentages of the 4 most typical ages (1.3, 1.2, 2.2, and 2.3), making inferences about any or all of the tissue and scale sampling data of the North Alaska Peninsula is problematic (Tables 7–12). Overall, age composition data for the North Peninsula demonstrate an increasing trend of younger fish from the early to later strata (i.e., more 2-ocean fish and less 3-ocean fish). Unfortunately, confounding information masks these results as well. While typical run timing of discrete salmon stocks begins with older aged fish and declines to younger ages, the size selective gillnet fishery of the North Alaska Peninsula begins with 5-1/8" mesh in June and switches to smaller gear (as low as 4-1/2") by mid to late July (Bob Murphy, ADF&G Area Management Biologist, Port Moller Alaska, personal communication) which would naturally increase harvest of 2-ocean sockeye salmon.

Age-0.3 sockeye salmon are common on some of the North Alaska Peninsula systems but rare in Bristol Bay systems, with the exception of infrequent abundance in the Nushagak River (Buck et al. 2012). In general, the abundance of age-0.3 fish appears to be tied to increased percentages of Ilnik, Meshik, and Cinder river stocks that all historically demonstrate the zero check life history in significant proportions.

The presence of East of WASSIP is perhaps the most intriguing aspect of the sockeye salmon stock composition estimates from the North Peninsula harvest. Without exception, East of WASSIP fish tend to become higher in relative percentages toward late July. While Foster et al. (2000) documented the presence of immature 2-ocean fish on the South Alaska Peninsula in July, these male and female immature sockeye salmon tended to be between 400 and 450 mm (METF) and generally < 3.0 lbs. Though the South Peninsula purse seine fisheries are unlike the size-selective gillnet fisheries of the North Peninsula (Bob Murphy, ADF&G Area Management Biologist, Port Moller Alaska, personal communication), as noted above the gillnet mesh size used by fisherman later in the season could preferentially select these smaller, younger fish. Based on the Port Moller offshore test fishery size selectivity curve of small mesh (4-1/2") panels (Sam Raborn, LGL Fishery Scientist, Anchorage Alaska), 400 to 450 mm sockeye salmon would be in the harvest if present. Using large mesh (5-1/8") panels, the likelihood of catching the smaller sockeye salmon is small. While no direct age assignment of the East of WASSIP sockeye salmon is possible from this analysis, it is known that they are 2-ocean or 3-ocean due to date and location of capture. The North Alaska Peninsula region centered on Ilnik Section is approximately 1,000 water km from the western edge of the East of WASSIP area. Considering the estimated swimming speed of homeward migrating sockeye salmon of 46-56 km/day (Groot and Margolis 1991), late-run East of WASSIP sockeye salmon could easily travel to natal streams by August or September. Considering both, it is likely that immature sockeye salmon are present in the North Peninsula harvest later in the season as smaller mesh is being used.

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TABLES AND FIGURES

Table 1.–Stock and age composition for sockeye salmon of Chignik Bay District, Chignik Area, Westward Region 2006, temporal Strata 1–3. Regional and subregional reporting group-specific stock composition estimates including mean (%), 90% credibility interval (%), the probability that reporting group estimate is equal to zero (P = 0), and standard deviation (SD; %). Age composition estimates including number, estimated percent, variance of the estimate, and 90% confidence intervals.

		Stratum 1 (6/8-6/19; H=105,006; n=400)					Stratum 2 (6/25-6/28; H=132,178; n=399)					Stratum 3 (6/29-7/4; H=116,238; n=379)				
Reporting Group			90% CI					90% CI					90% CI			
Regional	Subregional	Mean	5%	95%	P=0	SD	Mean	5%	95%	P=0	SD	Mean	5%	95%	P=0	SD
Norton Sound		0.0	0.0	0.0	0.92	0.0	0.0	0.0	0.0	0.89	0.1	0.0	0.0	0.0	0.92	0.0
Kuskokwim Bay		0.0	0.0	0.0	0.78	0.1	0.0	0.0	0.0	0.78	0.1	0.0	0.0	0.0	0.78	0.1
Bristol Bay		0.2	0.0	0.8	0.09	0.3	0.5	0.0	1.5	0.10	0.5	0.8	0.1	1.8	0.00	0.5
North Peninsula		0.0	0.0	0.1	0.56	0.1	0.1	0.0	0.4	0.50	0.2	0.0	0.0	0.2	0.55	0.1
South Peninsula		0.0	0.0	0.0	0.92	0.0	0.0	0.0	0.0	0.91	0.1	0.0	0.0	0.0	0.92	0.0
Chignik		99.7	99.1	100.0	0.00	0.3	99.4	98.4	100.0	0.00	0.5	99.2	98.2	99.9	0.00	0.5
East of WASSIP		0.0	0.0	0.0	0.90	0.1	0.0	0.0	0.0	0.91	0.1	0.0	0.0	0.0	0.92	0.0
Chignik	Black Lake	98.6	95.0	100.0	0.00	1.7	98.5	95.4	100.0	0.00	1.5	84.0	77.7	89.7	0.00	3.6
	Chignik Lake	1.1	0.0	4.7	0.28	1.7	0.9	0.0	4.0	0.22	1.4	15.2	9.5	21.5	0.00	3.6

Age				90% CI				90% CI					90% CI		
	Number	Percent	Var	5%	95%	Number	Percent	Var	5%	95%	Number	Percent	Var	5%	95%
0.2	0	0.0	0.00	0.0	0.0	3	0.5	0.00	0.0	1.1	0	0.0	0.00	0.0	0.0
0.3	3	0.8	0.00	0.0	1.6	5	0.9	0.00	0.1	1.7	2	0.6	0.00	0.0	1.3
0.4	0	0.0	0.00	0.0	0.0	0	0.0	0.00	0.0	0.0	4	1.1	0.00	0.0	2.2
1.2	25	6.4	0.02	4.0	8.8	24	4.2	0.01	2.6	5.9	7	2.0	0.01	0.5	3.4
1.3	291	74.2	0.05	69.9	78.6	385	68.0	0.04	64.2	71.9	207	58.1	0.07	53.0	63.3
1.4	4	1.0	0.00	0.0	2.0	8	1.4	0.00	0.4	2.4	4	1.1	0.00	0.0	2.2
2.2	7	1.8	0.00	0.5	3.1	10	1.8	0.00	0.7	2.9	4	1.1	0.00	0.0	2.2
2.3	62	15.8	0.03	12.2	19.4	129	22.8	0.03	19.3	26.3	126	35.4	0.06	30.4	40.4
2.4	0	0.0	0.00	0.0	0.0	1	0.2	0.00	0.0	0.5	2	0.6	0.00	0.0	1.3
3.3	0	0.0	0.00	0.0	0.0	1	0.2	0.00	0.0	0.5	0	0.0	0.00	0.0	0.0
Total	392					566					356				

Note: Stock and age composition estimates may not sum to 100% due to rounding error. For each temporal stratum, H is the number of sockeye salmon reported to be harvested.

Source: Stock composition estimates initially reported in Dann et al. (2012: Table 9).

Table 2.–Stock and age composition for sockeye salmon of Chignik Bay District, Chignik Area, Westward Region 2006, temporal Strata 4–6. Regional and subregional reporting group-specific stock composition estimates including mean (%), 90% credibility interval (%), the probability that reporting group estimate is equal to zero (P = 0), and standard deviation (SD; %). Age composition estimates including number, estimated percent, variance of the estimate, and 90% confidence intervals.

Reporting Group		Stratum 4 (7/5-7/10; H=62,390; n=399)					Stratum 5 (7/11-7/19; H=87,291; n=398)					Stratum 6 (7/21-7/31; H=156,065; n=398)				
			90% CI					90% CI					90% CI			
Regional	Subregional	Mean	5%	95%	P=0	SD	Mean	5%	95%	P=0	SD	Mean	5%	95%	P=0	SD
Norton Sound		0.0	0.0	0.0	0.92	0.0	0.0	0.0	0.0	0.92	0.0	0.0	0.0	0.0	0.92	0.0
Kuskokwim Bay		0.0	0.0	0.0	0.79	0.0	0.0	0.0	0.0	0.79	0.0	0.0	0.0	0.0	0.78	0.1
Bristol Bay		1.2	0.4	2.3	0.00	0.6	0.9	0.2	1.8	0.00	0.5	0.3	0.0	0.8	0.02	0.3
North Peninsula		0.0	0.0	0.2	0.55	0.1	0.0	0.0	0.1	0.56	0.1	0.0	0.0	0.2	0.54	0.1
South Peninsula		0.0	0.0	0.0	0.90	0.1	0.0	0.0	0.0	0.92	0.0	0.0	0.0	0.0	0.91	0.1
Chignik		98.7	97.6	99.6	0.00	0.6	99.1	98.1	99.8	0.00	0.5	99.7	99.1	100.0	0.00	0.3
East of WASSIP		0.0	0.0	0.0	0.92	0.0	0.0	0.0	0.0	0.92	0.0	0.0	0.0	0.0	0.92	0.0
Chignik	Black Lake	70.6	63.9	76.9	0.00	4.0	42.2	36.4	48.0	0.00	3.5	13.6	9.5	18.1	0.00	2.6
	Chignik Lake	28.2	21.8	34.8	0.00	3.9	56.9	51.1	62.7	0.00	3.5	86.0	81.5	90.2	0.00	2.6

Age				90% CI				90% CI				90% CI		
	Number	Percent	Var	5%	95%	Number	Percent	Var	5%	95%	Number	Percent	Var	5%	95%
0.2	0	0.0	0.00	0.0	0.0	0	0.0	0.00	0.0	0.0	0	0.0	0.00	0.0	0.0
0.3	0	0.0	0.00	0.0	0.0	1	0.2	0.00	0.0	0.7	0	0.0	0.00	0.0	0.0
0.4	1	0.3	0.00	0.0	0.8	1	0.2	0.00	0.0	0.7	0	0.0	0.00	0.0	0.0
1.2	6	1.6	0.00	0.3	2.9	7	1.6	0.00	0.4	2.7	13	3.7	0.01	1.7	5.7
1.3	195	53.3	0.07	48.2	58.4	227	51.0	0.06	46.4	55.7	141	40.4	0.07	35.2	45.6
1.4	7	1.9	0.01	0.5	3.3	1	0.2	0.00	0.0	0.7	0	0.0	0.00	0.0	0.0
2.2	6	1.6	0.00	0.3	2.9	23	5.2	0.01	3.1	7.2	19	5.4	0.01	3.1	7.8
2.3	148	40.4	0.07	35.4	45.5	183	41.1	0.05	36.5	45.7	175	50.1	0.07	44.9	55.4
2.4	2	0.5	0.00	0.0	1.3	1	0.2	0.00	0.0	0.7	1	0.3	0.00	0.0	0.8
3.3	1	0.3	0.00	0.0	0.8	1	0.2	0.00	0.0	0.7	0	0.0	0.00	0.0	0.0
Total	366					445					349				

Note: Stock and age composition estimates may not sum to 100% due to rounding error. For each temporal stratum, H is the number of sockeye salmon reported to be harvested.

Source: Stock composition estimates initially reported in Dann et al. (2012: Table 10).

Table 3.–Stock and age composition for sockeye salmon of Chignik Bay District, Chignik Area, Westward Region 2007, temporal Strata 1–3. Regional and subregional reporting group-specific stock composition estimates including mean (%), 90% credibility interval (%), the probability that reporting group estimate is equal to zero (P = 0), and standard deviation (SD; %). Age composition estimates including number, estimated percent, variance of the estimate, and 90% confidence intervals.

Reporting Group		Stratum 1 (6/9-6/19; H=45,221; n=397)					Stratum 2 (6/22-6/26; H=39,470; n=398)					Stratum 3 (6/28-7/4; H=78,118; n=397)				
			90% CI					90% CI					90% CI			
Regional	Subregional	Mean	5%	95%	P=0	SD	Mean	5%	95%	P=0	SD	Mean	5%	95%	P=0	SD
Norton Sound		0.0	0.0	0.0	0.90	0.1	0.0	0.0	0.0	0.92	0.0	0.0	0.0	0.0	0.92	0.0
Kuskokwim Bay		0.0	0.0	0.0	0.78	0.1	0.0	0.0	0.0	0.79	0.1	0.0	0.0	0.0	0.79	0.1
Bristol Bay		1.2	0.4	2.3	0.00	0.6	1.3	0.5	2.4	0.00	0.6	1.2	0.4	2.3	0.00	0.6
North Peninsula		0.3	0.0	1.0	0.16	0.4	0.0	0.0	0.2	0.54	0.1	0.0	0.0	0.2	0.56	0.1
South Peninsula		0.0	0.0	0.0	0.92	0.0	0.1	0.0	0.5	0.82	0.2	0.0	0.0	0.0	0.92	0.0
Chignik		98.5	97.2	99.4	0.00	0.7	98.6	97.4	99.5	0.00	0.6	98.8	97.7	99.6	0.00	0.6
East of WASSIP		0.0	0.0	0.0	0.92	0.0	0.0	0.0	0.2	0.82	0.1	0.0	0.0	0.0	0.92	0.0
Chignik	Black Lake	98.5	97.1	99.4	0.00	0.8	91.1	86.9	94.8	0.00	2.4	77.0	70.8	82.8	0.00	3.7
	Chignik Lake	0.0	0.0	0.0	0.91	0.3	7.5	3.9	11.7	0.00	2.4	21.7	16.0	27.9	0.00	3.6

Age				90% CI				90% CI					90% CI		
	Number	Percent	Var	5%	95%	Number	Percent	Var	5%	95%	Number	Percent	Var	5%	95%
0.2	3	0.5	0.00	0.0	1.1	4	1.1	0.00	0.0	2.2	3	0.4	0.00	0.0	0.8
0.3	69	11.5	0.02	9.0	14.1	31	8.8	0.02	5.8	11.7	121	16.0	0.02	13.4	18.6
1.1	0	0.0	0.00	0.0	0.0	0	0.0	0.00	0.0	0.0	0	0.0	0.00	0.0	0.0
1.2	25	4.2	0.01	2.6	5.8	33	9.3	0.02	6.3	12.4	51	6.7	0.01	5.0	8.5
1.3	249	41.6	0.04	37.6	45.5	144	40.7	0.07	35.6	45.8	298	39.4	0.03	35.9	42.9
1.4	12	2.0	0.00	0.9	3.1	7	2.0	0.01	0.5	3.4	19	2.5	0.00	1.4	3.6
2.2	7	1.2	0.00	0.3	2.0	9	2.5	0.01	0.9	4.2	4	0.5	0.00	0.0	1.0
2.3	226	37.7	0.04	33.8	41.6	124	35.0	0.06	30.1	40.0	247	32.7	0.03	29.3	36.0
2.4	5	0.8	0.00	0.1	1.6	1	0.3	0.00	0.0	0.8	8	1.1	0.00	0.3	1.8
3.2	0	0.0	0.00	0.0	0.0	0	0.0	0.00	0.0	0.0	1	0.1	0.00	0.0	0.4
3.3	3	0.5	0.00	0.0	1.1	1	0.3	0.00	0.0	0.8	4	0.5	0.00	0.0	1.0
Total	599					354					756				

Note: Stock and age composition estimates may not sum to 100% due to rounding error. For each temporal stratum, H is the number of sockeye salmon reported to be harvested.
Source: Stock composition estimates initially reported in Dann et al. (2012: Table 11).

Table 4.–Stock and age composition for sockeye salmon of Chignik Bay District, Chignik Area, Westward Region 2007, temporal Strata 4–6. Regional and subregional reporting group-specific stock composition estimates including mean (%), 90% credibility interval (%), the probability that reporting group estimate is equal to zero (P = 0), and standard deviation (SD; %). Age composition estimates including number, estimated percent, variance of the estimate, and 90% confidence intervals.

Reporting Group		Stratum 4 (7/5-7/11; H=66,463; n=400)					Stratum 5 (7/12-7/16; H=78,697; n=396)					Stratum 6 (7/20-7/31; H=141,849; n=399)				
			90% CI					90% CI					90% CI			
Regional	Subregional	Mean	5%	95%	P=0	SD	Mean	5%	95%	P=0	SD	Mean	5%	95%	P=0	SD
Norton Sound		0.0	0.0	0.0	0.92	0.0	0.0	0.0	0.0	0.92	0.0	0.0	0.0	0.0	0.92	0.0
Kuskokwim Bay		0.0	0.0	0.0	0.78	0.1	0.0	0.0	0.0	0.79	0.0	0.0	0.0	0.0	0.79	0.1
Bristol Bay		1.9	0.8	3.2	0.00	0.7	0.6	0.1	1.3	0.00	0.4	0.0	0.0	0.2	0.46	0.1
North Peninsula		0.0	0.0	0.2	0.55	0.1	0.0	0.0	0.2	0.55	0.1	0.0	0.0	0.2	0.55	0.1
South Peninsula		0.0	0.0	0.0	0.91	0.1	0.0	0.0	0.0	0.92	0.0	0.0	0.0	0.0	0.92	0.0
Chignik		97.9	96.4	99.0	0.00	0.8	99.4	98.5	99.9	0.00	0.4	99.9	99.6	100.0	0.00	0.2
East of WASSIP		0.2	0.0	0.7	0.15	0.3	0.1	0.0	0.4	0.75	0.2	0.0	0.0	0.0	0.92	0.0
Chignik	Black Lake	25.0	19.9	30.3	0.00	3.1	10.6	6.4	15.3	0.00	2.7	7.7	4.5	11.2	0.00	2.0
	Chignik Lake	72.9	67.6	78.0	0.00	3.2	88.7	84.0	93.0	0.00	2.7	92.3	88.7	95.4	0.00	2.1

Age				90% CI					90% CI					90% CI	
	Number	Percent	Var	5%	95%	Number	Percent	Var	5%	95%	Number	Percent	Var	5%	95%
0.2	5	1.0	0.00	0.1	1.9	6	1.2	0.00	0.2	2.1	2	0.4	0.00	0.0	0.9
0.3	43	8.8	0.02	6.3	11.3	37	7.3	0.01	5.0	9.5	34	6.8	0.01	4.6	9.0
1.1	1	0.2	0.00	0.0	0.6	1	0.2	0.00	0.0	0.6	0	0.0	0.00	0.0	0.0
1.2	43	8.8	0.02	6.3	11.3	18	3.5	0.01	1.9	5.1	22	4.4	0.01	2.6	6.2
1.3	193	39.4	0.05	35.1	43.7	155	30.5	0.04	26.4	34.5	189	37.6	0.05	33.3	41.8
1.4	6	1.2	0.00	0.2	2.2	8	1.6	0.00	0.5	2.7	5	1.0	0.00	0.1	1.9
2.2	6	1.2	0.00	0.2	2.2	3	0.6	0.00	0.0	1.3	3	0.6	0.00	0.0	1.3
2.3	186	38.0	0.05	33.7	42.3	271	53.2	0.05	48.9	57.6	242	48.1	0.05	43.7	52.5
2.4	5	1.0	0.00	0.1	1.9	4	0.8	0.00	0.0	1.6	1	0.2	0.00	0.0	0.6
3.2	0	0.0	0.00	0.0	0.0	0	0.0	0.00	0.0	0.0	0	0.0	0.00	0.0	0.0
3.3	2	0.4	0.00	0.0	1.0	6	1.2	0.00	0.2	2.1	5	1.0	0.00	0.1	1.9
Total	490					509					503				

Note: Stock and age composition estimates may not sum to 100% due to rounding error. For each temporal stratum, H is the number of sockeye salmon reported to be harvested.
Source: Stock composition estimates initially reported in Dann et al. (2012: Table 12).

Table 5.–Stock and age composition for sockeye salmon of Chignik Bay District, Chignik Area, Westward Region 2008, temporal Strata 1–3. Regional and subregional reporting group-specific stock composition estimates including mean (%), 90% credibility interval (%), the probability that reporting group estimate is equal to zero (P=0), and standard deviation (SD; %). Age composition estimates including number, estimated percent, variance of the estimate, and 90% confidence intervals.

Reporting Group		Stratum 1 (6/9-6/25; H=55,871; n=398)					Stratum 2 (6/26-7/1; H=114,252; n=397)					Stratum 3 (7/4-7/5; H=43,296; n=397)				
			90% CI					90% CI					90% CI			
Regional	Subregional	Mean	5%	95%	P=0	SD	Mean	5%	95%	P=0	SD	Mean	5%	95%	P=0	SD
Norton Sound		0.0	0.0	0.0	0.92	0.0	0.0	0.0	0.0	0.92	0.0	0.0	0.0	0.0	0.92	0.0
Kuskokwim Bay		0.2	0.0	1.0	0.55	0.4	0.0	0.0	0.0	0.79	0.1	0.0	0.0	0.0	0.78	0.1
Bristol Bay		0.2	0.0	0.8	0.16	0.3	0.4	0.0	1.1	0.01	0.4	0.5	0.1	1.2	0.00	0.4
North Peninsula		0.3	0.0	0.8	0.09	0.3	0.1	0.0	0.8	0.45	0.3	0.1	0.0	0.6	0.33	0.2
South Peninsula		0.0	0.0	0.0	0.92	0.0	0.0	0.0	0.0	0.91	0.1	0.0	0.0	0.0	0.92	0.1
Chignik		99.4	98.4	99.9	0.00	0.5	99.5	98.6	100.0	0.00	0.4	99.4	98.5	99.9	0.00	0.4
East of WASSIP		0.0	0.0	0.0	0.92	0.0	0.0	0.0	0.0	0.92	0.0	0.0	0.0	0.0	0.92	0.0
Chignik	Black Lake	94.1	89.7	99.4	0.00	2.8	85.7	79.2	92.0	0.00	3.9	52.9	46.6	59.1	0.00	3.8
	Chignik Lake	5.3	0.0	9.6	0.09	2.7	13.8	7.5	20.2	0.00	3.9	46.5	40.3	52.8	0.00	3.8

Age				90% CI				90% CI				90% CI		
	Number	Percent	Var	5%	95%	Number	Percent	Var	5%	95%	Number	Percent	Var	5%	95%
0.2	0	0.0	0.00	0.0	0.0	0	0.0	0.00	0.0	0.0	0	0.0	0.00	0.0	0.0
0.3	96	18.9	0.03	15.5	22.3	144	26.7	0.04	23.0	30.5	102	19.6	0.03	16.2	23.0
0.4	1	0.2	0.00	0.0	0.6	2	0.4	0.00	0.0	0.9	1	0.2	0.00	0.0	0.6
1.2	23	4.5	0.01	2.7	6.3	26	4.8	0.01	3.0	6.6	36	6.9	0.01	4.7	9.1
1.3	352	69.3	0.04	65.3	73.3	339	62.9	0.04	58.8	67.0	307	58.9	0.05	54.7	63.2
1.4	0	0.0	0.00	0.0	0.0	2	0.4	0.00	0.0	0.9	3	0.6	0.00	0.0	1.2
2.2	7	1.4	0.00	0.4	2.4	5	0.9	0.00	0.1	1.7	6	1.2	0.00	0.2	2.1
2.3	26	5.1	0.01	3.2	7.0	20	3.7	0.01	2.1	5.3	65	12.5	0.02	9.6	15.3
2.4	3	0.6	0.00	0.0	1.3	1	0.2	0.00	0.0	0.5	1	0.2	0.00	0.0	0.6
3.3	0	0.0	0.00	0.0	0.0	0	0.0	0.00	0.0	0.0	0	0.0	0.00	0.0	0.0
Total	508					539					521				

Note: Stock and age composition estimates may not sum to 100% due to rounding error. For each temporal stratum, H is the number of sockeye salmon reported to be harvested.

Source: Stock composition estimates initially reported in Dann et al. (2012: Table 13).

Table 6.–Stock and age composition for sockeye salmon of Chignik Bay District, Chignik Area, Westward Region 2008, temporal Strata 4 and 6. Regional and subregional reporting group-specific stock composition estimates including mean (%), 90% credibility interval (%), the probability that reporting group estimate is equal to zero (P = 0), and standard deviation (SD; %). Age composition estimates including number, estimated percent, variance of the estimate, and 90% confidence intervals.

Reporting Group		Stratum 4 (7/6-7/10; H=61,138; n=400)					Stratum 6 (7/18-7/31; H=88,042; n=397)				
			90% CI					90% CI			
Regional	Subregional	Mean	5%	95%	P=0	SD	Mean	5%	95%	P=0	SD
Norton Sound		0.0	0.0	0.0	0.92	0.0	0.0	0.0	0.0	0.92	0.0
Kuskokwim Bay		0.0	0.0	0.0	0.79	0.0	0.0	0.0	0.0	0.79	0.1
Bristol Bay		0.1	0.0	0.3	0.45	0.1	0.7	0.2	1.6	0.00	0.4
North Peninsula		0.0	0.0	0.2	0.54	0.1	0.0	0.0	0.2	0.56	0.1
South Peninsula		0.0	0.0	0.0	0.92	0.0	0.0	0.0	0.0	0.92	0.0
Chignik		99.9	99.5	100.0	0.00	0.2	99.2	98.4	99.8	0.00	0.5
East of WASSIP		0.0	0.0	0.0	0.93	0.0	0.0	0.0	0.0	0.92	0.0
Chignik	Black Lake	45.4	38.7	52.2	0.00	4.1	8.4	5.0	12.1	0.00	2.2
	Chignik Lake	54.5	47.7	61.2	0.00	4.1	90.8	87.1	94.3	0.00	2.2

Age				90% CI				90% CI	
	Number	Percent	Var	5%	95%	Number	Percent	Var	5%	95%
0.2	1	0.2	0.00	0.0	0.6	2	0.4	0.00	0.0	0.9
0.3	128	24.1	0.03	20.4	27.7	60	11.4	0.02	8.7	14.1
0.4	1	0.2	0.00	0.0	0.6	0	0.0	0.00	0.0	0.0
1.2	26	4.9	0.01	3.1	6.7	11	2.1	0.00	0.9	3.3
1.3	312	58.6	0.05	54.5	62.8	352	66.9	0.04	62.9	70.9
1.4	5	0.9	0.00	0.1	1.8	7	1.3	0.00	0.4	2.3
2.2	6	1.1	0.00	0.2	2.0	8	1.5	0.00	0.5	2.6
2.3	50	9.4	0.02	6.9	11.9	84	16.0	0.03	12.8	19.1
2.4	2	0.4	0.00	0.0	0.9	1	0.2	0.00	0.0	0.6
3.3	1	0.2	0.00	0.0	0.6	1	0.2	0.00	0.0	0.6
Total	532					526				

Note: Stock and age composition estimates may not sum to 100% due to rounding error. For each temporal stratum, H is the number of sockeye salmon reported to be harvested.
Source: Stock composition estimates initially reported in Dann et al. (2012: Table 14).

Table 7.–Stock and age composition for sockeye salmon of Bear River Section, Northern District, Westward Region 2006, temporal Strata 1–3. Regional and subregional reporting group-specific stock composition estimates including mean (%), 90% credibility interval (%), the probability that reporting group estimate is equal to zero ($P = 0$), and standard deviation (SD; %). Age composition estimates including number, estimated percent, variance of the estimate, and 90% confidence intervals.

Reporting Group		Stratum 1 (6/5-7/8; H=16,020; n=384)					Stratum 2 (7/9-7/17; H=156,374; n=402)					Stratum 3 (7/18-7/31; H=189,933; n=398)				
			90% CI					90% CI					90% CI			
Regional	Subregional	Mean	5%	95%	$P=0$	SD	Mean	5%	95%	$P=0$	SD	Mean	5%	95%	$P=0$	SD
Norton Sound		0.0	0.0	0.0	0.91	0.1	0.0	0.0	0.0	0.89	0.2	0.1	0.0	0.3	0.84	0.2
Kuskokwim Bay		0.3	0.0	1.2	0.48	0.5	0.1	0.0	0.4	0.68	0.2	0.0	0.0	0.1	0.78	0.1
Bristol Bay		9.7	6.9	12.7	0.00	1.8	13.9	10.9	17.2	0.00	1.9	17.4	14.0	21.1	0.00	2.2
North Peninsula		88.3	85.1	91.3	0.00	1.9	81.5	77.9	85.0	0.00	2.2	72.1	67.9	76.1	0.00	2.5
South Peninsula		0.0	0.0	0.0	0.89	0.1	0.0	0.0	0.0	0.92	0.1	0.0	0.0	0.0	0.91	0.1
Chignik		0.0	0.0	0.0	0.84	0.1	0.5	0.0	1.4	0.01	0.4	0.0	0.0	0.0	0.85	0.1
East of WASSIP		1.7	0.8	3.0	0.00	0.7	4.0	2.4	5.8	0.00	1.0	10.4	7.9	13.2	0.00	1.6
North Peninsula	Cinder	0.1	0.0	0.3	0.85	0.4	0.0	0.0	0.1	0.88	0.3	4.3	1.7	7.1	0.01	1.7
	Meshik	7.1	4.1	10.4	0.00	1.9	0.3	0.0	1.5	0.41	0.6	0.0	0.0	0.0	0.89	0.2
	Ilnik	0.1	0.0	0.7	0.83	0.3	0.1	0.0	0.3	0.86	0.3	1.0	0.3	2.0	0.00	0.6
	Sandy	8.4	5.7	11.6	0.00	1.8	4.1	2.1	6.5	0.00	1.4	4.3	2.1	7.0	0.00	1.5
	Bear	60.1	55.3	65.0	0.00	2.9	66.6	62.2	70.8	0.00	2.6	58.6	53.8	63.3	0.00	2.9
	Nelson	12.5	9.6	15.6	0.00	1.8	9.5	7.1	12.1	0.00	1.5	3.9	2.3	5.8	0.00	1.1
	NW Dist.-BH	0.0	0.0	0.0	0.89	0.1	1.0	0.1	2.7	0.00	0.8	0.0	0.0	0.0	0.89	0.1

Age				90% CI					90% CI					90% CI	
	Number	Percent	Var	5%	95%	Number	Percent	Var	5%	95%	Number	Percent	Var	5%	95%
0.2	0	0.0	0.00	0.0	0.0	1	0.1	0.00	0.0	0.4	3	0.4	0.00	0.0	0.9
0.3	12	3.2	0.01	1.4	5.0	12	1.5	0.00	0.7	2.3	9	1.2	0.00	0.4	2.0
0.4	1	0.3	0.00	0.0	0.8	3	0.4	0.00	0.0	0.8	0	0.0	0.00	0.0	0.0
1.2	37	9.9	0.02	6.9	12.9	123	15.3	0.02	12.8	17.8	191	25.7	0.03	22.6	28.9
1.3	142	38.0	0.06	33.0	42.9	229	28.5	0.03	25.4	31.6	198	26.7	0.03	23.5	29.9
1.4	12	3.2	0.01	1.4	5.0	14	1.7	0.00	0.8	2.6	14	1.9	0.00	0.9	2.9
2.2	57	15.2	0.03	11.6	18.9	230	28.6	0.03	25.5	31.8	192	25.9	0.03	22.7	29.0
2.3	102	27.3	0.05	22.8	31.8	179	22.3	0.02	19.4	25.2	132	17.8	0.02	15.0	20.5
2.4	8	2.1	0.01	0.7	3.6	6	0.7	0.00	0.2	1.3	2	0.3	0.00	0.0	0.6
3.2	1	0.3	0.00	0.0	0.8	2	0.2	0.00	0.0	0.6	1	0.1	0.00	0.0	0.4
3.3	2	0.5	0.00	0.0	1.3	4	0.5	0.00	0.0	1.0	0	0.0	0.00	0.0	0.0
Total	374					803					742				

Note: Stock and age composition estimates may not sum to 100% due to rounding error. For each temporal stratum, H is the number of sockeye salmon reported to be harvested.

Source: Stock composition estimates initially reported in Dann et al. (2012: Table 47).

Table 8.–Stock and age composition for sockeye salmon of Three Hills Section, Northern District, Westward Region 2006, temporal Strata 2–3. Regional and subregional reporting group-specific stock composition estimates including mean (%), 90% credibility interval (%), the probability that reporting group estimate is equal to zero (P = 0), and standard deviation (SD; %). Age composition estimates including number, estimated percent, variance of the estimate, and 90% confidence intervals.

Reporting Group		Stratum 2 (7/14-7/17; H=64,963; n=332)					Stratum 3 (7/18-7/28; H=30,463; n=320)				
			90% CI					90% CI			
Regional	Subregional	Mean	5%	95%	P=0	SD	Mean	5%	95%	P=0	SD
Norton Sound		0.0	0.0	0.0	0.90	0.1	0.0	0.0	0.0	0.91	0.1
Kuskokwim Bay		0.8	0.0	2.2	0.25	0.8	0.1	0.0	0.7	0.68	0.3
Bristol Bay		44.8	39.5	50.1	0.00	3.2	40.8	35.6	46.1	0.00	3.2
North Peninsula		51.9	46.7	57.2	0.00	3.2	49.2	43.8	54.5	0.00	3.3
South Peninsula		0.2	0.0	0.9	0.67	0.4	0.1	0.0	0.3	0.87	0.3
Chignik		0.0	0.0	0.1	0.80	0.1	0.0	0.0	0.0	0.83	0.1
East of WASSIP		2.3	1.1	3.9	0.00	0.9	9.9	7.2	12.9	0.00	1.7
North Peninsula	Cinder	0.7	0.0	4.0	0.47	1.5	5.1	2.2	8.6	0.01	2.0
	Meshik	6.3	2.3	10.3	0.00	2.4	0.7	0.0	2.7	0.29	1.0
	Ilnik	4.9	2.3	7.9	0.00	1.7	9.0	4.6	13.5	0.00	2.7
	Sandy	2.3	0.7	4.4	0.00	1.2	2.9	1.2	5.0	0.00	1.2
	Bear	25.9	21.4	30.5	0.00	2.8	30.7	26.0	35.7	0.00	3.0
	Nelson	11.8	8.8	15.1	0.00	1.9	0.4	0.0	1.3	0.00	0.4
	NW Dist.-BH	0.0	0.0	0.0	0.83	0.1	0.3	0.0	1.0	0.04	0.3

Age				90% CI				90% CI	
	Number	Percent	Var	5%	95%	Number	Percent	Var	5%	95%
0.3	1	0.5	0.00	0.0	1.5	3	1.1	0.00	0.0	2.2
0.4	0	0.0	0.00	0.0	0.0	3	1.1	0.00	0.0	2.2
1.2	49	25.1	0.10	19.0	31.2	92	32.3	0.08	26.8	37.7
1.3	58	29.7	0.11	23.3	36.2	71	24.9	0.07	19.9	29.9
1.4	7	3.6	0.02	1.0	6.2	10	3.5	0.01	1.4	5.6
2.2	42	21.5	0.09	15.8	27.3	58	20.4	0.06	15.7	25.0
2.3	38	19.5	0.08	13.9	25.1	46	16.1	0.05	11.9	20.4
2.4	0	0.0	0.00	0.0	0.0	0	0.0	0.00	0.0	0.0
3.3	0	0.0	0.00	0.0	0.0	2	0.7	0.00	0.0	1.7
Total	195					285				

Note: Stock and age composition estimates may not sum to 100% due to rounding error. For each temporal stratum, H is the number of sockeye salmon reported to be harvested.
Source: Stock composition estimates initially reported in Dann et al. (2012: Table 49).

Table 9.–Stock and age composition for sockeye salmon of SW Ilnik area, Northern District, Westward Region 2006, temporal Strata 1–3. Regional and subregional reporting group-specific stock composition estimates including mean (%), 90% credibility interval (%), the probability that reporting group estimate is equal to zero (P = 0), and standard deviation (SD; %). Age composition estimates including number, estimated percent, variance of the estimate, and 90% confidence intervals.

		Stratum 1 (6/25-7/4; H=301,660; n=392)					Stratum 2 (7/5-7/17; H=327,913; n=395)					Stratum 3 (7/18-7/31; H=63,937; n=397)				
Reporting Group			90% CI					90% CI					90% CI			
Regional	Subregional	Mean	5%	95%	P=0	SD	Mean	5%	95%	P=0	SD	Mean	5%	95%	P=0	SD
Norton Sound		0.1	0.0	0.0	0.89	0.3	0.0	0.0	0.0	0.89	0.2	0.0	0.0	0.0	0.90	0.1
Kuskokwim Bay		2.6	0.0	5.1	0.07	1.5	0.4	0.0	1.6	0.46	0.6	0.5	0.0	1.6	0.20	0.6
Bristol Bay		52.4	47.5	57.3	0.00	3.0	53.1	48.2	58.0	0.00	3.0	52.3	47.6	57.0	0.00	2.9
North Peninsula		43.1	38.4	47.8	0.00	2.9	42.0	37.2	46.9	0.00	3.0	34.6	30.1	39.2	0.00	2.8
South Peninsula		0.0	0.0	0.0	0.91	0.1	0.1	0.0	0.2	0.87	0.2	0.0	0.0	0.0	0.91	0.1
Chignik		0.1	0.0	0.7	0.66	0.3	0.0	0.0	0.1	0.82	0.1	0.0	0.0	0.0	0.84	0.1
East of WASSIP		1.7	0.7	3.2	0.00	0.8	4.4	2.8	6.3	0.00	1.1	12.6	9.8	15.6	0.00	1.8
North Peninsula	Cinder	3.2	0.0	7.4	0.13	2.5	1.8	0.0	5.1	0.26	1.8	4.2	1.6	7.1	0.01	1.7
	Meshik	2.6	0.6	6.6	0.00	1.9	2.7	0.4	6.4	0.00	1.9	0.2	0.0	1.0	0.84	0.8
	Ilnik	16.6	12.7	20.7	0.00	2.5	4.8	2.2	7.6	0.00	1.6	2.2	0.8	4.4	0.00	1.1
	Sandy	3.1	1.4	5.1	0.00	1.2	5.8	3.6	8.4	0.00	1.5	1.5	0.0	3.2	0.05	1.0
	Bear	14.7	11.4	18.3	0.00	2.1	20.5	16.8	24.5	0.00	2.3	23.3	19.5	27.4	0.00	2.4
	Nelson	2.9	1.5	4.5	0.00	0.9	6.5	4.2	9.0	0.00	1.4	3.3	1.8	5.1	0.00	1.0
	NW Dist.-BH	0.0	0.0	0.0	0.91	0.1	0.0	0.0	0.0	0.92	0.0	0.0	0.0	0.2	0.86	0.2

Age				90% CI				90% CI				90% CI			
	Number	Percent	Var	5%	95%	Number	Percent	Var	5%	95%	Number	Percent	Var	5%	95%
0.2	0	0.0	0.00	0.0	0.0	0	0.0	0.00	0.0	0.0	3	0.5	0.00	0.0	1.1
0.3	26	5.9	0.01	3.7	8.1	21	2.2	0.00	1.3	3.2	4	0.7	0.00	0.0	1.4
0.4	9	2.0	0.00	0.7	3.3	5	0.5	0.00	0.1	1.0	3	0.5	0.00	0.0	1.1
0.5	0	0.0	0.00	0.0	0.0	1	0.1	0.00	0.0	0.3	0	0.0	0.00	0.0	0.0
1.2	47	10.6	0.02	7.7	13.5	251	26.5	0.02	23.7	29.3	163	28.5	0.04	24.8	32.3
1.3	201	45.4	0.06	40.7	50.0	271	28.6	0.02	25.7	31.5	128	22.4	0.03	19.0	25.8
1.4	16	3.6	0.01	1.9	5.4	25	2.6	0.00	1.6	3.7	7	1.2	0.00	0.3	2.1
1.5	1	0.2	0.00	0.0	0.7	0	0.0	0.00	0.0	0.0	0	0.0	0.00	0.0	0.0
2.1	1	0.2	0.00	0.0	0.7	0	0.0	0.00	0.0	0.0	0	0.0	0.00	0.0	0.0
2.2	29	6.5	0.01	4.2	8.9	183	19.3	0.02	16.8	21.8	164	28.7	0.04	25.0	32.4
2.3	108	24.4	0.04	20.4	28.4	172	18.2	0.02	15.7	20.6	93	16.3	0.02	13.3	19.3
2.4	4	0.9	0.00	0.0	1.8	8	0.8	0.00	0.3	1.4	3	0.5	0.00	0.0	1.1
3.2	0	0.0	0.00	0.0	0.0	4	0.4	0.00	0.0	0.8	3	0.5	0.00	0.0	1.1
3.3	1	0.2	0.00	0.0	0.7	6	0.6	0.00	0.1	1.1	0	0.0	0.00	0.0	0.0
Total	443					947					571				

Note: Stock and age composition estimates may not sum to 100% due to rounding error. For each temporal stratum, H is the number of sockeye salmon reported to be harvested.

Source: Stock composition estimates initially reported in Dann et al. (2012: Table 50).

Table 10.–Stock and age composition for sockeye salmon of SW Ilnik area, Northern District, Westward Region 2007, temporal Strata 1–3. Regional and subregional reporting group-specific stock composition estimates including mean (%), 90% credibility interval (%), the probability that reporting group estimate is equal to zero (P = 0), and standard deviation (SD; %). Age composition estimates including number, estimated percent, variance of the estimate, and 90% confidence intervals.

Reporting Group		Stratum 1 (6/20-6/27; H=201,954; n=394)					Stratum 2 (6/28-7/7; H=484,898; n=396)					Stratum 3 (7/10-7/31; H=239,612; n=354)				
			90% CI					90% CI					90% CI			
Regional	Subregional	Mean	5%	95%	P=0	SD	Mean	5%	95%	P=0	SD	Mean	5%	95%	P=0	SD
Norton Sound		0.0	0.0	0.0	0.92	0.0	0.0	0.0	0.0	0.92	0.1	0.0	0.0	0.0	0.92	0.0
Kuskokwim Bay		0.1	0.0	0.5	0.65	0.2	0.0	0.0	0.0	0.78	0.1	0.7	0.0	2.8	0.45	1.0
Bristol Bay		30.2	26.1	34.4	0.00	2.5	72.9	68.6	77.0	0.00	2.6	41.4	36.6	46.3	0.00	3.0
North Peninsula		69.5	65.2	73.6	0.00	2.5	26.3	22.2	30.6	0.00	2.5	48.3	43.5	53.1	0.00	2.9
South Peninsula		0.0	0.0	0.0	0.91	0.1	0.0	0.0	0.0	0.92	0.0	0.0	0.0	0.0	0.91	0.1
Chignik		0.0	0.0	0.0	0.84	0.1	0.0	0.0	0.0	0.85	0.0	0.0	0.0	0.0	0.84	0.1
East of WASSIP		0.3	0.0	0.9	0.00	0.3	0.8	0.2	1.7	0.00	0.5	9.6	7.0	12.5	0.00	1.7
North Peninsula	Cinder	7.3	3.6	11.5	0.00	2.4	6.3	3.4	9.6	0.00	1.9	2.2	0.0	4.9	0.06	1.5
	Meshik	1.7	0.0	4.7	0.07	1.5	3.6	0.0	7.2	0.09	2.2	0.1	0.0	0.1	0.88	0.5
	Ilnik	38.0	33.0	43.1	0.00	3.1	2.4	0.9	4.3	0.00	1.1	1.7	0.6	3.3	0.00	0.9
	Sandy	4.3	2.4	6.5	0.00	1.3	0.6	0.0	1.7	0.01	0.6	0.5	0.0	2.5	0.63	0.9
	Bear	14.2	10.9	17.6	0.00	2.0	10.1	7.4	13.1	0.00	1.8	35.6	31.1	40.1	0.00	2.8
	Nelson	4.0	2.3	5.9	0.00	1.1	3.3	1.8	5.1	0.00	1.0	7.2	5.0	9.7	0.00	1.5
	NW Dist.-BH	0.0	0.0	0.0	0.91	0.1	0.0	0.0	0.0	0.92	0.1	1.1	0.3	2.3	0.00	0.6

Age				90% CI					90% CI					90% CI	
	Number	Percent	Var	5%	95%	Number	Percent	Var	5%	95%	Number	Percent	Var	5%	95%
0.2	5	0.7	0.00	0.1	1.3	1	0.2	0.00	0.0	0.6	0	0.0	0.00	0.0	0.0
0.3	166	23.4	0.03	20.3	26.6	45	9.0	0.02	6.5	11.5	7	4.0	0.02	1.1	6.8
0.4	32	4.5	0.01	3.0	6.1	8	1.6	0.00	0.5	2.7	0	0.0	0.00	0.0	0.0
1.2	134	18.9	0.02	16.0	21.8	166	33.1	0.04	28.9	37.2	48	27.1	0.11	20.6	33.7
1.3	217	30.6	0.03	27.3	34.0	181	36.1	0.05	31.9	40.3	75	42.4	0.14	35.1	49.7
1.4	19	2.7	0.00	1.5	3.9	2	0.4	0.00	0.0	1.0	1	0.6	0.00	0.0	1.7
2.2	35	4.9	0.01	3.3	6.5	24	4.8	0.01	2.9	6.6	18	10.2	0.05	5.7	14.6
2.3	97	13.7	0.02	11.2	16.2	71	14.1	0.02	11.1	17.2	27	15.3	0.07	9.9	20.6
2.4	0	0.0	0.00	0.0	0.0	3	0.6	0.00	0.0	1.3	1	0.6	0.00	0.0	1.7
3.2	1	0.1	0.00	0.0	0.4	0	0.0	0.00	0.0	0.0	0	0.0	0.00	0.0	0.0
3.3	1	0.1	0.00	0.0	0.4	1	0.2	0.00	0.0	0.6	0	0.0	0.00	0.0	0.0
3.4	1	0.1	0.00	0.0	0.4	0	0.0	0.00	0.0	0.0	0	0.0	0.00	0.0	0.0
Total	708					502					177				

Note: Stock and age composition estimates may not sum to 100% due to rounding error. For each temporal stratum, H is the number of sockeye salmon reported to be harvested.

Source: Stock composition estimates initially reported in Dann et al. (2012: Table 51).

Table 11.–Stock and age composition for sockeye salmon of NW Ilnik area, Northern District, Westward Region 2008, temporal Strata 1–2. Regional and subregional reporting group-specific stock composition estimates including mean (%), 90% credibility interval (%), the probability that reporting group estimate is equal to zero ($P = 0$), and standard deviation (SD; %). Age composition estimates including number, estimated percent, variance of the estimate, and 90% confidence intervals.

Reporting Group		Stratum 1 (6/30-7/3; H=100,032; n=384)					Stratum 2 (7/4-7/11; H=151,246; n=393)				
			90% CI					90% CI			
Regional	Subregional	Mean	5%	95%	$P=0$	SD	Mean	5%	95%	$P=0$	SD
Norton Sound		0.0	0.0	0.0	0.91	0.1	0.0	0.0	0.0	0.92	0.1
Kuskokwim Bay		3.1	1.3	5.3	0.00	1.3	5.5	2.9	8.1	0.00	1.6
Bristol Bay		58.2	53.3	62.9	0.00	2.9	69.1	64.4	73.7	0.00	2.8
North Peninsula		38.3	33.4	43.1	0.00	2.9	25.2	21.1	29.5	0.00	2.6
South Peninsula		0.0	0.0	0.0	0.89	0.1	0.0	0.0	0.0	0.89	0.1
Chignik		0.0	0.0	0.0	0.85	0.1	0.0	0.0	0.0	0.84	0.1
East of WASSIP		0.5	0.0	2.5	0.44	0.9	0.2	0.0	1.0	0.42	0.4
North Peninsula	Cinder	1.8	0.0	4.4	0.12	1.5	5.0	2.5	7.9	0.00	1.7
	Meshik	14.5	10.5	19.0	0.00	2.6	9.4	6.6	12.6	0.00	1.8
	Ilnik	8.6	5.7	11.9	0.00	1.9	0.6	0.1	1.3	0.00	0.4
	Sandy	1.1	0.1	2.5	0.02	0.8	0.4	0.0	1.8	0.49	0.7
	Bear	7.7	5.1	10.7	0.00	1.7	4.2	2.4	6.3	0.00	1.2
	Nelson	4.4	2.7	6.5	0.00	1.2	5.6	3.7	7.8	0.00	1.3
	NW Dist.-BH	0.1	0.0	0.2	0.88	0.3	0.0	0.0	0.0	0.89	0.1

Age				90% CI			90% CI		
	Number	Percent	Var	5%	95%	Number	Percent	Var	5%	95%
0.2	2	0.6	0.00	0.0	1.4	3	0.8	0.00	0.0	1.6
0.3	79	22.7	0.05	18.3	27.1	78	19.6	0.04	15.7	23.5
0.4	8	2.3	0.01	0.7	3.9	6	1.5	0.00	0.3	2.7
0.5	3	0.9	0.00	0.0	1.8	0	0.0	0.00	0.0	0.0
1.2	19	5.5	0.01	3.1	7.9	56	14.1	0.03	10.6	17.5
1.3	187	53.7	0.07	48.5	59.0	219	55.0	0.06	50.1	59.9
1.4	8	2.3	0.01	0.7	3.9	9	2.3	0.01	0.8	3.7
1.5	1	0.3	0.00	0.0	0.9	0	0.0	0.00	0.0	0.0
2.2	10	2.9	0.01	1.1	4.6	15	3.8	0.01	1.9	5.6
2.3	29	8.3	0.02	5.4	11.2	10	2.5	0.01	1.0	4.1
2.4	1	0.3	0.00	0.0	0.9	2	0.5	0.00	0.0	1.2
3.3	1	0.3	0.00	0.0	0.9	0	0.0	0.00	0.0	0.0
Total	348					398				

Note: Stock and age composition estimates may not sum to 100% due to rounding error. For each temporal stratum, H is the number of sockeye salmon reported to be harvested.
Source: Stock composition estimates initially reported in Dann et al. (2012: Table 52).

Table 12.–Stock and age composition for sockeye salmon of NW Ilnik area, Northern District, Westward Region 2006, temporal Strata 1–3. Regional and subregional reporting group-specific stock composition estimates including mean (%), 90% credibility interval (%), the probability that reporting group estimate is equal to zero (P = 0), and standard deviation (SD; %). Age composition estimates including number, estimated percent, variance of the estimate, and 90% confidence intervals.

Reporting Group		Stratum 1 (6/25-6/29; H=83,223; n=392)					Stratum 2 (7/3-7/14; H=336,573; n=392)					Stratum 3 (7/17-7/28; H=115,945; n=393)				
			90% CI					90% CI					90% CI			
Regional	Subregional	Mean	5%	95%	P=0	SD	Mean	5%	95%	P=0	SD	Mean	5%	95%	P=0	SD
Norton Sound		0.0	0.0	0.0	0.90	0.2	0.0	0.0	0.0	0.92	0.0	0.0	0.0	0.0	0.90	0.1
Kuskokwim Bay		0.1	0.0	0.8	0.68	0.4	1.9	0.0	4.4	0.14	1.4	0.0	0.0	0.3	0.69	0.2
Bristol Bay		48.1	43.3	52.8	0.00	2.9	69.0	64.1	73.9	0.00	3.0	81.4	77.7	84.9	0.00	2.2
North Peninsula		47.8	43.0	52.6	0.00	2.9	27.3	22.8	31.9	0.00	2.8	10.9	8.0	14.0	0.00	1.8
South Peninsula		0.0	0.0	0.0	0.92	0.0	0.0	0.0	0.0	0.92	0.1	0.0	0.0	0.1	0.87	0.2
Chignik		0.0	0.0	0.0	0.84	0.1	0.1	0.0	0.7	0.60	0.3	0.0	0.0	0.0	0.85	0.1
East of WASSIP		4.0	2.4	5.9	0.00	1.1	1.7	0.7	2.9	0.00	0.7	7.6	5.4	10.1	0.00	1.4
North Peninsula	Cinder	10.7	6.0	15.5	0.00	2.9	0.9	0.0	4.2	0.26	1.5	0.0	0.0	0.1	0.88	0.3
	Meshik	2.6	0.7	4.9	0.02	1.4	4.3	0.0	8.9	0.10	2.8	0.1	0.0	0.4	0.67	0.2
	Ilnik	14.1	10.5	18.1	0.00	2.3	5.8	3.1	9.0	0.00	1.8	1.4	0.5	2.7	0.00	0.7
	Sandy	3.7	1.8	5.9	0.00	1.2	2.4	1.0	4.1	0.00	1.0	1.3	0.3	2.7	0.01	0.7
	Bear	15.1	11.7	18.8	0.00	2.2	9.4	6.5	12.6	0.00	1.9	6.2	4.0	8.8	0.00	1.5
	Nelson	1.6	0.6	3.0	0.00	0.7	4.6	2.6	6.8	0.00	1.3	1.5	0.6	2.7	0.00	0.7
	NW Dist.-BH	0.0	0.0	0.0	0.92	0.0	0.0	0.0	0.0	0.92	0.1	0.4	0.0	1.7	0.60	0.6

Age				90% CI					90% CI					90% CI		
	Number	Percent	Var	5%	95%	Number	Percent	Var	5%	95%	Number	Percent	Var	5%	95%
0.2	1	0.2	0.00	0.0	0.7	0	0.0	0.00	0.0	0.0	1	0.1	0.00	0.0	0.3
0.3	31	7.5	0.02	5.0	10.1	39	4.7	0.01	3.2	6.1	9	1.0	0.00	0.3	1.6
0.4	8	1.9	0.00	0.6	3.3	12	1.4	0.00	0.6	2.2	1	0.1	0.00	0.0	0.3
1.2	32	7.8	0.02	5.2	10.4	179	21.5	0.02	18.7	24.3	360	39.5	0.03	36.3	42.6
1.3	191	46.4	0.06	41.5	51.2	335	40.2	0.03	36.8	43.5	215	23.6	0.02	20.8	26.3
1.4	9	2.2	0.01	0.8	3.6	10	1.2	0.00	0.5	1.9	12	1.3	0.00	0.6	2.1
1.5	0	0.0	0.00	0.0	0.0	0	0.0	0.00	0.0	0.0	2	0.2	0.00	0.0	0.5
2.2	41	10.0	0.02	7.1	12.8	100	12.0	0.01	9.8	14.2	161	17.7	0.02	15.2	20.1
2.3	95	23.1	0.04	19.0	27.1	156	18.7	0.02	16.1	21.4	133	14.6	0.01	12.3	16.9
2.4	2	0.5	0.00	0.0	1.2	1	0.1	0.00	0.0	0.4	9	1.0	0.00	0.3	1.6
3.2	0	0.0	0.00	0.0	0.0	1	0.1	0.00	0.0	0.4	6	0.7	0.00	0.1	1.2
3.3	2	0.5	0.00	0.0	1.2	1	0.1	0.00	0.0	0.4	3	0.3	0.00	0.0	0.7
Total	412					834					912				

Note: Stock and age composition estimates may not sum to 100% due to rounding error. For each temporal stratum, H is the number of sockeye salmon reported to be harvested.
Source: Stock composition estimates initially reported in Dann et al. (2012: Table 53).

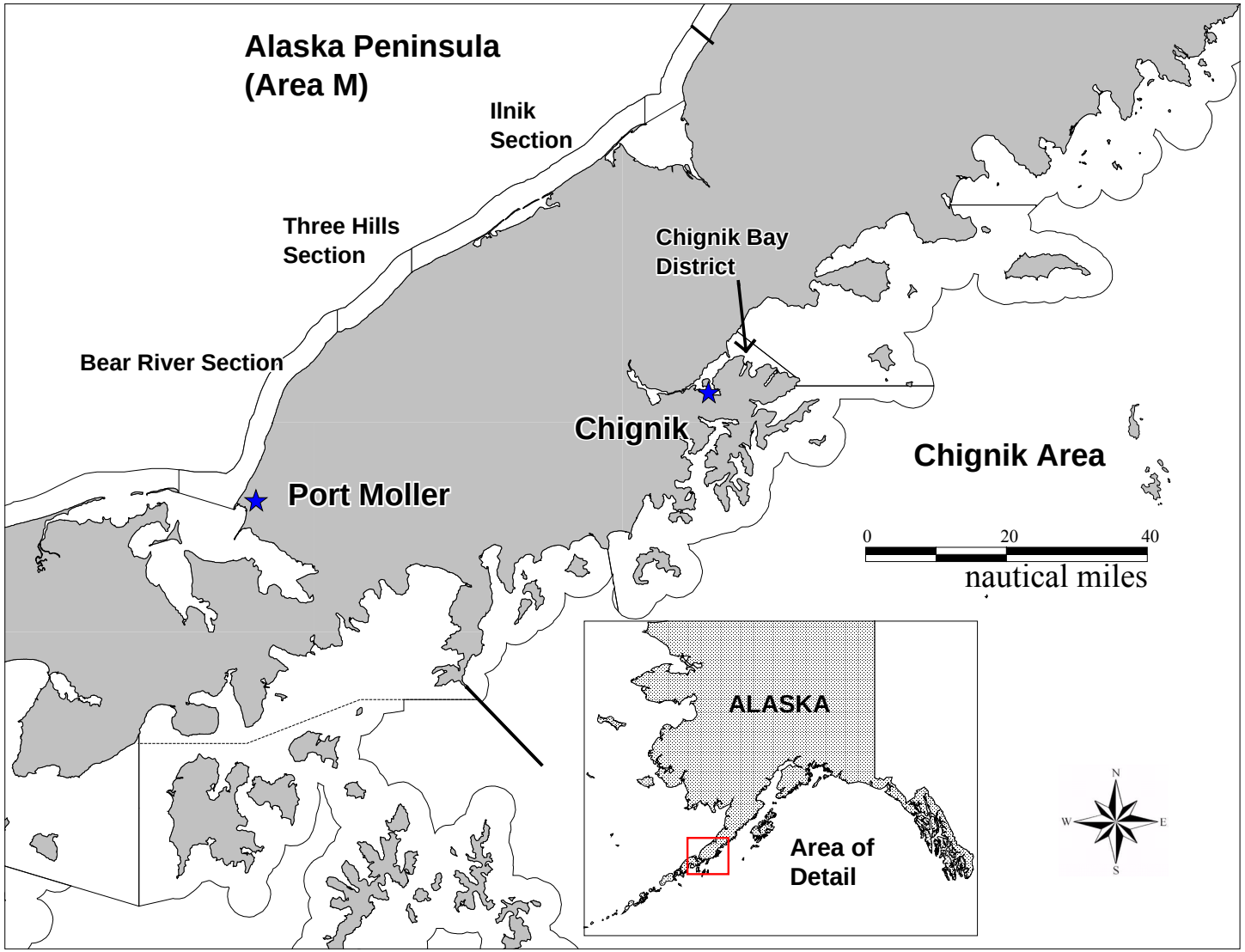

Figure 1.–Chignik Area and Alaska Peninsula Area map depicting commercial fishing sections or districts of WASSIP sampling locations where paired sampling (genetics and age) was conducted.