Special Publication No. 08-16

Pink Salmon Stock Status and Escapement Goals in Southeast Alaska and Yakutat

by

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and

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December 2008

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

Symbols and Abbreviations

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Weights and measures (metric)

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

Weights and measures (English)

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

Time and temperature

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

Physics and chemistry

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

General

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

Measures (fisheries)

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

Mathematics, statistics

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

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December 2008

The Special Publication series was established by the Division of Sport Fish in 1991 for the publication of techniques and procedures manuals, informational pamphlets, special subject reports to decision-making bodies, symposia and workshop proceedings, application software documentation, in-house lectures, and became a joint divisional series in 2004 with the Division of Commercial Fisheries. Special Publications are intended for fishery and other technical professionals. Special Publications are available through the Alaska State Library, Alaska Resources Library and Information Services (ARLIS) and on the Internet: http://www.sf.adfg.state.ak.us/statewide/divreports/html/intersearch.cfm. This publication has undergone editorial and peer review.

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This document should be cited as:
Heinl, S. C., D. M. Eggers, and A. W. Piston. 2008. Pink salmon stock status and escapement goals in Southeast Alaska and Yakutat. Alaska Department of Fish and Game, Special Publication No. 08-16, Anchorage.

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ABSTRACT

Pink salmon have been harvested in Southeast Alaska at the highest levels since record keeping began in the 20th century, though the annual average harvest over the past 10 years has dropped slightly compared to the 1990s, due to poor runs in 2006 and 2008. Recent changes to the Southeast Alaska pink salmon index, including removal of observer calibrations, addition of index observers, addition and removal of index streams, and automation of the index in the ADF&G regional database, required us to undertake a re-analysis of escapement goals that were established for three sub-regions in Southeast Alaska in 2003. We used a "tabular approach" to summarize 48 years of escapement and harvest information, and we examined yield as a function of escapement level, using a range of hypothesized expansions of escapement index to total escapement. This approach provided a range of highest potential yields, on which the revised *biological escapement goals* for the Southern Southeast, Northern Southeast Inside, and Northern Southeast Outside sub-regions are based. We also re-calculated escapement management targets to smaller districts and stock groups within each of the three sub-regions. With the exception of 2008, pink salmon escapement indices have been within or above escapement goals in Southeast Alaska, and escapements appear to have been well-distributed throughout the region. Escapement goals have also been met in nine of the last 10 years in the Situk River, in the Yakutat area. At this time, there are no stocks of pink salmon in Southeast Alaska or the Yakutat area that can be considered *stocks of concern*, under the definition of the Board of Fisheries' Sustainable Salmon Fisheries Policy; however, pink salmon runs in the Northern Inside sub-region will require careful management in the coming years due to particularly poor escapement in 2008.

Key words: escapement, escapement goals, escapement index, *Oncorhynchus gorbuscha*, pink salmon, Situk River, Southeast Alaska, stock status, Yakutat.

INTRODUCTION

Wild pink salmon (*Oncorhynchus gorbuscha*) spawn in approximately 2,500 short, coastal streams in Southeast Alaska (Zadina et al. 2004), and support a large and valuable commercial fishing industry (Clark et al. 2006). Pink salmon comprised an average 70% of all the salmon harvested, by numbers of fish, in Southeast Alaska over the most recent 10-year period, 1999–2008. An average of 44 million fish per year were harvested in the commercial fishery in Southeast Alaska over this same period, including the largest catch on record of 78 million fish in 1999 (Figure 1). The exvessel value of the commercial pink salmon harvest averaged $20 million a year, and ranged between $8 and $32 million, making pink salmon the most valuable species after chum salmon (*O. keta*) in Southeast Alaska fisheries. The majority of pink salmon harvested in Southeast Alaska commercial fisheries have been taken by purse seine gear (96%), while smaller portions were harvested in drift gillnet (3%), troll, and set gillnet (Yakutat area only) fisheries. Small numbers of pink salmon have been harvested in sport, personal use, and subsistence fisheries. Nearly all of the pink salmon harvested in Southeast Alaska are of wild origin: hatchery-produced pink salmon have contributed an average of only 4% of the total annual harvest since the late 1970s (White 2008, and previous reports in that series; Figure 1). Biological escapement goals based on weir counts have been maintained for the Situk River, one of the larger producers of pink salmon in the Yakutat area (Clark 1995, Heinl and Geiger 2005). For the rest of Southeast Alaska, escapement goals have been maintained for aggregates of pink salmon runs in three broad sub-regions; Southern Southeast sub-region, Northern Southeast Inside sub-region, and Northern Southeast Outside sub-region (Zadina et al. 2004).

Pink salmon stocks in Southeast Alaska are managed through extensive inseason monitoring of harvests, fishing effort, and developing escapements (Van Alen 2000, Zadina et al. 2004). Because pink salmon production is broadly dispersed in Southeast Alaska, the inseason assessment of escapements has been based on aerial observation. Prior to making decisions about opening fishing areas, experienced fishery managers fly over many miles of pink salmon spawning habitat and assess whether adequate numbers of salmon are present, and whether the

timing of the escapement is consistent with previous patterns. Although the managers fly these surveys to assess inseason abundance to base management decisions, a numerical summary of their visual impressions about salmon abundance is retained as one of the most important indicators of salmon abundance and management success. The peak annual aerial survey counts to a set of over 700 streams in the region are used to generate an annual escapement measure, or "index" of abundance, upon which the escapement goals are based.

The Southeast Alaska pink salmon escapement index was recently changed from that reported by Zadina et al. (2004) and updated by Heinl and Geiger (2005). The principal change was the complete removal of the "bias adjustments" that were previously made in an attempt to adjust for differences in observer counting rates (Hofmeister 1998, Van Alen 2000). Although the method used seemed like a practical way to address the well-known problem of observer counting bias (Dangel and Jones 1988, Jones et al. 1998), a close examination indicated that the calibrations often induced significant error due to the manner that observations from uncalibrated observers; were treated in historical data; therefore, we revised the current pink salmon escapement index using only raw survey data. Other changes included the addition and removal of index streams, addition of index observers (i.e., those experienced aerial observers whose aerial survey data are used to formulate the index) to make better use of available historical data, and the complete automation of the index through the Southeast Alaska Integrated Fisheries Database. The current pink salmon escapement index will be described in detail by Heinl et al. (*in prep*.). The recent changes made to the escapement index required us to recast the biological escapement goals for Southeast Alaska pink salmon.

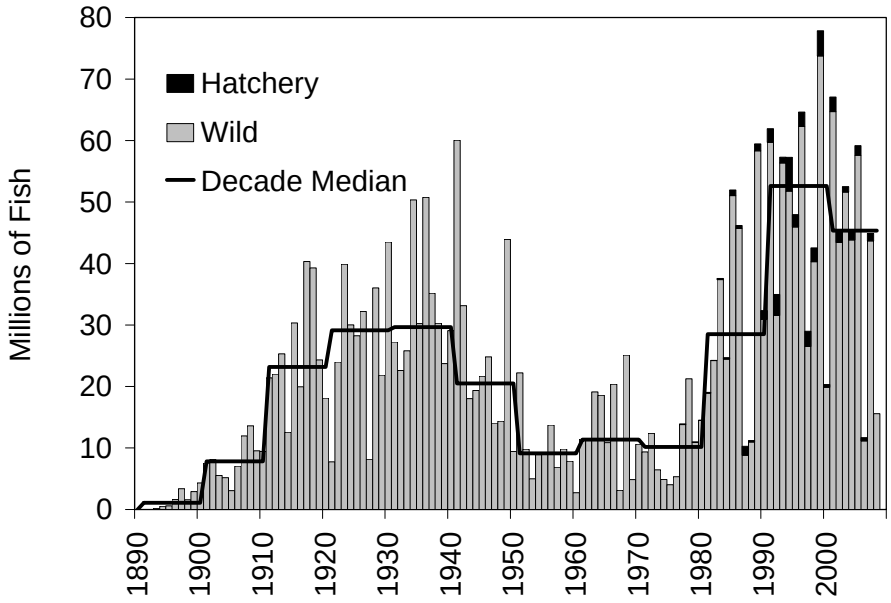

Figure 1.–Annual harvest of wild and hatchery-produced pink salmon in Southeast Alaska, 1890–2008. The black line represents the median catch by decade (data prior to 1960 are from Byerly et al. 1999).

In this report we provide a brief review of stock assessment measures for pink salmon in Southeast Alaska and the Yakutat area, provide a re-analysis of the biological escapement goals for Southeast Alaska using the same method employed by Zadina et al. (2004) and the current pink salmon index, and assess the recent pink salmon escapement performance in relation to the new index-based escapement goals.

DEFINITION OF PINK SALMON STOCKS

The vast majority of the pink salmon harvest in the region takes place in mixed-stock or passing-stock fisheries in the waters surrounding the Alexander Archipelago, from Dixon Entrance, north to Cross Sound, Icy Strait and Lynn Canal—what we refer to throughout the rest of this report as "Southeast Alaska," as distinct from the Yakutat area. Yakutat area pink salmon stocks are spatially segregated from the rest of Southeast Alaska, and are harvested primarily in terminal, in-river set gillnet fisheries (Clark 1995). Management and assessment of Yakutat area pink salmon stocks has occurred consistently only for the Situk River. Southeast Alaska pink salmon harvest statistics and escapement indices have commonly been divided into areas that reflect fisheries management divisions (management areas, districts, and stock groups) as well as biological divisions (sub-regions). Because Southeast Alaska pink salmon are largely harvested in mixed-stock fisheries, often some distance from spawning areas, it is not possible to allocate harvests of pink salmon to stock group of origin at any finer scale than sub-region. Therefore, biological escapement goals for Southeast Alaska pink salmon have been established at the sub-region level (Zadina et al. 2004). These sub-regional goals were further divided into "management targets" for the 12 management districts and 46 stock groups where pink salmon are monitored, as an aid to assessing the spatial distribution of the pink salmon escapement across Southeast Alaska (Zadina et al. 2004). These management targets are not considered to be escapement goals under the definition of the Statewide Salmon Escapement Goal Policy (5 AAC 39.223).

MANAGEMENT AREAS

There are four management areas in Southeast Alaska (Juneau, Ketchikan, Petersburg, and Sitka; see Appendix A1), which are further divided into 15 management districts (Districts 1–15). ADF&G Fisheries managers are responsible for managing the fisheries and monitoring escapements of pink salmon in each of their respective management areas.

SUB-REGIONS

Marine tagging studies have repeatedly demonstrated that Southeast Alaska pink salmon stocks are strongly segregated into southern and northern areas or sub-regions (e.g., Rich 1927, Rich and Suomela 1929, Rich and Morton 1930, Nakatani et al. 1975, Hoffman 1983), and the commercial fisheries in each sub-region generally target pink salmon stocks that ultimately spawn in that sub-region. The Southern Southeast sub-region comprises pink salmon stocks from Sumner Strait and south (Districts 1–8), while the Northern Southeast sub-region comprises pink salmon stocks north of Sumner Strait (Districts 9–15). In 1998, the northern area was further divided into Northern Southeast Inside and Northern Southeast Outside sub-regions, as marine tagging studies also showed that pink salmon spawning on the outer coast of Chichagof and Baranof islands generally do not enter inside waters (Nakatani et al. 1975, Alexandersdottir 1987). The Northern Southeast Outside sub-region includes all waters of District 13 (excluding Peril Straits and Hoonah Sound subdistricts 113-51 through 59, which are considered part of the Northern Southeast Inside sub-region).

STOCK GROUPS

Southeast Alaska has also been divided into 53 smaller "stock groups" contained within the district boundaries (Zadina et al. 2004; Appendices A2–A5). Each stock group represents a

collection of streams that support pink salmon runs with similar migration routes and run timing, are managed as a unit, and are assumed to share similar productivity and exploitation rates (Van Alen 2000). Seven of the pink salmon stock groups have not been consistently monitored for pink salmon spawning escapements: the Annette Island stock group is managed exclusively by the Metlakatla Indian Community (where the state has no jurisdiction), while six other stock groups are located in areas that do not have directed fisheries or are in remote areas where it would be cost prohibitive to conduct surveys on a regular basis—Suemez-Dall (Ketchikan area; Appendix A5), SW Baranof, W Kruzof, and W Yakobi (Sitka area; Appendix A4), and Dundas Bay and Glacier Bay (Juneau area; Appendix A2). The remaining 46 stock groups, representing 12 fishing districts, are actively managed and monitored for escapements.

STOCK ASSESSMENT

ESCAPEMENT MONITORING

Yakutat Area

Clark (1995) reviewed available escapement data for Yakutat area streams, 1960–1994. Consistent survey data in the Yakutat area were limited to two of the more substantial producers: the Situk River (ADF&G Stream Number 182-70-010) and Humpy Creek (ADF&G Stream Number 183-40-010). The Situk River supports a fishery that primarily targets sockeye (*O. nerka*) and coho (*O. kisutch*) salmon (Clark 1995). In recent years, there has been little economic incentive to harvest pink salmon and they have been harvested incidentally to sockeye and coho salmon (Woods 2007). Escapements in the Situk River have been assessed through aerial and boat surveys and with a weir, although there is some spawning that occurs downstream from the weir. Weir counts were available for the Situk River for 12 years between 1971 and 1989, and for every year since 1995. Clark (1995) compared weir counts in the Situk River to peak aerial and boat counts, and assumed a three-fold conversion factor to scale peak survey counts to the total escapement (Appendix A6).

Systematic surveys to estimate spawning escapement into Humpy Creek have not been conducted since the mid-1990s, because there was very little fishing effort at Humpy Creek in the early 1990s (despite fisheries openings) and no directed fishery since 1996 (Woods 2003). In 2005, the escapement goal for Humpy Creek was eliminated due to lack of fishing effort on the stock (Heinl and Geiger 2005).

Southeast Alaska

The department has maintained an annual index of the pink salmon escapement in Southeast Alaska, generated from aerial survey observations, conducted at intervals during most of the migration period. Most pink salmon stocks in Southeast Alaska do not show persistent trends of odd- or even-year dominance, and for simplicity, escapement indices of both brood lines are combined (Van Alen 2000, Zadina et al. 2004). The methods used to calculate the index have changed at different times, as knowledge of the region's pink salmon grew out of research programs designed to improve pink salmon management (e.g., Durley and Seibel 1972, Jones and Dangel 1983, Hofmeister et al. 1993). The most recent method of generating an annual index of the pink salmon escapement from aerial surveys was described in very general terms by Hofmeister (1998), Van Alen (2000), and Zadina et al. (2004), and updated by Heinl and Geiger (2005). In instances where major changes were implemented, the index was recalculated for all years to ensure the index was consistent over the entire series.

In 2004, the department began a project to completely automate calculation of the index through the Southeast Alaska region computer database (Alex/Integrated Fisheries Database; Heinl et al. *in prep*.). The primary goal of this project was to provide interested individuals with reliable and consistent statistics, calculated using the most current version of data within our regional database. Until very recently, the Southeast Alaska pink salmon escapement index was calculated and maintained by the Southeast Alaska pink salmon program biologist on a personal computer. Errors were almost certainly introduced over time, through typos and manipulations of data in spreadsheets. In addition, this information was only available in stock status reports to the Alaska Board of Fisheries that were published tri-annually (e.g., Zadina et al. 2004, Heinl and Geiger 2005) or through electronic data sets not subject to quality or version control. Thus, the index was not readily accessible to salmon researchers, department staff, or the public. A secondary goal of this project was to critically examine how the pink salmon index was constructed, and to make changes to the index as needed.

As noted earlier, the principal change in the new pink salmon escapement index was the complete removal of the observer calibrations that were previously used in an attempt to adjust for differences in observer counting rates (Heinl et al. *in prep*.). It is a well known problem that individual observers tend to count at their own rate, or "bias" (Dangel and Jones 1988, Jones et al. 1998). Beginning in 1995, raw stream survey counts were standardized to remove as much "observer bias" as possible—not by removing bias through comparison of counts to actual numbers of fish present, however, but rather by adjusting observer counts to the same counting rate. Individual observer's counts were calibrated to the counting rate of a major observer in each management area through comparisons of all the surveys conducted by the observers on the same stream within a three-day period (Hofmeister 1998, Van Alen 2000). Counts by one observer were then converted by an expansion factor to match the counts of another observer. Although this method seemed like a practical way to address the problem of observer counting bias, a close examination indicated that the calibrations often induced significant error into escapement index calculation. At this point in time we will simply use the raw survey data until a suitable method of adjusting survey estimates can be devised (preferably through a direct comparison of observer counts to the number of fish known to be within a closed study area). Other changes to the pink salmon escapement index included adding and removing a small number of index streams, and adding additional index observers (i.e., those experienced observers whose aerial survey data were used to formulate the index), particularly some commercial fisheries managers from the 1960s and 1970s, in order to make better use of the available historical data.

The pink salmon escapement index consists of the sum of the peak annual aerial survey observations for 714 index streams across the region. Although the index comprises pink salmon runs of varying magnitudes (Table 1), the set of index streams does not necessarily match the distribution of streams (by run size) across the entire region, as the majority of the 2,500 pink salmon spawning streams are likely very small producers. Only stream surveys conducted by key personnel, termed index observers, were used in the pink salmon escapement index. Index observers were typically management biologists or assistants, most of whom conducted more than 100 stream surveys per year for more than four years. Survey data were qualified (based on visibility, timing, and area surveyed) by the management biologists that conducted the surveys using the following codes: code 01, an incomplete survey—not useful for indexing abundance; code 02, a complete survey—potentially useful for indexing abundance; and code 03, the peak survey—useful for indexing abundance. Code 03 surveys identified the one and only peak survey for a stream each year. These codes were entered into the regional database to facilitate

identification of the peak survey observations for each index stream. Finally, an iterative EM algorithm (McLachlan and Krishnan 1997) is used to impute missing values (e.g., lack of a peak survey for a given stream due to weather) from the static table of historic data.

Table 1.–Distribution of pink salmon escapement index streams based on the 1960–2007 median escapement peak survey value by stream.

Median Peak Survey Range	Number of Streams
<500	19
500–2,500	208
2,500–5,000	175
5,000–10,000	154
10,000–25,000	101
25,000–100,000	54
>100,000	3
Total Number of Streams	714

It is important to note that the southeast Alaska pink salmon index does not provide an estimate of the total escapement, and its relationship with the total pink salmon escapement in southeast Alaska is far from certain. An *escapement estimate* is a statistically reliable measure of escapement magnitude; i.e., the total number of fish in the escapement. An escapement estimate is approximately in the same units as the estimates of harvest, and harvest estimates and escapement estimates can logically be added together to produce an estimate of total run size. Alternatively, an *escapement index* is a relative measure of escapement, useful for year-to-year comparisons. In the past, ADF&G biologists commonly multiplied the escapement indices by a factor of 2.5 to convert the index to an estimate of total escapement (e.g., Hofmeister and Blick 1991). The 2.5 multiplier was originally intended to convert peak escapement counts to an estimate of what was actually present at the time of the survey (Dangel and Jones 1988, Hofmeister 1990, Jones et al. 1998). Thus, multiplying the index by 2.5 does not account for fish that were not present at the time of the surveys and does not account for the more than 1,800 streams that were not surveyed (Heinl and Geiger 2005). There is no simple way to convert the current index series to an estimate of total escapement in Southeast Alaska. Moreover, escapement indices are clearly much less than total escapements (Hofmeister 1990, Van Alen 2000, Zadina et al. 2004).

HARVEST

Salmon landings from individual commercial fishers are recorded on fish tickets. Information recorded on the tickets includes the vessel name, Commercial Fisheries Entry Commission permit number, total weight of the harvest by species, and date and area of harvest. Catch in units of total weight are converted into units of fish numbers by the processors, based on their individual methods of determining the average weight of fish. Fish tickets are legal documents and serve as the basis of payment on the part of the processors to the fishers. State regulations require fish tickets to be delivered to ADF&G within seven days of a landing. Information from these tickets is entered into the ADF&G Fish Ticket Database System, and the total weight and the estimated total number of commercially harvested salmon is available in electronic format to biologists in various time and spatial summaries for all years since 1960 (Appendix A7). Estimates of the annual harvest of pink salmon prior to statehood were taken from Byerly et al. (1999).

ESCAPEMENT GOALS AND PERFORMANCE

YAKUTAT AREA ESCAPEMENT GOALS

Clark (1995) used Ricker-type stock-recruit analysis to establish escapement goals for the Situk River. He used a model-based approach to apportion the harvest in the Yakutat Bay set gillnet fisheries to stock of origin, based on the relative abundance of inshore returns of the two primary stocks, Humpy Creek and the Situk River. Clark recommended pink salmon escapement goal ranges for the Situk River of 42,000 to 105,000 in even years, and 54,000 to 200,000 in odd years, based on total weir counts (Table 1). Escapements to the Situk River have been above the escapement goal ranges, for both odd- and even-year brood lines combined, in 24 of the past 48 years, and below the lower bound of the biological escapement goal ranges in only eight of the past 48 years (Figure 2; Appendix A6).

Table 2.–Summary of escapement goals for Yakutat (Situk River) and Southeast Alaska pink salmon stocks and recommended escapement goals.

	Enumeration	Current Escapement Goal			Recommended Escapement Goal		
Stock Unit	Method	Goal	Type	Year	Action	Goal	Type
Situk River (even years)	Weir	42,000–105,000	BEG	1995	Continue		
Situk River (odd years)	Weir	54,000–200,000	BEG	1995	Contitnue		
Southern Southeast	Peak Aerial Surveys	4.0–9.0 million	BEG	2003	**Revise**	**3.0–8.0 million**	**BEG**
Northern Southeast Inside	Peak Aerial Surveys	2.5–5.5 million	BEG	2003	**Revise**	**2.5–6.0 million**	**BEG**
Northern Southeast Outside	Peak Aerial Surveys	0.75–1.75 million	BEG	2003	**Revise**	**0.75–2.5 million**	**BEG**

SOUTHEAST ALASKA ESCAPEMENT GOALS

The first pink salmon index escapement goals for Southeast Alaska were set at 5 million for southern Southeast and 3 million for northern Southeast (Valentine et al. 1970). The goals were not the result of a formal statistical analysis; they were instead based on the observation that in southern Southeast, escapement indices of less than 4 million had produced fair to poor returns, escapements in excess of 4 million generally produced good returns, and a southern Southeast escapement index that exceeded 5 million (1966) resulted in the largest return in many years. The pattern of returns in northern Southeast was more variable than in southern Southeast and the index goal was set at 3 million. Escapement goals were adjusted upward in later years based on analyses of the catch and index of escapement (Durley and Seibel 1972, Jones and Hofmeister 1981). From 1991 to 2002, the index goals were set at 4.8 million for northern Southeast, and a range of 6–9 million for southern Southeast (Hofmeister and Blick 1991).

The current biological escapement goals for Southeast Alaska pink salmon were established in 2003 (Zadina et al. 2004). Escapement goals have often been developed using Ricker stock-recruit analysis (Hilborn and Walters 1992, Quinn and Deriso 1999). Note, however, that the pink salmon index measures available for Southeast Alaska represent an unknown fraction of the total escapement (a relative measure) rather than an estimate of the total number. Thus, a Ricker analysis is not possible without making some unproven and possibly ill-advised assumptions. Zadina et al. (2004) used a "tabular approach" described by Hilborn and Walters (1992), a yield analysis that is useful for setting escapement goals when the form of the stock-recruit

relationship is not known, and when there might be errors that would complicate traditional statistical methods. Hilborn and Walters (1992) cautioned that this approach requires large sample sizes, which we have, with 48 years of escapement observations. This method simply involves examination of graphical representations of potential yield over several escapement categories, from which the range of escapements that produced the greatest yields is identified. Escapement goals for Southeast Alaska were based on examination of potential yields for each of five cases in which the escapement index was expanded to estimate total escapement by multiplying by factors of 1.0, 2.5, 5.0, 7.5, and 10.0.

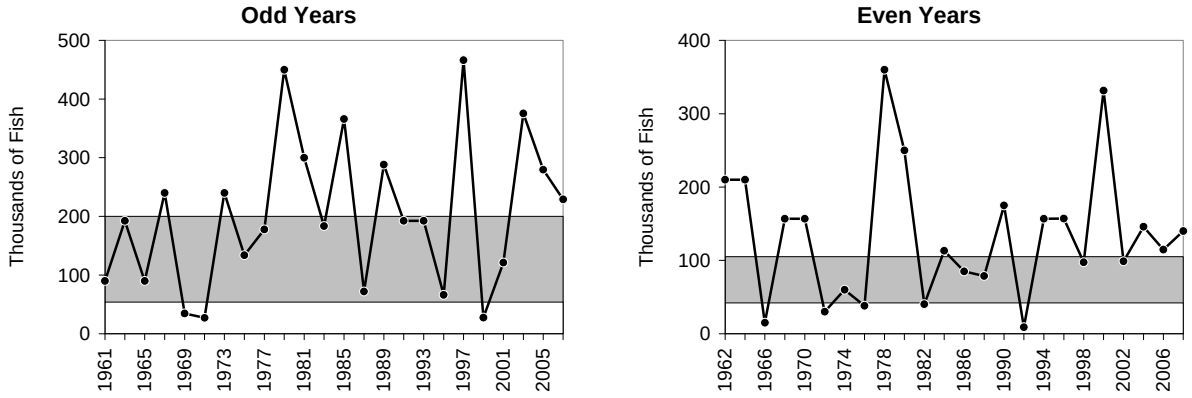

Figure 2.–Annual odd- and even-year pink salmon escapements to the Situk River, Yakutat area, 1961–2008. The shaded areas show the biological escapement goal ranges of 54,000–200,000 in odd years, and 42,000–105,000 in even years.

We re-examined the Southeast Alaska pink salmon escapement goals using the same yield analysis and the set of updated pink salmon escapement index data (Appendices A8–A13). We note that our escapement goal analyses were conducted prior to the 2008 season; therefore, we used data available through the 2007 field season, and updated catch and escapement information in this report through 2008. Escapement goal analysis was implemented in five steps. First, the catch and escapement index values were organized into the three sub-regions: Southern Southeast, Northern Southeast Inside, and Northern Southeast Outside. Next, annual escapement index data for each sub-region were partitioned into a variable number of escapement intervals that were not mutually exclusive; i.e., an escapement index observation could fall into two different categories. For example, Southern Southeast sub-region pink salmon escapement data were partitioned into ranges of 0–2 million, 1–3, million, 2–4 million, and so on (Appendix A14). Next, we expanded the escapement index for each sub-region by factors of 1.0, 2.5, 5.0, 7.5, and 10.0; these expansions created five different estimates of total escapement. We added the estimated total escapement to the catch to represent a presumption of what the total return might have been for each of the five cases. Finally, potential (or surplus) yield was calculated as the return (catch plus expanded escapement) minus the brood year escapement that produced that return. (Appendices A14–A16).

Based on a visual analysis of Figure 3, we recommend a revised biological escapement goal range of 3.0 to 8.0 million index spawners for the Southern Southeast sub-region (Table 1). This escapement goal is one million index fish lower than the previous escapement goal range of 4.0 to 9.0 million index spawners. The revision reflects changes that were made to the escapement

index that resulted in the index becoming approximately one million fish smaller, on average, than it was when the escapement goal was established in 2003 using the old escapement index (Heinl et al. *in prep*.). We recommend a revised biological escapement goal range of 2.5 to 6.0 million index spawners for the Northern Southeast Inside sub-region (Table 1; Figure 4). This escapement goal range is slightly wider than the previous escapement goal range of 2.5 to 5.5 million index spawners, and reflects changes that were made to the escapement index that resulted in the index becoming slightly larger, on average, particularly for the 1960s to mid-1970s, than it was when the escapement goal was established in 2003. Finally, we recommend a revised biological escapement goal of 0.75 to 2.5 million index spawners for the Northern Southeast Outside sub-region (Table 1; Figure 5). This revision represents an increase in the upper range of the goal, from 1.75 to 2.5 million index spawners, and is a result of the dramatic increase in pink salmon production in this sub-region since the mid-1990s.

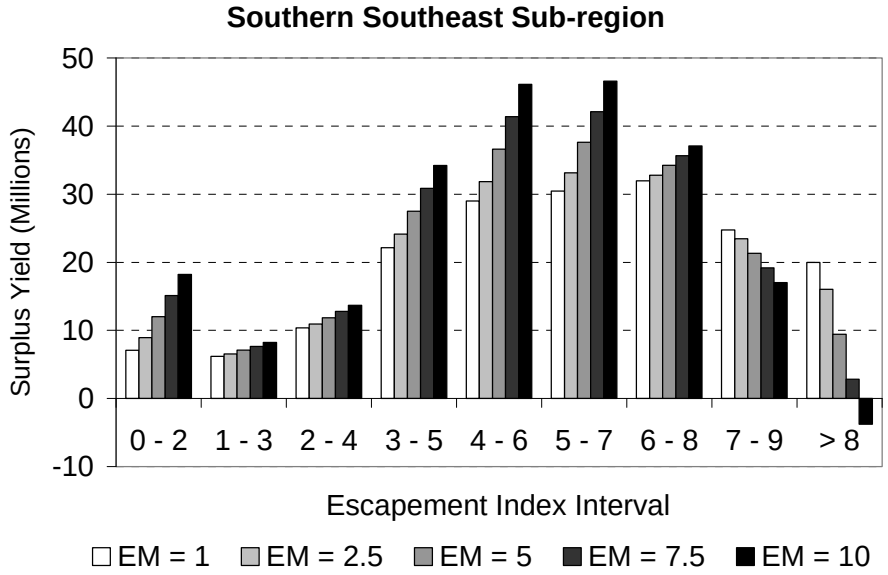

Figure 3.–Surplus (or potential) yield in five cases, as a function of index escapement, for the Southern Southeast sub-region of Southeast Alaska. The "EM" denotes the escapement magnitude; i.e., the escapement index multiplied by an expansion factor of 1.0, 2.5, 5.0, 7.5, and 10.0 to approximate the total escapement.

SOUTHEAST ALASKA MANAGEMENT TARGETS

We re-calculated the division of sub-region escapement goals into management targets for 12 management districts and 46 pink salmon stock groups. As clearly stated by Zadina et al. (2004), we consider our recommended escapement goals by sub-region to be *biological escapement goals*, and we consider our recommended escapement targets, by district and by stock group, to be an aid to management in achieving these sub-region goals—not escapement goals under the definition of the Statewide Salmon Escapement Goal Policy (5 AAC 39.223).

The district management targets were determined in three steps. First we calculated the 1960–2007 median escapement index value for each district. We then converted the median value for each district into a percent of the summed median index values for all districts within the same sub-region. The management target for each district was then calculated by applying the proportions for each district within a sub-region to the escapement goal for that sub-region. For example, the 1960–2007 median value of the District 1 pink salmon escapement index was 1.6 million, which represented 34% of the summed median index values for all districts within the Southern Southeast sub-region (Table 3). The management target range for District 1 was then calculated by multiplying the lower and upper bounds of the Southern Southeast sub-region escapement goal (3.0 to 8.0 million) by 34%. The management targets for stock groups within a district were similarly determined by calculating the 1960–2007 median escapement index value for each stock group; the median value for each stock group was converted into a percent of the summed median index values for all stock groups within the same district; and, finally, the proportions for each stock group within a district were then applied to the management target for that district. Thus, when pooled together, the management targets for the stock groups within a district sum to the management target for that district; similarly, the management targets for the districts within a sub-region sum to the escapement goal for that sub-region (Tables 4–6).

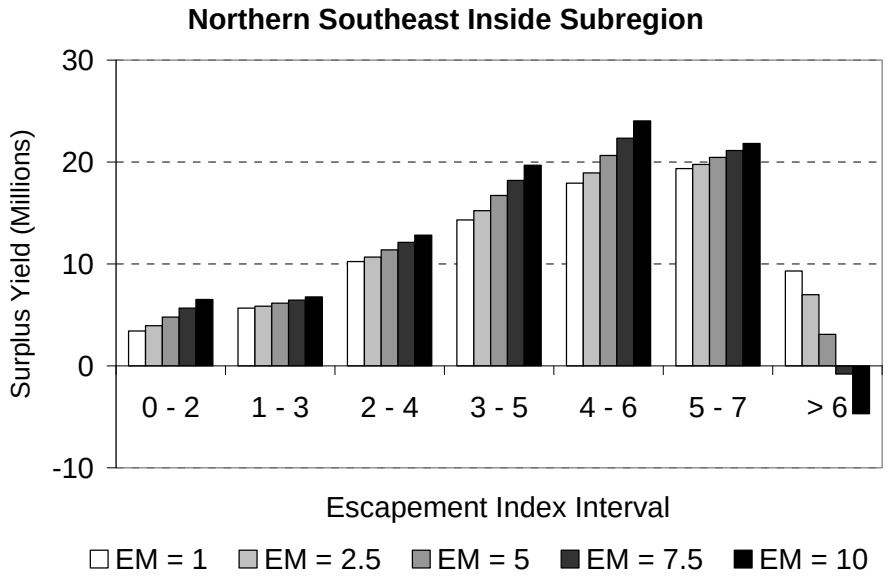

Figure 4.–Surplus (or potential) yield in five cases, as a function of index escapement, for the Northern Southeast Inside sub-region of Southeast Alaska. The "EM" denotes the escapement magnitude; i.e., the escapement index multiplied by an expansion factor of 1.0, 2.5, 5.0, 7.5, and 10.0 to approximate the total escapement.

STOCK STATUS IN SOUTHEAST ALASKA

The annual harvest of pink salmon in Southeast Alaska has declined slightly over the most recent 10 years (Figure 1), from 49 million per year in the 1990s, to an average of 43 million fish per year since 2001. This decline in overall harvest is due primarily to poor pink salmon runs in 2006 and 2008. Pink salmon escapement goals were met in all three sub-regions of Southeast Alaska over the past 10 years, with the exception of the Northern Southeast Inside sub-region in 2008.

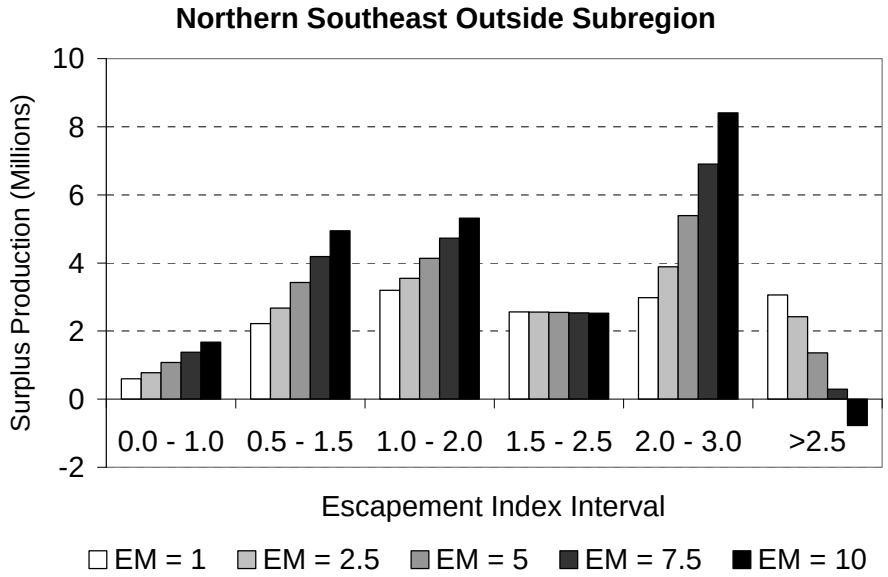

Figure 5.–Surplus (or potential) yield in five cases, as a function of index escapement, for the Northern Southeast Outside sub-region of Southeast Alaska. The "EM" denotes the escapement magnitude; i.e., the escapement index multiplied by 1.0, 2.5, 5.0, 7.5, and 10.0 to approximate the total escapement.

Southern Southeast Sub-region

The harvest of pink salmon in the Southern Southeast sub-region averaged 25 million fish per year over the past 10 years (1999–2008; Figure 6); down from an average harvest of 31 million in the 1990s. The recommended escapement goal of 3.0 to 8.0 million index spawners was met annually since 1974 in the Southern Southeast sub-region. In addition, the upper range of the goal (8.0 million index spawners) was exceeded in seven of the past 10 years (1999–2008; Figure 6). Pink salmon escapements appear to have been well-distributed over the Southern Southeast sub-region as well. With only three exceptions, management targets for Districts in the Southern Southeast sub-region (Districts 1–8) have been met or exceeded over the past decade (Table 7). With the exception of 2008, management targets for all 18 pink salmon stock groups in the Southern Southeast sub-region have also generally met been or exceeded over the past decade (Table 8). Pink salmon escapement indices for five of the 18 pink salmon stock groups were below the management target ranges in 2008.

Table 3.–Summary of recommended management targets (in millions of index fish) for Southeast Alaska pink salmon by District, compared to management targets established in 2003.

District	Sub-region	1960–2007 Median	Proportion of Escapement Goal	Recommended Management Targets		2003 Management Targets	
				Lower Target	Upper Target	Lower Target	Upper Target
1	SSE	1.58	34%	**1.02**	**2.71**	1.33	3.00
2	SSE	0.45	10%	**0.29**	**0.77**	0.40	1.10
3	SSE	1.48	32%	**0.95**	**2.54**	1.13	2.55
4	SSE			**No Target**		No Target	
5	SSE	0.38	8%	**0.25**	**0.66**	0.33	0.65
6	SSE	0.33	7%	**0.21**	**0.57**	0.40	0.85
7	SSE	0.40	9%	**0.26**	**0.69**	0.40	0.85
8	SSE	0.04	1%	**0.02**	**0.06**		
9	NSEI	0.61	25%	**0.63**	**1.50**	0.40	0.85
10	NSEI	0.57	23%	**0.59**	**1.41**	0.65	1.45
11	NSEI	0.26	11%	**0.27**	**0.65**	0.32	0.73
12	NSEI	0.52	21%	**0.53**	**1.26**	0.40	0.85
13 Inside	NSEI	0.31	13%	**0.32**	**0.76**	0.40	0.90
14	NSEI	0.14	6%	**0.15**	**0.35**	0.32	0.73
15	NSEI	0.03	1%	**0.03**	**0.07**	No Target	
13 Outside	NSEO	0.52	100%	**0.75**	**2.50**	0.75	1.75

Table 4.–Summary of recommended management targets for Southeast Alaska pink salmon stock groups in the Southern Southeast sub-region, compared to management targets established in 2003. (Numbers are rounded.)

Stock Group	Sub-region	District	1960–2007 Median	Proportion of District Index	Recommended Management Targets		2003 Management Targets	
					Lower Target	Upper Target	Lower Target	Upper Target
E Behm	SSE	101	999,000	65%	**670,000**	**1,770,000**	840,000	1,890,000
Portland	SSE	101	156,000	10%	**100,000**	**280,000**	170,000	370,000
W Behm	SSE	101	374,000	24%	**250,000**	**660,000**	330,000	740,000
Kasaan	SSE	102	358,000	83%	**240,000**	**640,000**	340,000	930,000
Moira	SSE	102	75,000	17%	**50,000**	**130,000**	60,000	170,000
E Dall	SSE	103	202,000	14%	**130,000**	**360,000**	160,000	360,000
Hetta	SSE	103	443,000	31%	**300,000**	**790,000**	300,000	680,000
Klawock	SSE	103	624,000	44%	**420,000**	**1,110,000**	520,000	1,170,000
Sea Otter Sound	SSE	103	154,000	11%	**100,000**	**280,000**	150,000	330,000
Affleck Canal	SSE	105	205,000	58%	**140,000**	**380,000**	200,000	380,000
Shipley Bay	SSE	105	150,000	42%	**110,000**	**280,000**	140,000	270,000
Burnett	SSE	106	81,000	24%	**50,000**	**140,000**	100,000	200,000
Ratz Harbor	SSE	106	69,000	20%	**40,000**	**120,000**	100,000	210,000
Totem Bay	SSE	106	80,000	24%	**50,000**	**130,000**	70,000	150,000
Whale Pass	SSE	106	110,000	32%	**70,000**	**180,000**	130,000	280,000
Anan	SSE	107	329,000	82%	**210,000**	**570,000**	320,000	680,000
Union Bay	SSE	107	71,000	18%	**50,000**	**120,000**	80,000	170,000
Stikine	SSE	108	38,000	100%	**20,000**	**60,000**	No Target	

Table 5.–Summary of recommended management targets for Southeast Alaska pink salmon stock groups in the Northern Southeast Inside sub-region, compared to management targets established in 2003. (Numbers are rounded.)

Stock Group	Sub-region	District	1960–2007 Median	Proportion of District Index	Recommended Management Targets		2003 Management Targets	
					Lower Target	Upper Target	Lower Target	Upper Target
E Baranof	NSEI	109	82,000	14%	**90,000**	**210,000**	70,000	140,000
Eliza Harbor	NSEI	109	130,000	22%	**140,000**	**330,000**	80,000	180,000
Saginaw Bay	NSEI	109	117,000	20%	**130,000**	**300,000**	70,000	150,000
SE Baranof	NSEI	109	63,000	11%	**70,000**	**160,000**	50,000	110,000
Tebenkof	NSEI	109	193,000	33%	**210,000**	**500,000**	130,000	270,000
Farragut Bay	NSEI	110	15,000	3%	**20,000**	**40,000**	10,000	30,000
Houghton	NSEI	110	360,000	64%	**380,000**	**900,000**	400,000	890,000
Portage Bay	NSEI	110	28,000	5%	**30,000**	**70,000**	40,000	80,000
Pybus/Gambier	NSEI	110	161,000	29%	**170,000**	**400,000**	200,000	450,000
Seymour Canal	NSEI	111	162,000	61%	**160,000**	**400,000**	180,000	410,000
Stephens	NSEI	111	103,000	39%	**110,000**	**250,000**	140,000	320,000
Freshwater Bay	NSEI	112	76,000	14%	**80,000**	**180,000**	60,000	130,000
Kelp Bay	NSEI	112	61,000	11%	**60,000**	**140,000**	30,000	60,000
Lower Lynn Canal	NSEI	112	25,000	5%	**20,000**	**60,000**	20,000	40,000
SW Admiralty	NSEI	112	105,000	20%	**100,000**	**250,000**	80,000	170,000
Tenakee	NSEI	112	217,000	41%	**210,000**	**510,000**	180,000	370,000
W Admiralty	NSEI	112	51,000	10%	**50,000**	**120,000**	40,000	80,000
Hoonah Sound	NSEI	113	310,000	100%	**320,000**	**760,000**	400,000	900,000
Homeshore	NSEI	114	31,000	21%	**30,000**	**70,000**	50,000	100,000
N Chichagof	NSEI	114	114,000	79%	**120,000**	**280,000**	280,000	620,000
Upper Lynn Canal	NSEI	115	28,000	100%	**30,000**	**70,000**	No Target	

Table 6.–Summary of recommended management targets for Southeast Alaska pink salmon stock groups in the Northern Southeast Outside sub-region, compared to management targets established in 2003. (Numbers are rounded.)

Stock Group	Sub-region	District	1960–2007 Median	Proportion of District Index	Recommended Management Targets		2003 Management Targets	
					Lower Target	Upper Target	Lower Target	Upper Target
Lisianski	NSEO	113	58,000	11%	**80,000**	**270,000**	70,000	170,000
Portlock	NSEO	113	28,000	5%	**40,000**	**130,000**	30,000	80,000
Salisbury Sound	NSEO	113	134,000	25%	**190,000**	**630,000**	160,000	360,000
Sitka Sound	NSEO	113	147,000	28%	**210,000**	**700,000**	210,000	500,000
Slocum Arm	NSEO	113	111,000	21%	**160,000**	**520,000**	210,000	480,000
W Crawfish	NSEO	113	20,000	4%	**30,000**	**100,000**	10,000	30,000
Whale Bay	NSEO	113	31,000	6%	**40,000**	**150,000**	50,000	120,000

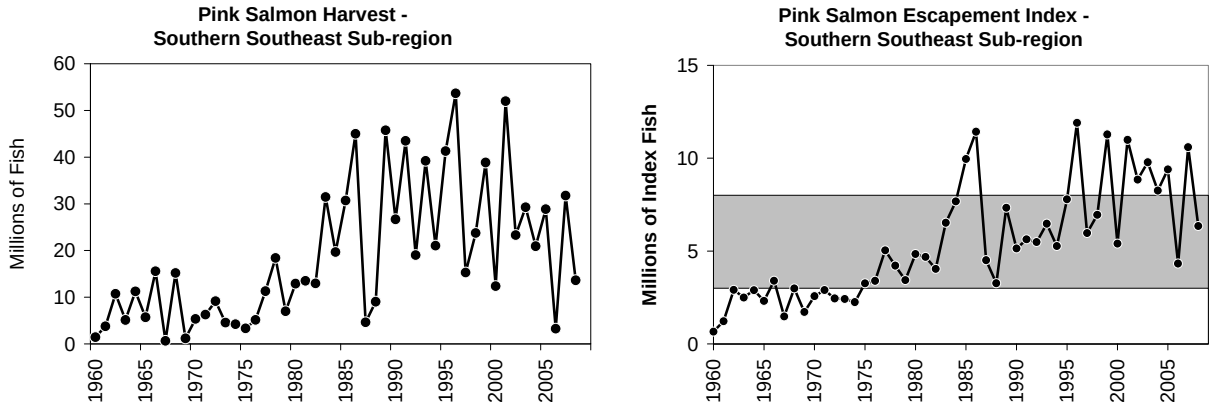

Figure 6.–Annual pink salmon harvest and escapement index for the Southern Southeast sub-region, 1960–2008. The shaded area shows the recommended escapement goal range of 3.0 million to 8.0 million index spawners.

Northern Southeast Inside Sub-region

The harvest of pink salmon in the Northern Southeast Inside sub-region averaged 17 million fish per year over the past 10 years (1998–2007; Figure 7), essentially unchanged from an average harvest of 17 million in the 1990s. The recommended escapement goal of 2.5 to 6.0 million index spawners was met annually since 1988, with the notable exception of 2008 (Figure 7). Prior to 2008, pink salmon escapements were well-distributed over the Northern Southeast sub-region. Management targets for Districts in the Northern Southeast Inside sub-region (Districts 9–12, 13 inside, and 14–15) were met or exceeded over the years 1999–2007, with only one exception (Table 7). With the exception of 2008, management targets were generally met or exceeded for the 21 pink salmon stock groups in the Northern Southeast sub-region over the years 1999–2007 (Table 8). The 2008 run of pink salmon to the Northern Southeast Inside sub-region was the poorest since the mid-1970s: the harvest of 0.4 million was the lowest since 1974 and the escapement index of 1.5 million was the lowest since 1976. Management targets were not met for any of the districts or 19 of the 21 stock groups in this sub-region in 2008.

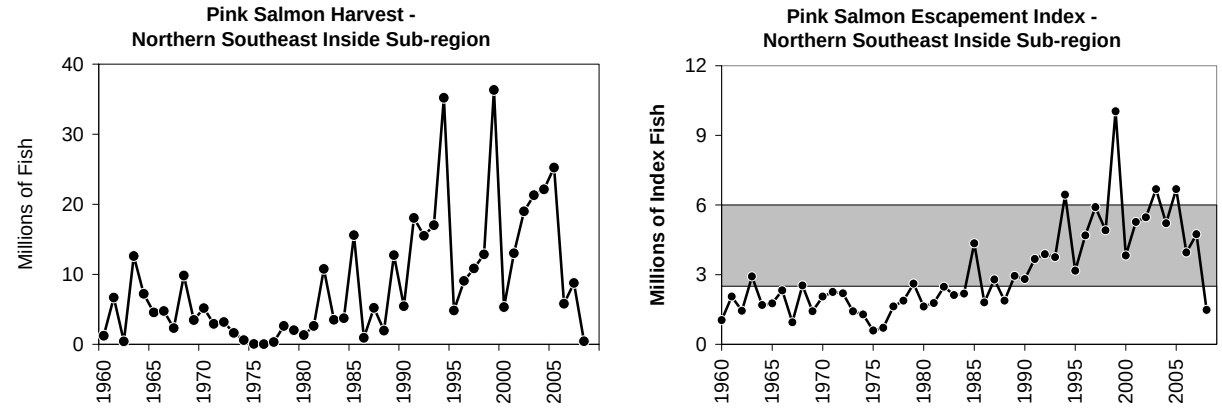

Figure 7.–Annual pink salmon harvest and escapement index for the Northern Southeast Inside sub-region, 1960–2008. The shaded area shows the recommended escapement goal range of 2.5 million to 6.0 million index spawners.

Table 7.–Southeast Alaska pink salmon escapement target ranges by district (in millions), and years for which the escapement index for each district was above (+), below (-), or within (blank cells) the management target range, 1999–2008.

Sub-region	District	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	Lower Management Target	Upper Management Target
SSE[a]	101			+	+	+		+		+		1.02	2.71
SSE	102	+	+	+	+	+		+		+	+	0.29	0.77
SSE	103	+		+	+	+	+	+		+		0.95	2.54
SSE	105	+		+	+	+		+	-			0.25	0.66
SSE	106	+		+		+	+	+				0.21	0.57
SSE	107	+		+		+		+				0.26	0.69
SSE	108	+	-	+		+	+	+			-	0.02	0.06
NSEI[b]	109	+						+			-	0.63	1.5
NSEI	110	+				+					-	0.59	1.41
NSEI	111	+									-	0.27	0.65
NSEI	112	+			+	+	+	+			-	0.53	1.26
NSEI	113	+				+				+	-	0.32	0.76
NSEI	114	+	-	+		+		+		+	-	0.15	0.35
NSEI	115	+						+			-	0.03	0.07
NSEO[c]	113	+				+		+				0.75	2.5

[a] SSE = Southern Southeast sub-region.
[b] NSEI = Northern Southeast Inside sub-region.
[c] NSEO = Northern Southeast Outside sub-region.

Northern Southeast Outside Sub-region

The harvest of pink salmon in the Northern Southeast Outside sub-region averaged 3.2 million fish per year over the past 10 years (1999–2008; Figure 8); an increase of 58% over the average harvest of 2.0 million in the 1990s. The recommended escapement goal of 0.75 to 2.5 million index spawners was met annually since 1994 in the Northern Southeast Outside sub-region. The escapement index averaged 2.8 million over the past 10 years (1999–2008); an increase of 138% over the prior decade (Figure 8). Given the recent, large increase in pink salmon production in the Northern Southeast Outside sub-region, it is no surprise that management targets for District 13 outside have been met annually over the past decade (Table 7), and management targets for the seven pink salmon stock groups within the sub-region have regularly been met or exceeded (Table 8).

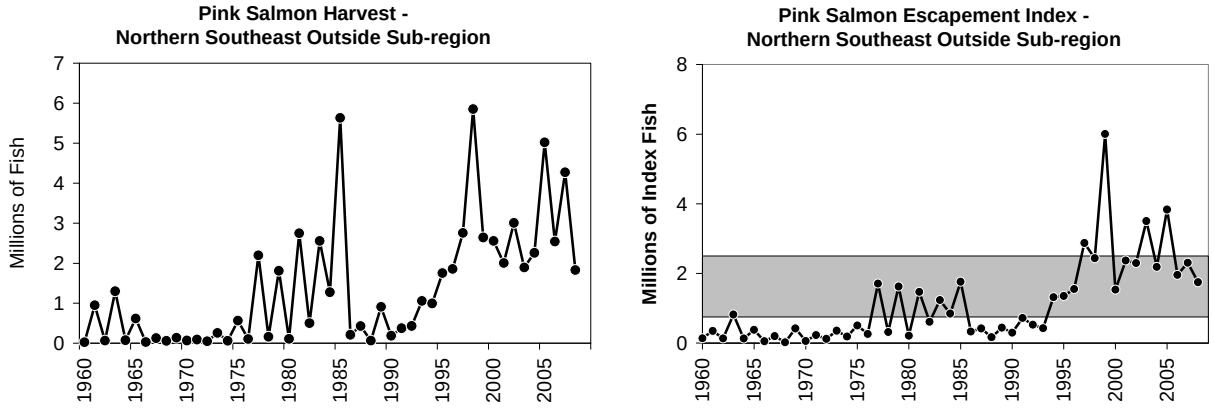

Figure 8.–Annual pink salmon harvest and escapement index for the Northern Southeast Outside sub-region, 1960–2008. The shaded area shows the recommended escapement goal range of 0.75 million to 2.5 million index spawners.

Table 8.–Southeast Alaska pink salmon escapement target ranges by stock group (in millions), and years for which the escapement index for each stock group was above (+), below (-), or within (blank cells) the management target range, 1999–2008.

Sub-region	District	Stock Group	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	Lower Management Target	Upper Management Target
SSE[a]	101	E Behm			+	+	+		+		+		0.67	1.77
SSE	101	Portland			+	+	+	+	+	-	+	-	0.10	0.28
SSE	101	W Behm	+		+		+			-	+	+	0.25	0.66
SSE	102	Kasaan	+	+	+	+	+		+		+	+	0.24	0.64
SSE	102	Moira	+					-			+	+	0.05	0.13
SSE	103	E Dall				+		+			+		0.13	0.36
SSE	103	Hetta	+	+		+			+		+	+	0.30	0.79
SSE	103	Klawock	+		+		+	+	+		+		0.42	1.11
SSE	103	Sea Otter Sound	+		+		+	+					0.10	0.28
SSE	105	Affleck Canal	+		+	+	+	+	+			-	0.14	0.38
SSE	105	Shipley Bay	+		+		+		+	-			0.11	0.28
SSE	106	Burnett	+		+	+	+		+		+		0.05	0.14
SSE	106	Ratz Harbor	+		+	+	+	+	+		+	+	0.04	0.12
SSE	106	Totem Bay	+		+		+	+	+			-	0.05	0.13
SSE	106	Whale Pass	+	-	+		+		+			-	0.07	0.18
SSE	107	Anan	+		+		+		+				0.21	0.57
SSE	107	Union Bay	+		+	+	+		+		+		0.05	0.12
SSE	108	Stikine	+	-	+		+	+	+			-	0.02	0.06
NSEI[b]	109	E Baranof	+					+	+	+		-	0.09	0.21
NSEI	109	Eliza Harbor	+						+			-	0.14	0.33
NSEI	109	Saginaw Bay	+			+		+	+			-	0.13	0.30
NSEI	109	SE Baranof	+			-	-	-	+			-	0.07	0.16
NSEI	109	Tebenkof	+			+	+						0.21	0.50
NSEI	110	Farragut Bay	+				+	+				-	0.02	0.04
NSEI	110	Houghton	+				+					-	0.38	0.90
NSEI	110	Portage Bay	+					+		-		-	0.03	0.07
NSEI	110	Pybus/Gambier	+					+	+			-	0.17	0.40

[a] SSE = Southern Southeast sub-region.
[b] NSEI = Northern Southeast Inside sub-region.

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Table 8.–Page 2 of 2.

Sub-region	District	Stock Group	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	Lower Management Target	Upper Management Target
NSEI[a]	111	Seymour Canal	+									-	0.16	0.40
NSEI	111	Stephens	+			+			+			-	0.11	0.25
NSEI	112	Freshwater Bay	+		+	+	+	+			+	-	0.08	0.18
NSEI	112	Kelp Bay	+		+		+		+	-	+		0.06	0.14
NSEI	112	Lower Lynn Canal	+		+		+		+	+		-	0.02	0.06
NSEI	112	SW Admiralty	+	+			+	+	+		+	-	0.10	0.25
NSEI	112	Tenakee	+		-	+			+			-	0.21	0.51
NSEI	112	W Admiralty	+	-			+	+	+	+		-	0.05	0.12
NSEI	113	Hoonah Sound	+				+				+	-	0.32	0.76
NSEO[b]	113	Lisianski	+	-	+		+		+		+		0.08	0.27
NSEO	113	Portlock	+		+	+	+	+	+	+	+	+	0.04	0.13
NSEO	113	Salisbury Sound	+		-							-	0.19	0.63
NSEO	113	Sitka Sound	+			+	+	+	+				0.21	0.70
NSEO	113	Slocum Arm	+		+		+						0.16	0.52
NSEO	113	W Crawfish	+		-	+		+	+	+	+		0.03	0.10
NSEO	113	Whale Bay	+		+	+	+	+	+		+		0.04	0.15
NSEI	114	Homeshore	+		+		+	+	+			-	0.03	0.07
NSEI	114	N Chichagof	+	-	+		+		+		+	-	0.12	0.28
NSEI	115	Upper Lynn Canal	+						+			-	0.03	0.07

[a] NSEI = Northern Southeast Inside sub-region.
[b] NSEO = Northern Southeast Outside sub-region.

DISCUSSION

Shaul et al. (2005) believed that the recent, high levels of coho salmon production in the region reflected influence "primarily by environmental conditions rather than variations in escapement." Pink salmon production in Southeast Alaska also appears to have been similarly limited primarily by variations in environmental conditions over the past 25 years, rather than by the number of fish that have successfully escaped to spawn. Pink salmon have been harvested in Southeast Alaska at the highest levels since record keeping began in the 20th century, though the annual average harvest over the past 10 years has dropped slightly compared to the 1990s, due to poor runs in 2006 and 2008. With the exception of 2008, pink salmon escapement indices have been within or above escapement goals and escapements appear to have been well-distributed throughout the region. Due to the very low commercial fishing effort and generally non-directed nature of harvests in the Yakutat area, we did not examine trends in the Yakutat commercial fishery harvests; however, it appears that escapements in that area have been far above levels needed to sustain these runs. At this time, no pink salmon stocks in Southeast Alaska or Yakutat can currently be considered stocks of concern under the definition of the Sustainable Salmon Policy (5 AAC 39.222).

The harvest series in Southeast Alaska has exhibited odd-year dominance since 1999, and poor runs of pink salmon in 2006 and 2008 may increase the magnitude of this cycle in the future. The harvest series in Southeast Alaska has not always exhibited odd-year dominance; even-year dominance occurred from 1964 to 1973, and from 1994 to 1998; Figure 1. The direct causes of the poor runs in Southeast Alaska in 2006 and 2008 are not known. Pink salmon runs are notoriously difficult to forecast (Adkison 2002, Haeseker et al. 2005), because survival rates vary tremendously (Pyper et al. 2001, Willette et al. 2001) in response to myriad potential factors in the freshwater, early marine, and offshore environments (see Wickett 1958, Heard 1991, Willette et al. 2001, Moss et al. 2005, et al.). The extremely poor pink salmon escapement into the inside waters of the Northern Southeast Inside sub-region (i.e., inside waters north of Sumner Strait) in 2008 was particularly startling, and a reminder of the mid-1970s, when the region's pink salmon runs were at their historically lowest levels. Careful management will be needed over the coming years to rebuild even-year pink salmon runs in the Northern Southeast Inside sub-region.

As pointed out by Zadina et al. (2004), our measures of pink salmon escapement in Southeast Alaska are imperfect, but we believe they are fully adequate to assess the health of this resource. Considering the difficulty measuring such widely dispersed salmon production, substantial improvements to the monitoring program would lead to modest improvements in the quality of the stock assessment information—which is not true for other species of salmon in Southeast Alaska. The consistency of all of our indicators gives us confidence in our assessment of pink salmon stock status. We will continue to improve the escapement estimation process, and try to better understand the relationship between the current escapement index and total escapement in the region. ADF&G received further funding from the Southeast Sustainable Salmon Fund to increase the aerial survey coverage of the region. In addition, there have been research programs to assess individual observer counting rates, their relationship to other observers, and the relationship of adjusted peak counts to the total spawning population for individual streams.

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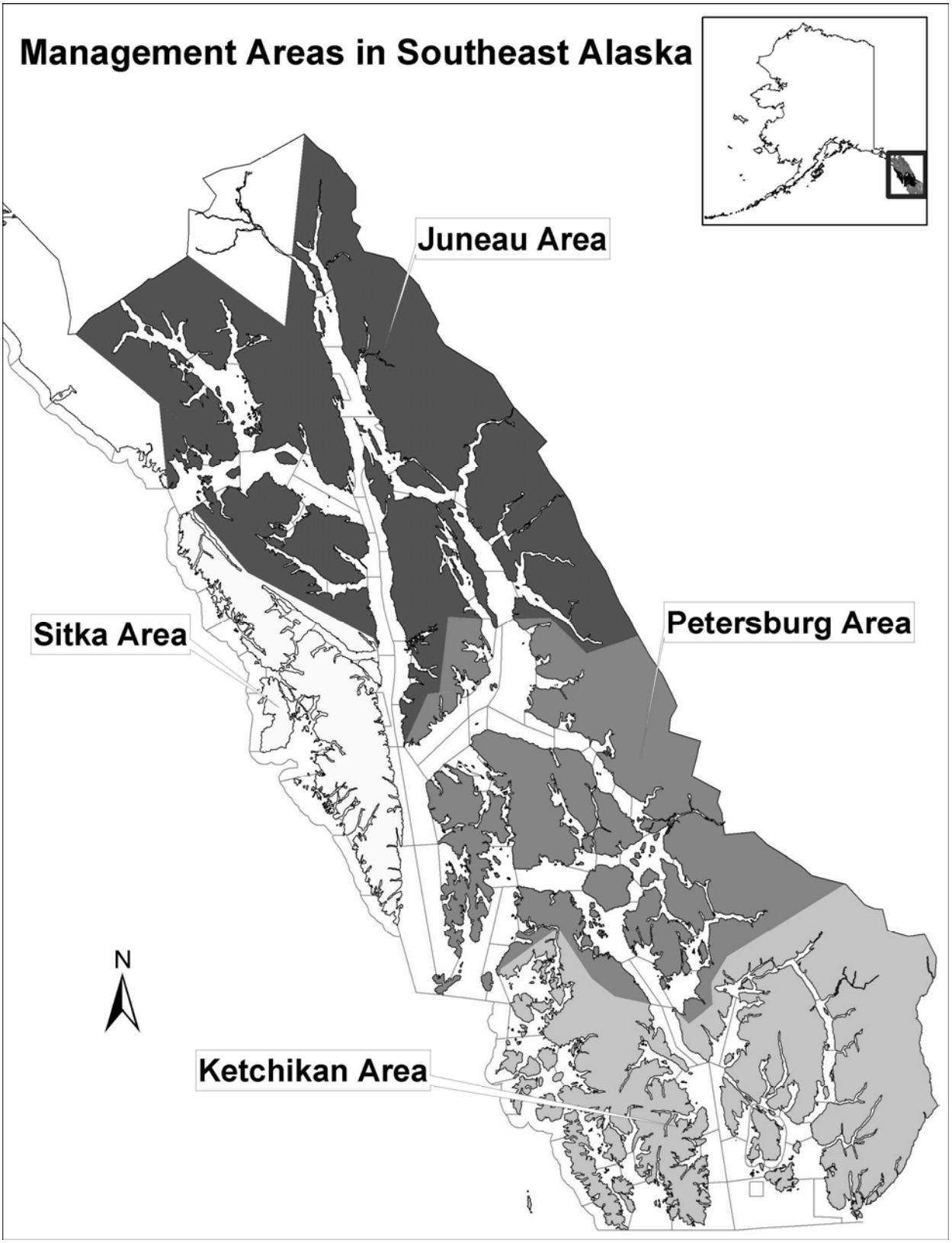
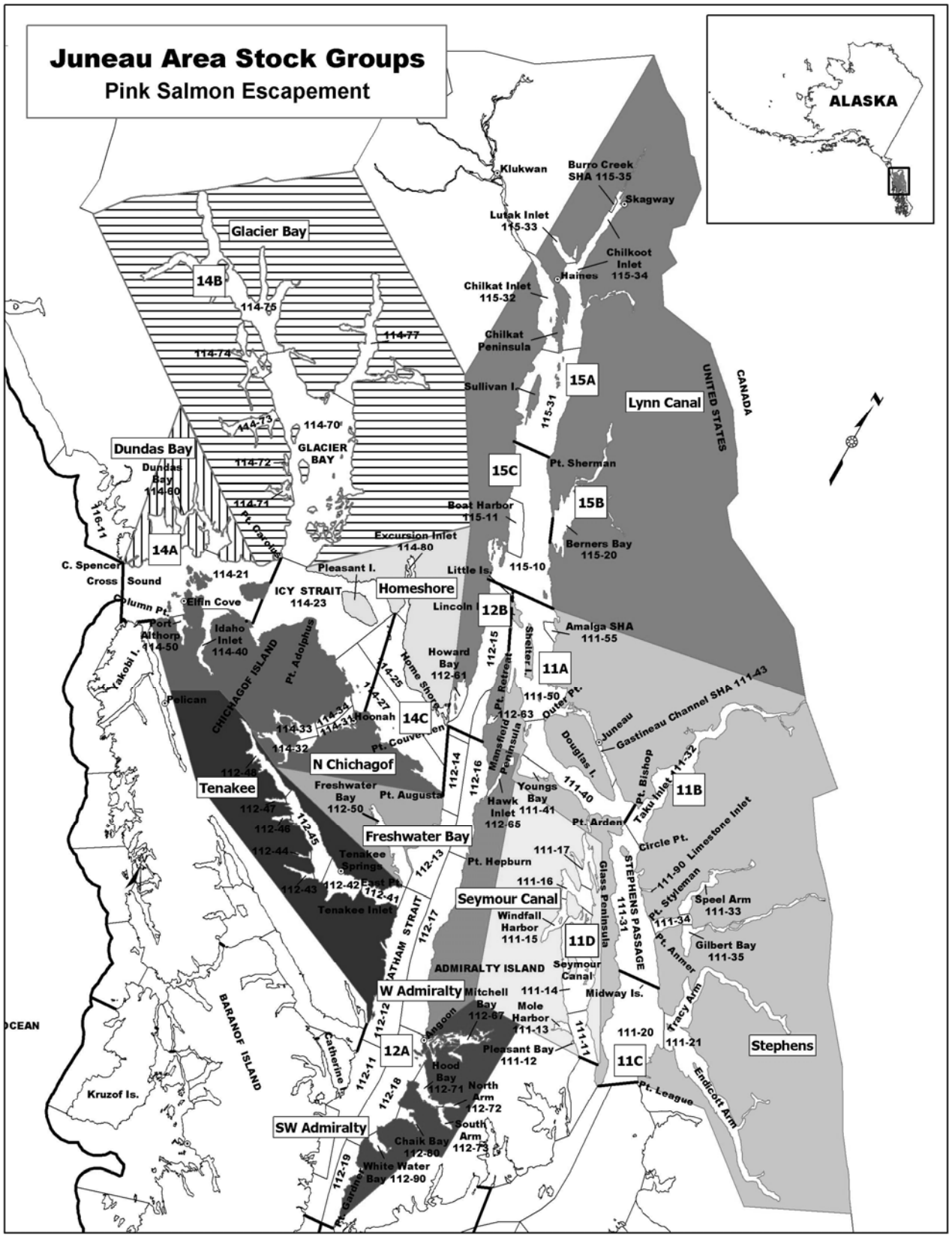
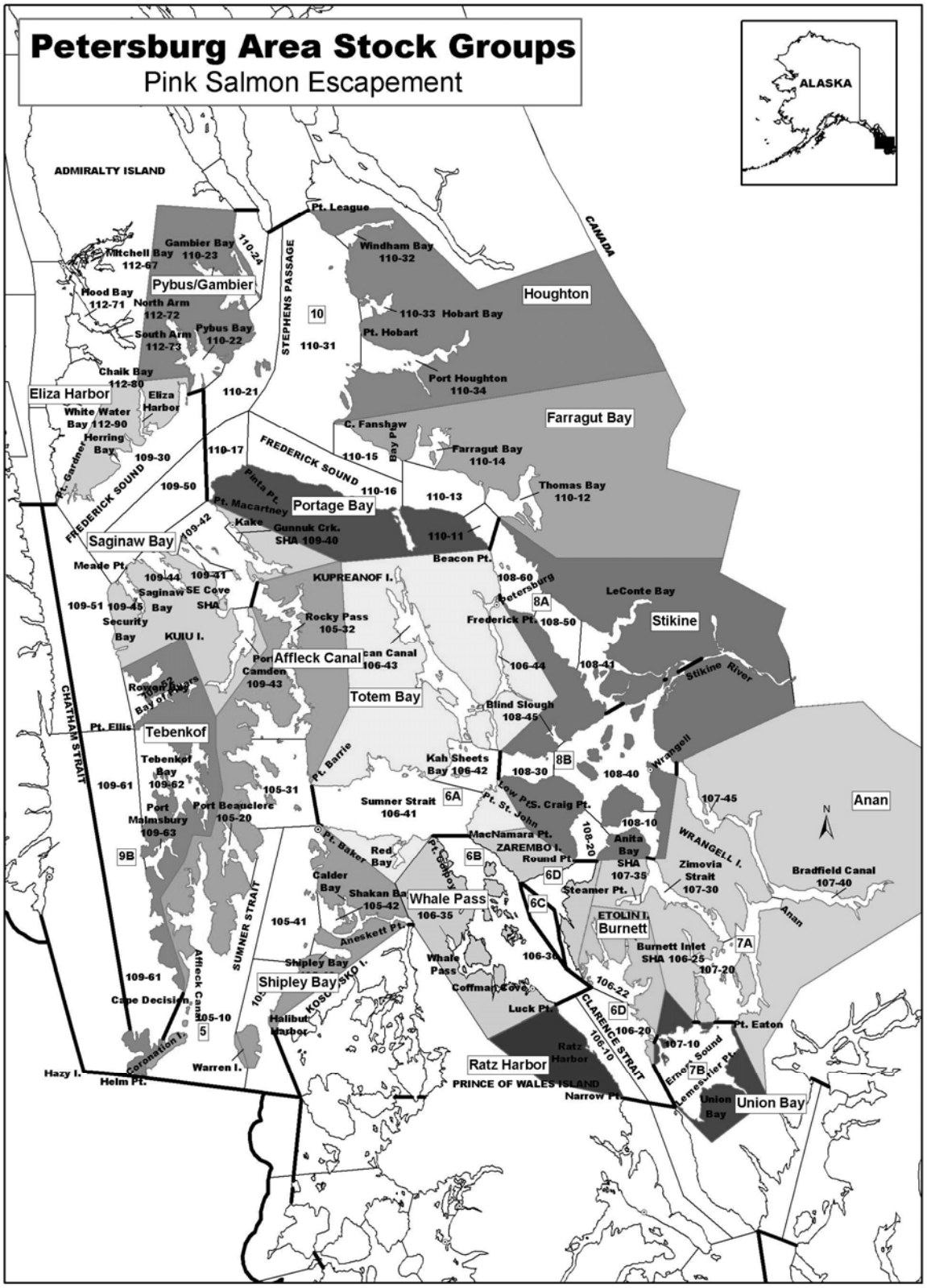
APPENDIX A



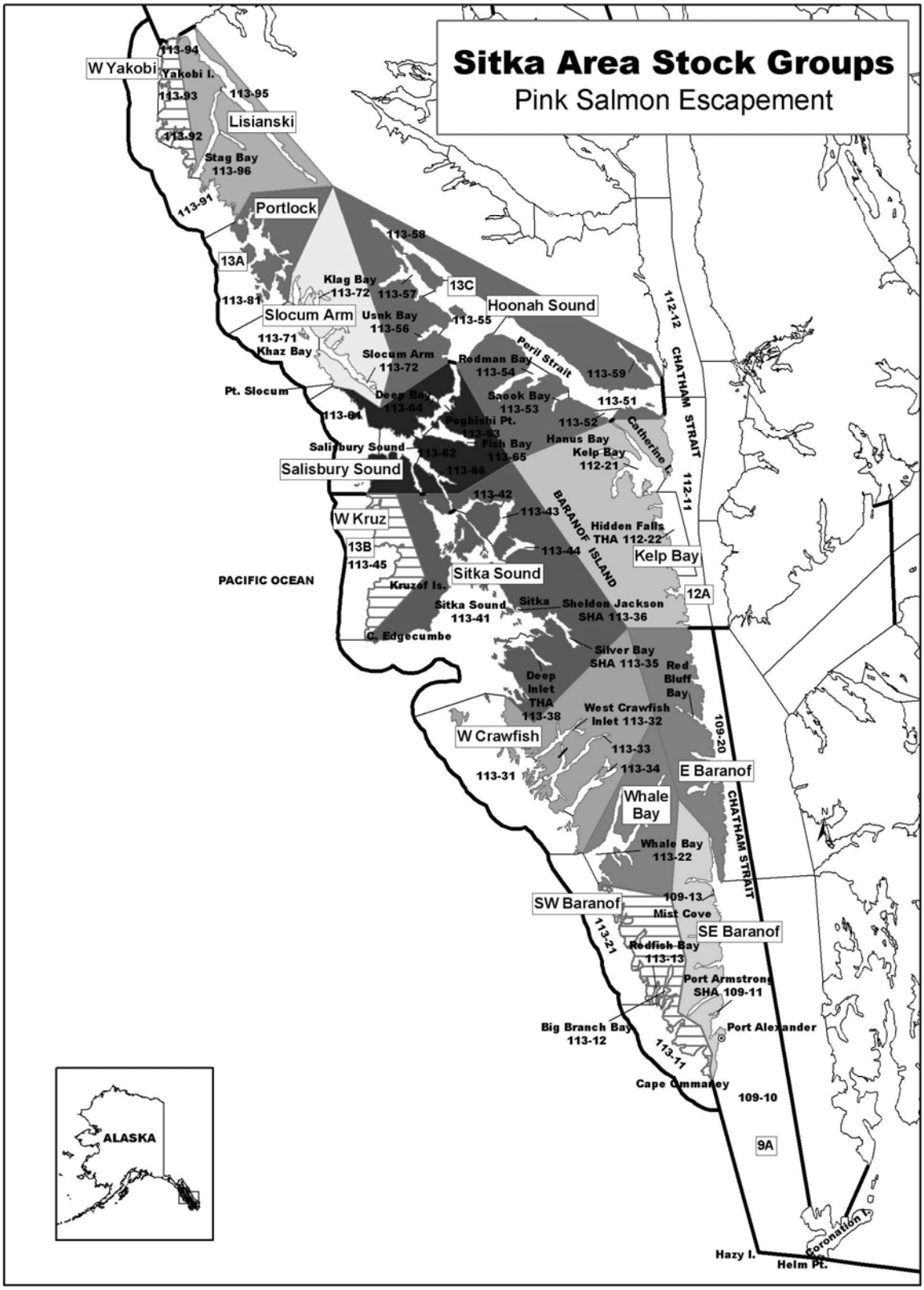
Appendix A1.–ADF&G salmon management areas in Southeast Alaska.



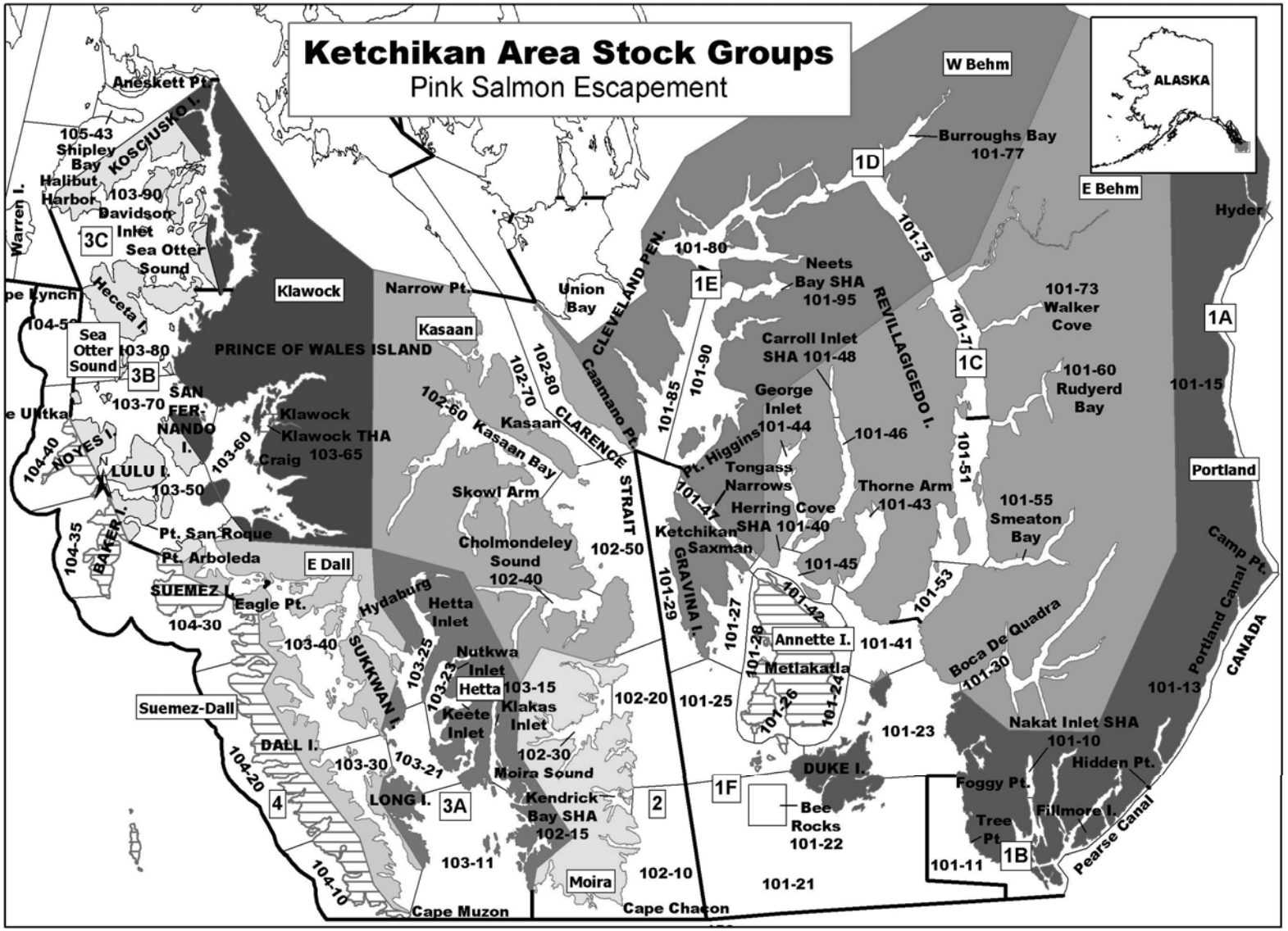
Appendix A2.–The ADF&G Juneau salmon management area and associated pink salmon escapement stock groups. Diagonal hatched stock groups indicate areas with no index streams or escapement targets.



Appendix A3.–The ADF&G Petersburg salmon management area and associated pink salmon escapement stock groups.



Appendix A4.–The ADF&G Sitka salmon management area and associated pink salmon escapement stock groups. Diagonal hatched stock groups indicate areas with no index streams or escapement targets.



Appendix A5.–The ADF&G Ketchikan salmon management area and associated pink salmon escapement stock groups. Diagonal hatched stock groups indicate areas with no index streams or escapement targets.

Appendix A6.–Estimated escapement of pink salmon to the Situk River, Yakutat area, 1961–2008.

Year [a]	Count	Type	Estimated Total Escapement [b]
1961	30,000	Aerial	90,000
1962	70,000	Aerial	210,000
1963	192,359	Extrapolated	192,359
1964	70,000	Aerial	210,000
1965	30,000	Aerial	90,000
1966	5,000	Aerial	15,000
1967	80,000	Aerial	240,000
1968	n/a	Extrapolated	156,735
1969	11,500	Aerial	34,500
1970	n/a	Extrapolated	156,735
1971	27,184	Weir	27,184
1972	10,000	Boat	30,000
1973	80,000	Boat	240,000
1974	20,000	Boat	60,000
1975	44,600	Boat	133,800
1976	38,081	Weir	38,081
1977	177,712	Weir	177,712
1978	120,000	Boat	360,000
1979	450,000	Weir	450,000
1980	250,000	Weir	250,000
1981	300,000	Weir	300,000
1982	40,300	Weir	40,300
1983	183,577	Weir	183,577
1984	113,161	Weir	113,161
1985	366,000	Weir	366,000
1986	85,000	Boat	85,000
1987	24,000	Boat	72,000
1988	78,753	Weir	78,753
1989	288,246	Weir	288,246
1990	175,000	Boat	175,000
1991	n/a	Extrapolated	192,359
1992	3,000	Boat	9,000
1993	n/a	Extrapolated	192,359
1994	n/a	Extrapolated	156,735
1995	66,273	Weir	66,273
1996	157,012	Weir	157,012
1997	466,267	Weir	466,267
1998	97,392	Weir	97,392
1999	27,386	Weir	27,386
2000	331,510	Weir	331,510
2001	121,267	Weir	121,267
2002	98,790	Weir	98,790
2003	375,333	Weir	375,333
2004	145,914	Weir	145,914
2005	279,648	Weir	279,648
2006	115,079	Weir	115,079
2007	229,024	Weir	229,024
2008	70,000	Boat	140,000

[a] Data for 1961–1994 are from Clark (1995).

[b] Peak aerial and foot surveys were multiplied by 3.0 to expand to estimated total escapement (Clark 1995). Peak boat count in 2008 was expanded by 2.0.

Appendix A7.–Southeast Alaska pink salmon harvest by sub-region, 1960–2008.

Year	Southern Southeast	Northern Southeast Inside	Northern Southeast Outside	Total Southeast	Yakutat Area
1960	1,439,666	1,234,374	25,195	2,699,235	12,911
1961	3,771,200	6,675,666	948,824	11,395,690	63,608
1962	10,740,428	424,435	64,864	11,229,727	26,063
1963	5,136,144	12,601,389	1,299,712	19,037,245	78,697
1964	11,257,947	7,206,628	75,646	18,540,221	40,038
1965	5,710,458	4,545,683	618,554	10,874,695	4,402
1966	15,561,555	4,758,856	29,101	20,349,512	1,405
1967	641,540	2,308,414	126,857	3,076,811	32,532
1968	15,193,876	9,821,918	59,760	25,075,554	2,317
1969	1,199,140	3,471,523	137,346	4,808,268	64,117
1970	5,370,759	5,176,532	67,955	10,615,246	4,049
1971	6,259,244	2,923,266	91,746	9,274,256	80,977
1972	9,152,645	3,187,714	49,734	12,390,093	3,026
1973	4,558,505	1,624,533	258,759	6,441,797	17,078
1974	4,220,805	601,734	62,221	4,884,760	4,277
1975	3,332,982	50,933	565,808	3,949,723	80,305
1976	5,161,936	38,033	105,641	5,305,610	28,549
1977	11,298,253	330,103	2,198,176	13,826,532	78,306
1978	18,424,978	2,619,929	161,987	21,206,894	36,484
1979	6,989,781	2,020,284	1,812,074	10,822,139	153,802
1980	12,924,273	1,322,635	109,642	14,356,550	143,865
1981	13,524,934	2,627,473	2,748,168	18,900,575	137,633
1982	12,961,072	10,768,872	502,612	24,232,556	12,267
1983	31,461,882	3,501,144	2,556,585	37,519,611	26,304
1984	19,676,515	3,733,277	1,274,806	24,684,598	21,158
1985	30,712,155	15,590,447	5,631,050	51,933,652	25,669
1986	45,019,457	931,285	212,319	46,163,061	9,216
1987	4,631,329	5,206,285	428,801	10,266,415	14,007
1988	9,054,789	1,964,105	66,605	11,085,499	121,663
1989	45,763,480	12,725,119	910,881	59,399,480	60,723
1990	26,683,252	5,438,631	187,888	32,309,771	32,231
1991	43,497,275	18,049,335	374,552	61,921,162	5,177
1992	19,009,576	15,499,994	432,711	34,942,281	21,027
1993	39,218,951	17,009,607	1,057,305	57,285,863	13,487
1994	21,060,265	35,205,066	995,836	57,261,167	13,710
1995	41,315,465	4,840,459	1,754,562	47,910,486	55,020
1996	53,676,323	9,063,248	1,858,221	64,597,792	31,922
1997	15,298,105	10,824,815	2,757,750	28,880,670	94,554
1998	23,748,765	12,846,432	5,853,552	42,448,749	86,653
1999	38,857,000	36,317,770	2,643,335	77,818,105	30,179
2000	12,376,777	5,315,004	2,557,196	20,248,977	64,449
2001	52,011,540	13,008,041	2,004,072	67,023,653	32,338
2002	23,319,261	18,989,224	3,006,916	45,315,401	15,606
2003	29,277,547	21,297,303	1,891,885	52,466,735	48,897
2004	20,924,256	22,125,523	2,259,965	45,309,744	23,268
2005	28,864,281	25,236,181	5,021,025	59,121,487	60,755
2006	3,267,182	5,795,700	2,543,618	11,606,500	88,911
2007	31,776,856	8,746,171	4,273,371	44,796,398	88,342
2008[a]	13,625,617	429,224	1,830,599	15,885,440	65,427

[a] 2008 harvest estimates are preliminary (downloaded from Southeast Alaska Integrated Fisheries Database 6 November 2008).

Appendix A8.–Southeast Alaska pink salmon escapement indices and biological escapement goal (BEG) ranges by sub-region (in millions of index fish), 1960–2008.

	Southern Southeast	Northern Southeast Inside	Northern Southeast Outside
BEG Lower Range	**3.00**	**2.50**	**0.75**
BEG Upper Range	**8.00**	**6.00**	**2.50**
1960	0.66	1.04	0.14
1961	1.22	2.06	0.35
1962	2.91	1.44	0.13
1963	2.50	2.92	0.82
1964	2.90	1.69	0.13
1965	2.32	1.76	0.38
1966	3.40	2.32	0.05
1967	1.48	0.95	0.20
1968	2.99	2.54	0.02
1969	1.72	1.43	0.42
1970	2.57	2.06	0.06
1971	2.90	2.26	0.23
1972	2.45	2.20	0.12
1973	2.42	1.42	0.36
1974	2.25	1.29	0.19
1975	3.26	0.59	0.50
1976	3.39	0.71	0.26
1977	5.04	1.63	1.71
1978	4.22	1.88	0.32
1979	3.43	2.62	1.62
1980	4.84	1.63	0.21
1981	4.68	1.78	1.47
1982	4.04	2.48	0.61
1983	6.52	2.12	1.24
1984	7.67	2.18	0.85
1985	9.95	4.35	1.76
1986	11.42	1.80	0.33
1987	4.51	2.79	0.42
1988	3.27	1.88	0.17
1989	7.33	2.95	0.44
1990	5.14	2.81	0.30
1991	5.63	3.68	0.72
1992	5.49	3.88	0.53
1993	6.47	3.75	0.43
1994	5.27	6.45	1.32
1995	7.79	3.17	1.35
1996	11.90	4.69	1.55
1997	5.97	5.91	2.88
1998	6.95	4.91	2.44
1999	11.28	10.04	6.00
2000	5.40	3.83	1.53
2001	10.99	5.27	2.37
2002	8.85	5.47	2.30
2003	9.78	6.68	3.51
2004	8.26	5.21	2.19
2005	9.40	6.68	3.84
2006	4.33	3.96	1.96
2007	10.59	4.74	2.31
2008	6.35	1.48	1.75

Appendix A9.–Pink salmon escapement index series and management target ranges by district (in millions of index fish), 1960–2008.

	Management District														
Management												Inside			Outside
Target	1	2	3	5	6	7	8	9	10	11	12	13	14	15	13
Lower	**1.02**	**0.29**	**0.95**	**0.25**	**0.21**	**0.26**	**0.02**	**0.63**	**0.59**	**0.27**	**0.53**	**0.32**	**0.15**	**0.03**	**0.75**
Upper	**2.71**	**0.77**	**2.54**	**0.66**	**0.57**	**0.69**	**0.06**	**1.50**	**1.41**	**0.65**	**1.26**	**0.76**	**0.35**	**0.07**	**2.50**
1960	0.24	0.06	0.18	0.08	0.04	0.05	0.00	0.22	0.21	0.22	0.24	0.09	0.06	0.01	0.14
1961	0.31	0.10	0.37	0.13	0.16	0.11	0.04	0.49	0.40	0.25	0.53	0.22	0.14	0.03	0.35
1962	0.79	0.21	0.73	0.41	0.31	0.45	0.01	0.40	0.39	0.16	0.30	0.09	0.09	0.02	0.13
1963	0.73	0.23	0.77	0.24	0.20	0.28	0.04	0.51	0.41	0.34	0.83	0.37	0.44	0.03	0.82
1964	0.77	0.28	0.73	0.36	0.38	0.34	0.04	0.52	0.40	0.14	0.33	0.16	0.12	0.02	0.13
1965	0.39	0.18	0.80	0.45	0.29	0.20	0.01	0.60	0.25	0.13	0.34	0.22	0.19	0.02	0.38
1966	0.98	0.35	0.92	0.39	0.33	0.41	0.03	0.59	0.44	0.39	0.54	0.22	0.11	0.03	0.05
1967	0.43	0.14	0.47	0.22	0.11	0.09	0.01	0.23	0.18	0.09	0.20	0.10	0.14	0.01	0.20
1968	0.92	0.26	0.80	0.39	0.35	0.21	0.05	0.70	0.64	0.37	0.46	0.24	0.10	0.03	0.02
1969	0.49	0.23	0.51	0.15	0.12	0.20	0.01	0.31	0.28	0.09	0.36	0.17	0.20	0.02	0.42
1970	0.87	0.18	0.80	0.21	0.18	0.30	0.04	0.41	0.57	0.32	0.46	0.18	0.09	0.02	0.06
1971	0.71	0.36	0.88	0.29	0.27	0.36	0.03	0.45	0.61	0.24	0.50	0.14	0.29	0.03	0.23
1972	0.86	0.19	0.63	0.20	0.19	0.36	0.02	0.39	0.59	0.45	0.41	0.25	0.09	0.03	0.12
1973	0.73	0.24	0.66	0.25	0.31	0.20	0.02	0.27	0.24	0.19	0.41	0.08	0.21	0.02	0.36
1974	0.82	0.21	0.61	0.14	0.22	0.24	0.01	0.22	0.29	0.27	0.27	0.17	0.06	0.02	0.19
1975	0.99	0.44	0.93	0.22	0.32	0.34	0.01	0.14	0.08	0.08	0.17	0.05	0.07	0.01	0.50
1976	1.06	0.38	1.01	0.14	0.44	0.36	0.02	0.17	0.14	0.06	0.17	0.11	0.05	0.01	0.26
1977	1.87	0.45	1.23	0.27	0.31	0.89	0.03	0.39	0.28	0.16	0.39	0.22	0.18	0.02	1.71
1978	1.59	0.38	1.33	0.27	0.24	0.40	0.01	0.38	0.35	0.12	0.51	0.40	0.09	0.02	0.32
1979	0.73	0.41	1.22	0.31	0.29	0.41	0.06	0.68	0.68	0.26	0.51	0.30	0.14	0.04	1.62
1980	1.80	0.46	1.62	0.24	0.33	0.36	0.04	0.36	0.43	0.11	0.39	0.23	0.09	0.02	0.21
1981	1.51	0.33	1.89	0.38	0.30	0.24	0.03	0.37	0.39	0.13	0.46	0.25	0.15	0.02	1.47
1982	1.39	0.28	1.40	0.24	0.31	0.36	0.06	0.65	0.57	0.25	0.53	0.33	0.12	0.03	0.61
1983	2.20	0.79	2.14	0.48	0.44	0.41	0.05	0.49	0.32	0.27	0.51	0.35	0.16	0.03	1.24
1984	3.16	0.72	2.54	0.46	0.33	0.42	0.04	0.57	0.37	0.27	0.42	0.39	0.14	0.02	0.85
1985	3.20	0.79	3.66	0.67	0.82	0.77	0.05	0.99	0.92	0.47	0.91	0.42	0.49	0.15	1.76
1986	4.03	0.95	4.46	0.65	0.72	0.56	0.06	0.64	0.25	0.12	0.52	0.20	0.07	0.02	0.33
1987	1.83	0.38	1.57	0.17	0.22	0.30	0.05	0.51	0.96	0.47	0.37	0.30	0.12	0.06	0.42
1988	1.14	0.38	1.07	0.19	0.21	0.26	0.02	0.52	0.41	0.16	0.44	0.22	0.09	0.03	0.17
1989	2.39	0.57	2.50	0.45	0.52	0.83	0.08	0.71	0.97	0.24	0.55	0.32	0.14	0.03	0.44
1990	1.59	0.47	1.77	0.41	0.47	0.38	0.06	0.62	1.03	0.17	0.47	0.33	0.13	0.06	0.30
1991	1.42	0.51	1.97	0.63	0.41	0.58	0.11	1.04	1.02	0.18	0.85	0.43	0.13	0.02	0.72
1992	2.63	0.71	1.23	0.14	0.19	0.53	0.06	0.90	1.07	0.44	0.85	0.43	0.15	0.04	0.53
1993	1.77	0.61	2.42	0.58	0.56	0.49	0.04	0.76	0.61	0.16	1.21	0.57	0.42	0.03	0.43
1994	1.58	0.34	1.78	0.39	0.64	0.51	0.04	1.43	1.28	1.00	1.62	0.62	0.40	0.10	1.32
1995	3.10	0.50	2.63	0.53	0.60	0.39	0.03	0.80	0.34	0.23	1.06	0.17	0.55	0.03	1.35
1996	4.23	1.58	4.27	0.66	0.59	0.55	0.03	1.68	0.47	0.83	1.19	0.34	0.14	0.05	1.55
1997	2.00	0.67	1.59	0.61	0.52	0.54	0.04	1.13	0.75	0.82	2.06	0.32	0.77	0.06	2.88
1998	2.44	0.82	2.19	0.40	0.56	0.51	0.04	1.19	0.85	0.73	1.38	0.52	0.18	0.06	2.44
1999	2.58	1.23	3.30	1.70	1.56	0.83	0.07	2.73	1.89	0.84	2.41	0.88	1.13	0.15	6.00
2000	1.73	0.89	1.70	0.33	0.30	0.43	0.01	0.90	0.89	0.34	0.93	0.60	0.12	0.05	1.53
2001	3.71	1.15	3.14	1.05	1.01	0.81	0.12	1.14	1.08	0.48	1.25	0.52	0.75	0.05	2.37
2002	3.03	1.25	2.69	0.68	0.57	0.58	0.04	1.43	1.30	0.51	1.38	0.53	0.28	0.04	2.30
2003	3.17	1.13	2.67	0.97	0.89	0.79	0.15	1.12	1.73	0.57	1.51	1.27	0.42	0.05	3.51
2004	2.48	0.64	3.30	0.64	0.58	0.56	0.06	1.28	1.28	0.50	1.29	0.54	0.27	0.05	2.19
2005	2.89	1.22	2.63	1.03	0.71	0.80	0.11	1.75	1.11	0.49	1.98	0.71	0.55	0.08	3.84
2006	1.36	0.63	1.33	0.24	0.34	0.37	0.05	1.09	0.78	0.37	0.95	0.46	0.24	0.07	1.96
2007	3.98	1.42	3.48	0.45	0.54	0.67	0.05	1.04	0.84	0.44	1.20	0.79	0.39	0.06	2.31
2008	2.15	0.94	1.98	0.27	0.40	0.59	0.01	0.53	0.35	0.18	0.24	0.10	0.06	0.02	1.75

Appendix A10.–Escapement index series and management targets for pink salmon stock groups in the Juneau management area (in millions of index fish), 1960–2008.

Stock Group	Seymour Canal	Stephens	Freshwater Bay	Lower Lynn Canal	SW Admiralty	Tenakee	W Admiralty	Homeshore	N Chichagof	Upper Lynn Canal
Management Area	Juneau	Juneau	Juneau	Juneau	Juneau	Juneau	Juneau	Juneau	Juneau	Juneau
Sub-region	NSEI[a]	NSEI	NSEI	NSEI	NSEI	NSEI	NSEI	NSEI	NSEI	NSEI
District	11	11	12	12	12	12	12	14	14	15
No. of Streams	14	35	15	6	17	19	14	10	23	9
Lower Target	**160,000**	**110,000**	**80,000**	**20,000**	**100,000**	**210,000**	**50,000**	**30,000**	**120,000**	**30,000**
Upper Target	**400,000**	**250,000**	**180,000**	**60,000**	**250,000**	**510,000**	**120,000**	**70,000**	**280,000**	**70,000**
1960	171,765	48,921	35,260	9,146	52,872	93,540	15,522	11,426	45,726	12,891
1961	175,834	74,839	78,611	25,273	79,602	252,535	40,581	17,537	126,405	25,466
1962	108,247	56,248	29,064	13,033	66,878	124,480	23,506	20,335	72,004	17,886
1963	237,438	99,736	113,578	32,095	77,161	472,644	50,789	37,220	402,211	30,187
1964	58,757	84,581	58,896	24,062	67,643	101,043	30,561	30,018	92,181	20,980
1965	66,586	65,299	53,783	18,393	48,888	138,374	34,784	25,012	169,566	21,800
1966	306,758	85,467	82,391	32,072	95,698	224,959	43,113	20,784	89,894	28,775
1967	51,297	35,748	25,280	20,751	30,116	42,530	54,187	12,245	125,987	11,747
1968	271,178	101,901	60,109	19,101	95,154	179,366	42,071	23,638	73,010	28,984
1969	30,526	56,533	49,458	23,605	88,779	90,550	75,014	44,032	154,519	15,089
1970	231,371	84,773	94,485	22,569	103,040	166,948	54,908	27,752	66,719	21,322
1971	151,956	89,200	72,718	36,839	116,324	166,826	62,733	31,986	256,982	27,927
1972	341,271	109,168	58,540	19,224	98,623	155,401	29,081	31,156	59,713	27,188
1973	115,726	77,598	63,065	29,622	42,781	173,573	66,152	23,095	188,831	17,616
1974	219,297	54,561	61,797	8,886	26,965	125,974	17,035	11,470	47,093	15,924
1975	34,477	45,936	35,639	8,167	17,882	52,708	37,741	6,920	61,161	7,360
1976	33,185	30,688	31,567	12,010	20,274	86,701	8,227	7,296	38,927	8,779
1977	84,527	73,588	96,341	37,563	62,117	113,744	37,856	17,836	159,254	20,221
1978	61,970	54,850	85,084	23,703	55,952	272,289	37,775	16,533	75,503	23,251
1979	136,748	120,323	111,975	54,000	100,123	96,598	70,201	30,203	110,075	42,372
1980	51,246	58,370	36,655	29,021	107,356	156,928	27,973	29,238	63,590	17,932
1981	32,010	101,453	30,856	20,355	63,592	149,510	54,464	30,920	116,649	16,072
1982	127,057	118,733	54,062	23,427	108,896	209,995	32,784	23,420	95,681	27,268
1983	124,168	150,401	34,680	34,936	116,876	228,922	34,027	22,958	133,978	33,923
1984	171,998	99,809	54,383	11,034	81,767	162,906	29,679	36,426	102,193	23,365
1985	234,224	237,294	113,949	43,857	195,400	324,803	108,800	153,557	335,258	151,395
1986	68,449	54,230	52,932	17,072	88,537	305,603	20,488	16,435	50,983	16,626
1987	197,405	272,728	46,561	14,950	85,397	98,869	49,600	21,698	93,423	60,421
1988	48,834	116,036	61,298	18,100	53,290	223,009	18,802	31,772	61,899	25,531
1989	130,207	104,807	69,725	30,379	128,714	154,052	64,400	27,825	112,349	28,036
1990	51,489	119,184	61,698	17,989	180,467	149,584	28,914	39,122	90,684	58,371
1991	57,808	125,028	68,786	14,340	109,956	456,771	59,130	17,075	111,419	23,850
1992	151,559	291,846	134,757	45,092	140,380	442,269	51,237	47,219	102,054	36,437
1993	107,741	50,741	169,300	23,921	219,198	608,693	81,298	62,000	357,595	29,764
1994	279,911	719,343	303,476	83,141	280,793	697,754	140,094	111,684	290,038	97,223
1995	130,532	100,007	276,509	48,491	136,518	454,893	120,442	63,879	481,969	25,512
1996	341,087	484,296	164,175	19,689	320,067	549,400	57,297	38,586	98,050	45,189
1997	505,019	316,711	332,688	136,000	221,133	1,020,790	190,221	114,861	651,809	55,968
1998	329,328	401,817	161,973	24,793	536,444	517,307	33,214	39,134	139,948	60,801
1999	435,221	403,789	252,853	235,881	457,511	990,616	210,682	204,630	927,528	151,849
2000	193,250	144,643	85,804	24,800	275,488	429,550	30,914	33,087	88,610	47,777
2001	278,145	203,278	265,777	293,290	235,058	157,827	99,403	107,151	646,384	47,817
2002	248,468	263,227	195,025	59,069	233,394	771,073	63,269	46,674	229,605	38,739
2003	349,333	223,792	185,808	67,575	378,463	245,012	158,834	70,806	353,585	51,517
2004	307,516	194,446	199,661	50,209	380,773	399,114	181,912	81,111	188,840	49,947
2005	210,198	281,419	171,148	138,741	643,682	531,660	161,746	104,705	442,293	83,550
2006	178,631	194,006	146,813	86,909	212,737	288,922	171,088	48,532	196,464	69,015
2007	266,115	169,622	180,417	45,158	388,800	360,692	65,092	57,859	329,824	55,927
2008	107,623	72,077	63,727	5,588	25,767	48,650	23,325	28,234	35,132	24,333

[a] NSEI = Northern Southeast Inside sub-region.

Appendix A11.–Escapement index series and management targets for pink salmon stock groups in the Petersburg management area (in millions of index fish), 1960–2008.

Stock Group	Affleck Canal	Shipley Bay	Burnett	Ratz Harbor	Totem Bay	Whale Pass	Anan	Union Bay	Stikine
Management Area	Petersburg	Petersburg	Petersburg	Petersburg	Petersburg	Petersburg	Petersburg	Petersburg	Petersburg
Sub-region	SSE[a]	SSE	SSE	SSE	SSE	SSE	SSE	SSE	SSE
District	5	5	6	6	6	6	7	7	8
No. of Streams	33	12	10	4	13	10	27	8	6
Lower Target	**140,000**	**110,000**	**50,000**	**40,000**	**50,000**	**70,000**	**210,000**	**50,000**	**20,000**
Upper Target	**380,000**	**280,000**	**140,000**	**120,000**	**130,000**	**180,000**	**570,000**	**120,000**	**60,000**
1960	56,874	22,310	11,550	11,093	13,166	6,429	42,794	7,955	4,087
1961	74,339	50,943	40,571	44,013	45,652	27,755	103,336	9,733	40,618
1962	315,377	97,339	42,737	40,793	87,067	138,456	405,147	46,603	11,009
1963	97,325	145,371	43,516	42,059	45,197	70,966	238,163	41,490	41,166
1964	241,853	115,376	178,169	48,812	60,893	88,234	299,409	45,390	37,150
1965	153,497	295,773	74,494	87,152	49,045	79,089	154,275	47,802	9,077
1966	231,652	155,599	60,480	57,336	71,513	144,414	337,890	68,023	27,104
1967	72,436	150,244	21,837	24,903	27,512	36,129	81,790	8,355	9,355
1968	184,459	207,042	122,870	50,333	98,850	82,573	183,423	26,442	49,493
1969	67,882	81,999	13,503	40,617	31,524	37,848	172,749	28,544	11,397
1970	129,948	75,689	42,015	31,198	53,612	53,908	266,527	29,447	38,702
1971	138,841	150,207	45,652	62,240	51,714	113,759	297,139	64,458	28,088
1972	151,062	48,888	50,854	44,876	45,620	47,925	318,011	44,942	17,595
1973	132,759	112,327	97,417	15,615	44,388	156,723	163,409	41,041	20,422
1974	98,977	41,438	50,581	37,318	35,629	95,447	202,365	37,747	9,157
1975	106,500	115,722	96,097	21,500	60,761	145,081	293,493	47,928	11,919
1976	96,352	39,023	138,003	60,817	40,803	201,678	261,615	93,602	19,184
1977	109,549	158,069	110,856	69,743	54,178	72,579	752,891	136,570	26,450
1978	165,405	104,074	44,248	70,400	50,147	72,002	326,129	70,541	8,154
1979	163,469	148,839	67,722	47,304	98,575	72,087	365,703	48,789	58,611
1980	156,218	78,975	66,601	77,412	75,422	112,301	281,714	79,778	35,080
1981	196,117	187,128	77,582	53,653	60,233	106,979	173,749	69,910	30,113
1982	127,583	115,259	65,220	86,300	85,091	72,089	293,009	67,500	59,058
1983	281,474	203,496	115,251	66,482	99,580	163,179	331,447	78,082	51,972
1984	286,050	171,794	65,811	16,300	83,180	166,773	348,254	68,997	37,607
1985	356,587	309,768	116,600	223,500	231,159	247,362	608,270	160,984	53,200
1986	445,786	206,313	132,775	196,900	143,793	244,710	371,920	183,950	59,410
1987	68,864	96,521	43,665	22,510	102,391	46,517	240,188	58,600	52,209
1988	157,710	34,861	47,711	70,000	55,841	37,856	163,871	94,600	15,513
1989	229,656	220,500	83,540	141,442	126,821	165,907	628,423	197,917	76,478
1990	320,857	88,806	115,300	71,300	85,607	194,488	236,062	142,004	56,136
1991	249,688	375,693	121,845	67,700	124,099	96,027	457,152	125,847	114,009
1992	111,985	30,386	76,973	17,500	58,711	38,045	480,860	50,618	56,504
1993	278,371	296,693	67,650	119,500	283,415	93,105	402,151	89,273	35,864
1994	251,082	134,593	172,054	107,200	82,617	273,690	402,878	107,800	35,744
1995	256,297	277,912	58,250	191,700	133,828	217,765	263,085	129,691	26,186
1996	449,929	209,200	147,200	131,200	149,539	161,045	363,694	183,400	25,950
1997	319,271	290,546	128,366	70,462	132,101	188,081	485,466	57,990	44,185
1998	223,369	174,409	125,780	138,300	80,728	214,377	388,962	120,063	38,002
1999	821,107	874,712	387,587	391,000	469,386	316,310	632,197	198,069	66,598
2000	214,344	118,400	120,867	56,700	79,902	47,214	358,607	72,200	12,436
2001	578,079	476,567	263,219	178,800	271,757	295,729	610,633	196,732	118,313
2002	536,426	146,757	212,455	148,313	108,662	100,420	441,025	138,527	41,915
2003	396,633	578,350	203,072	247,200	154,436	282,876	631,599	158,721	154,196
2004	463,593	177,835	96,600	172,000	175,843	131,787	450,034	110,842	62,188
2005	564,872	467,966	162,221	132,800	134,719	278,036	633,828	168,548	110,330
2006	140,991	96,959	70,447	101,200	72,993	99,245	274,024	97,589	54,895
2007	231,447	220,266	161,032	137,950	70,771	166,498	535,219	131,031	50,525
2008	121,123	150,815	132,750	181,200	33,517	49,811	486,738	98,552	14,348

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Stock Group	Eliza Harbor	Saginaw Bay	Tebenkof	Farragut Bay	Houghton	Portage Bay	Pybus/ Gambier
Management Area	Petersburg	Petersburg	Petersburg	Petersburg	Petersburg	Petersburg	Petersburg
Sub-region	NSEI[b]	NSEI	NSEI	NSEI	NSEI	NSEI	NSEI
District	9	9	9	10	10	10	10
No. of Streams	13	15	40	4	18	7	18
Lower Target	**140,000**	**130,000**	**210,000**	**20,000**	**380,000**	**30,000**	**170,000**
Upper Target	**330,000**	**300,000**	**500,000**	**40,000**	**900,000**	**70,000**	**400,000**
1960	37,686	45,222	64,577	6,412	142,821	10,361	52,604
1961	87,143	83,498	179,982	9,866	214,181	27,748	150,165
1962	65,524	68,831	169,362	10,789	248,942	19,099	107,408
1963	130,114	93,698	177,547	13,928	246,161	25,456	122,991
1964	130,205	167,256	168,131	10,435	238,958	24,179	123,588
1965	94,849	170,195	262,780	7,888	179,277	14,740	48,079
1966	222,341	77,901	205,947	14,313	290,413	23,276	110,342
1967	38,191	45,095	86,063	5,845	126,451	19,862	26,115
1968	190,289	148,048	246,557	15,613	374,995	45,784	199,651
1969	47,808	72,455	117,196	8,779	213,838	17,135	42,326
1970	116,656	56,065	150,250	10,859	357,635	19,918	183,554
1971	89,081	96,949	156,199	13,892	414,984	43,613	132,889
1972	79,569	96,861	128,378	13,260	363,255	16,789	193,726
1973	36,211	49,511	135,748	6,857	128,828	19,265	83,240
1974	34,534	77,033	67,888	7,921	134,928	11,797	133,389
1975	12,155	27,383	63,539	1,994	41,534	4,851	26,887
1976	21,210	23,620	104,222	4,367	76,676	6,921	56,470
1977	59,355	54,494	168,708	8,456	150,582	20,915	96,460
1978	61,587	42,203	162,282	7,383	186,702	23,408	132,854
1979	86,791	150,545	209,326	15,039	385,742	27,155	254,564
1980	77,840	65,830	106,231	7,154	274,751	21,847	128,740
1981	54,587	71,773	74,368	9,226	314,102	21,203	50,381
1982	68,021	155,405	163,756	24,850	389,728	35,016	124,143
1983	76,104	102,813	147,799	12,374	214,358	24,847	67,170
1984	99,318	118,641	163,848	7,420	249,966	33,710	82,669
1985	188,150	244,452	334,651	38,936	519,400	69,980	286,784
1986	87,711	209,523	245,681	12,891	129,221	23,111	80,384
1987	135,895	144,899	109,986	25,053	647,979	59,363	232,060
1988	80,639	64,914	191,074	6,100	266,705	34,728	103,272
1989	162,201	201,472	195,355	36,112	629,300	59,950	240,415
1990	199,513	106,801	175,353	21,915	709,385	53,430	246,617
1991	269,273	260,596	229,960	39,475	692,888	53,388	236,147
1992	329,419	114,273	290,736	20,236	685,602	53,300	313,829
1993	204,274	114,376	211,381	28,600	362,943	44,344	172,345
1994	248,100	279,874	462,549	29,600	803,512	55,218	393,281
1995	168,799	72,655	242,107	16,703	173,110	22,566	125,666
1996	305,900	276,951	539,271	20,865	213,789	27,444	209,761
1997	283,926	186,914	253,971	21,094	377,505	53,086	297,491
1998	227,784	206,352	259,364	17,602	446,203	34,506	347,010
1999	736,413	547,110	642,864	68,068	1,115,055	141,112	570,659
2000	196,205	243,604	241,250	22,903	468,280	30,859	363,813
2001	174,984	229,090	398,240	25,190	708,450	45,594	303,832
2002	193,956	493,594	521,082	29,351	824,900	52,472	397,157
2003	145,102	277,078	520,582	40,875	1,313,600	65,863	310,228
2004	275,600	309,440	353,626	55,166	640,250	88,684	497,400
2005	345,768	367,374	477,883	34,694	633,061	36,200	410,318
2006	200,538	199,393	230,596	24,363	438,999	24,000	291,285
2007	253,245	195,488	315,614	32,288	532,520	58,806	212,298
2008	70,028	62,578	278,233	9,865	215,138	18,429	103,570

[a] SSE = Southern Southeast sub-region.

[b] NSEI = Northern Southeast Inside sub-region.

Appendix A12.–Escapement index series and management targets for pink salmon stock groups in the Sitka management area (in millions of index fish), 1960–2008.

Stock Group	E Baranof	SE Baranof	Kelp Bay	Hoonah Sound	Lisianski	Portlock	Salisbury Sound	Sitka Sound	Slocum Arm	W Crawfish	Whale Bay
Manage.Area	Sitka	Sitka	Sitka	Sitka	Sitka	Sitka	Sitka	Sitka	Sitka	Sitka	Sitka
Sub-region	NSEI[a]	NSEI	NSEI	NSEI	NSEO[b]	NSEO	NSEO	NSEO	NSEO	NSEO	NSEO
District	9	9	12	13	13	13	13	13	13	13	13
No. of Streams	2	4	4	20	5	3	8	12	7	2	4
Upper Target	**90,000**	**70,000**	**60,000**	**320,000**	**80,000**	**40,000**	**190,000**	**210,000**	**160,000**	**30,000**	**40,000**
Lower Target	**210,000**	**160,000**	**140,000**	**760,000**	**270,000**	**130,000**	**630,000**	**700,000**	**520,000**	**100,000**	**150,000**
1960	39,848	28,250	29,122	87,516	10,839	17,600	15,772	30,494	45,964	3,528	13,485
1961	78,710	55,801	57,521	215,894	57,489	65,200	87,628	68,160	47,774	5,113	18,671
1962	55,279	39,191	40,398	88,296	10,018	22,800	18,776	23,885	45,031	3,237	10,105
1963	40,000	69,306	81,692	367,694	174,577	77,000	245,028	196,095	95,716	700	30,686
1964	7,312	45,971	47,387	162,628	34,895	11,500	19,465	13,735	40,898	1,100	9,928
1965	28,403	47,773	49,244	215,473	101,676	19,848	58,920	96,037	74,970	14,550	13,314
1966	18,171	63,052	64,995	223,815	7,124	3,779	9,007	15,732	10,451	1,995	3,926
1967	36,313	26,027	26,537	102,704	25,244	14,533	39,227	63,554	42,126	7,673	7,672
1968	58,460	59,354	59,802	242,877	3,848	1,684	5,129	4,470	3,831	796	1,000
1969	36,945	38,674	30,378	172,121	37,956	20,118	123,063	115,306	76,529	16,144	31,772
1970	30,000	52,712	21,846	182,444	4,979	3,855	14,528	10,275	17,854	2,228	4,387
1971	58,000	53,000	44,000	140,024	36,452	6,655	58,906	75,957	44,300	500	6,800
1972	27,996	54,064	45,564	247,442	7,271	7,189	16,317	17,850	61,338	4,700	7,858
1973	6,941	38,599	39,790	79,998	24,926	13,700	29,171	175,003	80,792	13,680	19,371
1974	6,755	31,344	26,217	165,557	16,942	11,779	17,594	56,334	64,089	7,218	14,203
1975	20,811	16,847	19,332	51,282	31,931	22,765	87,802	210,546	93,879	19,345	38,071
1976	2,200	17,423	8,327	110,183	12,476	15,382	29,800	68,611	110,440	10,017	14,416
1977	64,229	38,997	47,298	221,006	155,621	124,114	282,020	732,689	219,363	65,526	128,954
1978	33,000	84,000	35,600	402,247	28,662	13,415	79,682	82,941	76,982	12,193	23,995
1979	73,568	160,000	75,700	304,298	209,048	157,885	331,647	511,672	249,000	62,296	102,531
1980	28,200	79,500	35,656	225,422	23,643	10,747	46,546	45,039	48,055	8,135	29,925
1981	65,000	106,000	146,000	250,451	240,003	108,000	391,000	464,800	166,500	32,000	68,107
1982	114,000	153,000	98,000	330,259	38,666	31,485	220,746	161,929	95,500	33,911	30,151
1983	81,000	78,000	57,239	346,284	239,825	140,000	218,000	344,000	195,374	29,200	69,312
1984	101,000	83,000	84,000	387,063	58,777	20,500	178,000	315,946	104,000	106,000	66,000
1985	155,000	63,000	126,000	424,529	325,477	85,000	449,500	542,925	228,746	34,000	95,000
1986	68,100	24,731	35,600	196,647	46,579	14,000	41,128	117,217	72,355	16,818	23,000
1987	97,000	24,400	73,500	299,790	69,871	37,933	36,361	132,737	110,582	21,141	13,409
1988	157,566	26,556	68,000	222,759	29,819	7,743	26,874	40,121	42,576	6,430	13,432
1989	119,022	31,200	107,000	315,901	95,000	54,000	36,903	47,064	172,192	6,922	29,248
1990	83,837	56,000	32,500	329,697	21,727	16,816	56,318	49,448	119,172	10,341	24,538
1991	200,014	78,500	140,000	430,679	53,893	25,000	175,300	101,747	289,676	27,680	48,336
1992	85,293	76,500	37,372	430,739	20,866	20,500	41,629	77,393	139,028	21,655	205,000
1993	107,000	122,500	111,000	565,562	81,422	20,637	184,800	33,240	74,342	16,439	17,675
1994	322,000	113,500	117,000	617,825	53,747	62,000	144,000	336,154	447,000	57,208	220,000
1995	126,000	186,000	23,889	173,807	162,197	87,000	404,175	292,979	280,917	34,671	90,000
1996	321,401	238,000	77,500	343,341	78,751	98,185	255,000	587,275	307,000	82,000	143,000
1997	270,000	132,500	161,177	323,509	540,000	290,000	271,282	1,045,375	563,000	80,969	85,300
1998	236,701	262,000	106,800	522,607	90,103	97,894	311,000	1,061,978	349,019	152,000	377,000
1999	553,694	251,000	258,896	882,218	946,000	390,058	1,472,500	1,624,076	1,190,500	129,363	251,674
2000	132,218	86,457	86,295	599,273	78,120	127,000	255,900	514,558	389,955	47,307	120,273
2001	197,192	136,340	202,298	516,090	652,000	160,000	176,201	639,470	568,000	24,000	153,193
2002	157,466	62,500	62,576	529,013	149,076	137,574	387,808	882,403	381,953	114,418	243,449
2003	123,800	53,600	476,500	1,269,956	287,000	318,000	476,000	1,447,610	717,000	64,000	196,000
2004	291,800	48,900	78,800	539,182	87,000	170,000	375,800	847,000	267,000	155,000	285,800
2005	370,115	185,000	338,000	714,000	539,000	274,000	535,000	1,474,000	496,000	185,000	332,196
2006	299,000	159,000	41,500	455,000	233,000	183,000	304,000	693,000	287,000	157,000	101,000
2007	149,000	128,000	157,564	787,500	459,000	235,000	302,000	667,000	345,000	128,000	170,000
2008	84,000	36,218	72,600	98,882	248,000	239,000	186,500	631,000	299,000	84,000	60,988

[a] NSEI = Northern Southeast Inside sub-region.

[b] NSEO = Northern Southeast Outside sub-region.

Appendix A13.–Escapement index series and management targets for pink salmon stock groups in the Ketchikan management area (in millions of index fish), 1960–2008.

Stock Group	E Behm	Portland	W Behm	Kasaan	Moira	E Dall	Hetta	Klawock	Sea Otter Sound
Management Area	Ketchikan	Ketchikan	Ketchikan	Ketchikan	Ketchikan	Ketchikan	Ketchikan	Ketchikan	Ketchikan
Sub-region	SSE[a]	SSE	SSE	SSE	SSE	SSE	SSE	SSE	SSE
District	1	1	1	2	2	3	3	3	3
No. of Streams	41	16	34	28	12	32	15	47	18
Lower Target	**670,000**	**100,000**	**250,000**	**240,000**	**50,000**	**130,000**	**300,000**	**420,000**	**100,000**
Upper Target	**1,770,000**	**280,000**	**660,000**	**640,000**	**130,000**	**360,000**	**790,000**	**1,110,000**	**280,000**
1960	177,762	15,677	47,524	48,694	10,031	29,595	22,514	114,806	15,418
1961	190,729	44,518	79,186	82,099	15,787	41,190	77,649	223,948	28,660
1962	494,675	109,169	184,078	162,294	44,083	127,845	158,409	344,883	101,136
1963	415,782	150,249	167,517	179,102	49,914	83,866	241,314	377,034	65,623
1964	362,407	126,098	278,438	238,199	41,836	151,831	171,108	316,618	94,581
1965	190,649	123,325	71,566	142,112	34,359	117,830	155,231	396,870	133,524
1966	541,879	160,780	282,144	279,978	67,182	131,155	222,798	414,378	147,840
1967	274,793	55,330	102,635	120,129	21,111	65,940	126,628	230,205	48,313
1968	434,209	253,016	233,417	217,108	45,510	124,471	219,406	355,436	98,620
1969	291,218	75,133	123,124	207,180	26,164	73,417	111,051	267,493	56,138
1970	574,954	78,351	219,415	154,966	26,303	114,748	200,292	395,666	85,561
1971	426,284	86,675	192,388	309,370	50,992	94,095	256,895	443,449	87,721
1972	511,517	139,943	206,490	157,909	33,756	84,567	152,099	328,905	65,422
1973	493,350	92,631	145,144	170,175	68,941	98,027	145,135	316,629	105,086
1974	563,905	76,914	175,297	139,030	75,222	94,748	199,357	230,419	85,846
1975	677,986	122,204	185,297	345,515	98,941	127,590	298,404	342,434	166,169
1976	705,487	129,350	222,197	295,889	85,020	196,788	216,352	452,477	140,045
1977	1,050,919	283,948	534,872	370,922	80,294	200,353	279,569	568,795	179,246
1978	960,140	188,526	439,113	328,594	55,885	228,084	309,043	617,811	177,048
1979	328,634	40,758	361,852	366,742	45,532	175,154	258,256	630,763	155,592
1980	1,102,909	137,872	563,365	348,505	107,446	332,478	421,149	687,148	174,841
1981	916,630	206,445	386,107	253,952	72,403	292,054	435,151	977,223	185,718
1982	831,492	98,591	463,851	215,146	61,378	203,456	450,062	570,045	172,789
1983	1,512,445	227,730	454,986	682,319	111,334	252,267	504,541	1,133,029	253,631
1984	1,944,340	319,785	900,031	589,139	135,556	458,267	587,422	1,291,220	204,216
1985	1,635,238	436,835	1,126,743	644,636	145,200	563,605	777,601	1,980,094	337,400
1986	2,972,027	246,917	812,796	727,851	217,642	671,939	1,179,279	2,198,456	412,000
1987	1,193,959	294,478	343,920	302,747	77,344	159,787	546,813	793,468	65,484
1988	881,041	102,629	157,873	244,388	138,592	223,809	387,521	374,067	82,582
1989	1,252,591	470,927	670,662	525,579	46,192	199,110	475,862	1,656,890	163,556
1990	955,415	93,081	539,208	387,781	80,443	274,125	493,803	772,110	234,031
1991	954,414	138,228	328,444	430,891	74,595	173,309	543,332	1,119,384	135,890
1992	1,789,005	123,521	714,492	594,910	110,210	234,098	313,004	484,713	200,144
1993	1,105,713	279,700	386,450	572,800	40,550	270,031	596,193	1,418,734	136,300
1994	1,197,482	134,109	247,384	268,078	74,997	249,976	489,543	780,511	257,286
1995	2,080,905	327,500	691,600	378,342	124,800	375,214	835,500	1,184,535	233,010
1996	3,126,352	263,783	837,221	1,440,395	144,483	738,609	1,518,661	1,558,227	451,221
1997	1,297,271	172,701	525,755	619,436	53,962	161,180	451,655	876,723	95,825
1998	1,446,994	320,292	669,793	706,035	116,904	281,482	503,160	1,231,699	171,668
1999	1,602,403	268,371	711,714	1,038,954	195,475	274,985	1,374,047	1,321,969	330,960
2000	1,187,349	186,759	355,116	818,729	73,930	231,491	889,726	428,055	150,552
2001	2,717,693	307,792	680,731	1,053,217	98,007	343,951	488,500	1,821,121	485,438
2002	1,996,170	412,327	621,950	1,149,593	101,561	439,418	998,994	987,733	262,986
2003	2,158,576	331,150	675,373	1,027,646	107,346	253,985	474,400	1,606,070	335,740
2004	1,462,810	423,550	592,932	588,519	49,672	584,072	644,590	1,722,373	346,700
2005	2,026,508	339,694	528,558	1,095,679	123,650	317,780	833,377	1,323,920	153,193
2006	1,037,370	76,379	243,303	519,826	108,756	141,772	530,522	514,772	146,516
2007	2,531,650	557,100	895,829	1,262,000	158,000	437,883	866,119	1,968,846	209,206
2008	1,372,574	95,856	682,869	733,500	211,400	251,848	842,004	761,773	126,891

[a] SSE = Southern Southeast sub-region.

Appendix A14.–Estimated potential yields (in millions) for pink salmon in the Southern Southeast sub-region, based on the "tabular approach" of Hilborn and Walters (1992).

Escapement Index Interval	*n*	Mean Escapement Index	Expansion Factor	Mean Expanded Escapement	Mean Recruitment	Surplus Yield
0–2	4	1.3	1	1.3	8.3	7.1
1–3	13	2.4	1	2.4	8.5	6.2
2–4	15	2.9	1	2.9	13.2	10.4
3–5	10	3.9	1	3.9	26.0	22.1
4–6	12	5.0	1	5.0	34.0	29.0
5–7	10	5.8	1	5.8	36.2	30.4
6–8	6	7.1	1	7.1	39.1	31.9
7–9	5	8.0	1	8.0	32.7	24.7
>8	9	10.2	1	10.2	30.2	20.0
0–2	4	1.3	2.5	3.2	12.1	8.9
1–3	13	2.4	2.5	5.9	12.4	6.5
2–4	15	2.9	2.5	7.2	18.1	10.9
3–5	10	3.9	2.5	9.8	33.9	24.1
4–6	12	5.0	2.5	12.5	44.4	31.8
5–7	10	5.8	2.5	14.5	47.6	33.1
6–8	6	7.1	2.5	17.8	50.6	32.8
7–9	5	8.0	2.5	19.9	43.4	23.5
>8	9	10.2	2.5	25.5	41.5	16.0
0–2	4	1.3	5	6.3	18.4	12.0
1–3	13	2.4	5	11.8	18.9	7.1
2–4	15	2.9	5	14.3	26.2	11.9
3–5	10	3.9	5	19.5	47.0	27.5
4–6	12	5.0	5	25.1	61.7	36.6
5–7	10	5.8	5	28.9	66.6	37.6
6–8	6	7.1	5	35.6	69.8	34.2
7–9	5	8.0	5	39.9	61.2	21.3
>8	9	10.2	5	51.0	60.4	9.4
0–2	4	1.3	7.5	9.5	24.6	15.1
1–3	13	2.4	7.5	17.7	25.3	7.7
2–4	15	2.9	7.5	21.5	34.3	12.8
3–5	10	3.9	7.5	29.3	60.1	30.9
4–6	12	5.0	7.5	37.6	79.0	41.4
5–7	10	5.8	7.5	43.4	85.5	42.1
6–8	6	7.1	7.5	53.4	89.1	35.7
7–9	5	8.0	7.5	59.8	79.0	19.2
>8	9	10.2	7.5	76.5	79.3	2.8
0–2	4	1.3	10	12.7	30.9	18.2
1–3	13	2.4	10	23.5	31.8	8.2
2–4	15	2.9	10	28.6	42.3	13.7
3–5	10	3.9	10	39.0	73.3	34.2
4–6	12	5.0	10	50.2	96.3	46.1
5–7	10	5.8	10	57.9	104.5	46.6
6–8	6	7.1	10	71.2	108.3	37.1
7–9	5	8.0	10	79.8	96.8	17.0
>8	9	10.2	10	102.0	98.2	-3.8

Note: Escapement index intervals are non-exclusive categories of observed index escapement (because the categories are not exclusive, the sum of n is more than the actual number of escapement observations). Yield is based on 1960–2005 brood year catch plus escapement index observations. Surplus yield is shown for each spawner interval for each of five cases in which the escapement index was expanded to estimate total escapement; here multiplied by 1.0, 2.5, 5.0, 7.5, and 10.0.

Appendix A15.–Estimated potential yields (in millions) for pink salmon in the Northern Southeast Inside sub-region, based on the "tabular approach" of Hilborn and Walters (1992).

Escapement Index Interval	*n*	Mean Escapement Index	Expansion Factor	Mean Expanded Escapement	Mean Recruitment	Surplus Yield
0–2	16	1.4	1	1.4	4.8	3.4
1–3	27	2.0	1	2.0	7.7	5.7
2–4	20	2.8	1	2.8	13.1	10.2
3–5	10	4.1	1	4.1	18.4	14.3
4–6	8	5.1	1	5.1	23.0	17.9
5–7	6	5.8	1	5.8	25.2	19.4
>6	2	6.6	1	6.6	15.9	9.3
0–2	16	1.4	2.5	3.6	7.5	3.9
1–3	27	2.0	2.5	5.1	10.9	5.8
2–4	20	2.8	2.5	7.1	17.7	10.7
3–5	10	4.1	2.5	10.2	25.5	15.2
4–6	8	5.1	2.5	12.7	31.6	18.9
5–7	6	5.8	2.5	14.6	34.3	19.8
>6	2	6.6	2.5	16.4	23.4	7.0
0–2	16	1.4	5	7.2	12.0	4.8
1–3	27	2.0	5	10.2	16.3	6.2
2–4	20	2.8	5	14.1	25.5	11.4
3–5	10	4.1	5	20.5	37.2	16.7
4–6	8	5.1	5	25.3	46.0	20.6
5–7	6	5.8	5	29.2	49.6	20.5
>6	2	6.6	5	32.8	35.9	3.1
0–2	16	1.4	7.5	10.8	16.4	5.7
1–3	27	2.0	7.5	15.3	21.7	6.5
2–4	20	2.8	7.5	21.2	33.3	12.1
3–5	10	4.1	7.5	30.7	48.9	18.2
4–6	8	5.1	7.5	38.0	60.4	22.3
5–7	6	5.8	7.5	43.7	64.9	21.1
>6	2	6.6	7.5	49.2	48.4	-0.8
0–2	16	1.4	10	14.3	20.9	6.5
1–3	27	2.0	10	20.4	27.1	6.8
2–4	20	2.8	10	28.3	41.1	12.8
3–5	10	4.1	10	41.0	60.6	19.7
4–6	8	5.1	10	50.7	74.7	24.0
5–7	6	5.8	10	58.3	80.1	21.8
>6	2	6.6	10	65.6	60.9	-4.7

Note: Escapement index intervals are non-exclusive categories of observed index escapement (because the categories are not exclusive, the sum of n is more than the actual number of escapement observations). Yield is based on 1960–2005 brood year catch plus escapement index observations. Surplus yield is shown for each spawner interval for each of five cases in which the escapement index was expanded to estimate total escapement; here multiplied by 1.0, 2.5, 5.0, 7.5, and 10.0.

Appendix A16.–Estimated potential yields (in millions) for pink salmon in the Northern Southeast Outside sub-region, based on the "tabular approach" of Hilborn and Walters (1992).

Escapement Index Interval	*n*	Mean Escapement Index	Expansion Factor	Mean Expanded Escapement	Mean Recruitment	Surplus Yield
0.0–1.0	29	0.3	1	0.3	0.9	0.6
0.5–1.5	10	0.9	1	0.9	3.2	2.2
1.0–2.0	9	1.5	1	1.5	4.7	3.2
1.5–2.5	9	1.9	1	1.9	4.5	2.6
2.0–3.0	5	2.4	1	2.4	5.4	3.0
>2.5	4	4.1	1	4.1	7.1	3.1
0.0–1.0	29	0.3	2.5	0.8	1.6	0.8
0.5–1.5	10	0.9	2.5	2.4	5.0	2.7
1.0–2.0	9	1.5	2.5	3.8	7.3	3.6
1.5–2.5	9	1.9	2.5	4.9	7.4	2.6
2.0–3.0	5	2.4	2.5	6.1	10.0	3.9
>2.5	4	4.1	2.5	10.1	12.6	2.4
0.0–1.0	29	0.3	5	1.7	2.7	1.1
0.5–1.5	10	0.9	5	4.7	8.1	3.4
1.0–2.0	9	1.5	5	7.5	11.7	4.1
1.5–2.5	9	1.9	5	9.7	12.3	2.5
2.0–3.0	5	2.4	5	12.2	17.6	5.4
>2.5	4	4.1	5	20.3	21.6	1.4
0.0–1.0	29	0.3	7.5	2.5	3.9	1.4
0.5–1.5	10	0.9	7.5	7.1	11.2	4.2
1.0–2.0	9	1.5	7.5	11.3	16.0	4.7
1.5–2.5	9	1.9	7.5	14.6	17.1	2.5
2.0–3.0	5	2.4	7.5	18.3	25.2	6.9
>2.5	4	4.1	7.5	30.4	30.7	0.3
0.0–1.0	29	0.3	10	3.3	5.0	1.7
0.5–1.5	10	0.9	10	9.4	14.4	4.9
1.0–2.0	9	1.5	10	15.1	20.4	5.3
1.5–2.5	9	1.9	10	19.4	21.9	2.5
2.0–3.0	5	2.4	10	24.3	32.8	8.4
>2.5	4	4.1	10	40.6	39.8	-0.8

Note: Escapement index intervals are non-exclusive categories of observed index escapement (because the categories are not exclusive, the sum of n is more than the actual number of escapement observations). Yield is based on 1960–2005 brood year catch plus escapement index observations. Surplus yield is shown for each spawner interval for each of five cases in which the escapement index was expanded to estimate total escapement; here multiplied by 1.0, 2.5, 5.0, 7.5, and 10.0.