CHAPTER 4: PINK SALMON STOCK STATUS AND ESCAPEMENT GOALS IN SOUTHEAST ALASKA AND YAKUTAT

by

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and

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ABSTRACT

Pink salmon stocks in Southeast Alaska are at their highest abundance level since record keeping began in the late 1800s. Annual pink salmon harvests have been stable or increasing in both southern and northern Southeast Alaska since the mid-1980s, and the total pink salmon harvest in Southeast Alaska has averaged 49 million a year from 1995 to 2004. Escapement measures for pink salmon are at their highest level over the entire history of the series from 1960 to the present. *Biological escapement goals* for pink salmon were established for two Yakutat area streams in 1995, and three sub-regions in Southeast Alaska in 2003. In 2005, as part of a triennial review of the region's escapement goals, Alaska Department of Fish and Game staff recommended one change to existing escapement goals: the elimination of the escapement goal for one Yakutat area stream, Humpy Creek. There was very little fishing effort on this stock in the early 1990s, despite fisheries openings, and there has been no directed fishery since 1996. Because of the non-participation in the fishery, systematic surveys to estimate spawning escapement into Humpy Creek have not been conducted since the mid-1990s. Pink salmon escapements have annually met or exceeded escapement goals in the three Southeast Alaska sub-regions in all cases since 1993, and in 9 of the last 10 years in the Situk River. Of the 45 Southeast Alaska stock groups monitored by the Alaska Department of Fish and Game, only seven stocks measured small declining trends in pink salmon escapement survey measures over the last 21 years, none of which we consider biologically meaningful. 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.

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

INTRODUCTION

Wild pink salmon (*Oncorhynchus gorbuscha)*, spawn in approximately 2,500 short, coastal streams in Southeast Alaska and support a large and valuable commercial fishing industry. Pink salmon comprised an average 72% of all the salmon harvested, by numbers of fish, in Southeast Alaska over the most recent 10-year period, 1995–2004. An average of 49 million fish per year were in the commercial fishery in Southeast Alaska over this same period, including an all-time high catch of 78 million fish in 1999. The exvessel value of the commercial pink salmon harvest averaged $21 million a year, and ranged between $8 and $32 million, making the pink salmon the most valuable species after the chum salmon (*O. keta*) in this part of Alaska. 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.

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). *Biological escapement goals*[2] were established in 2003 for three large sub-regions of Southeast Alaska, and in 1995 for two of the larger producers of pink salmon in the Yakutat area (Clark 1995; Zadina et al. 2004). The escapement goals for Southeast Alaska were further divided into management targets for management districts and stock groups as an aid to management. Pink salmon escapement is assessed by means of aerial observations of the peak abundance in a series of over 700 streams in the region. These peak abundance counts are used to generate an

[2] Escapement goals that have a scientifically defendable basis, with the intent of producing maximum sustainable yield.

escapement measure from these key streams—but this measure should not be confused with an estimate of total escapement magnitude.

Below, we provide a brief review of stock assessment measures for pink salmon in Southeast Alaska and Yakutat area, assess the recent pink salmon escapement performance in relation to the index-based escapement goals, and examine recent trends in harvest and escapement.

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, inriver set gillnet fisheries (Clark 1995). Management and assessment of Yakutat area pink salmon stocks has occurred consistently only for Humpy Creek and the Situk River, two of the larger pink salmon streams in the area (Clark 1995; Zadina et al. 2004).

Southeast Alaska pink salmon harvest statistics and escapement indices have commonly been divided into three sub-regions and other fisheries management divisions (management areas, districts, and stock groups). Because Southeast Alaska pink salmon are harvested primarily 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, the current *biological escapement goals* for Southeast Alaska pink salmon were 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 45 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 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), that are further divided into 15 districts (Districts 101–115, Appendix 4.A.1). Alaska Department of Fish and Game (ADF&G) fisheries managers are responsible for managing the fisheries and monitoring escapements of pink salmon in each of their respective management areas, and the districts or portions of the districts within their 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 101–108), while the Northern Southeast sub-region comprises pink salmon stocks north of Sumner Strait (Districts 109–115). 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 do not enter inside waters (Nakatani et al. 1975; Alexandersdottir 1987). The Northern Southeast Outside sub-region includes all waters of District 113 (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 52 smaller *stock groups* contained within the district boundaries (Zadina et al. 2004; Appendices 4.A.2–4.A.5). 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, and the state has no jurisdiction in that area, 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 4.A.5), SW Baranof, W Kruz, and W Yakobi (Sitka area, Appendix 4.A.4), and Dundas Bay and Glacier Bay (Juneau area, Appendix 4.A.2). The remaining 45 stock groups, representing 12 districts, are actively managed and monitored for escapements.

STOCK STATUS

ESCAPEMENT MONITORING

Yakutat Area

Clark (1995a) reviewed available escapement data for Yakutat area streams from 1960 to 1994. Although spawning escapements had been surveyed for 20 streams, consistent survey data were limited to two of the more substantial producers in the area: the Situk River (ADF&G Stream Number 182-70-010) and Humpy Creek (ADF&G Stream Number 183-40-010). Each has supported a terminal set gillnet fishery, though the Situk fishery targets other species (Clark 1995) and the Humpy Creek fishery has not been active in recent years (Woods 2003). Escapements in the Situk River have been assessed with 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. Escapements into Humpy Creek have been assessed by foot, boat, and aerial surveys, although these assessments have been limited since the early 1990s. Clark (1995*a*) compared weir counts in the Situk River to peak aerial and boat counts, and assumed a 3-fold conversion factor to scale peak survey counts to the total escapement; this 3-fold conversion factor was then used to extrapolate total escapement estimates for Humpy Creek (Appendix 4.B.1).

Southeast Alaska

The methods used to monitor pink salmon escapements and calculate annual indices of spawning abundance in Southeast Alaska were described by Hofmeister (1998), Van Alen (2000), and Zadina et al. (2004). With the current method, area management biologists annually estimate the peak pink salmon abundance in 718 pink salmon index streams (selected from over 2,500 known pink salmon spawning streams in the region). This assessment is made via aerial surveys, 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 were combined (Van Alen 2000; Zadina et al. 2004).

Individual observers track absolute abundance within the streams, but each observer tends to count at his or her own rate, or "bias" (Dangel and Jones 1988; Jones et al. 1998; Bue et al. 1998). In 1995, raw stream survey counts were modified in an attempt to standardize as much observer bias as possible—not by removing bias, but rather by adjusting all observer counts within each of the four ADF&G management areas to the same bias level (Hofmeister 1998; Van Alen 2000). Only stream surveys conducted by key personnel, termed *major observers* were used in the index; a major observer being defined as an individual who had flown more than 100 surveys per year in more than four years. Each major observer's counts in a given management area were converted to the counting rate of the area management biologist, whose conversion rate was set at 1.0. These observations were statistically adjusted so the estimates of the number of fish were comparable among observers within the same management area (Hofmeister 1998). The largest count for the year was then retained for each stream in the survey and termed the *peak-adjusted count* for each stream. The index for each stock group was made up of the peak-adjusted counts, summed over this standard set of index streams, for a particular area.

If a particular index stream was missing escapement counts for any given year, an iterative EM algorithm (McLachlan and Krishnan 1997) was used to interpolate the missing value. Interpolations were based on the assumption that the expected count for a given year was equal to the sum of all counts for a given stream, divided by the sum of all counts over all years for all the streams in the unit of interest (i.e., row total times column total divided by grand total)—in this case, the unit of interest is the stock group, and interpolations for missing values were made at the stock group level. This method is based on an assumed multiplicative relation between yearly count and unit count, with no interaction.

This method of assessing the escapement does not actually provide an estimate of the total escapement of pink salmon in Southeast Alaska. In the past, ADF&G has multiplied the escapement indices by 2.5 to approximate the total escapement. For example, we found the statement, "an expansion factor of 2.5 was applied to the escapement index to convert the index to an estimate of total escapement," (Hofmeister and Blick 1991), and similar statements, several places in published material. 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; Jones et al. 1998; Hofmeister 1990). Another important factor to consider in relating total run size to index series of escapement is the relationship between the total fish that spawn and die and the number of fish that are present in the creek at the time of the "peak observation" (Bue et al. 1998). This factor has not been well studied for systems in Southeast Alaska (Zadina et al. 2004). The 718 streams in the current index represent only about 1/3 of the region's 2,500 pink salmon streams. Thus, the 2.5 multiplier does not take into account fish that were not present at the time of the survey and streams that were not surveyed. Finally, the majority of aerial surveys, particularly prior to about 1970, were conducted to monitor inseason development of salmon escapements for management purposes, not to estimate total escapements (Jones and Dangel 1981; Van Alen 2000). 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).

ESCAPEMENT GOALS

Yakutat Area

Clark (1995*a*) used Ricker-type stock-recruit analyses to identify escapement levels that he expected to produce maximum sustainable yield for the Situk River and Humpy Creek. He used a model-based approach to apportion the harvest in the Yakutat Bay set gillnet fisheries to stock of origin, using relative abundance of inshore returns of the two stocks. Clark organized his analysis by even- and odd-year brood lines, and 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, and escapement goal ranges for Humpy Creek of 3,300 to 8,000 in even years, and 7,000 to 18,000 in odd years, based on peak aerial or foot surveys.

Escapements to the Situk River have been above the escapement goal ranges, for both odd- and even-year brood lines combined, in 22 of the past 44 years, and below the lower bound of the biological escapement goal ranges in only 8 of the past 44 years (Figure 4.1; Appendix 4.B.1).

Fishing effort directed at Humpy Creek pink salmon has been sporadic. Despite scheduled commercial set gillnet fishery openings from 1991 to 1996, there was little actual fishing effort and few fish of any species harvested. There has not been a directed fishery on Humpy Creek pink salmon since 1996 (Woods 2003), and because of the low effort, and low numbers of fish in the creek, systematic surveys to estimate spawning escapement into Humpy Creek have also not been conducted since the mid-1990s (Gordon F. Woods, ADF&G, Yakutat, personal communication). Therefore, we recommend that the *biological escapement goals* for Humpy Creek pink salmon be eliminated.

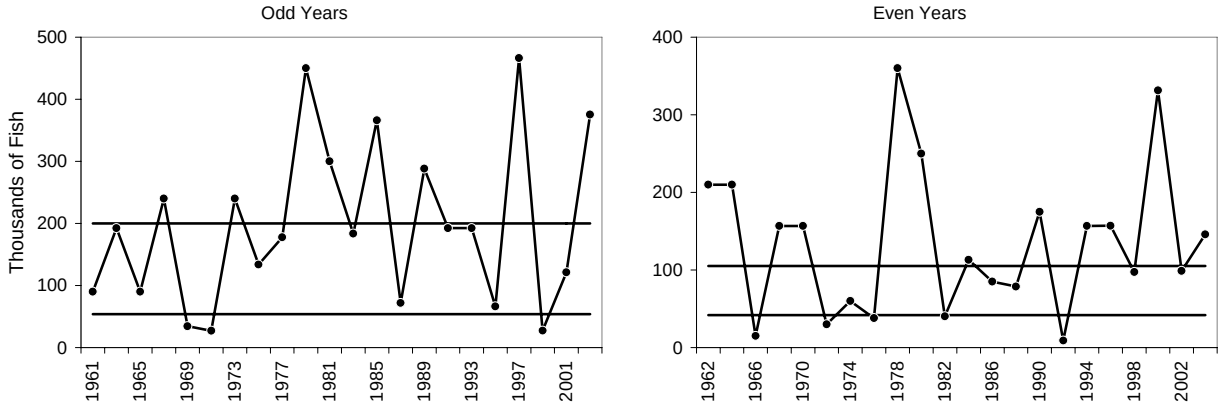

Figure 4.1–Annual odd- and even-year pink salmon escapements to the Situk River, Yakutat area, 1961–2004. The horizontal solid lines show the current biological escapement goal ranges of 54 thousand–200 thousand in odd years, and 42 thousand–105 thousand in even years.

Southeast Alaska

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 adopted by ADF&G in 2003 (Zadina et al. 2004). Escapement goals are often formed by means of the Ricker analysis (Hilborn and Walters 1992; Quinn and Deriso 1999); however, because the pink salmon index escapement measures that are available for Southeast Alaska represent an unknown fraction of the total escapement, a Ricker analysis is not possible without making some unproven and possibly ill-advised assumptions. Zadina et al. used a "tabular approach" (Hilborn and Walters 1992) to assess yield as a function of escapement level, using a range of hypothesized expansions of escapement index to total escapement. That approach provided a range of highest potential yields, on which the current *biological escapement goals* are based: 4.0 million to 9.0 million index spawners in the Southern Southeast sub-region, 2.5 million to 5.5 million in the Northern Southeast Inside sub-region, and 0.75 million to 1.75 million in the Northern Southeast Outside sub-region.

Pink salmon escapement goals have been met annually for all sub-regions in Southeast Alaska, from 1993 to 2004 (Appendix 4.B.2). The current escapement goal has been met in the Southern Southeast sub-region each year, 1989–2004, and the upper range of the goal (9.0 million index spawners) was exceeded in 6 of the past 10 years (Figure 4.2). The current escapement goal for the Northern Southeast Inside sub-region has also been met annually, 1989–2004 (Figure 4.3). The current escapement goal for Northern Southeast Outside sub-region has been met annually, 1994–2004, and the upper range of the escapement index goal (1.75 million index spawners) was exceeded in 7 of 8 years from 1997 to 2004 (Figure 4.4). Data for the 2005 season were not yet available for this report, but preliminary review of the raw survey data suggests that the escapement goals were met or exceed for all three sub-regions in 2005.

TRENDS IN ESCAPEMENT MEASURES

Pink salmon escapements in Southeast Alaska have been well distributed across the region. Since 1991, the escapement indices have generally been within or above management target ranges for most of the districts (Table 4.1; Appendix 4.B.3) and for most pink salmon stock groups in Southeast Alaska (Table 4.2; Appendices 4.B.4–4.B.7).

Salmon populations, like populations of most living things, do not remain constant through time—salmon recruitment is strongly influenced by oceanographic and other processes that cause the populations to periodically increase or decrease (Quinn and Marshall 1989; Beamish and Bouillon 1993; Adkison et al. 1996; Mantua et al. 1997, and many others). Although Southeast Alaska salmon populations have exhibited various historical trends, we are most interested in detecting recent changes, and in particular, we would like to determine if a recent decline in a specific stock is meaningful or not.

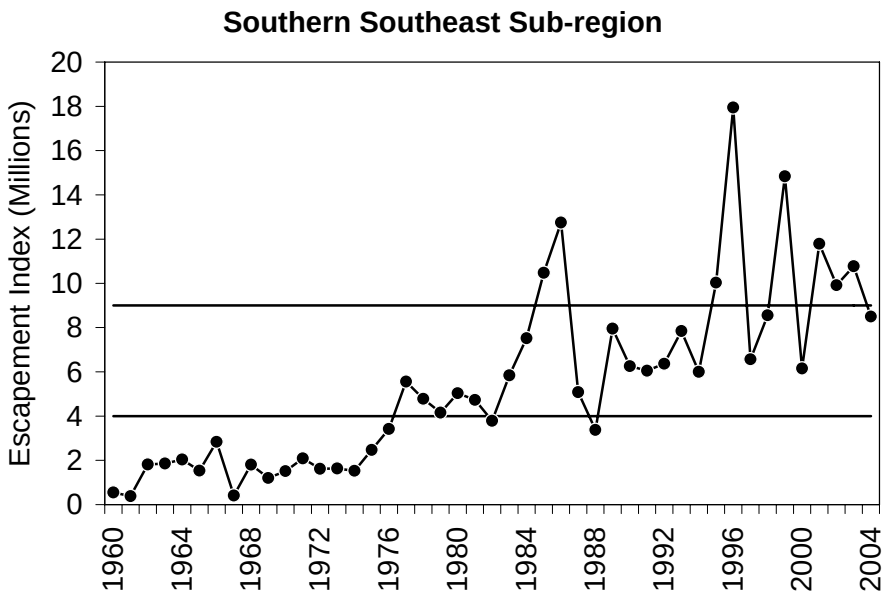

Figure 4.2–Annual pink salmon escapement index for the Southern Southeast sub-region, 1960–2004. The horizontal solid lines show the current escapement goal range of 4.0 million to 9.0 million index spawners.

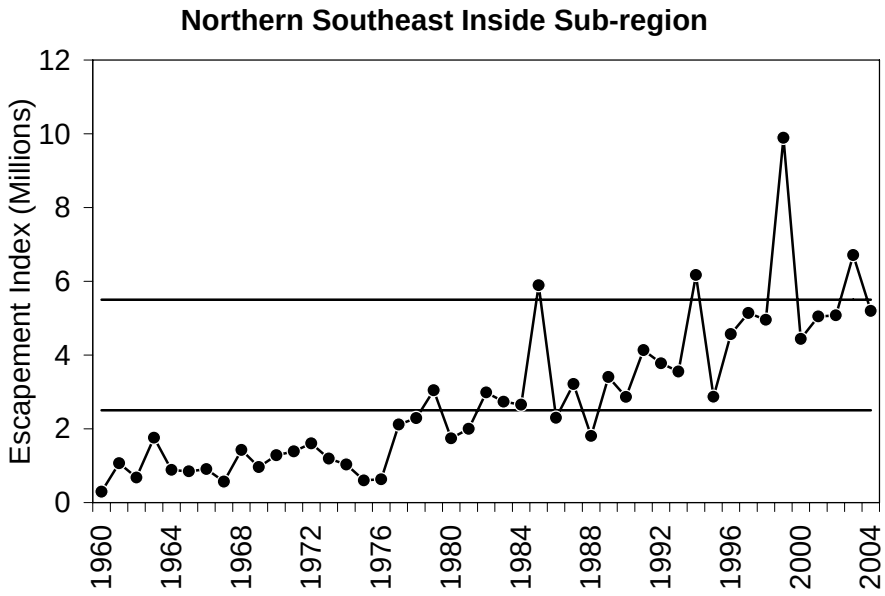

Figure 4.3–Annual pink salmon escapement index for the Northern Southeast Inside sub-region, 1960–2004. The horizontal solid lines show the current escapement goal range of 2.5 million to 5.5 million index spawners.

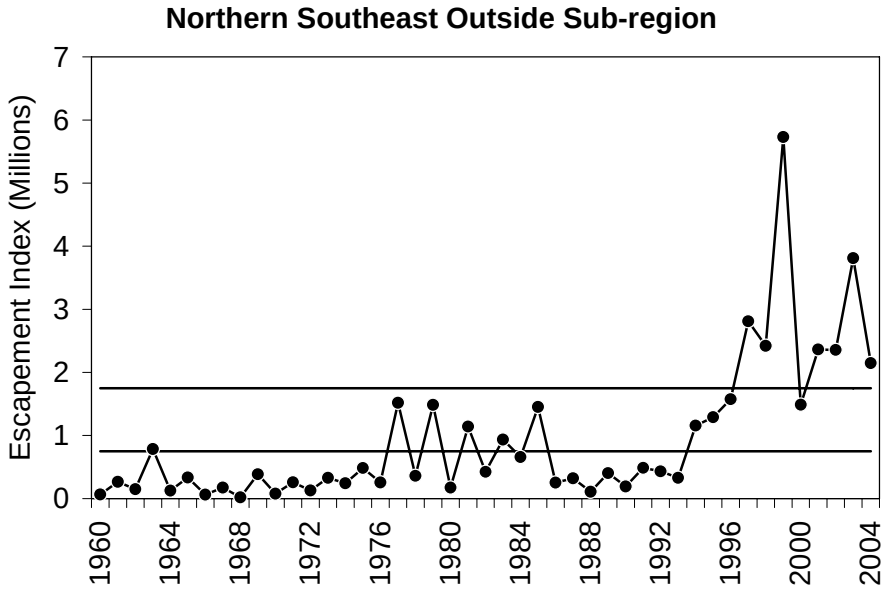

Figure 4.4–Annual pink salmon escapement index for the Northern Southeast Outside sub-region, 1960–2004. The horizontal solid lines show the current escapement goal range of 0.75 million to 1.75 million index spawners.

We used a non-parametric approach described by Geiger and Zhang (2002), to assess trends over the most recent 21 years of escapement index values. This method employs a simple regression that is robust to outliers that are common to data series of widely fluctuating salmon populations, and provides a means of relating stock decline to an underlying population level, so that the decline can be put into some kind of context. We regressed escapement on time using a resistant regression line, and we used the estimated *y*-intercept of this regression line as a back-cast estimate of what the underlying population level was at the start, or "year zero," of the series. The slope of the line was a robust estimate of the stock's decline (or increase) relative to the year-zero reference point. Geiger and Zhang (2002) suggested that a decline be considered *biologically meaningful* when the estimated underlying annual decline was more than 3% of the back-cast year-zero reference point over a 21-year series. A sustained 21-year, overall decline that is 3% of the back-cast year-zero reference point would result in the stock declining by more than 60%.

Not surprisingly, pink salmon escapement index values have shown increasing trends for all three sub-regions of Southeast Alaska over the most recent 21-year period, 1984–2004. Both odd- and even-year brood lines of Situk River pink salmon have also shown increasing trends over the past 21-years of escapements (by brood line). Of the 45 Southeast Alaska pink salmon stock groups, only seven showed declining trends since 1984, none of which we considered to be biologically meaningful. The stock groups with the largest declines in survey data were East Dall (1.4% of the year-zero reference point), Moira (1.5%), Stikine (2.3%), and Portage Bay (2.7%, Figure 4.5).

As noted by Zadina et al. (2004), several of the stock groups in the area of Icy Strait (District 114) and on the outer coast north of Kruzof Island (District 113) show much stronger runs in odd

Table 4.1–Southeast Alaska pink salmon escapement indices and 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, 1991–2004.

District	101	102	103	105	106	107	108	109	110	111	112	Inside 113	114	115	Outside 113
Management Target															
Lower	1.33	0.40	1.13	0.33	0.40	0.40	No	0.40	0.65	0.32	0.40	0.40	0.32	No	0.75
Upper	3.00	1.10	2.55	0.65	0.85	0.85	Target	0.85	1.45	0.73	0.85	0.90	0.73	Target	1.75
1991	1.65	0.63	1.97	0.59	0.50	0.58	0.12	1.03	1.02	0.30	1.26	0.31	0.21	0.00	0.49
1992	2.78	0.87	1.45	0.18	0.22	0.81	0.06	0.87	1.18	0.41	0.77	0.38	0.11	0.06	0.43
1993	2.12	0.90	2.92	0.61	0.62	0.66	0.01	0.88	0.61	0.15	1.03	0.52	0.34	0.03	0.33
1994	1.78	0.63	2.00	0.43	0.63	0.50	0.03	1.40	1.37	0.98	1.41	0.53	0.30	0.19	1.16
1995	3.82	0.91	3.42	0.51	0.63	0.73	0.01	0.85	0.31	0.21	0.88	0.11	0.50	0.02	1.29
1996	6.01	3.10	6.64	0.87	0.67	0.63	0.03	1.86	0.52	0.76	1.06	0.33	0.05	0.00	1.58
1997	2.32	0.81	1.77	0.62	0.51	0.53	0.01	1.04	0.70	0.71	1.71	0.30	0.65	0.03	2.81
1998	3.10	1.15	2.75	0.34	0.65	0.54	0.03	1.39	0.83	0.77	1.31	0.50	0.10	0.06	2.42
1999	2.79	1.72	3.45	2.83	3.19	0.79	0.06	2.72	1.86	0.82	2.41	0.84	1.14	0.10	5.73
2000	1.89	1.12	1.77	0.58	0.32	0.46	0.01	1.68	0.87	0.33	0.88	0.62	0.06	0.01	1.49
2001	4.35	1.15	3.26	1.04	1.00	0.88	0.12	1.07	1.03	0.49	1.05	0.44	0.80	0.17	2.36
2002	3.25	1.68	3.14	0.68	0.60	0.56	0.01	1.56	1.16	0.48	1.11	0.53	0.19	0.04	2.36
2003	3.70	1.34	2.98	0.89	0.88	0.83	0.16	1.15	1.67	0.54	1.55	1.35	0.41	0.04	3.81
2004	2.48	0.74	3.49	0.63	0.56	0.56	0.04	1.29	1.28	0.49	1.36	0.53	0.23	0.03	2.15
1991								+		-	+	-	-		-
1992				-	-			+				-	-		-
1993			+					+	-	-	+				-
1994								+		+	+		-		
1995	+		+					+	-	-	+	-			
1996	+	+	+	+				+	-	+	+	-	-		
1997								+			+	-			+
1998	+	+	+					+		+	+		-		+
1999		+	+	+	+			+	+	+	+		+		+
2000		+			-			+			+		-		
2001	+	+	+	+	+	+		+			+		+		+
2002	+	+	+	+				+			+		-		+
2003	+	+	+	+	+			+	+		+	+			+
2004			+					+			+		-		+
Years Below Range	0	0	0	1	2	0		0	3	3	0	5	8		3
Years Within Range	8	7	5	8	9	13		0	9	7	1	8	4		4
Years Above Range	6	7	9	5	3	1		14	2	4	13	1	2		7

years than in even years. The escapement indices for Homeshore and North Chichagof stock groups in Management District 114 have consistently come in under the lower bound of the management target ranges during even years (Tables 4.1 and 4.2). Geiger and Zhang trend analysis of the most recent 15 years of pink salmon escapement indices for the odd- and even-year brood lines for these stock groups have been stable, or trending upward, in much the same way as most of the other pink salmon stock groups in Southeast Alaska.

Table 4.2–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, 1991–2004.

				Year														Management Target	
Stock Group	Area Office	Sub-region	District	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	Lower	Upper
Portland	Ketchikan	SSE	101			+		+	+		+	+		+	+	+	+	0.17	0.37
E Behm	Ketchikan	SSE	101		+			+	+					+	+	+		0.84	1.89
W Behm	Ketchikan	SSE	101				-		+		+			+				0.33	0.74
Kasaan	Ketchikan	SSE	102						+		+	+	+	+	+	+		0.34	0.93
Moira	Ketchikan	SSE	102	-					+	-	+	+					-	0.06	0.17
E Dall	Ketchikan	SSE	103	-				+	+						+		+	0.16	0.36
Hetta	Ketchikan	SSE	103					+	+			+	+		+			0.30	0.68
Klawock	Ketchikan	SSE	103			+		+	+		+	+	-	+	+	+	+	0.52	1.17
Sea Otter Sound	Ketchikan	SSE	103	-					+	-			-	+		+	+	0.15	0.33
Affleck Canal	Petersburg	SSE	105		-				+		-	+	+	+	+		+	0.20	0.38
Shipley Bay	Petersburg	SSE	105	+	-	+				+		+		+	-	+		0.14	0.27
Burnett	Petersburg	SSE	106		-	-		-	+			+		+	+		-	0.10	0.20
Ratz Harbor	Petersburg	SSE	106		-					-		+	-			+		0.10	0.21
Totem Bay	Petersburg	SSE	106			+	-					+		+			+	0.07	0.15
Whale Pass	Petersburg	SSE	106		-		+					+	-	+	-	+		0.13	0.28
Anan	Petersburg	SSE	107		+													0.32	0.68
Union Bay	Petersburg	SSE	107		-			+	+	-		+	-	+		+		0.08	0.17
E Baranof	Sitka	NSEI	109	+	-		+		+	+	+	+		+	+	+	+	0.07	0.14
Eliza Harbor	Petersburg	NSEI	109	+	+	+	+		+	+	+	+	+				+	0.08	0.18
Saginaw Bay	Petersburg	NSEI	109	+			+		+	+	+	+	+	+	+	+	+	0.07	0.15
SE Baranof	Sitka	NSEI	109			+		+	+	+	+	+	+				-	0.05	0.11
Tebenkof	Petersburg	NSEI	109		+	+	+	+	+		+	+	+	+	+	+	+	0.13	0.27
Farragut Bay	Petersburg	NSEI	110	+				-				+					+	0.01	0.03
Houghton	Petersburg	NSEI	110			-	+	-	-	-		+				+		0.40	0.89
Portage Bay	Petersburg	NSEI	110			-	-	-	-	-	-	+	-	-	-		+	0.04	0.08
Pybus/ Gambier	Petersburg	NSEI	110			-		-				+					+	0.20	0.45
Seymour Canal	Juneau	NSEI	111	-	-	-		-		+		+						0.18	0.41
Stephens	Juneau	NSEI	111			-	+	-	+		+	+	-					0.14	0.32

-continued-

Table 4.2–page 2 of 2

Stock Group	Area Office	Sub-region	District	Year 1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	Management Target Lower	Upper
Freshwater Bay	Juneau	NSEI	112			+	+	+	+	+	+	+		+	+	+	+	0.06	0.13
Kelp Bay	Sitka	NSEI	112	+		+	+	-	+	+	+	+	+	+	+	+	+	0.03	0.06
Lynn Canal	Juneau	NSEI	112		+		+	+	-	+		+		+	+	+	+	0.02	0.04
SW Admiralty	Juneau	NSEI	112	+		+	+		+		+	+	+	+	+	+	+	0.08	0.17
Tenakee	Juneau	NSEI	112	+	+	+	+	+	+	+	+	+	+	-	+		+	0.18	0.37
W Admiralty	Juneau	NSEI	112				+	+		+	-	+	-	+	-	+	+	0.04	0.08
Hoonah Sound	Sitka	NSEI	113	-	-			-	-	-						+		0.40	0.90
Lisianski	Sitka	NSEO	113	-	-		-		-	+	-	+	-	+		+		0.07	0.17
Portlock	Sitka	NSEO	113	-	-	-		+		+		+	+	+	+	+	+	0.03	0.08
Salisbury Sound	Sitka	NSEO	113	-	-		-	+				+			+	+	+	0.16	0.36
Sitka Sound	Sitka	NSEO	113	-	-	-			+	+	+	+	+	+	+	+	+	0.21	0.50
Slocum Arm	Sitka	NSEO	113		-	-				+		+		+		+		0.21	0.48
W Crawfish	Sitka	NSEO	113	-		-	+		+	-	+	+			+	+	+	0.01	0.03
Whale Bay	Sitka	NSEO	113	-	+	-	+		+		+	+			+	+	+	0.05	0.12
Homeshore	Juneau	NSEI	114	-	-	-			-		-	+	-	+	-			0.05	0.10
N Chichagof	Juneau	NSEI	114	-	-		-		-		-	+	-	+	-		-	0.28	0.62

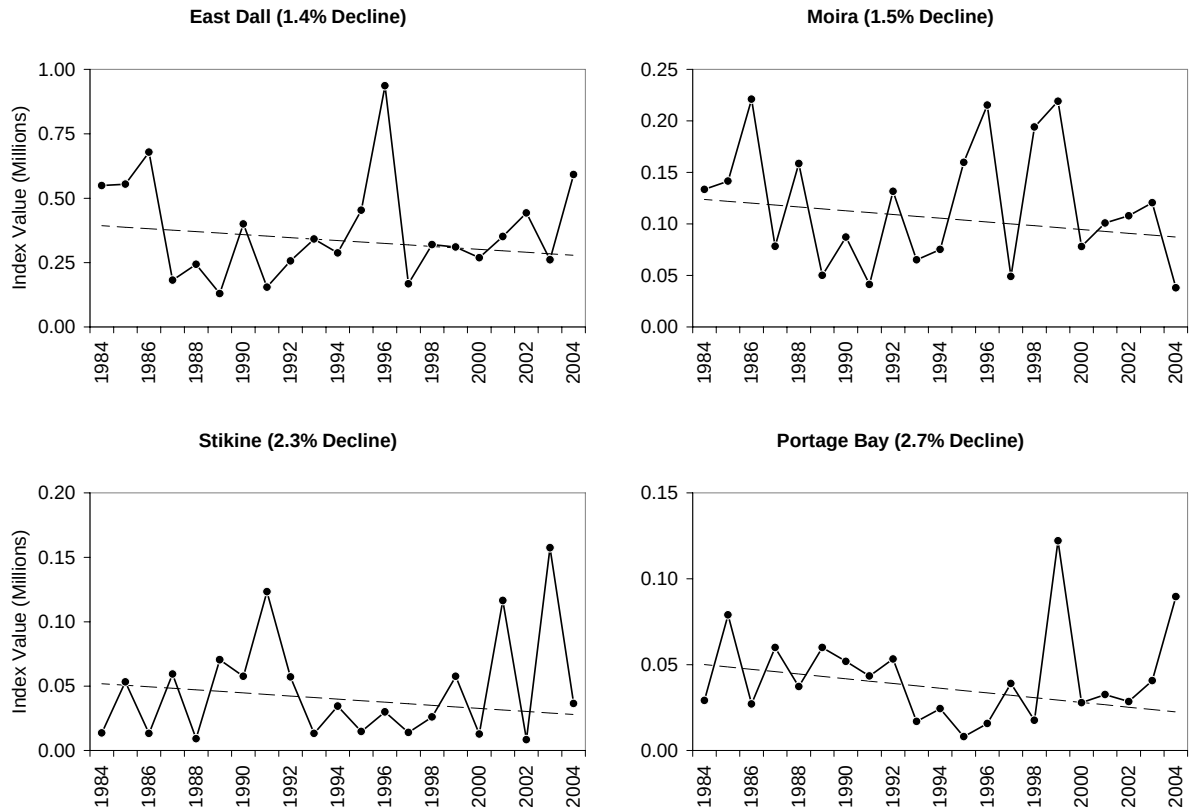

Figure 4.5–Pink salmon stock groups with the largest estimated declines in escapement index values per year over the most recent 21-years, 1984–2004. The dotted line is found by the "resistant regression," and the slope of the line is a robust estimate of the annual decline relative to the size of the escapement at the beginning of the series.

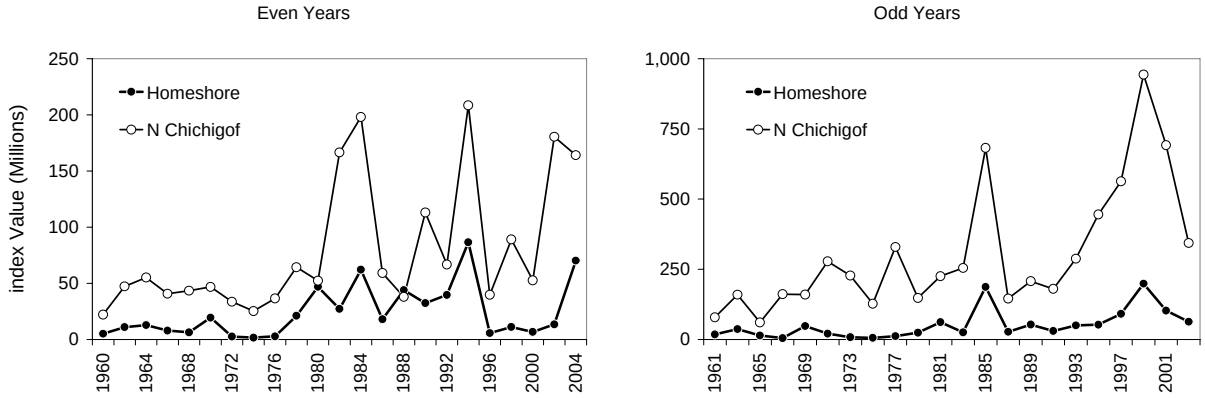

Figure 4.6–Annual odd- and even-year pink salmon escapement indices for the Homeshore and North Chichigof Island stock groups in Management District 114, Southeast Alaska, 1960–2004.

The even-year broodline for the Homeshore stock group showed a slight decreasing trend of 1.6% of the year-zero reference point, which does not meet our criteria for a biologically meaningful decline. During the last two decades ADF&G fisheries managers have limited directed fishing on even-year stocks in the Homeshore, North Chichagof, and Lisianski areas to attempt to allow even year runs to increase (Andy McGregor, ADF&G, Juneau, personal communication). Brood line dominance has been documented in throughout of the distribution of pink salmon, but underlying reasons for the pattern are not well understood (Heard 1991).

DISCUSSION

The status of pink salmon in Southeast Alaska and Yakutat continues to be biologically very favorable, particularly in Southeast Alaska, and no pink salmon stocks in either area can currently be considered *a stock of concern* under the definition of the Sustainable Salmon Policy (5 AAC 39.222). The commercial catch is currently at a sustained all-time high level in Southeast Alaska (Figure 4.7), even when considering the commercial catch history that extends back to the 19th century. The catch level has been more stable since the mid 1990s than at any time since statehood (Figure 4.8). The escapement indices, which extend back to statehood in Southeast Alaska, are at their all-time highest levels too. The salmon harvests in the three sub-regions are either increasing or at least stable (Figures 4.9–4.11). Many harvests during the past 10 years could have been higher—as indicated by the high escapements (Figures 4.2–4.4). However, processor capacity—not stock abundance—has now become the limit on high harvests.

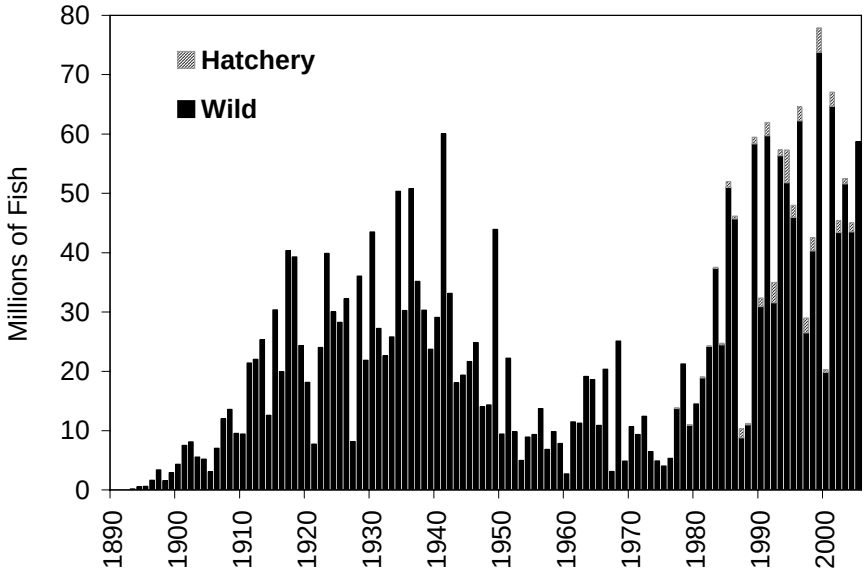

Figure 4.7–Annual harvest of wild and hatchery-produced pink salmon in Southeast Alaska, 1890–2005. Data prior to 1960 are from Byerly et al. 1999.

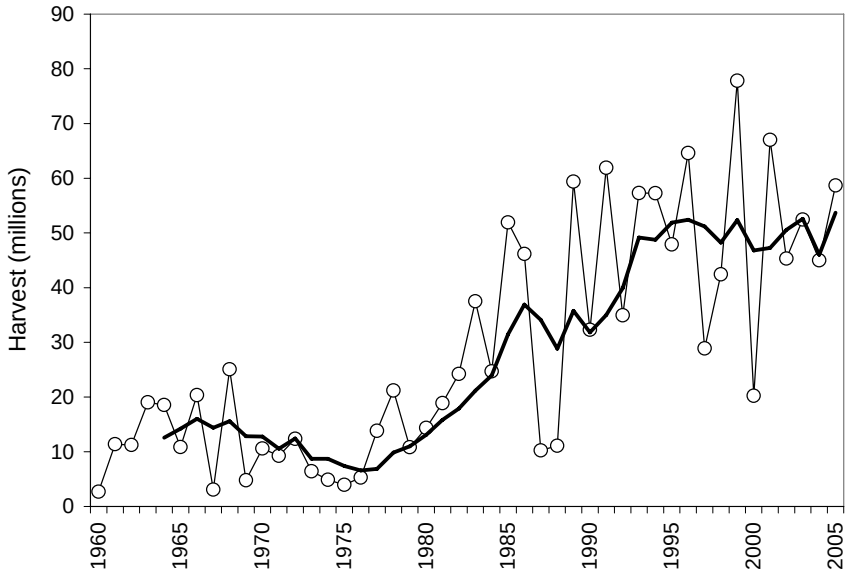

Figure 4.8–Annual harvest of pink salmon in Southeast Alaska, 1960–2005. The solid line shows the 5-year running average of the harvest. The catch for 2005 was current as of 19 September 2005.

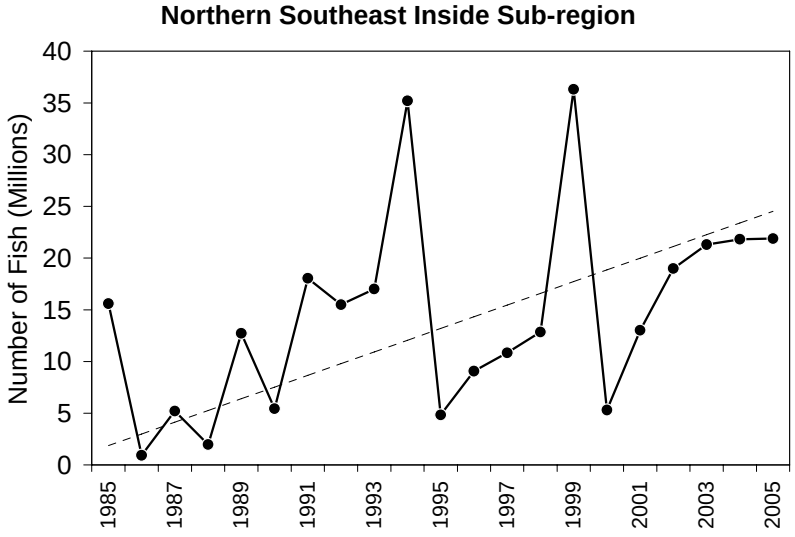

Figure 4.9–Annual harvest of pink salmon in the Northern Southeast Inside sub-region, 1985–2005. The dotted line is found by the "resistant regression," and the slope of the line is a robust estimate of the annual change relative to the size of the harvest at the beginning of the series; in this case the harvest has increased dramatically over the most recent 21 years, 1985–2005. The catch for 2005 was current as of 19 September 2005.

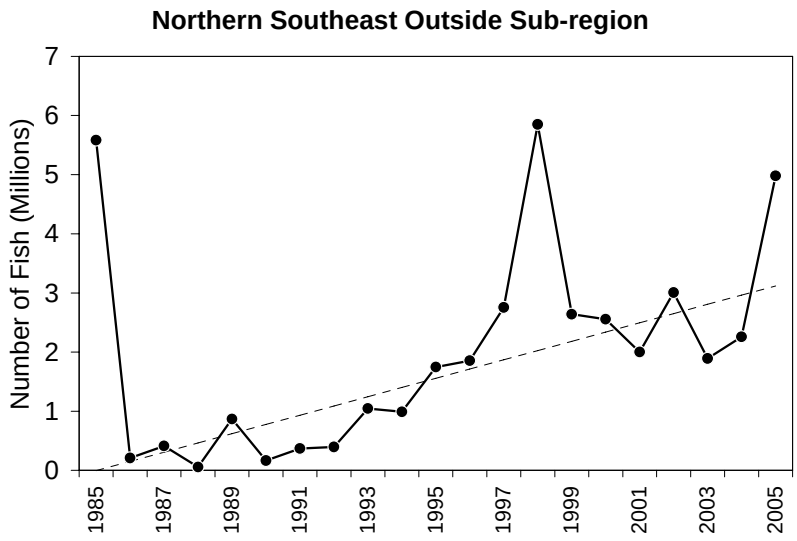

Figure 4.10–Annual harvest of pink salmon in the Northern Southeast Outside sub-region, 1985–2005. The dotted line is found by the "resistant regression," and the slope of the line is a robust estimate of the annual change relative to the size of the harvest at the beginning of the series; in this case the harvest has increased dramatically over the most recent 21 years, 1985–2005. The catch for 2005 was current as of 19 September 2005.

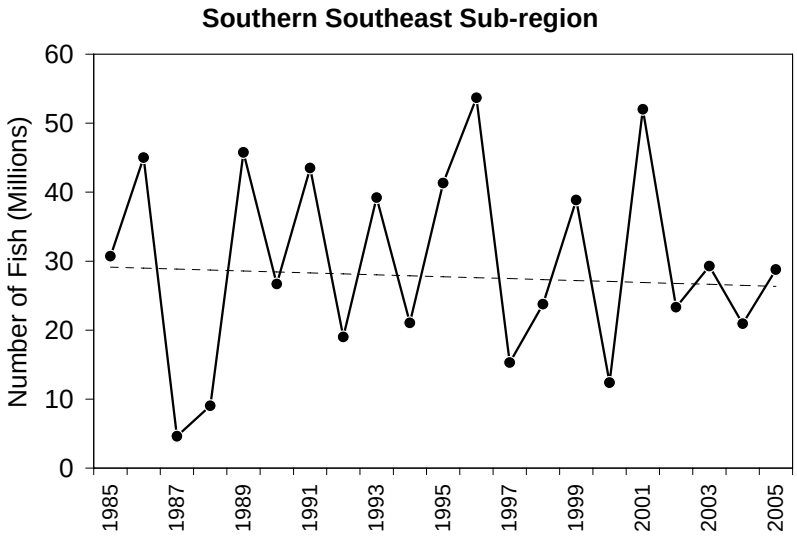

Figure 4.11–Annual harvest of pink salmon in the Southern Southeast sub-region, 1985–2005. The dotted line is found by the "resistant regression," and the slope of the line is a robust estimate of the annual change relative to the size of the harvest at the beginning of the series; in this case an annual decrease of 0.5% over the most recent 21 years, 1985–2005. The catch for 2005 was current as of 19 September 2005.

As pointed out by Zadina et al. (2004), our measures of escapement are imperfect, but we believe they are fully adequate to assess the health of this resource. Considering the difficulty measuring such dispersed salmon production, substantial improvements to the monitoring program would only 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. This is especially true of the consistency and sustainability of the harvest. 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 funding from the Southeast Sustainable Salmon Fund, starting in 2002, to increase the aerial survey coverage of the region. In addition, there are ongoing 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. Even so, we have more than adequate information to report a favorable stock status for pink salmon in Southeast Alaska.

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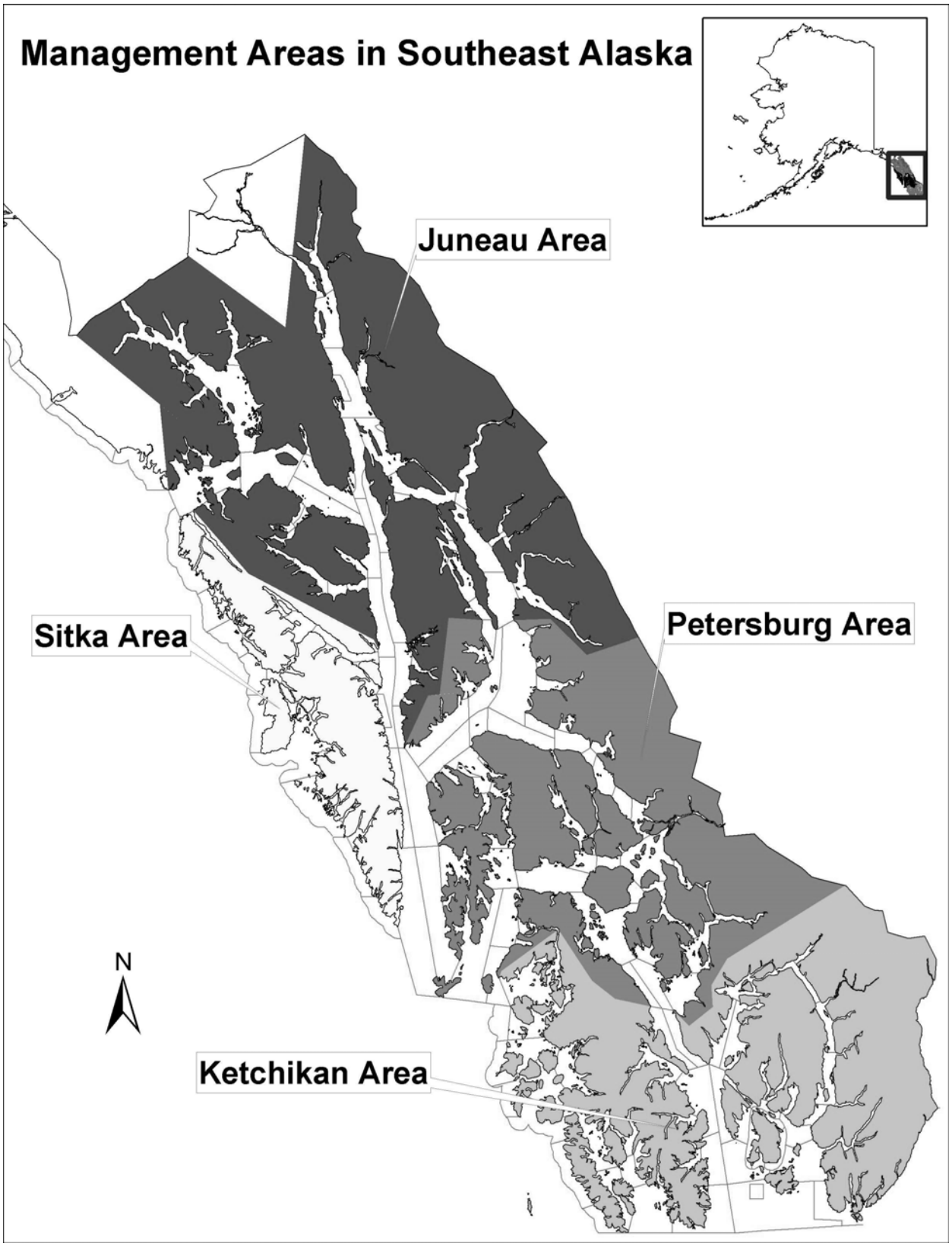
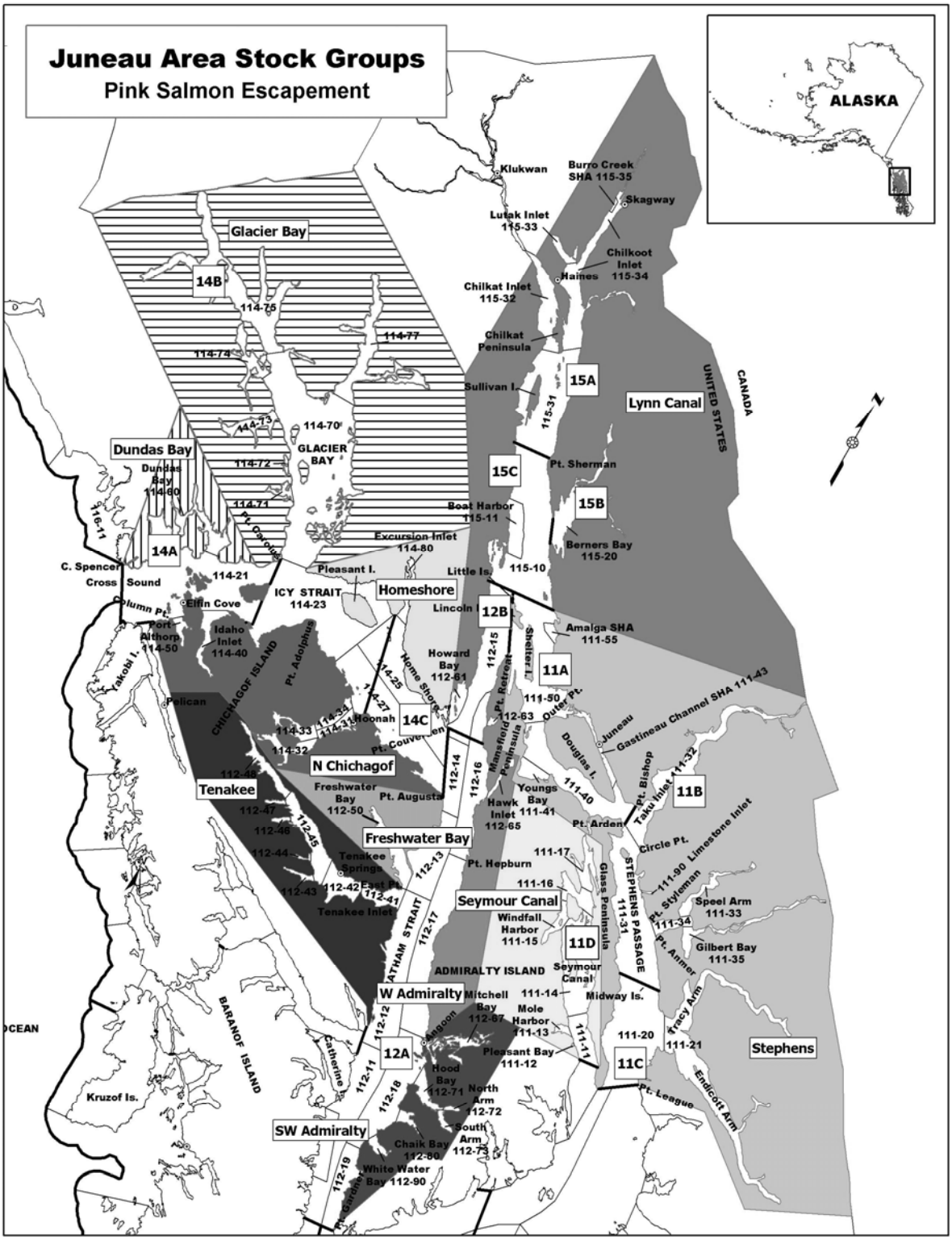
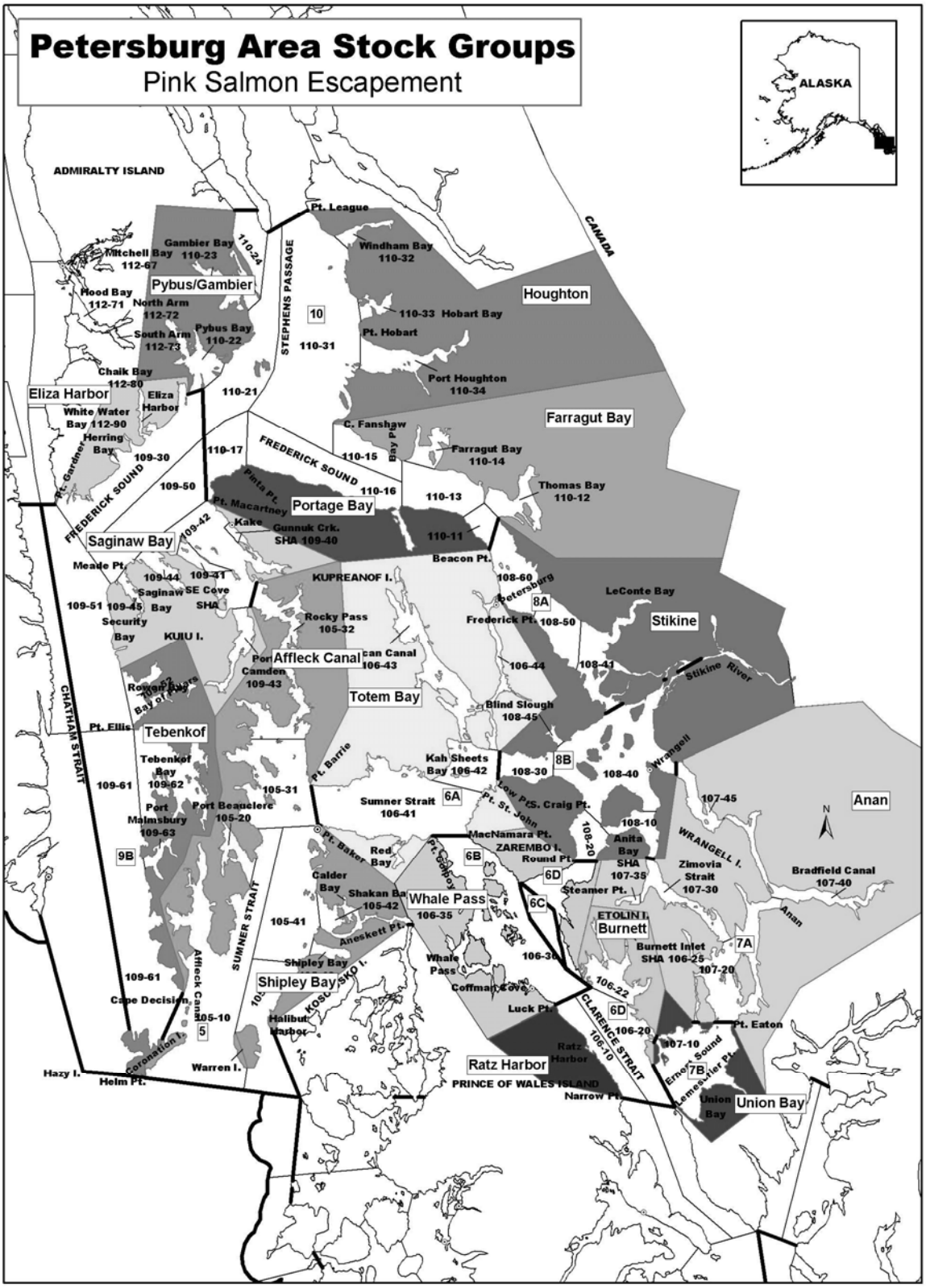
APPENDIX 4.A



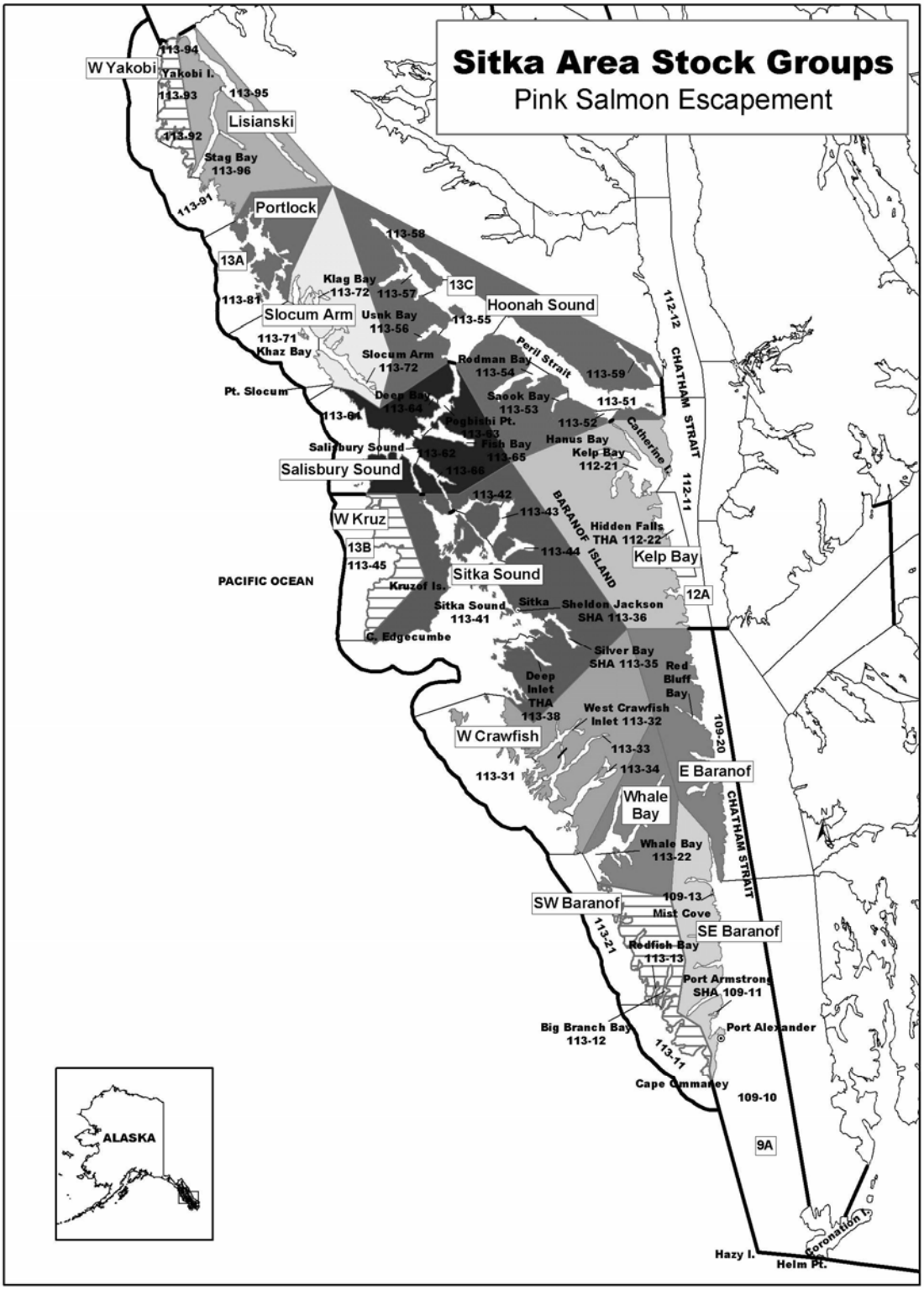
Appendix 4.A.1.–ADF&G salmon management areas in Southeast Alaska.



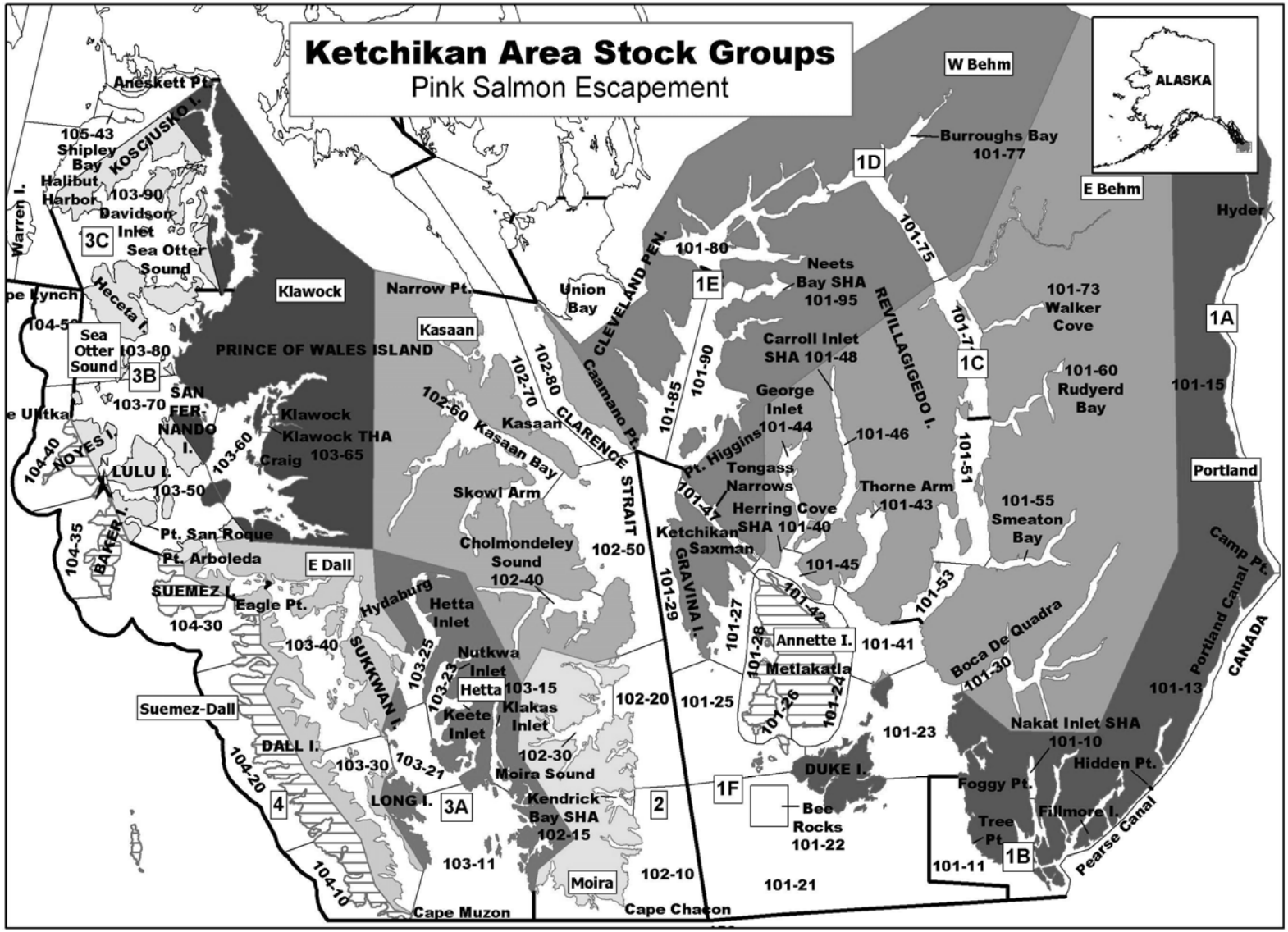
Appendix 4.A.2.–The ADF&G Juneau salmon management area and associated pink salmon escapement stock groups. Diagonal hatched stock groups indicate areas with no index streams or escapement targets.



Appendix 4.A.3.–The ADF&G Petersburg salmon management area and associated pink salmon escapement stock groups.



Appendix 4.A.4.–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 4.A.5.–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 4.B

Appendix 4.B.1–Estimated escapement of pink salmon to the Situk River, Yakutat area, 1961–2004.

	Situk River			Humpy Creek		
Year [a]	Count	Type	Estimated Total Escapement [b]	Count	Type	Estimated Total Escapement
1961	30,000	Aerial	90,000	25,000	Foot	75,000
1962	70,000	Aerial	210,000	23,000	Foot	69,000
1963	192,359	Extrapolated	192,359	63,278	Extrapolated	63,278
1964	70,000	Aerial	210,000	11,000	Foot	33,000
1965	30,000	Aerial	90,000	3,000	Foot	3,000
1966	5,000	Aerial	15,000	n/a	Extrapolated	28,186
1967	80,000	Aerial	240,000	63,278	Extrapolated	63,278
1968	n/a	Extrapolated	156,735	n/a	Extrapolated	28,186
1969	11,500	Aerial	34,500	29,169	Foot	29,169
1970	n/a	Extrapolated	156,735	n/a	Extrapolated	28,186
1971	27,184	Weir	27,184	63,278	Foot	63,278
1972	10,000	Boat	30,000	1,630	Foot	4,890
1973	80,000	Boat	240,000	3,969	Foot	3,969
1974	20,000	Boat	60,000	2,000	Foot	6,000
1975	44,600	Boat	133,800	39,000	Foot	39,000
1976	38,081	Weir	38,081	4,672	Foot	14,016
1977	177,712	Weir	177,712	36,000	Foot	36,000
1978	120,000	Boat	360,000	5,000	Foot	15,000
1979	450,000	Weir	450,000	45,000	Foot	45,000
1980	250,000	Weir	250,000	10,000	Foot	30,000
1981	300,000	Weir	300,000	210,000	Foot	210,000
1982	40,300	Weir	40,300	8,700	Foot	26,100
1983	183,577	Weir	183,577	90,000	Foot	90,000
1984	113,161	Weir	113,161	16,000	Foot	48,000
1985	366,000	Weir	366,000	225,000	Foot	225,000
1986	85,000	Boat	85,000	10,233	Foot	30,699
1987	24,000	Boat	72,000	6,000	Aerial	6,000
1988	78,753	Weir	78,753	10,000	Aerial	30,000
1989	288,246	Weir	288,246	60,600	Foot	60,600
1990	175,000	Boat	175,000	13,800	Foot	41,400
1991	n/a	Extrapolated	192,359	24,150	Foot	24,150
1992	3,000	Boat	9,000	4,500	Foot	13,500
1993	n/a	Extrapolated	192,359	39,000	Aerial	39,000
1994	n/a	Extrapolated	156,735	11,000	Aerial	33,000
1995	66,273	Weir	66,273	3,800	Aerial	11,400
1996	157,012	Weir	157,012	8,500	Aerial	25,500
1997	466,267	Weir	466,267	n/a		
1998	97,392	Weir	97,392	n/a		
1999	27,386	Weir	27,386	n/a		
2000	331,510	Weir	331,510	n/a		
2001	121,267	Weir	121,267	n/a		
2002	98,790	Weir	98,790	n/a		
2003	375,333	Weir	375,333			
2004	145,914	Weir	145,914			

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

[b] Aerial and foot surveys were expanded by 3.0 to estimate total escapement (Clark 1995).

Appendix 4.B.2–Southeast Alaska pink salmon escapement indices and biological escapement goal (BEG) ranges by sub-region (in millions), 1960–2004.

Sub-region	Southern Southeast	Northern Southeast Inside	Northern Southeast Outside
BEG Lower Range	4.00	2.50	0.75
BEG Upper Range	9.00	5.50	1.75
1960	0.54	0.29	0.07
1961	0.38	1.07	0.26
1962	1.82	0.68	0.15
1963	1.86	1.76	0.79
1964	2.04	0.88	0.13
1965	1.54	0.85	0.33
1966	2.83	0.91	0.06
1967	0.41	0.57	0.17
1968	1.81	1.42	0.02
1969	1.20	0.96	0.39
1970	1.51	1.28	0.08
1971	2.09	1.39	0.26
1972	1.62	1.60	0.13
1973	1.63	1.19	0.33
1974	1.53	1.03	0.24
1975	2.47	0.60	0.48
1976	3.42	0.63	0.25
1977	5.56	2.12	1.52
1978	4.78	2.29	0.36
1979	4.16	3.05	1.49
1980	5.03	1.74	0.17
1981	4.73	2.00	1.14
1982	3.79	2.99	0.42
1983	5.84	2.74	0.93
1984	7.52	2.65	0.66
1985	10.48	5.89	1.45
1986	12.75	2.30	0.25
1987	5.08	3.21	0.32
1988	3.38	1.81	0.11
1989	7.95	3.41	0.40
1990	6.26	2.86	0.19
1991	6.05	4.13	0.49
1992	6.37	3.78	0.43
1993	7.84	3.55	0.33
1994	6.00	6.17	1.16
1995	10.03	2.87	1.29
1996	17.95	4.57	1.58
1997	6.57	5.14	2.81
1998	8.56	4.96	2.42
1999	14.83	9.89	5.73
2000	6.15	4.44	1.49
2001	11.79	5.05	2.36
2002	9.92	5.08	2.36
2003	10.78	6.71	3.81
2004	8.50	5.20	2.15

Appendix 4.B.3–Pink salmon escapement index series and target ranges by management district (in millions), 1960–2004.

												Inside			Outside
Management District	101	102	103	105	106	107	108	109	110	111	112	113	114	115	113
Management Target:															
Lower	1.33	0.40	1.13	0.33	0.40	0.40	No	0.40	0.65	0.32	0.40	0.40	0.32	No	0.75
Upper	3.00	1.10	2.55	0.65	0.85	0.85	Target	0.85	1.45	0.73	0.85	0.90	0.73	Target	1.75
1960	0.21	0.07	0.19	0.05	0.01	0.02	0.00	0.03	0.06	0.04	0.09	0.04	0.03	0.01	0.07
1961	0.09	0.03	0.09	0.05	0.05	0.05	0.02	0.15	0.08	0.16	0.31	0.24	0.10	0.02	0.26
1962	0.67	0.14	0.54	0.19	0.08	0.20	0.00	0.12	0.15	0.09	0.19	0.05	0.06	0.01	0.15
1963	0.77	0.34	0.49	0.07	0.04	0.12	0.02	0.15	0.08	0.32	0.65	0.32	0.20	0.04	0.79
1964	0.79	0.26	0.55	0.05	0.24	0.13	0.01	0.19	0.13	0.11	0.22	0.16	0.07	0.02	0.13
1965	0.37	0.19	0.73	0.11	0.07	0.06	0.00	0.26	0.06	0.12	0.10	0.22	0.08	0.02	0.33
1966	1.06	0.49	0.86	0.11	0.13	0.18	0.01	0.21	0.12	0.21	0.19	0.14	0.05	0.00	0.06
1967	0.21	0.02	0.07	0.05	0.02	0.03	0.00	0.10	0.05	0.05	0.14	0.02	0.17	0.04	0.17
1968	0.80	0.32	0.28	0.14	0.12	0.13	0.03	0.27	0.24	0.34	0.33	0.20	0.05	0.00	0.02
1969	0.50	0.29	0.24	0.05	0.05	0.07	0.00	0.14	0.08	0.05	0.32	0.16	0.21	0.01	0.39
1970	0.75	0.13	0.37	0.06	0.06	0.13	0.01	0.14	0.19	0.29	0.44	0.13	0.07	0.01	0.08
1971	0.47	0.39	0.77	0.10	0.16	0.19	0.01	0.18	0.16	0.19	0.37	0.13	0.30	0.07	0.26
1972	0.70	0.18	0.46	0.06	0.06	0.16	0.00	0.16	0.18	0.71	0.33	0.18	0.04	0.01	0.13
1973	0.65	0.22	0.38	0.12	0.11	0.15	0.01	0.03	0.23	0.21	0.38	0.04	0.24	0.05	0.33
1974	0.58	0.21	0.48	0.04	0.10	0.12	0.00	0.05	0.10	0.38	0.31	0.16	0.03	0.01	0.24
1975	0.63	0.50	0.72	0.13	0.16	0.32	0.00	0.09	0.03	0.11	0.20	0.03	0.13	0.01	0.48
1976	0.78	0.52	1.05	0.09	0.37	0.61	0.00	0.11	0.08	0.07	0.22	0.11	0.04	0.01	0.25
1977	2.32	0.62	1.24	0.18	0.29	0.89	0.02	0.39	0.15	0.28	0.66	0.22	0.34	0.08	1.52
1978	1.98	0.42	1.46	0.24	0.25	0.43	0.00	0.34	0.36	0.17	0.90	0.42	0.09	0.02	0.36
1979	1.06	0.62	1.49	0.25	0.27	0.41	0.06	0.65	0.57	0.45	0.84	0.30	0.17	0.07	1.49
1980	1.88	0.60	2.04	0.11	0.09	0.30	0.00	0.27	0.36	0.18	0.64	0.16	0.10	0.03	0.17
1981	1.85	0.47	1.89	0.27	0.11	0.12	0.02	0.29	0.32	0.21	0.67	0.19	0.29	0.03	1.14
1982	1.34	0.35	1.39	0.10	0.21	0.35	0.04	0.61	0.56	0.48	0.85	0.25	0.19	0.04	0.42
1983	2.13	0.97	2.02	0.22	0.14	0.35	0.02	0.37	0.27	0.55	0.92	0.28	0.28	0.06	0.93
1984	3.55	0.77	2.67	0.15	0.12	0.25	0.01	0.51	0.35	0.57	0.63	0.30	0.26	0.03	0.66
1985	3.40	0.90	3.83	0.66	0.83	0.81	0.05	0.98	0.94	0.91	1.55	0.30	0.87	0.35	1.45
1986	4.39	1.50	4.82	0.64	0.71	0.67	0.01	0.64	0.27	0.21	0.94	0.16	0.08	0.00	0.25
1987	2.20	0.46	1.74	0.13	0.20	0.29	0.06	0.46	1.03	0.66	0.55	0.23	0.17	0.11	0.32
1988	1.21	0.46	1.10	0.13	0.19	0.27	0.01	0.42	0.42	0.17	0.52	0.16	0.08	0.04	0.11
1989	2.57	0.72	2.83	0.35	0.53	0.88	0.07	0.70	0.98	0.33	0.88	0.22	0.26	0.04	0.40
1990	1.74	0.93	2.36	0.36	0.46	0.37	0.06	0.49	1.02	0.15	0.67	0.25	0.15	0.13	0.19
1991	1.65	0.63	1.97	0.59	0.50	0.58	0.12	1.03	1.02	0.30	1.26	0.31	0.21	0.00	0.49
1992	2.78	0.87	1.45	0.18	0.22	0.81	0.06	0.87	1.18	0.41	0.77	0.38	0.11	0.06	0.43
1993	2.12	0.90	2.92	0.61	0.62	0.66	0.01	0.88	0.61	0.15	1.03	0.52	0.34	0.03	0.33
1994	1.78	0.63	2.00	0.43	0.63	0.50	0.03	1.40	1.37	0.98	1.41	0.53	0.30	0.19	1.16
1995	3.82	0.91	3.42	0.51	0.63	0.73	0.01	0.85	0.31	0.21	0.88	0.11	0.50	0.02	1.29
1996	6.01	3.10	6.64	0.87	0.67	0.63	0.03	1.86	0.52	0.76	1.06	0.33	0.05	0.00	1.58
1997	2.32	0.81	1.77	0.62	0.51	0.53	0.01	1.04	0.70	0.71	1.71	0.30	0.65	0.03	2.81
1998	3.10	1.15	2.75	0.34	0.65	0.54	0.03	1.39	0.83	0.77	1.31	0.50	0.10	0.06	2.42
1999	2.79	1.72	3.45	2.83	3.19	0.79	0.06	2.72	1.86	0.82	2.41	0.84	1.14	0.10	5.73
2000	1.89	1.12	1.77	0.58	0.32	0.46	0.01	1.68	0.87	0.33	0.88	0.62	0.06	0.01	1.49
2001	4.35	1.15	3.26	1.04	1.00	0.88	0.12	1.07	1.03	0.49	1.05	0.44	0.80	0.17	2.36
2002	3.25	1.68	3.14	0.68	0.60	0.56	0.01	1.56	1.16	0.48	1.11	0.53	0.19	0.04	2.36
2003	3.70	1.34	2.98	0.89	0.88	0.83	0.16	1.15	1.67	0.54	1.55	1.35	0.41	0.04	3.81
2004	2.48	0.74	3.49	0.63	0.56	0.56	0.04	1.29	1.28	0.49	1.36	0.53	0.23	0.03	2.15

Appendix 4.B.4–Escapement index series and management targets for the pink salmon stock groups in the Juneau Management Area (in millions), 1960–2004.

Stock Group	Seymour Canal	Stephens	Freshwater Bay	Lynn Canal	SW Admiralty	Tenakee	W Admiralty	Homeshore	N Chichagof	Lynn Canal
Management Area	Juneau	Juneau	Juneau	Juneau	Juneau	Juneau	Juneau	Juneau	Juneau	Juneau
Subregion	NSEI[1]	NSEI	NSEI	NSEI	NSEI	NSEI	NSEI	NSEI	NSEI	NSEI
District	111	111	112	112	112	112	112	114	114	115
Number of Streams	14	35	15	6	17	19	14	10	23	9
Management Target:										
Lower	0.18	0.14	0.06	0.02	0.08	0.18	0.04	0.05	0.28	No Target
Upper	0.41	0.32	0.13	0.04	0.17	0.37	0.08	0.10	0.62	
1960	0.02	0.02	0.01	0.00	0.02	0.04	0.01	0.01	0.02	0.01
1961	0.08	0.08	0.05	0.02	0.06	0.14	0.03	0.02	0.08	0.02
1962	0.05	0.05	0.03	0.01	0.03	0.08	0.02	0.01	0.05	0.01
1963	0.16	0.16	0.10	0.03	0.12	0.28	0.06	0.04	0.16	0.04
1964	0.06	0.05	0.03	0.01	0.04	0.10	0.02	0.01	0.06	0.02
1965	0.06	0.06	0.01	0.00	0.01	0.03	0.01	0.01	0.06	0.02
1966	0.10	0.10	0.03	0.02	0.07	0.03	0.04	0.01	0.04	0.00
1967	0.02	0.02	0.02	0.01	0.02	0.02	0.06	0.00	0.16	0.04
1968	0.29	0.05	0.05	0.01	0.08	0.12	0.03	0.01	0.04	0.00
1969	0.03	0.02	0.04	0.02	0.09	0.07	0.08	0.05	0.16	0.01
1970	0.24	0.06	0.09	0.02	0.10	0.17	0.05	0.02	0.05	0.01
1971	0.15	0.03	0.06	0.04	0.07	0.08	0.06	0.02	0.28	0.07
1972	0.36	0.35	0.05	0.01	0.07	0.15	0.02	0.00	0.03	0.01
1973	0.12	0.10	0.05	0.03	0.03	0.18	0.07	0.01	0.23	0.05
1974	0.35	0.03	0.06	0.01	0.03	0.18	0.01	0.00	0.03	0.01
1975	0.05	0.05	0.04	0.01	0.02	0.08	0.03	0.01	0.13	0.01
1976	0.05	0.01	0.04	0.01	0.02	0.13	0.01	0.00	0.04	0.01
1977	0.15	0.13	0.18	0.07	0.11	0.18	0.08	0.01	0.33	0.08
1978	0.11	0.07	0.15	0.03	0.07	0.54	0.06	0.02	0.06	0.02
1979	0.22	0.22	0.20	0.07	0.20	0.17	0.14	0.02	0.15	0.07
1980	0.08	0.10	0.05	0.05	0.18	0.29	0.04	0.05	0.05	0.03
1981	0.04	0.16	0.05	0.04	0.10	0.27	0.10	0.06	0.23	0.03
1982	0.23	0.25	0.10	0.05	0.21	0.36	0.06	0.03	0.17	0.04
1983	0.26	0.30	0.07	0.07	0.22	0.45	0.07	0.03	0.25	0.06
1984	0.37	0.20	0.10	0.02	0.15	0.24	0.06	0.06	0.20	0.03
1985	0.43	0.48	0.21	0.09	0.27	0.66	0.21	0.19	0.68	0.35
1986	0.13	0.08	0.10	0.01	0.17	0.60	0.02	0.02	0.06	0.00
1987	0.29	0.37	0.09	0.03	0.11	0.18	0.08	0.03	0.15	0.11
1988	0.08	0.10	0.07	0.02	0.09	0.28	0.02	0.04	0.04	0.04
1989	0.17	0.16	0.11	0.06	0.20	0.30	0.12	0.05	0.21	0.04
1990	0.04	0.11	0.11	0.03	0.20	0.26	0.05	0.03	0.11	0.13
1991	0.09	0.21	0.11	0.03	0.19	0.75	0.08	0.03	0.18	0.00
1992	0.13	0.29	0.12	0.04	0.16	0.37	0.05	0.04	0.07	0.06
1993	0.11	0.05	0.15	0.02	0.18	0.52	0.07	0.05	0.29	0.03
1994	0.23	0.75	0.27	0.07	0.23	0.59	0.13	0.09	0.21	0.19
1995	0.12	0.08	0.22	0.04	0.11	0.39	0.10	0.05	0.45	0.02
1996	0.29	0.46	0.13	0.02	0.29	0.49	0.05	0.01	0.04	0.00
1997	0.44	0.27	0.29	0.11	0.13	0.86	0.16	0.09	0.56	0.03
1998	0.31	0.46	0.15	0.02	0.52	0.49	0.03	0.01	0.09	0.06
1999	0.44	0.38	0.26	0.21	0.44	0.98	0.21	0.20	0.94	0.10
2000	0.20	0.13	0.08	0.02	0.26	0.42	0.01	0.01	0.05	0.01
2001	0.29	0.20	0.24	0.19	0.24	0.14	0.09	0.10	0.69	0.17
2002	0.22	0.26	0.16	0.05	0.21	0.60	0.02	0.01	0.18	0.04
2003	0.36	0.19	0.18	0.06	0.40	0.23	0.16	0.06	0.34	0.04
2004	0.31	0.18	0.20	0.05	0.42	0.43	0.19	0.07	0.16	0.03

Note: NSEI = Northern Southeast Inside sub-region.

Appendix 4.B.5–Escapement index series and management targets for the pink salmon stock groups in the Petersburg Management Area (in millions), 1960–2004.

Stock Group	Affleck Canal	Shipley Bay	Burnett	Ratz Harbor	Totem Bay	Whale Pass	Anan	Union Bay	Stikine	Eliza Harbor	Saginaw Bay	Tebenkof	Farragut Bay	Houghton	Portage Bay	Pybus/Gambier
Management Area	Petersburg	Petersburg	Petersburg	Petersburg	Petersburg	Petersburg	Petersburg	Petersburg	Petersburg	Petersburg	Petersburg	Petersburg	Petersburg	Petersburg	Petersburg	Petersburg
Subregion	SSE	SSE	SSE	SSE	SSE	SSE	SSE	SSE	SSE	NSEI	NSEI	NSEI	NSEI	NSEI	NSEI	NSEI
District	105	105	106	106	106	106	107	107	108	109	109	109	110	110	110	110
Number of Streams	33	12	9	4	13	11	27	8	6	13	16	40	4	19	7	18
Management Target:																
Lower	0.20	0.14	0.10	0.10	0.07	0.13	0.32	0.08	No Target	0.08	0.07	0.13	0.01	0.40	0.04	0.20
Upper	0.38	0.27	0.20	0.21	0.15	0.28	0.68	0.17		0.18	0.15	0.27	0.03	0.89	0.08	0.45
1960	0.05	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.01	0.01	0.00	0.04	0.00	0.01
1961	0.03	0.02	0.00	0.02	0.02	0.01	0.04	0.01	0.02	0.02	0.02	0.03	0.00	0.02	0.01	0.05
1962	0.16	0.03	0.00	0.02	0.03	0.02	0.16	0.04	0.00	0.00	0.02	0.06	0.00	0.09	0.01	0.04
1963	0.02	0.05	0.01	0.00	0.01	0.03	0.12	0.01	0.02	0.03	0.02	0.05	0.00	0.04	0.00	0.03
1964	0.05	0.00	0.16	0.07	0.00	0.00	0.10	0.03	0.01	0.05	0.07	0.06	0.00	0.08	0.01	0.04
1965	0.05	0.06	0.02	0.00	0.02	0.03	0.06	0.00	0.00	0.03	0.07	0.10	0.00	0.05	0.00	0.01
1966	0.05	0.06	0.02	0.03	0.03	0.06	0.14	0.04	0.01	0.08	0.02	0.08	0.00	0.08	0.01	0.03
1967	0.02	0.03	0.00	0.00	0.00	0.01	0.03	0.01	0.00	0.00	0.01	0.03	0.00	0.03	0.01	0.01
1968	0.07	0.07	0.05	0.00	0.04	0.03	0.12	0.01	0.03	0.09	0.04	0.08	0.00	0.14	0.03	0.07
1969	0.02	0.03	0.00	0.03	0.02	0.00	0.06	0.01	0.00	0.01	0.02	0.04	0.00	0.07	0.00	0.01
1970	0.04	0.02	0.01	0.01	0.02	0.02	0.12	0.01	0.01	0.04	0.01	0.03	0.00	0.12	0.01	0.06
1971	0.03	0.07	0.02	0.04	0.02	0.09	0.16	0.03	0.01	0.02	0.02	0.03	0.00	0.13	0.01	0.01
1972	0.05	0.01	0.03	0.02	0.00	0.01	0.15	0.02	0.00	0.02	0.03	0.03	0.00	0.11	0.01	0.06
1973	0.02	0.10	0.03	0.01	0.00	0.06	0.12	0.03	0.01	0.01	0.00	0.01	0.00	0.13	0.01	0.09
1974	0.02	0.02	0.02	0.01	0.00	0.06	0.09	0.02	0.00	0.01	0.00	0.01	0.00	0.06	0.00	0.03
1975	0.03	0.11	0.04	0.01	0.01	0.10	0.27	0.05	0.00	0.01	0.01	0.03	0.00	0.01	0.00	0.01
1976	0.06	0.03	0.10	0.05	0.01	0.22	0.53	0.08	0.00	0.00	0.01	0.08	0.00	0.04	0.00	0.04
1977	0.09	0.09	0.12	0.07	0.03	0.08	0.76	0.13	0.02	0.05	0.05	0.19	0.01	0.07	0.01	0.06
1978	0.14	0.10	0.05	0.08	0.04	0.08	0.35	0.08	0.00	0.04	0.04	0.15	0.01	0.19	0.02	0.14
1979	0.11	0.14	0.06	0.05	0.09	0.07	0.35	0.05	0.06	0.08	0.14	0.20	0.01	0.29	0.01	0.25
1980	0.07	0.04	0.04	0.01	0.02	0.02	0.23	0.08	0.00	0.07	0.05	0.07	0.00	0.21	0.02	0.13
1981	0.17	0.11	0.02	0.04	0.03	0.02	0.09	0.02	0.02	0.05	0.06	0.05	0.01	0.25	0.02	0.04
1982	0.07	0.03	0.01	0.09	0.06	0.05	0.28	0.07	0.04	0.08	0.17	0.15	0.02	0.39	0.03	0.11
1983	0.15	0.07	0.02	0.06	0.02	0.03	0.27	0.08	0.02	0.04	0.09	0.11	0.00	0.19	0.03	0.05
1984	0.10	0.05	0.03	0.02	0.02	0.05	0.19	0.06	0.01	0.10	0.12	0.14	0.01	0.24	0.03	0.07
1985	0.34	0.32	0.12	0.23	0.24	0.23	0.63	0.18	0.05	0.16	0.27	0.36	0.05	0.53	0.08	0.29
1986	0.46	0.18	0.12	0.20	0.14	0.25	0.37	0.30	0.01	0.09	0.23	0.25	0.02	0.13	0.03	0.09
1987	0.05	0.08	0.03	0.02	0.11	0.03	0.23	0.06	0.06	0.13	0.16	0.08	0.03	0.72	0.06	0.23
1988	0.11	0.02	0.05	0.07	0.04	0.03	0.18	0.10	0.01	0.08	0.06	0.19	0.01	0.27	0.04	0.11
1989	0.11	0.24	0.08	0.14	0.12	0.19	0.69	0.19	0.07	0.17	0.24	0.17	0.04	0.63	0.06	0.25
1990	0.32	0.04	0.11	0.07	0.05	0.23	0.22	0.15	0.06	0.20	0.05	0.13	0.01	0.71	0.05	0.25
1991	0.24	0.36	0.10	0.11	0.13	0.16	0.46	0.13	0.12	0.27	0.31	0.22	0.04	0.70	0.04	0.25
1992	0.12	0.06	0.05	0.02	0.08	0.07	0.74	0.06	0.06	0.33	0.12	0.27	0.02	0.79	0.05	0.31
1993	0.29	0.32	0.08	0.12	0.28	0.14	0.58	0.09	0.01	0.26	0.11	0.28	0.03	0.39	0.02	0.18
1994	0.26	0.16	0.16	0.11	0.06	0.30	0.40	0.11	0.03	0.25	0.35	0.45	0.03	0.93	0.02	0.38
1995	0.28	0.23	0.08	0.19	0.11	0.24	0.48	0.25	0.01	0.17	0.07	0.30	0.00	0.17	0.01	0.13
1996	0.62	0.25	0.26	0.15	0.07	0.19	0.41	0.22	0.03	0.31	0.34	0.64	0.02	0.16	0.02	0.32

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Stock Group	Affleck Canal	Shipley Bay	Burnett	Ratz Harbor	Totem Bay	Whale Pass	Anan	Union Bay	Stikine	Eliza Harbor	Saginaw Bay	Tebenkof	Farragut Bay	Houghton	Portage Bay	Pybus/Gambier
Management Area	Petersburg	Petersburg	Petersburg	Petersburg	Petersburg	Petersburg	Petersburg	Petersburg	Petersburg	Petersburg	Petersburg	Petersburg	Petersburg	Petersburg	Petersburg	Petersburg
Subregion	SSE	SSE	SSE	SSE	SSE	SSE	SSE	SSE	SSE	NSEI	NSEI	NSEI	NSEI	NSEI	NSEI	NSEI
District	105	105	106	106	106	106	107	107	108	109	109	109	110	110	110	110
Number of Streams	33	12	9	4	13	11	27	8	6	13	16	40	4	19	7	18
Management Target:																
Lower	0.20	0.14	0.10	0.10	0.07	0.13	0.32	0.08	No Target	0.08	0.07	0.13	0.01	0.40	0.04	0.20
Upper	0.38	0.27	0.20	0.21	0.15	0.28	0.68	0.17		0.18	0.15	0.27	0.03	0.89	0.08	0.45
1997	0.30	0.32	0.11	0.07	0.13	0.20	0.47	0.06	0.01	0.29	0.16	0.19	0.02	0.36	0.04	0.29
1998	0.20	0.15	0.17	0.16	0.10	0.23	0.40	0.14	0.03	0.27	0.24	0.37	0.02	0.45	0.02	0.35
1999	0.96	1.87	0.78	0.81	0.98	0.63	0.60	0.20	0.06	0.74	0.52	0.66	0.07	1.10	0.12	0.56
2000	0.44	0.14	0.14	0.06	0.08	0.05	0.40	0.06	0.01	0.40	0.49	0.53	0.02	0.46	0.03	0.36
2001	0.58	0.46	0.24	0.17	0.27	0.31	0.58	0.30	0.12	0.18	0.22	0.38	0.02	0.71	0.03	0.28
2002	0.55	0.14	0.21	0.16	0.14	0.09	0.42	0.14	0.01	0.18	0.54	0.59	0.02	0.74	0.03	0.37
2003	0.32	0.57	0.18	0.26	0.14	0.30	0.66	0.17	0.16	0.15	0.25	0.56	0.02	1.31	0.04	0.29
2004	0.47	0.17	0.08	0.17	0.18	0.13	0.45	0.11	0.04	0.28	0.32	0.35	0.06	0.63	0.09	0.50

Note: SSE = Southern Southeast sub-region; NSEI = Northern Southeast Inside sub-region.

Appendix 4.B.6–Escapement index series and management targets for the pink salmon stock groups in the Sitka Management Area (in millions), 1960–2004.

Stock Group	E Baranof	SE Baranof	Kelp Bay	Hoonah Sound	Lisianski	Portlock	Salisbury Sound	Sitka Sound	Slocum Arm	W Crawfish	Whale Bay
Management Area	Sitka	Sitka	Sitka	Sitka	Sitka	Sitka	Sitka	Sitka	Sitka	Sitka	Sitka
Subregion	NSEI[1]	NSEI	NSEI	NSEI	NSEO	NSEO	NSEO	NSEO	NSEO	NSEO	NSEO
District	109	109	112	113	113	113	113	113	113	113	113
Number of Streams	2	4	4	19	5	3	8	13	7	1	4
Management Target:											
Lower	0.07	0.05	0.03	0.40	0.07	0.03	0.16	0.21	0.21	0.01	0.05
Upper	0.14	0.11	0.06	0.90	0.17	0.08	0.36	0.50	0.48	0.03	0.12
1960	0.01	0.01	0.01	0.04	0.00	0.01	0.00	0.01	0.00	0.01	0.03
1961	0.05	0.04	0.02	0.24	0.04	0.05	0.06	0.06	0.03	0.01	0.02
1962	0.02	0.01	0.01	0.05	0.01	0.02	0.02	0.02	0.06	0.00	0.01
1963	0.04	0.01	0.06	0.32	0.18	0.08	0.25	0.17	0.10	0.00	0.00
1964	0.01	0.00	0.02	0.16	0.04	0.01	0.02	0.01	0.04	0.00	0.00
1965	0.03	0.02	0.03	0.22	0.11	0.01	0.05	0.09	0.07	0.00	0.00
1966	0.02	0.01	0.01	0.14	0.01	0.01	0.01	0.02	0.01	0.00	0.01
1967	0.04	0.03	0.01	0.02	0.02	0.01	0.04	0.06	0.04	0.00	0.00
1968	0.06	0.00	0.04	0.20	0.00	0.00	0.01	0.00	0.00	0.00	0.00
1969	0.04	0.03	0.02	0.16	0.03	0.01	0.14	0.10	0.06	0.01	0.03
1970	0.03	0.04	0.02	0.13	0.01	0.00	0.02	0.01	0.03	0.00	0.01
1971	0.06	0.05	0.05	0.13	0.05	0.00	0.06	0.09	0.05	0.00	0.01
1972	0.03	0.05	0.03	0.18	0.00	0.00	0.01	0.00	0.11	0.00	0.00
1973	0.01	0.00	0.02	0.04	0.02	0.01	0.03	0.18	0.08	0.00	0.00
1974	0.01	0.03	0.02	0.16	0.01	0.00	0.01	0.06	0.08	0.02	0.06
1975	0.02	0.02	0.02	0.03	0.03	0.01	0.08	0.21	0.11	0.01	0.03
1976	0.00	0.02	0.01	0.11	0.01	0.01	0.02	0.06	0.13	0.00	0.01
1977	0.06	0.04	0.03	0.22	0.15	0.02	0.28	0.75	0.21	0.02	0.08
1978	0.03	0.08	0.03	0.42	0.03	0.01	0.08	0.11	0.09	0.01	0.04
1979	0.07	0.16	0.06	0.30	0.21	0.17	0.32	0.51	0.25	0.01	0.02
1980	0.02	0.06	0.03	0.16	0.02	0.01	0.05	0.03	0.04	0.01	0.03
1981	0.05	0.08	0.12	0.19	0.19	0.09	0.31	0.38	0.13	0.02	0.03
1982	0.09	0.12	0.08	0.25	0.03	0.02	0.14	0.12	0.08	0.02	0.02
1983	0.06	0.06	0.04	0.28	0.20	0.11	0.17	0.28	0.11	0.02	0.04
1984	0.08	0.07	0.07	0.30	0.04	0.02	0.15	0.25	0.08	0.06	0.06
1985	0.12	0.07	0.10	0.30	0.26	0.07	0.36	0.55	0.13	0.02	0.08
1986	0.05	0.02	0.03	0.16	0.04	0.01	0.03	0.10	0.05	0.01	0.02
1987	0.08	0.01	0.06	0.23	0.06	0.03	0.02	0.10	0.09	0.01	0.01
1988	0.07	0.01	0.05	0.16	0.02	0.01	0.02	0.01	0.03	0.00	0.01
1989	0.09	0.02	0.09	0.22	0.08	0.04	0.03	0.01	0.23	0.00	0.02
1990	0.07	0.04	0.03	0.25	0.01	0.01	0.04	0.01	0.10	0.00	0.02
1991	0.16	0.06	0.11	0.31	0.03	0.02	0.14	0.06	0.22	0.00	0.02
1992	0.07	0.08	0.03	0.38	0.01	0.02	0.03	0.02	0.13	0.01	0.20
1993	0.10	0.12	0.09	0.52	0.08	0.01	0.17	0.02	0.05	0.00	0.01
1994	0.25	0.09	0.11	0.53	0.03	0.05	0.13	0.29	0.42	0.04	0.20
1995	0.13	0.19	0.02	0.11	0.15	0.09	0.43	0.24	0.29	0.02	0.09
1996	0.33	0.24	0.08	0.33	0.03	0.08	0.26	0.71	0.31	0.05	0.14
1997	0.27	0.13	0.16	0.30	0.54	0.29	0.27	1.04	0.57	0.01	0.10
1998	0.23	0.28	0.10	0.50	0.06	0.06	0.31	1.33	0.21	0.07	0.38
1999	0.56	0.25	0.32	0.84	0.95	0.29	1.48	1.62	1.19	0.04	0.17
2000	0.14	0.12	0.09	0.62	0.04	0.13	0.25	0.51	0.41	0.03	0.11
2001	0.20	0.10	0.15	0.44	0.65	0.17	0.17	0.69	0.57	0.02	0.11
2002	0.19	0.07	0.07	0.53	0.15	0.12	0.44	0.97	0.27	0.08	0.32
2003	0.14	0.06	0.52	1.35	0.34	0.36	0.45	1.59	0.82	0.05	0.21
2004	0.29	0.05	0.08	0.53	0.09	0.17	0.38	0.87	0.27	0.10	0.29

Note: NSEI = Northern Southeast Inside sub-region; NSEO = Northern Southeast Outside sub-region.

Appendix 4.B.7–Escapement index series and management targets for the pink salmon stock groups in the Ketchikan Management Area (in millions), 1960–2004.

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
Subregion	SSE[1]	SSE	SSE	SSE	SSE	SSE	SSE	SSE	SSE
District	101	101	101	102	102	103	103	103	103
Number of Streams	41	16	34	30	12	32	15	48	18
Management Target:									
Lower	0.84	0.17	0.33	0.34	0.06	0.16	0.30	0.52	0.15
Upper	1.89	0.37	0.74	0.93	0.17	0.36	0.68	1.17	0.33
1960	0.13	0.03	0.05	0.06	0.01	0.03	0.01	0.14	0.01
1961	0.06	0.01	0.02	0.03	0.00	0.01	0.02	0.04	0.01
1962	0.46	0.11	0.10	0.13	0.00	0.07	0.14	0.27	0.06
1963	0.42	0.17	0.17	0.17	0.17	0.07	0.04	0.33	0.05
1964	0.33	0.16	0.31	0.22	0.05	0.15	0.13	0.16	0.10
1965	0.16	0.16	0.05	0.16	0.03	0.15	0.16	0.26	0.17
1966	0.56	0.19	0.30	0.43	0.05	0.06	0.18	0.36	0.25
1967	0.11	0.03	0.07	0.02	0.00	0.01	0.02	0.03	0.01
1968	0.33	0.36	0.10	0.27	0.05	0.02	0.05	0.10	0.11
1969	0.29	0.09	0.12	0.27	0.02	0.03	0.08	0.12	0.01
1970	0.54	0.05	0.16	0.12	0.01	0.05	0.06	0.25	0.01
1971	0.23	0.06	0.17	0.34	0.05	0.03	0.24	0.42	0.08
1972	0.40	0.11	0.19	0.15	0.02	0.03	0.13	0.25	0.05
1973	0.43	0.17	0.05	0.14	0.08	0.02	0.09	0.16	0.12
1974	0.44	0.02	0.12	0.13	0.08	0.07	0.16	0.18	0.07
1975	0.42	0.08	0.13	0.39	0.10	0.08	0.23	0.23	0.18
1976	0.49	0.12	0.18	0.42	0.10	0.21	0.19	0.50	0.14
1977	1.28	0.51	0.53	0.51	0.11	0.17	0.25	0.61	0.20
1978	1.17	0.34	0.47	0.39	0.04	0.23	0.29	0.72	0.23
1979	0.48	0.04	0.53	0.57	0.05	0.22	0.27	0.82	0.18
1980	1.13	0.14	0.61	0.48	0.12	0.37	0.60	0.90	0.18
1981	1.11	0.34	0.39	0.39	0.08	0.30	0.41	0.99	0.18
1982	0.80	0.09	0.45	0.29	0.05	0.20	0.44	0.58	0.17
1983	1.46	0.23	0.44	0.85	0.12	0.22	0.47	1.08	0.25
1984	2.15	0.49	0.91	0.64	0.13	0.55	0.57	1.34	0.20
1985	1.74	0.53	1.14	0.76	0.14	0.55	0.74	2.20	0.33
1986	3.16	0.40	0.84	1.28	0.22	0.68	1.18	2.55	0.42
1987	1.28	0.49	0.43	0.39	0.08	0.18	0.60	0.86	0.09
1988	0.91	0.17	0.14	0.30	0.16	0.24	0.40	0.38	0.08
1989	1.09	0.68	0.80	0.67	0.05	0.13	0.51	1.96	0.24
1990	0.97	0.10	0.66	0.84	0.09	0.40	0.72	0.98	0.25
1991	1.03	0.21	0.40	0.59	0.04	0.15	0.54	1.13	0.14
1992	1.90	0.21	0.68	0.73	0.13	0.26	0.31	0.62	0.27
1993	1.27	0.46	0.39	0.83	0.07	0.34	0.66	1.70	0.22
1994	1.25	0.22	0.31	0.55	0.08	0.29	0.51	0.91	0.29
1995	2.59	0.54	0.69	0.75	0.16	0.45	0.98	1.67	0.31
1996	4.65	0.42	0.94	2.89	0.22	0.94	1.86	3.02	0.83
1997	1.44	0.27	0.62	0.76	0.05	0.17	0.46	1.03	0.11
1998	1.71	0.54	0.85	0.95	0.19	0.32	0.66	1.62	0.16
1999	1.66	0.42	0.71	1.50	0.22	0.31	1.39	1.43	0.32
2000	1.22	0.28	0.38	1.04	0.08	0.27	1.07	0.29	0.14
2001	2.98	0.52	0.85	1.05	0.10	0.35	0.50	1.92	0.49
2002	2.01	0.57	0.66	1.57	0.11	0.44	1.00	1.43	0.27
2003	2.56	0.46	0.68	1.22	0.12	0.26	0.48	1.74	0.50
2004	1.46	0.42	0.60	0.70	0.04	0.59	0.64	1.91	0.35

Note: SSE = Southern Southeast sub-region.