DISCUSSION OF THE SOCKEYE SALMON HARVEST IN THE SOUTHEASTERN DISTRICT OF THE ALASKA PENINSULA MANAGEMENT AREA

By

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF FIGURES (Cont.)

LIST OF APPENDICES

INTRODUCTION

The intent of this report is to provide information to the Alaska Board of Fisheries (Board) for deliberations on proposals 252 and 253. These proposals are requesting changes to 5 AAC 09.360, the Southeastern District Mainland Salmon Management Plan (SEDM). This report may also aid the Board with other proposals concerning the Southeastern District of the Alaska Peninsula Management Area. The Shumagin Islands Section post June fishery is regulated by 5 AAC 09.366, the Post June Salmon Management Plan for the Southern Alaska Peninsula.

Stock specific harvest information is not available for the Southeastern District of the Alaska Peninsula Management Area commercial salmon fisheries. We can however, provide some stock information generalities by applying four avenues of investigation: 1) tagging data, 2) travel time, 3) proximity arguments, and 4) age composition data of sockeye salmon harvests and escapements.

Prior Board reports by Robert Bercelli, Bruce Barrett and myself (McCullough 1990) compared sockeye salmon harvest and escapement data from several areas with the Southeastern District harvests from 1985 through 1995. This report emphasizes sockeye salmon data from 1995 through 1997. The conclusions of this report are similar to prior reports.

TAGGING DATA

Salmon tagging occurred in the South Alaska Peninsula as early as 1922 and as recent as 1987 (Appendix A). The tagging projects occurred mostly during June with a few projects running into early July. Even the 1961 tagging project by the Alaska Department of Fish and Game (ADF&G) which is the basis for the local/non-local allocation of sockeye salmon within the SEDM occurred during June (Appendix B). June tagging studies in the Southeastern District have reported recoveries of sockeye salmon from Bristol Bay (Togiak, Nushagak, Naknek/Kvichak, Egegik, and Ugashik) North Peninsula (Northern and Northwestern Districts), South Peninsula (Southwestern District, Shumagin Islands, Southeastern District Mainland), Chignik (early and late runs), Kodiak, and Cook Inlet (Figure 1). No stock composition tagging studies have been conducted for post June fisheries in the South Peninsula. The 1961 ADF&G Stepovak Bay tagging study that the Board used to determine allocations in the Southeastern District Mainland, would not be considered scientifically creditable in today's meetings (Figure 2). Some of faults in this tagging study include: 1) small sample size (only 130 sockeye salmon were tagged and few were recovered), 2) tagging occurred only in the south east portion of the SEDM, 3) tagging occurred only during two periods, June 17-18 and June 24-25, 4) nearly half of the recoveries attributed to Chignik were not physically recovered, some of the returns attributed to Chignik were observations by ADF&G personnel as the salmon swam through the weir, 5) the possibility exists that some of the recovered and observed tags were from another South Peninsula salmon migration study that occurred during the same time period and used the same style of tags as the SEDM study, 6) no known tag recovery effort was directed toward systems such as Orzinski that during this

study period were not weired, 7) it is not known if tag recovery effort was equal between the recovery areas, and 8) the study was only for one year, annual variation of stock composition was not studied.

One point that most agree to is that the stock composition of the sockeye harvest in the Southeastern District is likely different between June and the remainder of the salmon season (July through October). It is also likely that the stock composition changes during July through October and the stock composition may also be different between the Shumagin Islands Section and the Southeastern District Mainland area.

TRAVEL TIME

A method often used to determine if specific sockeye stocks may potentially contribute to the Southeastern District sockeye salmon harvests involves combining the tagging data with distance information between the Southeastern District and other areas, and the swimming rates of the salmon. June tagging data indicates that, at a minimum, Bristol Bay, North and South Alaska Peninsula, Chignik, Kodiak and Cook Inlet sockeye are present (Eggers et al. 1991). Arguments have also been presented for other North Pacific stocks being present. By knowing the run timing for a stock and a rate of travel for a species, based on general salmon literature (Groot and Margolis 1991) or tagging studies (Appendix C); it could then be suggested that the stock of interest is potentially present in the Southeastern District fisheries at some level. The problem with this analysis is that there is no scientifically creditable way to determine the actual stock contribution and harvest rate to the fishery using this method. Data is lacking on the abundance of stocks in the fisheries and each stock's vulnerability.

PROXIMITY

A third method often used to determine the stock composition of the Southeastern District sockeye salmon harvests simply involves relative distances from the Southeastern District to other areas. Simply stated this argument suggests that because a stock is geographically near or distant from the Southeastern District, then the Southeastern District harvest of a particular stock is large if geographically near and small if far away.

Although this argument is easily understandable it fails to take into account salmon migration routes, the productivity of the stock in question, and the stocks vulnerability in the Southeastern District commercial fisheries. Similar to the travel time method, this analysis is not scientifically creditable.

AGE COMPOSITION

Due to the lack of specific stock composition data on post June sockeye salmon harvests and the large number of possible contributing stocks, the best method currently available to compare the stock composition of the harvest in the Southeastern District with other areas is using age composition data.

Although the methodology for collection and analysis of age data from scales is standardized statewide, errors can occur. Error sources include: 1) the ability to sample throughout the run and 2) the accuracy and precision of determining the fish age from a scale. Bias in comparing different area's harvest may occur when harvest contain varying amounts of gillnet caught salmon. Gillnets are known to be selective for fish species, size and sex (Todd and Larkin 1971, Peterson 1954, Peterson 1966, Hamley 1975).

Purse seine samples are assumed to provide an accurate reflection of the true age structure of the fish available for harvest. Samples from an area such as Chignik where only purse seine commercial gear is allowed are assumed to accurately reflect the salmon run. Unfortunately, most other areas commercial samples include gillnet harvested salmon, in some cases the entire sample may be from gillnet gear (i.e. SEDM through July 10). An analysis to determine the effects of gear selectivity in the Southeastern District of the Alaska Peninsula is cost prohibitive. Commercial set gillnet gear is often developed to be site specific which could create a large variation in the age composition of the harvest between fishing sites even within a fishery.

In order to address the question of scale reader bias and its affect on the age composition estimates of sockeye salmon samples, a blind test with an independent reader was performed on Chignik and Shumagin Islands Section sockeye salmon scales. The results of the test showed no significant difference between scale readers (ADF&G, unpublished data).

Although sampling sockeye salmon is a high priority for South Peninsula sampling crews, there are times when weekly samples can not be taken, especially after 20 August. The South Peninsula sampling budget is not sufficient to sample throughout the duration of the salmon runs (mid June through mid October). During weeks where samples are unavailable, a prior sample is usually used to describe the missing sampling event (the choice to use a prior sample or to average samples for describing a missed sampling event or to not assign the weekly harvest to specific age classes is at the discretion of the area management and research staff). Using prior samples or averaging samples to describe missing sampling events may cause serious errors especially if weeks pass without samples or a lot of variability occurs between samples.

Salmon harvests and escapements are usually sampled weekly (n=600 for commercial harvests and n=240 for escapements). Within the Southeastern District post June harvests, ages which comprise more than 10% of the harvest usually include ages 1.2, 1.3, 2.2, and 2.3 (Nelson and Murphy 1996, Nelson et al. 1997, Nelson *In Press* 1998). In the Chignik Management Area ages which comprise more than 10% of the harvest usually includes ages 1.3, 2.2, and 2.3 (Owen *In Press a,b,c*).

1995 Season

From tagging data, an average travel time for sockeye salmon migrating from the Shumagin Islands or the SEDM area to another area can be determined (Appendix C). Tagging data indicates that on the average sockeye salmon take about two weeks to move from the Shumagin Islands Section to Chignik and about one week from the SEDM to Chignik. As an aid to comparing the fisheries, in Figures 5-8 the weekly age composition was adjusted to allow for average sockeye salmon travel times.

Figures 5 through 8 illustrate comparisons of age classes 1.2, 1.3, 2.2 and 2.3 Shumagin Islands, SEDM and the Chignik sockeye salmon harvest by week. In 1995, these age classes represented 98.0% of the sockeye salmon harvest in the Shumagin Islands Section, 99.2% of the SEDM harvest and 98.3% of the Chignik harvest (Table 1). If Chignik sockeye salmon stocks dominated the Shumagin Islands or the SEDM sockeye salmon harvest, the weekly percent of the harvest by age class and the abundance trends by age class in the harvest should be similar between areas.

As indicated in Figures 5 through 8, harvests in the Shumagin Islands Section and the Chignik Area appear different. For example, in 1995 age class 1.3 dominated the Shumagin Islands harvest from week 27 through week 32; during this time period the Chignik harvest of age class 1.3 salmon showed a near opposite trend. During weeks 33 through 35 the Shumagin Islands harvest of age class 1.3 decreased to about 22% while the Chignik harvest was about 8%. In 1995, three samples were obtained from the SEDM sockeye salmon fishery. The SEDM age 1.3 harvest most closely resembles the Shumagin Islands harvest trend. During weeks 27 through 32, all three fisheries show a similar low harvest of age 2.2 sockeye salmon; this age class comprised about 10% of all three areas total sockeye harvest. Age class 2.3 dominated the harvest in Chignik from week 26 through the end of the season, while in the Shumagin Islands the harvest of this age class never exceeded 22% and in the SEDM did not exceed 36.5%.

In 1995, Alaska Peninsula age composition data indicates that Orzinski Lake sockeye salmon escapement was 22.2% age 1.1, 6.5% age 1.2, 45.5% age 1.3, 14.2% age 2.2, and 4.8% age 2.3 (Nelson and Murphy 1995). Thin Point Lake escapement was 17.6% age 1.2, 81.5% age 1.3 and 1.4 % age 2.3. Middle Lagoon escapement was 55.1% age 1.2, 34.8% age 1.3 and 2.9% age 2.2. Bear River escapement was 2.1% age 1.2, 12.2% age 2.1, 0.6% age 1.3, 48.8% age 2.2 and 35% age 2.3. Karluk late run escapement was 1.7% age 1.2, 1.1% age 1.3, 55.5% age 2.2, 16.1% age 2.3, and 22.4% age 3.2 (Nelson and Swanton 1996). Cook Inlet total run was 24.5% age 1.2, 32.2% age 1.3, 11.1% age 2.2, 29.7% age 2.3 (David Waltemyer , ADF&G Soldotna, personnel communication).

1996 Season

As an aid to comparing the fisheries, in Figures 9-12 the weekly age composition was adjusted to allow for average sockeye salmon travel times between the Shumagin Islands, SEDM and Chignik.

Figures 9 through 12 illustrate comparisons of age classes 1.2, 1.3, 2.2 and 2.3 Shumagin Islands and Chignik sockeye salmon harvest by week. Only one sample was acquired in the SEDM fishery. In 1996, these age classes represented 96.2% of the sockeye salmon harvest in the Shumagin Islands Section, 96.4% of the SEDM harvest and 91.3% of the Chignik harvest (Table 2). Differences in the harvest between the areas are apparent, especially in the major age classes (age 1.3 and 2.3). For example, in 1996 age class 1.3 dominated the Chignik harvest in weeks 21 through week 25, then steadily decreased in importance through week 31; while in the Shumagin Islands this age class represented about 30-50 percent of the harvest and in the SEDM comprised about 55 percent of the harvest. Shumagin Islands age class 2.2 harvest from week 30 through week 32 indicates a similar trend as the Chignik harvest but the trend appears one week later in Chignik than expected after adjustments for travel time. Age class 2.3 comprises about 13 to 20 percent of the Shumagin Islands harvest and about 23 percent of the SEDM harvest during weeks 30 through 32; during this same time period in Chignik, this age class provided about 52 to 57 percent of the harvest.

In 1996, Alaska Peninsula age composition data indicates that Orzinski Lake sockeye salmon escapement was 62.6% age 1.2, 10.6% 1.3, 9.2% 2.2 and 5.1% age 2.3 (Nelson et al. 1997). Middle Lagoon sockeye salmon escapement was 12.2% 1.1, 37.5% 1.2, 34.8% 1.3 11.7% 2.2 and 1.5% 2.3. Nelson River escapement was 13.9% 1.2, 5.4% 1.3, 65.1% 2.2, 8.2% 2.3. Bear River escapement was 3.4% 1.2, 2.4% 1.3, 55.2% 2.2 and 22.4% 2.3. Karluk late run escapement was 0.7% age 1.2, 1.5% age 1.3, 65.8% age 2.2, 10.1% age 2.3, and 15.7% age 3.2 (Nelson and Swanton *In Press a*). Cook Inlet total run was 13.6% age 1.2, 64.5% age 1.3, 10.3% age 2.2, 10.3% age 2.3 (David Waltemyer, ADF&G, Soldotna, personnel communication).

1997 Season

As an aid to comparing the fisheries, in Figures 13-16 the weekly age composition was adjusted to allow for average sockeye salmon travel times between the Shumagin Islands, SEDM and Chignik.

Figures 13 through 16 illustrate comparisons of age classes 1.2, 1.3, 2.2 and 2.3 Shumagin Islands, SEDM and Chignik sockeye salmon harvest by week. In 1997, these age classes represented 98.0% of the sockeye salmon harvest in the Shumagin Islands Section, more than 90% of the SEDM harvest and 95.1% of the Chignik harvest (Table 3).

As indicated in Figures 13 through 16, harvests in the Shumagin Islands Section and the Chignik Area appear different. For example, in 1997 age class 1.3 dominated the Chignik harvest through week 26 while in the Shumagin Islands this age class comprised about 29 percent of the harvest. In weeks 28 through 41, age class 1.3 was a minor component of the Chignik harvest (about 19 to 2 percent), while it was the major age class in both the Shumagin Islands and SEDM harvest during weeks 27 through about 31. Age class 2.3 appears typical of the Chignik late run sockeye salmon age composition, gradually building from about 10 percent in week 22 to about 84 percent in week 34. In the Shumagin Islands and SEDM this age class, through at least week 33 remains below about 31 percent.

In 1997, ADF&G was able to collect a single sample from the SEDM fall fishery (sample occurred during the week of 27 September through 3 October). The 142 fish sample, although less than the desired sample size of 600 fish, is the only age composition data from the SEDM available during this time period. In the Chignik Management Area the last sample was acquired on 30 August, and this sample was used to describe the harvest from 30 August through mid September. As noted in the discussion about age composition, the harvest from the SEDM is from set gillnet gear which is know to be selective for specific salmon attributes (Hamley 1975) while the Chignik harvest is from purse seine gear. The samples do show some similarities between Chignik and the SEDM harvest in age classes 2.2 and 2.3 and appear to be dissimilar in regards to age classes 1.2 and 1.3. For example, age class 2.3 provided about 84 percent of the late Chignik fishery and about 69 percent of the SEDM fishery. Age class 1.3 provided about 2 percent of the late Chignik fishery and about 27 percent of the SEDM fishery.

In 1997, Alaska Peninsula age composition data indicates that Orzinski Lake sockeye salmon escapement was 24.5% age 1.2, 50.3% 1.3, 19.0% 2.2 and 4.2% age 2.3 (Nelson and Murphy. *In Press*). Nelson River escapement was 11.5% 1.2, 10.7% 1.3, 61.7% 2.2, 12.8% 2.3. Bear River escapement was 3.8% 1.2, 21.3% 2.1, 1.9% 1.3, 52.4% 2.2 and 19.1% 2.3. Karluk late run escapement was 0.8% age 1.2, 2.8% age 1.3, 12.9% age 2.2, 43.2% age 2.3, 18.2% age 3.2, and 15.1% age 3.3 (Nelson and Swanton *In Press b*). Cook Inlet total run was 9.7% age 1.2, 69.2% age 1.3, 4.7% age 2.2, 14.5% age 2.3 (David Waltemyer, ADF&G, Soldotna, personnel communication).

LOCAL STOCKS

There are at least 23 sockeye salmon producing systems within South Peninsula waters and 32 in North Peninsula waters (Figure 17; Murphy 1992). South Peninsula indexed escapements from 1988 through 1997 have averaged 99,666 sockeye salmon and the estimated total escapement has average 115,573 sockeye salmon during the same 10 year period (Table 4). Figure 18 illustrates the run timing of two weired South Alaska Peninsula sockeye salmon systems (Orzinski and Thin Point Lakes). The run timing of North Peninsula stocks are reported in the North Alaska Peninsula Board report (Murphy 1997). As with all Southeastern District sockeye salmon stock composition data, there is no specific information concerning the degree of local stock contribution to the Southeastern District harvest. However, production data suggest that local production can not account for the entire post June sockeye salmon harvest (McCullough 1997, Campbell et al. 1997).

CONCLUSION

Based on June historical tagging studies and analysis of July and August age composition data, sockeye salmon harvests in the Southeastern District of the Alaska Peninsula Management Area are a diverse mixture of stocks and no particular stock dominates. Currently, there is inadequate

information to quantify the contribution level of the various stocks in the harvest. Fleet distribution, inter-year variation in fish migrations, gear selectivity and other factors likely define the contribution of individual stocks to the harvest. From June and early July tagging data, we know that Bristol Bay, North and South Peninsula, Chignik, Kodiak and Cook Inlet Management Areas stocks are present and there may be other stocks contributing to the harvest. How many fish each stock may be contributing and whether their contribution changes from year to year or during an individual year is unknown. Based on 1995 through 1997, July through August sockeye salmon age composition data, the Chignik stock does not dominate the Shumagin Islands Section or the SEDM fisheries. There are similarities in age classes 2.2 and 2.3 as well as differences in age classes 1.2 and 1.3 between the SEDM and Chignik fall (September through October) fisheries as indicated by a single incomplete sample acquired from the SEDM in 1997.

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Table 1. Chignik, Shumagin Islands and SEDM sockeye salmon age composition of commercial catches in percent by statistical week, adusted for travel time from the Shumagin Islands, 1995.

Statistical Week	Age 1.2			Age 1.3			Age 2.2			Age 2.3		
	Chignik	Shumagin	SEDM	Chignik	Shumagin	SEDM	Chignik	Shumagin	SEDM	Chignik	Shumagin	SEDM
22	11.7			52.0			16.5			18.6		
23	11.8	20.4		55.8	10.8		15.5	58.4		15.5	9.0	
24	11.2	20.4		53.4	10.8		18.8	58.4		15.5	9.0	
25	10.8	19.5		35.9	14.3		25.4	54.9		27.0	9.7	
26	8.4	13.4		27.1	39.3		17.8	29.8		45.3	14.9	
27	6.5	8.7		21.1	58.1		7.5	10.8		64.3	18.9	
28	5.5	5.7		22.3	63.1		7.8	8.9		63.8	21.3	
29	5.4	5.7		14.3	63.1		9.3	8.9		68.5	21.3	
30	4.0	6.2	4.1	5.0	63.4	72.5	8.6	9.1	7.6	77.9	20.4	14.9
31	0.9	9.2	5.3	2.6	68.0	60.0	5.9	9.7	7.7	87.1	11.7	26.2
32	2.6	11.1	1.5	6.6	64.8	49.3	5.8	13.9	12.4	83.1	8.3	36.2
33	2.7	16.8		7.8	22.5		5.7	38.4		81.6	17.3	
34	2.7	16.9		7.8	21.7		5.7	38.9		81.6	17.5	
35	2.7	16.9		7.8	21.7		5.7	38.9		81.6	17.5	
36	2.7			7.8			5.7			81.6		
37	2.8			7.8			5.7			81.6		
38	2.7			7.8			5.7			81.6		

Table 2. Chignik, Shumagin Islands and SEDM sockeye salmon age composition of commercial catches in percent by statistical week, adjusted for travel time from the Shumagin Islands, 1996.

Statistical Week	Age 1.2			Age 1.3			Age 2.2			Age 2.3		
	Chignik	Shumagin	SEDM	Chignik	Shumagin	SEDM	Chignik	Shumagin	SEDM	Chignik	Shumagin	SEDM
21	1.2			52.2			0.3			33.8		
22	2.2			65.3			0.5			23.7		
23	2.6			69.2			1.0			18.9		
24	2.6			60.0			1.6			29.2		
25	2.2	17.6		49.9	36.8		2.4	23.2		40.0	19.7	
26	2.0	13.4		43.7	41.1		2.7	16.5		46.9	24.7	
27	2.4	23.2		27.4	32.8		6.7	25.0		56.8	14.3	
28	2.5			20.9			8.5			60.9		
29	2.3			12.9			14.6			52.2		
30	1.8	13.7		10.7	48.3		14.9	14.4		52.4	20.3	
31	0.6	15.9	9.3	7.0	41.6	54.6	13.6	23.0	9.3	56.9	16.5	23.2
32	0.7	18.0		5.1	34.8		16.4	31.6		52.6	12.6	
33	0.4			3.9			27.1			41.3		
34	0.4			3.3			32.0			38.9		
35	0.4			3.3			32.0			38.9		
36	0.4			3.3			32.0			38.9		
37	0.4			3.3			32.0			38.9		
38	0.4			3.3			32.0			38.9		
39	0.4			3.3			32.0			38.9		
40	0.4			3.3			32.0			38.9		

Table 3. Chignik, Shumagin Islands and SEDM sockeye salmon age composition of commercial catches in percent by statistical week, adjusted for travel time from the Shumagin Islands, 1997.

Statistical Week	Age 1.2			Age 1.3			Age 2.2			Age 2.3		
	Chignik	Shumagin	SEDM	Chignik	Shumagin	SEDM	Chignik	Shumagin	SEDM	Chignik	Shumagin	SEDM
22	9.4			69.8			4.7			9.6		
23	10.2			70.4			6.9			9.6		
24	9.7	19.9		65.7	29.2		8.4	32.1		13.1	16.4	
25	7.3	20.1		65.9	29.1		6.6	32.3		15.7	16.1	
26	3.7	22.7		51.6	28.7		15.5	34.8		25.6	12.0	
27	2.4		11.7[a]	32.2		65.8[a]	19.9		8.3[a]	42.4		13.7[a]
28	3.2	19.6	6.8[a]	18.9	41.7	73.8[a]	30.4	24.9	4.9[a]	44.1	11.9	12.7[a]
29	3.4	18.2	10.0[a]	18.5	45.8	68.2[a]	32.7	21.4	5.4[a]	41.9	12.3	14.9[a]
30	3.5	15.2	11.0[a]	11.2	55.2	66.4[a]	33.9	13.6	5.6[a]	46.5	13.4	15.5[a]
31	2.1	9.4		8.6	56.5		29.0	12.5		50.2	18.2	
32	1.4		9.4[b]	4.9		33.9[b]	20.4		17.2[b]	66.8		31.2[b]
33	0.9		9.4[b]	2.8		33.9[b]	15.4		17.2[b]	70.4		31.2[b]
34	0.9			2.2			8.6			83.6		
35	0.9			2.2			8.6			83.6		
36	0.9			2.2			8.6			83.6		
37	0.9			2.2			8.6			83.6		
38	0.9			2.2			8.6			83.6		
39	0.9		0.1[c]	2.2		26.7[c]	8.6		2.9[c]	83.6		68.8[c]
40	0.9			2.2			8.6			83.6		
41	0.9			2.2			8.6			83.6		

[a] Samples from Northwest Stepovak Section.
[b] Samples from Balboa Bay Section.
[c] Samples from Southwest and East Stepovak Sections.

Table 4. South Alaska Peninsula indexed and estimated total sockeye salmon escapement, 1988-1997.

Year	Indexed	Estimated Total
1988	74,100	85,497
1989	78,100	95,083
1990	95,300	114,233
1991	124,900	153,143
1992	97,600	120,418
1993	100,341	107,095
1994	120,255	102,210
1995	129,110	162,169
1996	72,950	88,999
1997	104,000	126,880
Average	99,666	115,573

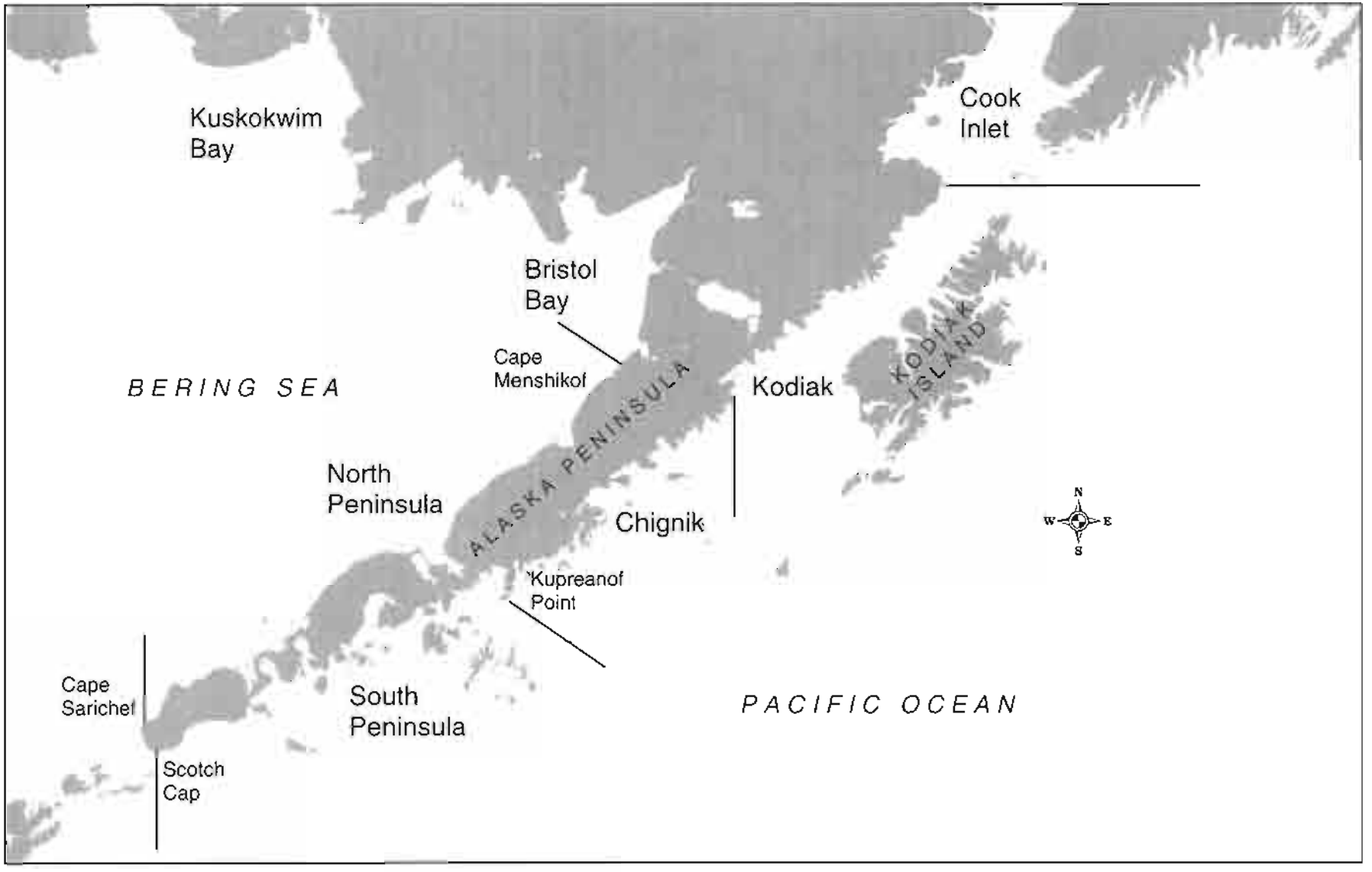

Figure 1. Map of Western Alaska illustrating the relative location of the South Peninsula.

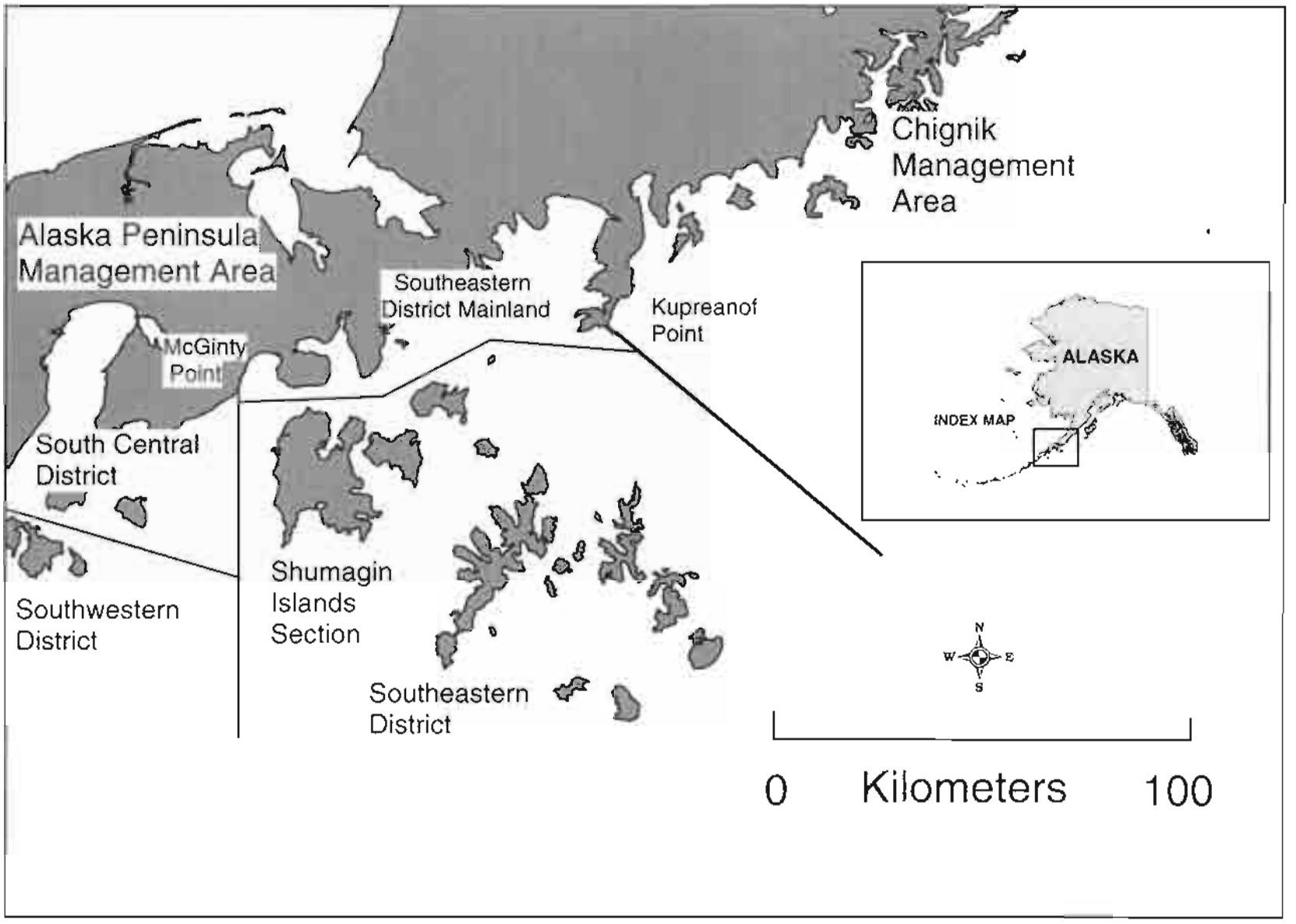

Figure 2. Map of the Southeastern District of the Alaska Peninsula Management Area.

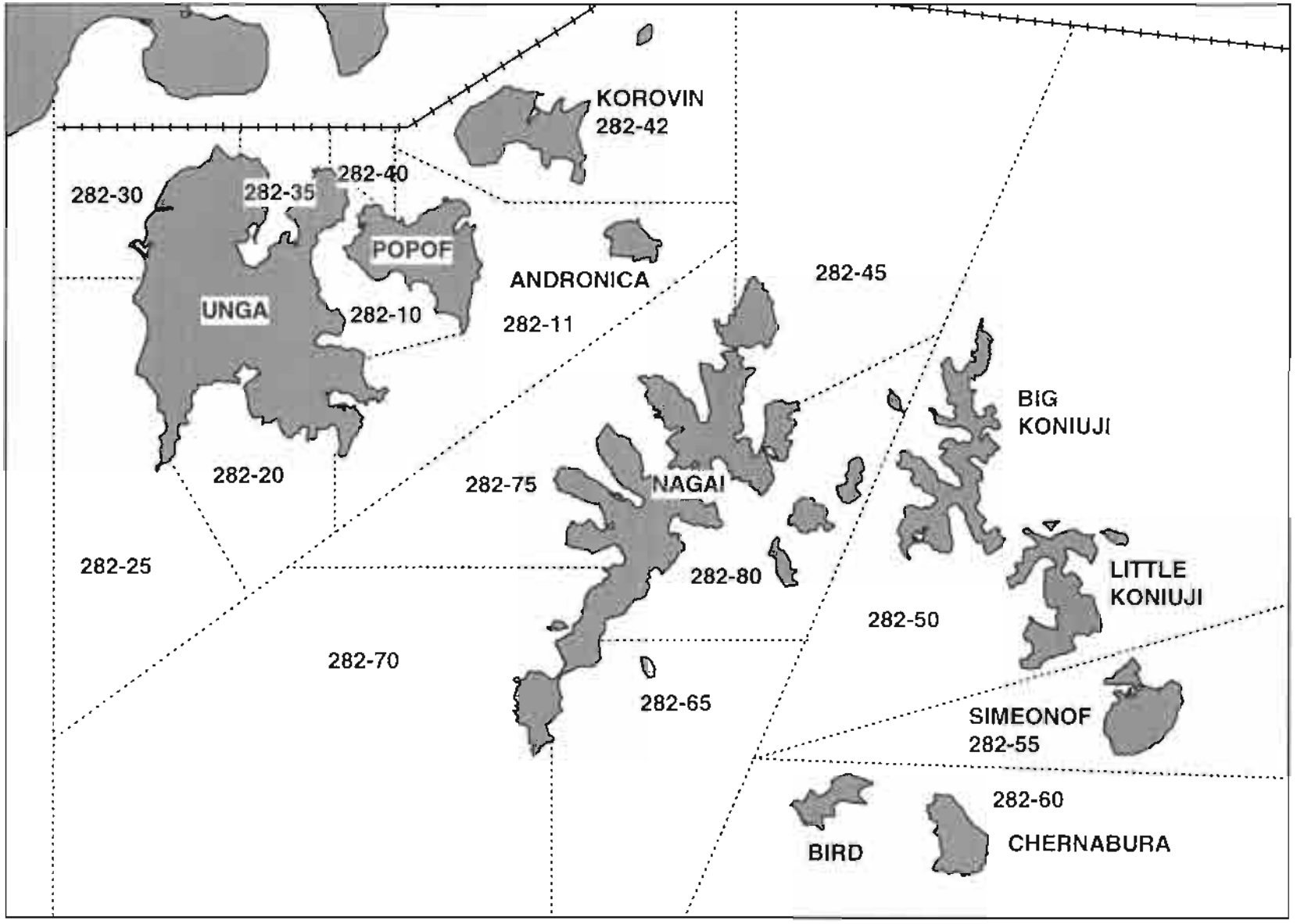

Figure 3. Map of the Shumagin Islands Section of the Southeastern District.

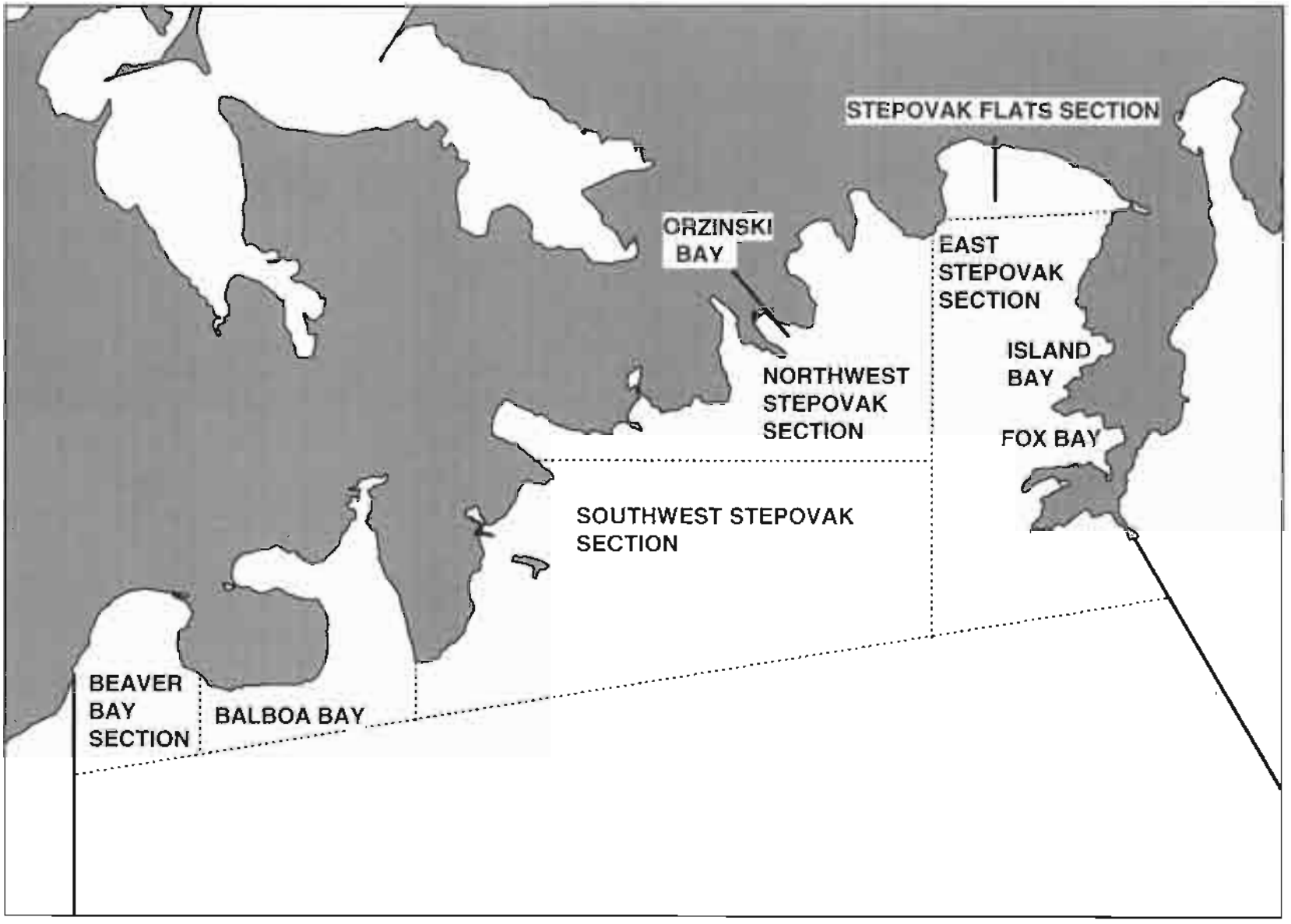

Figure 4. Map of the Southeastern District Mainland with section lines shown.

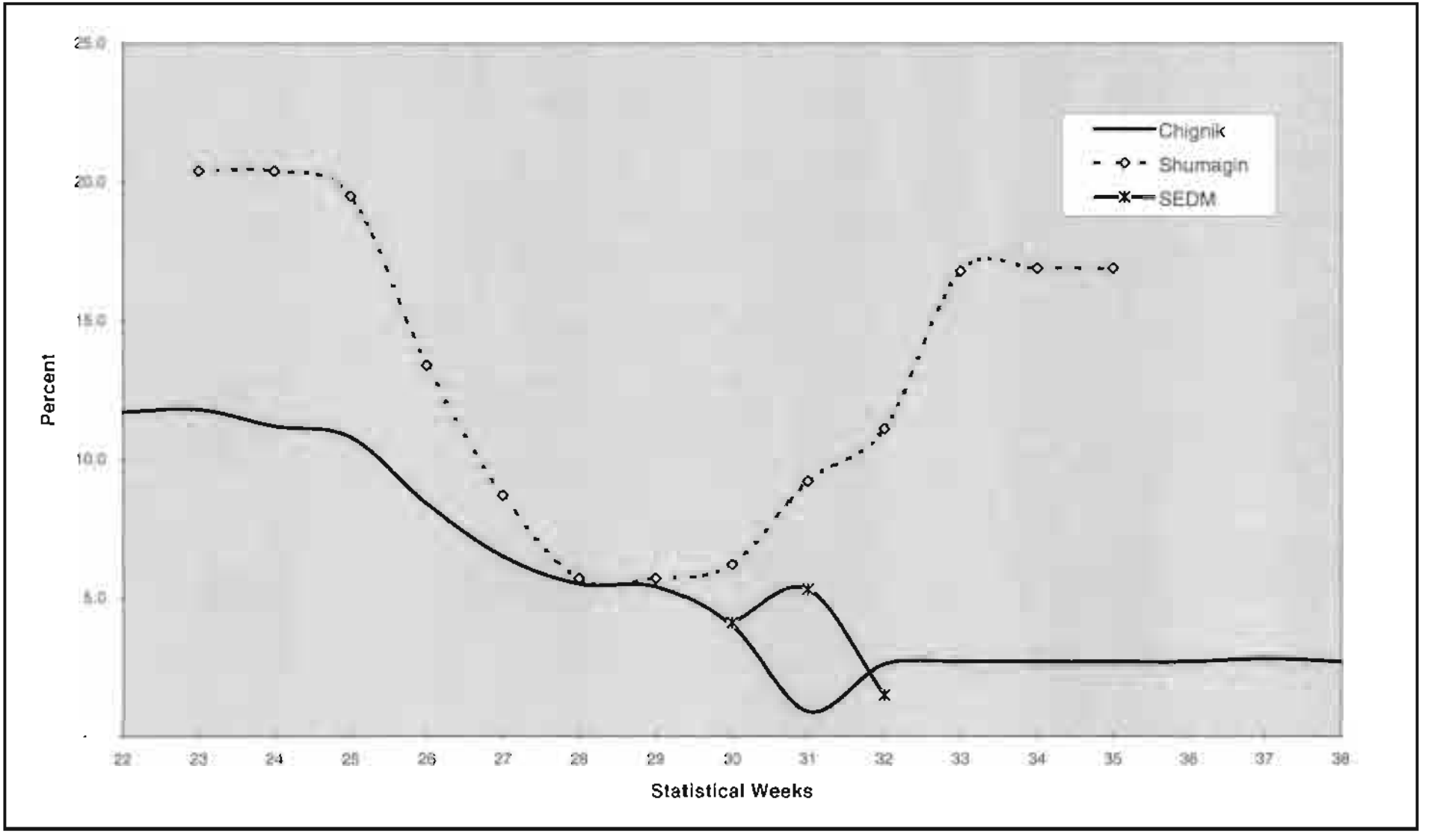

Figure 5. Shumagin Islands Section, SEDM and Chignik comparison of age 1.2 sockeye salmon, 1995.

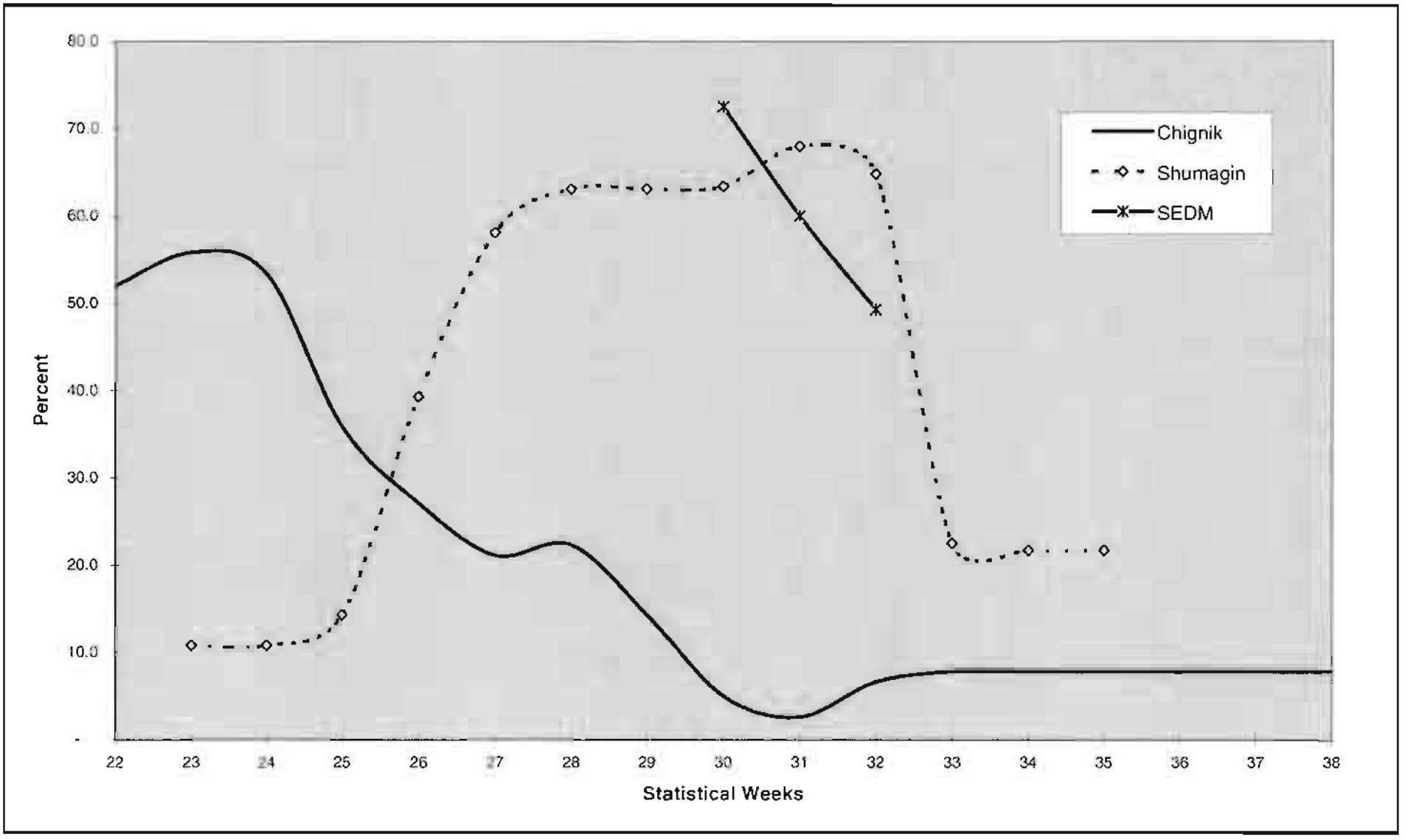

Figure 6. Shumagin Islands Section, SEDM and Chignik comparison of age 1.3 sockeye salmon, 1995.

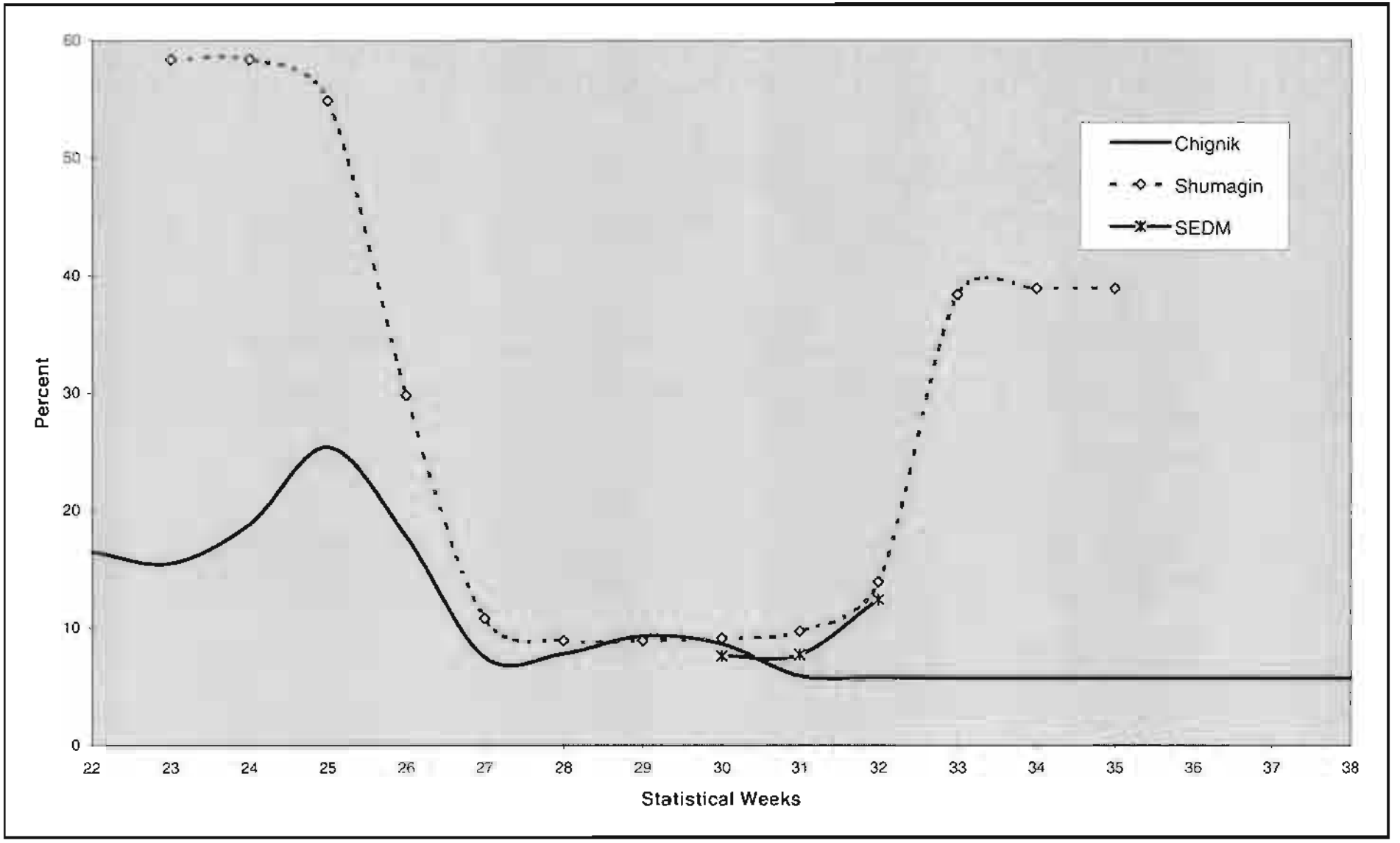

Figure 7. Shumagin Islands Section, SEDM and Chignik comparison of age 2.2 sockeye salmon, 1995.

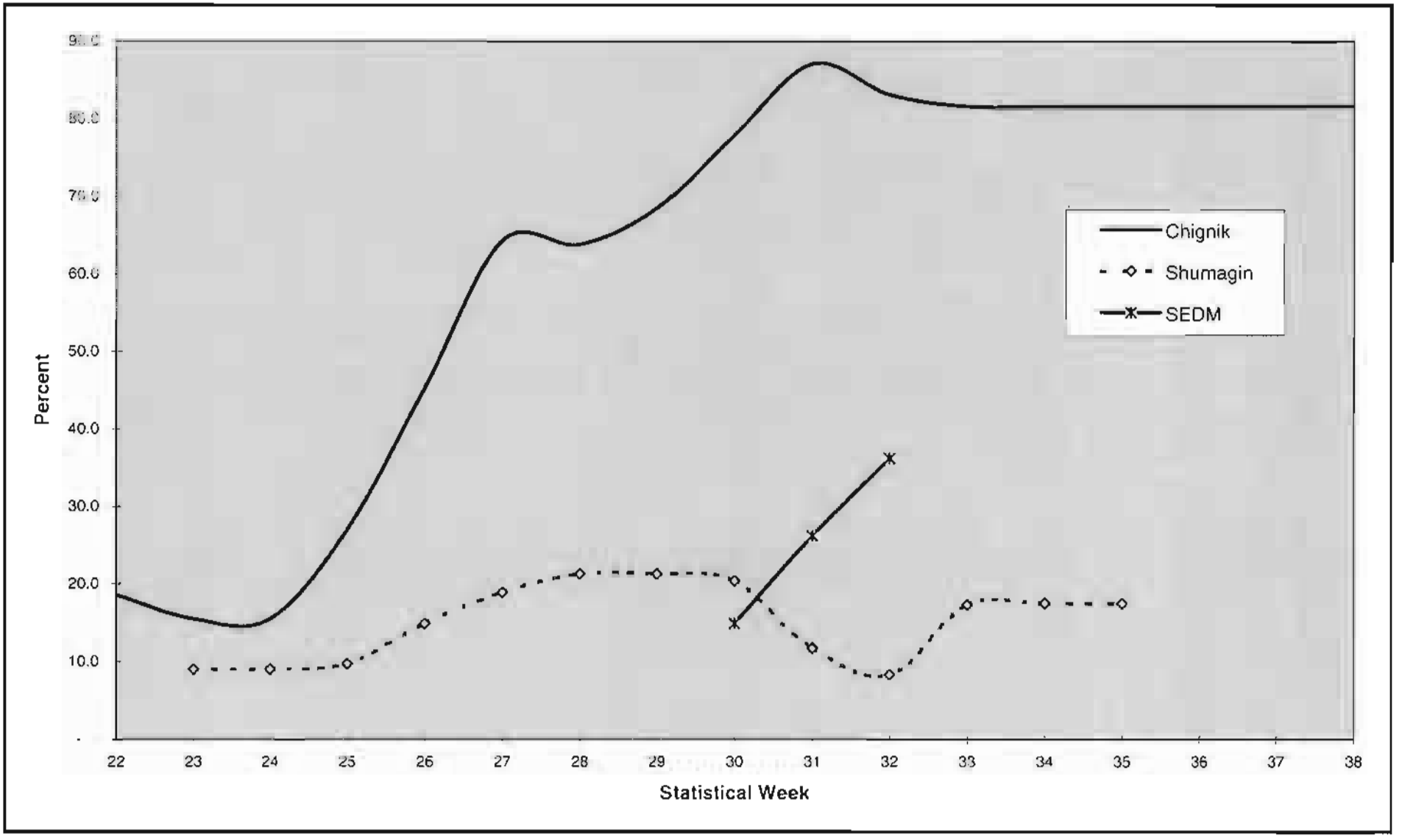

Figure 8. Shumagin Islands Section, SEDM and Chignik comparison of age 2.3 sockeye salmon, 1995.

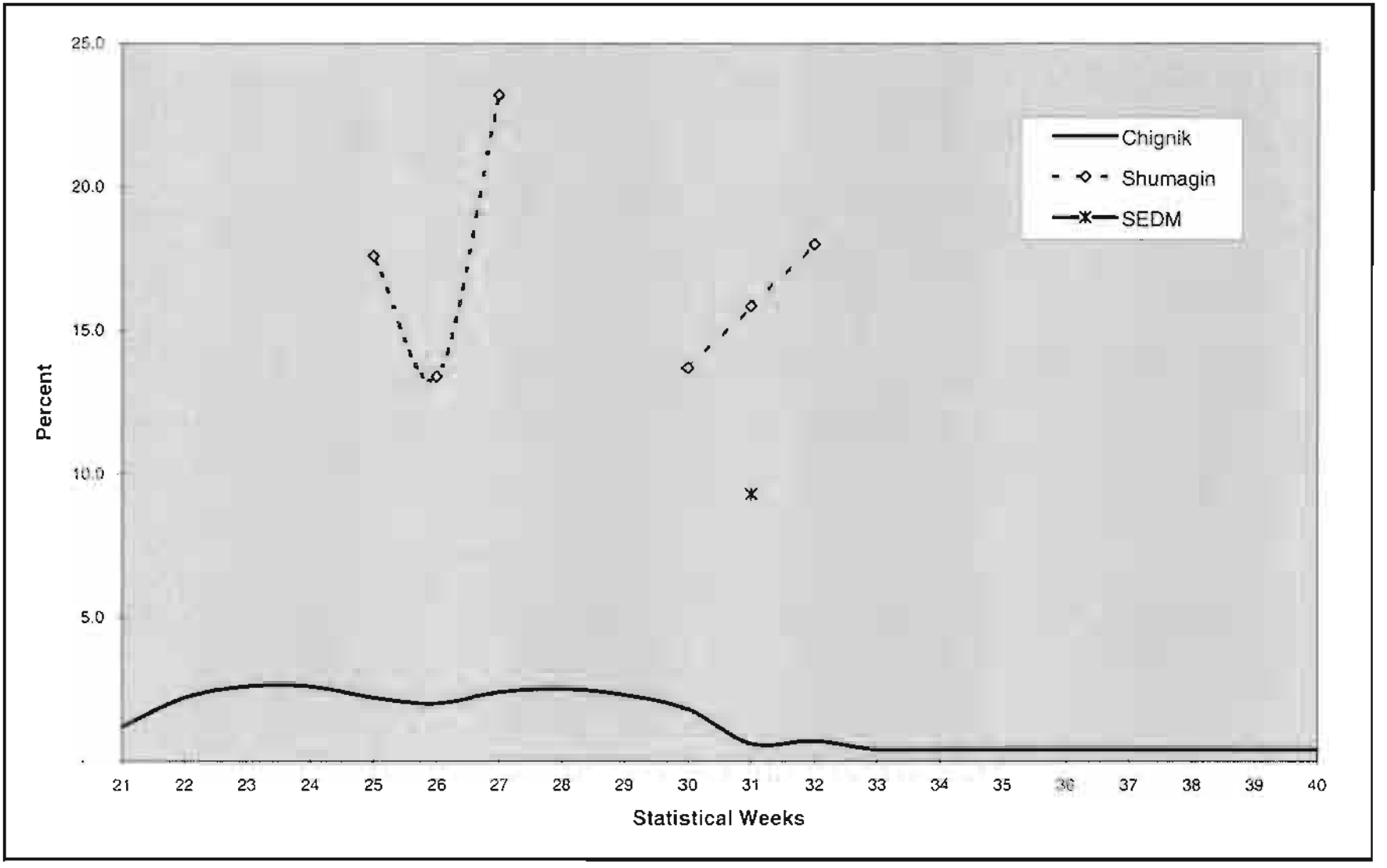

Figure 9. Shumagin Islands Section, SEDM and Chignik comparison of age 1.2 sockeye salmon, 1996.

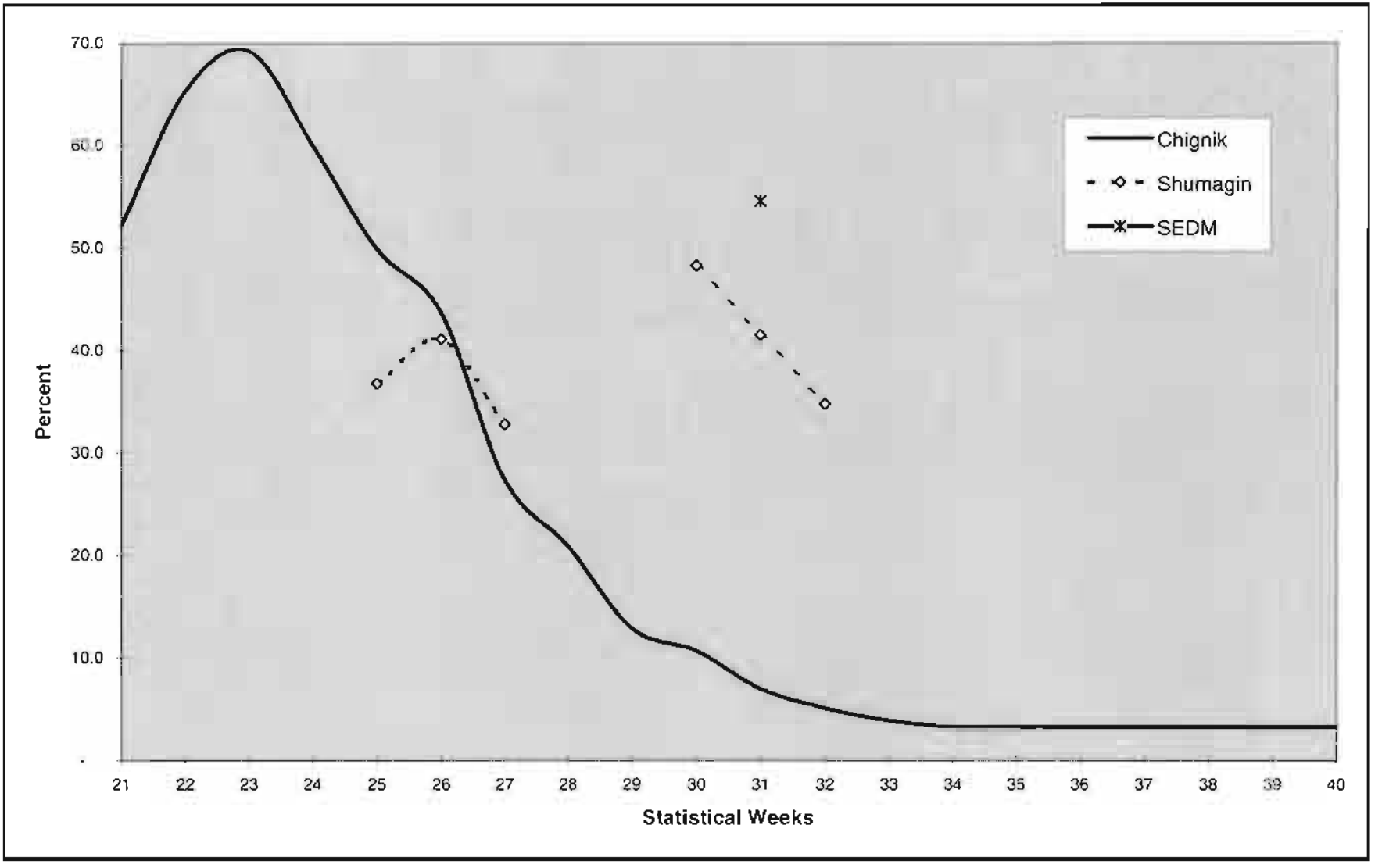

Figure 10. Shumagin Islands Section, SEDM and Chignik comparison of age 1.3 sockeye salmon, 1996.

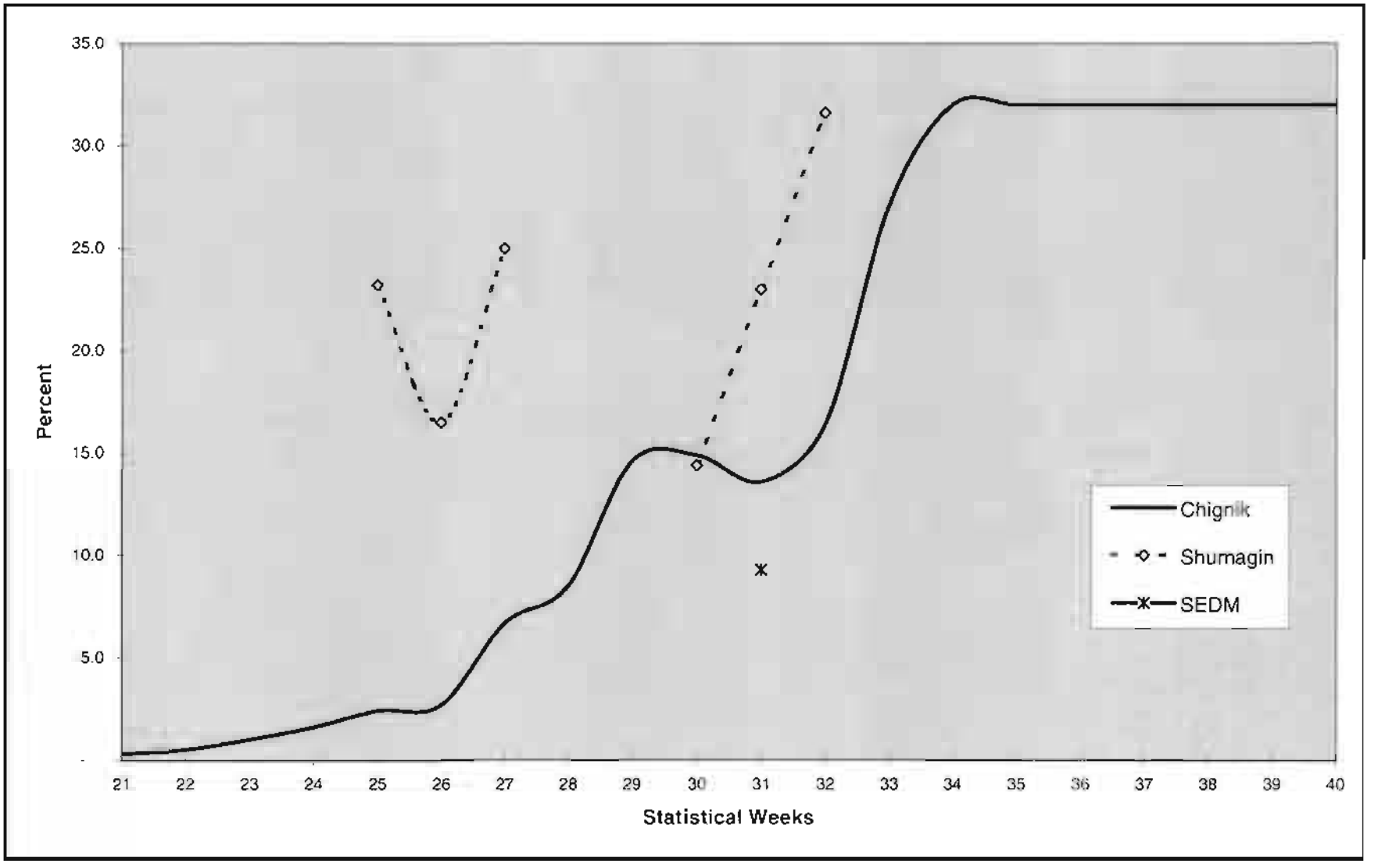

Figure 11. Shumagin Islands Section, SEDM and Chignik comparison of age 2.2 sockeye salmon, 1996.

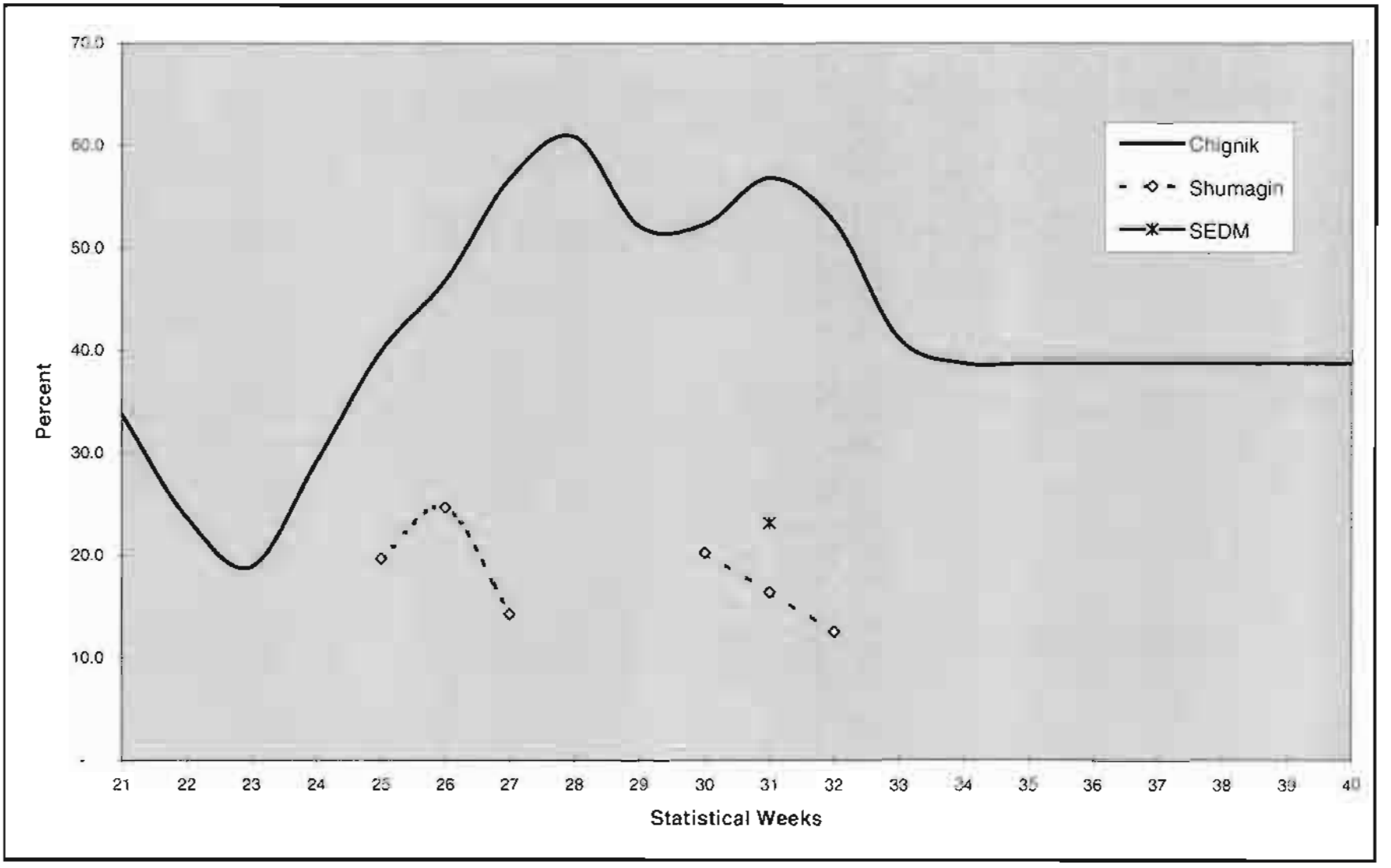

Figure 12. Shumagin Islands Section, SEDM and Chignik comparison of age 2.3 sockeye salmon, 1996.

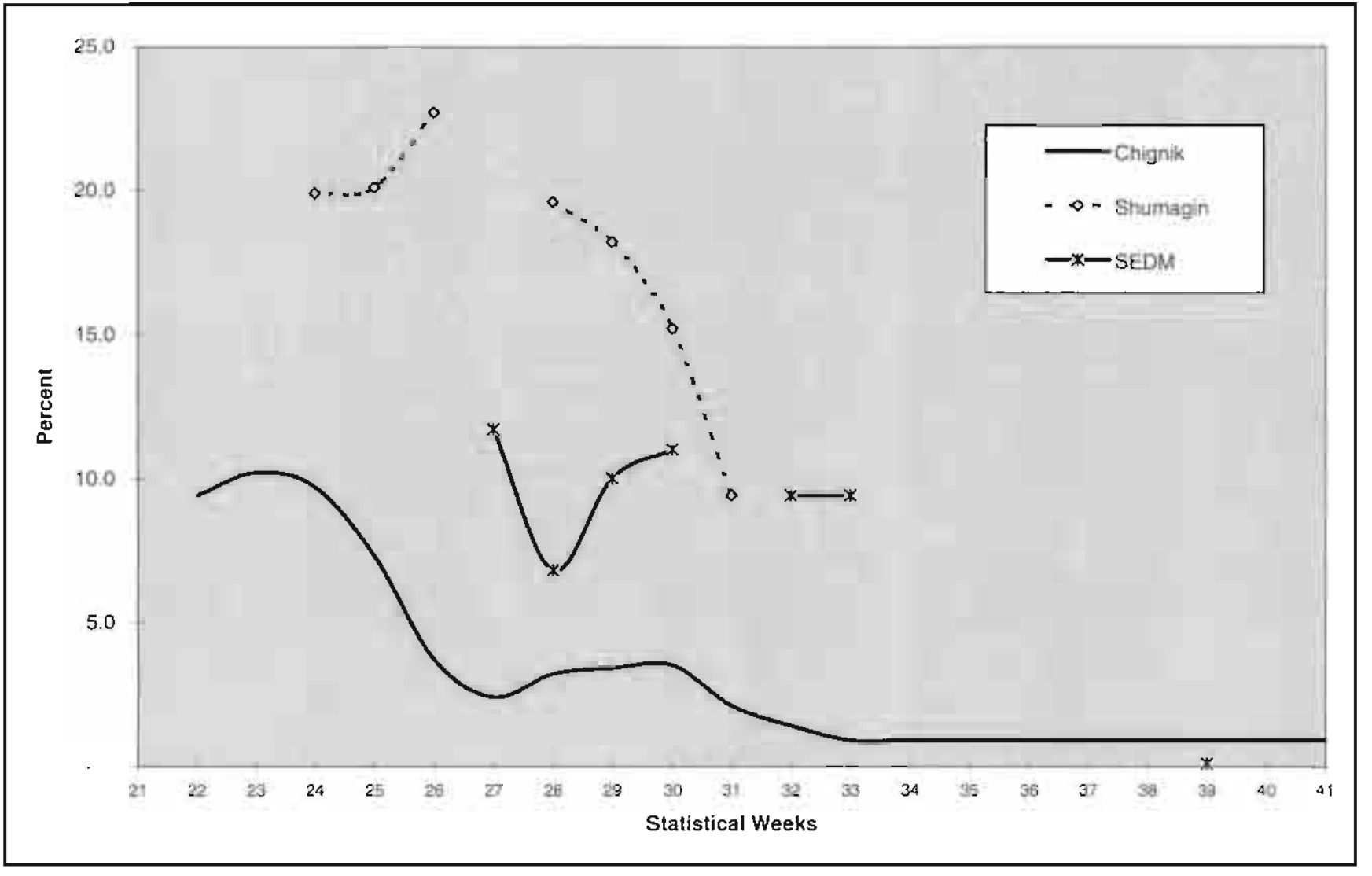

Figure 13. Shumagin Islands Section, SEDM and Chignik comparison of age 1.2 sockeye salmon, 1997.

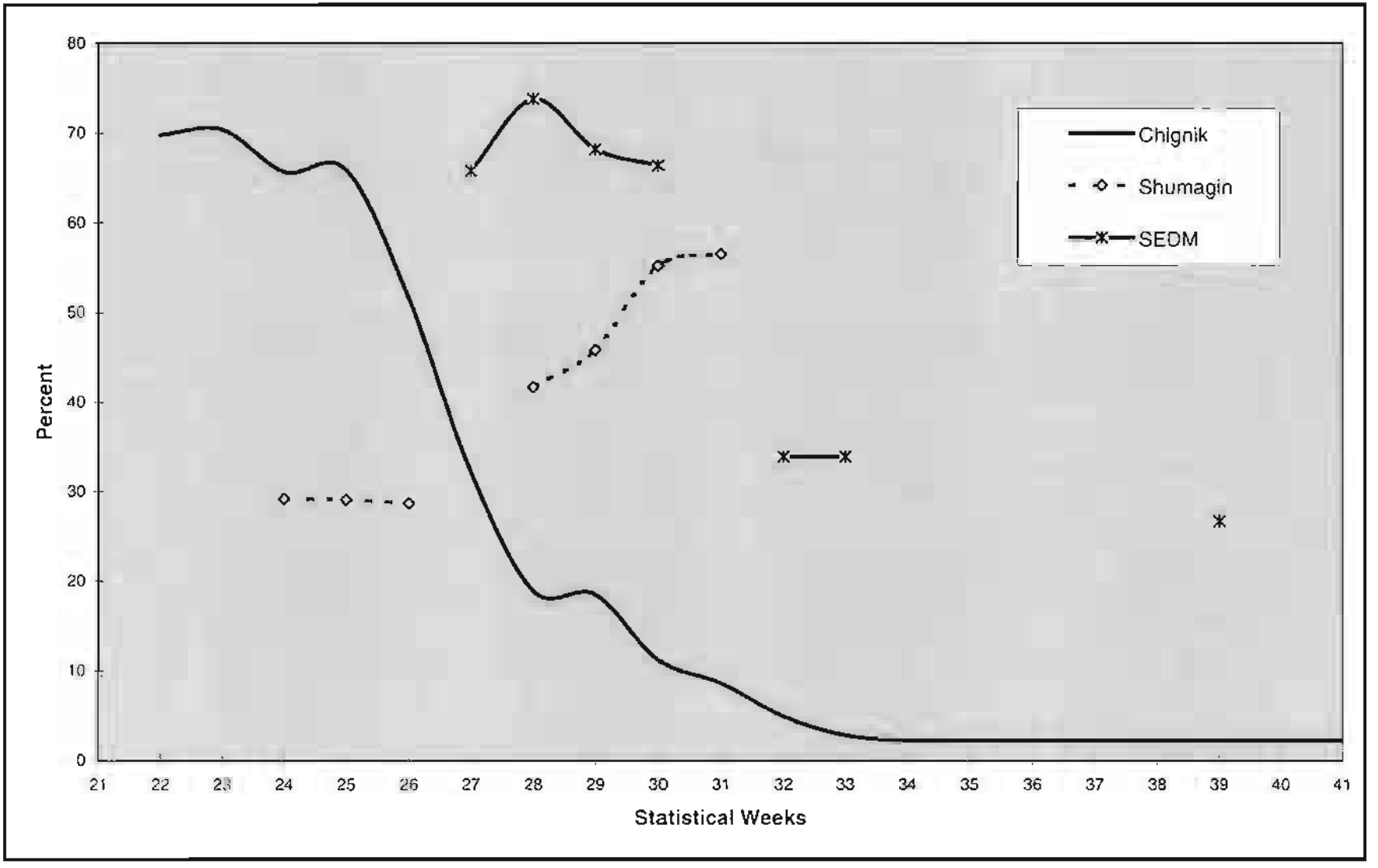

Figure 14. Shumagin Islands Section, SEDM and Chignik comparison of age 1.3 sockeye salmon, 1997.

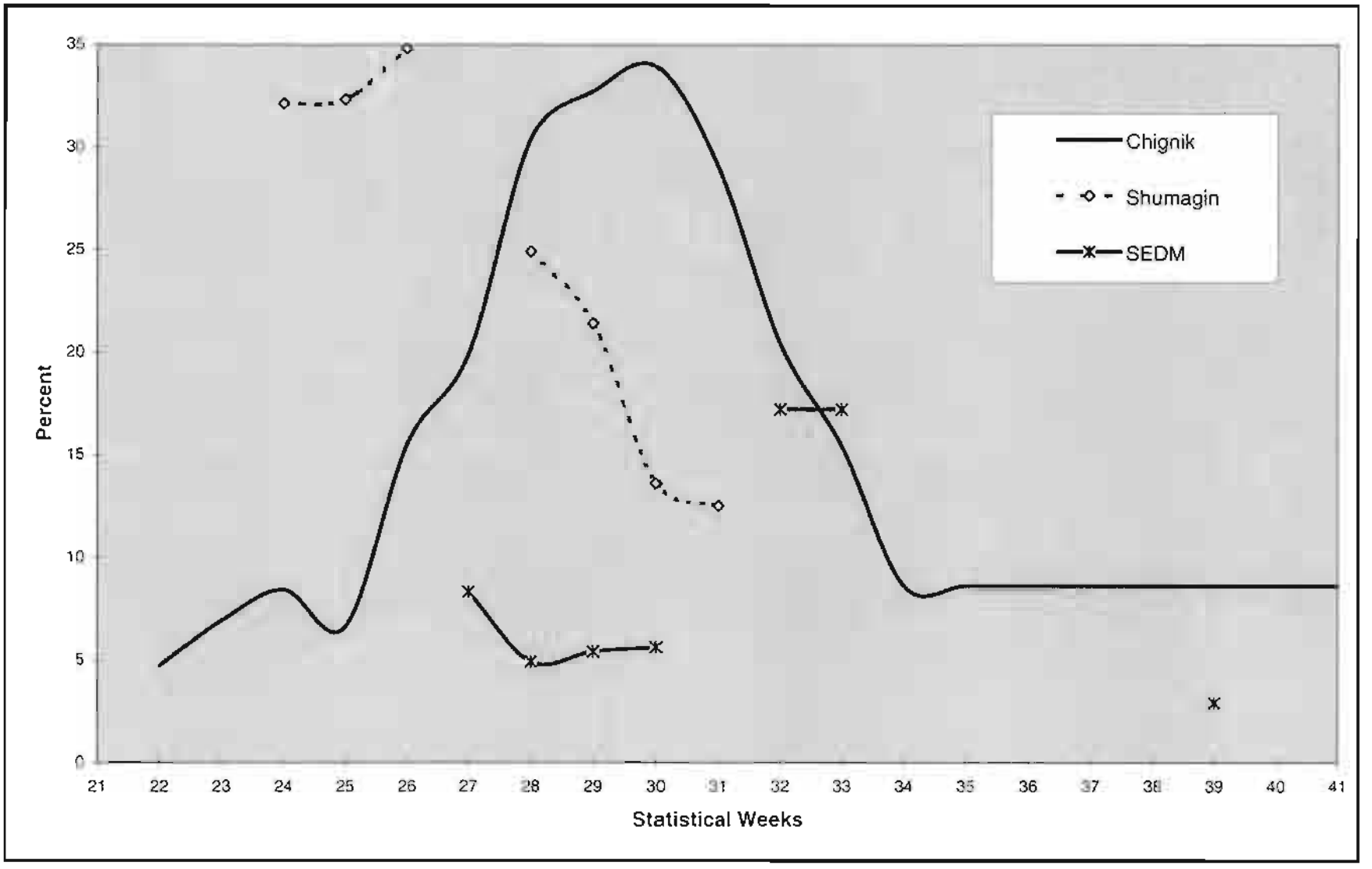

Figure 15. Shumagin Islands Section, SEDM and Chignik comparison of age 2.2 sockeye salmon, 1997.

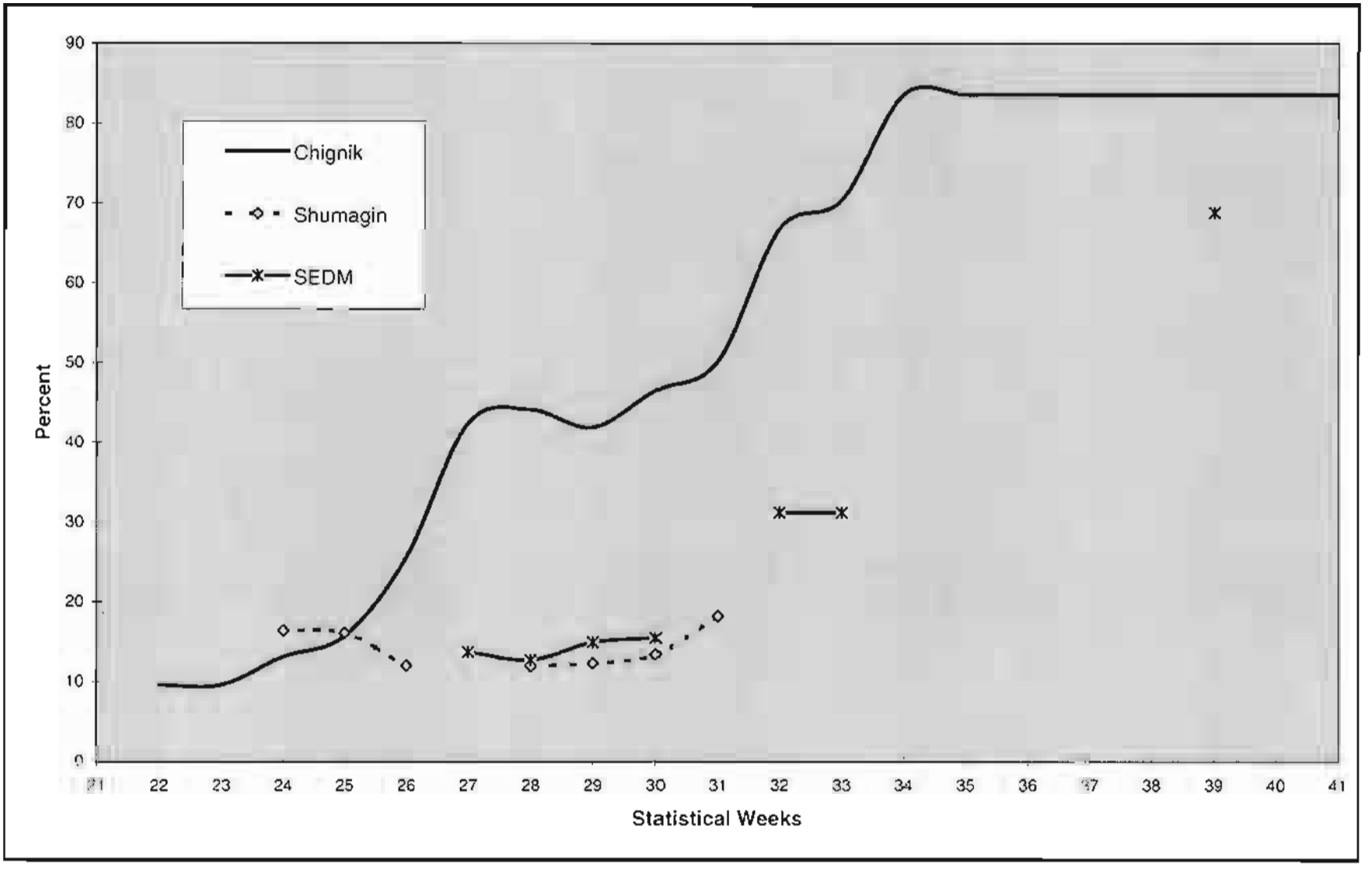

Figure 16. Shumagin Islands Section, SEDM and Chignik comparison of age 2.3 sockeye salmon, 1997.

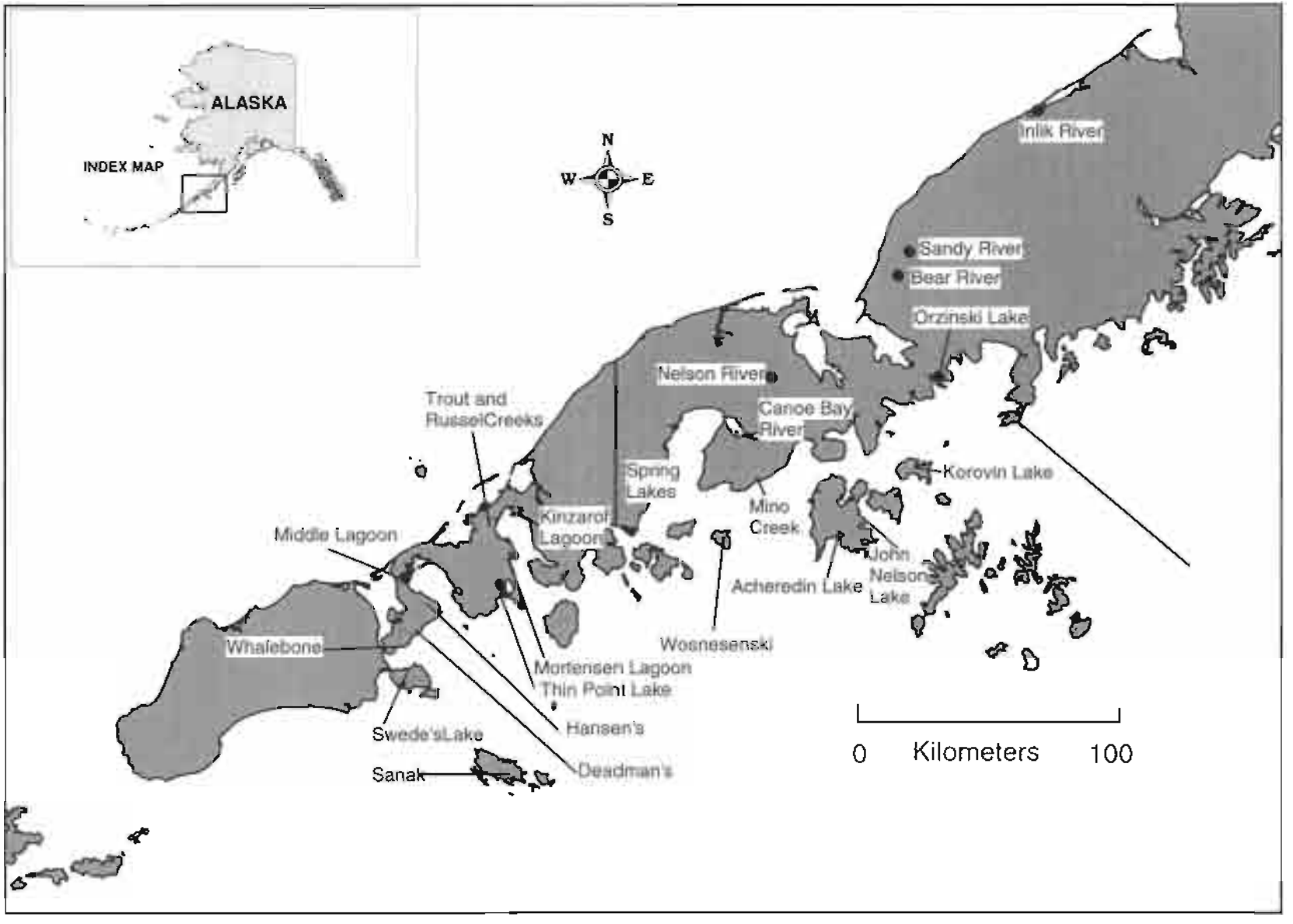

Figure 17. Map of the Alaska Peninsula Management Area with selected sockeye salmon systems shown.

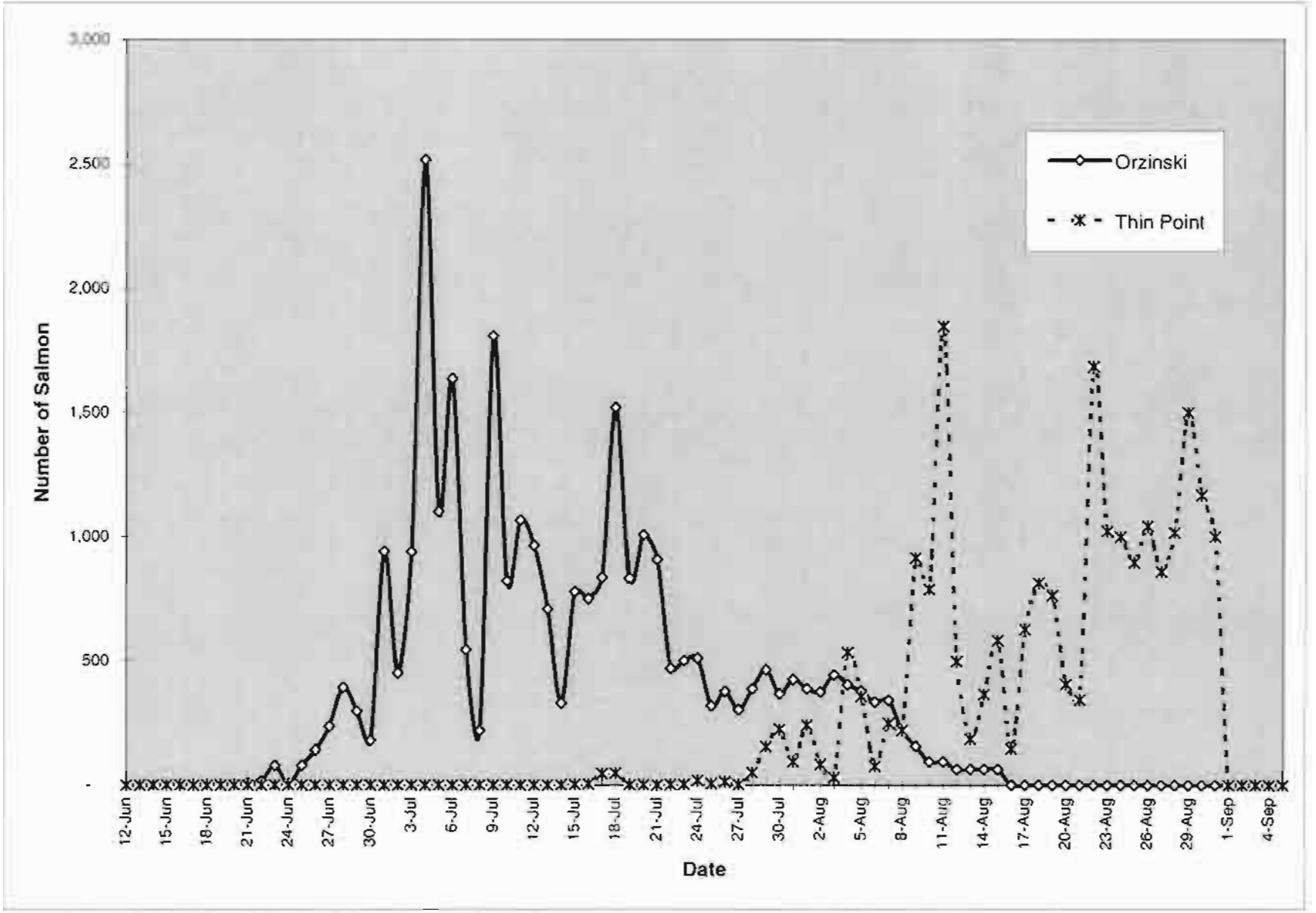

Figure 18. Orzinski (1990-1997) and Thin Point (1994-1996) Lakes average sockeye salmon escapement by day.

APPENDIX

Appendix A. List of Alaska Peninsula tagging studies.

Date	Author	Species	Area	Pages
1922	Gilbert	sockeye	South Peninsula	50 pp
1923	Gilbert/Rich	sockeye, chum	South Peninsula	75 pp
1923[a]	Gilbert/Rich	sockeye	North Peninsula (Port Moller)	???
1925	Rich	sockeye	North Peninsula (Port Moller)	3 pp
1928	Bureau Comm. Fish	sockeye	South Peninsula (Nikoloski)	4 pp
1939[b]	Barnaby	sockeye	North Peninsula (Port Moller)	???
1956	Rietz, et al.	sockeye	North Peninsula (offshore)	12 pp
1957	Thorsteinson	pink, chum	South Peninsula	12 pp
1958	Thorsteinson	pink, chum	South Peninsula	7 pp
1961	ADF&G	sockeye, chum	North Peninsula (Port Moller)	4 pp
1961	ADF&G	sockeye	South Peninsula (Stepovak)	1 pp
1964	Thorsteinson & Merrill	sockeye, chum	South Peninsula (S. Unimak)	16 pp
1971	Van Ray	tag summary	South Peninsula	18 pp
1984	Linda Brannian	chum	South Peninsula	30 pp
1987	Eggers et al.	sockeye, chum	South Peninsula	49 pp

[a] Rreport not available although results were similar to Rich, 1925.
[b] Results were summarized by Rietz et al., 1956.

Appendix B. ADF&G tagging report, 1961.

Preliminary Salmon Tagging Report, Alaska Peninsula, South Side, 1961

OBJECTIVES

An experimental salmon tagging program was initiated in Stepovak Bay during June, 1961, to further current knowledge of red salmon migrations, timing of runs, and origin of inshore stocks on the south side of the Alaska Peninsula. Specific objectives are to ascertain the influence, if any, of the Stepovak Bay set net fishery upon the Chignik red salmon run and the resulting migration time lag between the two fisheries.

TAG RELEASE DATA

The tagging was conducted in the Fox Bay, Island Bay and Kupreanof Point areas on the east shore of Stepovak Bay aboard the chartered vessel M/V Lemar. Releases were made on the weekends of June 17-18 and June 24-25 as outlined in Table I.

The actual number of salmon tagged was disappointingly low due to a lack of fish present in the area. The data presented herein may be inconclusive viewed by itself but should have considerable significance when correlated to the 1962 tagging experiments.

Table I. 1961 Stepovak Bay Tag Release Data

		Number Tagged			
Date	Area of Release	Red	Chum	Pink	Total
June 17	Fox Bay	52	12	1	65
June 18	Fox Bay	1	0	0	1
June 18	Kupreanof Point	6	10	0	16
June 24	Kupreanof Point	5	11	2	18
June 25	Fox Bay	1	0	0	1
June 25	Island Bay	65	9	15	89
June 17-25	East Side Stepovak Bay	130	42	18	190

RED SALMON TAG RECOVERIES

Table II summarizes the tag recovery results of the 130 red salmon released June 17 through June 25. Thirteen recoveries (10%) were reported, eight of which were from Chignik, two were recovered locally and one each from San Diego Bay, Karluk and Cook Inlet (north of Kalgan Island).

-Continued-

Additional sightings of tagged red salmon passing through the Chignik weir were recorded as follows:

Date	Location Observed	Number of Tagged Fish Observed
July 2	Chignik Weir	1
July 3	Chignik Weir	2
July 4	Chignik Weir	2
July 6	Chignik Weir	1
July 2-6	Chignik Weir	6

No physical recoveries were made. All of the tags observed were of the red-red Peterson disc combination similar to those used in the Stepovak Bay tagging. As five ADF&G tags were recovered from the commercial fishery in the Lagoon only a few days previous (June 30), it appears that these fish were from the same release. There is the possibility that one or more may have been U.S.F.W.S. tags, also a red-red combination, released off the South Peninsula during this period.

ANALYSIS OF RED SALMON TAGGING RESULTS

1. The movement of red salmon intercepted in eastern Stepovak Bay is primarily northward.

2. Eight out of the thirteen recoveries, including six additional tagged fish sightings, were in Chignik.

3. The average time between release at Stepovak and recovery at Chignik Lagoon was six (6) days.

CHUM AND PINK TAGGING

The number of tagged and recovered chum and pink salmon were too small to be of any significance. This data is presented in Table III.

-Continued-

Table II. Sockeye Tag Recovery

Date	Area of Release	No. Tagged	No. Recovered	Date and Location of Recovery
June 17	Fox Bay	52	4	(1) June 22 Island Bay (1) June 23 Chignik Bay (1) June 27 Fox Bay (1) July 29 Karluk (Canyon)
June 18	Fox Bay	1	0	
June 18	Kupreanof Point	6	1	(1) June 21 San Diego Bay
June 24	Kupreanof Point	5	0	
June 25	Fox Bay	1	0	
June 25	Island Bay	65	8[a]	(5) June 30 Chignik Lagoon (1) July 7 Chignik Lagoon (1) Aug. 26 Chignik (Bearskin Cr.) (1) July 28 Cook Inlet
Summary				
June 17-25	East Stepovak Bay	130	13	(1) San Diego Bay (1) Karluk (2) Local (8) Chignik (1) Cook Inlet

[a] Six tagged red salmon observed passing through Chignik Weir from July 2 to July 6, 1961.

-Continued-

Table III. Chum and Pink Salmon Tag Recovery

Date Of Release	Area Of Release	Number Tagged	Number Recovered	Date Recovered	Area Recovered
Chum Salmon Tag Recovery:					
June 17	Fox Bay	12	0		
June 18	Kupreanof Bay	10	1	June 27	Fox Bay
June 24	Kupreanof Bay	11	0		
June 25	Island Bay	9	2	July 4	Hook Bay
				July 12	Ivanof Bay
June 17-25		42	3		
Pink Salmon Tag Recovery:					
June 17	Fox Bay	1	0		
June 24	Kupreanof Bay	2	0		
June 25	Island Bay	15	2	June 29	Fox Bay
				July 3	Deadman Bay
					Kodiak Island
June 17-25		18	2		

POPOF HEAD TAGGING and RECOVERY

On June 18 a number of salmon were tagged by the M/V Lemar off Popof Head. This data was kept separate from the Stepovak Bay study and is outlined in Table IV.

Table V. Popof Head Tagging

Date Of Release	Area Of Release	Number Tagged			Number Recovered		
		Red	Chum	Total	Red	Chum	Total
June 18	Popof Head	16	55	71	0	2	2

The two recoveries, both chum salmon, were at Cape Lutke on June 23 and Humpy Cove (Kodiak) on July 20.

-Continued-

ALASKA PENINSULA - SOUTHEASTERN DISTRICT 1961 SALMON TAGGING SUMMARY

Tag Recoveries	Number	Location	Time Out	% Of Recoveries
Reds	1	local	5 days	
	1	local	10 days	local = 10.5%
	1	San Diego Bay	3 days	5.3%
	5	Chignik	5 days	
	1	Chignik	6 days	
	1	Chignik	12 days	
	1	Chignik (spwn grds)	62 days	
	6	Chignik weir	7/2-6	may include FRI tags Chignik total 73.6%
	1	Karluk(spwn grds)	42 days	5.3%
	1	Cook Inlet	33 days	5.3%
Pinks	1	local	4 days	
	1	Deadman (Kodiak)	8 days	
Chums	1	local	9 days	
	1	Hook Bay (Chignik)	9 days	
	1	Ivanof Bay	17 days	

Popof Head: Tag releases 6/18: 16 reds, 55 chums

Tag Recoveries	Number	Location	Time Out
Chums	1	Cape Lutke	5 days
	1	Humpy Cove (Kodiak)	32 days

Appendix C. Sockeye salmon travel time (Eggers et. al. 1991).

Release Site	Area Tag Recovered	Distance From Release Site (miles)	Sample Size	Average Travel Time (days)	Miles Per Day
Shumagin Islands	Bristol Bay	615	132	19	32
	North Peninsula	470	25	27	16
	Chignik	115	59	16	7
	Kodiak	295	17	20	16
	Cook Inlet	490	2	33	14

Travel time from the Southeastern District Mainland area to Chignik Lagoon is given as seven (7) days in Chignik Annual Management Reports (Dave Owen, ADF&G Kodiak, personnel communication).

Groot and Margolis (1991) give 30 miles per day as the average swimming speed of sockeye salmon in the marine environment.

Appendix D. Statistical weeks and actual dates.

Statistical Week	Date
21	May 17 - May 23
22	May 24 - May 30
23	May 31 - June 06
24	June 07 June 13
25	June 14 - June 20
26	June 21 - June 27
27	June 28 - July 04
28	July 05 - July 11
29	July 12- July 18
30	July 19 - July 25
31	July 26 - Aug 01
32	Aug 02 - Aug 08
33	Aug 09 - Aug 15
34	Aug 16 - Aug 22
35	Aug 23 - Aug 29
36	Aug 30 - Sept 05
37	Sept 06 - Sept 12
38	Sept 13 - Sept 19
39	Sept 20 - Sept 26
40	Sept 27 - Oct 03
41	Oct 04 - Oct 10