

INFORMATIONAL LEAFLET NO. 264

ASSESSMENT OF BRISTOL BAY SOCKEYE SALMON RUN STRENGTH
BASED ON IN-SEASON PERFORMANCE OF THE SOUTH PENINSULA
JUNE INTERCEPTION FISHERY

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ABSTRACT

Two methods of in-season forecasting for the inshore return of Bristol Bay sockeye salmon from in-season performance of the South Peninsula June fisheries were developed in this study. The first (CPUE forecast) was based on the relationship between catch per unit fishing effort of the Unimak District combined gill net and purse seine fishery and Bristol Bay inshore return. The second (chum catch forecast) was based on projected catch of chum salmon in the South Peninsula June fishery (i.e., Unimak District and Shumagin Section) at the end of the season, relationship between chum catch and intensity of the South Peninsula fishery, and extrapolation of the sockeye quota to the Bristol Bay return based on the estimated intensity of the South Peninsula fishery.

KEY WORDS: Sockeye, chum, CPUE, Bristol Bay, forecast in-season, South Peninsula June fishery.

INTRODUCTION

Numerous tagging studies conducted under auspices of INPFC, as described by Brannian (1984), have shown that the vast majority of sockeye salmon caught during June in the South Peninsula cape or interception fishery are bound for river systems in Bristol Bay. The South Peninsula interception fishery occurs during the month of June, in the vicinity of the North Pacific Ocean side of Unimak Island (Unimak District, Figure 1) and in the Shumagin Islands (Shumagin Islands Section of the Southeastern District, Figure 1). There are three types of gear used in the fishery: purse seine, drift gill net, and set gill nets. Purse seines are fished in both the Unimak District and the Shumagin Islands Section, while drift gill nets are fished exclusively in the Unimak District, and set gill nets are fished in both areas.

The objective of this study was to develop procedures for forecasting the return of Bristol Bay sockeye salmon, based on the in-season performance of the South Peninsula June fisheries. Bristol Bay sockeye salmon are intercepted roughly 2 weeks prior to their arrival in the inshore fishing districts of Bristol Bay. Thus, indicators of Bristol Bay return strength based on the South Peninsula fishery performance are available well in advance of the time that regulatory decisions are required to meet management objectives in Bristol Bay fishing districts. In addition, a fishery monitoring program has been implemented for the South Peninsula June fishery, since this information is required for regulation of this fishery. Thus any use of this data to aid the regulatory process in Bristol Bay is extremely cost effective. There is great potential for further investment in the South Peninsula fishery monitoring program to improve both the regulatory process in the South Peninsula fishery as well as the in-season forecasting of Bristol Bay run strength, particularly in view of the cost of alternatives such as the Port Moller outside test fishery.

METHODS

Database

Historical data were used to develop in-season forecasting methods detailed below. Catches of sockeye and chum salmon in the South Peninsula June fishery were published annually from 1962 - 1985 (Shaul et al. 1985) as were inshore catches and inshore returns of Bristol Bay sockeye salmon (Nelson et al. 1985), both of which are summarized in Table 1. Catches of chum and sockeye salmon, and fishing effort in boat days for each fishing period from 1977-1985 for Unimak purse seine, Unimak gill net, and Shumagin purse seine fisheries are given in Tables 2 - 10. Note that fishing effort (boat days) is the product of the length of the fishing period (hours) divided by 24 hours and the number of boats fishing the respective period. Catch and effort from both set and drift gill nets were included in the Unimak gill net data, however, set nets account for < 1% of the Unimak catch. Catches from set nets in the Shumagin Section were not included in the following analyses because they were an insignificant component of the Shumagin Section fishery.

Catches were tabulated by gear type, fishing district, and fishing period, from receipts for fish delivered to processors or fish tickets. Fishing

effort was estimated through a combination of pre-season vessel registrations, counts of vessel identification numbers on the fish ticket tabulations, and visual counts of the vessels participating in the Shumagin Section fishery. There was slight discrepancies between catches in Table 1 and Tables 2 - 10, because set net catches were not included in the later tables.

Forecast Methods

Two methods for forecasting the magnitude of the Bristol Bay sockeye salmon return were developed. The first method was based on historical relationship between the catch per unit fishing effort of sockeye salmon and the magnitude of the Bristol Bay return. The second method is based on historical relationship between the catch of chum salmon for the current year and the fishing intensity of the South Peninsula June fisheries on Bristol Bay sockeye salmon.

CPUE Forecast:

Fishery catch per unit effort is a widely used indicator of salmon run strength (Brannian 1982). Different combinations of South Peninsula fishery gear types and fishing districts were examined as potential indicators of Bristol Bay sockeye salmon return strength based on the historical South Peninsula fishery performance and Bristol Bay sockeye salmon return. Five different gear type/district combinations were examined in this study: (1) Unimak purse seine, (2) Unimak gill net, (3) combined Unimak purse seine/gill net, (4) Shumagin purse seine, and (5) combined Unimak/Shumagin purse seine. For the combined Unimak purse seine/gill net fishery a boat day of purse seine effort was not strictly comparable to a boat day of gill net effort, since purse seine vessels were much more efficient than gill net vessels. Purse seine effort in boat days was converted to gill net equivalent boat days by multiplying the nominal purse seine effort by the historical average ratio of sockeye salmon catch per day by purse seine vessels to sockeye catch per day by gill net vessels in the Unimak District.

For each of these gear type and fishing district combinations, the ratio of cumulative catch and cumulative fishing effort was examined over the course of the season and related to the magnitude of the Bristol Bay sockeye salmon return for the respective season. Standard linear regression was used to estimate the relationship between Bristol Bay sockeye salmon run strength and the ratio of cumulative catch and cumulative fishing effort used to forecast Bristol Bay sockeye salmon run strength. Confidence limits for the forecast were estimated using cross-validation methods (Efron 1982, 1983).

Chum Salmon Catch Forecast:

There is a very strong relationship between the actual rate of exploitation exerted by the South Peninsula June fishery on Bristol Bay sockeye salmon and the catch of chum salmon in that fishery (Figure 2). The years 1968, 1972, and 1973 were excluded in estimating this relationship. The excluded years were years of extremely depressed Bristol Bay sockeye returns. For years of depressed Bristol Bay runs the South Peninsula fishery would not have occurred or would have been substantially reduced under the current management plan. Therefore, the catches observed for those years were not representative (i.e., outliers), and excluded in subsequent analysis.

The rates of exploitation (Table 1) were calculated assuming that all of the sockeye caught in the South Peninsula June fishery were bound for Bristol Bay river systems. The rate of exploitation realized by the fishery on Bristol Bay sockeye salmon, was a measure of the intensity of the fishery. There was large variation in the intensity of the South Peninsula fishery because of the error in the pre-season Bristol Bay forecast. The South Peninsula sockeye quota has been set based on a fixed percentage (6.8% and 1.3% for Unimak District and Shumagin Section, respectively) of the forecasted Bristol Bay inshore catch (i.e., the pre-season Bristol Bay return less escapement requirements summed over river systems). In situations where the pre-season Bristol Bay forecast has been greater than the actual return, the South Peninsula June fishery quota was to be a higher percentage of the Bristol Bay return. Consequently, the South Peninsula June fishery was more intense and the fishery had to fish more fishing periods in order to harvest the quota. In situations where the pre-season Bristol Bay forecast has been lower than the actual return, the South Peninsula June fishery sockeye quota was a lower percentage of the Bristol Bay return. Consequently, the South Peninsula June fishery was less intense and the fishery achieved the quota in fewer fishing periods.

If the abundance of chum salmon available to the South Peninsula fishery is relatively stable from year to year or if fluctuations in chum salmon abundance are correlated with those of Bristol Bay sockeye salmon, then the catch of chum salmon will be directly related to how hard the South Peninsula June fishery must work to harvest the sockeye quota. Thus when the South Peninsula fishery is more intense the catch of chum salmon is larger, and when the fishery is less intense the catch of chum salmon is smaller. This hypothesis is consistent with the high correlation between the intensity of the aggregate South Peninsula fishery (Figure 2) and chum catch.

To further check the consistency this hypothesis, the intensity of the Unimak purse seine, Unimak gill net, and Shumagin purse seine was compared to the catch of chum salmon in those fisheries (Table 11). There was a strong relationship between chum catch and fishing intensity (i.e., the catch of sockeye salmon divided by the size of the Bristol Bay inshore return), for each of these fisheries (Figure 3). It is also apparent that no differences in the availability of chum salmon have occurred between these fisheries, since the catch rate of chum salmon appears to be similar in these fisheries (Figure 3).

A forecast of Bristol Bay sockeye return was developed based on the above relationship between catch of chum salmon and fishing intensity for the aggregate South Peninsula June fishery. The South Peninsula fishery has been very accurately managed for the pre-season quota where the actual catch has averaged 1.9% higher than the quota with a standard deviation of 6.5%. Note that the averages were taken over the years 1977 - 1987 exclusive of 1979-1980 and 1986. Price disputes occurred in Bristol Bay during 1979 - 1980 and a chum quota was in effect during 1986. For those years the South Peninsula June fishery was not managed for a sockeye quota, with essentially unrestricted fishing occurring in the strike years and very limited fishing during 1986. Because of the consistently high precision in achievement of management goals it is possible to accurately project the catch of sockeye salmon as well as chum salmon before the fishery is complete. The forecast method computes the fishing intensity of the South Peninsula June fishery

expected for the current year, based on the projected chum catch, and then expands the sockeye quota to the Bristol Bay return based on the computed fishing intensity.

Standard linear regression was used to estimate the relationship between the intensity and the catch of chum salmon in the South Peninsula June fishery on which the forecast Bristol Bay sockeye run strength was based. Confidence limits for the forecast were estimated using cross-validation methods (Effron 1982, 1983).

RESULTS AND DISCUSSION

CPUE Forecast

For each of the gear types and fishing district combinations, the ratio of cumulative catch and cumulative effort was examined over the course of the season for years 1977 - 1985, (Tables 12 - 20). In the Unimak purse seine, Unimak gill net, Shumagin purse seine, and Unimak/Shumagin combined purse seine groups, a unit of fishing effort (boat-day) was defined as a single fishing vessel of the respective gear type fishing for 24 hours. Note that for 1984 and 1985 fishing periods less than 24 hours occurred and the fishing effort for these periods was the number of vessels fishing times the proportion of the day actually fished (i.e., the period length in hours divided by 24 hours).

In the Unimak combined gill net and purse seine fishery, purse seine and gill net vessels have different fishing powers (Table 21). The purse seine effort in purse seine boat-days was converted to gill net equivalent boat-days by multiplying the nominal purse seine effort by the average fishing power of purse seine vessels relative to gill net vessels. The relative fishing power of purse seine vessels was taken to be the ratio of average CPUE of sockeye salmon for purse seine and the average CPUE of sockeye salmon for gill net vessels (Table 21). The relative fishing power was estimated to be 3.28 and was an average of that observed for 1977 - 1978 and 1981 - 1985. The years 1979 - 1980 were excluded because of unusually large Bristol Bay runs in those years. In those years the relative fishing power of purse seine vessels was very high. Presumably the relatively low CPUE's observed for gill net vessels during 1979 - 1980 was due either to saturation of gill nets or to limited hold capacity of the smaller gill net vessels. Hence, CPUE of gill net vessels were not reflective of high salmon abundances.

The ratio of cumulative catch to cumulative effort at the midpoint of the fishery was chosen as the best estimator of fishery performance. An alternate estimator is the CPUE (i.e., sockeye catch / boat-days) but this estimator was highly variable between fishing periods. Presumably this was due to weather related variability in sockeye catchability and to migratory timing related variability in fish availability. The estimate of average CPUE given by the ratio of cumulative catch to cumulative fishing effort evolves as the fishery progresses towards the pre-season quota. This estimator was less variable than CPUE since it integrates over the period-to-period variability. During most years this estimator was low early in the season but increased to a plateau that was relatively stable over the remainder of the

season (Figure 4). By the midpoint of the fishery the ratio of cumulative catch to cumulative effort was quite stable.

The estimates of fishery performance for each of the gear type and fishing district combinations are given in Table 22. The correlation (Pearson product moment coefficient) between in-season fishery performance and the eventual post-season Bristol Bay sockeye salmon return was the highest ($\rho = 0.911$) for the Unimak purse seine fishery. Unfortunately due to remoteness of processors and the large geographic area of the fishery, fish tickets cannot be collected in time for in-season allocation of catches in the Unimak district to purse seine and gill net fishing vessels. In order to assess the performance of the aggregate Unimak fishery the purse seine/gill net fishing effort was combined as described above. The correlation between the performance of the combined Unimak purse seine/gill net fishery and the Bristol Bay return was the second highest ($\rho = 0.89$) of those observed for the various fishery performance indicators observed (Table 22).

A simple linear regression model ($R^2 = 0.787$, $\sigma = 7.7$ million sockeye salmon) was developed to forecast Bristol Bay return (R) based on ratio of cumulative sockeye salmon catch and cumulative effort (E) observed in-season at the approximate midpoint of the aggregate Unimak fishery (Figure 3).

$$R = 10.56432 + 0.039544 E \quad (1)$$

To generate the forecast of Bristol Bay sockeye return in-season, Table 11 should be constructed based on catch of sockeye salmon and boat days of fishing effort as they become available. At the point where half the Unimak quota is reached, the Bristol Bay return is estimated based on the ratio of cumulative catch to cumulative effort and the above regression model.

Evaluation of CPUE Forecast. Standard parametric linear regression techniques can be used to estimate confidence limits for predictions in future years. However, using this method to predict Bristol Bay returns in past years will be biased and tend to give optimistic estimates of performance. This is because the data used to generate the prediction is used to estimate the parameters of the regression line (Efron 1982, 1983). One method that avoids this difficulty is to hindcast the Bristol Bay return for each year based on the regression model fitted to the data exclusive of the year being hindcasted. This so-called cross-validation method or leaving one out jackknife (Stone 1974, Geisser 1975, Efron 1982) was used to evaluate the performance of the CPUE forecast (Table 23). The root mean square (i.e., the mean of square root of the residuals squared) for the cross-validated model (8.52 million) was significantly greater than the residual mean square for the hindcasted regression model (7.71). The latter is the unbiased estimate of error associated with the model based on parametric linear regression. The greater error associated with the cross-validated model suggests that the confidence intervals based standard linear regression are conservative.

Unfortunately nonparametric resampling methods for estimation of confidence intervals in regression analysis have not been as robust as initially anticipated (see review by Wu 1986 and associated discussion). The jackknife and cross-validation techniques do yield robust estimates of variance under

most circumstances, but do not offer a nonparametric means to generate the sampling distribution on which confidence limits are based, for estimated parameters and predictions. Bootstrap methods offer a nonparametric means to estimate confidence limits but in situations where nonparametric methods are needed (i.e., where variance is heteroscedastic and sampling is unbalanced over the range of independent variables), bootstrap methods performed poorly (Wu 1986).

We have used parametric methods to estimate confidence limits (Figure 5), but have inflated the width of the confidence interval by 11% to adjust for the bias identified in the analysis of the cross-validated model.

Application to 1986 and 1987 Fisheries. The method was applied to the 1986 (Table 24) and the 1987 (Table 25) fisheries. In-season estimates of catch and fishing effort were tabulated and estimates of Bristol Bay return made following each fishing period. The ratio of cumulative catch to cumulative effort peaked on the June 18 period in 1986 generating an estimated Bristol Bay return of 23.3 million compared to the actual return of 23.9 million fish. In 1987 the cumulative CPUE peaked on the last day of the Unimak fishery, with a corresponding estimate of the Bristol Bay return of 19.0 million, compared to the actual return of 25.9 million. Both the 1986 and 1987 estimates were within the 80% confidence interval (Figure 5).

Chum Salmon Catch Forecast

The relationship between fishing intensity and catch of chum salmon was used to develop an in-season forecast of the Bristol Bay sockeye return. Given the catch of chum salmon in the South Peninsula fishery, the rate of exploitation realized on Bristol Bay sockeye salmon can be projected based on the above relationship. Since the fishery is managed on a pre-season quota of sockeye salmon that has been accurately achieved in the past, the approximate catch of sockeye salmon is known prior to the season. Thus, the magnitude of the Bristol Bay sockeye return can be estimated by expanding the pre-season sockeye quota by the estimated rate of exploitation on Bristol Bay sockeye salmon realized by the fishery. This forecast can be generated at anytime during the season, by expanding the chum catch to date to the end of season catch. This was done by dividing the catch to date by the proportion of the sockeye quota achieved to date.

The algorithm for development of this forecast is as follows: (Note that the forecast as presented was based on the total South Peninsula fishery, pooling both the South Unimak District and Shumagin Section catches.)

1. Expand the chum catch to date (C) to the end of season chum catch (C*).

$$C^* = C / p \quad (3)$$

Where, p = proportion of the sockeye quota achieved to date (i.e., $p = S / Q$, where Q = pre-season South Peninsula sockeye quota, S = catch of sockeye salmon to date in the South Peninsula fishery).

2. Compute the rate of exploitation realized by the South Peninsula fishery on Bristol Bay sockeye salmon (U) based on the projected catch of chum salmon (C^*).

$$U = 0.01177 + 0.000064 C^* \quad (4)$$

This relationship was based on a simple linear regression of U against C for years 1962 - 1985, exclusive of 1968, 1972 - 1973, ($R^2 = 0.779$, $\sigma = 0.0097$).

3. The inshore Bristol Bay return (R) is projected based on the South Peninsula sockeye quota (Q) and the rate of exploitation estimated in paragraph 2 above.

$$R = Q / U \quad (5)$$

Evaluation of Chum Catch Forecast. To evaluate the chum catch forecast method was evaluated by hindcasting the historical performance of the model (Table 26). In generating the hindcasts for each year, the predicted rate of exploitation (U) based on the projected end of season chum catch (C^*) was made with a regression model fitted to the historical data exclusive of the year being hindcasted. The root mean square for the hindcasted residuals was 12.839 million, compared with the 8.52 observed for the CPUE forecast method.

Standard parametric linear regression techniques can be used to estimate confidence limits for U . The confidence limits on the predicted Bristol Bay return can be estimated by expansion of the sockeye quota by the respective confidence limit on U . However, as with the CPUE forecast this will and tend to give optimistic estimates of performance. Estimates of error in the model made with standard linear regression and cross-validation methods (Table 27) showed that standard methods were very conservative with the root mean square error for the cross-validated model 28% greater than the residual mean square error (i.e., σ). This bias was greater for the chum catch model than for the CPUE model in spite of the greater number of data points used to estimate the chum catch model. The reason for the larger bias in applying standard methods is that the data are not balanced. There were very large chum catches and associated rate of exploitation observed for both 1982 and 1983 fisheries. These have a great influence on the regression equation and using a model fitted to these data to hindcast the corresponding model performance is very biased.

In generating confidence intervals for predictions made with the chum catch model, standard parametric methods should be used to construct the confidence interval on U . However, the standard error of the predicted U should be inflated by 28%, to correct for the biased error resulting from hindcasting with all historical data implicit in the model. Confidence limits in Figure 3 were adjusted for this bias.

Application to 1986 and 1987 Fisheries. The method was applied to the 1986 (Table 28) and 1987 (Table 29) fisheries. The 1986 fishery was managed for a chum quota of 400 thousand fish. Thus the application of the chum catch

method was different than that described above. For the 1986 fishery the end of season chum catch was taken to be 400 thousand and the end of season sockeye catch was estimated by expanding the catch to date of sockeye salmon by the fraction of the chum quota achieved to date. The estimated 1986 Bristol Bay return was 13.43 million compared to actual return of 23.9 million. The 1987 fishery was managed for a sockeye quota and the method was applied as described above. The estimated 1987 Bristol Bay sockeye return was 19.68 million compared to the actual return of 25.9 million.

Pooled Forecast

Alternative forecasts that are independent in terms of data and rational, may be pooled to form a single forecast. The best way to do this (i.e., that which is minimum variance) is to average the two weighted by the inverse of the variances of the respective estimates. The hindcasted performance of the pooled forecast was evaluated (Table 30). Note that we used the root mean square of the cross-validated residuals as the estimate of variance by which the two forecasts were weighted. The pooled forecast showed a better hindcasted performance than either the CPUE or the chum catch forecast. The root mean square of the residuals of the pooled forecast was 7.8 million, lower than that observed for the individual forecasts.

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Table 1. South Peninsula June fishery statistics, 1962-1985. All catches in thousands of fish.

Year	Catches in South Peninsula June Fishery						Bristol Bay Sockeye Fishery		Intensity of South Peninsula June Fishery 1/		
	S. Unimak		Shumagin		Pooled Fishery		Inshore Return	Inshore Catch	South		
	Sockeye	Chums	Sockeye	Chums	Sockeye	Chums			Unimak	Shumagin	Pooled
1962	272	209	54	61	326	270	10394	4717	2.6%	0.5%	3.1%
1963	116	81	33	36	149	117	6884	2871	1.7%	0.5%	2.2%
1964	159	161	85	67	244	228	10909	5588	1.5%	0.8%	2.2%
1965	568	121	207	45	775	166	53108	24252	1.1%	0.4%	1.5%
1966	528	215	54	17	582	232	17514	9305	3.0%	0.3%	3.3%
1967	186	73	69	51	255	124	10308	4301	1.8%	0.7%	2.5%
1968	342	115	233	51	575	166	7996	2786	4.3%	2.9%	7.2%
1969	781	254	76	13	857	267	19030	6617	4.1%	0.4%	4.5%
1970	1530	403	153	49	1683	452	39389	20720	3.9%	0.4%	4.3%
1971	565	554	45	115	610	669	15803	9575	3.6%	0.3%	3.9%
1972	443	468	76	108	519	576	5373	2392	8.2%	1.4%	9.7%
1973	239	189	23	23	262	212	2416	741	9.9%	1.0%	10.8%
1974					0	0	10932	1334	0.0%	0.0%	0.0%
1975	190	65	49	36	239	101	24223	4899	0.8%	0.2%	1.0%
1976	235	327	72	74	307	401	11514	5619	2.0%	0.6%	2.7%
1977	193	93	46	22	239	115	9675	4879	2.0%	0.5%	2.5%
1978	419	105	68	18	487	123	19878	9928	2.1%	0.3%	2.4%
1979	683	64	179	41	862	105	39871	21429	1.7%	0.4%	2.2%
1980	2731	457	572	71	3303	528	62341	23674	4.4%	0.9%	5.3%
1981	1474	521	351	54	1825	575	34525	25713	4.3%	1.0%	5.3%
1982	1670	934	451	160	2121	1094	22125	15146	7.5%	2.0%	9.6%
1983	1545	615	416	169	1961	784	45777	37278	3.4%	0.9%	4.3%
1984	1131	228	257	109	1388	337	40965	24684	2.8%	0.6%	3.4%
1985	1495	345	367	134	1862	479	36628	23474	4.1%	1.0%	5.1%

1/ Catch of sockeye as a percent of inshore Bristol Bay return.

Table 2. Daily catches of sockeye and chum salmon, and fishing effort (# boats/day) 1977 South Peninsula June fishery.

Date Month Day	South Unimak Island					Shumagin Islands					South Unimak and Shumagin Islands									
	Purse Seines				Gill Nets				Purse Seines				Gears Pooled							
	Sockeye		Chums		Sockeye		Chums		Sockeye		Chums		Sockeye		Chums					
	Boats	Catch	CPUE	Catch	CPUE	Boats	Catch	CPUE	Catch	CPUE	Boats	Catch	CPUE	Catch	CPUE	Boats	Catch	CPUE	Catch	CPUE
June 1																				
2																				
3																				
4																				
5																				
6																				
7						2	0	0	158	79						2	0	0	158	79
8						5	257	51	439	88	1	119	119	160	160	6	376	63	599	100
9	1	38	38	208	208	21	385	18	735	35	12	3150	263	5489	457	34	3573	105	6432	189
10	1	128	128	251	251	40	2176	54	3926	98	12	3346	279	3340	278	53	5650	107	7517	142
11																				
12																				
13						41	2670	65	2034	50	12	11861	988	8369	697	53	14531	274	10403	196
14																				
15	2	114	57	2	1	33	3847	117	2171	66						35	3961	113	2173	62
16	5	1841	368	1228	246	84	22411	267	17452	208						89	24252	272	18680	210
17	11	2283	208	1946	177	93	24280	261	10513	113						104	26563	255	12459	120
18	14	4289	306	1379	99	87	25477	293	10577	122						101	29766	295	11956	118
19																				
20	4	6153	1538	1065	266	98	60751	620	20332	207	11	25103	2282	4320	393	113	92007	814	25717	228
21																				
22																				
23																				
24	13	1854	143	1249	96	62	6891	111	4891	79						75	8745	117	6140	82
25	10	12998	1300	2524	252	44	15020	341	10826	246						54	28018	549	13350	247
26																				
27																				
28																				
29																				
30																				
Totals	61	29698		9852		610	164165		84054		48	43579		21678		719	237442		115584	

Table 3. Daily catches of sockeye and chum salmon, and fishing effort (# boats/day) 1978 South Peninsula June fishery.

Date Month Day	South Unimak Island					Shumagin Islands					South Unimak and Shumagin Islands									
	Purse Seines		Gill Nets			Purse Seines		Gears Pooled												
	Sockeye		Chums		Sockeye		Chums		Sockeye		Chums									
	Boats	Catch	CPUE	Catch	CPUE	Boats	Catch	CPUE	Catch	CPUE	Boats	Catch	CPUE	Catch	CPUE					
June 1					2	11	6	15	8					2	11	6	15	8		
2					2	42	21	1005	503					2	42	21	1005	503		
3																				
4																				
5					2	279	140	92	46					2	279	140	92	46		
6					2	61	31	76	38					2	61	31	76	38		
7					4	356	89	380	95					4	356	89	380	95		
8					6	66	11	149	25					6	66	11	149	25		
9					6	393	66	193	32					6	393	66	193	32		
10					6	261	44	1142	190					6	261	44	1142	190		
11										2	427	214	264	132	2	427	214	264	132	
12	4	122	31	210	53	59	5114	87	2679	45	12	3578	298	1340	112	75	8814	118	4229	56
13	2	17	9	0	0	59	5249	89	1954	33	14	3524	252	1875	134	75	8790	117	3829	51
14	2	264	132	149	75	88	15973	182	4191	48	15	8677	578	1743	116	105	24914	237	6083	58
15	3	1343	448	456	152	88	19518	222	4906	56	16	4339	271	1095	68	107	25200	236	6457	60
16	1	355	355	105	105	34	5610	165	2516	74					35	5965	170	2621	75	
17						27	4340	161	1620	60	1	123	123	36	36	28	4463	159	1656	59
18	4	6711	1678	754	189	72	29952	416	6424	89	17	4969	292	784	46	93	41632	448	7962	86
19	4	2527	632	328	82	106	43119	407	7364	69	16	5438	340	891	56	126	51084	405	8583	68
20	5	3869	774	544	109	84	34601	412	3143	37	15	2512	167	567	38	104	40982	394	4254	41
21	4	7438	1860	338	85	82	31021	378	10658	130	16	2294	143	763	48	102	40753	400	11759	115
22	2	253	127	37	19	64	17536	274	1993	31	1	12	12	3	3	67	17801	266	2033	30
23	14	18263	1305	2731	195	70	36013	514	7846	112	8	3141	393	1816	227	92	57417	624	12393	135
24	8	4407	551	354	44	61	24474	401	8900	146	8	4656	582	2107	263	77	33537	436	11361	148
25	13	11757	904	2338	180	73	35554	487	10412	143					86	47311	550	12750	148	
26	8	19895	2487	1859	232	92	29652	322	15557	169	9	9902	1100	2819	313	109	59449	545	20235	186
27											9	6853	761	900	100	9	6853	761	900	100
28											14	5361	383	790	56	14	5361	383	790	56
29																				
30																				
Totals	74	77221		10203		1089	339195		93215		173	65806		17793		1336	482222		121211	

Table 4. Daily catches of sockeye and chum salmon, and fishing effort (# boats/day) 1979 South Peninsula June fishery.

Date Month Day	South Unimak Island										Shumagin Islands				South Unimak and Shumagin Islands					
	Purse Seines					Gill Nets					Purse Seines				Gears Pooled					
	Sockeye		Chums			Sockeye		Chums			Sockeye		Chums		Sockeye		Chums			
	Boats	Catch	CPUE	Catch	CPUE	Boats	Catch	CPUE	Catch	CPUE	Boats	Catch	CPUE	Catch	CPUE	Boats	Catch	CPUE	Catch	CPUE
June 1																				
2																				
3																				
4																				
5						2	500	250	400	200					2	500	250	400	200	
6						5	1600	320	2600	520					5	1600	320	2600	520	
7						5	900	180	700	140					5	900	180	700	140	
8	1	200	200	600	600	7	1300	186	1300	186					8	1500	188	1900	238	
9						8	2500	313	1300	163					8	2500	313	1300	163	
10						9	1700	189	1500	167					9	1700	189	1500	167	
11	2	900	450	400	200	10	2800	280	3000	300					12	3700	308	3400	283	
12						11	1600	145	700	64					11	1600	145	700	64	
13	8	15400	1925	1800	225	28	2900	104	2100	75	20	5900	295	1800	90	56	24200	432	5700	102
14	10	8000	800	1900	190	89	15900	179	5200	58	20	12700	635	4700	235	119	36600	308	11800	99
15	3	3300	1100	700	233	92	10900	118	1300	14	20	12000	600	2100	105	115	26200	228	4100	36
16	6	24800	4133	400	67	42	4100	98	300	7	21	4700	224	1300	62	69	33600	487	2000	29
17	7	20100	2871	200	29	82	12700	155	900	11	19	7500	395	2200	116	108	40300	373	3300	31
18	13	72600	5585	1200	92	97	19300	199	1000	10	20	8600	430	2600	130	100	100500	773	4800	37
19	8	50100	6263	400	50	83	21400	258	2400	29	19	16300	858	4000	211	110	87800	798	6800	62
20	12	88400	7367	800	67	100	30300	303	6100	61	18	13100	728	2700	150	130	131800	1014	9600	74
21	16	79800	4988	2800	175	91	16300	179	4700	52	17	20000	1176	3200	188	124	116100	936	10700	86
22	14	12300	879	1300	93	66	8400	127	2000	30	12	5900	492	1000	83	92	26600	289	4300	47
23	10	16000	1600	1100	110	31	6800	219	1600	52	15	7400	493	1000	67	56	30200	539	3700	66
24	13	15000	1154	1200	92	47	16800	357	1400	30	16	2800	175	400	25	76	34600	455	3000	39
25	11	21700	1973	1000	91	36	5200	144	500	14	17	16400	965	3300	194	64	43300	677	4800	75
26	12	16300	1358	1000	83	21	5000	238	1100	52	18	17500	972	3600	200	51	38800	761	5700	112
27	12	15700	1308	1600	133	11	4400	400	1300	118	19	7200	379	2200	116	42	27300	650	5100	121
28	2	13600	6800	600	300	10	1200	120	100	10	5	4800	960	1800	360	17	19600	1153	2500	147
29																				
30																				
Totals	160	474200		19000		983	194500		43500		276	162800		37900		1419	831500		100400	

Table 5. Daily catches of sockeye and chum salmon, and fishing effort (# boats/day) 1980 South Peninsula June fishery.

Date Month Day	South Unimak Island										Shumagin Islands				South Unimak and Shumagin Islands					
	Purse Seines					Gill Nets					Purse Seines				Gears Pooled					
	Sockeye		Chums			Sockeye		Chums			Sockeye		Chums		Sockeye		Chums			
	Boats	Catch	CPUE	Catch	CPUE	Boats	Catch	CPUE	Catch	CPUE	Boats	Catch	CPUE	Catch	CPUE	Boats	Catch	CPUE	Catch	CPUE
June 1						1	300	300	0	0						1	300	300	0	0
2																				
3																				
4																				
5																				
6	1	4100	4100	300	300											1	4100	4100	300	300
7	1	5000	5000	400	400											1	5000	5000	400	400
8	1	3200	3200	1600	1600											1	3200	3200	1600	1600
9																				
10																				
11																				
12																				
13																				
14																				
15	14	31500	2250	4200	300	61	22000	361	4100	67	20	57900	2895	5900	295	95	111400	1173	14200	149
16	25	174700	6988	24500	980	79	73000	924	12000	152	20	54000	2700	3300	165	124	301700	2433	39800	321
17	27	206700	7656	30700	1137	73	59700	818	10500	144	23	29800	1296	6000	261	123	296200	2408	47200	384
18	40	223600	5590	43400	1085	113	88500	783	14600	129	15	33500	2233	2800	187	168	345600	2057	60800	362
19	23	158600	6896	29800	1296	77	28300	368	6000	78	16	9100	569	1500	94	116	196000	1690	37300	322
20	25	157400	6296	23900	956	82	38900	474	3400	41	11	20000	1818	1200	109	118	216300	1833	28500	242
21	39	296800	7610	39900	1023	92	99000	1076	12000	130	13	32100	2469	2100	162	144	427900	2972	54000	375
22	34	192100	5650	37500	1103	54	40700	754	6500	120	5	16900	3380	1100	220	93	249700	2685	45100	485
23	24	85900	3579	20900	871	36	21400	594	3200	89	8	13000	1625	1200	150	68	120300	1769	25300	372
24	38	213000	5605	46600	1226	67	43800	654	6000	90	12	5400	450	900	75	117	262200	2241	53500	457
25	36	108800	3022	20700	575	81	36600	452	3800	47	15	11400	760	1400	93	132	156800	1188	25900	196
26	19	91400	4811	14400	758	43	21400	498	3900	91	17	71400	4200	6900	406	79	184200	2332	25200	319
27	21	62600	2981	15800	752	26	16900	650	2600	100	20	45200	2260	4600	230	67	124700	1861	23000	343
28	25	52400	2096	6300	252	29	30100	1038	5200	179	23	43400	1887	5700	248	77	125900	1635	17200	223
29	14	17800	1271	1300	93	22	7100	323	800	36	22	9500	432	2400	109	58	34400	593	4500	78
30	4	500	125	1100	275	11	2400	218	200	18	23	5400	235	2000	87	38	8300	218	3300	87
Totals	411	2086100		363300		947	630100		94800		263	458000		49000		1621	3174200		507100	

Table 6. Daily catches of sockeye and chum salmon, and fishing effort (# boats/day) 1981 South Peninsula June fishery.

Date Month Day	South Unimak Island										Shumagin Islands				South Unimak and Shumagin Islands					
	Purse Seines					Gill Nets					Purse Seines				Gears Pooled					
	Sockeye		Chums			Sockeye		Chums			Sockeye		Chums		Sockeye		Chums			
	Boats	Catch	CPUE	Catch	CPUE	Boats	Catch	CPUE	Catch	CPUE	Boats	Catch	CPUE	Catch	CPUE	Boats	Catch	CPUE	Catch	CPUE
June 1					3	100	33	200	67							3	100	33	200	67
2					1	300	300	900	900							1	300	300	900	900
3					4	700	175	1800	450							4	700	175	1800	450
4					3	600	200	1300	433							3	600	200	1300	433
5					1	500	500	900	900							1	500	500	900	900
6					5	800	160	1900	380							5	800	160	1900	380
7																				
8	2	1200	600	900	450	3	700	233	900	300	2	2300	1150	3300	1650	7	4200	600	5100	729
9						9	2900	322	2100	233						9	2900	322	2100	233
10	1	1200	1200	800	800	12	4600	383	2100	175	1	1600	1600	1500	1500	14	7400	529	4400	314
11	33	23100	700	12000	364	91	24000	264	12100	133	24	2600	108	8100	338	148	49700	336	32200	218
12	33	37700	1142	9400	285	105	34000	324	26200	250	24	21600	900	5800	242	162	93300	576	41400	256
13	49	79100	1614	19200	392	108	62000	574	28900	268	25	31200	1248	4200	168	182	172300	947	52300	287
14	45	34300	762	7800	173	109	95200	873	16200	149	23	34800	1513	2900	126	177	164300	928	26900	152
15	28	21400	764	3300	118	125	49400	395	7100	57	19	17500	921	1300	68	172	88300	513	11700	68
16	17	4600	271	2300	135	81	14900	184	4800	59	28	46900	1675	2200	79	126	66400	527	9300	74
17																				
18																				
19	42	105700	2517	23700	564	111	87700	790	20300	183	21	23400	1114	4300	205	174	216800	1246	48300	278
20	50	129600	2592	23500	470	109	95200	873	16200	149	21	55500	2643	6100	290	180	280300	1557	45800	254
21	46	89700	1950	21800	474	123	122000	992	15900	129	18	35500	1972	5500	306	187	247200	1322	43200	231
22	50	73300	1466	21900	438	105	48000	457	4500	43	24	33000	1375	6600	275	179	154300	862	33000	184
23						22	12100	550	1300	59						22	12100	550	1300	59
24																				
25	5	2700	540	900	180											5	2700	540	900	180
26	44	62600	1423	34500	784	102	31100	305	11600	114						146	93700	642	46100	316
27	42	42200	1005	72200	1719	23	6600	287	1700	74						65	48800	751	73900	1137
28	50	22600	452	42500	850	6	1200	200	300	50						56	23800	425	42800	764
29																				
30	13	14600	1123	27000	2077	3	2100	700	500	167						16	16700	1044	27500	1719
Totals	550	745600		323700		1264	696700		179700		230	305900		51800		2044	1748200		555200	

Table 7. Daily catches of sockeye and chum salmon, and fishing effort (# boats/day) 1982 South Peninsula June fishery.

Date Month Day	South Unimak Island										Shumagin Islands					South Unimak and Shumagin Islands				
	Purse Seines					Gill Nets					Purse Seines					Gears Pooled				
	Sockeye		Chums			Sockeye		Chums			Sockeye		Chums			Sockeye		Chums		
	Boats	Catch	CPUE	Catch	CPUE	Boats	Catch	CPUE	Catch	CPUE	Boats	Catch	CPUE	Catch	CPUE	Boats	Catch	CPUE	Catch	CPUE
June 1																				
2						6	900	150	3600	600						6	900	150	3600	600
3						5	200	40	1000	200						5	200	40	1000	200
4						9	1600	178	2700	300						9	1600	178	2700	300
5						8	1400	175	3000	375						8	1400	175	3000	375
6						15	3600	240	9200	613						15	3600	240	9200	613
7						16	2400	150	10200	638						16	2400	150	10200	638
8						25	3100	124	13300	532						25	3100	124	13300	532
9						11	1600	145	4200	382						11	1600	145	4200	382
10	1	300	300	300	300	16	6900	431	10100	631						17	7200	424	10400	612
11						31	12700	410	19800	639	2	900	450	1600	800	33	13600	412	21400	648
12						35	13300	380	35200	1006						35	13300	380	35200	1006
13	1	200	200	100	100	21	5700	271	13400	638						22	5900	268	13500	614
14						8	3200	400	7000	875	1	1600	1600	6200	6200	9	4800	533	13200	1467
15	38	69200	1821	48100	1266	102	49100	481	49900	489	23	14900	648	12900	561	163	133200	817	110900	680
16	46	65700	1428	41100	893	120	75500	629	63400	528	19	23800	1253	12000	632	185	165000	892	116500	630
17	49	75700	1545	40000	816	126	76900	610	49300	391	26	39600	1523	16200	623	201	192200	956	105500	525
18	41	46800	1141	26700	651	124	60000	484	31100	251	26	21600	831	6600	254	191	128400	672	64400	337
19	51	90500	1775	25000	490	116	40700	351	41600	359	24	41300	1721	8600	358	191	172500	903	75200	394
20	8	19800	2475	4800	600	13	3100	238	1600	123	16	21900	1369	9500	594	37	44800	1211	15900	430
21	38	49400	1300	21500	566	112	60800	543	30600	273	23	63100	2743	17400	757	173	173300	1002	69500	402
22	27	41900	1552	24500	907	108	61600	570	18900	175	23	96600	4200	30400	1322	158	200100	1266	73800	467
23	43	94200	2191	36500	849	113	59000	522	19000	168	23	64800	2817	22500	978	179	218000	1218	78000	436
24	54	83600	1548	26400	489	110	85800	780	24100	219						164	169400	1033	50500	308
25	6	3800	633	1100	183	10	4000	400	1100	110						16	7800	488	2200	138
26	41	62300	1520	31900	778	80	58500	731	16100	201	22	46500	2114	16300	741	143	167300	1170	64300	450
27	30	50500	1683	33200	1107	51	24400	478	9500	186						81	74900	925	42700	527
28	19	43600	2295	3800	200	36	12600	350	4100	114						55	56200	1022	7900	144
29	40	69300	1733	40400	1010	15	10000	667	4800	320						55	79300	1442	45200	822
30	49	51700	1055	27400	559	8	8100	1013	3200	400						57	59800	1049	30600	537
Totals	582	918500		432800		1450	746700		501000		228	436600		160200		2260	2101800		1094000	

Table 8. Daily catches of sockeye and chum salmon, and fishing effort (# boats/day) 1983 South Peninsula June fishery.

Date Month Day	South Unimak Island										Shumagin Islands					South Unimak and Shumagin Islands				
	Purse Seines					Gill Nets					Purse Seines					Gears Pooled				
	Sockeye		Chums			Sockeye		Chums			Sockeye		Chums			Sockeye		Chums		
	Boats	Catch	CPUE	Catch	CPUE	Boats	Catch	CPUE	Catch	CPUE	Boats	Catch	CPUE	Catch	CPUE	Boats	Catch	CPUE	Catch	CPUE
June 1						9	400	44	800	89										
2	1	100	100	700	700	27	3700	137	4900	181	11	1900	173	4600	418	39	5700	146	10200	262
3	2	400	200	300	150	35	6700	191	7000	200	14	1600	114	6800	486	51	8700	171	14100	276
4	4	1600	400	700	175	45	7900	176	12000	267	27	7700	285	6400	237	76	17200	226	19100	251
5	4	2700	675	600	150	64	36800	575	16700	261	28	11800	421	13900	496	96	51300	534	31200	325
6	10	27600	2760	11900	1190	86	53000	616	19300	224	35	6700	191	5300	151	131	87300	666	36500	279
7																				
8																				
9																				
10																				
11																				
12	41	103400	2522	52900	1290	130	96940	746	35500	273	30	89300	2977	34100	1137	201	289640	1441	122500	609
13	57	195600	3432	80700	1416	133	93300	702	29400	221	32	85900	2684	40200	1256	222	374800	1688	150300	677
14	59	157900	2676	61300	1039	150	140600	937	36400	243	33	75700	2294	23200	703	242	374200	1546	120900	500
15																				
16																				
17																				
18																				
19	76	331500	4362	144100	1896	139	83700	602	25200	181	22	125000	5682	34200	1555	237	540200	2279	203500	859
20																				
21	88	113400	1289	51300	583	111	74500	671	21700	195						199	187900	944	73000	367
22																				
23																				
24																				
25																				
26																				
27																				
28																				
29																				
30																				
Totals	342	934200		404500		929	597540		208900		232	405600		168700		1494	1936940		781300	

Table 9. Daily catches of sockeye and chum salmon, and fishing effort (# boats/day) 1984 South Peninsula June fishery.

Date Month Day	South Unimak Island										Shumagin Islands				South Unimak and Shumagin Islands					
	Purse Seines					Gill Nets					Purse Seines				Gears Pooled					
	Boat Days	Sockeye		Chums		Boat Days	Sockeye		Chums		Boat Days	Sockeye		Chums		Boat Days	Sockeye		Chums	
		Catch	CPUE	Catch	CPUE		Catch	CPUE	Catch	CPUE		Catch	CPUE	Catch	CPUE		Catch	CPUE	Catch	CPUE
June 1																				
2																				
3	11	5400	491	3500	318	85	19800	233	10800	127	38	6500	171	2300	61	134	31700	237	16600	124
4	33	25400	770	22100	670	87	23300	268	10200	117	51	16200	318	11800	231	171	64900	380	44100	258
5																				
6																				
7																				
8																				
9																				
10																				
11																				
12	47	302800	6443	54800	1166	138	162300	1176	36000	261	27	71900	2663	26500	981	212	537000	2533	117300	553
13	8	79900	10653	13800	1840	22	42400	1963	9600	444	9	33800	3634	12800	1376	38	156100	4065	36200	943
14																				
15																				
16																				
17																				
18																				
19	77	304900	3960	42900	557	130	156600	1205	25400	195	27	74900	2774	16500	611	234	536400	2292	84800	362
20																				
21																				
22																				
23																				
24																				
25																				
26											62	41400	668	38500	621	62	41400	668	38500	621
27																				
28																				
29																				
30																				
Totals	176	718400		137100		462	404400		92000		214	244700		108400		851	1367500		337500	

Table 10. Daily catches of sockeye and chum salmon, and fishing effort (# boats/day) 1985 South Peninsula June fishery.

Date Month Day	South Unimak Island										Shumagin Islands				South Unimak and Shumagin Islands					
	Purse Seines					Gill Nets					Purse Seines				Gears Pooled					
	Boat Days	Sockeye		Chums		Boat Days	Sockeye		Chums		Boat Days	Sockeye		Chums		Boat Days	Sockeye		Chums	
		Catch	CPUE	Catch	CPUE		Catch	CPUE	Catch	CPUE		Catch	CPUE	Catch	CPUE		Catch	CPUE	Catch	CPUE
June 1																				
2																				
3	6	344	57	1140	190	22	2031	92	7754	352	23	6584	283	11178	480	51	8959	175	20072	391
4																				
5	15	2082	142	3928	267	69	9684	141	30125	439	26	8594	331	12673	487	109	20360	186	46726	427
6																				
7	21	22693	1096	18028	871	73	16528	225	18002	246	32	41073	1284	29267	915	126	80294	637	65297	518
8																				
9	32	41488	1297	20562	643	73	37906	523	32465	448						105	79394	760	53027	507
10																				
11																				
12	46	83157	1808	22177	482	97	117239	1205	26310	270	22	58012	2637	14978	681	165	258408	1563	63465	384
13																				
14	42	247404	5891	26815	638	96	141623	1475	38882	405	21	74039	3577	19713	952	159	463066	2918	85410	538
15																				
16																				
17																				
18																				
19	47	90607	1916	15229	322	97	90988	941	21097	218	19	48311	2583	9448	505	163	229906	1413	45774	281
20																				
21	47	169115	3575	9660	204	85	88967	1050	9821	116	50	58450	1181	14014	283	182	316532	1744	33495	185
22																				
23	63	253518	4043	28145	449	83	79592	962	14560	176						145	333110	2291	42705	294
24																				
25																				
26											43	24061	563	7918	185	43	24061	563	7918	185
27																				
28											30	29116	971	9069	302	30	29116	971	9069	302
29																				
30																				
Totals	319	910408		145684		694	584558		199016		265	348240		128258		1278	1843206		472958	

Table 11. Catches (thousands) of sockeye salmon, intensity of the sockeye fishery (% of Bristol Bay inshore return), and catches (thousands) of chum salmon for South Peninsula June fisheries.

Year	Unimak Purse Seine			Unimak Gill Net			Shumagin Purse Seine			Inshore Bristol Bay Return (millions)
	Catch of Sockeye		Catch of Chum (No.'s)	Catch of Sockeye		Catch of Chum (No.'s)	Catch of Sockeye		Catch of Chum (No.'s)	
	(No.'s)	% of BB Return		(No.'s)	% of BB Return		(No.'s)	% of BB Return		
	(No.'s)	% of BB Return	(No.'s)	% of BB Return	(No.'s)	% of BB Return	(No.'s)	% of BB Return		
1977	30	0.31%	10	164	1.70%	84	44	0.45%	22	9.675
1978	77	0.39%	10	339	1.71%	93	66	0.33%	18	19.878
1979	474	1.19%	19	195	0.49%	44	163	0.41%	38	39.871
1980	2086	3.35%	363	630	1.01%	95	458	0.73%	49	62.341
1981	746	2.16%	324	697	2.02%	180	306	0.89%	52	34.525
1982	919	4.15%	433	747	3.38%	501	437	1.98%	160	22.125
1983	934	2.04%	405	580	1.27%	209	406	0.89%	169	45.777
1984	718	1.75%	137	404	0.99%	92	248	0.61%	108	40.965
1985	910	2.48%	146	585	1.60%	199	348	0.95%	128	36.628

Table 12. 1977 South Peninsula June sockeye salmon fishery, effort, catch, CPUE, cumulative catch, cumulative effort, and ratio of cumulative catch to cumulative effort for various aggregations of fisheries.

Date Mt. Day	Unimak Purse Seines			Unimak Gill Nets			Combined Unimak Gill Net and Purse Seines (* 1 PS = 3.28 GN)						Cumulative Catch as percent of S. Unimak Quota								
	Cumulative			Cumulative			(*) Gill Net Boat Days	Cumulative			Cumulative Catch CPUE										
	(1)	(2)	(1)/(2)	(1)	(2)	(1)/(2)		(1)	(2)	(1)/(2)											
Boats	Catch	CPUE	Effort	Catch	CPUE	Boats	Catch	CPUE	Effort	Catch	CPUE	Effort	Catch	CPUE							
June 1																					
2																					
3																					
4																					
5																					
6																					
7							2	0	0	2	0	0	2	0	0		0.0%				
8							5	257	51	7	257	37	5	257	51	7	257	37		0.1%	
9	1	38	38	1	38	38	21	385	18	28	642	23	24	423	18	31	680	22		0.3%	
10	1	128	128	2	166	83	40	2176	54	68	2818	41	43	2304	54	74	2984	40		1.5%	
11																					
12																					
13							41	2670	65	109	5488	50	41	2670	65	115	5654	49		2.9%	
14																					
15	2	114	57	4	280	70	33	3847	117	142	9335	66	39	3961	101	154	9615	62		4.9%	
16	5	1841	368	9	2121	236	84	22411	267	226	31746	140	99	24252	244	254	33867	134		17.4%	
17	11	2283	208	20	4404	220	93	24280	261	319	56026	176	127	26563	210	380	60430	159		31.0%	
18	14	4289	306	34	8693	256	87	25477	293	406	81503	201	130	29766	229	510	90196	177		46.3%	
19																					
20	4	6153	1538	38	14846	391	98	60751	620	504	142254	282	110	66904	607	620	157100	253		80.6%	
21																					
22																					
23																					
24	13	1854	143	51	16700	327	62	6891	111	566	149145	264	102	8745	86	722	165845	230		85.0%	
25	10	12998	1300	61	29698	487	44	15020	341	610	164165	269	75	28018	376	797	193863	243		99.4%	
26																					
27																					
28																					
29																					
30																					

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Table 12. 1977 South Peninsula June sockeye salmon fishery, effort, catch, CPUE, cumulative catch, cumulative effort, and ratio of cumulative catch to cumulative effort for various aggregations of fisheries (continued).

Date Mt. Day	Shumagins Purse Seine						Unimak/Shumagins Combined Purse Seines					
	Cumulative						Cumulative					
	Boats	Catch	CPUE	(1)	(2)	(1)/(2)	Boats	Catch	CPUE	(1)	(2)	(1)/(2)
				Effort	Catch	CPUE				Effort	Catch	CPUE
June 1												
2												
3												
4												
5												
6												
7												
8	1	119	119	1	119	119	1	119	119	1	119	119
9	12	3150	262.5	13	3269	251	13	3188	245	14	3307	236
10	12	3346	278.83	25	6615	265	13	3474	267	27	6781	251
11												
12												
13	12	11861	988.41	37	18476	499	12	11861	988	39	18642	478
14												
15							2	114	57	41	18756	457
16							5	1841	368	46	20597	448
17							11	2283	208	57	22880	401
18							14	4289	306	71	27169	383
19												
20	11	25103	2282.0	48	43579	908	15	31256	2084	86	58425	679
21												
22												
23												
24							13	1854	143	99	60279	609
25							10	12998	1300	109	73277	672
26												
27												
28												
29												
30												

Table 13. 1978 South Peninsula June sockeye salmon fishery, effort, catch, CPUE, cumulative catch, cumulative effort, and ratio of cumulative catch to cumulative effort for various aggregations of fisheries.

Date Mt. Day	Unimak Purse Seines			Unimak Gill Nets			Combined Unimak Gill Net and Purse Seines (* 1 PS = 3.28 GN)									
	Cumulative			Cumulative			(*) Gill Net Boat Days	Cumulative			Cumulative Catch as percent of Unimak Quota					
	Boats	Catch	CPUE	(1) Effort	(2) Catch	(1)/(2) CPUE		(1) Effort	(2) Catch	(1)/(2) CPUE						
June 1							2	11	6	2	11	6	2	11	6	0.0%
2							2	42	21	4	53	13	2	42	21	0.0%
3																
4																
5							2	279	140	6	332	55	2	279	140	0.1%
6							2	61	31	8	393	49	2	61	31	0.1%
7							4	356	89	12	749	62	4	356	89	0.2%
8							6	66	11	18	815	45	6	66	11	0.2%
9							6	393	66	24	1208	50	6	393	66	0.3%
10							6	261	44	30	1469	49	6	261	44	0.3%
11													0	0	ERR	0.3%
12	4	122	31	4	122	31	59	5114	87	89	6583	74	72	5236	73	1.6%
13	2	17	9	6	139	23	59	5249	89	148	11832	80	66	5266	80	2.8%
14	2	264	132	8	403	50	88	15973	182	236	27805	118	95	16237	172	6.6%
15	3	1343	448	11	1746	159	88	19518	222	324	47323	146	98	20861	213	11.5%
16	1	355	355	12	2101	175	34	5610	165	358	52933	148	37	5965	160	12.9%
17							27	4340	161	385	57273	149	27	4340	161	13.9%
18	4	6711	1678	16	8812	551	72	29952	416	457	87225	191	85	36663	431	22.4%
19	4	2527	632	20	11339	567	106	43119	407	563	130344	232	119	45646	383	33.1%
20	5	3869	774	25	15208	608	84	34601	412	647	164945	255	100	38470	383	42.1%
21	4	7438	1860	29	22646	781	82	31021	378	729	195966	269	95	38459	404	51.1%
22	2	253	127	31	22899	739	64	17536	274	793	213502	269	71	17789	252	55.2%
23	14	18263	1305	45	41162	915	70	36013	514	863	249515	289	116	54276	468	67.9%
24	8	4407	551	53	45569	860	61	24474	401	924	273989	297	87	28881	331	74.7%
25	13	11757	904	66	57326	869	73	35554	487	997	309543	310	116	47311	409	85.7%
26	8	19895	2487	74	77221	1044	92	29652	322	1089	339195	311	118	49547	419	97.3%
27																
28																
29																
30																

-Continued-

Table 13. 1978 South Peninsula June sockeye salmon fishery, effort, catch, CPUE, cumulative catch, cumulative effort, and ratio of cumulative catch to cumulative effort for various aggregations of fisheries (continued).

Date Mt. Day	Shumagins Purse Seine						Unimak/Shumagins Combined Purse Seines					
	Cumulative						Cumulative					
	Boats	Catch	CPUE	(1)	(2)	(1)/(2)	Boats	Catch	CPUE	(1)	(2)	(1)/(2)
				Effort	Catch	CPUE				Effort	Catch	CPUE
June 1												
2												
3												
4												
5												
6												
7												
8												
9												
10												
11	2	427	213.5	2	427	214	2	427	214	2	427	214
12	12	3578	298.16	14	4005	286	16	3700	231	18	4127	229
13	14	3524	251.71	28	7529	269	16	3541	221	34	7668	226
14	15	8677	578.46	43	16206	377	17	8941	526	51	16609	326
15	16	4339	271.18	59	20545	348	19	5682	299	70	22291	318
16							1	355	355	71	22646	319
17	1	123	123	60	20668	344	1	123	123	72	22769	316
18	17	4969	292.29	77	25637	333	21	11680	556	93	34449	370
19	16	5438	339.87	93	31075	334	20	7965	398	113	42414	375
20	15	2512	167.46	108	33587	311	20	6381	319	133	48795	367
21	16	2294	143.37	124	35881	289	20	9732	487	153	58527	383
22	1	12	12	125	35893	287	3	265	88	156	58792	377
23	8	3141	392.62	133	39034	293	22	21404	973	178	80196	451
24	8	4656	582	141	43690	310	16	9063	566	194	89259	460
25							13	11757	904	207	101016	488
26	9	9902	1100.2	150	53592	357	17	29797	1753	224	130813	584
27	9	6853	761.44	159	60445	380	9	6853	761	233	137666	591
28	14	5361	382.92	173	65806	380	14	5361	383	247	143027	579
29												
30												

Table 14. 1979 South Peninsula June sockeye salmon fishery, effort, catch, CPUE, cumulative catch, cumulative effort, and ratio of cumulative catch to cumulative effort for various aggregations of fisheries (continued).

Date Mt. Day	Unimak Purse Seines						Unimak Gill Nets						Combined Unimak Gill Net and Purse Seines (* 1 PS = 3.28 GN)						
	Cumulative						Cumulative						(*) Gill Net Boat Days	Cumulative			Cumulative Catch as percent of S. Unimak Quota		
	Boats	Catch	CPUE	(1) Effort	(2) Catch	(1)/(2) CPUE	Boats	Catch	CPUE	(1) Effort	(2) Catch	(1)/(2) CPUE		(1) Effort	(2) Catch	(1)/(2) CPUE			
June 1																			
2																			
3																			
4																			
5							2	500	250	2	500	250	2	500	250			0.1%	
6							5	1600	320	7	2100	300	5	1600	320	7	2100	300	0.2%
7							5	900	180	12	3000	250	5	900	180	12	3000	250	0.3%
8	1	200	200	1	200	200	7	1300	186	19	4300	226	10	1500	146	22	4500	202	0.5%
9							8	2500	313	27	6800	252	8	2500	313	30	7000	231	0.8%
10							9	1700	189	36	8500	236	9	1700	189	39	8700	221	1.0%
11	2	900	450	3	1100	367	10	2800	280	46	11300	246	17	3700	223	56	12400	222	1.4%
12							11	1600	145	57	12900	226	11	1600	145	67	14000	209	1.6%
13	8	15400	1925	11	16500	1500	28	2900	104	85	15800	186	54	18300	337	121	32300	267	3.6%
14	10	8000	800	21	24500	1167	89	15900	179	174	31700	182	122	23900	196	243	56200	231	6.2%
15	3	3300	1100	24	27800	1158	92	10900	118	266	42600	160	102	14200	139	345	70400	204	7.8%
16	6	24800	4133	30	52600	1753	42	4100	98	308	46700	152	62	28900	469	406	99300	244	11.0%
17	7	20100	2871	37	72700	1965	82	12700	155	390	59400	152	105	32800	313	511	132100	258	14.7%
18	13	72600	5585	50	145300	2906	97	19300	199	487	78700	162	140	91900	658	651	224000	344	24.9%
19	8	50100	6263	58	195400	3369	83	21400	258	570	100100	176	109	71500	655	760	295500	389	32.8%
20	12	88400	7367	70	283800	4054	100	30300	303	670	130400	195	139	118700	852	900	414200	460	46.0%
21	16	79800	4988	86	363600	4228	91	16300	179	761	146700	193	143	96100	670	1043	510300	489	56.7%
22	14	12300	879	100	375900	3759	66	8400	127	827	155100	188	112	20700	185	1155	531000	460	59.0%
23	10	16000	1600	110	391900	3563	31	6800	219	858	161900	189	64	22800	357	1219	553800	454	61.5%
24	13	15000	1154	123	406900	3308	47	16800	357	905	178700	197	90	31800	355	1308	585600	448	65.1%
25	11	21700	1973	134	428600	3199	36	5200	144	941	183900	195	72	26900	373	1381	612500	444	68.1%
26	12	16300	1358	146	444900	3047	21	5000	238	962	188900	196	60	21300	353	1441	633800	440	70.4%
27	12	15700	1308	158	460600	2915	11	4400	400	973	193300	199	50	20100	399	1491	653900	438	72.7%
28	2	13600	6800	160	474200	2964	10	1200	120	983	194500	198	17	14800	894	1508	668700	443	74.3%
29																			
30																			

-Continued-

Table 14. 1979 South Peninsula June sockeye salmon fishery, effort, catch, CPUE, cumulative catch, cumulative effort, and ratio of cumulative catch to cumulative effort for various aggregations of fisheries (continued).

Date Mt. Day	Shumagins Purse Seine						Unimak/Shumagins Combined Purse Seines					
	Cumulative						Cumulative					
	Boats	Catch	CPUE	(1)	(2)	(1)/(2)	Boats	Catch	CPUE	(1)	(2)	(1)/(2)
				Effort	Catch	CPUE				Effort	Catch	CPUE
June 1												
2												
3												
4												
5												
6												
7												
8							1	200	200	1	200	200
9												
10												
11							2	900	450	3	1100	367
12												
13	20	5900	295	20	5900	295	28	21300	761	31	22400	723
14	20	12700	635	40	18600	465	30	20700	690	61	43100	707
15	20	12000	600	60	30600	510	23	15300	665	84	58400	695
16	21	4700	224	81	35300	436	27	29500	1093	111	87900	792
17	19	7500	395	100	42800	428	26	27600	1062	137	115500	843
18	20	8600	430	120	51400	428	33	81200	2461	170	196700	1157
19	19	16300	858	139	67700	487	27	66400	2459	197	263100	1336
20	18	13100	728	157	80800	515	30	101500	3383	227	364600	1606
21	17	20000	1176	174	100800	579	33	99800	3024	260	464400	1786
22	12	5900	492	186	106700	574	26	18200	700	286	482600	1687
23	15	7400	493	201	114100	568	25	23400	936	311	506000	1627
24	16	2800	175	217	116900	539	29	17800	614	340	523800	1541
25	17	16400	965	234	133300	570	28	38100	1361	368	561900	1527
26	18	17500	972	252	150800	598	30	33800	1127	398	595700	1497
27	19	7200	379	271	158000	583	31	22900	739	429	618600	1442
28	5	4800	960	276	162800	590	7	18400	2629	436	637000	1461
29												
30												

Table 15. 1980 South Peninsula June sockeye salmon fishery, effort, catch, CPUE, cumulative catch, cumulative effort, and ratio of cumulative catch to cumulative effort for various aggregations of fisheries.

Date Mt. Day	Unimak Purse Seines			Unimak Gill Nets			Combined Unimak Gill Net and Purse Seines (* 1 PS = 3.28 GN)						Cumulative Catch as percent of S. Unimak Quota						
	Boats	Cumulative		Boats	Cumulative		(*) Gill Net Boat Days	Catch	CPUE	Cumulative									
		Catch	CPUE		Effort	Catch				CPUE	(1)	(2)		(1)/(2)					
June 1				1	300	300	1	300	300	1	300	300	1	300	300	0.0%			
2																			
3																			
4																			
5																			
6	1	4100	4100	1	4100	4100				3	4100	1250	4	4400	1028	0.2%			
7	1	5000	5000	2	9100	4550				3	5000	1524	8	9400	1243	0.4%			
8	1	3200	3200	3	12300	4100				3	3200	976	11	12600	1162	0.5%			
9																			
10																			
11																			
12																			
13																			
14																			
15	14	31500	2250	17	43800	2576	61	22000	361	62	22300	360	107	53500	500	118	66100	561	2.6%
16	25	174700	6988	42	218500	5202	79	73000	924	141	95300	676	161	247700	1539	279	313800	1126	12.5%
17	27	206700	7656	69	425200	6162	73	59700	818	214	155000	724	162	266400	1649	440	580200	1318	23.1%
18	40	223600	5590	109	648800	5952	113	88500	783	327	243500	745	244	312100	1278	685	892300	1304	35.5%
19	23	158600	6896	132	807400	6117	77	28300	368	404	271800	673	152	186900	1226	837	1079200	1289	42.9%
20	25	157400	6296	157	964800	6145	82	38900	474	486	310700	639	164	196300	1197	1001	1275500	1274	50.8%
21	39	296800	7610	196	1E+06	6437	92	99000	1076	578	409700	709	220	395800	1800	1221	1671300	1369	66.5%
22	34	192100	5650	230	1E+06	6320	54	40700	754	632	450400	713	166	232800	1406	1386	1904100	1373	75.8%
23	24	85900	3579	254	2E+06	6061	36	21400	594	668	471800	706	115	107300	935	1501	2011400	1340	80.0%
24	38	213000	5605	292	2E+06	6002	67	43800	654	735	515600	701	192	256800	1340	1693	2268200	1340	90.3%
25	36	108800	3022	328	2E+06	5675	81	36600	452	816	552200	677	199	145400	730	1892	2413600	1276	96.0%
26	19	91400	4811	347	2E+06	5628	43	21400	498	859	573600	668	105	112800	1071	1997	2526400	1265	100.5%
27	21	62600	2981	368	2E+06	5477	26	16900	650	885	590500	667	95	79500	838	2092	2605900	1246	103.7%
28	25	52400	2096	393	2E+06	5262	29	30100	1038	914	620600	679	111	82500	743	2203	2688400	1220	107.0%
29	14	17800	1271	407	2E+06	5124	22	7100	323	936	627700	671	68	24900	367	2271	2713300	1195	108.0%
30	4	500	125	411	2E+06	5076	11	2400	218	947	630100	665	24	2900	120	2295	2716200	1183	108.1%

-Continued-

Table 15. 1980 South Peninsula June sockeye salmon fishery, effort, catch, CPUE, cumulative catch, cumulative effort, and ratio of cumulative catch to cumulative effort for various aggregations of fisheries (continued).

Date Mt. Day	Shumagins Purse Seine						Unimak/Shumagins Combined Purse Seines					
	Cumulative						Cumulative					
	Boats	Catch	CPUE	(1) Effort	(2) Catch	(1)/(2) CPUE	Boats	Catch	CPUE	(1) Effort	(2) Catch	(1)/(2) CPUE
June 1												
2												
3												
4												
5												
6							1	4100	4100	1	4100	4100
7							1	5000	5000	2	9100	4550
8							1	3200	3200	3	12300	4100
9												
10												
11												
12												
13												
14												
15	20	57900	2895	20	57900	2895	34	89400	2629	37	101700	2749
16	20	54000	2700	40	111900	2798	45	228700	5082	82	330400	4029
17	23	29800	1296	63	141700	2249	50	236500	4730	132	566900	4295
18	15	33500	2233	78	175200	2246	55	257100	4675	187	824000	4406
19	16	9100	569	94	184300	1961	39	167700	4300	226	991700	4388
20	11	20000	1818	105	204300	1946	36	177400	4928	262	1169100	4462
21	13	32100	2469	118	236400	2003	52	328900	6325	314	1498000	4771
22	5	16900	3380	123	253300	2059	39	209000	5359	353	1707000	4836
23	8	13000	1625	131	266300	2033	32	98900	3091	385	1805900	4691
24	12	5400	450	143	271700	1900	50	218400	4368	435	2024300	4654
25	15	11400	760	158	283100	1792	51	120200	2357	486	2144500	4413
26	17	71400	4200	175	354500	2026	36	162800	4522	522	2307300	4420
27	20	45200	2260	195	399700	2050	41	107800	2629	563	2415100	4290
28	23	43400	1887	218	443100	2033	48	95800	1996	611	2510900	4109
29	22	9500	432	240	452600	1886	36	27300	758	647	2538200	3923
30	23	5400	235	263	458000	1741	27	5900	219	674	2544100	3775

Table 16. 1981 South Peninsula June sockeye salmon fishery, effort, catch, CPUE, cumulative catch, cumulative effort, and ratio of cumulative catch to cumulative effort for various aggregations of fisheries.

Date Mt. Day	Unimak Purse Seines						Unimak Gill Nets						Combined Unimak Gill Net and Purse Seines (* 1 PS = 3.28 GN)						
				Cumulative						Cumulative			(*)			Cumulative			Cumulative
	Boats	Catch	CPUE	(1) Effort	(2) Catch	(1)/(2) CPUE	Boats	Catch	CPUE	(1) Effort	(2) Catch	(1)/(2) CPUE	Gill Net Boat Days	Catch	CPUE	(1) Effort	(2) Catch	(1)/(2) CPUE	Catch as percent of S. Unimak Quota
June 1							3	100	33	3	100	33	3	100	33	3	100	33	0.0%
2							1	300	300	4	400	100	1	300	300	4	400	100	0.0%
3							4	700	175	8	1100	138	4	700	175	8	1100	138	0.1%
4							3	600	200	11	1700	155	3	600	200	11	1700	155	0.1%
5							1	500	500	12	2200	183	1	500	500	12	2200	183	0.2%
6							5	800	160	17	3000	176	5	800	160	17	3000	176	0.2%
7																			
8	2	1200	600	2	1200	600	3	700	233	20	3700	185	10	1900	199	27	4900	184	0.3%
9							9	2900	322	29	6600	228	9	2900	322	36	7800	219	0.5%
10	1	1200	1200	3	2400	800	12	4600	383	41	11200	273	15	5800	380	51	13600	268	0.9%
11	33	23100	700	36	25500	708	91	24000	264	132	35200	267	199	47100	236	250	60700	243	4.2%
12	33	37700	1142	69	63200	916	105	34000	324	237	69200	292	213	71700	336	463	132400	286	9.2%
13	49	79100	1614	118	142300	1206	108	62000	574	345	131200	380	269	141100	525	732	273500	374	19.0%
14	45	34300	762	163	176600	1083	109	95200	873	454	226400	499	257	129500	505	989	403000	408	27.9%
15	28	21400	764	191	198000	1037	125	49400	395	579	275800	476	217	70800	327	1205	473800	393	32.9%
16	17	4600	271	208	202600	974	81	14900	184	660	290700	440	137	19500	143	1342	493300	368	34.2%
17																			
18																			
19	42	105700	2517	250	308300	1233	111	87700	790	771	378400	491	249	193400	777	1591	686700	432	47.6%
20	50	129600	2592	300	437900	1460	109	95200	873	880	473600	538	273	224800	823	1864	911500	489	63.2%
21	46	89700	1950	346	527600	1525	123	122000	992	1003	595600	594	274	211700	773	2138	1123200	525	77.9%
22	50	73300	1466	396	600900	1517	105	48000	457	1108	643600	581	269	121300	451	2407	1244500	517	86.3%
23							22	12100	550	1130	655700	580	22	12100	550	2429	1256600	517	87.1%
24																			
25	5	2700	540	401	603600	1505							16	2700	165	2445	1259300	515	87.3%
26	44	62600	1423	445	666200	1497	102	31100	305	1232	686800	557	246	93700	380	2692	1353000	503	93.8%
27	42	42200	1005	487	708400	1455	23	6600	287	1255	693400	553	161	48800	304	2852	1401800	491	97.2%
28	50	22600	452	537	731000	1361	6	1200	200	1261	694600	551	170	23800	140	3022	1425600	472	98.9%
29																			
30	13	14600	1123	550	745600	1356	3	2100	700	1264	696700	551	46	16700	366	3068	1442300	470	100.0%

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Table 16. 1981 South Peninsula June sockeye salmon fishery, effort, catch, CPUE, cumulative catch, cumulative effort, and ratio of cumulative catch to cumulative effort for various aggregations of fisheries (continued).

Date Mt. Day	Shumagins Purse Seine						Unimak/Shumagins Combined Purse Seines					
	Cumulative						Cumulative					
	Boats	Catch	CPUE	(1)	(2)	(1)/(2)	Boats	Catch	CPUE	(1)	(2)	(1)/(2)
				Effort	Catch	CPUE				Effort	Catch	CPUE
June 1												
2												
3												
4												
5												
6												
7												
8	2	2300	1150	2	2300	1150	4	3500	875	4	3500	875
9												
10	1	1600	1600	3	3900	1300	2	2800	1400	6	6300	1050
11	24	2600	108	27	6500	241	57	25700	451	63	32000	508
12	24	21600	900	51	28100	551	57	59300	1040	120	91300	761
13	25	31200	1248	76	59300	780	74	110300	1491	194	201600	1039
14	23	34800	1513	99	94100	951	68	69100	1016	262	270700	1033
15	19	17500	921	118	111600	946	47	38900	828	309	309600	1002
16	28	46900	1675	146	158500	1086	45	51500	1144	354	361100	1020
17												
18												
19	21	23400	1114	167	181900	1089	63	129100	2049	417	490200	1176
20	21	55500	2643	188	237400	1263	71	185100	2607	488	675300	1384
21	18	35500	1972	206	272900	1325	64	125200	1956	552	800500	1450
22	24	33000	1375	230	305900	1330	74	106300	1436	626	906800	1449
23												
24												
25							5	2700	540	631	909500	1441
26							44	62600	1423	675	972100	1440
27							42	42200	1005	717	1014300	1415
28							50	22600	452	767	1036900	1352
29												
30							13	14600	1123	780	1051500	1348

-Continued-

Table 17. 1982 South Peninsula June sockeye salmon fishery, effort, catch, CPUE, cumulative catch, cumulative effort, and ratio of cumulative catch to cumulative effort for various aggregations of fisheries.

Date Mt. Day	Unimak Purse Seines			Unimak Gill Nets			Combined Unimak Gill Net and Purse Seines (* 1 PS = 3.28 GN)												
	Cumulative			Cumulative			(*) Gill Net Boat Days	Cumulative			Cumulative Catch as percent of S. Unimak Quota								
	Boats	Catch	CPUE	(1) Effort	(2) Catch	(1)/(2) CPUE		(1) Effort	(2) Catch	(1)/(2) CPUE									
June 1																			
2							6	900	150	6	900	150	6	900	150	6	900	150	0.0%
3							5	200	40	11	1100	100	5	200	40	11	1100	100	0.1%
4							9	1600	178	20	2700	135	9	1600	178	20	2700	135	0.1%
5							8	1400	175	28	4100	146	8	1400	175	28	4100	146	0.2%
6							15	3600	240	43	7700	179	15	3600	240	43	7700	179	0.4%
7							16	2400	150	59	10100	171	16	2400	150	59	10100	171	0.5%
8							25	3100	124	84	13200	157	25	3100	124	84	13200	157	0.7%
9							11	1600	145	95	14800	156	11	1600	145	95	14800	156	0.8%
10	1	300	300	1	300	300	16	6900	431	111	21700	195	19	7200	373	114	22000	193	1.2%
11							31	12700	410	142	34400	242	31	12700	410	145	34700	239	1.9%
12							35	13300	380	177	47700	269	35	13300	380	180	48000	266	2.6%
13	1	200	200	2	500	250	21	5700	271	198	53400	270	24	5900	243	205	53900	263	2.9%
14							8	3200	400	206	56600	275	8	3200	400	213	57100	269	3.1%
15	38	69200	1821	40	69700	1743	102	49100	481	308	105700	343	227	118300	522	439	175400	399	9.5%
16	46	65700	1428	86	135400	1574	120	75500	629	428	181200	423	271	141200	521	710	316600	446	17.1%
17	49	75700	1545	135	211100	1564	126	76900	610	554	258100	466	287	152600	532	997	469200	471	25.4%
18	41	46800	1141	176	257900	1465	124	60000	484	678	318100	469	258	106800	413	1255	576000	459	31.1%
19	51	90500	1775	227	348400	1535	116	40700	351	794	358800	452	283	131200	463	1539	707200	460	38.2%
20	8	19800	2475	235	368200	1567	13	3100	238	807	361900	448	39	22900	584	1578	730100	463	39.5%
21	38	49400	1300	273	417600	1530	112	60800	543	919	422700	460	237	110200	466	1814	840300	463	45.4%
22	27	41900	1552	300	459500	1532	108	61600	570	1027	484300	472	197	103500	527	2011	943800	469	51.0%
23	43	94200	2191	343	553700	1614	113	59000	522	1140	543300	477	254	153200	603	2265	1097000	484	59.3%
24	54	83600	1548	397	637300	1605	110	85800	780	1250	629100	503	287	169400	590	2552	1266400	496	68.5%
25	6	3800	633	403	641100	1591	10	4000	400	1260	633100	502	30	7800	263	2582	1274200	494	68.9%
26	41	62300	1520	444	703400	1584	80	58500	731	1340	691600	516	214	120800	563	2796	1395000	499	75.4%
27	30	50500	1683	474	753900	1591	51	24400	478	1391	716000	515	149	74900	501	2946	1469900	499	79.5%
28	19	43600	2295	493	797500	1618	36	12600	350	1427	728600	511	98	56200	572	3044	1526100	501	82.5%
29	40	69300	1733	533	866800	1626	15	10000	667	1442	738600	512	146	79300	542	3190	1605400	503	86.8%
30	49	51700	1055	582	918500	1578	8	8100	1013	1450	746700	515	169	59800	354	3359	1665200	496	90.0%

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Table 17. 1982 South Peninsula June sockeye salmon fishery, effort, catch, CPUE, cumulative catch, cumulative effort, and ratio of cumulative catch to cumulative effort for various aggregations of fisheries (continued).

Date Mt. Day	Shumagins Purse Seine						Unimak/Shumagins Combined Purse Seines					
	Cumulative						Cumulative					
	Boats	Catch	CPUE	(1) Effort	(2) Catch	(1)/(2) CPUE	Boats	Catch	CPUE	(1) Effort	(2) Catch	(1)/(2) CPUE
June 1												
2												
3												
4												
5												
6												
7												
8												
9												
10							1	300	300	1	300	300
11	2	900	450	2	900	450	2	900	450	3	1200	400
12												
13							1	200	200	4	1400	350
14	1	1600	1600	3	2500	833	1	1600	1600	5	3000	600
15	23	14900	648	26	17400	669	61	84100	1379	66	87100	1320
16	19	23800	1253	45	41200	916	65	89500	1377	131	176600	1348
17	26	39600	1523	71	80800	1138	75	115300	1537	206	291900	1417
18	26	21600	831	97	102400	1056	67	68400	1021	273	360300	1320
19	24	41300	1721	121	143700	1188	75	131800	1757	348	492100	1414
20	16	21900	1369	137	165600	1209	24	41700	1738	372	533800	1435
21	23	63100	2743	160	228700	1429	61	112500	1844	433	646300	1493
22	23	96600	4200	183	325300	1778	50	138500	2770	483	784800	1625
23	23	64800	2817	206	390100	1894	66	159000	2409	549	943800	1719
24							54	83600	1548	603	1027400	1704
25							6	3800	633	609	1031200	1693
26	22	46500	2114	228	436600	1915	63	108800	1727	672	1140000	1696
27							30	50500	1683	702	1190500	1696
28							19	43600	2295	721	1234100	1712
29							40	69300	1733	761	1303400	1713
30							49	51700	1055	810	1355100	1673

Table 18. 1983 South Peninsula June sockeye salmon fishery, effort, catch, CPUE, cumulative catch, cumulative effort, and ratio of cumulative catch to cumulative effort for various aggregations of fisheries.

Date Mt. Day	Unimak Purse Seines						Unimak Gill Nets						Combined Unimak Gill Net and Purse Seines (* 1 PS = 3.28 GN)						
				Cumulative						Cumulative						Cumulative			Cumulative Catch as percent of S. Unimak Quota
	Boats	Catch	CPUE	(1) Effort	(2) Catch	(1)/(2) CPUE	Boats	Catch	CPUE	(1) Effort	(2) Catch	(1)/(2) CPUE	(*) Gill Net Boat Days	Catch	CPUE	(1) Effort	(2) Catch	(1)/(2) CPUE	
June 1							9	400	44	9	400	44	9	400	44	9	400	44	0.0%
2	1	100	100	1	100	100	27	3700	137	36	4100	114	30	3800	125	39	4200	107	0.3%
3	2	400	200	3	500	167	35	6700	191	71	10800	152	42	7100	171	81	11300	140	0.8%
4	4	1600	400	7	2100	300	45	7900	176	116	18700	161	58	9500	163	139	20800	150	1.4%
5	4	2700	675	11	4800	436	64	36800	575	180	55500	308	77	39500	512	216	60300	279	4.1%
6	10	27600	2760	21	32400	1543	86	53000	616	266	108500	408	119	80600	678	335	140900	421	9.6%
7																			
8																			
9																			
10																			
11																			
12	41	103400	2522	62	135800	2190	130	96940	746	396	205440	519	264	200340	757	599	341240	569	23.2%
13	57	195600	3432	119	331400	2785	133	93300	702	529	298740	565	320	288900	903	919	630140	685	42.9%
14	59	157900	2676	178	489300	2749	150	140600	937	679	439340	647	344	298500	869	1263	928640	735	63.2%
15																			
16																			
17																			
18																			
19	76	331500	4362	254	820800	3231	139	83700	602	818	523040	639	388	415200	1069	1651	1343840	814	91.5%
20																			
21	88	113400	1289	342	934200	2732	111	74500	671	929	597540	643	400	187900	470	2051	1531740	747	104.3%
22																			
23																			
24																			
25																			
26																			
27																			
28																			
29																			
30																			

-Continued-

Table 18. 1983 South Peninsula June sockeye salmon fishery, effort, catch, CPUE, cumulative catch, cumulative effort, and ratio of cumulative catch to cumulative effort for various aggregations of fisheries (continued).

Date Mt. Day	Shumagins Purse Seine						Unimak/Shumagins Combined Purse Seines					
	Cumulative						Cumulative					
	Boats	Catch	CPUE	(1)	(2)	(1)/(2)	Boats	Catch	CPUE	(1)	(2)	(1)/(2)
				Effort	Catch	CPUE				Effort	Catch	CPUE
June 1												
2	11	1900	173	11	1900	173	12	2000	167	12	2000	167
3	14	1600	114	25	3500	140	16	2000	125	28	4000	143
4	27	7700	285	52	11200	215	31	9300	300	59	13300	225
5	28	11800	421	80	23000	288	32	14500	453	91	27800	305
6	35	6700	191	115	29700	258	45	34300	762	136	62100	457
7												
8												
9												
10												
11												
12	30	89300	2977	145	119000	821	71	192700	2714	207	254800	1231
13	32	85900	2684	177	204900	1158	89	281500	3163	296	536300	1812
14	33	75700	2294	210	280600	1336	92	233600	2539	388	769900	1984
15												
16												
17												
18												
19	22	125000	5682	232	405600	1748	98	456500	4658	486	1226400	2523
20												
21							88	113400	1289	574	1339800	2334
22												
23												
24												
25												
26												
27												
28												
29												
30												

Table 19. 1984 South Peninsula June sockeye salmon fishery, effort, catch, CPUE, cumulative catch, cumulative effort, and ratio of cumulative catch to cumulative effort for various aggregations of fisheries.

Date Mt. Day	Unimak Purse Seines			Unimak Gill Nets			Combined Unimak Gill Net and Purse Seines (* 1 PS = 3.28 GN)														
	Cumulative			Cumulative			Cumulative			(*) Gill Net Boat Days	Cumulative			Cumulative Catch as percent of S. Unimak Quota							
	Boats	Catch	CPUE	(1) Effort	(2) Catch	(1)/(2) CPUE	(1) Effort	(2) Catch	(1)/(2) CPUE		(1) Effort	(2) Catch	(1)/(2) CPUE								
June 1																					
2																					
3	11	5400	491	11	5400	491	85	19800	233	85	19800	233	121	25200	208	121	25200	208		2.3%	
4	33	25400	770	44	30800	700	87	23300	268	172	43100	251	195	48700	249	316	73900	234		6.7%	
5																					
6																					
7																					
8																					
9																					
10																					
11																					
12	47	302800	6443	91	333600	3666	138	162300	1176	310	205400	663	292	465100	1592	608	539000	886		48.5%	
13	8	79900	10653	98.5	413500	4198	21.6	42400	1963	331.6	247800	747	46	122300	2647	655	661300	1010		59.5%	
14																					
15																					
16																					
17																					
18																					
19	77	304900	3960	175.5	718400	4093	130	156600	1205	461.6	404400	876	383	461500	1206	1037	1122800	1082		101.1%	
20																					
21																					
22																					
23																					
24																					
25																					
26																					
27																					
28																					
29																					
30																					

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Table 19. 1984 South Peninsula June sockeye salmon fishery, effort, catch, CPUE, cumulative catch, cumulative effort, and ratio of cumulative catch to cumulative effort for various aggregations of fisheries (continued).

Date Mt. Day	Shumagins Purse Seine						Unimak/Shumagins Combined Purse Seines					
	Cumulative						Cumulative					
	Boats	Catch	CPUE	(1) Effort	(2) Catch	(1)/(2) CPUE	Boats	Catch	CPUE	(1) Effort	(2) Catch	(1)/(2) CPUE
June 1												
2												
3	38	6500	171	38	6500	171	49	11900	243	49	11900	243
4	51	16200	318	89	22700	255	84	41600	495	133	53500	402
5												
6												
7												
8												
9												
10												
11												
12	27	71900	2663	116	94600	816	74	374700	5064	207	428200	2069
13	9	33800	3634	125	128400	1025	16.8	113700	6768	224	541900	2421
14												
15												
16												
17												
18												
19	27	74900	2774	152	203300	1335	104	379800	3652	328	921700	2812
20												
21												
22												
23												
24												
25												
26	62	41400	668	214	244700	1142	62	41400	668	390	963100	2471
27												
28												
29												
30												

Table 20. 1985 South Peninsula June sockeye salmon fishery, effort, catch, CPUE, cumulative catch, cumulative effort, and ratio of cumulative catch to cumulative effort for various aggregations of fisheries.

Date Mt. Day	Unimak Purse Seines			Unimak Gill Nets						Combined Unimak Gill Net and Purse Seines (* 1 PS = 3.28 GN)										
	Boats	Catch	CPUE	Cumulative			Boats	Catch	CPUE	Cumulative			(*) Gill Net Boat Days	Catch	CPUE	Cumulative			Cumulative Catch as percent of S. Unimak Quota	
				(1) Effort	(2) Catch	(1)/(2) CPUE				(1) Effort	(2) Catch	(1)/(2) CPUE				(1) Effort	(2) Catch	(1)/(2) CPUE		
June 1																				
2																				
3	6	344	57	6	344	57	22	2031	92	22	2031	92	42	2375	57	42	2375	57	0.2%	
4																				
5	15	2082	142	20.7	2426	117	68.7	9684	141	90.7	11715	129	117	11766	101	159	14141	89	1.0%	
6																				
7	21	22693	1096	41.4	25119	607	73.3	16528	225	164	28243	172	141	39221	278	300	53362	178	3.9%	
8																				
9	32	41488	1297	73.4	66607	907	172.5	37906	220	336.5	66149	197	277	79394	286	577	132756	230	9.6%	
10																				
11																				
12	46	83157	1808	119.4	149764	1254	97.3	117239	1205	433.8	183388	423	248	200396	807	825	333152	404	24.1%	
13																				
14	42	247404	5891	161.4	397168	2461	96	141623	1475	529.8	325011	613	234	389027	1664	1059	722179	682	52.3%	
15																				
16																				
17																				
18																				
19	47	90607	1916	208.7	487775	2337	96.7	90988	941	626.5	415999	664	252	181595	721	1311	903774	689	65.5%	
20																				
21	47	169115	3575	256	656890	2566	84.7	88967	1050	711.2	504966	710	240	258082	1076	1551	1161856	749	84.2%	
22																				
23	63	253518	4043	318.7	910408	2857	82.7	79592	962	793.9	584558	736	288	333110	1155	1839	1494966	813	108.3%	
24																				
25																				
26																				
27																				
28																				
29																				
30																				

-Continued-

Table 20. 1985 South Peninsula June sockeye salmon fishery, effort, catch, CPUE, cumulative catch, cumulative effort, and ratio of cumulative catch to cumulative effort for various aggregations of fisheries (continued).

Date Mt. Day	Shumagins Purse Seine						Unimak/Shumagins Combined Purse Seines					
	Cumulative						Cumulative					
	Boats	Catch	CPUE	(1) Effort	(2) Catch	(1)/(2) CPUE	Boats	Catch	CPUE	(1) Effort	(2) Catch	(1)/(2) CPUE
June 1												
2												
3	23.3	6584	283	23	6584	283	29.3	6928	236	29	6928	236
4												
5	26	8594	331	49	15178	308	40.7	10676	262	70	17604	251
6												
7	32	41073	1284	81	56251	692	52.7	63766	1210	123	81370	663
8												
9				81	56251	692	32	41488	1297	155	122858	794
10												
11												
12	22	58012	2637	103	114263	1106	68	141169	2076	223	264027	1186
13												
14	21	74039	3577	124	188302	1519	62.7	321443	5127	285	585470	2051
15												
16												
17												
18												
19	19	48311	2583	143	236613	1658	66	138918	2105	351	724388	2061
20												
21	50	58450	1181	192	295063	1535	96.8	227565	2351	448	951953	2124
22												
23							62.7	253518	4043	511	1205471	2360
24												
25												
26	43	24061	563	235	319124	1359	42.7	24061	563	554	1229532	2221
27												
28	30	29116	971	265	348240	1315	30	29116	971	584	1258648	2157
29												
30												

Table 21. Effort, catch of sockeye salmon, catch per unit effort, and relative fishing power of purse seine and gill net vessels fishing in Unimak District, 1977-1985.

Year	Purse Seine			Gill Net			(1)/(2) Relative Efficiency
	Effort (boat days)	Catch (# sockeye)	(1) CPUE (#/boat day)	Effort (boat days)	Catch (# sockeye)	(2) CPUE (#/boat day)	
1977	61	29698	487	610	164165	269	1.81
1978	74	77221	1044	1089	339195	311	3.35
1979	160	474200	2964	983	194500	198	-----
1980	411	2086100	5076	947	630100	665	-----
1981	550	745600	1356	1264	696700	551	2.46
1982	582	918500	1578	1450	746700	515	3.06
1983	342	934200	2732	929	597540	643	4.25
1984	176	718400	4082	462	404400	875	4.66
1985	319	910408	2854	694	584558	842	3.39
				Average			3.28
				Standard Deviation			0.978

Table 22. Relationship between in-season CPUE (no./day) of sockeye salmon for South Peninsula fisheries and Bristol Bay inshore return (millions).

Year	Date of 50 % Unimak Quota	Ratio of Cumulative Catch and Cumulative Effort on Day that Fifty Percent of Unimak Quota Achieved					Unimak/Shum. Combined Seine	Inshore Bristol Bay Return (millions)
		Unimak Seine	Unimak Gill Net	Unimak Combined		Shumagin Seine		
				GN/Seine				
1977	6/18	256	201	174	499	383	9.675	
1978	6/21	781	269	265	289	383	19.878	
1979	6/21	4228	193	489	579	1786	39.871	
1980	6/20	6145	639	1274	1946	4462	62.341	
1981	6/19	1233	491	432	1089	1176	34.525	
1982	6/22	1532	472	469	1778	1625	22.125	
1983	6/13	2785	565	685	1158	1812	45.777	
1984	6/13	3666	663	1010	1025	2421	40.965	
1985	6/14	2461	613	682	1519	2051	36.628	
Correlation Coefficient between In-season CPUE and Bristol Bay Return		0.911	0.655	0.89	0.558	0.893		

Table 23. Evaluation of CPUE forecast based on standard linear regression and based on cross-validation.

Year	Unimak Combined GN/PS Fishery Performance (# sockeye per GN boat day)	Observed Inshore BB Return (millions)	Evaluation Based on Standard Linear Regression			Evaluation Based on Cross Validation Techniques		
			Predicted Return	Residual	Residual Squared	Predicted Return	Residual	Residual Squared
1977	174	9.675	17.445	-7.77	60.373	20.819	-11.144	124.189
1978	265	19.878	21.044	-1.166	1.360	21.394	-1.516	2.298
1979	489	39.871	29.002	10.869	118.135	28.469	11.402	130.006
1980	1274	62.341	60.945	1.396	1.949	59.172	3.169	10.043
1981	432	34.525	27.648	6.877	47.293	26.502	8.023	64.369
1982	469	22.125	29.111	-6.986	48.804	30.163	-8.038	64.609
1983	685	45.777	37.653	8.124	65.999	36.576	9.201	84.658
1984	1010	40.965	50.505	-9.54	91.012	54.107	-13.142	172.712
1985	682	36.628	37.534	-0.906	0.821	37.653	-1.025	1.051
Root Mean Square								8.52
Residual Mean Square					7.71			

Table 24. Worksheet for 1986 in-season forecast of Bristol Bay sockeye salmon return based on CPUE in the combined Unimak gill net and purse seine sockeye fishery.

Date Mt. Day		Fishing Period Length (hr)	No. of Vessels Fishing		Unimak Combined Gill Net and Purse Seines (* 1 PS = 3.28 GN)						CPUE a/ Forecast (millions)
			GN	PS	(*) Gill Net Boat Days	Catch	CPUE	Cumulative			
								(1) Effort	(2) Catch	(2)/(1) CPUE	
June	5										
	6										
	7										
	8										
	9										
	10										
	11	24				8000					
	12										
	13										
	14	16	140	65	235	56000	238	235	56000	238	19.97
	15										
	16	6	140	65	88	24000	272	324	80000	247	20.34
	17										
	18	12	120	68	172	79000	461	495	159000	321	23.26
	19										
	20										
	21	18	110	70	255	62000	243	750	221000	295	22.22
	22										
	23	24	60	65	273	22000	81	1023	243000	237	19.96
	24	24				18000		1023	261000		
	25	24				27500		1023	288500		
	26										
	27										
	28										
	29										
	30										

a/ Forecast based on equation (1) in text.

Table 25. Worksheet for 1987 in-season forecast of Bristol Bay sockeye salmon return based on CPUE in the combined Unimak gill net and purse seine sockeye fishery.

Date Mt. Day		Fishing Period Length (hr)	No. of Vessels Fishing		Unimak Combined Gill Net and Purse Seines (* 1 PS = 3.28 GN)						CPUE a/ Forecast (millions)
			GN	PS	(*) Gill Net Boat Days	Catch	CPUE	Cumulative			
								(1) Effort	(2) Catch	(2)/(1) CPUE	
June	5										
	6										
	7										
	8	40	38	0	63	4330	68	63	4330	68	10.56
	9										
	10	18	150	56	250	9300	37	314	13630	43	12.28
	11	22	150	56	306	18000	59	619	31630	51	12.58
	12										
	13										
	14	18	145	53	239	45300	189	859	76930	90	14.11
	15	22	145	56	301	48700	162	1160	125630	108	14.85
	16										
	17	18	150	85	322	90400	281	1481	216030	146	16.33
	18	16	150	85	286	74300	260	1767	290330	164	17.06
	19										
	20	16	140	65	235	52000	221	2003	342330	171	17.32
	21	24	100	65	313	109600	350	2316	451930	195	18.28
	22	22	100	85	347	70100	202	2663	522030	196	18.32
	23										
	24										
	25	12	100	85	189	51400	271	2853	573430	201	18.51
	26	22	100	65	287	96800	337	3140	670230	213	19.01
	27										
	28										
	29										
	30										

a/ Forecast based on equation (1) in text.

Table 26. Hindcasted performance of forecast based on in-season catch of chum salmon in the South Peninsula June fishery. Note that catches are in thousands.

Year	Sockeye Catch Through 6/21	(1)	(2)	(3)	(3)/(2)	Forecasted a/ Fishing Intensity on BB Sockeye	(4)		Deviation (millions)	
		Preseason S. Penin. Sockeye Quota	Sockeye Catch as % of Quota	Chum Catch Through 6/21	Inseason Forecast of Chum Catch		Forecasted BB Sockeye Return (millions)	Observed BB Sockeye Return (millions)		
1977	201	237	85%	96	113	115	1.87%	12.674	9.675	-2.999
1978	255	522	49%	61	125	123	1.96%	26.701	19.878	-6.823
1979	615	1121	55%	73	133	105	2.02%	55.468	39.871	-15.597
1980	1908	3068	62%	284	457	528	4.09%	75.049	62.341	-12.708
1981	1459	1760	83%	339	409	575	3.80%	46.291	34.525	-11.766
1982	1069	2258	47%	699	1476	1094	9.22%	24.488	22.125	-2.363
1983	1919	1793	107%	782	731	784	6.30%	28.465	45.777	17.312
1984	1326	1356	98%	299	306	337	2.09%	64.787	40.965	-23.822
1985	1457	1706	85%	413	484	479	4.26%	40.094	36.628	-3.466
Root Mean Square									12.839	

a/ Forecast based on cross-validation techniques, where prediction based on regression model estimated by excluding the current year's data.

Table 27. Evaluation of chum salmon catch forecast based on standard linear regression and based on cross-validation.

Year	South Peninsula Chum Catch (thousands)	Observed Intensity of South Peninsula Sockeye Fishery (catch as % of BB ret.)	Evaluation Based on Standard Linear Regression			Evaluation Based on Cross Validation Techniques		
			Predicted Intensity	Residual	Residual Squared	Predicted Intensity	Residual	Residual Squared
1977	115	2.47%	1.92%	0.55%	0.003%	1.87%	0.60%	0.004%
1978	123	2.45%	1.97%	0.48%	0.002%	1.93%	0.52%	0.003%
1979	105	2.16%	1.85%	0.31%	0.001%	1.82%	0.34%	0.001%
1980	528	5.30%	4.58%	0.72%	0.005%	4.53%	0.77%	0.006%
1981	575	5.29%	4.89%	0.40%	0.002%	4.85%	0.44%	0.002%
1982	1094	9.59%	8.24%	1.35%	0.018%	7.22%	2.37%	0.056%
1983	784	4.28%	6.24%	-1.95%	0.038%	6.66%	-2.38%	0.056%
1984	337	3.40%	3.35%	0.05%	0.000%	3.35%	0.05%	0.000%
1985	479	4.89%	4.27%	0.63%	0.004%	4.23%	0.66%	0.004%
							Root Mean Square	1.21%
Residual Mean Square					0.96%			

Table 28. Worksheet for 1986 in-season forecast of Bristol Bay sockeye salmon return based on catch of chum salmon in the South Peninsula June fishery. Note that in 1986 the fishery was managed for a quota of 400 thousand chum salmon and sockeye catches projected based on the fraction of chum quota attained to date.

Date Mt. Day	Sockeye			Projected a/ End of Season Catch	Chum			Projected b/ End of Season Catch	Chum /c Catch Forecast (millions)
	Unimak Daily	Shumagin Daily	Total Cumul.		Unimak Daily	Shumagin Daily	Total Cumul.		
June 5									
6									
7									
8									
9									
10									
11	8000	6000	14000	350000	13000	3000	16000	400000	9.29
12									
13									
14	56000	26000	96000	412903	55000	22000	93000	400000	10.95
15									
16	24000	25000	145000	414286	33000	14000	140000	400000	10.99
17									
18	79000	13000	237000	398319	86000	12000	238000	400000	10.57
19									
20									
21	62000	23000	322000	460000	31000	11000	280000	400000	12.20
22									
23	22000	23000	367000	489333	7000	13000	300000	400000	12.98
24	18000	12000	397000	508974	4000	8000	312000	400000	13.50
25	27500	24810	449310	449310	9000	13302	334302	334302	13.43
26									
27									
28									

- a/ Projected end of season catch = catch to date / fraction of chum quota achieved to date.
b/ Projected end of season catch = chum quota or end of season catch.
c/ Forecast based on expansion of projected sockeye catch by forecasted rate of exploitation (equation 4) realized by the South Peninsula fishery.

Table 29. Worksheet for 1987 in-season forecast of Bristol Bay sockeye salmon return based on catch of chum salmon in the South Peninsula June fishery.

Date Mt. Day	Sockeye			Projected a/ End of Season Catch	Chum			Projected b/ End of Season Catch	Chum /c Catch Forecast (millions)
	Unimak Daily	Shumagin Daily	Total Cumul.		Unimak Daily	Shumagin Daily	Total Cumul.		
June 5									
6									
7									
8	4330		4330	775000	4000		4000	715935	13.35
9									
10	9300	31900	45530	775000	10000	9100	23100	393202	20.80
11	18000		63530	775000	23000		46100	562372	16.09
12									
13									
14	45300	27600	136430	775000	22800	6900	75800	430587	19.54
15	48700		185130	775000	27200		103000	431183	19.52
16									
17	90400		275530	775000	66400		169400	476482	18.18
18	74300		349830	775000	64800		234200	518838	17.09
19									
20	52000	55300	457130	775000	21500	13300	269000	456052	18.76
21	109600		566730	775000	51100		320100	437735	19.31
22	70100		636830	775000	43100		363200	442002	19.18
23									
24									
25	51400		688230	775000	32000		395200	445026	19.09
26	96800	30400	815430	815430	54600	8400	458200	458026	19.68
27									
28									

a/ Projected end of season catch = sockeye quota
b/ Projected end of season catch = catch to date / fraction of sockeye quota achieved to date.
c/ Forecast based on expansion of projected sockeye catch by forecasted rate of exploitation (equation 4) realized by the South Peninsula fishery.

Table 30. Evaluation of forecast based on a pooling of the chum salmon catch and CPUE forecast.

Year	Observed Bristol Bay Return	Chum Catch Forecast Evaluation Based on Cross Validation Techniques			CPUE Forecast Evaluation Based on Cross Validation Techniques			Pooled Estimate Based on Sum Weighted by Inverse of Root Mean Square		
		Predicted Return	Residual Squared	Residual Squared	Predicted Return	Residual	Residual Squared	Predicted Return	Residual	Residual Squared
1977	9.675	12.674	-2.999	8.993	20.819	-11.144	124.189	18.406	8.731	76.226
1978	19.878	26.701	-6.823	46.550	21.394	-1.516	2.298	22.966	3.088	9.538
1979	39.871	55.468	-15.597	243.254	28.469	11.402	130.006	36.468	-3.403	11.579
1980	62.341	75.049	-12.708	161.491	59.172	3.169	10.043	63.876	1.535	2.356
1981	34.525	46.291	-11.766	138.449	26.502	8.023	64.369	32.365	-2.160	4.665
1982	22.125	24.488	-2.363	5.582	30.163	-8.038	64.609	28.481	6.356	40.405
1983	45.777	28.465	17.312	299.711	36.576	9.201	84.658	34.173	-11.604	134.657
1984	40.965	64.787	-23.822	567.506	54.107	-13.142	172.712	57.271	16.306	265.898
1985	36.628	40.094	-3.466	12.013	37.653	-1.025	1.051	38.376	1.748	3.056
1986	23.883	19.31	4.573	20.912	23.26	0.623	0.388	22.090	-1.793	3.216
1987	25.912	12.2	13.712	188.019	18.28	7.632	58.247	16.479	-9.433	88.989
		Root Mean Square		12.404			8.049			7.806

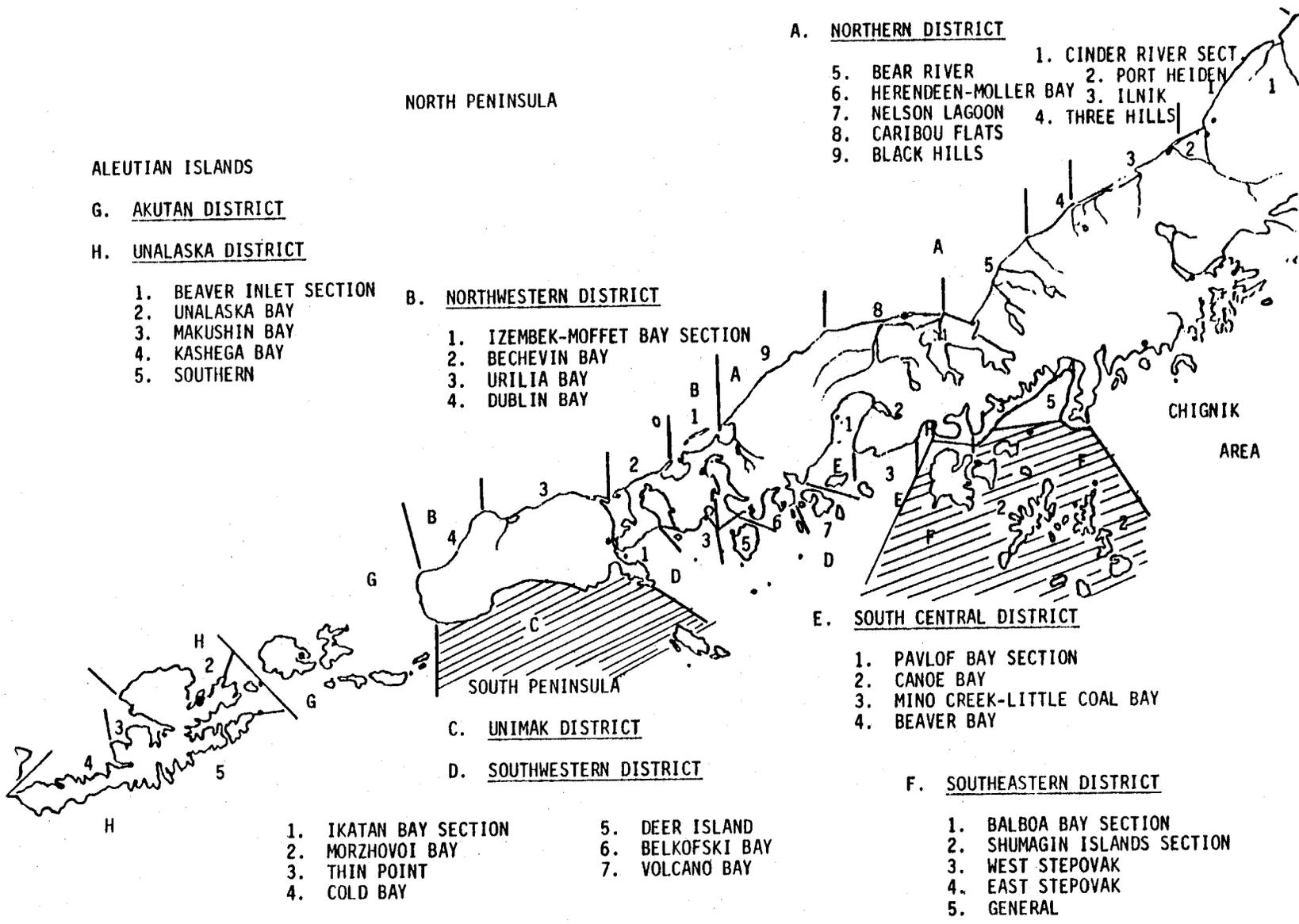


Figure 1. South Peninsula fishing districts (stippled area are the Ikutan Bay section of Southeastern District, Unimak District, and the Shumagin Section of the Southeastern District).

Evolution of CPUE, Inseason, for South Unimak
Combined PS/GN Fishery, 1977 - 1985

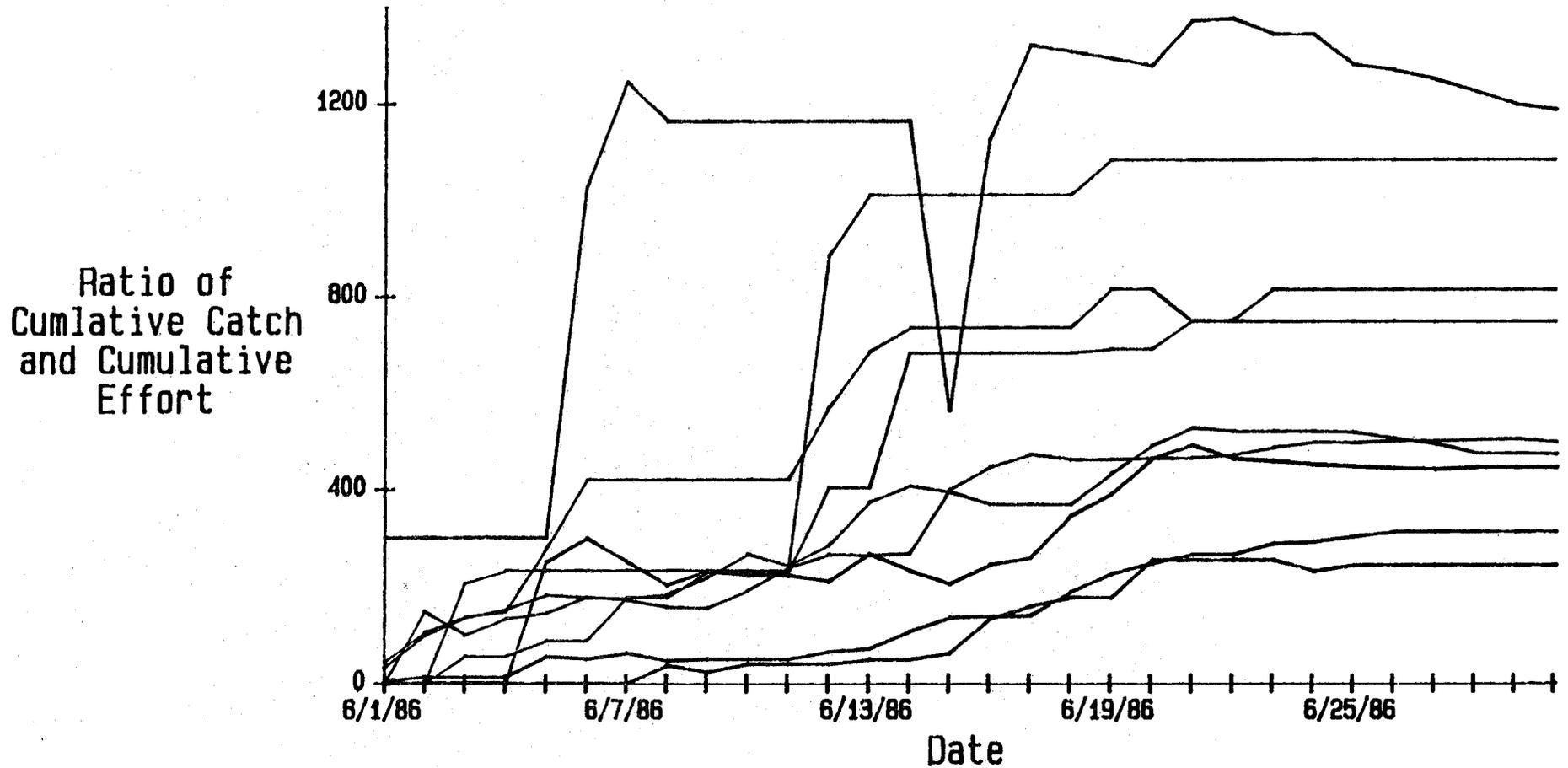


Figure 2. Ratio of cumulative sockeye salmon catch to cumulative effort for the combined South Unimak June purse seine/gill net fishery, as it has evolved in-season, 1977-1985.

South Peninsula June Fishery (all gears)
 Catch of Sockeye (percent of Bristol Bay Inshore Return)
 versus catch of Chums, 1962 - 87

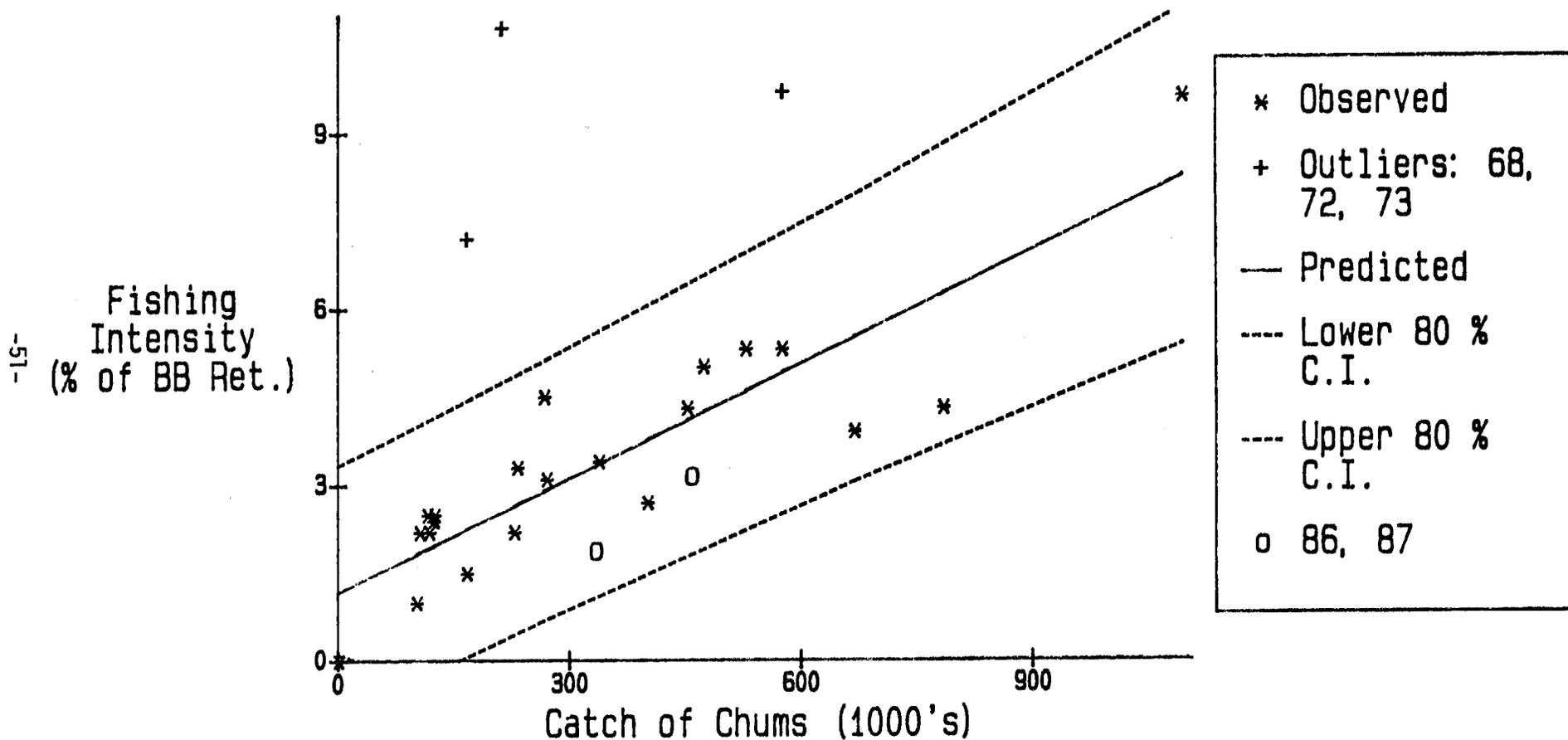


Figure 3. Relationship between the fishing intensity of the South Peninsula fisheries (catch of sockeye salmon as a percent of the inshore Bristol Bay return) and the catch of chum salmon (thousands) in the South Peninsula June fisheries. Shown are the observed and the predicted including the 80% confidence interval based on regression model with bias correction (described in the text).

Catch of Sockeye (percent of Bristol Bay Inshore Return)
versus Catch of Chums, 1977 - 1985

o	S. Unimak Purse Seine	+	S. Unimak Gill Net	*	Shumagin Purse Seine
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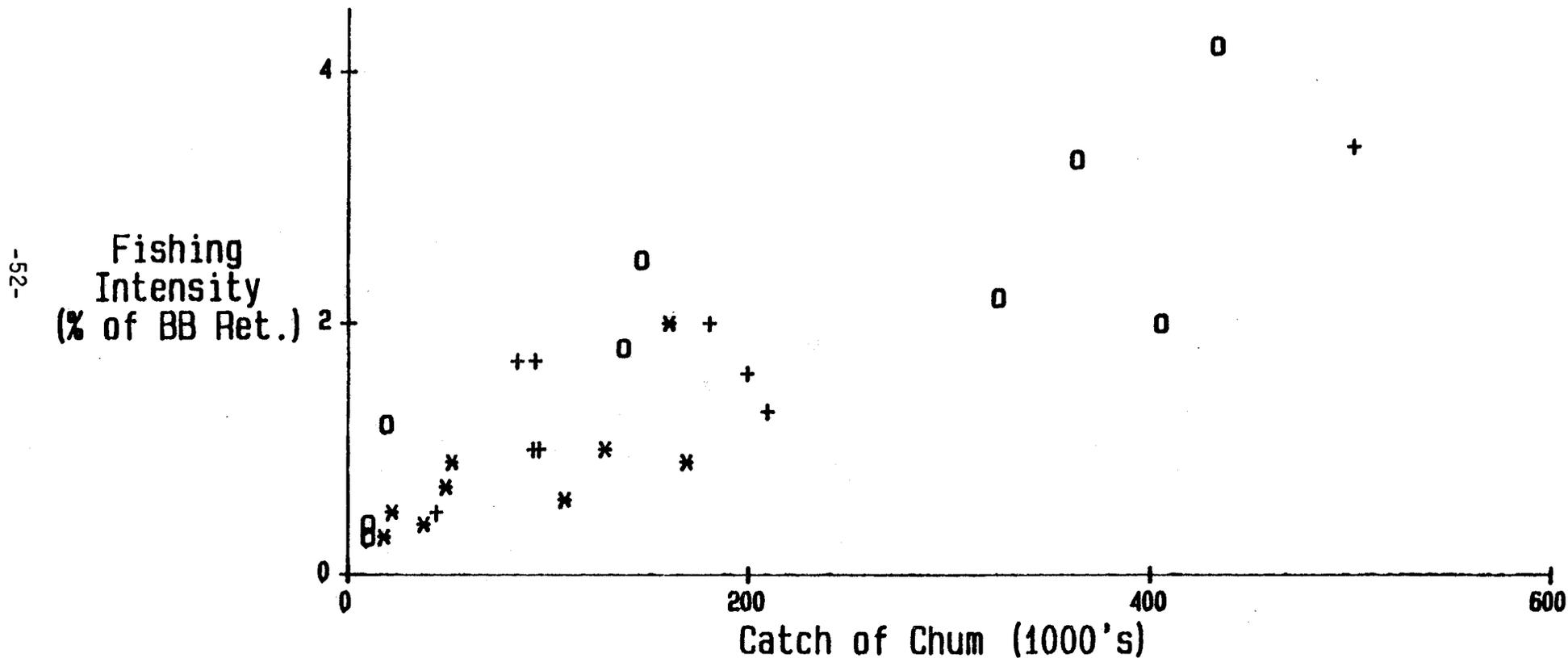


Figure 4. Relationship between the fishing intensity of the South Unimak purse seine, South Unimak gill net, and Shumagin purse seine fisheries (catch of sockeye salmon in the respective fishery as a percent of inshore Bristol Bay return) and the catch of chum salmon in the respective fishery (thousands).

Bristol Bay Return versus Performance of Unimak Combined GN/PS Fishery

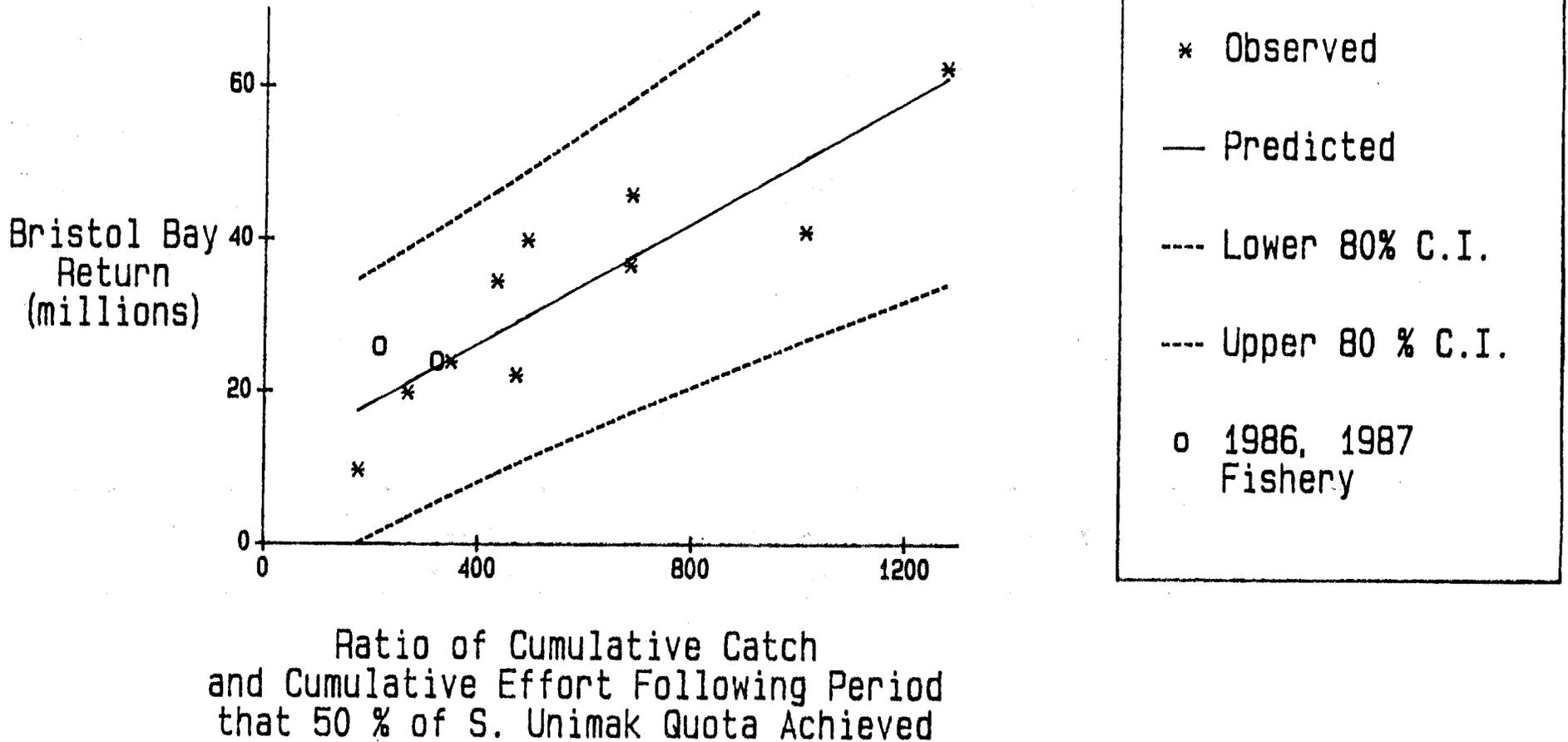


Figure 5. Relationship between Bristol Bay inshore return (millions of sockeye salmon) and the ratio of cumulative sockeye catch to cumulative effort (gill net equivalent boat/days) at the midpoint of the South Unimak June fishery. Shown are the observed and the predicted including the 80% confidence interval based on regression model with bias correction (described in the text).

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