

Informational Leaflet 65

FORECAST RESEARCH ON 1965 CENTRAL ALASKA PINK SALMON FISHERIES

By:

Robert S. Roys
Division of Commercial Fisheries
Cordova, Alaska

Allen S. Davis
Division of Commercial Fisheries
Homer, Alaska

Wallace H. Noerenberg
Division of Commercial Fisheries
Juneau, Alaska

July 14, 1965

STATE OF ALASKA
WILLIAM A. EGAN - GOVERNOR
DEPARTMENT OF
FISH AND GAME
WALTER KIRKNESS - COMMISSIONER
SUBPORT BUILDING, JUNEAU



TABLE OF CONTENTS

	Page
Background	1
Objectives	1
Methods	2
Results	2
Prince William Sound Pink and Chum Salmon Forecast	4
Cook Inlet Area Pink Salmon Forecast Studies ...	20
Kodiak Area Pink Salmon Forecast Studies	26
Literature Cited	28
Appendix	29

FORECAST RESEARCH ON 1965 CENTRAL ALASKAN
PINK SALMON FISHERIES

by

Robert S. Roys
Alaska Department of Fish and Game
Division of Commercial Fisheries
Cordova, Alaska

Allen S. Davis
Alaska Department of Fish and Game
Division of Commercial Fisheries
Homer, Alaska

Wallace H. Noerenberg
Alaska Department of Fish and Game
Division of Commercial Fisheries
Juneau, Alaska

BACKGROUND

This is the third report discussing the Department's expanded pink salmon forecast studies throughout Alaska. Informational Leaflet #36, issued in March 1964, dealt with the initial year of extensive pre-emergent fry (alevin) sampling at Kodiak, outer Cook Inlet and Southeastern Alaska, as well as the third forecast of Prince William Sound pink and chum salmon runs. Informational Leaflet #47, (Hoffman, January 1965), dealt with pre-emergent fry studies in Southeastern Alaska in 1964, which give much evidence of probable areas of adult abundance in the 1965 run. However, the short history of these studies has not permitted establishment of sufficient fry abundance - adult abundance relationships to enable firm forecasts except in the case of Prince William Sound.

Recent pink salmon runs appearing on odd-numbered years have been notably smaller than those of even-numbered years throughout Central Alaska. As seen in Figure 1, this differential cycle strength has always persisted in the Cook Inlet fishery but has been evident only since 1949 in the Kodiak and Prince William Sound fisheries.

OBJECTIVES

In each of the three central Alaska areas under study, development of reliable pre-emergent fry indices for use in adult forecasting has been the primary objective.

Secondary objectives have been as follows:

- 1) Improvement of accuracy of escapement enumeration information,

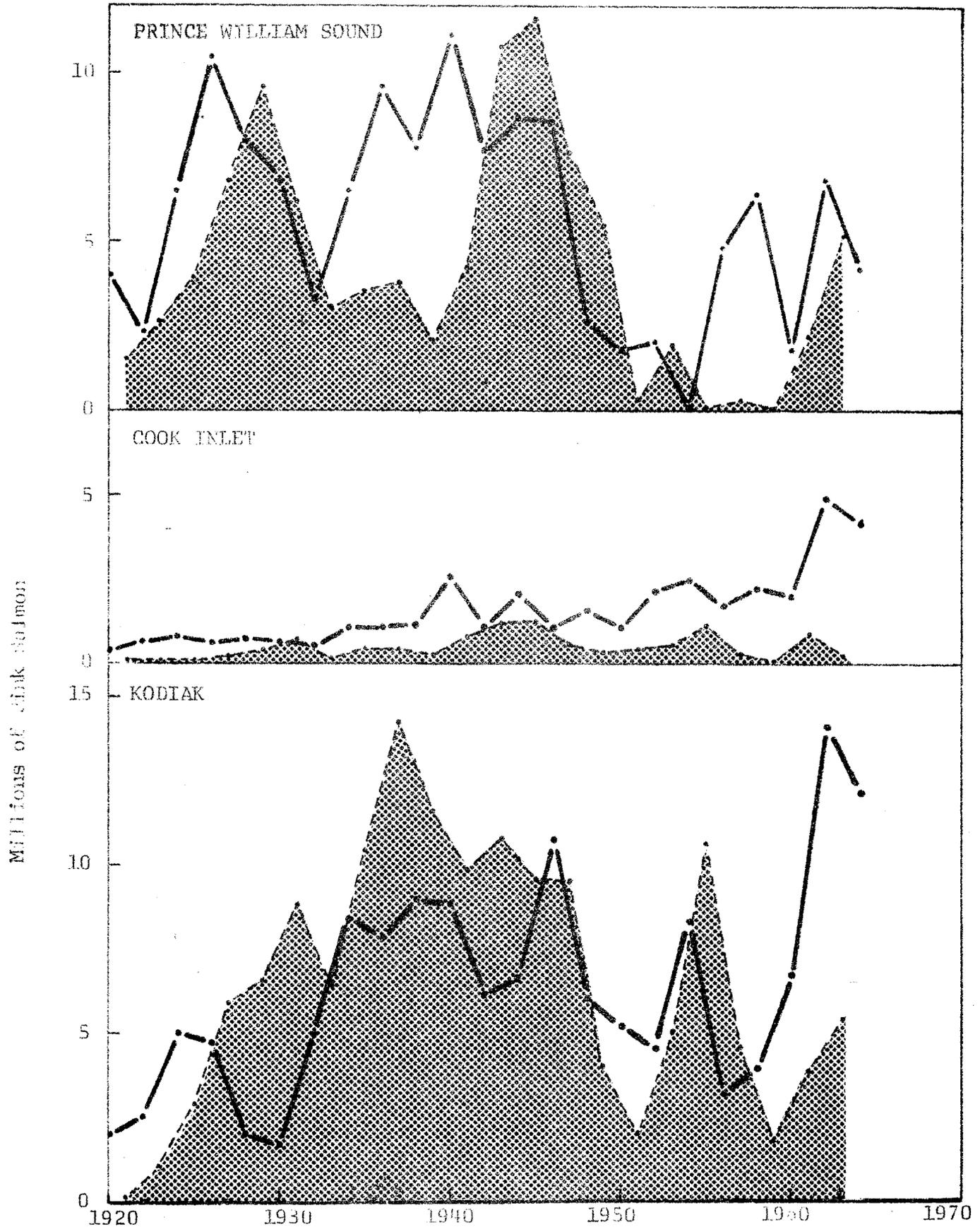


Figure 1. Odd and Even-Year Commercial Catches of Pink Salmon in Central Alaska Areas. Even-Year Catch Solid Line; Odd-Year Catches Broken Line (Shaded).

especially in those streams under study for pre-emergent fry and distribution abundance.

2) Expansion of optimum escapement research by instituting egg sampling during the early fall. The pinpointing of actual egg depositions will shed light on initial spawning success of escapements of variable size. Losses from this source may equal or exceed losses from egg to fry stages.

METHODS

The pre-emergent fry and estuarine study methods in all areas were thoroughly described in Informational Leaflets #21 and #36. No change in procedures in the three Central Alaska areas were made in 1964. In each area we have attempted to increase the number of random points obtained from each stream where previous sampling appeared inadequate for the spawning area involved. The number of sample points per stream has been gradually adjusted to be proportional to the size of the spawning areas.

In reporting results of the 1964 pre-emergent fry sampling, all tables and figures have been converted into the metric system, as used by other agencies doing similar work. Thus, fry densities are reported in terms of fry (or alevins) per square meter, an area 10.75 times as large as the square foot standard used in previous reports.

RESULTS

Separate reports on Prince William Sound, Cook Inlet and Kodiak area contained on the following pages. An appendix giving detailed Prince William Sd. spawning ground counts and age analysis of chum salmon is attached at the rear of the three reports.

FORECAST OF THE 1965 PRINCE WILLIAM SOUND PINK AND
CHUM SALMON RUNS

by

Robert S. Roys^{1/}

and

Wallace H. Noerenberg^{2/}
Division of Commercial Fisheries

INTRODUCTION

This is the fourth report on salmon forecast studies in Prince William Sound. Noerenberg (61, 63, 64) forecast pink salmon runs in Prince William Sound by analysis of data collected annually from three successive life history stages: (1) relationship of indexed spawners to return, (2) relationship of indexed alevin (pre-emergent fry) abundance to return, and (3) relationship of indexed early-stage fry abundance in the estuarine environment to return. In this report, data from these three applied studies will be analysed and our best estimate of the 1965 pink and chum salmon run will be finalized.^{3/}

Reliability of Three Forecast Indices

Theoretically, our forecast estimates obtained from data collected during earlier stages of the life history (escapement index) should be less reliable than estimates obtained from data collected in later life history stages (alevin and estuarine fry). This is assuming of course that all three sampling programs (escapement, alevin and estuarine fry) are providing true indices to relative abundance.

Deviations from the average expected return from a given escapement index would depend on how much the following applicable factors varied: (1) potential and actual egg deposition (2) over-winter survival (in the gravel) (3) estuarine survival and (4) ocean survival. Deviations from the average expected return from an alevin index, however, should be less than in the case of the escapement index as the freshwater survival (1 & 2) is reflected in the alevin density and only the variations of the estuarine and ocean stages of development would apply. Therefore, a late estuarine index to abundance should reflect a true abundance after freshwater and initial saltwater mortality have occurred and yield an index for forecasting pink runs that would be more precise than either an escapement index or an alevin index.

^{1/} Fishery Biologist, Cordova, Alaska

^{2/} Assistant Division Director, for Research, Juneau, Alaska

^{3/} A preliminary forecast of the 1965 pink run in Prince William Sound was made in Informational Leaflet #43 - Noerenberg and Ossiander.

In Figure 2 the history and relative accuracy of the three indices that have been used to forecast the Prince William Sound pink salmon runs are shown. In Table 1, the differences between the mean forecast estimates and actual returning runs have been converted from numbers of fish to percent deviations for the years 1962, 1963 and 1964.

From Table 1 it is apparent that thus far the alevin (pre-emergent fry) sampling program has yielded the most reliable index. This is particularly true on the even-numbered years, as evidenced by only a 1.1% difference between the forecast and the actual return in 1962, and only .1% difference in 1964. Noerenberg (1964) suggested that alevin sampling on even-numbered year runs would probably provide a better index to actual alevin abundance in the stream gravels than sampling on odd-year runs since 70 to 77 percent of even-year pinks spawn in easily sampled intertidal locations. However, in the odd-years, 50 to 70 percent of the pinks spawn in upstream areas where ice and snow in March and April often inhibit comprehensive sampling. This problem was recognized and in the 1963 forecast report it was stated that the intertidal alevin index was probably underestimating the 1963 run. This was the case as the forecast in 1963 was 21.2% low (Table 1).

From Table 1 and Figure 2 it also is apparent that our escapement indices have yielded returns that have varied considerably and are not as precise as the alevin index. Furthermore, the estuarine-beach count index, which should be the most precise, is the most unreliable (92% high in 1963 and 52% low in 1964) and is undoubtedly a result of sampling techniques that are not providing a true index to abundance. The Department is in the process of revamping the estuarine sampling program in an effort to develop a usable index of abundance.

TABLE 1. PERCENT ACCURACY OF THREE PINK SALMON FORECAST INDICES IN PRINCE WILLIAM SOUND, 1962-1964

Year of Return	1962	1963	1964
Escapement Index ^{1/}	27.3% Low	25.0% High	18.9% High
Pre-emergent Fry Index (Intertidal)	1.1% High	21.2% Low	0.1% Low
Estuarine-Beach Counts	--	92.4% High	52.1% Low

^{1/} Linear regression 1962 & 1964 - logistic curve 1963. Linear regression in 1963 was 228% high.

As a result of the history and relative success of the three forecast indices - escapement, alevin, and estuarine fry - it is concluded that the alevin index (pre-emergent fry) is the most reliable to date and the pink salmon forecast for 1965 will be based on this index. However, certain escapement data will be used in order to establish the timing and relative magnitude

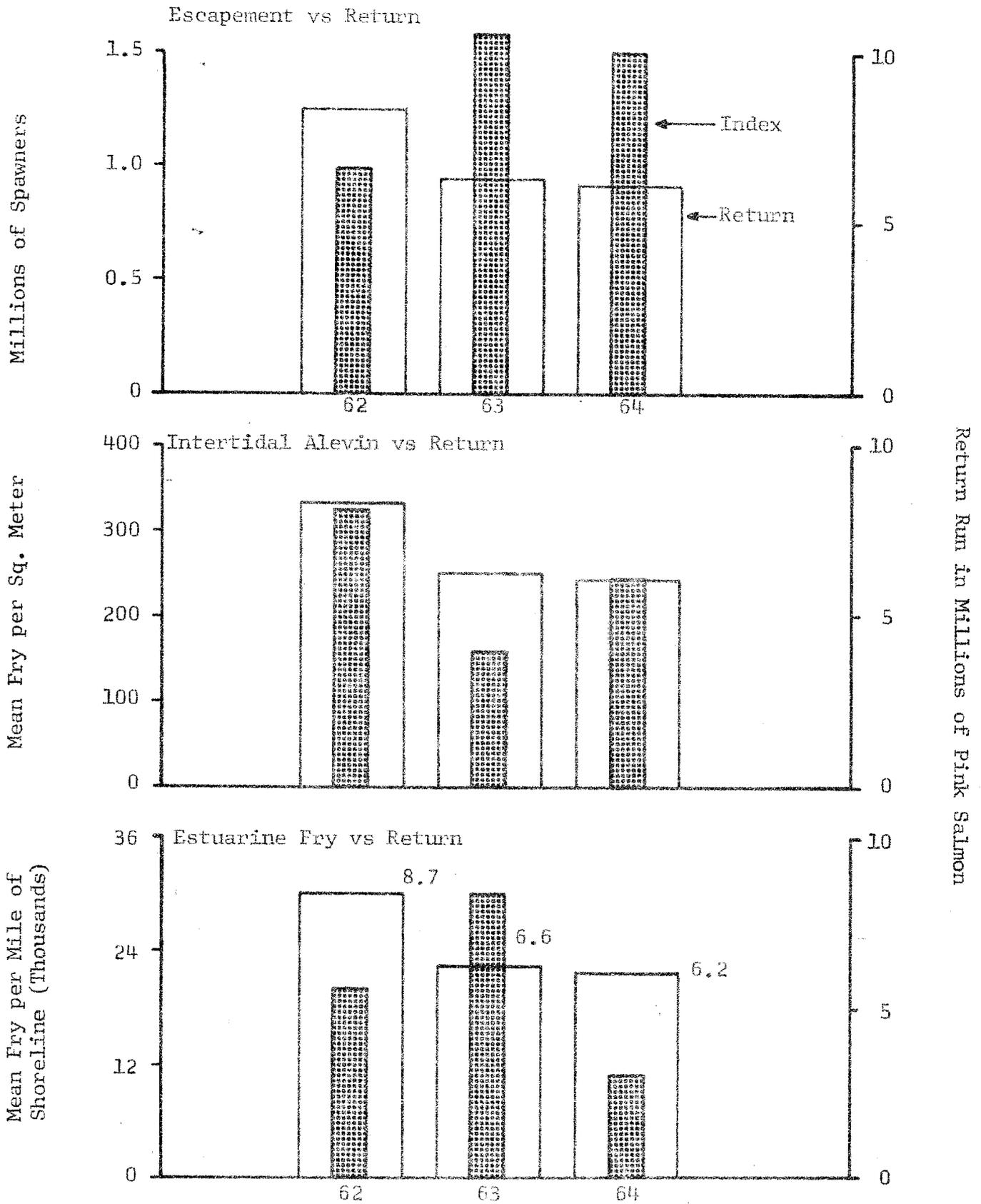


Figure 2. Comparison of three forecast indices and actual returning run - 1962-1964.

of the District runs.^{1/}

Total Pink Salmon Run Estimate Using Alevin Index (Pre-emergent fry) for 1965

As was mentioned in the section on Reliability of Forecasts, the pre-emergent fry index on the even years has been exceptionally precise, and it was also pointed out that odd-year forecasts from this index would vary more, due to inability to adequately sample the important upstream zones in some years. However, if we had weighted our samples collected from the intertidal and freshwater zones in the spring of 1962 by the percentage of total spawners utilizing these two zones (Table 2) our forecast estimate in 1963 would have been approximately 13% low instead of 21% low. The linear relationship between alevin per square meter and the returning run one year later is illustrated in Figure 3. Calculations from this regression indicates that the pink return in 1965 should be in the neighborhood of 4.1 million pinks, but may vary from a low of about 2.7 million to a high of 5.7 million (calculated 10% error of fry samples means and 95% confidence interval of returns about fitted line). Distribution of sample streams and abundance is shown in Figure 4.

Relative Abundance of Alevins (Pre-emergent fry) by Spawning Zone and Timing

Although we have only two odd-year cycles for comparison in Table 3, pre-emergent fry densities are listed for the early, middle and late run streams as well as by intertidal and freshwater spawning zones. One weakness in the data collected thus far is that most of the upstream or freshwater zone samples have been taken in a limited area immediately above high tide. However, it is interesting to note that in the freshwater zones, early, middle and late groups on the average have yielded higher fry densities.

^{1/} Pink salmon escapement counts by stream and district are in Appendix A.

Prince William Sound Pink Salmon Regression of Alevin Index
and Return

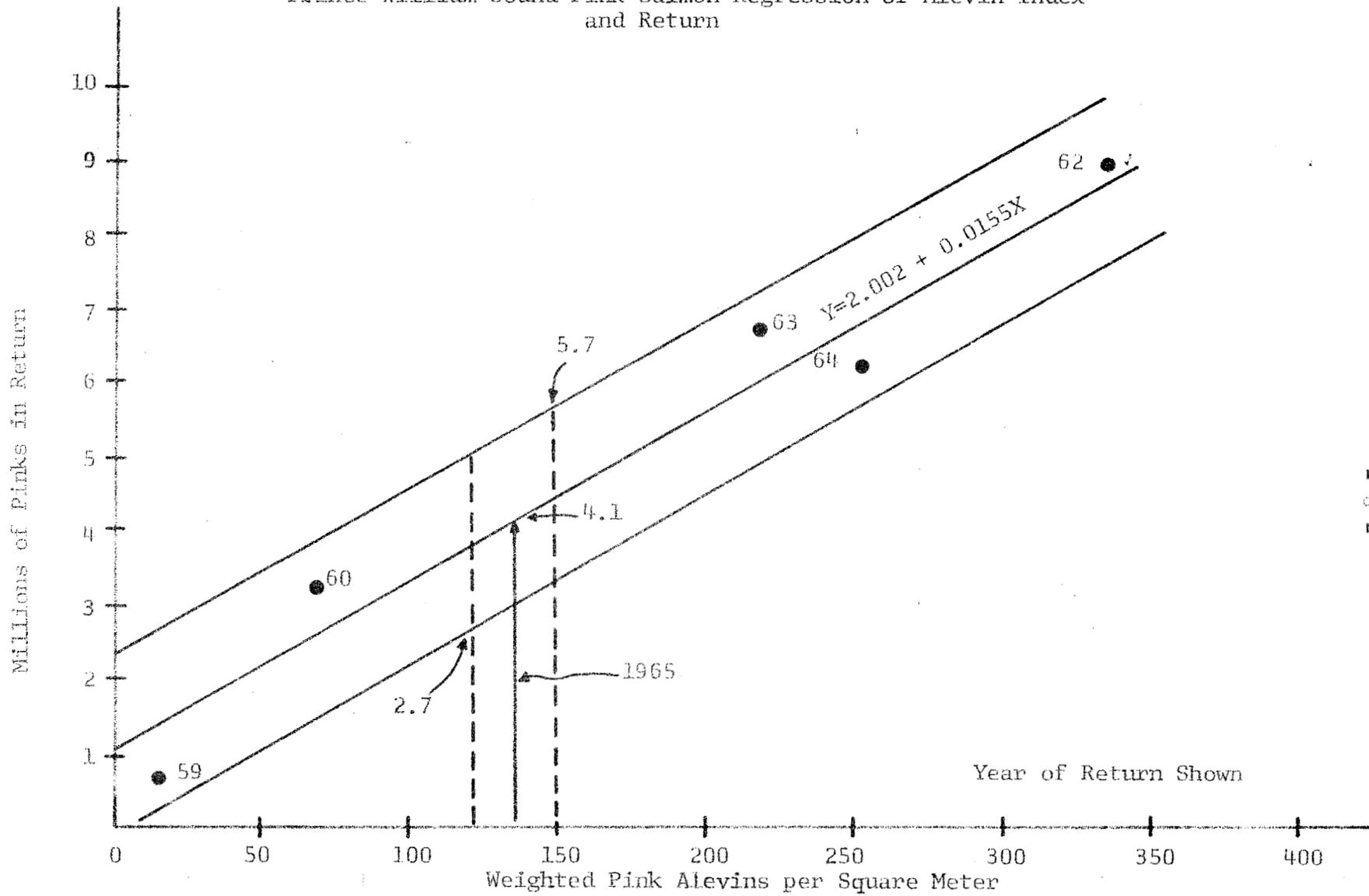


Figure 3. Relationship Between Pre-emergent Pink Salmon Fry (Alevins) and Return Run One Year Later

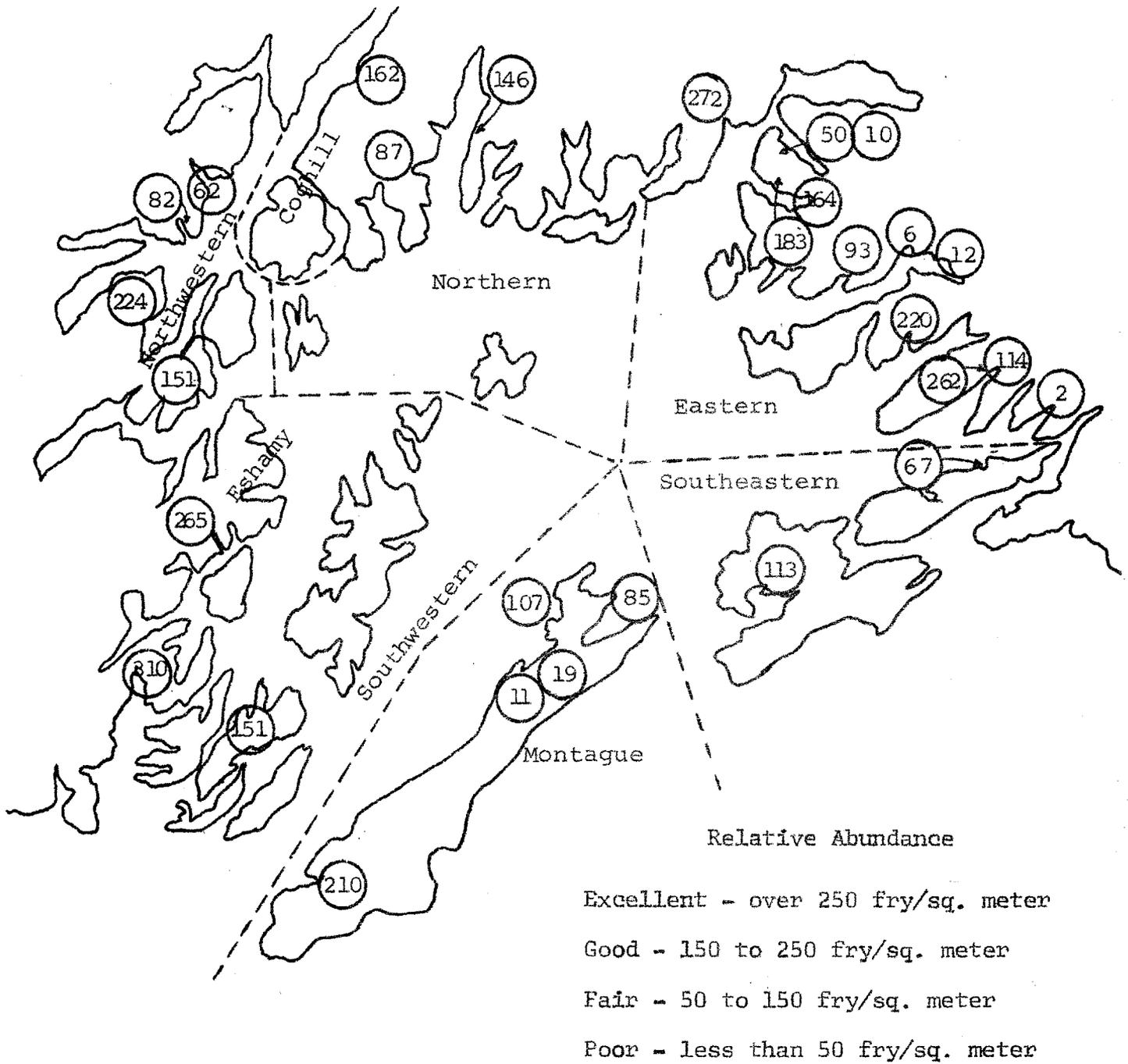


Figure 4. Mean Pink Salmon Fry Per Square Meter in 29 Streams Sampled in April, 1964.

TABLE 2. WEIGHTED RESULTS OF PRE-EMERGENT PINK SALMON FRY SAMPLING 1958 - 1963

Year of Spawning	Number and Percent of Intertidal Spawners		Number and Percent of Upstream Spawners		Resultant Alevins Densities per Sq. Meter ^{1/}			Return Run (Catch & Escapement) in Millions
					6-12' Int. Zone ^{2/}	Upstream Zone ^{3/}	Weighted	
1957	55,900	43%	74,100	57%	11.8	(14.1)	13.1	.601
1958	652,100	76%	204,900	24%	64.9	(77.4)	67.9	3.190
1959	342,600	57%	258,400	43%	No Sampling			4.500
1960	1,038,000	77%	310,000	23%	331.4	339.8	333.4	8.822
1961	771,400	35%	1,432,600	65%	158.0	247.9	216.4	6.600
1962	1,413,300	70%	605,700	30%	246.4	269.0	253.2	6.190
1963	618,700	46%	726,300	54%	114.5	157.7	137.8	--

Year of Sampling	X	Y	N=5	
1958	13.1	.601	$\Sigma X = 884.0$	$\bar{X} = 176.8$
1959	67.9	3.190	$\Sigma Y = 23.713$	
1961	333.4	4.500	$\Sigma XY = 5304.9749$	$\bar{Y} = 4.74$
1962	216.4	8.822	$\Sigma X^2 = 226876.78$	
1963	253.2	6.600	$\Sigma Y^2 = 152.174989$	

^{1/} Square-yard samples in 1958, 1959 and 1961; 3-square foot samples in 1962, 1963 and 1964.

^{2/} Samples from 4'-6' tide stratum eliminated for years 1961 and 1962; adjustment estimated for years 1958 and 1959.

^{3/} No upstream samples taken on 1957 and 1958 fry population; estimated from observed ratios of 1960-1963 samples.

Source: 1957-1958, Kirkwood (1962); 1960-1963 ADF&G Annual Reports

TABLE 3. PRE-EMERGENT FRY DENSITIES PER SQUARE METER IN THE INTERTIDAL AND FRESHWATER SPAWNING ZONES OF EARLY, MIDDLE AND LATE STREAMS.

Timing of Escapement	Year of Sampling	INTERTIDAL ZONE			FRESHWATER ZONE			ALL ZONES
		Number Streams	Number Samples	Fry Per Sq. Meter	Number Streams	Number Samples	Fry Per Sq. Meter	Fry Per Sq. Meter
Early	1962	7	226	138.14	3	50	224.33	171.89
	1964	5	98	94.49	7	136	178.77	143.41
Middle	1962	9	222	143.73	5	123	267.57	187.91
	1964	5	108	179.63	7	179	154.26	163.83
Late	1962	16	423	152.54	9	70	158.89	130.94
	1964	16	392	107.07	10	200	150.07	121.58

The fry densities of middle run streams are comparatively higher in the intertidal zone compared to early and late streams. These differing fry densities in 1962 and 1964 could be a function of sampling error, dissimilar spawning densities, varied over-winter mortalities in the gravel, or possibly timing difference in outmigration. In 1964 we must add a fourth factor. That is, the earthquake and subsequent tsunamic action.

Timing of Run as Determined by Pre-emergent Fry Index

By weighting the pre-emergent indices in 1962 for the early, middle and late run streams by the early, middle and late run escapement indices (1961) it is possible to arrive at a rough approximation of the relative size of the early, middle and late runs in 1963 (Table 4). Likewise by multiplying the percentages obtained from 1964's fry densities and 1963's escapement, (16.6% early, 22.1% middle and 61.3% late) by the 4.1 total forecast from pre-emergent fry sources (Figure 3) the returning run in 1965 should approximate:

1. Early 682,000 (mid July)
2. Middle 908,000 (late July)
3. Late 2,519,000 (early August)

If our run returns in the upper range (4.1 to 5.7) or in the lower range (4.1 to 2.7) then these estimates would be higher or lower accordingly. Also, from Table 4 it appears as if our early and middle run segment will be less important in 1965 than in 1963 in its percentage contribution to the total run. The late run will probably comprise a larger percent of the total run in 1965 than in 1963. There is a distinct possibility (Figure 4) that earthquake and tsunamic action may have contributed to this disproportionate weakening of the early and middle runs, particularly since a significant number of early and middle run streams are located in areas where the greatest tidal disturbances were noted (Figure 5).

TABLE 4. ESTIMATED TIMING OF RUNS - PRINCE WILLIAM SOUND 1963 AND 1965

Year Fry Sampled	No. of Streams Sampled	No. of Samples	Mean Fry Densities		Escapement in Previous Year	Weighted	Percent Return Run	
			Per sq. ft.	Per sq. meter				
EARLY RUN STREAMS								
1961	7	150	22.87	245.85				
1962	7	329	13.81	171.89	376,000	64,630,640	24.7	
1963	9	281	25.09	269.72				
1964	7	234	13.34	143.41	160,000	23,519,240	16.6	
MIDDLE RUN STREAMS								
1961	5	105	26.80	288.10				
1962	7	247	24.91	187.91	356,000	66,895,960	25.6	
1963	8	261	32.04	344.43				
1964	7	287	15.24	163.83	190,000	31,127,700	22.1	
LATE RUN STREAMS								
1961	17	297	35.68	383.56				
1962	17	538	14.36	130.94	994,000	130,154,360	49.7	
1963	21	583	19.04	204.68				
1964	16	592	11.31	<u>121.58</u>	<u>711,000</u>	<u>86,443,380</u>	<u>61.3</u>	
TOTALS					Escapement Year 1961	1,726,000	261,680,960	100.00
					Escapement Year 1963	1,061,000	141,090,320	100.00

Escapements are for timing segments and are not for streams sampled.

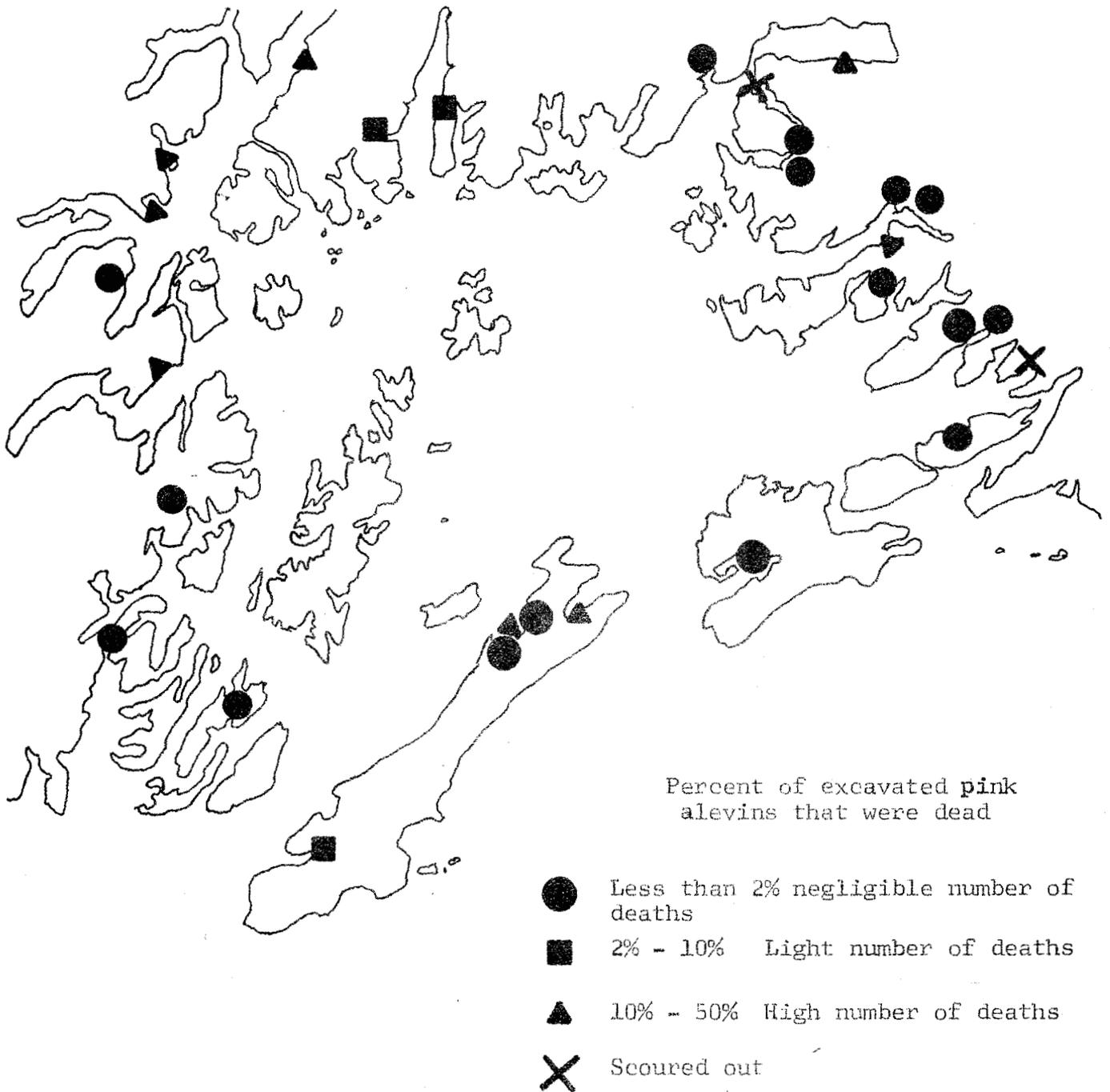


Figure 5. Relative impact of the earthquake as determined by percent of dead fry excavated.

Note: Noerenberg and Osslander determined number of fry dead in 1964 were significantly higher than any previous year's sampling.

Estimate of District Runs by Weighting Pre-emergent Fry Index by District Escapements

The final objective of pink salmon forecast studies in Prince William Sound is to provide the fishermen, the industry and management with a forecast that is accurate in three ways:

1. The magnitude of the total run,
2. magnitude by timing of the various segments of the runs and
3. magnitude of district runs.

TABLE 5. ESTIMATES OF THE 1963 PINK SALMON RUN BY DISTRICT COMPARED TO ACTUAL RETURN AND ESTIMATES OF 1965 PINK SALMON RUN BY DISTRICT.

1961 Escapement

District	Escapement (Total Est.)	% of Total	Fry Density .1 Meter	% Escapement X Fry Density	'63 Percent Estimate	% Actual Catch and Escapement
Eastern	707,000	32.1	16.77	538.32	30.9	25.2
Northern	124,000	5.6	1.51	8.46	.5	1.6
N. W. Coghill	448,000	20.3	15.59	316.48	18.1	17.5
S. Western & Eshamy	135,000	6.1	22.58	137.73	7.9	15.0
Montague	289,000	13.1	17.95	235.15	13.5	15.0
Southeastern	<u>501,000</u>	<u>22.7</u>	<u>22.36</u>	<u>507.57</u>	<u>29.1</u>	<u>25.6</u>
TOTALS	<u>2,204,000</u>	<u>99.9</u>	<u> </u>	<u>1,743.71</u>	<u>100.00</u>	<u> </u>

1963 Escapement

District	Escapement	% of Total	Fry Density .1 Meter	% Escapement X Fry Density	'63 Percent Estimate	Est. Run in Thousands 1965
Eastern	378,000	28.1	14.3	401.83	31.9	1,311,000
Northern	78,000	5.8	11.7	67.86	5.4	220,000
N.W. Coghill	354,000	26.3	14.3	376.09	29.8	1,220,000
S. Western & Eshamy	50,000	3.7	24.8	91.76	7.3	300,000
Montague	69,000	5.1	8.7	44.37	3.5	144,000
Southeastern	<u>417,000</u>	<u>31.0</u>	<u>9.0</u>	<u>279.00</u>	<u>22.1</u>	<u>980,000</u>
TOTALS	<u>1,346,000</u>	<u>100.00</u>	<u> </u>	<u>1,260.91</u>	<u>100.00</u>	<u>4,175,000</u>

Point estimate of 4,175,000 in pink run for 1965.

In Table 5, an attempt has been made to breakdown the point estimate of 4.1 million (fry regression in Figure 3) into the probable magnitude of the run returning to each management district in 1965. Based on these data, the

Eastern, Northwestern-Coghill and Southeastern districts will be the largest producers. There is a possibility that the estimate for the Southeastern district is low particularly since upstream spawning is very important in this area and our upstream pre-emergent fry sampling was quite limited.

Summary and Conclusions of Pink Salmon Forecast Using Alevin (Pre-emergent Fry) Index

1. Alevin index thus far has been exceptionally precise for forecasting the even-year cycle. A weighted alevin index (to compensate for upstream spawning), indicated the total 1965 pink run should be between 2.7 and 5.7 million, with the mean return calculated at 4.1 million.
2. The probable timing of the 1965 pink run was determined by weighting the 1963 early, middle and late escapements with respective fry densities. This indicated the early and middle runs should be fairly weak in proportion to the late run. This estimate was based on 4.1 million total run point estimate of the alevin index. There was a possibility the earthquake in part may have caused this disproportionate reduction in the early and middle runs.
3. Using the 4.1 million total run figure, the probable magnitude of district runs was calculated. Based on this, the Eastern, Northwestern-Coghill and Southeastern districts will make up the bulk of the 1965 run. The Southeastern district may be underestimated since upstream sampling was poor.
4. If the point estimate of 4.1 million (range 2.7 to 5.7) is realized in 1965, and depending on the level of gear operating, exceptionally restrictive field regulations may be necessary; particularly during the early and middle runs and in Montague, Northern and Southwestern districts.

CHUM SALMON

In forecasting the 1964 chum salmon run in Prince William Sound, Noerenberg (1964) considered five types of data:

1. Historic population trends
2. Recent escapement trends
3. Age analysis
4. Pre-emergent fry densities
5. Beach counts in estuaries

His conclusions indicated that the chum run in 1964 should approach a historic maximum of over 1.0 million fish. A relatively large chum salmon run did occur (minimum estimate, with limited fishery: 920,000) but the run was probably below recorded historic maximums that occurred in 1944 and 1945 (1.2 million plus) and less than 1962 and 1963, 1.4 and 1.3 million respectively.

Forecast Indices for Chum Salmon Runs

Thorsteinson, Noerenberg and Smith (1963) indicated from 1952 to 1958 the average age composition of chum runs was 13 percent - 3 year olds, 75 percent - 4 year olds, and 12 percent - 5 year olds. Noerenberg (1964) found the 1963 chum runs were composed of 41 percent 3's, 49 percent 4's and 10 percent 5's. Intense age analysis by the Department on 1964's runs (Table 6 and 7) revealed some interesting points.

TABLE 6. CHUM SALMON AGE ANALYSIS BY TIME PERIODS IN THE FISHERY - 1964

Date	No. of chums sampled				Percent Each Age			
	Age			Total	Age			Total
3	4	5	3		4	5		
7/22-7/28	188	372	25	585	32.14	63.59	4.27	100.00
7/29-8/2	345	476	9	830	41.57	57.35	1.08	100.00
8/3-8/7	369	344	13	726	50.83	47.38	1.79	100.00
8/10-8/16	151	113	--	264	57.20	42.80	--	100.00
TOTALS	1,053	1,305	47	2,405	43.78	54.26	1.95	99.99

TABLE 7. CHUM SALMON AGE ANALYSIS OF EARLY, MIDDLE AND LATE RUN STREAMS - 1964

Timing	Age			Total	Percent Each Age			Total
	3	4	5		3	4	5	
Early	40	281	66	387	10.34	72.61	17.05	100.00
Middle	30	75	6	111	27.03	67.57	5.40	100.00
Late	33	80	15	128	25.78	62.50	11.72	100.00
TOTALS	103	436	87	626	16.45	69.65	13.90	100.00

The age composition of the catch was quite different than age composition determined from stream carcass samples.^{1/} In part this difference could be attributed to reabsorption of scales. There is a possibility that since the fishery did not become intense until late July that a majority of the 4's had already passed through before the advent of the fishery, thus yielding a higher percent of 4's in the stream analysis. Conversely the 3's may have been harvested more heavily. If this assumption is true then samples collected from streams (60% of samples in 1952-1958) may not yield accurate age analysis of Prince William Sound chum runs in some years.^{2/} Thusly, our

^{1/} For breakdown of scale analysis, see Appendix G.

^{2/} Fishing seasons from 1953-1958 were generally earlier than that conducted in 1964.

age composition of past chum runs probably can not be readily applied to catches in order to determine whether an escapement to return correlation exists. One other point that should be made is that fishery age analysis in the 1964 chum run confirms Helle's findings (1960) in that the early fish tend to be older. Furthermore, the data suggests, though it is far from conclusive, that possibly the middle and late run streams tend towards a higher percentage of younger fish (3's and 4's) than the early runs. Intense studies will be conducted in 1965 to follow through on age composition in the fishery and in early, middle and late run streams.

Recent Population Trends

Noerenberg (64) pointed out that historically, (in 1930 and 1940's) abundance peaks in pink salmon were usually accompanied by similar abundance peaks in chum salmon about two years later. Furthermore, from these same data it appears that when pink runs increased substantially over a given parent year, chum runs increased also, only one and two years later. For example in Table 8 the pink run in 1959 was estimated at 601,000; there was an increase to 4.5 million in 1961. One year later (1962) the chum run (3's from 59's escapement) was 1.36 million. The pink run in 1960 (3.2 million) increased to 8.8 million in 1962; thus 4's from the high pink survival year of 59, and 3's from the high pink survival year of 1960 made up the 1963 chum run of 1.3 million. The pink run in 1961, (4.5 million) increased to 5.6 million in 1963, indicating moderate pink survival. The chum run on the other hand, declined one year later (1964), when 3's from the moderate pink survival year of 1961, and 4's from the good pink survival year of 1960 made up most of the run. The chum runs in 1965 will be composed of 4's from the moderate pink survival year of 1961, and 3's from the reduced pink survival year of 1962. From this we will postulate that the chum run in 1965 will be lower than 1964.

TABLE 8. PINK AND CHUM SALMON RUNS IN PRINCE WILLIAM SOUND
1956-1964 - TOTAL RUN

<u>Year</u>	<u>Pinks</u>	<u>Chums</u>
1956	5,829,000	735,000
1957	679,000	794,000
1958	7,148,000	773,000
1959	601,000	158,000
1960	3,190,000	584,000
1961	4,493,000	560,000
1962	8,761,000	1,359,000
1963	6,613,000	1,304,000
1964	6,190,000	923,000

Source: F.R.I., University of Washington, 1956-1958; U.S.F.W.S 1956-1959; A.D.F.& G., 1960-1962.

Recent Escapement Trends in Chum Salmon Escapement

The estimated chum salmon escapements by district for Prince William Sound from 1957 to 1963 are listed in Table 9. ^{1/}No linear regression was evident between escapements and returning run. Returning run to any particular escapement level was determined by percentage composition of runs 3, 4 and 5 years later. As pointed out previously, the age analysis in the 1950's was quite limited and may account in part for this lack of correlation.

TABLE 9. CHUM SALMON ESCAPEMENTS, BY MANAGEMENT DISTRICT, 1957-1963

MANAGEMENT DISTRICT	1957	1958	1959	1960	1961	1962	1963
EASTERN	161,500	42,400	35,100	92,100	118,000	238,700	148,060
NORTHERN	33,200	12,300	4,000	24,700	50,400	67,700	68,390
NORTHWESTERN	46,200	10,500	107,100	40,500	70,900	96,000	114,240
SOUTHWESTERN	5,300	4,400	1,300	4,800	4,800	10,600	5,320
MONTAGUE	9,700	7,000	3,500	16,800	34,400	34,200	15,070
SOUTHEASTERN	13,500	9,200	6,700	23,000	59,900	39,700	20,020
PWS TOTAL	269,400	85,800	157,700	201,900	338,400	486,900	371,100

SOURCE: F.R.I., University of Washington, 1956-1958; U.S.F.W.S. 1956-1959; A.D.F. & G., 1960-1963.

Results of Pre-emergent Chum Salmon Sampling

Major chum salmon streams have been sampled comprehensively in the Sound only since 1961. The results are summarized in Table 10 in chum alevins per square meter for early, middle, and late-run stream categories. Chums from the 1961 samples will be returning in 1965 as 5 year olds; 1962 samples as 4's and 1963 samples as 3's. The age analysis of the 1963 run indicated 10% 5's. Age analysis on the 1964 chum run showed variance between fishery and stream, but stream age analysis indicated only 13% 5's and the fishery 1.9% 5's. For purposes of estimating the 1965 run, we will not consider 5 year olds as dominating segments of the run. If we sum the fry densities of all major chum salmon streams combined for 1961 and 1962, (80.52 + 38.92) and divide by 2, a mean density of 59.72 fry per square meter yielded a total chum run in 1964 of an estimated 924,000 fish. (4 year olds from 61 sampling and 3's from 62's sampling.) Then, the densities for 62 and 63 (38.92 + 56.01) are summed and divided by 2; a mean density of 47.47 fry per square meter results. By cross multiplying in the proportion $\frac{59.72}{924,000} = \frac{47.47}{X}$ a rough esti-

^{1/} Breakdown of chum escapements are listed in Appendix B-E, 1960-1963.

mate of 1965 chum run can be made of 734,000. Two possible sources of error in this type of point estimate are:

1. The fry densities for a particular year do not reflect mean densities of potential 3's, 4's and 5's in the gravel.
2. Ocean and estuarine survivals for the years in question differed considerably.

Estuarine Observations May and June 1962 and 1963

Beach surveys in 1962 indicated chum fry were in fair abundance particularly in Sheep Bay, but 1963 surveys showed fewer numbers. The history of estuarine work for pinks has to date not proven satisfactory, and the same applies to chums.

Summary and Conclusions of Chum Salmon Forecast Indices

Based upon historic population trends, and pink survival years the chum run in 1965 will probably be lower than 1964's. Using the limited pre-emergent chum salmon indices that are available, the 1965 chum run is estimated to be in the neighborhood of 734,000. The Eastern and Northwestern districts will make up the bulk of the run with early and middle runs tending to be stronger than the late run.

TABLE 10. RESULTS OF PRE-EMERGENT CHUM FRY SAMPLING IN PRINCE WILLIAM SOUND
1961-1963

Sampling Year	Number of Streams Sampled	Number of Samples Taken	Mean Fry Density Per Square Meter
A. Early Run Streams			
1961	6	93	86.32
1962	6	220	27.63
1963	7	202	48.48
B. Middle Run Streams			
1961	7	89	103.20
1962	6	153	78.91
1963	7	219	47.09
C. Late Run Streams			
1961	4	46	25.05
1962	5	136	12.04
1963	4	136	81.81
D. All Major Chum Streams			
1961	17	228	80.52
1962	17	509	38.92
1963	18	557	56.01

COOK INLET AREA PINK SALMON FORECAST STUDIES

by

Allen S. Davis, Fishery Biologist
Alaska Department of Fish and Game
Division of Commercial Fisheries
Homer, Alaska

INTRODUCTION

The Division of Commercial Fisheries initiated a pre-emergent fry sampling program in Cook Inlet in the spring of 1963. The initial purpose of the program was to determine the feasibility of sampling fry in stream gravels on the outer Kenai Peninsula, from Kachemak Bay to Port Dick. Ten major pink salmon streams were selected for study, of which six were actually sampled for fry abundance in 1963. Figure 6 shows the study stream locations. The 1963 sampling results were presented in Department of Fish and Game Informational Leaflet #36 (Davis, 1964). It was concluded from this program that pre-emergent fry sampling was feasible and would eventually provide estimates of returning adult pink salmon in the study area (Southern and Outer District runs).

History of Cook Inlet Pink Salmon Catches

The commercial catches of pink salmon from 1951 to 1964 in three areas of Cook Inlet are shown in Figure 7. The runs on odd-numbered years in the Northern and Central districts are of insignificant magnitude. Since 1955, relatively small odd-year runs have occurred in the Southern and Outer districts. The combined catch of these two districts was only 121,000 pinks in 1963, compared to 2.1 million and 1.0 million in 1962 and 1964, respectively. A small catch of pinks (82,000) was also made in 1963 in the Kamishak Bay district.

From this catch history, it is clear the only significant elements of the 1965 pink salmon run will occur in the Outer, Southern and Kamishak Bay districts. Further, a circumstance of moderate to good escapement coupled with above average survival of progeny would be necessary to produce a 1965 run larger than the 200,000-300,000 level of the odd-year runs of 1957-1963. There is no evidence from the escapement or fry indices that unusually good circumstances did occur during this cycle, with the possible exception of two streams in Kachemak Bay, Humpy Creek and Tutka Lagoon Creek.

METHODS OF STUDY

Following the March 27, 1964 earthquake and tsunami, pre-emergent fry sampling was conducted in seven of the ten study streams, using the hydraulic sampler described by McNeil (1962). Gravel shift and freezing level indi-

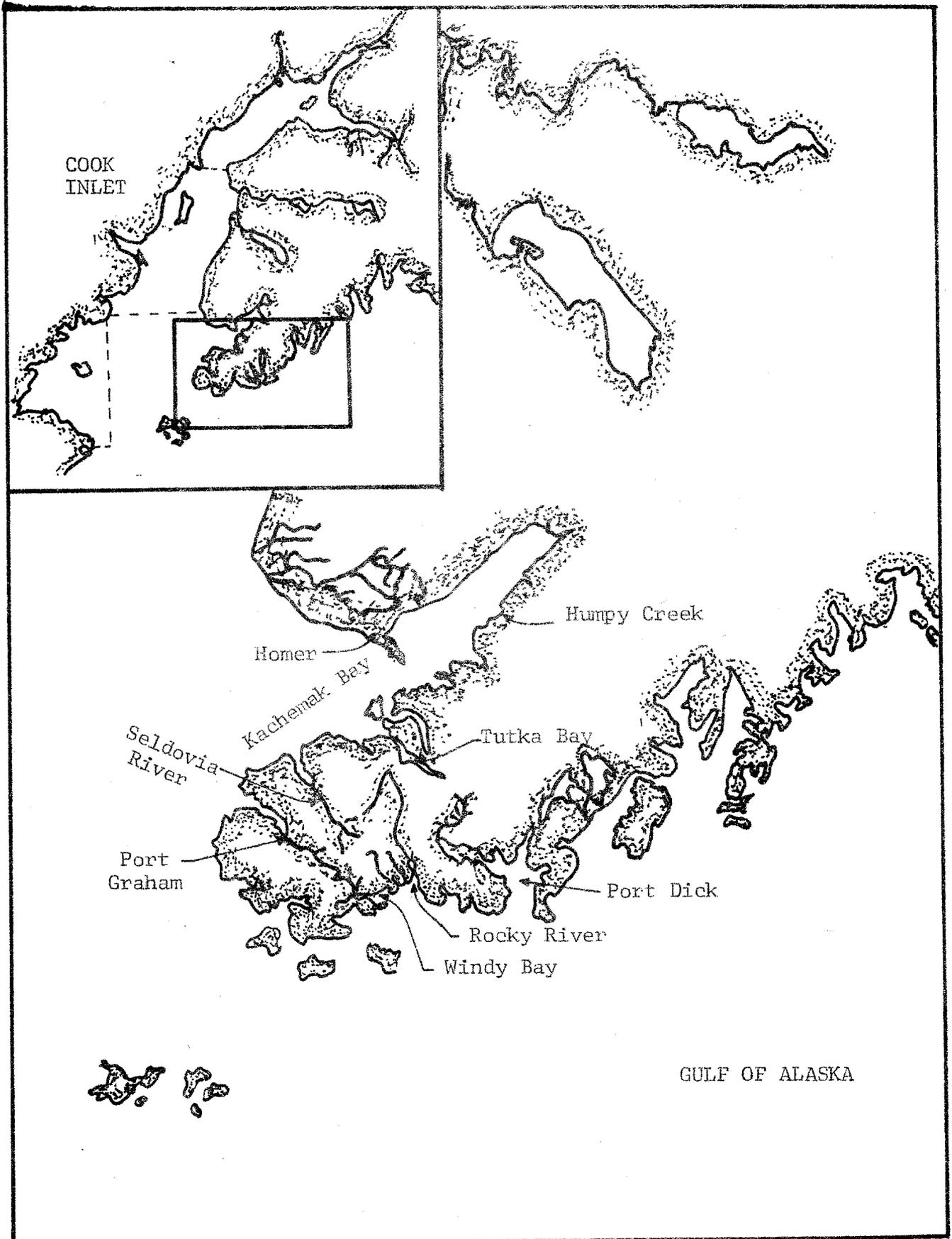


Figure 6. Cook Inlet pink salmon study stream locations.

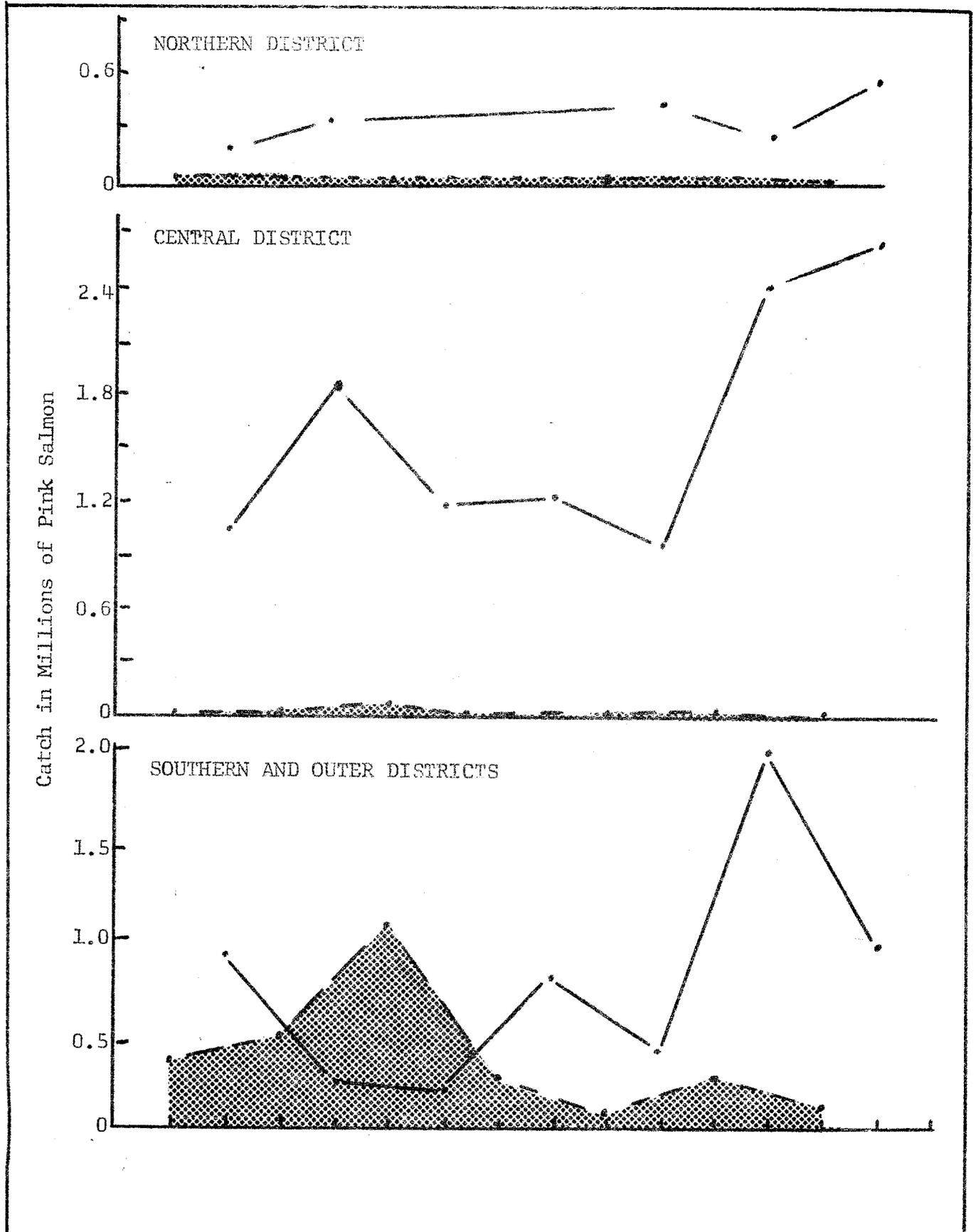


Figure 7. Odd and even-year commercial catches of pink salmon in three districts of Cook Inlet, 1951-1964. Even-year catch solid line; odd-year catches broken line (shaded).

cators, which had been placed in the gravel following spawning in the fall of 1963, were checked. Observations on these two mortality factors were accomplished by burying perforated ping pong balls and water filled and capped glass vials in vertical columns in the spawning gravels. The balls were painted six different colors to indicate burial depth and vials were placed at the top and bottom of the ping pong ball columns.

Broken vials indicate freezing conditions, and missing balls indicate gravel shift. The depth of gravel shift is determined by the number of missing balls.

DISCUSSION AND CONCLUSIONS

Results of examination of gravel shift and freezing indicators in the gravels of the study streams are presented in Table 11. Gravel shift was noted in both Port Dick streams where shift indicators were placed. This gravel movement was attributed to the tsunami immediately following the March 27, 1964 earthquake. Little or no gravel shift was noted in the three other streams containing shift indicator setups. A more detailed discussion of these findings appears in a Department of Fish and Game report on post-earthquake fisheries evaluation in southern Cook Inlet (Davis, 1965).

TABLE 11. STREAMS, SAMPLE DATES AND NUMBER OF PING PONG BALL SETUPS FOR EACH STREAM STUDIED

STREAM	NUMBER SETUPS	PLANTING DATE	RECOVERY DATE	RESULTS
1. Humpy	23	12/30/63	4/8/64	Indicators showed no gravel shift or freezing.
2. Tutka	20	12/15/63	4/23/64	Indicators showed minor gravel shift (1-2 inches) in one area, no freezing.
3. Seldovia	0			
4. Port Graham	0			
5, 6. Windy Bay	0			
7. Rocky	17	12/18/63	4/17/64	Indicator showed no gravel shift or freezing in the sampled time period. Extreme high water occurred before the indicators were placed in the gravel.
8. Port Dick Creek	15	12/16/63	4/14/64	Indicators showed lower intertidal zone sustained gravel deposition. Upstream areas had gravel scouring.
9. Middle Creek	0			Visual observations indicated some gravel movement.
10. Island Creek	20	12/16/63	4/15/64	Intertidal indicators not located. Upstream setups covered by 2-3 inches of gravel.

Freezing level vial examination indicated that freezing conditions in the spawning gravels did not occur in the areas studied.

The results of pre-emergent fry sampling in 1963 and 1964 are presented in Table 12. The 1964 sampling showed reduced levels of pink fry from those noted in 1963 in all streams sampled. These reductions were undoubtedly related to similar reductions in escapement size as noted in Table 2 but escapement-fry ratios were quite inconsistent. Fair levels of fry were produced by the Humpy Creek, Tutka Lagoon Creek and Seldovia River escapements, while little or no pink salmon production could be detected in Rocky River and the three Port Dick streams.

TABLE 12. PINK SALMON ESCAPEMENT AND PRE-EMERGENT FRY OBSERVATIONS IN TEN STREAMS OF THE SOUTHERN AND OUTER DISTRICTS OF COOK INLET IN 1963 AND 1964.

Stream	1962 RUN			1963 RUN			
	Peak Escapement Counts	No. of Samples	Mean Fry Per Sq. Meter	Peak Escapement Counts	Measured Sample Area (Sq. Meters)	No. of Samples	Mean Fry P Sq. Meter
Humpy Creek	56,000	65	118.4	34,684 ^{1/}	19,700	86	86.4
Tutka Lagoon Creek	30,000	13	139.9	10,000	4,600	26	72.3
Seldovia River	50,000	28	231.4	15,000	12,000	35	84.3
Port Graham River	50,000	45	279.9	2,000	----	--	----
Windy Bay)	25,000	--	-----	3,000	4,500	--	----
Windy Bay)		--	-----	3,000	4,900	--	----
Rocky River	200,000	--	-----	12,000	---	26	0.0
Port Dick Creek)	55,000	25	240.0	16,000	7,600	18	5.4 ^{2/}
Island Cr., Port Dick)		30	113.0	1,000	1,500	31	0.0 ^{3/}
Middle Cr., Port Dick)	--	--	-----	4,000	3,600	33	0.0 ^{4/}
Totals or Means	466,000	206	184.4	97,684		255	47.8

1/ Weir count, including 18,250 females.

2/ Also 31.2 chum fry per square meter.

3/ Also 60.0 chum fry per square meter.

4/ Also 9.5 chum fry per square meter.

Table 13 summarizes the information available on the 1965 pink salmon run of the Southern and Outer districts. In managing the relatively small 1963 run (8-1/2 percent of 1962 run), the Department restricted the catch to 6 percent of the 1962 catch, and thereby obtained an escapement 21 percent as large as 1962. Fairly good fry survival in the Kachemak Bay streams offset disastrous mortalities in Rocky Bay and Port Dick, yielding average fry density for the study area of 26 percent of that noted in the preceding year. Assuming no change in marine survival between years, a pink salmon run slightly larger than in 1963 in the Southern and Outer districts is indicated for 1965.

TABLE 13. SUMMARY OF PINK SALMON CATCHES, ESCAPEMENT AND PRE-EMERGENT FRY ABUNDANCE RATIOS IN THE STUDY AREA, 1962-1963.

Spawning Year	Catch	10-Stream Esc. Index	Pre-emergent Fry Density (Sq. Meter Means)	Return 10 Stream Catch + Peak Escapement
1962	2,113,570	466,000	184.4	1,300,000 ± (1964)
1963	121,026	97,684	47.8	(1965)
Ratio 63/62	0.06	0.21	0.26	

KODIAK AREA PINK SALMON FORECAST STUDIES

by

Wallace H. Noerenberg
Alaska Department of Fish and Game
Division of Commercial Fisheries
Juneau, Alaska

INTRODUCTION

The initial year of extensive pre-emergent fry sampling in the Kodiak area was reported by Roys (1964). The sampling in the spring of 1963 included 20 streams in all but the Mainland district of the Kodiak area. An average of 15 pink salmon fry per square foot were found in these 20 streams. While results from stream to stream were quite variable, most of the major streams sampled had apparent high densities of live fry. Red River, for example, averaged 25.4 fry per square foot in 150 samples. Return runs to Red River and other streams in 1964 was near all-time record numbers.

Results of 1964 Sampling

While sampling in the spring of 1964 was planned for about the same level as in 1963, but in a slightly different group of streams important during odd-year spawning, only half of the work was accomplished before the March 27 earthquake and seismic waves interrupted activities. Equipment in use was destroyed and the bulk of the detailed data collected were lost with the sinking of the Department vessel C. L. Anderson.

Table 14 lists the 10 streams which were completed prior to March 27, with pink salmon fry levels observed in 1964, and in previous years where available. The low levels of fry abundance apparent in the Chiniak Bay area (Buskin, American and Sid Olds Rivers) were undoubtedly further reduced by tsunamic action on March 27, 1964, as waves severely tore up most of the lower streambeds.

The main sign of potential strength in the 1965 adult pink run was detected in Uyak River, where very high densities of fry were found. Early-run pink salmon in Dog Salmon Creek, Olga Bay were also relatively abundant.

The 1964 sampling was insufficient to provide a forecast of the 1965 Kodiak pink salmon run. However, with a relatively small escapement in 1963 and some losses evident from tsunamic action, the general outlook for 1965 must be classed as fair at best and probably poor.

TABLE 14. RESULTS OF PRE-EMERGENT PINK SALMON FRY SAMPLING IN THE KODIAK AREA DURING MARCH, 1964, WITH COMPARATIVE RESULTS FROM 1962 AND 1963.

Stream	Density of fry (per square meter)		
	1962	1963	1964
Buskin River	24.7	365.50	67.73
American River	-----	121.48	67.73
Sid Olds Creek	-----	79.55	8.60
Cannery Creek, Olga Bay	-----	-----	0.00
Sharatin Creek	-----	112.87	22.58
Baumans Creek, Terror Bay	-----	76.33	152.65
Uganik River	-----	150.50	64.50
Terror River	-----	47.30	72.03
Uyak River	-----	-----	400.98
Dog Salmon Creek, Olga Bay	-----	-----	182.75

LITERATURE CITED

Davis, Allen S.

1965. Effect of the March 27, 1964 earthquake on pink and chum salmon streams of the lower Kenai Peninsula. In Post Earthquake Fisheries Evaluation Report. Alaska Department of Fish and Game. January 1965, pp 29-32.

1964. Forecast research on 1964 Alaskan pink salmon fisheries: Cook Inlet. Alaska Department of Fish and Game Informational Leaflet No. 36. Juneau, Alaska. 51 p.

Helle, John H.

1960. Characteristic and structure of early and late spawning runs of chum salmon Oncorhynchus keta (Walbaum), in the streams of Prince William Sound, Alaska. M.S. Thesis, University of Idaho, 53 p.

Hoffman, Theodore C.

1965. Southeastern Alaska pink salmon forecast studies; pre-emergent fry program. Alaska Department of Fish and Game, Informational Leaflet No. 47. Juneau, Alaska. 29 p., 12 figs.

Kirkwood, James B.

1962. Inshore-marine and freshwater life history phases of the pink salmon Oncorhynchus gorbuscha (Walbaum), and the chum salmon O. keta (Walbaum), in Prince William Sound, Alaska. PhD. Thesis. University of Louisville, Louisville, Kentucky. 300 p.

McNeil, William J.

1962. Mortality of pink and chum salmon eggs and larvae in Southeast Alaska streams. PhD. Thesis, University of Washington, 270 p.

Noerenberg, Wallace H.

1964. Forecast research on 1964 Alaskan pink salmon fisheries: Prince William Sound. Alaska Department of Fish and Game, Informational Leaflet No. 36, Juneau, Alaska. 51 p.

1963. Salmon forecast studies on 1963 runs in Prince William Sound. Alaska Department of Fish and Game, Informational Leaflet No. 21, Cordova, Alaska. 17 p., 6 figs.

1961. Observations on spawning and subsequent survival of fry of the 1960 salmon runs in Prince William Sound, Alaska. Alaska Department of Fish and Game, Memorandum No. 5, Cordova, Alaska. 22 p., 6 figs.

Roys, Robert S.

1964. Forecast research on 1964 Alaskan pink salmon fisheries: Kodiak Area. Alaska Department of Fish and Game, Informational Leaflet No. 36, Juneau, Alaska. 51 p.

Thorsteinson, F.V., W.H. Noerenberg and H.D. Smith

1963. The length, age and sex ratio of chum salmon in the Alaska Peninsula, Kodiak Island and Prince William Sound areas of Alaska. U.S. Fish and Wildlife Service, Special Scientific Report - Fisheries No. 430, 84 p., 8 figs.

1963 PRINCE WILLIAM SOUND PINK SALMON
(Live Counts in Streams) 1/

APPENDIX A

St. <u>5/</u> No.	Stream or Bay	Week Endings													Calculated	
		6/23	6/30	7/7	7/14	7/21	7/28	8/4	8/11	8/18	8/25	9/1	9/8	9/15	9/22	Season Total
<u>I. EASTERN DISTRICT</u>																
2	Hartney Creek		0	<u>100</u>											2300	4320
11	Humpy Creek	<u>0</u>			<u>510</u>	<u>2250</u>		<u>4500</u>		<u>4080</u>						9860
21	Rogue Creek	0	0	200	<u>1740</u>		900	<u>800</u>	0			1070				4700
35	Koppen Creek	<u>0</u>	0	1200	<u>13630</u>		5000	2500	4000	29000		<u>16530</u>				49440
41	Pass Creek			0	0	0	0	0	1200			<u>420</u>				4420
36	Sheep River	0	0	0	<u>1450</u>		2600	3500	4000	16000		<u>24050</u>				41340
46	Comfort Creek			0	150		700	800	1500							7560
48	Beartrap River			0	0	0	0	1000								5600
51	Olsen Creek	0	<u>10</u>	<u>1520</u>	1500		500	500	<u>1500</u>							11410
52	Control Creek	0	0	<u>360</u>			500	800		4000						5320
54	Carlsen Creek	0	0	0			500	500								2340
56	St. Matthews Cr.		0	0			200	100				<u>14850</u>				19400
65	Coho Creek						0	0	1000							6200
76	Irish Creek			300	<u>1250</u>				5000	9800		<u>5220</u>				15510
80	Whalen Creek	0	0	3800	<u>6050</u>		0		500			<u>1950</u>			<u>560</u>	8360
83	Keta Creek		0		0		0	0	0			<u>390</u>				2480
87	Sunny River				0		0	0	0			<u>2060</u>			<u>1750</u>	3720
89	Fish Creek	0	0	0	<u>1200</u>		0	2500	300			<u>4040</u>				6700
99	Lagoon Creek	0	0	0	<u>1300</u>		0	1000	100			<u>2660</u>				7260
106	Gladhough Creek							100				<u>1270</u>				2070
115	Millard Creek		0	0	<u>20</u>				500			<u>1400</u>				2090 ^{4/}
116	Duck River				<u>600</u>					26000		<u>23830</u>		2000		36490
117	Indian Creek	0	0	0	<u>2580</u>		3500	5000		13000		<u>4120</u>		0		18580
121	Levshakoff Creek	0	0	0	<u>620</u>		3000	0	600							6090
123	Gregorioff Creek	0	0	0	<u>1720</u>		3500	3000	500						<u>90</u>	7740
129	Vlasoff Creek	0	0	0	0		2200								<u>570</u>	7830
133	Sawmill Creek	0	0		2120				0							2450
143	Siwash Creek	0	0		<u>11760</u>		5500		0							15300
150	Kaydas Creek	0	0		50		2000		0							2100
152	Twin Falls Creek			0			300		200							2210
153	Stellar Creek		0	300	<u>8180</u>		11000		2000						<u>80</u>	21820
Other Streams (66) <u>2/ 3/</u>		0	0	600	<u>3090</u>	4650	1400	1150	2970	6830	25990	21490	11550	2420	720	37340
District Total <u>3/</u>		0		11430		77550		46000		50430		182290		67120		378050
(97 Streams)			10		68020		50650		44770		204650		129670		19790	

1/ Ground counts underlined. 2/ From records maintained on small streams which had a total of less than 2000 pinks in 1963. 3/ Contains interpreted data where surveys lacking on certain weeks. 4/ Stream life factor 4.0 weeks, these calculated from stream life factor of 2.5 weeks. 5/ Stream numbering revised in 1962.

1-29 1

1963 PRINCE WILLIAM SOUND PINK SALMON
(Live Counts in Streams) 1/

APPENDIX A. (Cont.)

St. <u>5/</u> No.	Stream or Bay	Week Endings													Calculated Season Total	
		6/23	6/30	7/7	7/14	7/21	7/28	8/4	8/11	8/18	8/25	9/1	9/8	9/15		9/22
<u>II. NORTHERN DISTRICT</u>																
224	Backyard Creek									1500		<u>7250</u>	60			8740
229	Cedar Creek							0	0			<u>2410</u>				2560
234	Wells River	0	0	500		<u>2130</u>	15000			12000		<u>760</u>				25860
241	Cannery Creek	0				<u>0</u>	0		0	5000		<u>5720</u>				9890 ^{4/}
258	Jonah Creek	0					800			5300		<u>3100</u>				9920 ^{4/}
264	Siwash River	0	0				0		0	700		<u>1660</u>				2140
279	Canyon Creek	0					100			3700						6120
	Other Streams (37) <u>2/ 3/</u>	0	0	0	500	1930	50	350	700	1450	6900	11300	4750	2490	900	12540
<hr/>																
	District Total <u>3/</u>	0		500		4760		17350		29650		34800		9420		7777
			0		1600		15950		20520		33800		22550		3520	
<hr/>																

1/ Ground counts underlined; others are aerial counts.

2/ From records maintained on small streams which had a total of less than 2000 pinks each in 1963.

3/ Contains interpreted data where surveys lacking on certain weeks.

4/ Stream life factor 4.0 weeks, these calculated from stream life 2.5 weeks.

5/ Stream numbering revised in 1962.

1963 PRINCE WILLIAM SOUND PINK SALMON
(Live Counts in Streams) 1/

APPENDIX A (Cont.)

St. <u>5/</u> No.	Stream or Bay	<u>Week Endings</u>														Calculated Season Total	
		6/23	6/30	7/7	7/14	7/21	7/28	8/4	8/11	8/18	8/25	9/1	9/8	9/15	9/22		
<u>III. COGHILL DISTRICT</u>																	
322	Coghill River	0	0	0	0	<u>10000</u>	20000			34200		40000		500		57930	
	Other Streams (8) <u>2/</u> <u>3/</u>	0	0	0	0	0	0	0	0	100	1600	1250	650	270	150	1610	
<hr/>																	
	District Totals <u>3/</u> (9 Streams)	0		0		10000		20000		35000		34300		41250		770	59540
<hr/>																	
			0		0			20000		35000		38600		20650		150	

- 1/ Ground counts underlined; other are aerial counts.
- 2/ From records maintained on small streams which had a total of less than 2000 pinks each in 1963.
- 3/ Contains interpreted data where surveys lacking on certain weeks.
- 4/ Stream life factor 4.0 weeks, these calculated from stream life of 2.5 weeks.
- 5/ Stream numbering revised in 1962.

1
3
1
1

1963 PRINCE WILLIAM SOUND PINK SALMON
(Live Counts in Streams) ^{1/}

APPENDIX A (Cont.)

st. ^{5/} No.	Stream or Bay	Week Endings													Calculated Season Total	
		6/23	6/30	7/7	7/14	7/21	7/28	8/4	8/11	8/18	8/25	9/1	9/8	9/15		9/22
<u>IV. NORTHWESTERN DISTRICT</u>																
421	Mill Creek	0	0	0	0	<u>20</u>	200			8000		<u>8660</u>			16470	
428	Pirate Creek	0	0		0	<u>0</u>	0		200	0		<u>2410</u>			2280	
430	Meacham Creek	0	0	0	0	<u>2450</u>	2400		12000	5300		<u>10510</u>	<u>325</u>		21200	
432	Swanson Creek	0	0	200	200	<u>1960</u>	4500		24000	13400		<u>15100</u>	<u>3480</u>		40770	
435	Logging Camp Creek	0	0	0	0	<u>1540</u>	3100		10000	2000		<u>7590</u>			15290	
450	Tebenkof Creek	0	0	0	0	<u>320</u>	200		0	400		<u>1880</u>			2240	
454	Halferty Creek	0	0			<u>0</u>	200			4600		<u>2990</u>			6840	
455	Paulson Creek		0	0	0	<u>20</u>	100		0	300		<u>2360</u>			2290	
471	Wickett Creek	0				<u>0</u>						<u>2610</u>			2960	
476	Shrode Creek	0	0	0		<u>100</u>	22200			109000		<u>110000</u>	<u>37450</u>		153450 ^{4/}	
480	Mink Creek	0	0	0	0	<u>190</u>	800		2000	1500		<u>9890</u>			11110	
484	East Finger Creek			0	0	<u>0</u>	0		3000						5400 ¹	
485	West Finger Creek			0	0	<u>0</u>	0		200						3440 ²	
	Other Streams (36) ^{2/ 3/}	0	0	0	200	<u>670</u>	700	700	1250	3750	6450	7645	3680	1700	710	10950 ¹
District Totals ^{3/} (49 Streams)		0	0	0	400	<u>7270</u>		81450		149250		185145		53105	19860	294690

^{1/} Ground counts underlined; others are aerial counts.

^{2/} From records maintained on small streams which had a total of less than 2000 pinks each in 1963.

^{3/} Contains interpreted data where surveys lacking on certain weeks.

^{4/} Stream life factor 4.0 weeks, these calculated from stream life 2.5 weeks.

^{5/} Stream numbering revised in 1962.

1963 PRINCE WILLIAM SOUND PINK SALMON
(Live Counts in Streams) ^{1/}

APPENDIX A (Cont.)

St. ^{5/} No.	Stream or Bay	Week Endings												Calculated Season Total		
		6/23	6/30	7/7	7/14	7/21	7/28	8/4	8/11	8/18	8/25	9/1	9/8		9/15	9/22
<u>V. ESHAMY DISTRICT</u>																
510	Eshamy Lagoon						0				500		<u>1050</u>		2380	
510	Eshamy River						0				3000		<u>3350</u>		6540	
	Other Streams (7) ^{2/ 3/}	0	0	0	0	0	0	0	400	1000	2150	1600	1160	680	400	3060
<hr/>																
	District Totals ^{3/} (9 Streams)	0		0		0		1000		4000		5400		3780		11980
			0		0		0		2400		5650		5560		1900	
<hr/>																

^{1/} Ground counts underlined; others are aerial counts.

^{2/} From records maintained on small streams which had a total of less than 2000 pinks each in 1963.

^{3/} Contains interpreted data where surveys lacking on certain weeks.

^{4/} Stream life factor 4.0 weeks, these calculated from stream life of 2.5 weeks.

^{5/} Stream numbering revised in 1962.

1
3
3
1

1963 PRINCE WILLIAM SOUND PINK SALMON
(Live Counts in Streams) ^{1/}

APPENDIX A. (Cont.)

St. ^{5/} No.	Stream or Bay	<u>Week Endings</u>												Calculated		
		6/23	6/30	7/7	7/14	7/21	7/28	8/4	8/11	8/18	8/25	9/1	9/8	9/15	9/22	Season Total
<u>VI. SOUTHEASTERN DISTRICT</u>																
603	Ewan Creek					0	0		0						<u>5800</u>	8520
608	Jackpot River		0	0			1400		0						<u>3625</u>	7090 ^{4/}
628	Chenega Creek														<u>1565</u>	3550
630	Bainbridge Creek		0	100			200	<u>340</u>	1500						<u>1750</u>	5860
	Other Streams (35) ^{2/ 3/}	0	0	150	400	950	1090	1700	3420	6080	8400	5300	2920	1450		12770
District Total ^{3/} (39 Streams)		0	100		1550		2330		7970		24400		11420			37790
			0	250		2600		3700		15480		18040		6550		

^{1/} Ground counts underlined; others are aerial counts.

^{2/} From records maintained on small streams which had a total of less than 2000 pinks each in 1963.

^{3/} Contains interpreted data where surveys lacking on certain weeks.

^{4/} Stream life factor 4.0 weeks, these calculated from stream life of 2.5 weeks.

^{5/} Stream number revised in 1962.

1963 PRINCE WILLIAM SOUND PINK SALMON
(Live Counts in Streams) ^{1/}

APPENDIX A (Cont.)

St. ^{5/} No.	Stream or Bay	6/23	6/30	7/7	7/14	7/21	Week Endings		8/11	8/18	8/25	9/1	9/8	9/15	9/22	Calculated Season Total
VII. MONTAGUE DISTRICT																
703	Clam Beach Creek									1500						2840
707	Macleod Creek							0		1500						3400
736	W. Shore, Montague Is.						0	2500								6480
739	Swamp Creek		0			0	0	0		3500						6500
741	Chalmers River		0					0		900	3500					3760
745	Wild Creek		0					4000		50	3200					7220
746	Schuman Creek		0					1000		150	2800					3940
747	Cabin Creek		0				1000	1260		250	6500					8610
749	Shad Creek							0		650	1900					2160
752	Stockdale Creek							0		600	2800					3000
759	Rocky Creek									0	6000					6320
770	Udall Creek						0	300			1800					2060
775	Pautzke Creek						0	2000		0	4200					4800
	Other Streams (43) ^{2/ 3/}		0	0	50	150	350	4100	5400	4900	14970	8270	4300	1970	800	18120
District Totals ^{3/} (56 Streams)			0	400		2950		15060		12700		31730		10670		68710
				0	1450		4650		15700		51770		19000		5700	

^{1/} Ground counts underlined; others are aerial counts.

^{2/} From records maintained on small streams which had a total of less than 2000 pinks each in 1963.

^{3/} Contains interpreted data where surveys lacking on certain weeks.

^{4/} Stream life factor 4.0 weeks, these calculated from stream life 2.5 weeks.

^{5/} Stream numbering revised in 1962.

1963 PRINCE WILLIAM SOUND PINK SALMON
(Live Counts in Streams) ^{1/}

APPENDIX A (Cont.)

St. ^{5/} No.	Stream or Bay	Week Endings											Calculated			
		6/23	6/30	7/7	7/14	7/21	7/28	8/4	8/11	8/18	8/25	9/1	9/8	9/15	9/22	Season Total
<u>VIII. SOUTHEASTERN DISTRICT</u>																
806	Dog Salmon Creek		0			0	0		1000	1500	5600		<u>4300</u>			7960
810	Garden Creek		0			0	0	0	500	2500						3400
812	Nuchek Creek		0	0		500	2400		18000	14000	23000		<u>4130</u>			35490
815	Constantine Creek		0	0		500	1600	4000	23000		40000		<u>23490</u>			65840
817	Deer Creek		0	0		0			6000							12440
818	Juania Creek		0	0		0		0	5500							11560
821	Brown Bear Creek		0	0		400	800		4000							9680
823	Johnstone Creek			0		0			2000							3200
827	Captain Creek			0		0		0	350	4600						5140
828	Cook Creek			0		0		<u>420</u>	1200	2800	16300					18690
829	King Creek			0		0	0	0	0	1500						3000
831	Double Creek			0		0	0		10000	10000	15000					26320
834	Hardy Creek		0	0		0	2000		38000		35000					70800
835	Scott Creek		0	0		0	0		10000		14000					19240
836	Dan's Creek						100		1000	3600	9500					9720
837	Dan's Bay								1000		2500					2900
839	Dan's Bay			0					0	300	3700					3700
841A	Snake Creek										4800					4800
844	Makarka Creek						300		5000	8000	14700		<u>820</u>			15650
847	Hawkins Creek						100	<u>3500</u>	10500	6000	18000		<u>1250</u>			19860
849	Rollin Creek						0		0		2800					3520
850	Canoe Creek						100		1500	2200	4000		<u>680</u>			6910
851	Zillesenoff Creek						0		500		1200		<u>510</u>			2500
856	Cedar Bay						0		300	200	2100					2840
857	Cedar Bay						500		200		8100					9980
861	Bernard Creek						0	<u>430</u>	500	300	<u>8570</u>					10920
862	Clamdiggers Creek						1000		3500		<u>2520</u>					3940 ^{4/}
863	Orca Creek						1500		5300		6040					7560 ^{4/}
867	Trail Creek												<u>1390</u>			4500
Other Streams (21) ^{2/ 3/}									1250	4500	12670	11500	5090	1650	100	15110
District Total ^{3/} (50 Streams)		0	0	0	0	1400	12100	61200	145000	168250	284700	230900	106206	39940	10450	417180

^{1/} Ground counts underlined; others are aerial counts.

^{2/} From records maintained on small streams which had a total of less than 2000 pinks each in 1963.

^{3/} Contains interpreted data where surveys lacking on certain weeks.

^{4/} Stream life factor 4.0 weeks, these calculated from stream life of 2.5 weeks.

^{5/} Stream numbers revised in 1962.

1963 RECAPITULATION OF WEEKLY PINK SALMON COUNTS BY DISTRICT
(Live Counts in Streams) ^{1/}

APPENDIX A. (Cont.)

No. of Sts. District	6/23	6/30	7/7	7/14	7/21	7/28	Week Endings		8/18	8/25	9/1	9/8	9/15	9/22	Calculated Season Total
							8/4	8/11							
97 Eastern	0	10	11430	60820	77550	50650	46000	44770	50430	204650	182290	129670	67120	19790	378050
44 Northern	0	0	500	1600	4760	15950	17350	20520	29650	33800	34800	22550	9420	3520	77770
9 Coghill	0	0	0	0	10000	20000	35000	35000	34300	38600	41250	20650	770	150	59540
49 Northwestern	0	0	0	400	7270	34400	81450	144450	149250	150900	185145	114880	53105	19860	294690
9 Eshamy	0	0	0	0	0	0	1000	2400	4000	5650	5400	5560	3780	1900	11980
39 Southwestern	-	0	100	250	1550	2600	2330	3700	7970	15480	24400	18040	11420	6550	37790
56 Montague	-	0	400	1450	2950	4650	15060	15700	12700	51770	31730	19000	10670	5700	68710
50 Southeastern	-	0	0	0	1400	12100	61200	145000	168250	284700	230900	106260	39940	10450	417180
<hr/>															
353 Prince William	0		12430		105480		259390		456550		735915		196225		1344710
Sound Total		0		64520		140350		411540		785550		436610		67920	

^{1/} The counts were derived from 1086 aerial surveys and 185 ground surveys. Total surveys 1,271.

1963 PRINCE WILLIAM SOUND CHUM SALMON
(Live Counts in Streams) ^{1/}

APPENDIX B

St. No.	Stream or Bay	6/23	6/30	7/7	7/14	7/21	Week Endings							Calculated Season Total		
							7/28	8/4	8/11	8/18	8/25	9/1	9/8		9/15	9/22
<u>I. EASTERN DISTRICT</u>																
21	Rogue Creek	0	0		<u>70</u>	6500	800		0	30			<u>2</u>		3150	
35	Koppen Creek		1000	0	<u>5760</u>	13000	1000			0			<u>220</u>		9410	
36	Sheep River	0	100	800	<u>130</u>	500	500		0	0			<u>1240</u>		4570	
48	Beartrap River		1500			6800	6000		2000	6500					22080	
51	Olsen Creek	0	800	<u>4680</u>		6200	6000		3000						14430	
80	Whalen Creek	0	200		<u>1840</u>	10000	400			250			<u>27</u>		3770	
83	Keta Creek		0			0	0		3500	500			<u>1360</u>	<u>1000</u>	5060	
87	Sunny River					200			4000	1500			<u>3870</u>	<u>1720</u>	10250	
89	Fish Creek	0	300	0	<u>490</u>	1000	800		0	2500			<u>31</u>		2610	
116	Duck River				<u>450</u>		3500		0	8500			<u>1720</u>	<u>20</u>	9680	
117	Indian Creek	0	900		<u>3640</u>		3500		0	5000			<u>10</u>	0	9620	
123	Gregorioff Creek	0	50		<u>380</u>		1000		0	700				<u>35</u>	2050	
127	Naomoff River								1800						3020	
133	Sawmill Creek	0	500		<u>1000</u>		5500			100					6180	
135	Allison Creek						2000								2660	
145	Crooked Creek		0		<u>100</u>		2500			0					2580	
152	Twin Falls Creek		0				300		500	800				<u>840</u>	2710	
153	Stellar Creek	0	50			1200	1000			4500				<u>120</u>	7550	
	Other Streams (38) ^{2/ 3/}	400	1650	2570	3850	7470	5330	5870	5710	8390	8030	5717	3430	1890	1320	24650
District Totals ^{3/} (56 Streams)		2300		16120		66720		34920		43670		25715		9590		148060
			7250		30390		42330		26810		42030		15692		6555	

- ^{1/} Ground survey counts underlined; others are aerial counts.
^{2/} Streams with less than 2000 chum salmon total escapement.
^{3/} Contains interpreted data where surveys lacking on certain weeks.
/ Stream life factor 2.5 weeks unless otherwise noted.

33

1963 PRINCE WILLIAM SOUND CHUM SALMON
(Live Counts in Streams) ^{1/}

APPENDIX B (Cont.)

St. No.	Stream or Bay	Week Endings													Calculated	
		6/23	6/30	7/7	7/14	7/21	7/28	8/4	8/11	8/18	8/25	9/1	9/8	9/15	9/22	Season Total
<u>II. NORTHERN DISTRICT</u>																
214	Long Creek					<u>1270</u>	3000			3700						10430
216	Vanishing Creek						150			1400						2940
229	Cedar Creek	0		0			600		1500	500		<u>270</u>				2410
234	Wells River	0	4000	13500		<u>13440</u>	15000		21000	1500		<u>310</u>				40140
	Other Streams (27) ^{2/} ^{3/}		20	150	520	1050	2175	3370	2900	3120	6910	5525	3230	1530	670	11610
District Totals ^{3/} (31 streams)		200		14450		16240		25870		10220		9305		2790		68390
			4420		15140		20925		31200		13610		5380		1220	

- ^{1/} Ground survey counts underlined; others are aerial counts.
^{2/} Streams with less than 2000 chum salmon total escapement.
^{3/} Contains interpreted data where surveys lacking on certain weeks.
Stream life factor 2.5 weeks unless otherwise noted.

1963 PRINCE WILLIAM SOUND CHUM SALMON
(Live Counts in Streams) ^{1/}

APPENDIX B (Cont.)

St. No.	Stream or Bay	6/23	6/30	7/7	7/14	7/21	Week Endings							Calculated Season Total		
							7/28	8/4	8/11	8/18	8/25	9/1	9/8		9/15	9/22
<u>III. NORTHWESTERN AND COGHILL DISTRICTS</u>																
322	Coghill River	0	0			20000	40000		24000	11000		<u>1500</u>		<u>0</u>	63400	
421	Mill Creek	0	0	50		<u>210</u>	600		0	3500		<u>1450</u>			4080	
425	Hummer Creek	0		0		<u>0</u>	300		1500	1500					3280	
432	Swanson Creek	0	0	200		3000	500		2000	800		<u>525</u>		<u>80</u>	4060	
458	Parks Creek	0				0	400			1100					2220	
476	Shrode Creek	0	0	0		<u>0</u>	0		16000	0		<u>240</u>			10600	
480	Mink Creek	0	0	0		1000	1000		1000	200		<u>10</u>			2440	
484	East Finger Creek			1000		2500	1500		0						3480	
486	Twin Creek					500	400		800						1680	
487	Kings River					1550									2560	
Other Streams (41) ^{2/} ^{3/}		40	100	340	2830	5330	4850	5720	7640	5190	5020	2361	1210	350	70	16440
District Totals ^{3/} (51 Streams)		590		10590		34100		52420		24090		7636		1430		114240
			1400		9930		50550		55140		16720		4360		440	

^{1/} Ground survey counts underlined; other are aerial counts.

^{2/} Streams with less than 2000 chum salmon total escapement.

^{3/} Contains interpreted data where surveys lacking on certain weeks.

Stream life factor 2.5 weeks unless otherwise noted.

1963 PRINCE WILLIAM SOUND CHUM SALMON
(Live Counts in Streams) ^{1/}

APPENDIX B; (Cont.)

St. No.	Stream or Bay	<u>Week Endings</u>													Calculated Season Total	
		6/23	6/30	7/7	7/14	7/21	7/28	8/4	8/11	8/18	8/25	9/1	9/8	9/15		9/22
<u>IV. ESHAMY-SOUTHWESTERN DISTRICTS</u>																
613	Jackson Creek		0				2000		0				<u>55</u>		2190	
	Other Streams (18) ^{2/} ^{3/}		0	100	250	600	1200	1240	650	1850	1300	590	41	10	0	3130
<hr/>																
	District Totals ^{3/} (17 Streams)		0		1050		3200		650		1350		96		20	5320
			0	500		1600		2240		1850		690		60		
<hr/>																

^{1/} Ground survey counts underlined; others are aerial counts.

^{2/} Streams with less than 2000 chum salmon total escapement.

^{3/} Contains interpreted data where surveys lacking on certain weeks.
Stream life factor 2.5 weeks unless otherwise noted.

1963 PRINCE WILLIAM SOUND CHUM SALMON
(Live Counts in Streams) ^{1/}

APPENDIX B (Cont.)

St. No.	Stream or Bay	<u>Week Endings</u>												Calculated		
		6/23	6/30	7/7	7/14	7/21	7/28	8/4	8/11	8/18	8/25	9/1	9/8	9/15	9/22	Season Total
<u>V. MONTAGUE DISTRICT</u>																
739	Swamp Creek		0				500	0	4000	3500						5580
741	Chalmers River		0					0	2000	1300	4800					5800
	Other Streams (17) ^{2/} ^{3/}		0	0	0	0	0	0	1760	2350	2650	1350	700	300	120	3690
<hr/>																
District Totals ^{3/}			0		100		500		7760		9950		3100		720	15070
(19 Streams)			0		50		300		0		7150		6350		1700	

^{1/} Ground survey counts underlined; others are aerial counts.

^{2/} Streams with less than 2000 chum salmon total escapement.

^{3/} Contains interpreted data where surveys lacking on certain weeks.

Stream life factor 2.5 weeks unless otherwise noted.

1
1
1

1963 PRINCE WILLIAM SOUND CHUM SALMON
(Live Counts in Streams) ^{1/}

APPENDIX B (Cont.)

St. No.	Stream or Bay	6/23	6/30	7/7	7/14	7/21	Week Endings		8/11	8/18	8/25	9/1	9/8	9/15	9/22	Calculated
							7/28	8/4								Season Total
<u>VI. SOUTHEASTERN DISTRICT</u>																
815	Constantine Creek		300	2500		3000	1100	1200	2500	500	500		<u>720</u>			7010
821	Brown Bear Creek		0	1500		0	1700		1000	200						2820
835	Scott Creek		0	0		0	400		0		5000					4920
	Other Streams (17) ^{2/} ^{3/}	100	200	0	0	0	700	940	1000	2150	3400	2450	1350	610	270	5270
District Totals ^{3/} (20 streams)		300		4000		3000		3840		5350		6500		1460		20020
			500		4000		3900		4500		9000		3070		620	

^{1/} Ground survey counts underlined; others are aerial counts.

^{2/} Streams with less than 2000 chum salmon total escapement.

^{3/} Contains interpreted data where surveys lacking on certain weeks.
Stream life factor 2.5 weeks unless otherwise noted.

1963 RECAPITULATION OF WEEKLY CHUM SALMON COUNTS BY DISTRICT
(Live Counts in Streams) ^{1/}

APPENDIX B (Cont.)

No. of Sts.	District	Week Endings														Calculated Season Total
		6/23	6/30	7/7	7/14	7/21	7/28	8/4	8/11	8/18	8/25	9/1	9/8	9/15	9/22	
56	Eastern	2300	7250	16120	56390	66720	42330	34920	26810	43670	42030	25715	15692	9590	6555	148060
31	Northern- Coghill	200	4420	14450	15140	16240	20925	25870	31200	10220	13610	9305	5380	2790	1220	68390
51	Northwestern- Eshamy	590	1400	10590	9930	34100	50550	52420	55140	24090	16720	7636	4360	1430	440	114240
17	Southwestern	---	0	500	1050	1600	3200	2240	650	1850	1350	690	96	60	20	5320
19	Montague	---	0	50	100	300	500	0	7760	7150	9950	6350	3100	1700	720	15070
20	Southeastern	300	500	4000	4000	3000	3900	3840	4500	5350	9000	6500	3070	1460	620	20020
194	Prince William Sound Total	3390		45710		212960		119290		92330		56196		17030		371100
			13570		60610		121405		126060		92660		31698		9575	

^{1/} The counts were derived from 1,086 aerial surveys and 185 ground surveys. Total surveys 1,271.

1962 RECAPITULATION OF WEEKLY CHUM SALMON COUNTS BY DISTRICT
 (Live Counts in Streams)^{1/}

APPENDIX C

No. of Streams	District	Week Endings												Calculated Season Total	
		6/30	7/7	7/14	7/21	7/28	8/4	8/11	8/18	8/25	9/1	9/8	9/15		9/22
44	Eastern	3500	21210	34850	44250	59160	54090	52080	48610	51690	60120	64220	64150	38720	238680
19	Northern	150	5050	10500	15150	21500	18900	18870	21220	21050	22900	12210	1670	0	67670
35	Northwestern & Coghill	0	1400	6450	22800	42860	46720	44310	37760	21200	11250	4550	700	100	96018
12	Southwestern & Eshamy	100	350	1550	2820	3100	4810	4220	3680	3090	1850	750	200	0	10610
7	Montague	0	0	0	500	2000	5690	8750	12800	16950	19600	19700	10450	4390	34190
15	Southeastern	200	500	3000	4300	7600	14850	13050	12960	10100	10100	10200	10340	2040	39690
132	Prince William Sound Total	3950	28510	56350	89820	136220	145060	141280	137030	124080	125820	111630	87510	45250	486858

^{1/} The total counts were derived from 877 aerial surveys and 226 ground surveys. Total surveys, 1,103.

54
1

1961 RECAPITULATION OF WEEKLY CHUM SALMON COUNTS BY DISTRICT 1/

APPENDIX D

No. of Streams District	<u>Week Endings</u>													Calculated Season Total
	7/1	7/8	7/15	7/22	7/29	8/5	8/12	8/19	8/26	9/2	9/9	9/16	9/23	
53 Eastern	2240	31310	38180	35830	18830	17240	23470	37100	36390	30700	15860	5320	1500	117950
26 Northern	350	3800	6600	9300	12150	14120	14550	13140	18180	19510	9530	4300	500	50420
34 Northwestern & Coghill	0	5000	15600	14170	25710	39710	35800	20840	11210	6750	2000	550	0	70940
11 Southwestern & Eshamy	0	110	250	600	900	1180	1560	2510	1940	1480	900	330	70	4750
14 Montague	0	0	100	430	910	4060	14700	21710	22920	10660	5680	3230	1540	34380
18 Southeastern	500	4200	5700	5470	9260	14330	18900	22300	20980	23883	16410	10630	4470	62820
158 Prince William Sound Total	3090	44420	66930	65800	67760	90690	108980	47600	111620	92983	50380	24360	8080	341260

1/ Total figures slightly revised from live counts in stream by district. Refer to Memorandum #5 by W. H. Noerenberg for 1961 run for revised estimates.

1
45
1

1960 RECAPITULATION OF WEEKLY CHUM SALMON COUNTS BY DISTRICT

APPENDIX E

No. of Streams District	6/25	7/2	7/9	7/16	7/23	<u>Week Endings</u>							Calculated Season Total	
						7/30	8/6	8/13	8/20	8/27	9/3	9/10		9/17
38 Eastern	0	1010	6355	20875	23246	24962	29084	26710	19876	19960	19420	16145	12805	92100
23 Northern	0	259	2652	3600	6282	8550	9700	8120	6730	5750	4250	3462	1650	24729
21 Northwestern & Coghill	0	0	1230	7250	13365	18400	27800	17845	9675	5590	3520	995	375	40458
16 Southwestern & Eshamy	0	0	0	220	1333	2735	2580	2295	1185	865	447	325	115	4800
23 Montague	0	0	0	0	0	1375	2475	4050	8500	8385	9829	6730	3420	16782
14 Southeastern	0	0	0	1100	1870	2872	7750	8865	13570	11036	8230	5390	2770	23008
135 Prince William Sound Total	0	1269	10237	33045	46096	58894	79389	67885	59486	51946	45696	33047	21135	201877

APPENDIX F. AGE ANALYSIS OF 1964 CHUM SALMON, PRINCE WILLIAM SOUND,
COMMERCIAL CATCH, JULY 22-28

AREA	DATE	MALES				FEMALES			
		Age			Total	Age			Total
		3	4	5			3	4	
Port Wells	7/22	1	10	--	11	2	12	2	16
	7/22	1	14	1	16	2	9	2	13
Culross	7/23	4	13	--	17	3	7	--	10
	7/23	5	12	--	22	3	14	1	18
	7/24	2	7	1	10	3	12	6	21
	7/24	1	15	2	18	3	14	1	18
Chenega	7/25	3	9	--	12	3	11	--	14
Esther Island	7/25	2	14	1	17	2	10	1	13
	7/25	6	10	2	18	4	16	--	20
Chenega Island	7/26	8	11	--	19	7	12	2	21
	7/26	12	8	--	20	5	15	--	20
Point Helen	7/27	7	9	--	16	3	9	--	12
	7/27	7	9	--	16	8	11	--	19
Esther Pass	7/27	8	7	1	16	6	7	--	13
	7/27	8	7	--	15	4	10	--	14
Chenega Island	7/28	12	5	--	17	9	9	--	18
Culross Island	7/28	5	8	1	14	9	11	--	20
	7/28	12	6	--	18	8	9	1	18
TOTALS		104	174	9	287	84	198	16	298
PERCENT		36.24	60.63	3.14		28.79	66.44	5.37	

APPENDIX F. (Cont.) AGE ANALYSIS OF 1964 CHUM SALMON, PRINCE WILLIAM SOUND,
COMMERCIAL CATCH, JULY 29-AUGUST 2

AREA	DATE	MALES				FEMALES			
		3	Age 4	5	Total	3	Age 4	5	Total
Chenega Island	7/29	11	7	--	18	3	12	--	15
	7/29	5	7	--	12	2	9	--	11
Valdez Arm	7/29	3	12	--	15	5	8	--	13
Esther Island	7/29	8	3	--	11	10	6	--	16
	7/29	8	9	3	20	7	7	1	15
Port Etches	7/30	14	9	--	23	7	13	--	20
	7/30	7	9	--	16	--	4	--	4
Chenega Island	7/30	5	8	--	13	7	10	--	17
	7/30	8	12	--	20	7	10	--	17
Macleod	7/30	2	16	--	18	3	11	--	14
Galena	7/30	7	4	--	11	3	8	--	11
Chenega Island	7/31	7	2	--	9	7	4	--	11
Port Fidalge	7/31	3	16	--	19	4	4	1	9
Hanning Bay	7/31	1	6	--	7	2	18	--	20
	7/31	6	13	--	19	1	7	--	8
Port Etches	7/31	8	12	--	20	6	13	--	19
	7/31	7	12	--	19	8	10	--	18
Chenega Island	7/31	12	6	1	19	10	8	--	18
Eaglek	7/31	3	8	--	11	6	9	--	15
	7/31	4	13	--	17	7	6	2	15
Chenega Island	8/2	10	5	--	15	8	8	--	16
	8/2	11	6	--	17	12	5	1	18
	8/2	10	4	--	14	11	7	--	18

APPENDIX F. (Cont.)

AREA	DATE	MALES			Total	FEMALES			Total
		Age 3	Age 4	Age 5		Age 3	Age 4	Age 5	
Macleod	8/2	3	10	--	13	6	11	--	17
	8/2	--	15	--	15	4	11	--	15
Hanning Bay	8/2	1	6	--	7	--	--	--	--
	8/2	1	11	--	12	2	10	--	12
Chenega Island	8/2	18	2	--	20	14	4	--	18
TOTALS		183	243	4	430	162	233	5	400
PERCENT		42.56	56.51	.93		40.50	58.25	1.25	

APPENDIX F. (Cont.) AGE ANALYSIS OF 1964 CHUM SALMON, PRINCE WILLIAM SOUND,
COMMERCIAL CATCH, AUGUST 3-7

AREA	DATE	MALES				FEMALES			
		Age 3	Age 4	Age 5	Total	Age 3	Age 4	Age 5	Total
Montague Island	8/3	11	6	--	17	10	6	--	16
	8/3	6	11	1	18	9	8	2	19
	8/3	7	12	--	19	8	9	1	18
	8/3	8	12	--	20	8	11	1	20
Nellie Juan	8/4	10	7	--	17	6	5	1	12
	8/4	10	6	--	16	13	6	--	19
Two Moon Bay	8/5	5	11	1	17	4	16	--	20
	8/5	4	8	--	12	9	4	--	11
Stockdale Harbor	8/5	10	5	--	15	11	7	--	18
	8/5	6	9	1	16	8	6	--	14
Eaglek Bay	8/6	13	5	--	18	13	8	--	21
	8/6	6	10	--	16	13	8	--	21
Two Moon Bay	8/6	9	9	--	18	11	7	--	18
	8/6	1	16	1	18	6	11	1	18
Chenega Island	8/7	8	14	--	22	16	4	--	20
Eaglek Bay	8/7	11	4	2	17	11	6	--	17
	8/7	12	7	--	19	12	4	--	16
Unakwik Inlet	8/7	3	8	--	11	5	5	--	10
Long Bay	8/7	5	14	--	19	9	8	1	18
Jack Bay	8/7	9	7	--	16	7	12	--	19
	8/7	7	9	--	16	12	6	--	18
TOTAL		171	192	6	369	198	152	7	357
PERCENT		46.34	52.03	1.63		55.46	42.58	1.96	

APPENDIX F. (Cont.) AGE ANALYSIS OF 1964 CHUM SALMON, PRINCE WILLIAM SOUND,
COMMERCIAL CATCH, AUGUST 10-16

AREA	DATE	MALES				FEMALES			
		Age 3	Age 4	Age 5	Total	Age 3	Age 4	Age 5	Total
Unakwik Inlet	8/10	9	10	--	19	8	10	--	18
	8/10	4	5	--	9	1	10	--	11
Valdez Arm	8/10	5	15	--	20	8	11	--	19
Sawmill Bay	8/14	12	8	--	20	3	16	--	19
	8/14	11	7	--	18	9	11	--	20
Port Etches	8/14	13	1	--	14	12	--	--	12
	8/14	5	--	--	5	10	--	--	10
	8/16	10	2	--	12	7	2	--	9
	8/16	15	2	--	17	9	3	--	12
TOTALS		84	50	--	134	67	63	--	130
PERCENT		62.69	37.31			51.54	48.46		

GRAND TOTALS ALL FISHERIES

7/22-7/28	104	174	9	287	84	198	16	298
7/29-8/2	183	243	4	430	162	233	5	400
8/3-8/7	171	192	6	369	198	152	7	357
8/10-8/16	84	50	--	134	67	63	--	130
TOTALS	542	659	19	1,120	511	646	28	1,185
PERCENT	44.43	54.02	1.56		43.12	54.51	2.36	

APPENDIX G. AGE ANALYSIS OF 1964 CHUM SALMON, PRINCE WILLIAM SOUND
SPAWNING GROUNDS

St. No.	Name	Area	Date	Stream Classification	MALES			Total	FEMALES			Total
					3	4	5		3	4	5	
35	Koppen Creek	Sheep Bay	7/28	E	1	15	2	17	2	11	2	1
48	Beartrap River	Beartrap Bay	7/29	E	--	7	4	11	--	8	10	1
52	Control Creek	Olsen Bay	7/29	E	--	8	1	9	--	5	4	
89	Fish Creek	Port Fidalgo	8/2	E	2	15	2	19	1	10	3	1
117	Indian Creek	Galena Bay	8/4	E	2	15	4	21	--	11	4	1
	Indian Creek	Galena Bay	8/4	E	1	13	2	16	--	14	3	1
123	Gregorioff	Jack Bay	8/5	E	--	18	--	18	1	13	--	1
153	Stellar Creek	Sawmill Bay	8/5	M	--	10	3	13	--	15	2	1
234	Wells River	Wells Bay	8/6	E	--	12	4	16	3	11	5	19
432	Swanson Creek (right fork)	Pigot Bay	8/8	E	--	17	2	19	--	16	3	19
35	Koppen Creek	Sheep Bay	8/15	E	2	13	2	17	--	14	4	18
36	Sheep River	Sheep Bay	8/15	L	1	11	4	16	2	12	5	19
35	Koppen Creek	Sheep Bay	8/15	E	5	11	1	17	2	14	4	20
20	Spring Creek	Simpson Bay	8/21	E	5	10	1	16	5	12	--	17
48	Beartrap R.	Beartrap Bay	8/24	E	3	9	2	14	3	6	2	11
473	Goose	Goose Bay	9/3	M	6	5	--	11	5	2	--	7
741	Chalmers R.	Port Chalmers	9/6	L	6	10	--	16	6	11	--	17
815	Constantine	Constantine Hbr.	9/8	M	6	12	--	18	3	14	--	17
83	Keta Creek	Port Fidalgo	9/9	L	8	13	4	25	8	13	4	25
87	Sunny River	Port Fidalgo	9/10	L	5	11	--	16	3	12	--	15
116	Duck River	Galena Bay	9/10	M	7	8	1	16	3	9	--	12
152	Twin Falls	Sawmill Bay	9/11	L	6	10	1	17	4	13	1	18
TOTALS					66	253	40	359	43	233	52	328
PERCENT					18.38	70.74	11.14		13.11	71.04	15.85	
SEXES COMBINED (percentages only)												
Number					109	486	92	687				
Percent					15	71	14	100				

APPENDIX H. COMBINED 1964 CHUM SALMON AGE ANALYSIS, PRINCE WILLIAM SOUND,
SAMPLES IN CATCH AND SPAWNING GROUND

Source of Samples	PERCENT AGE COMPOSITION								
	MALE			FEMALE			COMBINED		
	Age	Age	Age	Age	Age	Age	Age	Age	Age
	3	4	5	3	4	5	3	4	5
Fishery Catches	44	54	2	43	55	2	44	54	2
Spawning Ground	18	71	11	13	71	16	15	71	14
Estimated Total Run ^{1/}	25	65	10	21	65	14	23	65	12

^{1/} Late seine opening and minimal fishery on 1964 stocks. Total run estimated to be composed of 1/3 catch, 2/3 escapement; therefore escapement age composition weighted double in the total figures.

The Alaska Department of Fish and Game administers all programs and activities free from discrimination based on race, color, national origin, age, sex, religion, marital status, pregnancy, parenthood, or disability. The department administers all programs and activities in compliance with Title VI of the Civil Rights Act of 1964, Section 504 of the Rehabilitation Act of 1973, Title II of the Americans with Disabilities Act of 1990, the Age Discrimination Act of 1975, and Title IX of the Education Amendments of 1972.

If you believe you have been discriminated against in any program, activity, or facility, or if you desire further information please write to ADF&G, P.O. Box 25526, Juneau, AK 99802-5526; U.S. Fish and Wildlife Service, 4040 N. Fairfax Drive, Suite 300 Webb, Arlington, VA 22203 or O.E.O., U.S. Department of the Interior, Washington DC 20240.

For information on alternative formats for this and other department publications, please contact the department ADA Coordinator at (voice) 907-465-6077, (TDD) 907-465-3646, or (FAX) 907-465-6078.