

Informational Leaflet

117

FORECAST RESEARCH ON 1968 COOK INLET AREA

PINK SALMON FISHERIES

By:

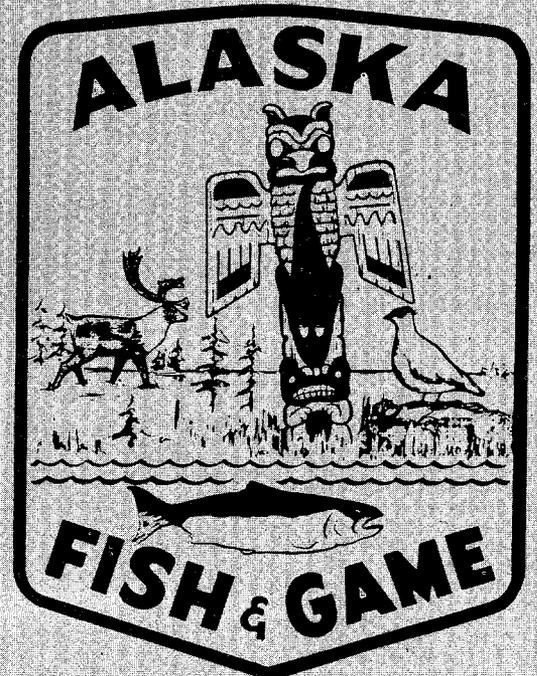
Allen S. Davis
Division of Commercial Fisheries
Research Section
Homer, Alaska

February 29, 1968

STATE OF ALASKA
WALTER J. HICKEL - GOVERNOR

DEPARTMENT OF
FISH AND GAME

URBAN C. NELSON - COMMISSIONER
SUPPORT BUILDING, JUNEAU



FORECAST RESEARCH ON 1968 COOK INLET AREA PINK SALMON FISHERIES 1/

by

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

INTRODUCTION

This is the fifth report dealing with pink salmon forecast studies in the Cook Inlet Area. The first two reports (Davis, 1964 and 1965) presented the initial pre-emergent fry data and did not provide numerical forecast estimates of the magnitude of the returning runs. The following two reports (Davis, 1966 and 1967) forecast numerical estimates of the returning runs in the Southern and Outer Districts of Cook Inlet (Figure 1).

This report will provide the estimated total return for the Southern and Outer Districts, and will indicate the bays where the largest number of fish can be expected to return.

1967 Prediction Results

The 1967 predicted return for the Southern and Outer Districts of Cook Inlet, based on pre-emergent fry density, amounted to 500,000 pink salmon in both catch and escapement. The actual total return in 1967 (catch plus escapement) was 508,000 fish. The commercial fishery in the two districts caught 358,000 pink salmon with the Southern District catch accounting for 98,000 pinks and the remaining 260,000 taken in the Outer District. The catch in the Outer District was centered in the Port Dick area with small catches taken in Nuka Bay and Taylor Bay regions (Figure 2). The total estimated escapement for the two districts amounted to approximately 150,000 pink salmon.

1/ This investigation was financed by the Commercial Fisheries Research and Development Act (P.L. 88-309) under sub-project 5-4-R-3, Contract No. 14-17-0007-732.

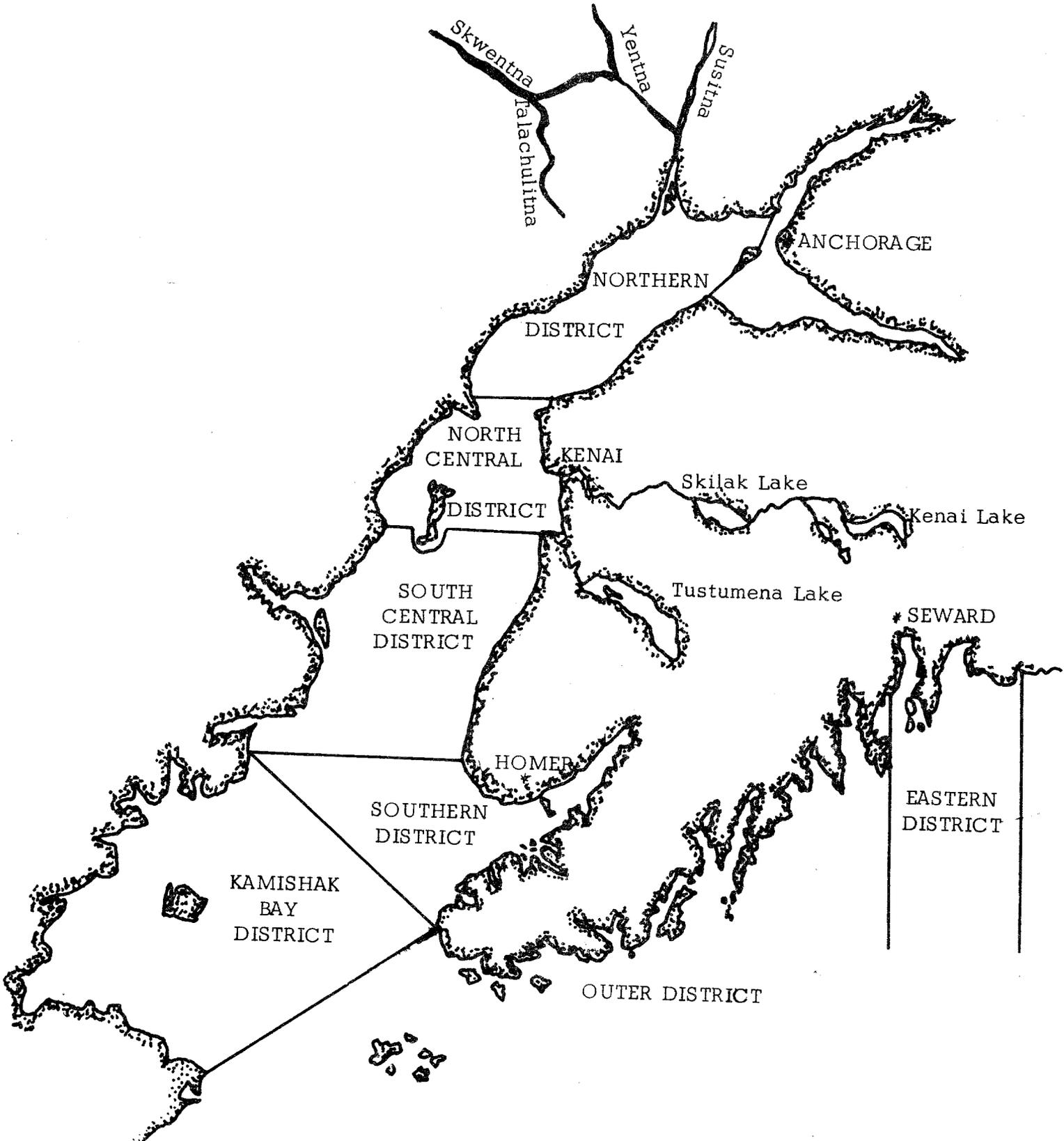


Figure 1. Cook Inlet Area Management Districts.

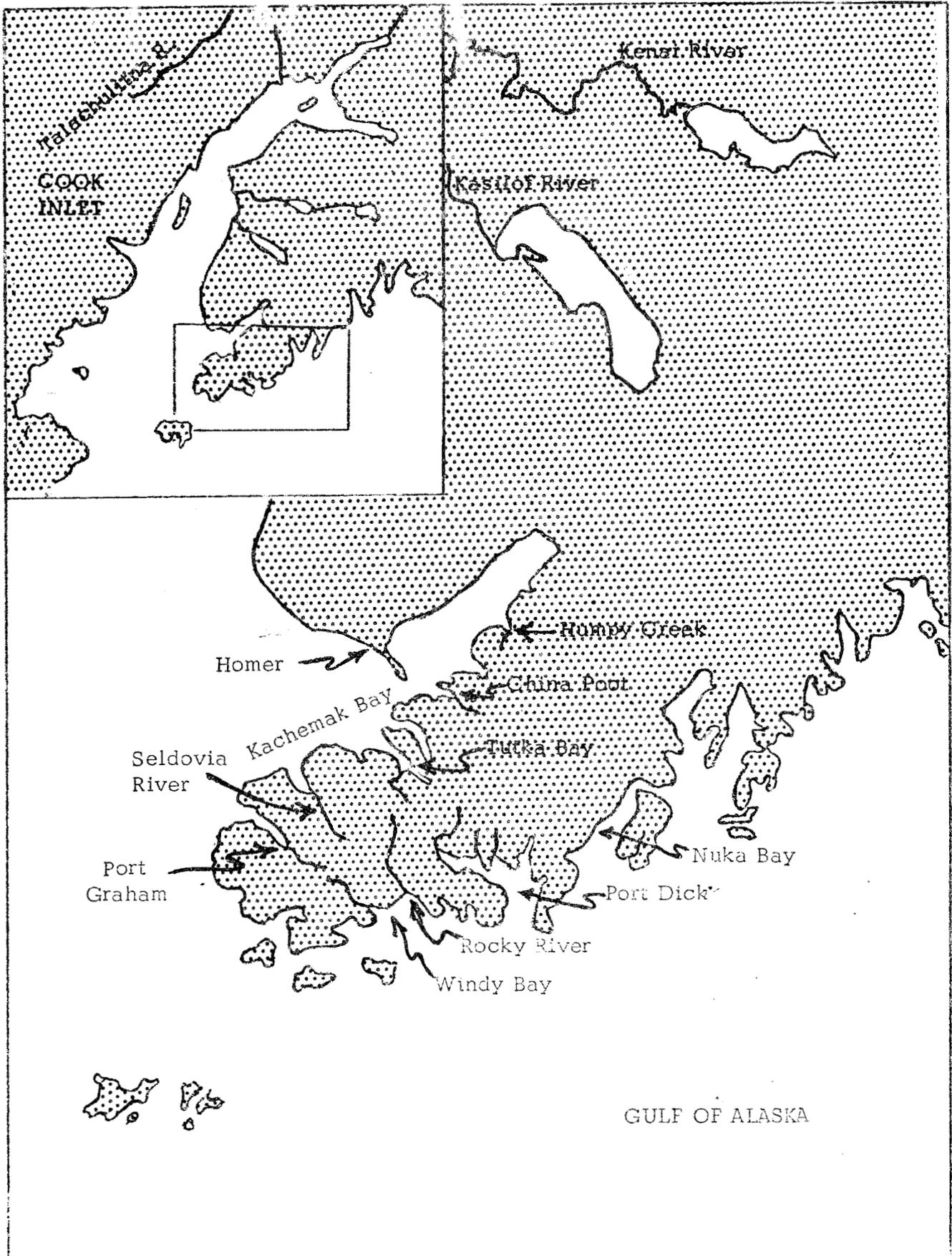


Figure 2. Cook Inlet Pink Salmon Study Stream Locations.

Pink salmon catches in the Northern, North Central and South Central Districts (Figure 1) amounted to 31,000 fish. This value compares favorably with the average odd year (1961, 1963, 1965) catch for the area of 28,500.

The Kamishak Bay area produced a catch of 17,000 pink salmon in 1967. Fishing effort in the district was very light and catches were not indicative of the actual abundance of pink salmon.

Summary of the 1968 Prediction

Pre-emergent fry sampling of the 1966 brood stock, the parents of those expected to return in 1968, resulted in an overall pre-emergent fry density per square meter of 84.1 (Table 1).

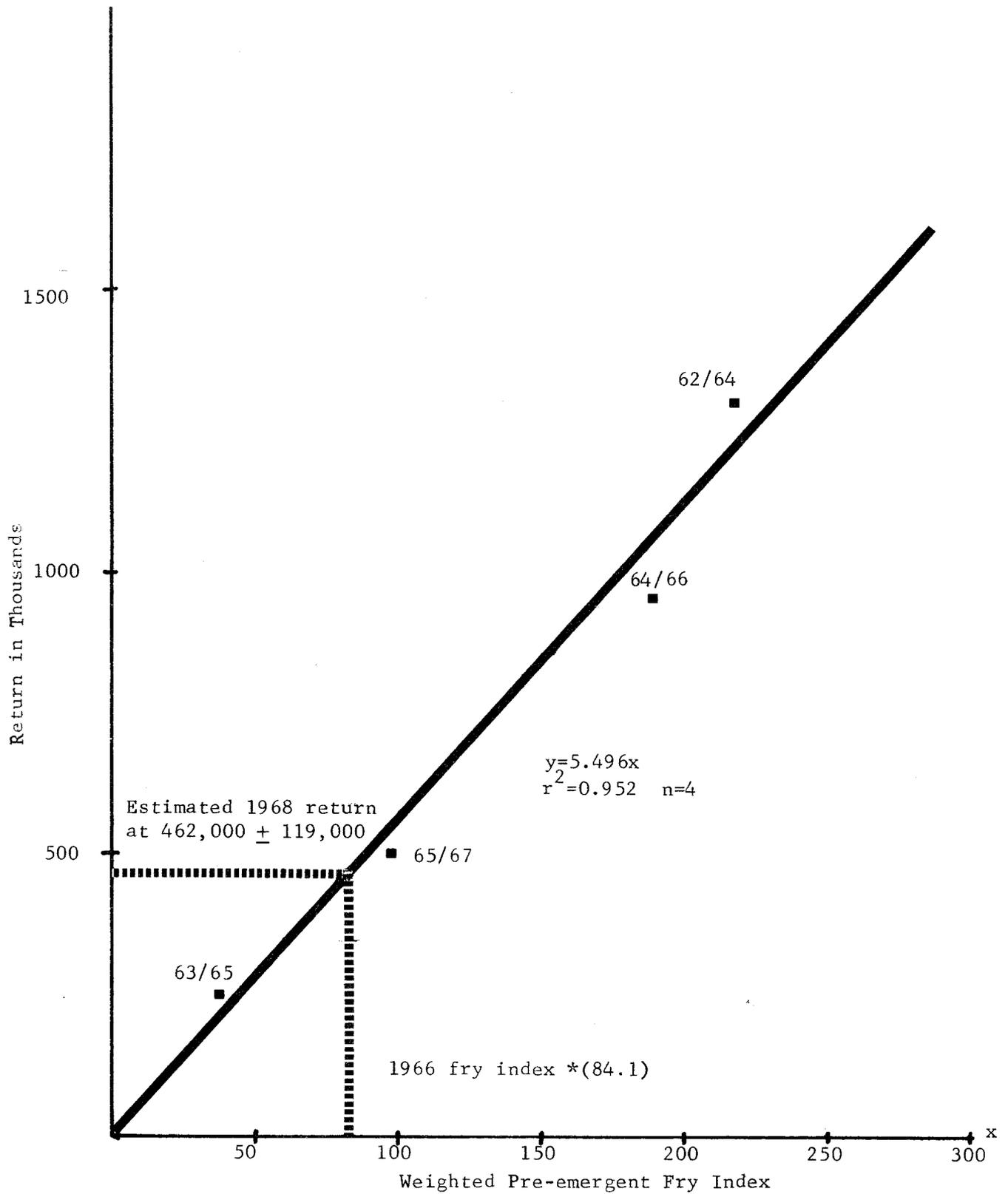
Table 1. Summary of Pink Salmon Catches, Escapements, Pre-emergent Fry Densities and Returns for the Years 1962-1967

Spawning Year	Catch	Stream Esc. Index	Weighted ^{1/} Pre-emergent Fry Density	Return (year) Catch and Escapement
1962	2,113,570	466,000	217.8	1,306,185 (1964)
1963	121,026	97,684	36.3	255,000 (1965)
1964	1,033,885	272,300	188.4	911,000 (1966)
1965	112,200	142,800	96.8	508,000 (1967)
1966	645,000	266,000	84.1	462,000 ^{2/} (1968)

^{1/} Fry density indices are derived from seven streams in which comparable annual data is available. Weighting factors are based on average escapements to these streams.

^{2/} 1968 prediction (catch plus escapement).

Figure 3 shows the relationship between weighted pre-emergent fry densities and subsequent returns (catch plus escapement). The pre-emergent fry densities are weighted by the average escapement spawning in the individual streams. The 1966 pre-emergent fry density of 84.1 fry per square meter when applied to the regression line in Figure 3 will result in a predicted total return (catch plus escapement) of 462,000 pink salmon in 1968. At the 95 per cent confidence level, the lower expected return will be 343,000 salmon and the upper limit will be 581,000 pinks. Provided each of the major streams in the two



*Fry index weighted by average escapement
 Figure 3. Relationship Between Weighted Pre-emergent Fry Index and Return
 (Catch plus Escapement).

districts received adequate spawning populations, the total escapement goal is 250,000 fish. The return distribution by bay will be discussed further in the report.

The escapement/return relationship as presented in Figure 4 indicates that these data, when utilized for forecast purposes, are not as accurate as the pre-emergent fry/return relationship. The escapement/return relationship does not include the highly variable winter mortality factor the extent of which is determined by means of the pre-emergent fry sampling. For this reason less confidence is placed on the escapement index for forecast purposes.

North Central, South Central and Northern District Pink Salmon

Pink salmon also utilize streams in the more northern areas of Cook Inlet with the dominant year class occurring during even numbered years. Pre-emergent fry studies have been attempted in the spawning streams of the Northern District, but extensive ice cover has limited success of the program. It is anticipated that a harvest similar in size to recent even year catches will develop in the three northern districts.

Methods and Means

When the original sampling scheme for the Southern and Outer Districts was set up, ten streams were selected for sampling. Of these ten streams, only seven were successfully sampled in the first two years of digging. Figure 2 shows the location of the study streams. For this reason, data from the seven sampled streams are the only densities utilized for the prediction. Pre-emergent fry density information from the streams not included in the analysis is presented in Table 2 for comparison purposes. Streams located in Port Chatham and Nuka Bay were sampled for the first time in 1967 and the densities are also presented in Table 2.

The factor utilized for weighting the pre-emergent fry densities is the average escapement for the particular stream (Table 3). This weighting is accomplished by multiplying the individual stream fry index by the average escapement. The results are then added together and the total divided by the total escapement for the index streams. Utilization of the average escapement weighting factor places relative production importance on the pre-emergent fry densities.

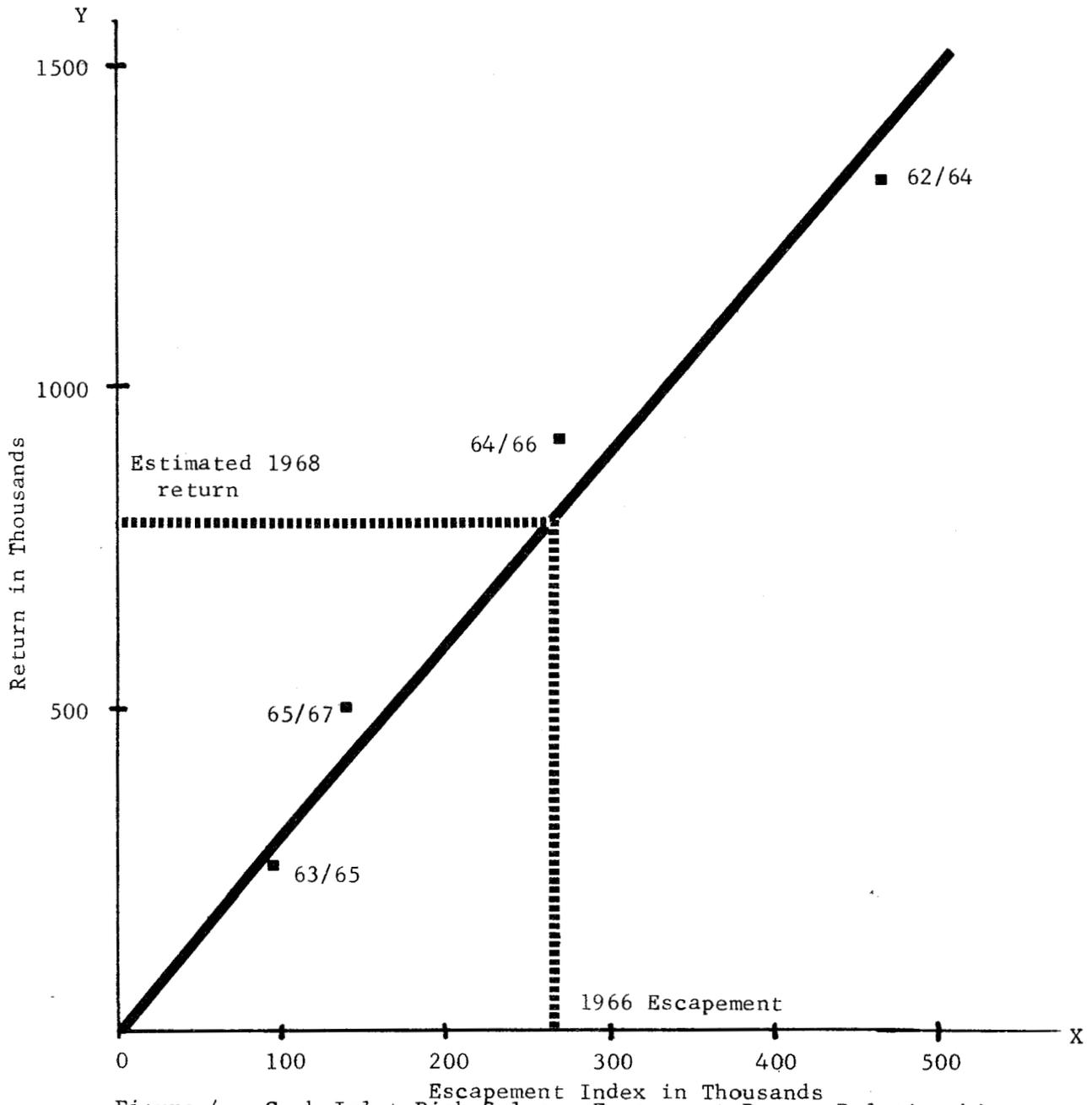


Figure 4. Cook Inlet Pink Salmon, Escapement-Return Relationship (Numbers by plotted points represent "brood year/year of return".)

Table 2. Cook Inlet Pink Salmon Pre-emergent Fry Data

Stream	Utilized Spawning Area m ²	No. Points Sampled in 1966	Fry per m ² per brood year				
			1962	1963	1964	1965	1966
Humpy <u>1/</u>	19,700	150	118.4	86.4	199.1	245.7	131.3
Tutka <u>1/</u>	4,600	45	139.9	72.3	195.8	154.7	120.5
Seldovia <u>1/</u>	12,000	80	231.4	84.3	284.1	151.3	136.6
Pt. Graham <u>1/</u>	8,000	60	279.9	(40.0) <u>2/</u>	242.1	40.5	165.7
Windy L.	4,700	50			100.1	21.2	28.3
Windy R.	4,700	50			75.3	48.4	13.9
Rocky <u>1/</u>		100	(284.1) <u>3/</u>	0.0	131.3	(0.0) <u>5/</u>	11.4
Pt. Dick <u>1/</u>	7,600	60	240.0	5.4	222.7	149.6	43.4
Island <u>1/</u>	3,600	50	113.0	0.0	80.7	0.0	67.4
China Poot		15				244.3	673.9
Pt. Chatham L.		25					207.5
Pt. Chatham R.		20					64.2
Nuka South		10					23.7
Weighted Averages <u>4/</u>			217.8	36.3	188.4	96.8	84.1

1/ Used only these streams when calculating weighted averages.

2/ Given same value as 1965 because of similar escapements.

3/ Used highest density observed because of large 1963 spawning density in Rocky River.

4/ Stream fry densities weighted by average escapement.

5/ Estimated zero fry density since escapement was estimated to be only 300 spawners.

Table 3. Pink Salmon Escapement, Southern and Outer Districts of Cook Inlet, 1962-1966

Stream	Avg. Esc. (10 ³) 1962-1966	1962	1963	1964	1965	1966
Humpy	33	56,000 ^{1/}	34,684 ^{1/}	18,500 ^{1/}	28,000 ^{1/}	30,000
Tutka	18	30,000	10,000	20,000	20,000	12,000
Seldovia	48	50,000	15,000	60,000	30,000	86,000
Pt. Graham	22	50,000	2,000	16,000	1,500	24,000
Windy L.	8		4,500	7,700	10,000	7,000
Windy R.	6	25,000	4,900	6,200	2,000	7,000
Rocky ^{2/}	67	200,000	12,000	80,000	300	44,000
Port Dick	34		16,000	31,500	50,000	35,000
Island	12	55,000	3,600	30,000	500	7,000
Totals		466,000	97,684 ^{2/}	272,300 ^{2/}	142,800 ^{2/}	266,000

^{1/} Weir Count.

^{2/} Total includes Middle Creek escapement which was dropped from sampling scheme in 1966.

Pre-emergent fry sampling methods in the Cook Inlet area are essentially the same as used in other regions of the State. A packboard mounted Homelite water pump with a discharge of 4200 gallons per hour is used for the power source. On the end of the discharge hose is attached a Venturi nozzle which mixes air and water. The nozzle is pushed into the gravel and the air-water mixture forces the fry out of the gravel and into the current. The fry are swept downstream and collected in a net attached to the sampling screen. The sampling screen is circular in shape and two square feet in area. Catches of fry are expressed in number of fry per square meter for purposes of this report.

The number of samples collected in a stream is dependent on the amount of spawning area utilized by the salmon. Approximately one sample is dug for every 100 square meters of utilized spawning area. The spawning areas for individual streams were measured by transit surveys during spawning seasons. Table 2 lists the utilized spawning area for the study streams.

Catch and Escapement Estimates

Catch information is derived from the statistical compilation of the fish tickets as reported by the individual fishermen. Table 4 lists the pink salmon catches by bay for the years 1962, 1964, and 1966. The percentage of the total catch harvested in each of the bays is listed on the table also. These percentages indicate that the catch distribution compared between the three years did not change drastically. The largest change occurred in the Nuka Bay catches. It should be mentioned that fish harvested in the Nuka Bay region are delivered to tenders located in Port Dick. In some cases these Nuka Bay caught fish are erroneously reported as harvested in the Port Dick statistical area. The magnitude of these errors is not known. These data indicate that a general overall decline of even year pink salmon runs is occurring in the Southern and Outer Districts. The forecast for 1968 also indicates a further reduction in the even year harvest.

Total escapement estimates are derived from foot and aerial surveys of spawning pink salmon taken at various intervals during the spawning period. The total escapement figures are determined by graphing the available daily counts of pink salmon in the streams by magnitude and day and calculating the area under the graph. This figure is then divided by the estimated time the pink salmon are present in the stream, which averages 2.5 weeks. Table 3 lists the total escapement estimates for the major pink salmon streams for the years 1962 through 1966 in the study area.

Table 4. Total Catch of Pink Salmon by Bay during Years 1962, 1964 and 1966

Area	1962	%	1964	%	1966	%
Upper Kachemak <u>1/</u>	109,430	(5.2)	82,753	(8.0)	40,824	(6.3)
Tutka	268,854	(12.7)	101,317	(9.8)	53,785	(8.3)
Seldovia	145,364	(6.9)	43,954	(4.3)	58,985	(9.1)
Pt. Graham Bay	10,415	(.5)	36,402	(3.5)	23,950	(3.7)
English Bay	7,729	(.4)	1,986	(.2)		
Dogfish Bay	374	(0.0)	77	(0.0)		
Pt. Chatham Bay	95,741	(4.5)	67,222	(6.5)		
Chugach Bay	16,148	(.8)	28,452	(2.7)		
Windy Bay	63,209	(3.0)	68,567	(6.7)	35,020	(5.4)
Rocky Bay	198,686	(9.4)	53,186	(5.1)	23,216	(3.6)
Pt. Dick	1,099,264	(52.0)	526,298	(51.0)	297,876	(46.3) <u>2/</u>
Nuka	98,356	(4.6)	23,671	(2.2)	111,344	(17.3)
Totals	2,113,570		1,033,885		645,000	

1/ Includes catches of pink salmon bound for Humpy and China Poot Creeks.

2/ Includes 75,600 pinks which were caught and dumped due to lack of tender service.

Expected Areas of Abundance During 1968

Table 2 lists the pre-emergent fry data for the salmon that spawned in 1966 (the parent cycle year for the 1968 return). These data indicate the most likely areas where harvestable numbers of pink salmon will return. Upper Kachemak Bay, as well as Seldovia and Port Graham Bays, should receive the largest percentage of the return. The earlier run streams located in Port Dick are not expected to produce large returns of pink salmon. Port Chatham had relatively high pre-emergent fry densities, but it was the first year the area was sampled and no comparison data is available.

LITERATURE CITED

Davis, Allen S. and others.

- 1964 Forecast research on 1964 Alaskan pink salmon fisheries. Alaska Department of Fish and Game, Informational Leaflet No. 36. Juneau, Alaska, pp. 36-39.
- 1965 Forecast research on 1965 Alaska pink salmon fisheries. Alaska Department of Fish and Game, Informational Leaflet No. 65. Juneau, Alaska, pp. 20-25.

Davis, Allen S.

- 1966 Cook Inlet area pink salmon forecast studies 1964-1966. Alaska Department of Fish and Game, Informational Leaflet No. 74. Juneau, Alaska, 13 pp.
- 1967 Forecast research on 1967 Cook Inlet area pink salmon fisheries. Alaska Department of Fish and Game. Informational Leaflet No. 98. Juneau, Alaska, 13 pp.

Rearden, Jim

- 1965 Status of the Cook Inlet-Resurrection Bay commercial salmon fishery, 1965. Alaska Department of Fish and Game, Informational Leaflet No. 69. Juneau, Alaska, 39 pp.

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.