

Informational Leaflet 136

A SUMMARY OF PRELIMINARY 1970 SALMON FORECASTS FOR ALASKAN FISHERIES

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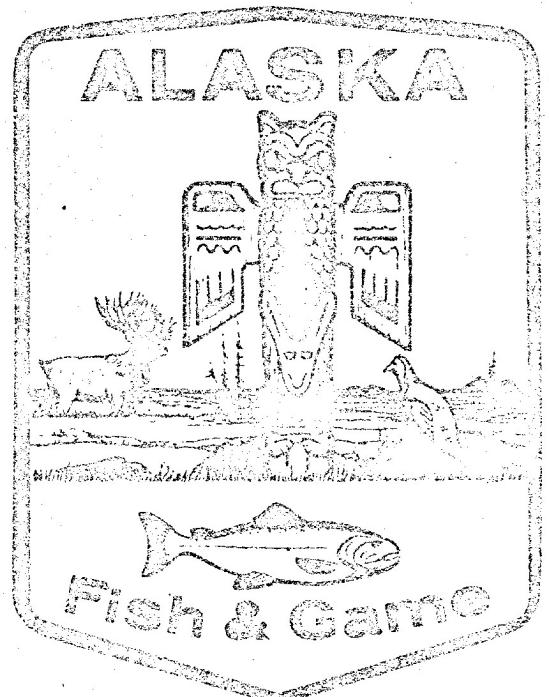


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FOREWORD

The Alaska Department of Fish and Game sincerely hopes that the information contained in this report will prove valuable to persons involved in the commercial salmon fisheries of Alaska, and that it will aid in the development of sound conservation policies directed toward the achievement of maximum utilization of this valuable, renewable resource. We wish to emphasize the preliminary status of the forecast information presented as many of the forecasts are based in part on preliminary data obtained during the 1969 season. Significant changes which may occur in the final forecasts will be made public via the news media and/or the final forecast publications.

A SUMMARY OF PRELIMINARY 1970 SALMON FORECASTS
FOR ALASKAN FISHERIES

INTRODUCTION

Introductory Remarks

Alaska's salmon resources rate high on the list of renewable resources which form the economic base for a large portion of the people of this state. Past experiences with other salmon fisheries of the world have lucidly shown that strict compliance with the scientific principles of conservation is imperative if Alaska's salmon resources are to be developed to, and maintained at their maximum level of production. The severe climatological conditions which Alaskan salmon encounter in their freshwater environment may require even more strict attention to conservation principles than necessary in geographical areas with more favorable climatological conditions. The reward from adhering to sound conservation principles will be a continued high level of economic and aesthetic return from the salmon resource to the people of Alaska.

The average annual Alaska commercial salmon harvest of 51 million fish for the 10-year period 1960-69 has reflected a 24 percent increase over the average annual harvest of 41 million for the previous 9-year period 1951-59. As seen from Table 1, which presents the annual Alaska commercial salmon harvest for the period 1951-69, the annual harvest has ranged from a low of 21 million fish in 1967 to a high of 66 million fish in 1964. To achieve maximum utilization of a resource which exhibits this large degree of annual variation, it is imperative that, for the purpose of operational planning, annual forecasts of the expected salmon returns and consequent commercial harvests be provided at an early date to all persons involved with the management and harvest of Alaska's salmon resources. Forecast information is of particular importance to the fisherman and processors (in combination referred to as the "fishing industry"), the Alaska Fish and Game Board, the Alaska Department of Fish and Game and federal agencies representing Alaska's interests in international commitments such as the International North Pacific Fisheries Treaty with Canada and Japan.

Recognizing the need for annual salmon forecasts, the Alaska Department of Fish and Game has continued to expand and improve its salmon forecasting program. In 1969, formal salmon forecasts were prepared for seven major salmon fisheries. The forecasts, actual returns and degrees of forecast success are presented in Table 2. Investments of funds in these forecast research programs

TABLE 1. ANNUAL ALASKA COMMERCIAL SALMON HARVEST BY SPECIES
AND STATISTICAL REGION, 1951-69

Year	Statistical Region ^{1/}	Species (No. of fish in thousands)					No. of 48-lb. Cases in Thousands ^{2/}	
		King	Red	Coho	Pink	Chum		
1951	SOUTHEASTERN	474	820	3,310	22,211	4,123	30,938	2,028
	CENTRAL	213	4,136	645	6,185	2,040	13,219	1,068
	WESTERN	102	4,697	76	21	454	5,350	389
	Subtotal	789	9,653	4,031	28,417	6,617	49,507	3,485
1952	SOUTHEASTERN	528	919	1,746	9,819	4,179	17,191	1,321
	CENTRAL	115	4,341	617	10,012	3,463	18,548	1,456
	WESTERN	92	11,664	70	47	522	12,395	797
	Subtotal	735	16,924	2,433	19,878	8,164	48,134	3,574
1953	SOUTHEASTERN	498	1,376	1,164	4,980	3,542	11,560	978
	CENTRAL	112	3,763	387	10,602	3,132	17,996	1,351
	WESTERN	102	6,654	31	88	619	7,494	534
	Subtotal	712	11,793	1,582	15,670	7,293	37,050	2,863
1954	SOUTHEASTERN	398	1,208	1,771	8,909	4,242	16,528	1,303
	CENTRAL	85	3,190	679	12,576	3,323	19,853	1,395
	WESTERN	128	5,014	59	688	820	6,709	397
	Subtotal	611	9,412	2,509	22,173	8,385	43,090	3,095
1955	SOUTHEASTERN	372	681	1,338	9,334	1,527	13,252	840
	CENTRAL	74	2,675	468	14,758	1,631	19,606	1,163
	WESTERN	135	5,148	27	32	342	5,684	383
	Subtotal	581	8,504	1,833	24,124	3,500	38,542	2,386
1956	SOUTHEASTERN	239	921	935	13,472	2,736	18,303	1,032
	CENTRAL	82	3,432	495	11,940	3,674	19,623	1,349
	WESTERN	137	10,252	52	125	791	11,357	641
	Subtotal	458	14,605	1,482	25,537	7,201	49,283	3,022
1957	SOUTHEASTERN	298	1,031	1,217	6,858	3,369	12,773	905
	CENTRAL	57	2,071	301	6,659	4,362	13,450	1,002
	WESTERN	158	6,631	87	4	548	7,428	557
	Subtotal	513	9,733	1,605	13,521	8,279	33,651	2,464
1958	SOUTHEASTERN	323	971	955	9,836	2,767	14,852	1,181
	CENTRAL	45	1,636	459	14,452	3,244	19,836	1,354
	WESTERN	182	3,460	193	1,809	613	6,257	437
	Subtotal	550	6,067	1,607	26,097	6,624	40,945	2,972

TABLE 1. ANNUAL ALASKA COMMERCIAL SALMON HARVEST BY SPECIES
AND STATISTICAL REGION, 1951-69 (Continued)

Year	Statistical Region ^{1/}	Species (No. of fish in thousands)					No. of 48-lb. Cases in Thousands ^{2/}	
		King	Red	Coho	Pink	Chum		
1959	SOUTHEASTERN	359	777	1,094	7,851	1,247	11,328	759
	CENTRAL	47	1,937	332	3,057	1,908	7,281	573
	WESTERN	195	5,249	76	22	886	6,428	446
	Subtotal	601	7,963	1,502	10,930	4,041	25,037	1,778
1960	SOUTHEASTERN	310	588	721	2,985	1,019	5,623	318
	CENTRAL	41	2,835	618	12,313	3,682	19,489	1,205
	WESTERN	196	14,411	66	782	1,923	17,378	1,049
	Subtotal	547	17,834	1,405	16,080	6,624	42,490	2,572
1961	SOUTHEASTERN	230	744	889	12,638	2,559	17,060	1,224
	CENTRAL	31	3,030	357	8,736	2,080	14,234	940
	WESTERN	243	12,307	67	132	991	13,740	1,048
	Subtotal	504	16,081	1,313	21,506	5,630	45,034	3,212
1962	SOUTHEASTERN	206	772	1,223	11,585	1,996	15,782	935
	CENTRAL	42	3,534	692	29,297	4,024	37,589	2,013
	WESTERN	213	4,990	124	2,981	1,128	9,436	528
	Subtotal	461	9,296	2,039	43,863	7,148	62,807	3,476
1963	SOUTHEASTERN	258	678	1,275	19,145	1,479	22,835	1,216
	CENTRAL	35	2,437	627	14,976	2,350	20,425	1,135
	WESTERN	208	3,101	121	154	635	4,219	305
	Subtotal	501	6,216	2,023	34,275	4,464	47,479	2,656
1964	SOUTHEASTERN	357	924	1,588	18,581	1,936	23,386	1,263
	CENTRAL	22	3,198	866	24,945	4,160	33,191	1,724
	WESTERN	260	5,839	105	1,747	1,179	9,130	563
	Subtotal	639	9,961	2,559	45,273	7,275	65,707	3,550
1965	SOUTHEASTERN	287	1,085	1,548	10,880	1,474	15,274	758
	CENTRAL	31	4,229	393	9,464	1,635	15,752	985
	WESTERN	265	24,732	57	3	271	25,328	1,525
	Subtotal	583	30,046	1,998	20,347	3,380	56,354	3,268
1966	SOUTHEASTERN	308	1,054	1,227	20,438	3,273	26,300	1,562
	CENTRAL	24	4,458	574	17,028	2,574	24,658	1,532
	WESTERN	208	9,562	119	2,585	609	13,083	897
	Subtotal	540	15,074	1,920	40,051	6,456	64,041	3,991

TABLE 1. ANNUAL ALASKA COMMERCIAL SALMON HARVEST BY SPECIES
AND STATISTICAL REGION, 1951-69 (Continued)

Year	Statistical Region ^{1/}	Species (No. of fish in thousands)					No. of 48-lb. Cases in Thousands ^{2/}	
		King	Red	Coho	Pink	Chum		
1967	SOUTHEASTERN	301	972	866	3,111	1,810	7,060	431
	CENTRAL	26	3,049	450	3,409	1,198	8,132	609
	WESTERN	284	4,557	172	39	646	5,698	424
	Subtotal	611	8,578	1,488	6,559	3,654	20,890	1,464
1968	SOUTHEASTERN	332	831	1,543	25,085	2,644	30,435	1,372
	CENTRAL	20	4,260	875	16,664	2,837	24,656	1,437
	WESTERN	259	3,039	333	2,977	601	7,209	359
	Subtotal	611	8,130	2,751	44,726	6,082	62,300	3,168
1969 ^{3/}	SOUTHEASTERN	420	1,260	500	4,700	760	7,640	308
	CENTRAL	37	3,659	264	20,538	1,624	26,122	1,447
	WESTERN	290	6,950	260	430	780	8,710	497
	Subtotal	747	11,869	1,024	25,668	3,164	42,472	2,252

- Data Sources:
- i) Alaska Department of Fish and Game Statistical Leaflet No. 15.
 - ii) Alaska Department of Fish and Game Unpublished data.
 - iii) Alaska Fisheries Reports, 1954-59. Bureau of Commercial Fisheries, U.S. Fish and Wildlife Service.

1/ For the purpose of reporting Alaska commercial fisheries statistics, the statistical regions are defined as follows:

SOUTHEASTERN: Dixon Entrance to Cape Suckling

CENTRAL: Cape Suckling to Seal Cape on the southwestern tip of Unimak Island

WESTERN: Seal Cape to, and including, the Aleutian Islands and the Bering Cape north through Kotzebue Sound.

2/ Although the majority of commercially harvested salmon in Alaska are processed as canned products, in some regions certain species (such as king and coho salmon in the southeastern region) are processed predominantly as fresh/frozen or cured products. These case pack figures do not include salmon processed in ways other than canning.

3/ Preliminary data.

TABLE 2. A SUMMARY OF 1969 SALMON FORECASTS AND ACTUAL RETURNS
TO SEVEN MAJOR SALMON FISHERIES IN ALASKA (Number of fish
in millions)

Area	Species	Preseason Forecasts	Actual Returns ^{1/}	Difference ^{2/}
Southeastern Alaska	Pink	6.8 - 7.5	8.8	+1.7
Prince William Sound	Pink	4.5 - 7.3	6.2	+0.3
Prince William Sound	Chum	0.4	0.5	+0.1
Cook Inlet (Southern and Outer District only)	Pink	0.4 - 0.6	0.3	-0.2
Kodiak	Pink	7.0 - 10.0	14.0	+5.5
Chignik	Sockeye	1.0	0.9	-0.1
Bristol Bay	Sockeye	21.3	19.0	-2.3

1/ Preliminary data.

2/ When a range forecast is presented, the midpoint of the range is used to determine the forecast error.

have resulted in manyfold returns in the form of increased commercial harvests and achievement of desired escapement levels necessary for the perpetuation of the salmon populations.

As a result of the increasing complexity of problems encountered in managing Alaska's salmon resources -- and on a larger basis, all of Alaska's fishery resources -- for maximum sustained harvest, the need exists for an annual summary of all salmon forecast information to be published each year prior to the fall Alaska Fish and Game Board meetings. This new forecast publication series is intended to fill this need.

Scope and Objectives of Report

As mentioned above, annual salmon forecasts are presently provided for several of the major salmon fisheries in Alaska. In the past, the criteria for determining whether or not a formal forecast would be provided for a specific salmon fishery was the availability of sufficient data on which to base forecast analysis. The contents of the present forecast reports have generally been made public first via the news media in late fall and secondly through the Department's Informational Leaflet series in the spring. The forecast publications serve not only to publicize the annual salmon forecasts, but also include: i) information on the forecast research programs, methods of analysis and data; ii) detailed forecast information such as expected returns to specific rivers, streams or subareas; and iii) anticipated management philosophies including escapement goals, anticipated harvests and discussion of special problems that might be encountered during the course of the fishing season.

This new forecast publication series is intended to supplement, rather than replace, the existing forecast publications. The immediate objectives of this report are as follows:

- 1) To make available at an early date each year the results of salmon forecast research and analysis.

Since the primary purpose of a salmon forecast is to aid in the planning of operations for the subsequent fishing season, it is desirable to make this information available at the earliest possible date. In the past, formal forecast publications have generally been delayed until spring as a result of late summer and fall field work schedules and the unavailability, until spring, of final compiled catch/escapement data and other biological data emanating from the previous season. However, preliminary forecasts,

based in part on preliminary data, are generally available by late fall. This new report series will help to realize maximum value from forecast research by making this preliminary salmon forecast information available prior to the fall Fish and Game Board meeting and early enough to allow inclusion of this information in pre-season planning. Generally, the final forecasts do not vary significantly from the preliminary forecasts, however, any significant changes that may occur will be made public by the Department via the news media and the final forecast publications.

- 2) To present salmon forecast information which has not been formally published in the past.

For some salmon fisheries in the state, only very limited information is available on which to base annual forecasts of returning runs and/or expected commercial harvests. Consequently, no attempt has been made to prepare formal forecasts for these fisheries. In many cases the relative magnitudes of the commercial harvests are not sufficiently large to justify, at the present time, the expenditure of funds at the level required to develop adequate forecast research programs. However, for some of these fisheries, the data presently available may be used to develop forecasts which, although exhibiting less reliability than desirable, indicate at least the general magnitude of the expected total returns and/or anticipated harvests. It is the purpose of this report to include such information when available.

- 3) To provide the basis for developing an annual statewide forecasts of salmon returns and expected commercial harvests.

The salmon fisheries for which formal forecasts are presently available account for a large percentage of the total annual harvest of the two major commercial salmon species, namely, pink and red salmon. More specifically, the combined pink salmon fisheries of Southeastern Alaska, Prince William Sound, Cook Inlet (Southern and Outer Districts) and Kodiak contribute in excess of 75 percent of the total pink salmon harvest in the state, while the Chignik and Bristol Bay red salmon fisheries generally contribute in excess of 50 percent -- in years of large Bristol Bay returns, in excess of 75 percent -- of the statewide commercial red salmon harvest. By supplementing the forecast information from these major fisheries with forecast information

which can be extracted from other salmon fisheries in the state, a basis can be developed for annually forecasting the total statewide salmon harvest. Such information is of much significance to industry suppliers, the transportation industry and for projection of anticipated state revenue.

Finally, a long range objective of this series will be to broaden and improve the basis for communication between different groups involved with the management and/or harvest of Alaska's salmon resources. To this end, each subsequent report of this series will include a discussion in depth on a specific aspect of salmon forecasting -- or a closely related subject. Tentative plans for the 1971 publication are to include a discussion on the evaluation of forecast accuracy and error.

It is not the intent of this report to include basic data on which area forecasts are based, detailed descriptions of forecast techniques or discussions in depth on particular problems or aspects of specific area fisheries. As in the past, these items will be presented in the formal area forecast publications.

Format of Report

Forecast information will be presented in the following manner:

- 1) In the section entitled "Regional Forecast Summaries", the individual area forecast are summarized in table form by statistical region. In addition, estimates of the total region commercial harvest by species will be developed. No detailed information on specific area forecasts will be contained in this section.
- 2) In the section entitled "Statewide Forecast Summary", the regional summaries will be combined and expanded to obtain estimates of the total state commercial harvest by species for the following season.
- 3) In the appendix, the preliminary area forecasts are presented individually with additional information on specific aspects of the forecasts. This will include general descriptions of the data and forecast techniques utilized, more detailed forecast information such as expected returns to specific locations and basic management philosophies including anticipated escapement goals, expected harvests and special points of interests.

GENERAL COMMENTS ON FORECAST METHODS

There are numerous techniques which can be used to forecast the magnitude of returning salmon runs. Detailed descriptions of these techniques do not lie within the scope of this report, however, some general comments may provide some insight into the methods used for forecasting salmon returns in Alaska.

The technique used to forecast a particular salmon run depends primarily on the type of data available on which to base the forecast analysis. If extensive data is available, several different techniques may be used, in which case the relative reliability of the different resulting forecasts must be evaluated and some "average" forecast derived. Some forecast techniques are unique to specific species of salmon -- special techniques are used when forecasting the returns of multiple age class salmon such as red salmon.

Perhaps the simplest method of forecasting the magnitude of a salmon return (or commercial harvest) consists of compiling actual returns for as many previous years as available and using the arithmetic average of these returns as the forecast of the return for the following season. Although this method may appear suspiciously simple, there are instances when it may be used to obtain adequate forecasts. If the salmon runs to a particular location do not exhibit a large degree of annual variation, the above technique may provide a forecast of sufficient accuracy. In some instances the data available may be of such a limited nature as to exclude all methods except the above. The most serious deficiency of this method is that it contains no power to detect and predict returns which vary greatly from the average as a result of exceptional spawning populations, survival conditions, etc. Consequently, when salmon populations experience wide fluctuations -- the inshore return in 1963 to the Kvichak River (Bristol Bay) totaled only 560,000 red salmon while in 1965 the return exceeded 42 million -- this method obviously has little application to the problem of forecasting.

A slight modification of the above technique can sometimes result in a significant improvement in forecast accuracy. Although a particular salmon run may not vary greatly between consecutive years, conditions may be such as to induce a trend -- either increasing or decreasing, either short term or long term -- in the magnitude of returns. By adjusting for these trends, the forecast accuracy may be improved over the use of simple averages.

The more common and powerful forecast techniques all employ the same principle. A measure of abundance of the population of salmon to be forecasted is obtained at some stage of the salmon's life cycle prior to the arrival of the salmon at the inshore fishery. By comparing this measure of abundance with

similar measures of abundance and subsequent total returns observed in previous years, an estimate of the total return for the following season is obtained. In the Department's forecast research programs the initial measure of abundance is generally obtained at one or more of three life history stages: i) the parent spawning stage where the escapement producing the return to be forecasted is enumerated or an index is obtained; this actually represents an indirect measure of the population to be forecasted; ii) the egg and/or pre-emergent fry stage where the measure of abundance is obtained in the spring while the eggs and/or fry are still in the spawning gravel and after the very significant initial mortalities have occurred; or iii) the outmigration stage where a measure of the fry or smolt is obtained while the fish are migrating from the freshwater environment to the ocean. Although it would be desirable to obtain a measure of abundance as late in the life cycle as possible -- after the major mortalities have occurred -- the difficulty and cost encountered in obtaining an accurate measure of abundance at a particular life stage must also be considered.

The accuracy with which salmon runs can be forecasted using this technique depends to a large extent on two factors:

- 1) The accuracy with which the measure of abundance at the intermediate stage in the life cycle can be obtained and the accuracy with which the subsequent adult returns can be measured; and
- 2) The degree to which the size of the salmon population is affected by various factors after the initial measure of abundance is obtained. Changes in salmon abundance result from natural mortalities and fishing mortalities which occur prior to the arrival of the salmon at the inshore fishery.

To a great extent, errors experienced in forecasting salmon runs often result from the failure of the initial measure of abundance to provide an accurate measure and from the lack of information on factors which affect the magnitude of the salmon population after the initial measure of abundance is obtained and prior to the arrival of the salmon at the inshore fishery.

A modification of the technique described above provides a useful method for forecasting some specific age class returns for multiple age class salmon populations. In this method use is made of the fact that a relationship may exist between the number of fish from a given brood year which mature (i.e. return to spawn) at a particular age and the number of fish from the same brood year which mature at an older age. If such a relationship exists, the number of fish of the earlier age class which are observed to return one year provide a basis for estimating the number of fish of the older age class which

return in a subsequent year. To illustrate, if a relationship is observed between the number of 4_2 red salmon (red salmon having reared two years in freshwater and two years in the ocean) which return one year and the number of 5_2 red salmon (having reared two years in the freshwater and three years in the ocean) which return the following year, then the number of 4_2 fish returning in 1969 may be used to forecast the numbers of 5_2 fish returning in 1970.

Realizing that the above discussion is very brief and cursory, future reports in this series will periodically contain detailed discussion of the forecast techniques presently being utilized to forecast Alaskan salmon returns.

REGIONAL FORECAST SUMMARIES

In the following presentation of the regional forecasts, several points should be clarified:

- 1) The regions used for the purpose of this report are the statistical regions by which commercial fisheries statistics are presented in the Department's Statistical Leaflet series and in prior statistical reports. The boundaries of these regions are defined as follows:

SOUTHEASTERN: Dixon Entrance to Cape Suckling.

CENTRAL: Cape Suckling to Seal Cape on the southwestern tip of Unimak Island.

WESTERN: Seal Cape to, and including, the Aleutian Islands and the Bering Sea north through Kotzebue Sound.

The use of these statistical regions for the presentation of the forecasts facilitates the comparison of the forecasted levels of harvest with past salmon harvest statistics.

- 2) The forecasts presented in the summary tables are of two types:

- i) forecasted total returns - These forecasts are estimates of the total returns to the inshore fisheries and, as such, are comprised of both catch and escapement.
- ii) estimated commercial harvests - In those cases where sufficient data is not available on which to base forecasts of total salmon

returns, the past pattern of commercial harvests is used to estimate the level of commercial harvest expected in 1970.

- 3) **IMPORTANT** - It should be emphasized that the forecasted commercial harvests do not constitute goals that the Department will attempt to achieve regardless of the strength or magnitude of the returning salmon run. Should the actual return be weaker than forecasted or normally encountered, additional restriction may be necessary to allow adequate escapement with a resulting smaller harvest than predicted; if the return is stronger, relaxation of regulations to insure adequate harvest may result in a larger harvest than predicted.
- 4) Although the majority of salmon harvested commercially in Alaska are processed by canning, in some regions the commercial harvest of certain species is processed predominantly as fresh/frozen and cured products. Whereas the fish processed by means other than canning are included in the reported total number of fish harvested, they are not included in the number of 48-lb. cases produced. In the following tables, the estimated numbers of 48-lb. cases for 1970 are based on the previously observed ratio of total number of commercially harvested salmon to the total number of 48-lb. cases produced. As such, the resulting ratio of fish per case does not represent the actual conversion rate of fish to 48-lb. cases at the cannery.
- 5) In some instances trends existing in past commercial harvest levels may be used to improve the forecasts of future harvest levels. It is not the intent of this report to discuss possible explanations for the existence of these trends. Limited discussion of this nature may occur in the area forecasts presented in the appendix.

Southeastern Region Forecasts

Preliminary forecasts of total returns and/or commercial harvests for the southeastern statistical region fisheries are presented in Table 3. Additional information on forecasts for specific areas or districts is presented in Appendix 1. The southeastern region forecast research program was only recently initiated with field work beginning in 1963, consequently extensive data does not exist on which to base forecasts of total returns. The decision to concentrate initial forecast research efforts on the pink salmon stocks was based on the consideration that the pink salmon represents the most important commercial species in this region. Although a forecast of the total return of pink salmon is presented, the lack of extensive data on the total returns of salmon of other species necessitates the prediction of commercial harvest

TABLE 3 . SOUTHEASTERN ALASKA STATISTICAL REGION , PRELIMINARY 1970 SALMON FORECASTS^{1/}

Area and/or District ^{2/}	SPECIES								
	King			Red			Coho		
	Total Return	Harvest	Total Return	Harvest	Total Return	Harvest	Total Return	Harvest	Total Return
Number of Fish in Thousands									
Southern Southeastern	--	--	--	--	--	--	18,700	13,200	--
Northern Southeastern	--	--	--	--	--	--	9,000	5,500	--
Icy Straits-Lynn Canal-Taku Inlet Only	--	--	400	--	--	--	--	--	--
Forecast Subtotals	--	--	400	--	--	--	27,700	18,700	--
Estimated Additional Region Harvest ^{3/}	--	400	--	500	--	1,200	--	--	2,000
Region Totals	--	400	--	900	--	1,200	27,700	18,700	--
*****Estimated Number of 48-lb. Cases in Thousands ^{4/}									
Region Totals	--	<u>4/</u>	--	64	--	<u>4/</u>	--	882	--
								198	

^{1/} For some salmon stocks sufficient data is not available on which to base forecasts of total salmon returns. In such cases, the commercial harvests are predicted by merely projecting the recently observed trends of the past commercial harvests. The projected commercial harvests for 1970 do not represent Department harvest goals as actual abundance in 1970 may necessitate management regulation which will result in harvest levels significantly different from those presented.

^{2/} For geographical descriptions of the areas or districts, refer to the Alaska commercial fishing regulations. The areas and/or districts listed here may not be distinct but are presented in the manner in which the individual species forecasts are developed.

(Continued)

3/ These projections of commercial harvest are included to supplement the existing area forecasts and provide a basis for estimating the total region commercial harvest.

4/ Although the majority of commercially harvested salmon in Alaska are processed as canned products, in some regions certain species (such as king and coho salmon in the southeastern region) are processed predominantly as fresh/frozen or cured products. In such instances, no attempt is made to project an estimate of cases in 1970. Furthermore, since the average ratio of fish/case used to estimate number of cases is affected by the proportion of fish that are processed by means other than canning, these ratios may differ from the actual cannery conversion rates of fish/case.

rather than total return for species other than pink salmon.

Following a period of declining king salmon abundance from 1951-62 -- the commercial harvest declined from a high of approximately 530,000 in 1952 to a low of approximately 200,000 in 1962 -- the king salmon abundance in the southeastern region has reflected an increasing trend from 1962 to 1969. The annual harvest has ranged from a low of 200,000 in 1962 to a high of approximately 400,000 in 1969. Assuming that the most recent increasing trend will continue, the 1970 commercial harvest of king salmon is estimated to be approximately 400,000 fish. (An improvement in subsequent reports in this series will be the inclusion of fitted trend lines, when appropriate, as a means of graphically illustrating the methods used to forecast commercial harvests.)

The southeastern region red salmon harvest has remained relatively constant since 1951, varying from 600,000 to 1.4 million and averaging approximately 900,000 fish. The Icy Straits-Lynn Canal-Taku Inlet area red salmon forecast (Appendix 1) indicates that this portion of the southeastern red salmon fishery should contribute approximately 400,000 fish to the region red salmon harvest. Assuming that the past pattern of red salmon abundance continues through 1970, the total region red salmon harvest for 1970 is estimated to be 900,000 with the Icy Straits-Lynn Canal-Taku Inlet fisheries contributing an estimated 400,000 fish. It should be emphasized that due to the fact that a large portion of the southeastern region red salmon harvest is taken incidentally in the larger pink salmon fisheries, regulations promulgated for management of the pink salmon fisheries may have a very significant effect on the level of harvest of red salmon.

The commercial harvest of coho salmon in the southeastern region declined from a 1951 harvest of 3.3 million to a 700,000 harvest in 1960. Following this period, a relatively constant pattern of annual harvest levels developed with annual harvests ranging from 800,000 to 1.6 million, except for 1969 when the southeastern region coho harvest of approximately 500,000 represented an alltime low since 1951. Assuming that the level of harvest experienced in 1969 represents an exceptionally low level of abundance -- and not the limitation of a declining trend -- and that the relatively level pattern established since 1961 will continue, the commercial harvest of coho salmon in 1970 is estimated to be approximately 1.2 million fish.

Since 1951 the southeastern region pink salmon harvest has fluctuated widely from a low of 3.0 million in 1960 to a high of 25.1 million in 1968. Although no apparent increasing or decreasing trend has been established in recent years, a very predominant even-year pattern has developed. The even-year commercial harvests in 1966 and 1968 have exceeded by six - to seven-fold the odd-year harvests in 1967 and 1969 (refer to Table 1). The southeastern region pink salmon 1970 forecast (Appendix 1) of 27.7 million total return, with

an associated commercial harvest of 18.7 million pink salmon, indicates a continuation of the predominant even-year pattern through 1970. As such, the predicted 1970 pink salmon harvest will compare closely with the 1966 and 1968 harvests of 20.0 and 25.1 million fish respectively. For the years 1964-68 the average number of pink salmon per 48-lb. case was 21.2 fish/case, thus indicating an estimated case pack of 882,000 48-lb. cases.

The annual harvest levels of chum salmon in the southeastern region have reflected large variations since 1951. Following an apparent decline during the period 1951-60, the chum harvest developed a relatively level, but erratic pattern with no apparent increasing or decreasing trends. Similar to the 1969 coho harvest, the 1969 chum harvest of approximately 800,000 fish represents the lowest level of harvest since 1951. Assuming that the 1969 harvest represented an exceptionally low level of abundance -- and not the initiation of a declining trend -- and that the pattern developed since 1961 will continue, the 1970 harvest of chum salmon for the southeastern region is estimated at 2.0 million fish.

Central Region Forecasts

The central statistical region is composed of the following major areas: Prince William Sound (including the Copper and Bering Rivers), Cook Inlet (including Resurrection Bay), Kodiak, Chignik and South Side Alaska Peninsula. Preliminary forecasts of total salmon returns and/or commercial harvests for these areas are summarized in Table 4. Additional information on forecasts for specific areas or districts is presented in Appendix 2.

For the Prince William Sound-Copper, Bering Rivers area, forecasts of total salmon returns are presented for pink and chum salmon and the Eshamby River red salmon stocks. In addition, commercial harvest projections for 1970 are made for other salmon contributing to the total commercial salmon harvest for this area. Estimated 1970 harvest levels of king, red and coho salmon compare closely to recently observed levels. Although the estimated 1970 harvest of 200,000 chum salmon reflects a 40 percent decrease relative to the post-earthquake average chum harvest of 340,000, the estimated harvest of 3.1 million pink salmon would nearly duplicate the post-earthquake average harvest level of pink salmon.

With the exception of the forecasted total return of pink salmon to the Southern and Outer Cook Inlet districts, salmon forecasts for the Cook Inlet-Resurrection Bay area consist of projections of the 1970 commercial harvest levels. The 1970 chum, coho and pink salmon harvest levels are expected to reflect the somewhat higher levels observed in recent even years. The estimated 1970 pink salmon harvest of 4.2 million fish compares favorably with

the harvest levels of 1962 and 1964 when 5.0 and 4.3 million pink salmon respectively were harvested.

Forecast information based on pre-emergent fry data indicates that the 1970 Kodiak area commercial salmon season should be dominated by an exceptionally large pink salmon return of approximately 20 million fish. If the 1970 pink salmon return materializes as predicted, it will have a two-fold significance. In addition to representing a record even-year return, it will represent, in conjunction with the 1969 harvest of 12.5 million pink salmon, the first time since 1945-46 that successive year's catches have exceeded 10 million fish. The 1969 return of 14 million pink salmon -- following a pre-season forecast of 7-10 million -- was especially significant from the standpoint of salmon forecasting in that the parent year total return in 1967 barely reached one million pink salmon. In the absence of any pre-emergent fry data, it is very probable that a small 1969 return would have been expected, consequently an inadequate harvest of the actual 14 million return could possibly have occurred. However, on the basis of the actual 1969 forecast, additional processing facilities were prepared and an adequate harvest achieved. A pink salmon harvest of approximately 16 million pink salmon would result in a pack of approximately 700,000 48-lb. cases for the 1970 season. Pre-emergent fry data indicates that the Karluk-Red River and Eastside-Chiniak districts should receive the strongest returns in 1970. Additional forecast information on returns to specific districts is contained in Appendix 2.

1970 Forecasts of total returns of red and pink salmon and projected commercial harvests of coho and chum salmon for the Chignik area are presented in Table 4. The expected 600,000 red salmon harvest represents an approximate 30 percent increase over the 1960-69 average annual harvest of 450,000 and would nearly double the 1969 harvest of approximately 310,000 red salmon. Pink salmon harvest levels in the Chignik area have fluctuated widely since 1960 with peak levels exceeding 1.5 million and the lower levels reaching only several hundred thousand. The predicted 1970 pink salmon harvest of 1.1 million would fall in the upper range of recent harvest levels.

No data is available on which to base forecasts of total salmon returns for the south side of the Alaska Peninsula. Consequently, only projections of commercial harvests are presented in Table 4. Very few king and coho salmon are harvested in this area, with red, pink and chum salmon being the primary commercial species. Commercial catches of the latter three species have reflected considerable annual variation during the period 1960-69. The 1969 red salmon harvest of 900,000 represented the maximum annual harvest since 1960, while a low harvest of 200,000 red salmon was experienced in 1963. The projected 1970 harvest of 750,000 red salmon would fall in the upper range of recent harvest levels. Following an increasing trend of annual pink salmon harvests during the period 1960-65 (the 1965 commercial harvest was 2.9 million)

TABLE 4. CENTRAL ALASKA STATISTICAL REGION, PRELIMINARY 1970 SALMON FORECASTS^{1/}

Area and/or District ^{2/}	SPECIES						Total Return	Harvest	Total Return	Harvest	Total Return	Harvest						
	King		Red		Coho													
	Total Return	Harvest	Total Return	Harvest	Total Return	Harvest												
			Number of Fish in Thousands															
Pr. William Sound Copper-Bering Rivers	--	10	--	750	--	260	4,400	3,100	350	200								
Cook Inlet - Southern and Outer Districts	--	--	--	--	--	--	2,000	1,800	--	--								
Additional Cook Inlet - Resurrection Bay Harvest ^{3/}	--	10	--	1,250	--	400	--	2,380	--	1,100								
<hr/>																		
1 Cook Inlet- 2 Resurrection Bay Subtotal	--	10	--	1,250	--	400	--	4,180	--	1,100								
Kodiak, excluding Mainland District	--	--	--	--	--	--	20,200	16,000	--	--								
Mainland District only	--	--	--	--	--	--	--	--	560	--								
Additional Kodiak Area Harvest ^{3/}	--	--	--	500	--	40	--	--	--	600								
Kodiak Subtotal	--	+	--	500	--	40	20,200	16,560	--	600								
Chignik	--	+	1,230	600	--	10	2,000	1,100	--	200								

(Continued)

TABLE 4. CENTRAL ALASKA STATISTICAL REGION, PRELIMINARY 1970 SALMON FORECASTS 1/ (Continued)

Area and/or District <u>2/</u>	SPECIES									
	King		Red		Coho		Pink		Chum	
	Total Return	Harvest	Total Return	Harvest	Total Return	Harvest	Total Return	Harvest	Total Return	Harvest
South Side Alaska Peninsula	--	+	--	750	--	10	--	1,630	--	400
Total Region	--	30 <u>4/</u>	--	3,850	--	720	--	26,570	--	2,500
<u>*****</u>										
<u>Estimated Number of 48-lb. Cases in Thousands <u>5/</u></u>										
Total Region	--	10	--	330	--	40	--	1,280	--	190

1/ For some salmon stocks sufficient data is not available on which to base forecasts of total salmon returns. In such cases, the commercial harvests are predicted by merely projecting the recently observed trends of the past commercial harvests. The projected commercial harvests for 1970 do not represent Department harvest goals as actual abundance in 1970 may necessitate management regulation which will result in harvest levels significantly different from those presented.

2/ For geographical descriptions of the areas or districts, refer to the Alaska commercial fishing regulations. The areas and/or districts listed here may not be distinct but are presented in the manner in which the individual species forecasts are developed.

3/ These projections of commercial harvest are included to supplement the existing area forecasts and provide a basis for estimating the total region commercial harvest.

4/ This includes an estimated 10,000 king salmon which will be harvested jointly in the Kodiak, Chignik and South Side Alaska Peninsula fisheries.

5/ Although the majority of all salmon harvested commercially in Alaska are processed as canned products, a large proportion of the harvest of certain species, in particular king and coho salmon, is processed as fresh/frozen and cured products. The number of cases presented above are not adjusted to include salmon processed by means other than canning, consequently the fish per case ratio indicated in this table may not agree with the actual cannery conversion rate of fish per case.

the pink salmon abundance in this area declined drastically with only 78,000 salmon being harvested in 1967. However, the 1969 harvest of approximately 1.2 million suggests that the pink salmon stocks may be recovering to some extent. Consequently, an estimated harvest of 1.6 million pink salmon is projected for 1970. The chum salmon stocks in this area do not appear to be recovering from a decline (the 1960 harvest totaled 1.1 million compared to the 390,000 of 1969) which has occurred since 1960. The estimated 1970 commercial harvest of 400,000 chum salmon is based on the assumption that the existing trend will continue.

Western Region Forecasts

The western statistical region is composed of the following major fishing areas: the North Side of the Alaska Peninsula and the Aleutian Islands, Bristol Bay, and the Arctic-Yukon-Kuskokwim area. Forecasts of total salmon returns and/or commercial harvests for the salmon fisheries of the western region in 1970 are presented in Table 5. Additional forecast information is contained in the area forecasts in Appendix 3.

No data is available on which to base forecasts of total salmon returns to the North Side Alaska Peninsula and Aleutian Island fisheries, consequently only projections of the 1970 commercial harvest levels are presented in Table 5. Due to the extreme variation reflected in the harvest levels of some species, it is difficult to predict -- with any certitude -- future harvest levels for this area, and therefore, the estimates presented here should be evaluated with additional caution. Projected 1970 harvest levels for the two major commercial species, red and pink salmon, are 400,000 and 200,000 fish respectively. In addition, estimated harvests of 70,000 chums, 40,000 cohos and 10,000 kings are projected for the 1970 season.

Forecasts of the 1970 total red salmon return to the Bristol Bay area and the total pink salmon return to the Nushagak/Igushik district are presented in Table 5. In addition, estimates of the 1970 commercial harvests of king, coho and chum salmon for the total area are presented. If the 1970 forecasts prove to be accurate, the 1970 Bristol Bay commercial fishing season will be dominated by a record-breaking return of red salmon to the Kvichak River system. Of the total forecasted return of 56 million red salmon to the Bristol Bay area, red salmon returning to the Kvichak system will comprise in excess of 75 percent of the total area return. The estimated harvest of 35 million red salmon would represent the largest harvest on record since the inception of the Bristol Bay fishery in the late 1800's, and would exceed past peak harvest levels -- 24.7 and 24.3 million in 1938 and 1965 respectively -- by some 10 million fish. It should be emphasized that since the predicted 1970 salmon return represents a level not previously observed, the usual problems encountered in forecasting

TABLE 5. WESTERN ALASKA STATISTICAL REGION, PRELIMINARY 1970 SALMON FORECASTS^{1/}

Area and/or District ^{2/}	SPECIES						Total Return	Harvest	Total Return	Harvest	Total Return	Harvest						
	King		Red		Coho													
	Total Return	Harvest	Total Return	Harvest	Total Return	Pink												
	Number of Fish in Thousands																	
North Side Alaska Peninsula and Aleutian Islands	--	10	--	400	--	40	--	200	--	--	70							
Bristol Bay	--	--	48,090	29,950	--	--	--	--	--	--	--							
Naknek/Kvichak	--	--	3,310	2,310	--	--	--	--	--	--	--							
Egegik	--	--	1,370	670	--	--	--	--	--	--	--							
Ugashik	--	75	2,970	1,520	--	--	2,500	1,750	--	--	180							
Nushagak/Igushik	--	--	270	170	--	--	--	--	--	--	100							
Togiak	--	25	--	--	--	40	--	290	--	--	100							
^{1/} Additional Bristol Bay Harvest ^{3/}	--	100	56,010	34,620	--	40	--	2,040	--	--	380							
Bristol Bay Subtotal	--	160	--	20	--	120	--	150	--	--	300							
Arctic-Yukon-Kuskokwim	--	270	--	35,040	--	200	--	2,390	--	--	750							
Region Totals	--	30	--	2,500	--	+	--	110	--	--	20							
	^{2/} Estimated Number of 48-lb. Cases in Thousands						^{4/} (Continued)											

TABLE 5. WESTERN ALASKA STATISTICAL REGION, PRELIMINARY 1970 SALMON FORECASTS ^{1/} (Continued)

- 1/ For some salmon stocks sufficient data is not available on which to base forecasts of total salmon returns. In such cases, the commercial harvests are predicted by merely projecting the recently observed trends of the past commercial harvests. The projected commercial harvests for 1970 do not represent Department harvest goals as actual abundance in 1970 may necessitate management regulation which will result in harvest levels significantly different from those presented.
- 2/ For geographical descriptions of the areas or districts, refer to the Alaska commercial fishing regulations. The areas and/or districts listed here may not be distinct but are presented in the manner in which the individual species forecasts are developed.
- 3/ These projections of commercial harvest are included to supplement the existing area forecasts and provide a basis for estimating the total region commercial harvest.
- 4/ Although the majority of all salmon harvested commercially in Alaska are processed as canned products, a large proportion of the harvest of certain species, in particular king and coho salmon, is processed as fresh/frozen and cured products. The number of cases presented above are not adjusted to include salmon processed by means other than canning, consequently the fish per case ratio indicated in this table may not agree with the actual cannery conversion rate of fish per case.

salmon returns are accentuated and new problems are introduced. Consequently a relative large discrepancy -- in total numbers of fish -- between the forecast and actual return of red salmon could occur. In addition to the red salmon harvest, an estimated 2.0 million pink salmon will be harvested, primarily from the Nushagak/Igushik district where pink salmon runs occur almost exclusively in the even years. Finally, projected 1970 commercial harvests of other species include 100,000 kings, 170,000 cohos and 640,000 chum salmon for the total Bristol Bay area.

The Arctic-Yukon-Kuskokwim (A-Y-K) area consists primarily of five major districts: Kuskokwim, Yukon, Norton Sound, Port Clarence and Kotzebue. The fisheries of these five districts produce all but a small percentage of the total commercial salmon harvest for the A-Y-K area. Data is not available on which to base forecasts of total salmon returns to this area, consequently the forecasts presented in Table 5 consist of projected commercial harvest levels for the 1970 season. Major contribution to the 1970 salmon harvest for the A-Y-K area will be the estimated 160,000 king salmon and 300,000 chum salmon. In addition, projected harvests of 120,000 coho, 150,000 pink salmon and 20,000 red salmon are expected in 1970. Annual red salmon harvests in this area total only several thousand fish.

STATEWIDE FORECAST SUMMARY

A summary of projected 1970 commercial salmon harvests for the major Alaskan fisheries is presented in Table 6. Due to the limited nature of forecast information on total salmon returns, the forecasted total returns presented in the region summaries are not duplicated in the state summary.

In addition to the projected harvest levels in numbers of salmon, the estimated 1970 case pack, expressed in standardized 48-lb. case units, is presented by species for the total state. It should be emphasized that the estimated case pack represents only that portion of the commercial salmon harvest processed as canned products and is not adjusted to represent all commercial salmon products. In addition to canned products, an increasing amount of fresh/frozen and cured products are prepared from Alaska salmon. To illustrate recent levels of salmon processed in fresh/frozen and cured products, the following information is presented.

Thousands of Pounds of Alaskan Salmon Processed as Fresh/Frozen and Cured

<u>Year</u>	<u>SPECIES</u>						<u>Total</u>
	<u>King</u>	<u>Red</u>	<u>Coho</u>	<u>Pink</u>	<u>Chum</u>		
1966	4,120	2,930	5,750	6,850	6,560	26,210	
1967	4,810	1,890	6,690	1,190	4,780	19,360	
1968	5,610	550	7,450	340	3,530	17,480	
Average	4,850	1,790	6,630	2,790	4,960	21,020	

Source: Alaska Department of Fish and Game commercial fisheries Statistical Leaflets (1968 statistics preliminary).

In view of the exceptionally large forecasted harvest for 1970, it is very probable that the quantity of fresh/frozen and cured salmon produced in 1970 will also reflect an increase over recent years.

Projected 1970 commercial harvest levels of king, coho and chum salmon compare closely with recent levels, primarily because these forecasts are based almost entirely on recently observed harvest levels and no adjustments are made for parent spawning population strength or for factors affecting survival. However, in terms of total numbers of salmon expected to be harvested in 1970, king, coho and chum salmon will contribute less than ten percent.

The two major contributing salmon species in 1970 will be red and pink salmon, which in combination are expected to contribute nearly 90 million fish to the commercial salmon harvest in Alaska. If the forecasted levels of harvest are attained in 1970, the salmon harvest of all species will total just short of 100 million salmon, the largest return achieved in nearly thirty years. This exceptionally large forecasted salmon harvest results from the coincidence of a predicted record red salmon harvest for the Bristol Bay area and expected large pink salmon harvest in the Kodiak and Southeastern Alaska areas.

As shown in Table 6, the expected 1970 harvests of red and pink salmon would result in the production of approximately 2.9 and 2.3 million 48-lb. cases respectively, contributing to a total 5.6 million cases of Alaskan salmon. For comparison, the previous largest casepack was 8.4 million cases of combined salmon species in 1936.

TABLE 6. SUMMARY OF 1970 FORECASTS ^{1/} OF COMMERCIAL SALMON HARVESTS FOR ALASKAN FISHERIES

Location ^{2/}	SPECIES				
	<u>Number of Fish in Thousands</u>				
	King	Red	Coho	Pink	Chum
Southeastern Statistical Region	400	900	1,200	18,700	2,000
Central Statistical Region					
Prince William Sound-Copper-Bering Rivers	10	750	260	3,100	200
Cook Inlet-Resurrection Bay	10	1,250	400	4,180	1,100
Kodiak	+	500	40	16,560	600
Chignik	+	600	10	1,100	200
South Side Alaska Peninsula	+	750	10	1,630	400
Central Region Subtotals	30 ^{3/}	3,850	720	26,570	2,500
Western Statistical Region					
North Side Alaska Peninsula and Aleutian Islands	10	400	40	200	70
Bristol Bay	100	34,620	40	2,040	380
Arctic-Yukon-Kuskokwim	160	20	120	150	300
Western Region Subtotals	270	35,040	200	2,390	750
State Totals	700	39,790	2,120	47,660	5,250
<u>Estimated Number of 48-lb. Cases in Thousands ^{4/}</u>					
State Totals	40	2,890	40	2,270	410

(Continued)

TABLE 6. SUMMARY OF 1970 FORECASTS ^{1/} OF COMMERCIAL SALMON HARVESTS FOR ALASKAN FISHERIES (Continued)

- 1/ The estimates of commercial harvests are obtained in one of two ways:
- i) expected escapement levels are subtracted from forecasts of total salmon returns, or
 - ii) projection of recent commercial harvest levels.
- The latter method, used when insufficient data is available on which to base forecasts of total returns, is generally less reliable as no adjustment is made for the relative strength of parent spawning populations or relative survival rates. Reference should be made to the regional summaries and/or area forecasts (appendix) to determine which method was used.
- 2/ For geographical descriptions of the areas or districts listed in this table, refer to the Alaska commercial fishing regulations.
- 3/ This includes an estimated 10,000 king salmon which will be harvested jointly in the Kodiak, Chignik and South Side Alaska Peninsula fisheries.
- 4/ Although the majority of all salmon harvested commercially in Alaska are processed as canned products, a large proportion of the harvest of certain species, in particular king and coho salmon, is processed as fresh/frozen and cured products. The number of cases presented above are not adjusted to include salmon processed by means other than canning, consequently the fish per case ratio indicated in this table may not agree with the actual cannery conversion rate of fish per case.

In addition to the estimated 5.6 million 48-lb. cases of canned salmon, the 1970 production of fresh/frozen and cured salmon products should exceed 20 million pounds for all species.

CONCLUDING REMARKS

In summary, two points should be re-emphasized. First, all forecast information presented in this report is of preliminary status and, as such, is liable to changes prior to the publication of the final forecasts. Second, the projected harvest levels for 1970 are not to be interpreted as harvest goals which the Department will attempt to achieve regardless of the strength of the actual returns. Actual salmon abundance in 1970 may require management regulations which result in harvest levels significantly different from those presented here. The harvest levels presented in this report are expected to approximate the actual 1970 levels if the forecasted total returns are accurate and/or the 1970 salmon abundances agree closely with recent levels.

Although the forecast information presented above is based on the best information available, the Alaska Department of Fish and Game obviously cannot guarantee the complete agreement of these forecasts with the eventual return. Many factors lying outside human control and the range of present knowledge affect the survival of salmon as they are spawned in the vast Alaska watersheds, as they migrate from the inland streams, river and lakes to the ocean rearing areas in the Gulf of Alaska and as they eventually return to the commercial fisheries and their original spawning grounds. However, recent salmon forecasts have generally reflected sufficient precision to aid the Department in management of the salmon resource and to aid the fishing industry in its operational planning. The Department is optimistic that future salmon forecasts will continue to be of value in the attempt to achieve proper utilization of this resource.

Acknowledgements

The major portion of the forecast information presented has been provided by Commercial Fisheries Division biologists presently conducting salmon forecast research in Alaska. Credit for specific forecast information is given in the area forecasts presented in the appendix. Past commercial fisheries statistics were made available by the Department's statistical section and the Commercial Fisheries Division area offices. The editors claim credit for all errors which appear in this report.

APPENDIX 1: SOUTHEASTERN REGION FORECASTS

REGION: Southeastern

GEOGRAPHICAL DESCRIPTION: Dixon Entrance to Cape Suckling

FORECAST AREA: Southeastern Alaska

SPECIES: Pink Salmon

1970 FORECAST OF TOTAL RETURN: 27.7 million

FORECAST METHODS:

The forecast of 1970 pink salmon returns to Southeastern Alaska is based primarily on the results of sampling conducted at the pre-emergent fry stage. Data collected through 1969 has been used to establish relationships between observed pre-emergent fry abundances and subsequent adult returns. These relationships are used to forecast the 1970 pink salmon returns from the results of pre-emergent fry sampling conducted in the spring of 1969.

To supplement the forecast information based on the rather limited pre-emergent fry data presently available, escapement-return data is also used as a basis for forecasting the 1970 returns. Because of the large degree of variability generally observed in escapement-return data, and as a result of the relatively high level of forecast success experienced in other regions where pre-emergent fry data is used as a basis for forecasting, the forecasts based on pre-emergent fry data are considered to be more reliable than those based on escapement-return data.

DISCUSSION OF 1970 FORECAST:

Due to the relatively short duration of the pink salmon research conducted in the Southeastern region, forecasts presented at this time should be evaluated with additional caution.

Although the 1969 level of sampling was reduced by approximately 15 percent from the previous year as a result of severe winter conditions, it is not felt that this reduction was critical to obtaining a reliable measure of abundance of pre-emergent fry in the study area.

For the purpose of forecasting pink salmon returns, the Southeastern region is divided into a Southern Section and a Northern Section by a line extending through the Kuiu, Kupreanof, Mitkof Island complex.

Southern Section Forecast

Thirty-nine major pink salmon streams in the Southern Section were sampled for pre-emergent fry in the spring of 1969. The results of the sampling indicated an average of 12.5 fry per square foot of spawning gravel in the study areas. For comparison, estimates of 14.1 and 13.6 fry per square foot in 1965 and 1967 resulted in returns of 21.0 million and 20.5 million pink salmon respectively in 1966 and 1968.

Because of the marked even-year predominance in pink salmon returns in the Southern Section, only data pertinent to the even years was used to forecast the 1970 return to this section. Preliminary analysis of the pre-emergent fry data indicates a 1970 return of 18.7 million pink salmon to the Southern Section. Analysis of escapement-return data indicates a return of 21.4 million pink salmon while another variation of analysis of the pre-emergent fry data results in a forecast of 17.2 million fish. Although the estimate of 18.7 million is considered the most reliable, the other two estimates of 21.4 million and 17.2 million may be considered as constituting the possible range of returns.

Assuming a return of 18.7 million pink salmon and a subsequent escapement of 5.5 million fish, this would leave a balance of 13.2 million pink salmon to be commercially harvested in the Southern Section.

Northern Section Forecast

Sampling of 46 major pink salmon streams in the Northern Section during the spring of 1969 resulted in an estimate of 10.3 pre-emergent fry per square feet of study area. Since the pink salmon runs to this section have exhibited no odd- or even-year dominance since 1963, data from all years is combined for the purpose of forecasting.

Preliminary analysis of pre-emergent fry data indicates a 1970 return of 9.0 million pink salmon to the Northern Section. Other methods of forecasting, including analysis of escapement-return data, results in forecasts of 9.6 million to 10.0 million. The forecast of 9.0 million based on the pre-emergent fry data is considered to be the most reliable.

Assuming a return of 9.0 million pink salmon and a sub-

sequent escapement of 3.5 million fish, this would leave a balance of 5.5 million pink salmon for commercial harvest in the Northern Section.

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FORECAST AREA: Icy Straits-Lynn Canal-Taku Inlet

SPECIES: Red Salmon

1970 PROJECTION OF COMMERCIAL HARVEST: 400,000

FORECAST METHODS:

Data is not available on which to base forecasts of total returns to these fisheries. A program initiated in 1967 has provided estimates of escapement magnitude and age structure of red salmon spawning in the Chilkat River system, however, similar data is not presently available for the Chilkoot and Taku River systems. One objective of this program is to develop a basis for forecasting total returns to these systems.

At present, a projection of recent commercial harvest levels is used to estimate the commercial harvest of red salmon for these fisheries in 1970.

DISCUSSION OF 1970 FORECAST:

Annual commercial harvests of red salmon in the Southeastern region, excluding the Yakutat area, have averaged 740,000 since 1951. The Icy Straits-Lynn Canal-Taku fisheries have contributed approximately 44 percent of this total harvest.

Assuming that the relatively good levels of red salmon commercial harvests in 1965 and 1966 were associated with subsequent good levels of spawning populations, a good return of red salmon in 1970 may result. The total 1970 harvest for the Icy Straits-Lynn Canal-Taku Inlet fisheries is estimated to be 400,000 red salmon.

The Icy Straits purse seine fishery is regulated primarily on the basis of pink salmon abundance, with red salmon being taken incidental to the pink salmon. Consequently, regulations promulgated primarily for the management of pink salmon in the Icy Straits area may have a very significant effect on the eventual level of red salmon harvest.

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APPENDIX 2: CENTRAL REGION AREA FORECASTS

REGION: Central

GEOGRAPHICAL DESCRIPTION: Cape Suckling to Seal Cape on the southwestern tip of Unimak Island.

FORECAST AREA: Prince William Sound

SPECIES: Pink Salmon

1970 FORECAST OF TOTAL RETURN: Point Estimate = 4.4 million
Range Estimate = 3.2 - 5.6 million

FORECAST METHODS:

Pink salmon forecasts in Prince William Sound (total run, district and timing) are based on the alevin index and to date have been quite accurate. For example the mean forecast in 1969 was 5,889,000 and the returning run was 5,955,000. The alevin index for 1970's run is 194 pink alevis per square meter which is considered to be in the fair to poor category. A good alevin index is greater than 250 pink alevis per square meter as was observed for the good runs of 1962 (358), 1963 (314), 1964 (300) and 1969 (266). One of the major causes for a fair to poor alevin index for the run in 1970 is the fact that the even year run of pink salmon is still suffering from the after effects of the 1964 earthquake. There are indications that the even year cycle is recovering in specific streams or general areas but there are still many streams that are not producing harvestable levels of pink salmon.

DISCUSSION OF 1970 FORECAST:

Assuming a total 1970 return of 4.4 million pink salmon to the Prince William Sound area, the following additional predictions are made:

Commercial Catch = 3.1 million (range = 1.9 - 4.4 million)
Catch for Peak Week = 1.0 million (range = 0.6 - 1.4 million)
Mean Catch Per Boat = 15,490 fish (range = 9,300 - 21,800)
(Based on 200 boats total effort.)

Areas that were not seriously affected by the 1964 earthquake or have effectively recovered from damage, and, therefore will be able to withstand relatively intense fishing effort in 1970, are those areas lying with an arc extending westerly and southerly from Knowles Head to and including Latouche Island.

The origin of those stocks that have not fully recovered yet, but could withstand a small harvest in 1970 are located in an arc easterly and southerly from Knowles Head to Cape Hinchinbrook.

The majority of stocks (there are several exceptions) originating on Montague Island have not recovered from after effects of the 1964 earthquake and cannot withstand a harvest in 1970.

It is difficult to pinpoint when the peak of the pink run will occur, since this has varied over the years from the last week in July to the first week in August. Weather and distribution of the fleet are not constant from year to year and deviations of these two factors can cause the peak to fall a week earlier one year and a week later another year.

It is highly probable that it will peak around the last week in July. We expect that if the mean estimate of the total run is fairly accurate then all segments (early, middle, and late) of the run should be slightly stronger than 1968.

SPECIES: Chum Salmon

1970 FORECAST OF TOTAL RETURN: Point Estimate = 347,000
Range Estimate = 70,000-496,000

FORECAST METHODS:

Chum salmon forecasts are based on the chum alevin index. However, chum forecasts are not as simple as pink forecasts because unlike pinks that are always two years olds, chums may return to Prince William Sound as three, four or five year olds. Furthermore, the age composition of the run varies considerably from year to year or during the season, and this makes it difficult to construct accurately the contribution of a given brood year to the adult runs (age is determined from scale analysis). Also at this point in our understanding we do not know why chums return as three year olds instead of fours or visa versa.

The chum forecast for 1970 is based on a relationship that exists between the alevin index and the subsequent four year old return. (Alevin index is poor for 1970's run). The assumption was made that we will make up about 82 percent of the total chum run in 1970 (it is possible, but the odds are that we will not see many threes until 1971).

DISCUSSION OF 1970 FORECAST:

Assuming a total chum salmon return of 347,000, the commercial harvest of chum salmon is estimated to be 197,000 fish.

We do not anticipate any special problems for the chum runs in 1970 other than obtaining a reasonable escapement. Those chum runs that have been dehabilitated by after effects of the earthquake are for the most part located on Montague Island where we do not anticipate having a commercial fishery in 1970. The principal chum runs with the exception of Port Gravina and Sheep Bay, are located in the same arc where we expect the biggest portion of our pink run in 1970, namely westerly and southerly of an arc from Knowles Head to Latouche Island.

FORECAST AREA: Eshamy River

SPECIES: Red Salmon

1970 FORECAST OF TOTAL RETURN: Point Estimate = 90,000

FORECAST METHODS:

Counting the numbers of jacks was begun at Eshamy Weir in 1964 and beginning in 1966, numbers of smolts were estimated using one smolt trap in conjunction with marking and recovery experiments.

The relationship between the catch of outmigrant smolts and the return of adults two years later is not good, even though the trap was operated in the same way each year. The relationship between numbers of jacks and the following year's return appears to be more useful as the 1969 forecast based on this ratio (jacks to adults one year later) was 194,000 and the actual return was 186,000. The relationship between jacks and the following years adult run at Eshamy apparently is curvilinear and from this relationship we expect the return in 1970 to be about 90,000.

DISCUSSION OF 1970 FORECAST:

During the past six years, the Prince William Sound seine fishery, fishing primarily for pink salmon, has incidentally harvested approximately 30 percent of the total Eshamy River red salmon return. If this occurs in 1970, an incidental harvest of approximately 30,000 red salmon by the seine fishery would reduce the number of red salmon bound for the Eshamy River to approximately 60,000 fish. Although the gill net fishery has, in the past, harvested approximately 50 percent of the Eshamy red salmon remaining after the incidental harvest

by the seine fishery, the relatively small forecasted return for 1970 will probably require reduced fishing time for the gill net fishery to insure that an adequate escapement is obtained for the Eshamy system.

Prepared by: Robert Roys, Fishery Biologist
Division of Commercial Fisheries
Cordova

Contributing Scientist: J. Solf

FORECAST AREA: Cook Inlet-Southern and Outer Districts Only.

SPECIES: Pink Salmon

1970 FORECAST OF TOTAL RETURN: Point Estimate = 2.0 million
Range Estimate = 1.2 - 2.8 million

FORECAST METHODS:

Forecast of pink salmon runs in the southern and outer districts of Cook Inlet is based on indices of alevin abundance from nine important spawning streams. Alevin densities from each stream are weighted by its average escapement and the resultant indices combined to arrive at a weighted pre-emergent index for the districts as a whole.

The overall weighted index of 385.3 from the 1969 spring sampling is nearly two times the previous high.

DISCUSSION OF 1970 FORECAST:

Approximately 200,000 pinks are needed for spawning purposes if all streams receive adequate numbers of fish. This would mean an allowable commercial harvest of 1,800,000 pink salmon.

The alevin indices indicate that the major area of return will be in the southern district. Humpy, Tutka, Seldovia and Port Graham streams should all have large returning runs in 1970. Streams in the outer district had average or above alevin densities.

FORECAST AREA: Cook Inlet - Kamishak, Northern, North Central and South Central Districts only.

SPECIES: Pink Salmon

1970 PROJECTED COMMERCIAL HARVEST: 2.4 million

FORECAST METHODS:

Data does not exist on which to base forecasts of total salmon returns to these districts. Consequently, projections of the 1970 commercial harvests are made on the basis of recent commercial harvest trends.

DISCUSSION OF 1970 FORECASTS:

These districts in Cook Inlet have a strong even-year pink salmon run and practically no run in the odd years. Even-year annual catches since 1960 have averaged 2.4 million pink salmon, and this average is used as the projected 1970 commercial harvest level.

It should be pointed out, however, that the past four even-year runs have contributed to much higher catches than in years previous to this period. The pink salmon catch in 1968 (excluding southern and outer districts) was 2,475,000.

Prepared by: Allen S. Davis, Fishery Biologist
Division of Commercial Fisheries
Homer

Note: This investigation was partially financed by the Commercial Fisheries Research and Development Act (P.L. 88-309) under sub-project 5-17-R-1, Contract Number 14-17-0005-230.

FORECAST AREA: Kodiak

SPECIES: Pink Salmon

1970 FORECAST OF TOTAL RETURN: Point Estimate = 20.2 million
Range Estimate = 17.5-23.5 million

FORECAST METHODS:

Forecasts of total pink salmon returns to the Kodiak area are based on the abundance of pre-emergent fry observed during the spring sampling periods. Hydraulic sampling of 31 major pink salmon producing streams in 1969 yielded the highest fry density obtained in the 6-year history of data collection. A ratio of the parent year pre-emergent fry density with the 1970 index for 29 comparable streams indicates the 1970 return at 20,200,000 pink salmon.

DISCUSSION OF 1970 FORECASTS:

If the 1970 return corresponds closely to the forecasted level of 20.2 million, an estimated 16.6 million pink salmon would be harvested. The relative strengths of expected returns to the six major districts of the Kodiak-Afognak area are indicated below:

- 1) Afognak-Kizhuyak. The excellent fry densities obtained in the streams of this area indicate a return of 1.9 million pinks in 1970. Malina River should be the primary producer in this area.
- 2) Westside. The area from Outlet Cape to Rocky Point including Terror, Uganik, and Uyak Bays should contribute 3.5 million pinks in 1970.
- 3) Karluk-Red River. An exceptionally high fry density obtained in Red River indicates this area should receive a near record return in 1970; some 6.3 million fish is the forecast.
- 4) Alitak Bay. Fry densities in this area were above the parent year index in all streams except Humpy River. The return for this district is projected at 3.3 million pinks.
- 5) Eastside-Chiniak. This area, from Monashka Bay to Cape Trinity, should produce 5.2 million fish in 1970. Chiniak Bay should produce an exceptionally strong return.

- 6) Mainland. The area between Cape Douglas and Kilokak Rocks on the Alaska Peninsula mainland should produce an average even-year catch of 563,000 pinks.

Since no pre-emergent fry sampling has been conducted in the Mainland District, and since the escapement data is incomplete both in number of surveys and number of streams surveyed each year, no escapement-return relationship can be developed. Therefore the expected catch in 1970 is the average of the even-year catches since 1960.

Forecasts by district have, at times, been subject to error because they assume a projected pattern of catch similar to that of the parent year. Since the commercial effort varies with the timing and migration routes of the run, weather and regulations, fish destined for a particular district are often caught in neighboring districts. With these reservations in mind, the trend in 1970 is for good to excellent returns in all six districts and the result could be the highest even-year pink salmon catch in history for the Kodiak area.

Prepared by: Larry Edfelt, Fishery Biologist
Division of Commercial Fisheries
Kodiak

FORECAST AREA: Chignik

SPECIES: Red Salmon

1970 FORECAST OF TOTAL RETURNS: Point Estimate = 1.2 million

FORECAST METHODS:

Red salmon returning to the Chignik system are composed of salmon returning to the Black Lake system (referred to as the "early" run) and salmon returning to the Chignik Lake system (referred to as the "late" run). The returns to these two systems are forecasted independently.

Black Lake Forecast

Although the relationship between the number of 2-ocean salmon (salmon having reared two years in the ocean) returning as adults one year and the number of 3-ocean salmon returning the following year has been used in recent years to forecast the number of 3-ocean fish expected to return, the exceptionally large return of 2-ocean salmon in 1969 appears to have been an unusual occurrence and, as such, may not provide a reliable basis on which to base the forecast of 3-ocean fish for 1970. Applying the above technique yields a forecasted return of 3-ocean fish of approximately 1.5 million -- the largest observed return since 1954 was 737,000 3-ocean red salmon in 1965. Consequently, the reliability of this estimate appears questionable.

However, use of an escapement-return relationship results in a 1970 forecast of approximately 850,000 red salmon for the Black Lake system. This forecasted return would compare favorably with the large return of 780,000 red salmon in 1965. (Since 1954 no returns have exceeded these levels.) Additional evidence of a large return in 1970 was detected by the Fisheries Research Institute (University of Washington) when their studies on the Black Lake system in 1966 indicated an above average fry abundance in the lake.

Chignik Lake Forecast

A relationship between the 2-ocean salmon returning one year and the 3-ocean salmon returning the following year produces a forecasted return of approximately 540,000 3-ocean red salmon to the Chignik Lake system. However, in view of the fact that the parent year escapement in 1964 was the lowest since 1945, the forecast of 540,000

3-ocean salmon for 1970 appears high.

Previous to 1968, the Chignik Lake system forecast was based on the average return for the past five years. For 1970, this indicates a forecasted return of approximately 380,000, a return which appears more consistent with the exceptionally low parent year escapement.

DISCUSSION OF 1970 FORECAST:

The optimum escapement for the Black Lake system has been estimated at approximately 400,000 red salmon. Assuming an actual return of 850,000 fish, this would indicate an early run commercial harvest of approximately 400,000 red salmon.

The Chignik Lake system should receive an escapement of approximately 200,000-250,000 spawners. This would leave approximately 150,000 red salmon for the late run commercial harvest.

In combination the two systems should provide approximately 550,000 red salmon for commercial harvest in 1970.

Prepared by: Paul Pedersen, Area Management Biologist
Division of Commercial Fisheries
Kodiak

FORECAST AREA: Chignik (Kilokak Rocks to Kupreanof Point)

SPECIES: Pink Salmon

1970 FORECAST OF TOTAL RETURN: 1.7 million

FORECAST METHODS:

Pre-emergent fry sampling was just initiated in 1969, hence, sufficient data for forecasting returns using the normal technique will not be available for several years. Consequently, recent levels of total pink salmon returns to this area will be used to indicate the expected magnitude of the 1970 return.

DISCUSSION OF 1970 FORECAST:

Pre-emergent fry sampling of the primary even-year pink salmon streams was begun for the 1970 return. The Eastern District is the primary pink salmon producing area on this cycle year. Parent escapements in the Eastern District were good and fry survival was probably normal. Additionally, good fry densities were obtained in the Western and Perryville Districts. Therefore, the 1970 return is forecast to be above the even-year average of 1.7 million.

Prepared by: Larry Edfelt, Fishery Biologist
Division of Commercial Fisheries
Kodiak

Note: This project was partially financed by the Anadromous Fish Act (P.L. 89-304) under sub-project AFC-14-2, Contract Number 14-17-0005-181.

APPENDIX 3: WESTERN REGION AREA FORECASTS

REGION: Western

GEOGRAPHICAL DESCRIPTION: Seal Cape to, and including, the Aleutian Islands and the Bering Sea north through Kotzebue Sound.

FORECAST AREA: Bristol Bay

SPECIES: Red Salmon

1970 FORECAST OF TOTAL RETURN: Point Estimate = 56 million
Range Estimate = 50-65 million

FORECAST METHODS:

Since the majority of red salmon mature and return to Bristol Bay at the age of four, five or six years, salmon returning in 1970 will have emanated primarily from parent salmon spawning in the brood years 1964, 1965 and 1966. Forecasts of total red salmon returns to Bristol Bay are generally obtained by one, or more, of the following three methods:

- 1) Escapement-return relationships, established on the basis of past observed data, are used to estimate the total red salmon productions for pertinent brood year escapements. The age structures of the estimated total returns are then estimated on the basis of past average age structures of returns. Finally all age class returns expected in 1970 are combined for the total forecast.
- 2) For some red salmon systems of Bristol Bay, research programs have been developed which provides estimates of the annual relative abundance of red salmon smolt migrating from the lake rearing areas to the ocean. For these systems, past smolt survival rates are used to estimate future adult returns from observed smolt outmigrations. Past age structures of adult returns are used to estimate the age structure of adult returns expected from smolt outmigrations.
- 3) In some instances relationships have been observed between the numbers of salmon from a particular brood year which mature to return as adults of a particular age and the number of salmon, from the same brood year,

which return at an older age. Using these relationships, estimates of certain age classes of salmon returning in 1970 are obtained from the numbers of salmon, of specific age classes, which returned in 1969.

Slight modifications and/or combinations of the above forecasting technique are also used to obtain forecasts. If several estimates of the same age class returns are obtained from different forecast techniques, the estimates are evaluated according to their expected reliability and combined accordingly to provide a single estimate.

DISCUSSION OF 1970 FORECAST:

The forecast range of 50-65,000,000 would yield an allowable catch ranging from 30 to 40 million red salmon after escapement requirements are satisfied. The largest previous catch was 24,700,000 in 1938. The majority of these fish (79%) are forecasted to return to the Kvichak River system of the Naknek-Kvichak district. Most of these will be the progeny of the 24,300,000 spawning escapement in 1965.

With a forecasted return of 56,000,000 the allowable catch of red salmon by district should be:

Naknek/Kvichak	29,949,000
Egegik	2,312,000
Ugashik	672,000
Nushagak/Igushik	1,525,000
Togiak	<u>168,000</u>
Total Bristol Bay	34,626,000

Prepared by: Steven Pennoyer, Region Research Supervisor
Division of Commercial Fisheries
Anchorage

Contributing Scientists: R. Paulus, M. McCurdy

Note: This investigation was partially financed by the Anadromous Fish Act (P.L. 89-304) under sub-project AFC-21-1, Contract No. 14-17-0005-227.

FORECAST AREA: Nushagak/Igushik District, Bristol Bay

SPECIES: Pink Salmon

1970 FORECAST OF TOTAL RETURN: Point Estimate = 2.5 million
Range Estimate = 1.6-3.4 million

FORECAST METHODS:

In recent years the Nushagak/Igushik pink salmon runs have been of significance only during the even years. Escapement-return data obtained since 1958 is used to forecast the 1970 return.

DISCUSSION OF 1970 FORECAST:

The Nushagak district pink salmon run is produced by the spawning pink salmon stocks in the Nuyakuk River of the Nushagak system drainage. This 50 mile long river, which provides spawning grounds for the majority of the Nushagak pink salmon, has produced almost 2.5 million pinks each even year since 1958.

The Department initiated a counting station on the lower Nuyakuk River in 1960, and now uses escapement and subsequent returns to forecast runs for future years.

The limited escapement and return data, which covers only five pink salmon cycles (1958 to 1968), was used to forecast the 1970 run. The pink salmon escapements and subsequent returns that have been monitored since 1958 suggest a reduction in return per spawner with escapements in excess of 1.0 million pinks.

Consequently the 1968 escapement of 2.2 million pinks is expected to produce at a reduced level over the previous few years. The likelihood of a return at the 1968 return per spawner level, which would equal approximately 5.5 million fish, is unlikely but cannot be completely ruled out.

In view of the forecast of 2.5 million and the reduced production from escapements of over 1.0 million pinks the escapement goal for 1970 will be from 0.6 to 0.9 million, which will allow a commercial catch of 1.6 to 1.9 million.

SPECIES: King Salmon

1970 PROJECTED COMMERCIAL HARVEST: Point Estimate = 75,000
Range Estimate = 65,000-85,000

FORECAST METHODS:

Recent harvest levels of king salmon in the Nushagak/Igushik district are used to project an expected king salmon harvest for 1970.

DISCUSSION OF 1970 FORECAST:

Although the Department does not forecast king salmon runs to the Nushagak district, this fishery has grown to the point where anticipated harvest production would be useful to fishermen and processors alike.

The vast 14,000 square mile Nushagak-Mulchatna River watershed harbors approximately one dozen major king salmon spawning stocks and many others of minor importance.

Analysis of catch samples have shown that over 70 percent of each years return are 5 and 6 years old, thus the 1970 return run will result primarily from escapements in 1964 and 1965. Aerial survey indices for these two years show better than average escapements. Based on this limited data the Department feels that a harvest in 1970 of 65,000 to 85,000 kings is not out of line with past historical catches and more recent escapement indices. The average king salmon catch in the Nushagak district since Statehood has been 76,000 or 74 percent of the total Bristol Bay catch.

SPECIES: Chum Salmon

1970 PROJECTED COMMERCIAL HARVEST: Point Estimate = 175,000
Range Estimate = 150,000-200,000

FORECAST METHODS:

Recent harvest levels, past age structure data and aerial surveys of spawning populations are used in conjunction to estimate the expected commercial harvest of chum salmon for 1970.

DISCUSSION OF 1970 FORECAST:

The Nushagak district chum salmon catch has averaged 286,000 since statehood, or about half of the entire Bristol Bay harvest.

The Department initiated an all-purpose counting station on the Nushagak River in 1966, the major access river to most of the important chum salmon spawning grounds in the Nushagak district. Although only a partial count of chums was possible due to adverse weather and other factors, the chum salmon escapement indices derived in 1966 when compared with those in 1967 through 1969 was about average (40,000 in 1966; 28,000 in 1967; 72,000 in 1968 and 26,000 in 1969).

Since over 75 percent of the Nushagak chums are 4-year-old fish, the 1966 brood year is expected to carry the harvest production in 1970. With the low escapement in 1966, the Department estimates that the 1970 harvest will be from 150,000 to 200,000, significantly lower than the average catch since statehood.

FORECAST AREA: Togiak District, Bristol Bay

SPECIES: Chum Salmon

1970 PROJECTED COMMERCIAL HARVEST: Point Estimate = 100,000
Range Estimate = 80,000-120,000

FORECAST METHOD:

Recent harvest levels, past age structure data and aerial surveys of spawning populations are used in conjunction to estimate the expected commercial harvest of chum salmon for 1970.

DISCUSSION OF 1970 FORECAST:

As in the Nushagak district, most Togiak chums are 4-year-old fish and will thus be produced by the 1966 spawning. Analysis of the 1966 spawning ground surveys shows an average escapement indices which indicates a harvest production in 1970 of 80,000 to 120,000. The average chum salmon catch in the Togiak district since statehood is 126,000.

Prepared by: Michael L. Nelson, Area Management Biologist
Division of Commercial Fisheries
Dillingham

FORECAST AREA: Arctic-Yukon-Kuskokwim

SPECIES: All Salmon Species

1970 PROJECTED COMMERCIAL HARVEST: Refer to Table below.

FORECAST METHODS:

Since data is not available in which to base forecasts of total salmon returns, recent levels of commercial harvests are used to estimate expected levels of harvests in 1970.

DISCUSSION OF 1970 FORECASTS:

For the purpose of projecting estimates of the 1970 commercial harvests for the A-Y-K area, average commercial harvests for the past five years have been used with some adjustments being made to reflect recent expansions of the commercial fisheries in some districts. The 1970 projections are presented below:

District	King	Chum	Coho	Pink	Red
Kuskokwim	60,000	30,000	110,000	75,000	25,000
Yukon	93,000	150,000	10,000	-	-
Norton Sound	2,000	80,000	5,000	75,000	-
Port Clarence	-	+	-	-	-
Kotzebue	-	40,000	-	-	-
TOTAL A-Y-K	155,000	300,000	125,000	150,000	25,000

These averages are used as the projected harvest levels for 1970. Annual commercial harvests have shown an increasing trend during the past five years.

Records indicate an even year pink salmon run in the area, however, the Norton Sound district experienced two succeeding record breaking catches during 1968 and 1969, an unusual occurrence.

Prepared by: Ronald Regnart, Area Management Biologist
Division of Commercial Fisheries
Anchorage

PRELIMINARY 1969 COMMERCIAL HARVEST OF ALASKA SALMON

Location	SPECIES				
	<u>King</u>	<u>Red</u>	<u>Coho</u>	<u>Pink</u>	<u>Chum</u>
Number of Fish in Thousands					
Southeastern Alaska	420	1,260	500	4,700	760
Prince William Sound-Copper-Bering Rivers	17	1,022	89	4,829	323
Cook Inlet-Resurrection Bay	12	814	111	233	311
Kodiak	2	604	35	12,493	537
Chignik	3	310	18	1,780	68
South Side Alaska Peninsula	2	910	11	1,205	385
North Side Alaska Peninsula and Aleutians	5	323	49	242	28
Bristol Bay	124	6,618	75	2	366
Arctic-Yukon-Kuskokwim	157	10	132	187	380

Number of 48-lb. Cases in Thousands

State Totals	35	787	24	1,223	182
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Data Source: Commercial Fisheries Division area offices and statistical section.

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