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A SUMMARY OF PRELIMINARY 1973 FORECASTS FOR ALASKAN SALMON FISHERIES

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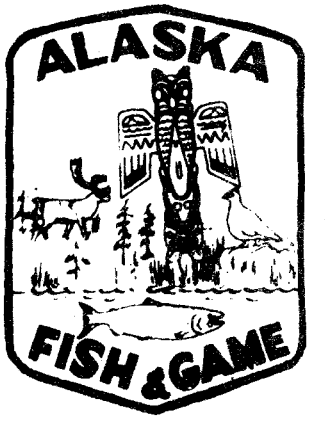

November 15, 1972

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INTRODUCTION

This is the fourth in a series of annual reports prepared by the Division of Commercial Fisheries, Alaska Department of Fish and Game, for the purpose of presenting preliminary pre-season forecasts for Alaska's commercial salmon fisheries. Released in November, these reports make available information on salmon returns expected the following year to some of the major fisheries in the state. A projection of the total commercial salmon harvest for the state is also presented.

In order to provide pre-season forecast information at this time it is necessary to include in some analyses preliminary data collected during the season just ended. Special attention is drawn to the use of very preliminary data on commercial catches in 1972. Final compilation of commercial catch statistics will not be completed until the spring of 1973. Some differences, though generally minor, will exist between preliminary commercial harvest data used in this report and final data presently being compiled.

Salmon forecasts in this leaflet are, therefore, presented under preliminary status. Revision of data on which these forecasts are based and further analyses may require modification of preliminary forecasts. In the past, however, preliminary forecasts have not differed substantially from final forecasts. Final forecasts are published by the Department and/or are made available via the news media.

Pre-season Projections of Past Commercial Salmon Harvests

Pre-season projections of statewide commercial salmon harvests have been made formally since 1970. Although the 1970 harvest of 68.5 million was the largest in more than 20 years, it did not reach the 96 million level predicted in the fall of 1969. A projected harvest of 42 million salmon for the 1971 season compared favorably with the actual harvest of 47.5 million. In 1972 the harvest of approximately 30 million salmon fell substantially short of the pre-season projected harvest of 46.7 million, the shortage being due almost entirely to weaker than expected pink salmon returns. Probable reasons for the weak pink salmon returns in 1972 are discussed in this leaflet.

Differences between predicted and actual harvest levels reflect the lack of complete information on survival conditions encountered by salmon during the course of a very complex life cycle. As the state of knowledge on factors affecting survival increases and data bases expand, forecasting of annual salmon return should continue to improve.

Terminology and Definitions

Definitions of some key terms frequently used in this report are as follows:

Salmon return or run - the total number of salmon returning in a given year to Alaskan waters from ocean rearing areas. A portion of these returning salmon is normally harvested while the remaining fish are allowed to reach the spawning grounds.

Commercial catch or harvest - that portion of a returning salmon run harvested by commercial fisheries.

Escapement, spawning population or brood stock - that portion of a returning salmon run which is not harvested and survives to reach the spawning grounds.

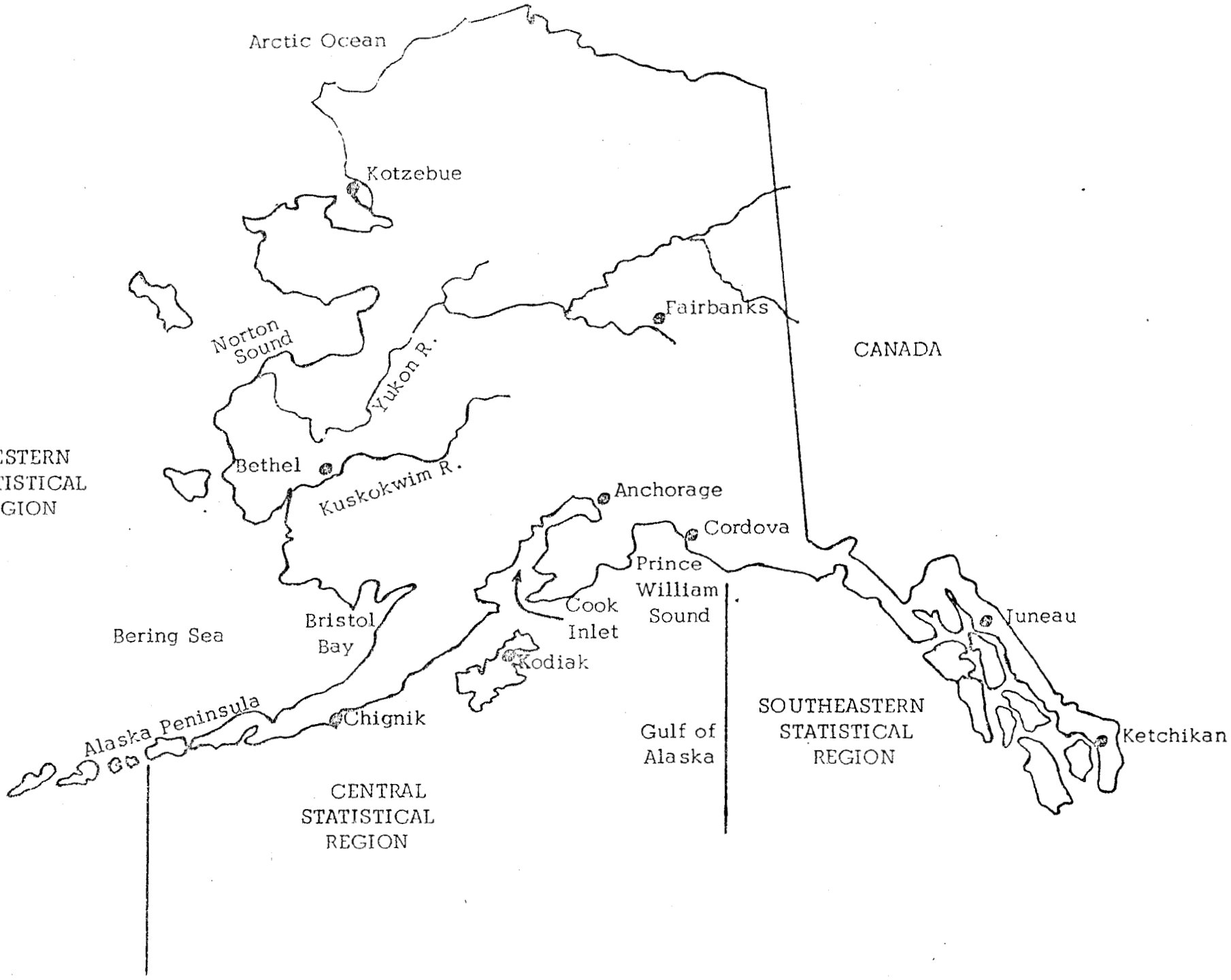
Different common names are often used for a particular species of salmon. The scientific names and most frequently used common names for the five species of Pacific salmon are given below:

Scientific Name	Common Name
Oncorhynchus tshawytscha	king, chinook
Oncorhynchus nerka	red, sockeye
Oncorhynchus kisutch	coho, silver
Oncorhynchus gorbuscha	pink, humpback, humpy
Oncorhynchus keta	chum, dog, keta

The three 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 shown in Figure 1 and are defined as follows:

SOUTHEASTERN: Dixon Entrance to Cape Suckling (including the Southeastern Alaska and Yakutat areas).

FIGURE 1. ALASKA DEPARTMENT OF FISH AND GAME COMMERCIAL FISHERIES STATISTICAL REGIONS.



CENTRAL:	Cape Suckling to Seal Cape on the southwestern tip of Unimak Island (including the Copper River-Bering River, Prince William Sound, Cook Inlet, Kodiak, Chignik and South Side Alaska Peninsula areas).
WESTERN:	Seal Cape to, and including, the Aleutian Islands and the Bering Sea north through Kotzebue Sound (including the Aleutian Islands, North Side Alaska Peninsula, Bristol Bay, and Arctic-Yukon-Kuskokwim areas).

Acknowledgments

Materials presented in this report were prepared by Division of Commercial Fisheries biologists located in field offices throughout the state. Area biologists, not individually identified, contributed the materials for the discussion of the 1972 fishing season. Individual credit for forecast material is given following the area forecasts presented in Appendix A.

REVIEW OF THE 1972 SEASON

In November, 1971, the Alaska Department of Fish and Game predicted a commercial harvest of 46.7 million salmon of all species for Alaskan fisheries in 1972. Approximately 65 percent or 30 million of the total harvest were expected to be pink salmon, the most abundant commercial species in the state.

Preliminary statistics from the 1972 season indicate that approximately 30 million salmon of all species were harvested commercially in the state's fisheries. Commercial catches by species and fishing area are presented in Table 1. (Late reported catches might be expected to contribute another 0.5 to 1.0 million salmon to the total harvest.) While differences in the range of say $\pm$ 5 million fish between predicted and actual harvest would have been expected as a result of incomplete forecast data and natural fluctuations in survival rates, the fact that the eventual harvest was nearly 17 million or a third less than predicted raises questions as to the existence of extraordinary causes.

The most striking discrepancy between predicted and actual harvest levels in 1972 occurred in the pink salmon harvest. While a catch of approximately 30 million pink salmon had been anticipated prior to the season, only 16 million or roughly half that expected number were harvested. This difference of 14 million pinks accounted for roughly 80 percent of the total difference of 17 million between predicted and actual harvest of all species. For all species other than pink salmon, the difference between the pre-season projected harvest of 17.7 million and the actual harvest of 14.5 million would not be considered unusual but reflects a magnitude of variation normally expected.

In terms of total numbers of fish, the major difference between predicted and actual pink salmon harvest in 1972 was due to the large pink salmon fisheries in Southeastern Alaska and Kodiak where the combined harvest fell some 9 million below the forecasted level. However, a similar pattern developed in almost all other pink salmon fisheries throughout the state. Figure 2 illustrates this pattern. For the purpose of illustration, the ratio of the harvest of pink salmon in 1972 to the harvest in the parent year 1970 (pink salmon characteristically mature as 2-year old fish) is plotted against the latitude and longitude of the major pink salmon areas. Only in Southern Southeastern Alaska did the 1972 pink salmon harvest exceed that of the parent year 1970. It is also apparent from this figure that the degree of failure was worse for fisheries in the more northerly and westerly areas of the state. In Prince William Sound, the most northerly major pink salmon fishery, and along the Alaska Peninsula, the most westerly fishery, pink salmon harvests in 1972 were only a small

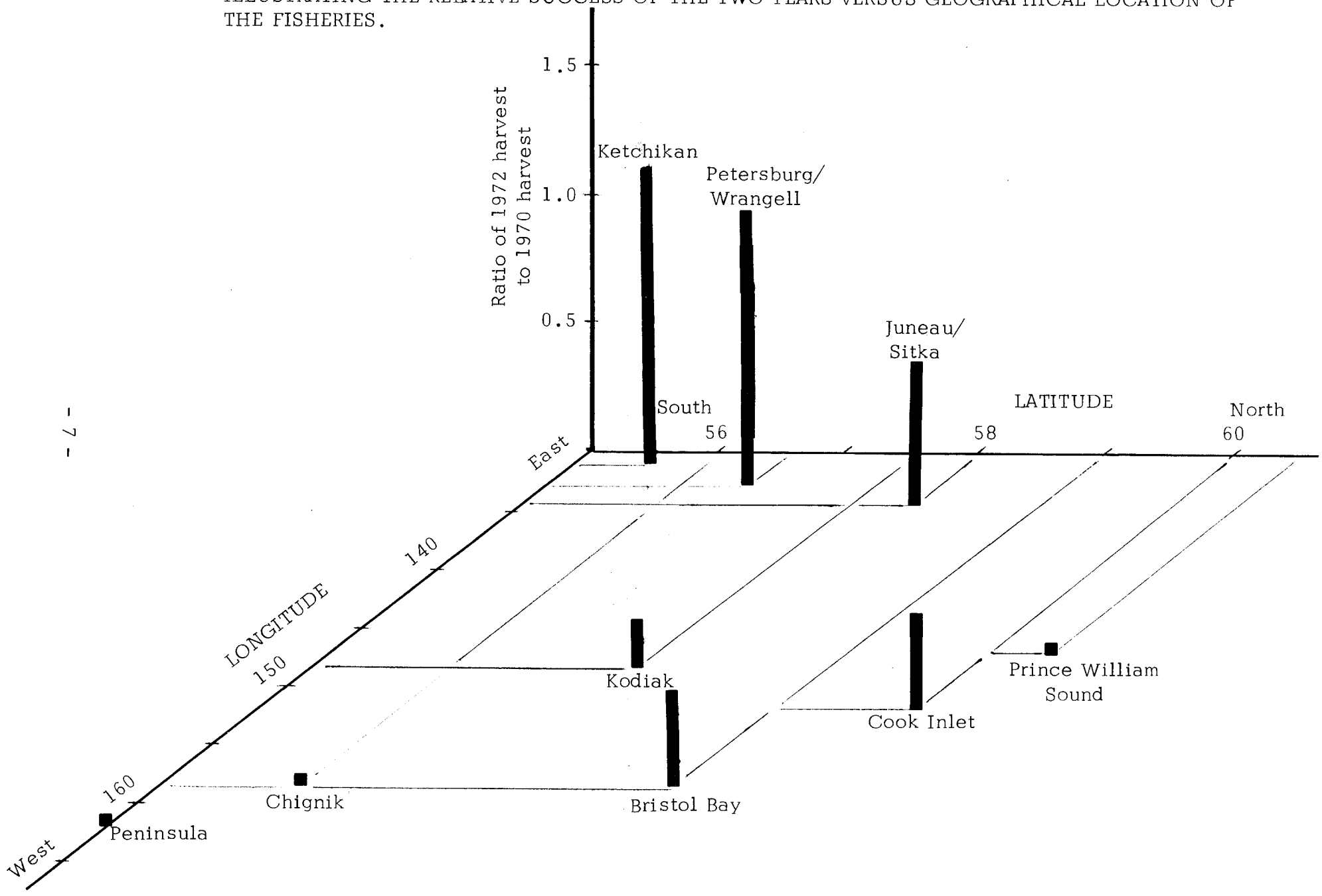
TABLE 1. PRELIMINARY 1/ 1972 ALASKA COMMERCIAL SALMON HARVEST BY SPECIES AND MAJOR FISHING AREAS.

Number of Fish in Thousands

Area	Species					
	King	Sockeye	Coho	Pink	Chum	Total
Southeastern Alaska	250	794	1,306	11,900	2,300	16,550
Yakutat	4	132	51	3	8	198
SOUTHEASTERN REGION SUBTOTAL	254	926	1,357	11,903	2,308	16,748
Prince William Sound	23	979	124	57	46	1,229
Cook Inlet	15	934	73	583	700	2,305
Kodiak	1	221	14	2,500	1,154	3,890
Chignik	-	380	-	70	78	528
Alaska Peninsula - S. Side	-	540	-	140	690	1,370
CENTRAL REGION SUBTOTAL	39	3,054	211	3,350	2,668	9,322
Alaska Peninsula - N. Side and Aleutian Islands	-	250	-	-	110	360
Bristol Bay	66	2,390	15	76	615	3,162
Arctic-Yukon-Kuskokwim	152	4	43	48	652	899
WESTERN REGION SUBTOTAL	218	2,644	58	124	1,377	4,421
TOTAL ALASKA	511	6,624	1,626	15,377	6,353	30,491

1/ This data is based on preliminary in-season reports of commercial catches of salmon. Final commercial catch statistics are presently being compiled from fish tickets and will be available in 1973.

FIGURE 2. COMPARISON OF 1972 AND 1970 PINK SALMON HARVESTS FOR SOME MAJOR ALASKAN FISHERIES ILLUSTRATING THE RELATIVE SUCCESS OF THE TWO YEARS VERSUS GEOGRAPHICAL LOCATION OF THE FISHERIES.



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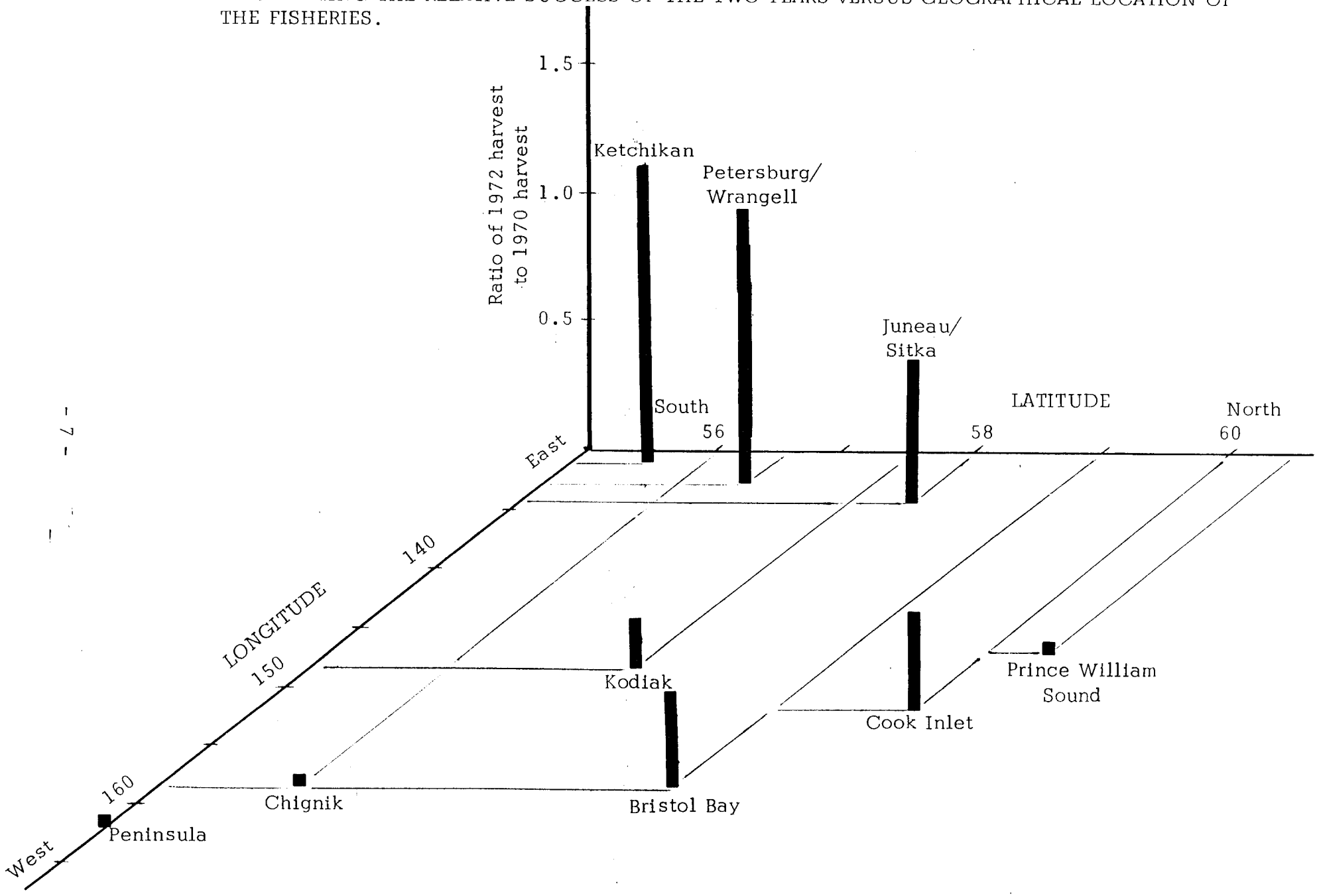

fraction of the 1970 harvest levels.

The smaller than expected pink salmon harvests throughout the state were due to smaller than expected returns and not to decreases in fishing gear or changes in basic management policy. It was necessary, of course, to implement more stringent regulations than were expected prior to the season in an attempt to obtain adequate numbers of spawning fish from the smaller returns.

Substantial evidence exists which indicates that pink salmon spawned in 1970 and expected to return as mature adults in 1972 encountered unusually severe climatic conditions and subsequently abnormally high mortalities during the winter and spring of 1970-71. In the table below, deviations of average monthly temperatures from normal temperatures for December 1970 through June 1971 are shown for five areas of the state (data obtained from the National Oceanic and Atmospheric Administration).

Month and year	Deviations in Degrees Fahrenheit				
	Juneau	Cordova	Kodiak	Anchorage	King Salmon (Bristol Bay)
December '70	-6.8	-3.8	NA	1.4	-1.6
January '71	-12.1	-9.8	-10.3	-9.4	-16.0
February '71	1.3	1.6	-4.0	1.9	-5.2
March '71	-1.5	-4.1	-8.1	-10.4	-4.7
April '71	0.6	0.9	-2.0	-3.5	-6.0
May '71	-2.1	-1.2	-2.2	-5.8	-5.6
June '71	0.9	1.5	-1.1	-4.5	-4.1

NA--Not Available

Data obtained in Prince William Sound during alevin or pre-emergent fry sampling in the spring of 1971 indicated the worst freshwater survival of pink salmon since 1960. In Kodiak, similar studies indicated below average freshwater survival. It appears, however, that pink salmon fry also encountered poor survival conditions after leaving the streams in which they were spawned. In areas of the state where measures of alevin abundance were available as a basis for forecasting the 1972 pink salmon returns, actual returns were consistently less than forecasted implying that larger than average mortalities had occurred in the estuarine and/or ocean areas.

For species other than pink salmon, a major discrepancy between predicted and actual harvest occurred in the Bristol Bay fishery where a 2.4 million sockeye harvest fell an equal amount or 2.4 million short of the pre-season predictions.

Chum salmon returns and subsequent harvests in 1972 were generally good in most areas of the state with the exception of Prince William Sound and Chignik. In spite of the weaknesses in several areas, the statewide harvest of 6.2 million chums still exceeded by roughly 10 percent the average annual harvest of 5.7 million since 1960.

Additional comments on the 1972 commercial fishing season in specific areas are presented below. All commercial catch statistics are preliminary.

Southeastern Alaska and Yakutat

The 1972 pink salmon harvest in Southeastern Alaska totaled approximately 12.0 million or 4.5 million less than anticipated prior to the season. Since 1960 the average even-year pink salmon harvest has been 14.9 million. In Southern Southeastern , that portion of the Alaska Panhandle lying roughly south of Frederick Sound, the 8.9 million harvest in 1972 compared favorably with the pre-season prediction of 8.5 million, however, in Northern Southeastern the harvest of 3.0 million fell substantially short of the expected 8.0 million harvest. Pink salmon returns bound for Northern Southeastern streams in Peril Straits, Port Frederick, Icy Straits and the outside area of Chichagof Island were especially weak. Escapements in these areas were also weak but escapements were generally good for other portions of the northern section and for Southern Southeastern Alaska. Pink salmon returning to the southern section were unusually small in 1972 with some canneries reporting that 30 fish or more were required to produce a 48-pound case of canned salmon.

Approximately 2.3 million chum salmon were harvested from strong returns of this species to Southeastern Alaska fisheries. In Lynn Canal a record harvest of 360,000 chums occurred. Chum salmon escapements were generally good, especially in Northern Southeastern where substantially restricted fishing regulations required to protect weak pink salmon returns also benefited chum salmon.

Sockeye returns to Southeastern in 1972 were somewhat better than in recent years with the harvest of 926,000 for Southeastern and Yakutat combined being the largest since 1967. The 1972 coho harvest of 1.4 million slightly exceeded the average harvest of 1.1 million since 1960 while the king salmon harvest of 254,000 was below the average of 297,000.

Prince William Sound

The 1972 pink salmon forecast of 1.7 million, with the range of 0 to 3.6 million, left little possibility of a purse seine fishery for this area. A return in the upper part of the range may have permitted fishing in some areas, however, this did not occur. A total return of approximately 0.7 million pink salmon occurred with nearly all fish being allowed to reach the spawning grounds. The harvest of pink salmon totaled less than 100,000 fish with most of these being taken in fisheries operating on other species of salmon.

The return of approximately 362,000 chum salmon fell short of the predicted 800,000. While this magnitude of return would normally still have allowed a substantial harvest of chum salmon, the fact that chum salmon are intermixed with pink salmon in the fishing areas combined with the need to insure protection of very weak pink salmon returns resulted in a harvest of only 46,000 chums. Excellent chum salmon escapements were subsequently achieved.

In the Copper River fishery an above-average harvest of 728,000 sockeye was taken. As in 1971, ice conditions and price negotiations delayed the opening date of this fishery, however the timing of the run appeared to be at least 7-10 days later than normal with the result that early delays had little effect on the fishery. Upriver escapements were near average levels while the downriver or delta area escapements appeared to be much better than average.

Also in the Copper River fishery, the coho harvest of 108,000 reflected the weakness of returns of this species. This fishery was closed on September 8th by emergency order.

Cook Inlet

The commercial harvest of salmon of all species in the Cook Inlet area totaled approximately 2.3 million. This was considerably below normal levels for comparable even years primarily as a result of lower than average catches of pink salmon in the Southern and Outer districts, however catches in other districts were also depressed. The total pink salmon catch of 583,000 was roughly one sixth of the even-year average of 3.0 million since 1960.

The sockeye harvest of 934,000 and the chum harvest of 700,000 were slightly below the past ten-year averages while the coho harvest of approximately 73,000 was the lowest on record since the early 1900's.

Escapements of sockeye salmon in the Kenai Peninsula systems were good to excellent while those in the Susitna Basin and west side streams appeared to be about average.

Kodiak

Although the predicted 1972 pink salmon harvest of 6.5 million was substantially below the average even-year harvest of 10.7 million since 1960, the actual return was even weaker than expected and only 2.5 million pink salmon were eventually harvested. This was the lowest even-year harvest since 1934. Returns to the various districts appeared to be uniformly depressed below levels predicted on the basis of pre-emergent fry or alevin abundance observed in the spring of 1971 which, in conjunction with similar patterns in pink salmon returns to other areas of the state, suggests the likelihood of greater than average mortalities having occurred in estuarine and/or ocean areas. Due to exceptionally weak returns of pink salmon to some districts, especially the larger river systems on the west side of Kodiak Island, escapement levels generally fell below desired levels.

In contrast to the weak pink salmon returns, chum salmon returns and catches in the Kodiak area fisheries were exceptionally strong, the harvest of 1.2 million being the second largest since 1934. In addition to an excellent harvest, chum salmon escapements were especially strong in 1972 with aerial surveys indicating an estimated 335,000 chum salmon on spawning grounds.

Sockeye catches for the Kodiak area totaled only 221,000 fish, the lowest sockeye harvest since 1955. Approximately half of this harvest was taken from runs bound for the Karluk, Red and Sturgeon rivers. The Cape Igvak fishery took approximately 42,000 sockeye, the majority of which would be bound for Chignik area sockeye systems. An estimated escapement of 523,000 sockeye was obtained for the major Kodiak sockeye systems. This was somewhat below average levels since 1960.

King and coho salmon are primarily harvested incidental to other species in the Kodiak fisheries. The combined harvest of both species totaled approximately 15,000.

Chignik

In 1972 the Chignik area experienced the poorest overall salmon run since the early fifties.

The total sockeye salmon return of approximately 950,000 was the lowest since 1969, but compares favorably with average returns to the Chignik River system of about a million fish. The early run was very poor, however, and produced only enough fish for an escapement. The catch of sockeye salmon in the Chignik area of 380,000 was all attributed to the late run. Approximately 532,000 sockeye were counted migrating through the weir enroute to spawning grounds in the Chignik Lake and Black Lake systems.

Only 70,000 pink salmon were caught, the poorest catch since 1959. Escapement was very poor and spotty. The normal catch of pink salmon is over one million fish.

The chum salmon run was also much below average, although poorer catches occurred in both 1967 and 1969. The 1972 catch was approximately 78,000. Escapements were fair in the major systems.

Alaska Peninsula and Aleutian Islands

The 1972 salmon runs to the Alaska Peninsula and Aleutian Islands were weak with the return of pink salmon best described as a disaster. The primary fishing area is on the Pacific Ocean side of the Alaska Peninsula, and catches there normally run two to four million salmon. Only 1.37 million salmon were taken in the 1972 season.

The pink salmon catches generally vary between one and two million salmon and constitute 50 to 70 percent of the total salmon catch (in numbers of fish). The 1972 catch totaled only 78,000 pinks. Worse, the spawning escapement totaled only 111,000 pinks versus a norm of 600,000 to 1,000,000 pinks. The extremely severe winter of 1970-71 was doubtlessly responsible for this disastrous return, and it is expected that even with very good survival of this year's spawn the even-year pink salmon runs will not return to normal until 1976. The Aleutian Island pink salmon runs were similarly weak.

Chum salmon runs were good on the Peninsula this season, 800,000 being taken in the fishery and 365,000 escaping to spawn. Indications are that future chum runs will be weak 1973 through 1975, primarily because of the affects of the aforementioned severe winters.

The South Unimak June fishery took 428,000 sockeye salmon, an unexpectedly high catch considering the weak return to Bristol Bay. This amounted to 18 percent of the number of sockeye salmon taken in Bristol Bay versus the norm of 3-7 percent since the fishery's inception in 1911. This high catch is

attributed primarily to the fish setting harder onshore than normal, though other factors such as increased fishing effort also had their affect.

King and coho salmon are minor species on the Alaska Peninsula, but even these runs were notably weak this season.

Bristol Bay

The 1972 Bristol Bay sockeye run totaled 5.4 million, approximately 55 percent of the 9.7 million forecasted. The major shortage of fish occurred in the 2-ocean age group and was experienced in all Bristol Bay river systems. Good catches of Bristol Bay sockeye passing through the False Pass-Unimak fishery in June of 1972 suggested that the run could approximate forecasted magnitude. Test fishing in the Port Moller vicinity indicated a run of lesser magnitude, but considerable test fishing time had been missed early in the season because of mechanical breakdowns and weather. Sampling during early-season fishing periods provided a second indication of a run shortage through lower-than-forecasted occurrence of 2-ocean age fish in the catch.

Fishing periods had been limited drastically by July 4, the usual peak date of the sockeye fishery. Only 12 hours of fishing was permitted after July 4 in the Naknek-Kvichak district and only 36 hours in the Nushagak district. At season's end, only 2.4 million sockeye had been caught, the lowest catch since 1896 although comparable low catches were made in 1935, 1958, 1963 and 1968. Escapement totaled 3.0 million and escapement goals were fully achieved in only two major rivers, Egegik and Togiak.

Catches of other salmon species, except chums, were also lower than average. In the Nushagak district, Bristol Bay's foremost producer of king salmon, only 46,000 kings were caught as compared to the 20-year average of 68,000. The total catch of king salmon for all districts was 66,000. The Nushagak district also generally contributes in excess of 90 percent of all pink salmon harvested in Bristol Bay. Pink salmon returns, in recent years, have been of significant magnitude only in even-years. The Nushagak pink salmon harvest in 1972 of 76,000 was well below the average catch of 844,000 for the past 10 even-years. Bristol Bay's coho harvest totaled approximately 15,000 or about 38 percent of the 20-year average of 40,000. The chum salmon catch totaled about 615,000 compared to the 20-year average of 491,000.

Arctic-Yukon-Kuskokwim

The 1972 commercial salmon harvest of 900,000 fish was the second

largest in the history of the region. This harvest included 151,900 king and 651,900 chum salmon, economically the most important species in the region. Catches of other species for the region were sockeye - 4,500, coho - 43,450 and pink - 48,300. By management area commercial catches of salmon of all species were Kuskokwim - 182,000, Yukon - 396,000, Norton Sound - 151,000 and Kotzebue - 171,000.

With some notable exceptions, the salmon runs and escapements in most areas were average in magnitudes based on comparative data obtained since the early 1960's.

The Kotzebue area experienced its third consecutive above average chum salmon run which resulted in a record commercial catch of 171,000 fish. Record spawning escapements were also recorded in this area.

PRELIMINARY FORECASTS OF TOTAL SALMON RETURNS TO SOME MAJOR ALASKAN FISHERIES IN 1973

The Department's salmon management program includes a number of projects designed to provide pre-season forecasts of total salmon returns to some of the major salmon fisheries throughout the state. Areas and species on which intensified forecast research is presently being conducted were chosen on priority basis relative to economic importance, potential predictability of annual returns and compatibility with existing programs. The Department's forecasting program is being expanded as funding permits.

These intensified forecasting programs are generally designed to provide a more reliable forecasting basis than merely number of spawners in parent years. This may include more refined information on spawning distributions, survival to an intermediate life stage, population age compositions or some combinations of these factors. In addition to forecasts of total salmon returns to an area, information on the relative strength of returns to specific districts or systems obtained from these studies provides for more efficient management of these stocks.

Salmon stocks included in these intensified forecast studies have contributed from 50 percent to 70 percent of the total statewide salmon harvest in recent years.

Comparison of 1972 Forecasts with Actual Returns

For a brief review of the accuracy of the 1972 forecasts of total returns to these major salmon fisheries, Table 2 compares the final pre-season forecasts with preliminary 1972 returns. Only minor revisions of the preliminary forecasts of November, 1971 were made prior to the 1972 season. Both preliminary and final forecasts are shown in the table.

The 1972 returns of pink salmon to Southern Southeastern Alaska and sockeye to Chignik agreed favorably with pre-season forecasts which exhibited errors of -1 and -6 percent respectively. Subsequent salmon harvests in these fisheries also agreed closely with expected harvest levels. In Prince William Sound, an area where pink salmon forecasts have been exceptionally successful since initiated in the early 1960's, a return of 0.7 million fell in the predicted range of 0 to 3.6 million and, as expected prior to the season, no commercial fishery could be allowed on these pink salmon stocks.

TABLE 2. COMPARISON OF PRELIMINARY 1972 SALMON RETURNS WITH PRE-SEASON FORECASTS FOR SOME MAJOR ALASKAN SALMON FISHERIES [1]

Numbers of Fish in Thousands

Area	Species	Pre-season Forecast [2] Range	Pre-season Forecast [2] Point	Preliminary Return	Forecast Error [3] Number	Forecast Error [3] Percent
Southern Southeastern	Pink	11,600-15,900	13,700 (14,500)	13,900	-200	-1
Northern Southeastern	Pink	8,100-17,600	12,900 (12,000)	6,000	+6,900	+53
Southeastern Subtotals	Pink	19,700-33,500	26,600 (26,500)	19,900	+6,700	+25
Prince William Sound	Pink	0-3,600	1,700	690	+1,010	+59
	Chum	700-900	800	360	+440	+55
Cook Inlet-Southern and Outer Districts only	Pink	400-1,100	750	55	+695	+93
Kodiak	Pink	7,900-11,100	9,500	3,550	+5,950	+63
Chignik	Sockeye	-	860	910	-50	-6
Bristol Bay, All Districts	Sockeye	-	9,770 (10,300)	5,400	+4,370	+45
Nushagak District	Pink	-	1,400	130	+1,270	+91

1/ Formal forecasts of total 1972 salmon returns were made only for the species and areas presented above.

2/ Final pre-season forecasts are shown. Preliminary forecasts of November,1971 are shown in parenthesis if different from the final forecasts.

3/ Forecast error computed from point forecast. Percent error computed from forecast.

Forecasts of total returns to other fisheries exhibited substantially greater errors ranging from +48 percent for Bristol Bay sockeye to +91 percent for Nushagak district (Bristol Bay) pink salmon.

As discussed previously, pink salmon returns in 1972 were exceptionally weak throughout most of the state. One exception was the Southern Southeastern pink return of approximately 13.9 million which compared favorably with both the forecast of 13.7 million and the even-year average since 1960 of 14.3 million. Although it may appear strange at first glance that in Northern Southeastern, immediately adjacent to Southern Southeastern, the return was much weaker than forecast, climatological conditions in these two areas differ substantially in some years. Of interest is the fact that immediately south of Southern Southeastern Alaska, in northern British Columbia, pink salmon returns were also relatively strong and did not reflect the weakness characteristic of most of Alaska's pink salmon returns.

As illustrated in Figure 2, pink salmon stocks resident to those areas lying north and west of Southern Southeastern apparently experienced environmental conditions severe enough to cause substantially greater than average mortalities; conditions encountered by Southern Southeastern pink salmon, while not conducive to optimum growth, apparently did not cause levels of mortality experienced by other Alaskan stocks.

Forecast studies conducted on major pink salmon stocks in Alaska are designed to measure survival during the freshwater stage of the life cycle - that period when the greatest and most variable mortalities normally occur - however, they do not provide measures of survival during estuarine and marine stages 1/. The fact that 1972 pink salmon returns to Northern Southeastern,

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1/ While it is known that mortality rates occurring during estuarine and ocean stages of the salmon's life cycle do in fact exhibit annual variations, it was assumed that in most years these variations were small compared to variations in freshwater mortalities and that measures of fry abundance obtained at or near the end of the freshwater stage would provide pink salmon forecasts of acceptable accuracy. This assumption has been strongly supported by forecast studies conducted in Prince William Sound. It was recognized, however, that (1) pink salmon in other areas of the state could encounter estuarine and early marine environmental conditions substantially different from those occurring in the Prince William Sound area which could result in larger average forecast errors and (2) extreme post-freshwater mortalities and, therefore, large forecast errors were bound to occur in some years.

Prince William Sound, the Southern and Outer districts of Cook Inlet and Kodiak all fell below forecasted returns (based on measures of relative abundance of fry obtained in the spring of 1971 just prior to emergence from stream gravel and migration to estuarine areas) strongly suggests that substantially greater than average mortalities occurred in estuarine and/or ocean areas. Additionally, returns to specific districts within the major fisheries tended to be uniformly depressed and thus weak returns to all districts rather than extreme weaknesses in one or two districts produced the area weaknesses observed.

The return of 910,000 sockeye to the Chignik systems, while being the poorest since the early 1950's, was not unexpected as a return of only 860,000 had been predicted. Also as predicted, no harvest could be allowed on the early or Black Lake run as the entire run was needed to meet escapement requirements. The late or Chignik Lake run was responsible for nearly the entire harvest of 380,000. Individually, returns to the Black Lake and Chignik Lake systems reflected differences of -17 and +22 percent respectively from forecasted levels.

In Bristol Bay, where the 1972 returns of 5.4 million sockeye barely exceeded half the predicted return, returns to eight of the major systems were below forecasted levels. In the Kvichak system, largest of the Bristol Bay systems, a return of 1.4 million sockeye fell substantially short of the predicted 3.9 million return. Only in the Togiak system did return exceed forecast; catch plus escapement totaled approximately 151,000 or some 20 percent more than the predicted 126,000. Because forecasts of sockeye returns to Bristol Bay depend to a great extent on the size of brood year escapements and because information on freshwater survival is limited, it is not possible at this time to say whether greater than average mortalities occurred in freshwater or marine environment or both. However, the severe climatological conditions which apparently affected pink salmon fry in the winter and spring of 1970-71 would not have been expected to affect 1972 returns of sockeye as these fish would have been in ocean rearing areas during that period.

Preliminary 1973 Forecasts

Forecasts of 1973 returns to major Alaskan salmon fisheries for which forecasts of total returns are available are summarized in Table 3. Point and range forecasts are given for both total returns and harvest levels.

Included in 1972 but not 1973 were forecasts of pink salmon returns to the Southern and Outer districts of Cook Inlet and to the Nushagak District of

TABLE 3. PRELIMINARY FORECASTS OF TOTAL SALMON RETURNS TO SOME[1/] MAJOR ALASKAN FISHERIES IN 1973.

Number of Fish in Thousands

Area	Species	Forecasted Total Return		Estimated Harvest	
		Range	Point	Range	Point
Southern Southeastern	Pink	11,300-16,700	14,000	5,300-10,700	8,000
Northern Southeastern	Pink	3,500-8,500	6,000	0-4,500	2,000
Southeastern Subtotals		14,800-25,200	20,000	5,300-15,200	10,000
Prince William Sound	Pink	1,100-4,300	2,700	0-2,800	1,200
	Chum	360-930	640	160-730	440
Kodiak	Pink	3,600-9,700	7,800	2,300-8,400	6,500
Chignik	Sockeye	530-1,070	780	100-470	190
	Pink	2/	400	Negligible	Negligible
	Chum	2/	130	Negligible	Negligible
Bristol Bay	Sockeye	2/	6,200	1,120-1,870	1,490
Totals[3/]			38,650		19,820

1/ Formal forecasts of total salmon returns are presently prepared only for those areas and species listed above.
2/ Forecast ranges are not available for these areas and species.
3/ These totals are only for the areas and species listed above. They do not include all species and all areas of Alaska.

Bristol Bay. In Cook Inlet, severe climatic conditions in the spring of 1972 prevented sampling of pink salmon streams for pre-emergent fry abundance while in the Nushagak District of Bristol Bay only negligible numbers of pink salmon return in odd years. Included for the first time in 1973 are forecasts of pink and chum salmon returns to the Chignik area

In Southeastern Alaska, pink salmon returns of 14.0 and 6.0 million are expected in 1973 for the southern and northern sections respectively. The corresponding ranges of possible returns are estimated to be 11.3 to 16.7 million for Southern Southeastern and 3.5 to 8.5 million for Northern Southeastern. A return of 14 million pink salmon to Southern Southeastern would be nearly twice the average odd-year return of 6.7 million since 1961 and would, in fact, exceed the largest odd-year run during that period of 11.0 million which occurred in 1971. In Northern Southeastern, the predicted return of 6.0 million would be below the average odd-year return since 1961 of 8.6 million and would be nearly identical to the 1972 return. Returns of the magnitude predicted would result in harvests of 8.0 and 2.0 million pink salmon for the southern and northern sections respectively. Because the winter and spring of 1971-72 also produced unusually severe climatological conditions in the northern section, special attention is drawn to the forecast range of 3.5 to 8.5 million with the corresponding projected harvest range of 0 to 4.5 million.

The forecast of 2.7 million pink salmon for Prince William Sound in 1973 indicates the possibility of the second consecutive poor season for this fishery. Although a return of 2.7 million would allow a harvest of approximately 1.2 million pink salmon, this would still be the second smallest harvest since 1960 - in 1972 less than 100,000 pinks were harvested. With an escapement goal of approximately 1.5 million, a return in the lower portion of the 1.1 to 4.3 million range would again require almost total closure of the pink salmon fishery. A forecasted return of 640,000 chum salmon to Prince William Sound with a projected allowable harvest of 440,000 could contribute substantially to the fishery, however, it should be emphasized that in the event of an extremely weak pink salmon return the need to protect major pink salmon stocks makes it very difficult to achieve maximum allowable harvest of chum salmon stocks.

A return of 7.8 million pink salmon is predicted to the Kodiak area in 1973. This prediction has an associated range of 3.6 to 9.7 million. As in other areas of the state, climatic conditions existing in the winter and spring of 1971-72 in the Kodiak Island area were generally more severe than normal and sampling of pink salmon fry in estuarine areas by Fisheries Research Institute, University of Washington, indicated that the 1973 return is more likely to fall below the point forecast given here. With a return of 7.8 million,

approximately 6.5 million pink salmon should be available for harvest, however, a harvest in the range of 2.3 to 8.4 million is also considered possible. Major contributions to the harvest are expected from the General and Alitak districts which should receive approximately 80 percent of the total return.

The outlook for salmon returns to the Chignik area in 1973 is not encouraging. The most abundant species, sockeye salmon, are expected to be below average for the second consecutive year. A point forecast of 780,000 consisting of 340,000 early run or Black Lake stocks and 440,000 late run or Chignik Lake stocks would allow a harvest of only 190,000 sockeye all of which would have to be taken from the late run. The expected return of only 340,000 for the early run would be needed to satisfy escapement requirements. For other species, expected returns of 400,000 pink salmon and 130,000 chum salmon to the Chignik area would not be large enough to provide substantial numbers of surplus fish for harvest. Forecast studies conducted in the spring of 1972 indicated extremely poor pink salmon fry production apparently as a result of poor parent escapements coupled with poor over-winter survival.

In Bristol Bay, a predicted return of only 6.2 million sockeye indicates the possibility of a second disasterous season for the major sockeye producing area of the state. With escapement requirements for the various systems totaling 4.7 million, a harvest of only 1.5 million sockeye could be expected in 1973. This would represent the smallest catch since 1896, an event which would be especially critical as the harvest by this fishery in 1972 was only 2.4 million sockeye, presently the smallest catch since 1896. Returns to all districts are expected to be seriously depressed and in at least one district, the Ugashik, no fishing time would be expected as the predicted return is less than minimum escapement requirements. Projected harvest levels in the two largest fishing districts, the Naknek/Kvichak and the Nushagak/Igushik, are 670,000 and 270,000 respectively. The 1973 forecast is heavily dependent on measures of relative abundance of Bristol Bay sockeye obtained by National Marine Fisheries Service and Fisheries Research Institute (University of Washington) research vessels while operating in Bering Sea and Gulf of Alaska waters. Data obtained during these cruises provided evidence that sockeye smolt migrating to the ocean from Bristol Bay lakes and rivers in the spring of 1971 suffered unusually heavy mortalities in estuarine and/or ocean areas. The extremely severe climatic conditions which existed during the spring of 1971 in the Bristol Bay and Bering Sea areas is suspected of being responsible for the high mortality rates.

In total, a contribution to the 1973 state salmon harvest of 19.8 million fish is expected from the salmon stocks discussed in this section. By comparison, these fisheries contributed 17.4 million salmon in 1972, 32.8 million in

1971 and 49.6 million in 1970. The reduced levels for 1972 and 1973 are primarily due to poor pink salmon returns resulting from poor survival in the winters and springs of 1970-71 and 1971-72 and to unusually low off-cycle sockeye returns to Bristol Bay.

Additional information on forecast techniques, relative strength of returns to specific districts or systems, potential problems anticipated for the 1973 season and other items of interest related to the 1973 forecasts are presented in Appendix A.

In the following section, the estimated allowable harvest from those salmon stocks discussed above is combined with the projected harvests from other salmon stocks to provide a projection of the total state salmon harvest for 1973.

PROJECTED TOTAL COMMERCIAL SALMON HARVEST FOR ALASKAN FISHERIES IN 1973

Pre-season forecasts of salmon runs and anticipated harvests for specific area fisheries are essential to the operational planning of persons directly involved with these fisheries. However, information on the expected total Alaska salmon production is also important to agencies, industries or persons involved in many or all fisheries such as industry suppliers, the transportation industry and the State government (for projection of state revenues). Consequently, the Department is continuing efforts to develop a basis for providing useful and accurate pre-season estimates of total state salmon production.

For salmon fisheries not discussed in the previous section, it is generally necessary to base pre-season estimates of harvest on recent harvest trends. Projections based on this method will generally reflect more variation from actual harvests as adjustments are not made for variations in brood stock abundance or annual survival rates. However, for 1973, the exceptionally strong evidence for reduced survival of pink salmon throughout the state and for sockeye in the Western Region has been recognized in projecting the 1973 harvest levels. In addition, the probable affect of the extreme climatological conditions of the 1970-71 winter on that segment of the 1973 chum return composed of 3-year fish, progeny of the 1970 brood year, is also taken into consideration.

Projected commercial salmon harvests for Alaskan fisheries in 1973 are presented by species and statistical region in Table 4. Approximately 30.0 million salmon of all species are expected to be harvested by Alaskan fisheries in 1973. Percentage contributions expected by statistical region are Southeastern - 45%, Central - 45% and Western - 10%. Percentage contributions expected by species are pink - 62%, chum - 17%, sockeye - 16%, coho - 3% and king - 2%.

If projections for 1973 are substantially correct, salmon harvests by the Southeastern and Kodiak fisheries should jointly contribute approximately 21.1 million or 70 percent of the total state harvest. The above average contribution of these two areas is due to the extremely low projected harvests for the Prince William Sound and Bristol Bay fisheries and weak returns expected to the other areas as well.

Pink salmon returns to all areas of the state, except Southern Southeastern, are expected to be substantially below average in 1973 and generally of the same magnitudes as in 1972. As discussed in the previous section,

TABLE 4. PROJECTED[1] TOTAL COMMERCIAL SALMON HARVESTS BY ALASKAN FISHERIES IN 1973

Numbers of Fish in Thousands

Statistical Region	Species					
	King	Sockeye	Coho	Pink	Chum	Total
Southeastern	300	800	750	10,000	1,620	13,470
Central	40	2,260	200	8,430	2,560	13,490
Western	220	1,740	80	60	980	3,085
Total Alaska	560	4,800	1,030	18,490	5,160	30,040
Estimated number of 48-lb. cases in thousands[2]	30	330	20	880	320	1,580

1/ The above estimates of 1973 salmon harvests were obtained by combining estimates of commercial harvests resulting from the forecasts of total returns to some of the major salmon fisheries (refer to Table 3) with projected harvests of the remaining fisheries based on recent harvest trends.

2/ Although the majority of 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. Cases other than 48-lb. cases are converted to an equivalent number of standard 48-lb. cases.

severe climatological conditions occurring in the winters of 1970-71 and 1971-72 appeared to have caused greater than average mortalities of pink salmon in the freshwater environment and, for salmon returning in 1972, also in estuarine and/or marine environments. The affect of greater than average freshwater mortalities are reflected in forecasts - based on observed fry production - of weak returns in 1973 to the Northern Southeastern, Prince William Sound and Kodiak areas. However, pink salmon returns to other areas of the state would also be expected to be depressed. Furthermore, in the event that pink salmon destined to return in 1973 also suffered greater than average estuarine and/or marine mortalities - after measures of fry were obtained - actual returns in 1973 could be even smaller than forecast. In 1972, pink salmon returns to the three areas listed above were less than half the predicted levels.

The state sockeye harvest in 1973 is expected to be severely depressed; the projected harvest of 4.8 million would be the lowest of the century. While this is due primarily to a predicted poor return to Bristol Bay, sockeye returns to the entire Western Region are expected to be depressed. Furthermore, harvests in the South Side Peninsula and Chignik fisheries are expected to be substantially below average.

Information on which to base projections of chum, king and coho harvests is very limited. Projections for 1973 were generally made on the basis of past harvest trends with special emphasis being placed on levels of harvests occurring in 1972.

Preliminary data compiled by the Department's statistics section indicates a total salmon casepack in 1972 of 1.7 million 48-pound cases or equivalent. In addition, approximately 32.6 million pounds of salmon were processed as fresh, frozen or cured products in 1972. For 1973, a salmon casepack of approximately 1.6 million 48-pound cases or equivalent is projected, the slightly smaller casepack than in 1972 being due to the larger anticipated contribution of pink salmon to the total harvest. Fresh, frozen and cured products are expected to total approximately 28 million pounds in 1973, with kings, cohos and chums contributing all but 10 or 15 percent of the total.

SUMMARY

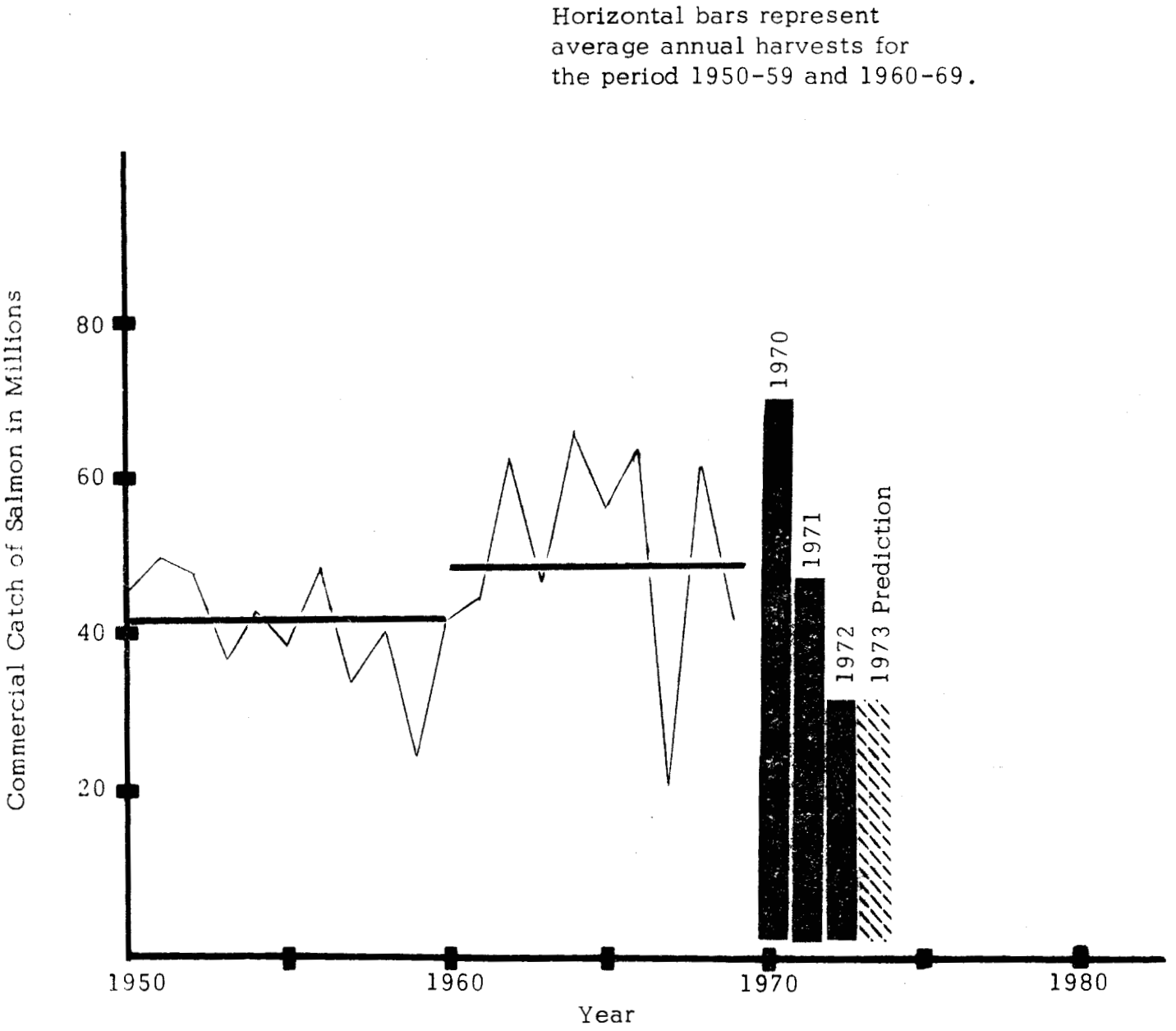
Commercial catches of Alaskan salmon since 1950 are given in Appendix B and shown graphically in Figure 3. Annual catches during this period have ranged from 21 million in 1967 to 68 million in 1970. Average annual catches, represented by horizontal bars in Figure 3, were 41 million and 51 million for the 1950's and 1960's respectively.

In 1970, 68 million salmon of all species were harvested commercially, in 1971 47 million and in 1972 30 million. The 1972 harvest was one of the lowest since 1950; other harvests of similar magnitudes occurred in 1957 (34 million), 1959 (25 million) and 1967 (21 million). While the larger than average harvest in 1970 resulted from an excellent peak year sockeye harvest of 21 million in Bristol Bay occurring coincidentally with good harvests in most of the other fisheries, the smaller than average harvest in 1972 resulted from an exceptionally weak non-peak year sockeye harvest of 2.4 million in Bristol Bay coupled with unusually weak pink salmon returns to almost all areas of the state.

The pattern of commercial salmon harvests which occurred in 1972 is expected to be repeated again in 1973. The projected 1973 harvest of 30.0 million salmon of all species is only several hundred thousand less than the 1972 harvest. Major weaknesses are again anticipated in the Bristol Bay sockeye fishery and in pink salmon fisheries throughout the state. Should the 1973 salmon harvest compare closely with the projected level, the average annual harvest for the first four years of the 1970's would be approximately 44 million, substantially below the 51 million average of the 1960's.

Evidence available at this time points to continued low salmon production from the state's fisheries for the next several years. Pink salmon escapements in 1972 were below desired levels in some areas as a result of extremely poor returns, thus indicating the possibility of weak pink salmon returns in 1974. Chum salmon spawned in 1970 and 1971 and expected to return during the period 1973-76 were almost surely affected by the severe winters of 1970-71 and 1971-72 which resulted in low survival of pink salmon sharing the same freshwater environment. Studies on Bristol Bay sockeye indicate that fish expected to return during the period 1973-76 encountered unusually poor survival; sockeye stocks of some other areas encountered similar environmental conditions and perhaps comparably low survival rates. Although direct information does not exist on probable production from coho and king salmon stocks, it is also likely that these species experienced lower than average survival, especially in areas of the state where recent winters have been extremely severe.

FIGURE 3. ANNUAL COMMERCIAL HARVESTS OF ALASKAN SALMON, 1950-1972.



It is readily apparent in a year such as 1972 that achievement of good spawning populations in one year does not guarantee successful harvests in subsequent years. Factors presently beyond man's control, in particular climatological factors, can and do fluctuate greatly and in some years cause unusually severe mortalities in salmon populations. However, while the success of a particular brood year spawning can not be guaranteed, it can be easily demonstrated that failure to consistently achieve adequate spawning populations will, on the average, reduce the number of salmon available for harvest. It is especially important, therefore, in years of low returns to maintain adequate levels of spawning to insure the shortest possible recovery time when conditions again become favorable for salmon production.

In summary, the Department wishes to emphasize that the estimates of salmon harvests for 1973 presented above are dependent on 1973 salmon returns being of the magnitudes anticipated. Returns weaker than forecasted may require additional restriction of harvests to insure desired escapement goals while returns larger than forecasted may result in relaxation of regulations to insure maximum allowable harvest.

APPENDIX A. PRELIMINARY FORECASTS, FORECAST TECHNIQUES AND DISCUSSION OF ANTICIPATED 1973 SEASON FOR MAJOR SALMON FISHERIES FOR WHICH FORECASTS OF TOTAL RETURNS ARE AVAILABLE

FORECAST AREA: Southeastern Alaska

SPECIES: Pink Salmon

PRELIMINARY FORECAST OF 1973 TOTAL RETURN:

Northern Southeastern

Point Estimate = 6.0 million

Range Estimate = 3.5 - 8.5 million

Southern Southeastern

Point Estimate = 14.0 million

Range Estimate = 11.3 - 16.7 million

Total Southeastern

Point Estimate = 20.0 million

Range Estimate = 14.8 - 25.2 million

FORECAST METHODS:

The 1973 pink salmon forecast is based primarily on the relationship between pre-emergent fry or alevin indices and subsequent adult returns. Indices are weighted by average district escapements for the years 1967-1971. Alevin index data collected since 1966 were used to establish the relationship. Because of the apparent separation of pink salmon stocks between the Northern and Southern Southeastern areas two forecasts are provided.

DISCUSSION OF 1973 FORECAST:

For Northern Southeastern, a total return of 6.0 million pink salmon is predicted for 1973. This prediction has an associated range of 3.5 to 8.5 million reflecting the variability in data used as a basis for forecasting. Because of the similarity in climatological conditions existing in the winters of 1970-71 and 1971-72 and the apparent poor survival of fry during the 1970-71 winter - as evidenced by the much lower than predicted return in 1972 - the forecast for 1973 was based on a survival rate similar to that of salmon returning in 1972.

In Southern Southeastern, the 1973 return is expected to fall in the range of 11.3 to 16.7 million. The most probable return is expected to be approximately 14.0 million. This would be the largest odd-year return since prior to 1960.

With escapement requirements of approximately 4 million spawners for Northern Southeastern, the predicted return of 6.0 million would allow a harvest of approximately 2.0 million pinks in 1973. For Southern Southeastern, the predicted return of 14.0 million would allow for a harvest of 8.0 million with 6.0 million being required for escapement.

Prepared by: Kenneth Durley
Fisheries Research Biologist
Juneau

FORECAST AREA: Prince William Sound

SPECIES: Pink Salmon

PRELIMINARY FORECAST OF 1973 TOTAL RETURN:

Point Estimate = 2.7 million

Range Estimate = 1.1 - 4.3 million

FORECAST METHODS:

Pink salmon forecasts in Prince William Sound (total run, district strength and timing) are based on indices of relative abundance of alevin obtained just prior to their emergence from stream gravel.

DISCUSSION OF 1973 FORECAST:

The pink alevin index for the 1973 run is 130 per square meter. This is the second lowest density observed since 1959.

The alevin index indicates a total pink salmon run of approximately 2.7 million fish (range 1.1 - 4.3). The spawner escapement goal for Prince William Sound is 1.5 million pinks. This would allow a commercial harvest of 1.2 million fish.

The low alevin index could be in part a result of unsatisfactory sampling operations. The work was not completed until May 26th, about a month later than usual, because of snow and ice cover over the streams. The fry migration out of the streams could have been well underway.

SPECIES: Chum Salmon

PRELIMINARY FORECAST OF 1973 TOTAL RETURN:

Point Estimate = 643,000

Range Estimate = 359,000 - 927,000

FORECAST METHODS:

Chum salmon may mature as three, four or five year old fish. Forecasts

are based primarily on a relationship that exists between the chum alevin index and the subsequent return of four-year old fish, the most abundant age class.

DISCUSSION OF 1973 FORECAST:

The chum alevin density of 89 per square meter for the parent year 1969 is the largest observed since 1960 and is expected to contribute approximately 90 percent of the 1973 chum run as four-year old fish. This density indicates a run of about 578,000 four-year chums in 1973 and a total chum run of 643,000. The chum run should be in the upper range of the forecast. Production of pink salmon from the 1969 spawning was also excellent.

Prepared by: John D. Solf
Fisheries Research Biologist
Cordova

FORECAST AREA: Kodiak

SPECIES: Pink Salmon

PRELIMINARY FORECAST OF 1973 TOTAL RETURN:

Point Estimate = 7.8 million

Range Estimate = 3.6 - 9.7 million

FORECAST METHODS:

Forecasts of total pink salmon returns to the Kodiak area are based measures of relative abundance of pre-emergent fry observed during the spring sampling period. Hydraulic sampling of 22 major pink salmon streams in the spring of 1972 yielded a pink salmon fry density that was a little above average for an odd-year cycle adult return. For the first time, linear regressions using only odd-year data were used to forecast the pink salmon run to the Kodiak area. The summation of the district forecasts indicates a 1973 return of 7.8 million pink salmon. Classic statistical confidence limits, using only three years' data, yield such a wide range as to be of little value. For this reason, the high and low forecasts developed from other methods have been chosen as the range for the point estimate of 7.8 million. A high forecast of 9.7 million was developed, using the odd-year data for the whole Island. A much lower forecast of 3.6 million resulted from using the escapement-return relationship. These two additional figures (3.6 million and 9.7 million) are considered to be the range of the forecast.

DISCUSSION OF 1973 FORECAST:

The relative strengths of expected returns to major districts and catch-associated districts in the Kodiak area (excluding the Mainland District) are indicated below:

(1) Afognak District: The generally poor densities obtained in this area indicate a return of about .6 million. Perenosa Creek and Danger River should receive the bulk of the return.

(2) Westside: This area includes the Uganik, Uyak, Karluk, Red River and Sturgeon districts. The pre-emergent fry densities obtained in these districts indicate a return of about .7 million. The last three odd-year returns for the Westside averaged 650,000

pink salmon. Uganik and Uyak rivers should be the primary producers in this area.

(3) Alitak District: Fry densities in this district indicate a very strong return for 1973 of 2.9 million. In recent years, only 1969 had produced a return that was larger than the 1973 forecast for this district. The 1969 return totaled more than 3.9 million. A record high density in Deadman River and a very good density for the upper section of Humpy River largely contributed to the strong 1973 forecast to this district.

(4) General District: This district extends from Kizhuyak Bay to Cape Trinity on the east side of Kodiak Island. Pre-emergent fry sampling densities indicate a return of 3.6 million. This is very near the average of the last three odd-year returns. Seven Rivers is the only stream that should receive an above-average return in the General District.

The summation of the district forecasts indicates a return of 7.8 million pink salmon. If the 1973 return corresponds closely to the 7.8 million forecast (indicated by the summation of the district forecasts), an estimated 6.5 million pink salmon could be harvested.

There are two pieces of evidence which would indicate a greater likelihood of the 1973 return falling in the lower half of the 3.6 to 9.7 million range, that is in the range of 3.6 to 7.8 million. First, climatological conditions in the winter and spring of 1971-72 were similar in severity to those of 1970-71. The return of only 3.6 million pink salmon in 1972 following a forecast of 9.5 million indicates the possibility that the 1973 return could be similarly depressed relative to forecast. Second, sampling conducted by the Fisheries Research Institute (University of Washington) indicated that the abundance of fry in estuarine rearing areas in the spring of 1972 was similar to the abundance observed in the spring of 1971.

Prepared by: Kenneth R. Manthey
Assistant Area Management Biologist
Kodiak

FORECAST AREA: Chignik

SPECIES: Sockeye Salmon

PRELIMINARY FORECAST OF 1972 TOTAL RETURN:

Early (Black Lake) Run

Point Estimate = 341,000

Interval Estimate = 185,000 - 537,000

Late (Chignik Lake) Run

Point Estimate = 439,000

Interval Estimate = 384,000 - 530,000

FORECAST METHODS:

Early Run

The forecast for the early or Black Lake run is calculated as the number of sockeye returning to the system prior to July 1. Black Lake fish continue to enter Chignik River well into July, and generally, fish bound for Chignik Lake enter the system during the latter part of June. The assumption is made that the number of Black Lake fish entering after July 1 is approximately equal to the number of Chignik Lake fish entering prior to July 1.

The four major age groups in order of importance are those of age 1.3, 2.3, 1.2 and 2.2. Seven minor age classes are represented by such small numbers that they are not considered in the forecast. During the past ten years, .3 ocean fish have constituted about 85 percent of the total early run. The magnitude of their return has in past years been closely related to the number of .2 ocean fish returning in the year previous and this provides the basis for forecasting the return of .3 ocean fish.

Age data obtained from scale samples collected at Chignik from 1954 to present is used. A regression analysis of .2 ocean fish to .3 ocean fish the following year shows a 1973 return of only 273,000 .3 ocean fish. The ten-year average return of .2 ocean fish is 68,000. Assuming an average return of this age group, a return of approximately 341,000 fish can be expected prior to July 1.

Late Run

Forecasts for returns of sockeye to Chignik Lake based on the above methods have not been accurate. Until a more reliable technique is developed, average returns and the magnitude of parent spawning stocks will be used as a basis for determining the probable size of future returns. Average returns over the past ten years have been approximately 530,000 fish, ranging from 315,000 to 963,000. The parent year escapement in 1967 (the majority of Chignik Lake sockeye are five year-old fish) was 189,000. With a 15-year average spawner-return average of 1.84, possibly as few as 348,000 could be expected. These two estimates, 348,000 and 530,000 with the midpoint of 439,000 represent the approximate magnitude of return expected in 1973.

DISCUSSION OF 1973 FORECAST:

Early Run

The predicted return of 341,000 sockeye prior to July 1 would be very similar to the early run in 1972. Since this size of return would fall in the range of escapement requirements, 350,000 to 400,000, little if any fishing can be expected prior to July 1.

Late Run

The expected return of 439,000 sockeye would allow for a harvest of approximately 190,000 fish, however should the 1973 return fall at the lower end of probable range, namely 348,000, a catch of only 100,000 fish would be allowed.

Prepared by: Paul C. Pedersen
Area Management Biologist
Chignik Area

FORECAST AREA: Bristol Bay

SPECIES: Sockeye Salmon

PRELIMINARY FORECAST OF 1973 TOTAL RETURN:

Point Estimate = 6.2 million

FORECAST METHODS:

Most Bristol Bay sockeye salmon mature after four, five or six years. The forecasted run for 1973 will, therefore, be progeny of the spawning escapements of 1967, 1968 and 1969. Forecasts of Bristol Bay sockeye salmon returns are generally based on one or more of the following methods:

(1) Escapement-return relationships, based on past data, provide estimates of total return by system from parent year escapements. Returns to the Kvichak River, because of the distinct difference between peak and non-peak year escapement magnitudes, are forecasted from two sets of relationships, one for peak years, and another for non-peak years. Average age structures of past returns are applied to the total estimated return, and those fish expected in the forecasted year are added by system for a total forecasted return.

(2) On several systems, studies are conducted to evaluate production of the outmigrating fingerlings, called smolt, from each escapement. Past marine survival by smolt age class is applied to the smolt index of abundance to obtain an estimate of returning adults. Past ocean age structures are applied to the estimates of total smolt returning for forecasting numbers by ocean age returning in a forecast year.

(3) For all systems relationships have been developed between fish returning at a specific age in one year and fish from the same brood year of the same freshwater age returning in the following year. In cases where the relationship is reliable, the technique may be applied.

In any system modifications or combinations of the above may be applied. The choice of methods used depends on which data are available, and the tested or apparent consistency of each technique for the age class and system being forecasted.

For the 1973 forecast, data obtained on abundance and age composition of immature Bristol Bay sockeye present in Bering Sea and Gulf of Alaska rearing areas was also incorporated in the analysis. Fisheries Research Institute (University of Washington) and National Marine Fisheries Service vessels sampling ocean rearing areas detected abnormally high mortalities in sockeye which would be expected to return to Bristol Bay in 1973 after having spent two years in the ocean. This information was used, therefore, to adjust downward the forecast of 2-ocean fish expected to return if average mortalities had occurred in estuarine and/or ocean areas.

DISCUSSION OF 1973 FORECAST:

The 1973 forecast of 6.2 million sockeye is composed of 44 percent 2-ocean and 56 percent 3-ocean fish. While a larger return of 2-ocean fish had been expected on the basis of good escapement obtained in parent years, more recent data obtained on the abundance of this age class of fish in ocean rearing areas indicated extremely poor survival at some stage in their life cycle after migration from freshwater.

Escapement requirements for the various Bristol Bay systems total 4.7 million fish, leaving approximately 1.5 million available for harvest. By major fishing districts, expected harvest levels in descending order of magnitude are: Naknek/Kvichak - 674,000, Egegik - 509,000, Nushagak/Igushik - 271,000, Togiak - 39,000 and Ugashik - negligible. The fact that the forecasted return of 188,000 to the Ugashik system is less than minimum escapement requirements indicates that no fishing time would be expected in this district. Although small numbers of fish might be available for harvest in the other districts, fishing time will be extremely limited should the return materialize as forecast. In some districts the entire harvest projected for the 1973 season could be taken in only one or two fishing periods.

Prepared by: Robert Paulus
Fisheries Research Biologist
Anchorage

APPENDIX B. ANNUAL ALASKA COMMERCIAL SALMON HARVEST BY SPECIES AND STATISTICAL REGION, 1950-1972

APPENDIX TABLE B. ANNUAL ALASKA COMMERCIAL SALMON HARVEST BY SPECIES AND STATISTICAL REGION, 1950-1972.

Number of Fish in Thousands

Year	Statistical Region 1/	Species						No. of 48-lb. Cases in Thousands 2/
		King	Sockeye	Coho	Pink	Chum	Total	
1950	SOUTHEASTERN	379	552	1,652	9,424	4,779	16,786	1,199
	CENTRAL	137	5,947	762	11,978	2,515	21,339	1,465
	WESTERN	95	7,267	83	30	447	7,922	644
	Subtotal	611	13,766	2,497	21,432	7,741	46,047	3,308
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

APPENDIX TABLE B. ANNUAL ALASKA COMMERCIAL SALMON HARVEST BY SPECIES AND STATISTICAL REGION, 1950-1972 (cont.)

Year	Statistical Region 1/	Number of Fish in Thousands: Species						No. of 48-lb. Cases in Thousands 2/
		King	Sockeye	Coho	Pink	Chum	Total	
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
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

APPENDIX TABLE B. ANNUAL ALASKA COMMERCIAL SALMON HARVEST BY SPECIES AND STATISTICAL REGION, 1950-1972 (cont.)

Year	Statistical Region 1/	Number of Fish in Thousands: Species						No. of 48-lb. Cases in Thousands 2/
		King	Sockeye	Coho	Pink	Chum	Total	
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
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	SOUTHEASTERN	314	812	596	4,870	561	7,153	292
	CENTRAL	38	3,650	274	20,565	1,644	26,171	1,412
	WESTERN	287	6,931	263	332	770	8,583	519
	Subtotal	639	11,393	1,133	25,767	2,975	41,907	2,223
1970	SOUTHEASTERN	322	668	759	10,657	2,446	14,851	676
	CENTRAL	33	6,020	647	19,263	3,609	29,571	1,662
	WESTERN	291	20,946	121	1,228	1,445	24,031	1,227
	Subtotal	646	27,634	1,527	31,147	7,500	68,454	3,565

APPENDIX TABLE B. ANNUAL ALASKA COMMERCIAL SALMON HARVEST BY SPECIES AND STATISTICAL REGION, 1950-1972 (cont.)

		Number of Fish in Thousands						No. of 48 lb. Cases in
		Species						
Year	Statistical Region 1/	King	Sockeye	Coho	Pink	Chum	Total	Thousands 2/
1971	SOUTHEASTERN	334	623	914	9,345	1,946	13,162	687
	CENTRAL	45	3,611	487	14,133	4,317	22,593	1,425
	WESTERN	283	9,945	46	51	1,417	11,742	787
	Subtotal	662	14,179	1,447	23,529	7,680	47,497	2,899
1972 3/	SOUTHEASTERN	254	926	1,357	11,903	2,308	16,748	748
	CENTRAL	39	3,054	211	3,350	2,668	9,322	679
	WESTERN	218	2,644	58	124	1,377	4,421	299
	Subtotal	511	6,624	1,626	15,377	6,353	30,491	1,726

Data Sources i) Alaska Department of Fish and Game Statistical Leaflets thru No. 23

ii) Alaska Department of Fish and Game Statistics Section. 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.