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THE PACIFIC SALMON COMMISSION
JOINT COHO TECHNICAL COMMITTEE REPORT

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IMPACTS OF SWIFTSURE BANK CLOSURE AND INCIDENTAL COHO CATCH ESTIMATES FOR 1987 CANADIAN AREA 20 AND U.S. AREAS 7/7A

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Joint Coho Technical Committee
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Prepared for a Southern Panel Chairmen's Meeting, Seattle, June 4, 1987

INTRODUCTION

The Joint Coho Technical Committee convened on May 26–27, 1987 to address two primary subjects: (1) the impact of the closure of Swiftsure Bank; and (2) anticipated incidental catch of coho by net fisheries operating in Canadian Area 20 and U.S. Areas 7/7A. This report summarizes the results and conclusions of the Committee for reference and consideration at a Chairmen's meeting of the Southern Panel scheduled for June 4th.

C O N T E N T S

I. SWIFTSURE BANK CLOSURE

The primary effect of the Swiftsure Bank closure outlined in paragraph 3(b) of the new Coho Chapter is to reduce the impacts of releasing under–sized chinook and coho in the troll fishery. For coho, this problem is particularly severe in September when juvenile fish are recruited to the fishery. The problem for chinook occurs throughout the season. Small benefits to escapement are expected due to reduction of shaker mortality. A more direct benefit for maturing fish would occur if the catch quota is not reached since the Swiftsure Bank closure reduces the potential catch and the catch rates in Area 21 are typically higher than for the rest of the West Coast of Vancouver Island.

The closed area has been discussed with Canadian commercial fishing groups and will be very similar to that in place in 1986. It will include Management Units 21, 121–1 and the northeast half of Management Unit 121–2.

The closure may be removed in mid to late August for sockeye and from late August to early September for pink salmon if troll catches are below their respective quota levels and cannot be made up in Johnstone Strait. If the diversion rate through Johnstone Strait is low, Swiftsure might be opened for achieve Canadian domestic allocation objectives. Inseason mechanisms to track the troll catch of pink and sockeye would involve the use of "red lines" similar to those used for chinook and coho. These lines of expected weekly catch would be based on expected run size, timing and diversion rate for each species. In the event that Swiftsure is re–opened for sockeye or pink salmon, it will be closed again if the allocations are subsequently reached or if abundance of pink and/or sockeye diminishes to very low levels.

II. INCIDENTAL COHO CATCH BY 1987 AREA 20 AND AREAS 7-7A NET FISHERIES

SUMMARY

Estimation of Canadian Area 20 and U.S. Areas 7/7A anticipated incidental coho catch levels pursuant to the provisions of the Coho Annex has potential policy implications regarding the possibility of directed coho fisheries. Determinations on policy matters should be resolved at the Panel or Pacific Salmon Commission (PSC) levels. Therefore, the Committee has provided a range of incidental catch estimates accompanied by associated biological implications for consideration by policy decision–makers.

The incidental coho catch estimates for fisheries under the control of the Fraser Panel, given the currently projected fishing schedule, range from 107,600 to 371,700 (average 195,900) in Area 20 and from 37,400 to 99,100 in Areas 7/7A (average 55,300). Additional incidental catches during chum–directed fisheries in Areas 7/7A are estimated to range from 6,100 to 44,700 depending upon the magnitude of the chum harvest. Due to the number of critical factors that affect these estimates (e.g. rate of diversion, time of the fishery, stock abundance, and availability) and the vagueness of the technical assignment, the Committee is unable

to provide a more precise estimate of incidental coho catch for 1987 at this time.

The Committee emphasizes that preseason forecasts of incidental coho catch are highly uncertain due to a number of critical factors:

1. Incidental catches are highly dependent upon the timing of the fishery and the diversion rate of Fraser stocks through Johnstone Strait. The actual season for Fraser sockeye and pink is likely to differ substantially from the preseason fishing plan as estimates of stock size, run timing and diversion rates improve.

2. The incidental coho catch by Areas 7/7A chum fisheries is dependent upon the magnitude of the chum harvest, which in turn is conditional upon the size of the chum harvest in Canadian fisheries. The 1987 Canadian inside chum forecast is on the borderline between clockwork steps.

3. Catch per unit effort and effort are highly variable from year to year.

4. Quantitative preseason abundance forecasts for Canadian coho stocks are not available.

5. The proportions of Georgia Strait and Puget Sound coho stocks that remain inside are variable.

DISCUSSION OF FACTORS AFFECTING THE ACCURACY OF FORECASTS FOR INCIDENTAL COHO CATCH DURING FRASER SOCKEYE AND PINK FISHERIES

The uncertainty inherent in several factors that affect the incidental coho catch results in large variability associated with preseason estimates of incidental catch levels. These factors include forecasts of run size, run timing and diversion rate through Johnstone Strait for both sockeye and pink salmon. Actual fishing periods are based upon an assessment of inseason data.

Run Size:

Run size forecasts for Fraser pinks are based on estimates of the number of migrating fry and predictions of fry to adult survival. Fry survival estimates are based on discharge from several rivers on the west coast of the Olympic Peninsula, or ocean surface salinities from several sites off the West Coast of Vancouver Island. Forecasting ocean survival is an uncertain science, and substantial deviations from the predicted values occur. For 1987, the pink fishery plan is based on a forecast of 11 million, but a run of anywhere from 5 to 20 million is entirely possible. With an escapement goal of 6 million, runs of much below 8 million will result in severe restrictions to fisheries and reductions in coho incidental catch in Area 20 and Areas 7/7A. A larger pink run will result in substantial increases in both fishing time and incidental coho catch.

Compared to pink, sockeye run size forecasts have been more accurate. However, the forecasts have generally under estimated the actual run size. This conservative tendency can result in increased fishing time later in the season from that planned preseason if other factors, such as daily fishing effort and diversion rate, do not change.

Diversion Rate:

The rate of diversion through Johnstone Strait for sockeye and pink can vary within a wide range. Although the rate has been as high as 80%, the long–term average on the 1987 cycle is 27% and 30% for sockeye and pink, respectively. The 1987 preseason fishing plan for Fraser sockeye and pink is based on these averages.

Effort is related to diversion rate. The effect of a higher diversion rate is fewer days of fishing in Area 20 and a lower coho catch, and more fishing in Areas 7/7A with a larger coho catch. The opposite is true for a lower diversion rate. As an example, a diversion rate as high as was experienced in 1983 would likely result in no fishing in Area 20 and a seven day per week fishery in Areas 7/7A. This obviously would have a dramatic effect on coho catch, from zero in Area 20 to quite high in Areas 7/7A.

Run Timing:

Run timing of Fraser sockeye and pink is fairly consistent and forecasts of run timing are reasonably accurate (although a run timing forecast is not prepared until just prior to Panel control). While runs are rarely more than a week early or late, shifts of a week can dramatically affect the incidental catch of coho in Area 20 and Areas 7/7A. In general, fisheries are simply advanced or delayed to compensate for changes in run timing. Because coho abundance is increasing rapidly during September, especially in Areas 7/7A, the incidental catch of coho is particularly sensitive to changes in pink run timing.

QUANTITATIVE ESTIMATES OF ANTICIPATED INCIDENTAL CATCH

The estimation of anticipated incidental catch implicitly refers to the time when the estimate is made. At the time of the Annex negotiations this spring, U.S. representatives anticipated that the incidental coho catch for net fisheries conducted in Canadian Area 20 and U.S. Areas 7/7A would be 237,000 and 165,000, respectively, based upon recent year averages (Fraser sockeye and pink fishery: 1979, 1981, and 1985; 1983 was omitted due to El Nino effects. Area 7/7A Chum fishery: 1978, 1980, 1982, 1985, 1986; years in which directed chum fisheries occurred).

Since that time, additional information concerning the abundance of Fraser sockeye and pink and a preliminary fishing season structure has become available. Although the Fraser Panel has not approved the preliminary season structure, these data have been employed to refine estimates of incidental coho catch during fisheries under the control of the Fraser Panel.

The incidental catch during Fraser sockeye and pink fisheries was estimated as the product of three components: weekly catch per landing by gear type, weekly landings per day opened by gear type (Catch per Unit Effort or CPUE), and season. Catch per landing was directly from historical data (where catch per effort data were not available, the 1980– 86 average was employed). For Area 20, landings per day opened were estimated as the 1982, 1985 and 1986 average, the same base used for preliminary planning for the Fraser sockeye and pink fishery. For Areas 7/7A, landings per day opened was the 1985–6 average for the nontreaty fishery and 1986 for the treaty fishery. The season structure was derived from the PSC's South Coast Model for sockeye and pink management. Since data concerning the diversion rate through Johnstone Strait are not yet available, long–term averages of 27% for sockeye and 30% for pink were assumed. Results are summarized in Table 1.

The variability apparent in the historic data on incidental catch during sockeye and pink fisheries conducted in Area 20 and Areas 7/7A makes any point estimate highly uncertain. Consequently, the 1987 projected sockeye and pink season was applied to observed weekly CPUE's for each of the years 1980 to 1986 to provide an indication of the variability that might be expected due solely to differences in coho CPUE. For Area 20, the incidental coho catch level ranged from 107,600 to 371,100 and averaged 195,900. For Areas 7/7A, the incidental catch level ranged from 37,400 to 99,100 and averaged 55,300. The high variability in these estimates illustrates the effect of only one source of uncertainty associated with preliminary forecasts of incidental catch during Fraser sockeye and pink fisheries.

Two other sources of uncertainty stem from variable run timing of Fraser sockeye and pink and from the length of season. It is not unusual for sockeye and pink fisheries to change substantially from preseason expectations due to uncertainties in run strength, migration timing, and diversion rates. Comparative estimates are provided in Table 2 to illustrate the large potential impact of early and late run timing scenarios (one week shift) for the target species and of additional fishing time in week 37 (the week immediately following the end of the season under the preliminary fishing plan for sockeye and pink).

Figure 1 illustrates the impacts of sockeye and pink run timing differences on incidental coho catch levels for Area 20. Expected incidental coho catch for Area 20 varied from a low of 68,100 for an early run timing and 1984 coho CPUE scenario to a high of 541,500 for an early timing and 1980 CPUE scenario. With average CPUE, the incidental catch levels under these run timing scenarios did not vary appreciably, ranging from 182,800 to 243,400.

For Areas 7/7A, variability in expected incidental catch under different sockeye and pink run timing scenarios was slightly greater than for Area 20 (Figure 2). The greatest variability was associated with the 1982 coho CPUE scenario, with incidental catch estimates ranging from 19,200 under early timing to 235,000 under late timing. These estimates are 50% and over 600% of the corresponding expectation under the current fishing plan. Unlike Area 20, the average CPUE scenarios varied widely, ranging from 37,400 to 125,600.

Incidental catch estimates derived through this procedure are extremely

sensitive to the number of fishing days that are permitted in September. Preliminary plans indicate that 1987 sockeye and pink directed fisheries are expected to be completed by September 5th. This early date would substantially reduce the incidental coho catch from levels experienced in recent years, particularly for Areas 7/7A. Coho catch per landing in Areas 7/7A has increased at least ten fold from late August to mid-September (three fold for Area 20). Figures 3 and 4 illustrate the incidental coho catches resulting from the provision of additional fishing time in week 37 (the week following the currently projected end of the sockeye and pink fishery) for Area 20 and Areas 7/7A, respectively.

For Area 20, the addition of one day's fishing in week 37 would have increased the incidental coho catch from current estimates by from 16,900 to 87,400; the percentage change ranged from 7% to 44%. For Areas 7/7A, the addition of one day's fishing in week 37 for the nontreaty fleet and two days for the treaty fleet would have increased the incidental coho catch by from 10,400 to 162,500; the percentage change from estimates under the currently projected season ranged from 28% to 434%.

INCIDENTAL CATCH DURING CHUM FISHERIES

The last component in the estimation of incidental coho catch by net fisheries in Area 20 and Areas 7/7A involves the chum fishery. There is typically no Area 20 chum fishery. The chum fishery in Areas 7/7A is conditioned by the results of Canadian fisheries which are conducted pursuant to the "clockwork" management plan. Estimates of incidental coho catch expected under the chum management steps established for Areas 7/7A are provided below. The chum run size could be based on either a preseason forecast or an inseason update.

Chum Catch	20,000	120,000	140,000
Estimated Incidental Coho Catch	6,100	38,300	44,700

These estimates are based on several assumptions concerning the structure of the chum fishery and may require revision when final fishing plans are established. As with the sockeye and pink fisheries, the timing of the chum fishery can have a dramatic effect on the incidental coho catch. Alternative scenarios were not developed for the anticipated incidental coho catch during the chum fisheries. Further analyses could be completed at the request of the Southern Panel or the Commission.

CONSERVATION CONCERNS

Fisheries that may be conducted under the language of paragraph 3(d) of the Coho Annex pertaining to anticipated incidental coho catches in 1987 Canadian Area 20 and U.S. Areas 7/7A fisheries could, when combined with impacts of all other planned fisheries, produce total impacts that are inconsistent with the conservation

status of stocks of concern. This language appears to guarantee a minimum coho catch level for these fisheries. If the actual incidental catch is below anticipated levels because of lower–than–expected stock abundance, then directed fisheries in these areas might be initiated even though escapements of depressed stocks would be decreased. Conversely, if incidental catch levels are exceeded because of higher–than–expected abundance, directed coho fisheries would be precluded when stocks may be better able to withstand additional fishing pressure. However, currently available data indicate that coho catches during Fraser sockeye and pink management are not well correlated with selected coho abundance indices for Fraser and Puget Sound stocks.

OPTIONS

1. **Independent Implementation:**

   The language of the Coho Annex is unclear as to whether the task of establishing the anticipated levels of incidental catch for the Areas 7/7A and Area 20 fisheries is the responsibility of the PSC or the Parties. Preseason forecasts of the incidental catch could be made by each Party for its own fisheries and implemented, with a review at the end of the season by the PSC to determine if the intent of this arrangement was met. The problem with this approach is that a post–season conflict could arise if the Parties have different views on the intent and method of implementation of this arrangement.

2. **Estimate Incidental Catch Inseason:**

   A method of reducing the error in estimating incidental coho catch levels in the Areas 7/7A and Area 20 fisheries is to project the catch inseason. Accuracy should be greater than for preseason methods because at least four sources of inseason information would be available:

   a. The sockeye and pink fishing plan would be finalized.

   b. More information would be available concerning the results of Canadian chum fisheries under the "clockwork" plan.

   c. Effort to date in Areas 7/7A and Area 20 fisheries and knowledge of scheduled coincidental openings in other fisheries would be available for estimating effort in the coming week.

   d. Coho CPUE to date in Areas 7/7A and Area 20 fisheries would be known.

   e. Inseason indicators of coho abundance would be available from troll, sport and PSC test fisheries.

   Incidental coho catch would be estimated during the week prior to the opening with weekly deviations accumulated through the season. Both effort and CPUE would be estimated from current inseason information. Effort would be

projected on the basis of effort profiles observed in previous years, but would include observed effort to date and planned openings in other fisheries. Coho CPUE would be projected from past CPUE profiles, modified on the basis of observed CPUE to date and available inseason coho abundance indicators. Should this inseason approach be adopted in 1987, a summer meeting of the Coho Technical Committee would be necessary to refine analytic methodologies.

A variation of this option would involve modification of a preseason forecast based upon data collected inseason.

3. **Adopt Jointly Agreed Preseason Estimates of Incidental Catch:**

The third option is to adopt preseason estimates of incidental catch and use them as the basis for management intent. There are several types of estimates that could be employed, each with their own biological and policy implications. Three types of estimates are provided for purposes of discussion:

Type of Estimate	Objective	Properties
Low	Protect Stocks of conservation concern	Little prospect for directed coho fisheries Maximum protection within these fisheries for stocks of conservation concern
Average	Provide a mid-point estimate	Increased chance of directed coho fishery Increased chance of greater impacts on stocks of conservation concern
High	Provide a minimum basis for planning the conduct of subsequent fisheries on stocks of conservation concern	Highest probability for directed coho fishery Increased risk to stocks of conservation concern due to larger magnitude of potential directed coho fishery

Table 1. Preliminary Estimates of Incidental Coho Catch During 1987 Commercial Fisheries For Fraser Sockeye and Pink Salmon in Canadian Area 20 and US Areas 7/7A. Based on Observed Catch Per Effort and 1987 Expectations for Effort and Season Structure for Fraser Sockeye and Pink Fisheries.

	Based On Observed Catch Per Effort in Year							RANGE		
	1980	1981	1982	1983	1984	1985	1986	AVG	LOW	HIGH
Diversion Rate Sockeye	70%	67%	22%	80%	31%	33%	22%			
Pink		33%		66%		33%				
AREA 20 a/			(Thousand Coho)							
Gill Net	53.3	30.7	45.9	20.4	20.4	24.2	21.9	31.0	20.4	53.3
Purse Seine	318.4	240.9	124.4	174.5	92.3	83.4	120.5	164.9	83.4	318.4
	371.7	271.6	170.3	194.9	112.7	107.6	142.4	195.9	103.8	371.7
								103.3 STD DEV		
OBSERVED CATCH b/			(Thousand Fish)							
Coho	56.5	283.3	54.6	15.4	75.1	233.0	217.9			
Sockeye	104.8	318.5	1,580.4	3.0	574.2	2,732.5	2,030.0			
Pink	0.2	2,785.9	12.9	58.2	3.4	2,134.9	NA			
AREA 7/7A			(Thousand Coho)							
Treaty Gill Net	21.2	18.1	14.7	13.0	9.2	43.2	19.1	19.8	9.2	43.2
Treaty Reef Net	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Treaty Purse Seine	20.1	3.5	2.9	8.2	14.3	25.3	10.2	12.1	2.9	25.3
Nontreaty Gill Net	13.0	6.7	10.0	5.4	9.8	14.0	5.0	8.9	5.0	13.0
Nontreaty Reef Net	0.5	0.1	0.2	0.1	0.2	0.5	0.1	0.2	0.1	0.5
Nontreaty Purse Seine	23.1	7.1	7.5	8.9	15.3	15.0	8.5	12.2	7.1	23.1
Test Fishery	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
	80.0	37.6	37.4	37.7	49.9	99.1	45.0	55.3	26.4	107.2
								26.5 STD DEV		
OBSERVED CATCH b/			(Thousand Fish)							
Coho	31.6	160.5	101.2	60.5	24.2	115.4	57.5			
Sockeye	430.2	1,225.2	2,755.1	337.4	1,498.0	2,818.2	2,593.9			
Pink	0.2	3,664.3	0.0	1,743.9	0.0	3,697.0	0.1			

a/ For purposes of this analysis, the catch by troll fisheries during periods of net fishery openings was not included as an "incidental" catch.

b/ During Fraser sockeye and pink management periods only.

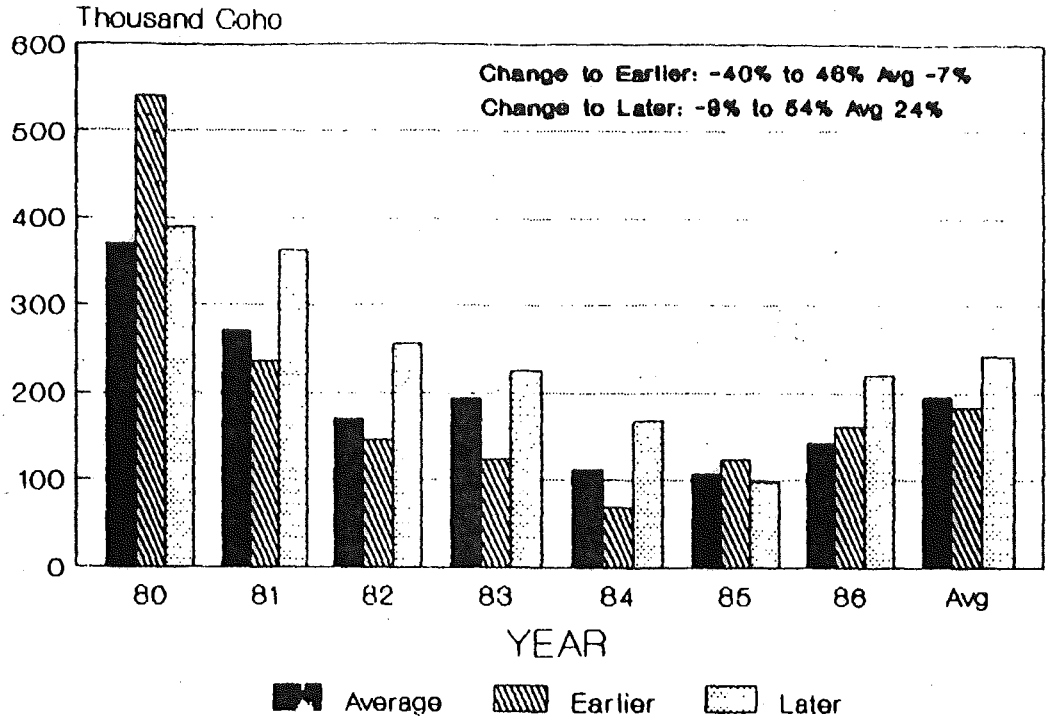
Table 2. Effects on Incidental Coho Catch of Altering Season Structure From Preliminary Expectations For Sockeye and Pink Fisheries (Thousand Coho).

	Base Year Used For Incidental Catch Estimate.....							
	1980	1981	1982	1983	1984	1985	1986	AVG
AREA 20								
Current Plan	371.7	271.6	170.3	195.0	112.7	107.6	142.5	195.9
% of Average	190%	139%	87%	100%	58%	55%	73%	
One Week Earlier	541.5	237.0	146.3	124.6	68.1	124.4	162.9	182.9
% of Average	296%	130%	80%	68%	37%	68%	89%	
Change From Current	169.8	-34.6	-24.0	-70.4	-44.6	16.8	20.4	-13.1
% Change From Current	46%	-13%	-14%	-36%	-40%	16%	14%	-7%
One Week Later	389.6	363.4	256.3	225.2	167.8	98.3	220.1	243.4
% of Average	160%	149%	105%	93%	69%	40%	90%	
Change From Current	17.9	91.8	86.0	30.2	55.1	-9.3	77.6	47.5
% Change From Current	5%	34%	50%	15%	49%	-9%	54%	24%
Additional Time a/	397.9	359.0	244.7	244.1	161.8	124.5	191.5	245.0
% of Average	162%	147%	100%	100%	66%	51%	78%	
Change From Current	26.2	87.4	74.4	49.1	49.1	16.9	49.0	49.1
% Change From Current	7%	32%	44%	25%	44%	16%	34%	25%
AREAS 7/7A								
Current Plan	80.1	37.7	37.4	37.7	59.0	99.1	45.0	55.3
% of Average	145%	69%	68%	68%	90%	179%	81%	
One Week Earlier	36.5	23.6	19.2	39.9	41.5	46.7	34.6	37.4
% of Average	151%	63%	51%	107%	111%	125%	93%	
Change From Current	-23.6	-14.1	-18.2	2.2	-8.5	-52.4	-10.4	-17.9
% Change From Current	-29%	-37%	-49%	6%	-17%	-53%	-23%	-32%
One Week Later	137.1	64.0	235.0	38.8	115.8	173.3	115.4	125.6
% of Average	109%	51%	187%	31%	92%	138%	92%	
Change From Current	57.0	26.3	197.6	1.1	65.3	74.2	70.4	70.3
% Change From Current	71%	70%	528%	3%	132%	75%	156%	127%
Additional Time b/	138.8	61.7	199.9	48.1	114.3	164.9	109.3	119.6
% of Average	116%	52%	167%	40%	96%	138%	91%	
Change From Current	58.7	24.0	162.5	10.4	64.3	65.8	64.3	64.3
% Change From Current	73%	64%	434%	28%	129%	66%	143%	116%

a/ One day of fishing in Area 20 during week 37.

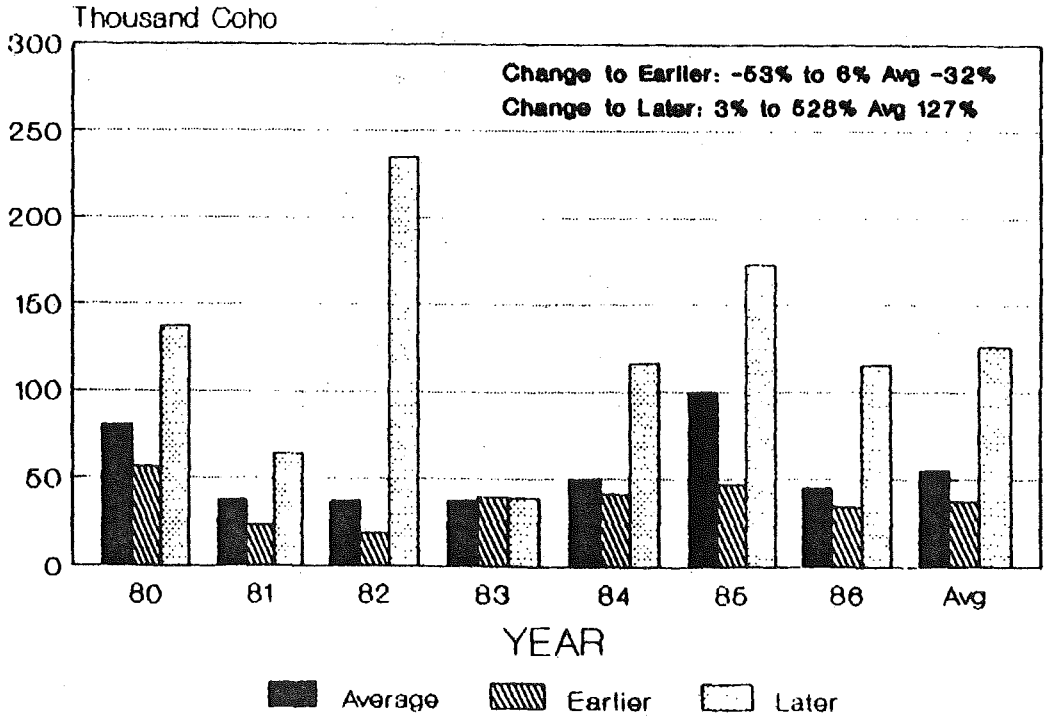
b/ One day of fishing in Areas 7/7A for nontreaty fisheries and two days for treaty fisheries.

Figure 1. Effect of Target Species Run Timing on Incidental Coho Catch in Area 20



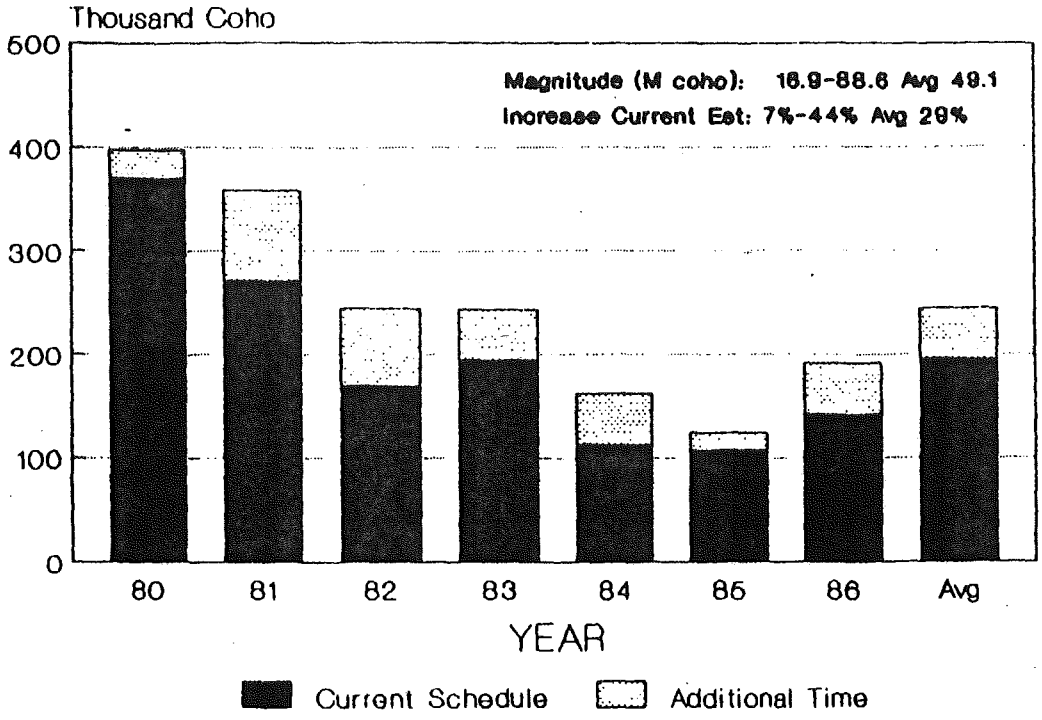
Fraser Panel Fisheries Only (1980-1986)

Figure 2. Effect of Target Species Run Timing on Incidental Coho Catch in Areas 7/7A



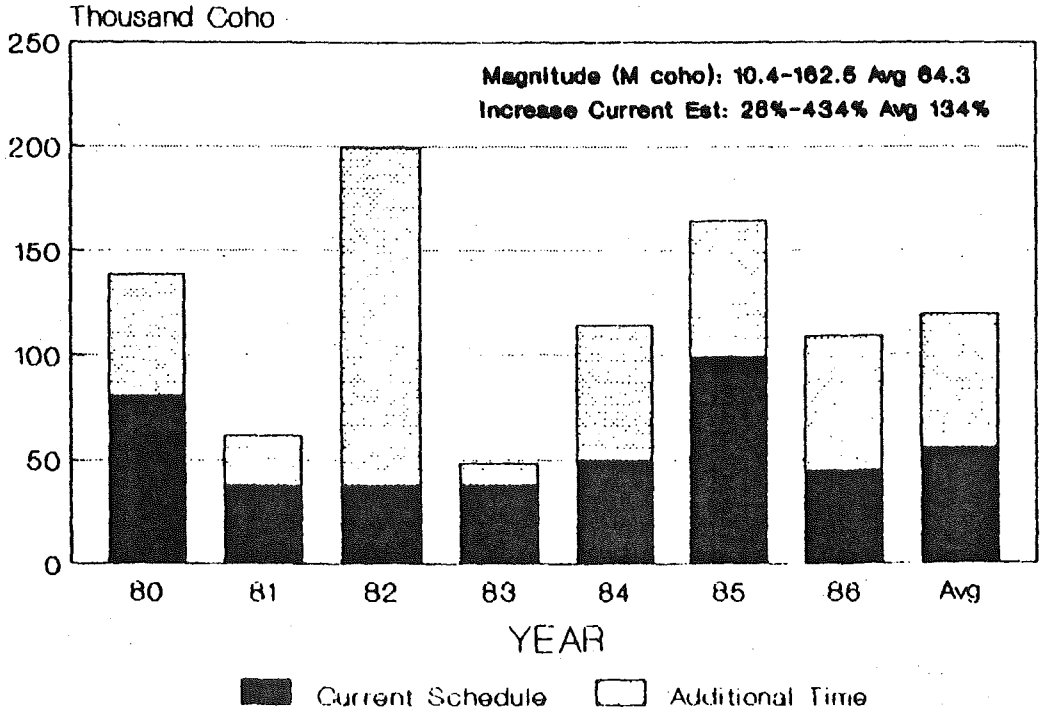
Fraser Panel Fisheries Only (1980-1986)

Figure 3. **Effect of More Target Fishing Time on Incidental Coho Catch in Area 20**



Fraser Panel Fisheries Only (1980-1986)

Figure 4. **Effect of More Target Fishing Time on Incidental Coho Catch in Areas 7/7A**



Fraser Panel Fisheries Only (1980-1986)