APPENDIX 1

REPORT TCCHINOOK (88) - 2

Assessment of Escapements Through 1987
A report of the Rebuilding Assessment Work Group *
of the Chinook Technical Committee

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REVIEW OF THE PACIFIC SALMON TREATY'S CHINOOK REBUILDING PROGRAM

The Pacific Salmon Treaty (PST) established a system of fishery specific catch and harvest rate restrictions intended to:

> "halt the decline in spawning escapements of depressed stocks; and attain by 1998, escapement goals established in order to restore production of naturally spawning chinook stocks, as represented by indicator stocks identified by the Parties, based on a rebuilding program begun in 1984".

The goal of the program, therefore, is to increase production through progressive increases in spawning escapements achieved by a combination of catch ceilings in selected mixed-stock fisheries and harvest rate restrictions in non-ceilinged, pass-through fisheries.

The Treaty instructed the Chinook Technical Committee (CTC) to "develop procedures to evaluate progress in the rebuilding of naturally spawning chinook stocks". The February 1987 Chinook Technical report "Assessing Progress Toward Rebuilding Depressed Chinook Stocks" established an evaluation framework which documented an indicator stock program, identified information requirements, and recommended analytical procedures for the assessment of rebuilding. The CTC also identified a number of policy issues (e.g. appropriate stock aggregates; proportion of the stocks rebuilding, etc.) which must be resolved before final conclusions can be reached regarding the status of rebuilding on a regional or coastwide basis. Decisions on those issues remain outstanding.

In assessing the status of individual stocks under the rebuilding program, the CTC identified three main elements for examination: (1) spawning escapement trends and levels; (2) fishery and stock-specific exploitation rates; and (3) production responses to increases in spawning escapements. The Committee recommended that rebuilding assessment be separated into three phases corresponding with the three, approximately 5-year chinook life-cycles in the rebuilding period: 1984-88; 1989-93; and 1994-98. The Committee also felt that a three phase approach to assessment would address the problems of changing data availability and quality over time. This report provides a preliminary evaluation of escapements during the first phase of the rebuilding program incorporating data through 1987.

SUMMARY OF ESCAPEMENT ASSESSMENT IN PHASE I

Evaluation in Phase I focuses on trends in spawning escapements, fishery exploitation rates and stock-specific exploitation rates relative to interim expectations. Information regarding the productivity resulting from increased escapements is not expected to play a major role in the evaluation of Phase I.

Adequate exploitation rate and escapement information is not available for all naturally spawning chinook stocks of concern to the Pacific Salmon Commission (PSC). Stocks for which escapement information is considered reliable enough to allow assessment are referred to as "escapement indicator" stocks. These stocks vary widely in their run sizes, with escapement goals ranging from only a couple of hundred to over 200,000. The assessment of the escapement to these indicator stocks is presented in Appendix I.

The assessment of rebuilding also includes the assessment of ocean fisheries by the "exploitation rate analysis". Exploitation rate indicator stocks serve as data sources for that analysis. That set of stocks is not the same as those used in the escapement analysis, though there may be some overlap. The exploitation rate analysis is described in detail in Appendix II.

The set of escapement indicator stocks is not completely represented in the PSC chinook model. In those cases where an escapement indicator stock is represented in the Chinook Model, it is possible to construct a hypothetical rebuilding schedule of escapements for comparison with actual data. For other stocks, linear rebuilding schedules can be used as a first approximation.

In Phase I, it is expected that changes in spawning escapements of some stocks will be difficult to detect, given the small magnitude of the expected response in relation to annual variability and sampling uncertainty. However, major changes in spawning escapements should be detectable. As more information on stock productivity becomes available, some adjustments to the interim escapement goals should be expected.

METHODS

Escapement Indicator Stocks

Information about escapement indicator stocks is usually in the form of annual measures of spawner abundance, or abundance of the population in the most terminal area of their migration. Our assessment begins with (43) indicator stocks. The distribution of these by run type and area of origin is:

Area	Spring	Spring/ Summer	Summer	Summer/ Fall	Fall	Total
S.E. Alaska	5					5
Transboundary	6					6
Northern B.C.		4	3			7
Southern B.C.		3		1	3	7
WA/OR	3	2	2	3	8	18
Total	14	9	5	4	11	43

Most indicator stocks have escapement goals below 15,000 adults but some range above 200,000 (Figure 1). The selection of stocks for inclusion as an escapement indicator is essentially a matter of information availability. Most stocks which are managed for natural production are included if escapement information is consistently available since 1975. Most indicator stocks represent individual stocks of a particular run type, (i.e. spring, summer, or fall), originating from a single river system. However, some indicator stocks represent an aggregate of geographically close stocks of a particular run type (e.g. some Canadian stocks).

Availability of escapement information depends on several factors, including: 1) physical logistics of escapement enumeration; 2) management importance of the stock, which itself is determined by many factors including relative abundance and fishery contribution; and 3) budgetary constraints of the agencies providing data. Factors affecting availability of escapement information have changed over time, so the length of the data time series is variable between stocks. In addition, the methodology and thus the comparability varies over time and between management agencies, further complicating the use of the data in the assessment of escapements.

The effectiveness of indicator stocks in representing other stocks will depend upon the degree of similarity between indicator and the associated stocks over a variety of characteristics. These characteristics include run type (e.g., spring, summer or fall), geographic area, temporal or spatial migratory distribution, harvest pattern, age at maturity and productivity rates.

Escapement Data Escapement data and run-type classification used for assessment of rebuilding progress were collected and provided by management agencies in the various jurisdictions. The escapement used by the CTC for most stocks was the spawning escapement, with the exception of dam counts (which are measured after the major fisheries) used for escapement of the upper Columbia River spring, summer, and fall bright stocks. We point out that the use of escapement defined in this manner, as opposed to alternative definitions such as ocean escapement or river run size, presents some interpretation problems in this analysis. In some terminal areas, significant fishery harvest or conservation closures may occur on stocks. Consequently, effects of PSC actions on these stocks may be masked. Use of terminal run size or ocean escapement may be employed in future analysis to help assess specific impacts of PSC conservation measures. Some terminal run size information is presented graphically in the Basic Data section of this appendix. Both Canadian and U.S. estimates of escapements to Transboundary rivers are presented when those estimates are different.

Natural chinook escapements are enumerated by a number of methods including weirs or counting fences, aerial or foot surveys, counting gates at dams, and sonar or electronic

counters. Methods used depend on river system characteristics and funding availability. Accuracy of escapement counts vary considerably between estimation methods; however, escapement data provided by management agencies are considered to be the best scientific information currently available. Quality of natural chinook escapement information is expected to improve as a result of increased attention being focused on natural chinook stock management.

As with other salmon species, escapements of naturally spawning chinook salmon typically exhibit considerable year to year variation. Primary factors contributing to this variability include differences in brood year spawning escapements, fluctuating freshwater and marine survival rates, and variable fisheries harvest rates. Some variability also results from counting or estimation errors. Variability from all causes should be taken into account in evaluating changes in escapement and progress toward escapement goals.

Escapement Goals Current escapement goals for natural chinook indicator stocks have been developed independently by the respective management agencies. In some cases, the goals represent best estimates of optimum escapement levels based on analysis of available stock productivity or habitat data. In other cases, where little direct information on stock productivity is available, escapement goals represent interim management goals developed from general considerations of stock sizes, history of escapement, freshwater spawning and rearing environments, and average chinook stock productivity. In the case of some Canadian chinook stocks, for which very limited stock productivity information is available, current escapements are only interim targets based on a doubling of base period averages. Both Canadian and U.S. escapement goals for Transboundary rivers are presented when these goals are different. Management agencies have established escapement goals for most escapement indicator stocks, but in several Washington coastal stocks "floor" levels of escapement are specified. These stocks are managed on the basis of a fixed harvest rate in terminal areas, so long as terminal runs exceed the escapement floor.

Improvement is expected in future determination of appropriate escapement goals. The PSC can expect goal changes in later phases of the rebuilding program as new information on stock productivity and optimum escapement levels become available.

Analytical Framework

The first question we addressed was: "Have our indicator stocks shown increasing escapements since the start of Treaty management?". The second question was: "Are the escapements showing a consistent trend towards their escapement goal by 1998?". We also considered whether stocks aggregated by certain characteristics were responding in similar ways. Transboundary stocks with different U.S. and Canadian escapement estimates and goals were included in analyses when the results were the same

for both sources of estimates. When results were different, the stock was excluded from the analysis.

The Committee considered whether escapements observed since implementation of conservation actions differed from those observed prior to these actions. When comparisons are made between escapements occurring before and after conservation measures were taken, two different "break" periods must be considered. For Southeast Alaska (SEAK) and Transboundary (TBR) stocks, conservation actions began in 1981. Therefore, the base period for SEAK and TBR stocks includes 1975-80, and the conservation (treaty) period includes 1981-87. For all other stocks, conservation measures were fully implemented in 1985. Consequently for these stocks, the base period includes 1979-82 and the conservation (Treaty) period includes 1985-87. For the Harrison River stock (Fraser River), escapement information was gathered only since 1984; this single year has been used as the reference year when appropriate. Both the terms "base period" and "pre-Treaty" will be used to denote years prior to conservation action and "Treaty" will be used to refer to years since conservation action.

Three levels of analysis were conducted. First, simple tabular and graphical data summaries of reported escapements were presented. Second, statistical comparisons of average escapement levels between time periods were conducted. And third, trend analysis was conducted as an alternative view of escapement changes across periods. For the statistical tests, a 10% chance of error (i.e. a one in ten chance of concluding a significant difference exists when in fact one does not) was chosen.

Tabular and Graphical Data Summary The information compiled for this analysis is provided in Supplement A of this Appendix. On these graphs are the stated escapement goals which serve as the current targets for the completion of rebuilding by 1998. A straight line at the base period average escapement level was connected from the end of the base period to the goal at 1998. This straight line was used as an aid in observing the rate of rebuilding progress and can provide a useful, working approximation provided that differences between linear and the expected PST schedule are recognized.

Increases in chinook escapement were expected to proceed slowly during Phase I of the 15-year rebuilding period and accelerate during Phase II and III. Both linear and expected rebuilding schedules are depicted in the hypothetical escapement response curve in Figure 2 (after Fig. 1 of the Feb. 1987 CTC Rebuilding Assessment Report, depicting a depressed chinook stock with average productivity). Lack of stock specific information makes it impossible to accurately derive expected response curves for each indicator stock. The expected schedule for individual stocks could be more or less than the linear rebuilding response, depending on the status of the stock at the beginning of the rebuilding schedule and a variety of other stock specific characteristics. Differences between the two schedules are

greatest near the middle of the rebuilding period, with the two forms converging at the beginning and end of the period.

Comparison of Means The question investigated is whether the mean escapement in the Treaty period is statistically greater than the pre-Treaty period escapements. The change in mean escapement between pre-Treaty and Treaty time periods can be expressed in terms of the numbers of fish and percent change relative to the base. The Committee acknowledges that several statistical concerns may influence the interpretation of these significance tests, but presents them as a preliminary assessment. This analysis does at least compare changes in average escapements against the between year variability. The data were log-transformed to normalize the escapement observations. A Student's t-Test that accounts for unequal sample sizes and variances was applied. While in most cases variances between escapements within time periods were not significantly different, the more conservative method of unequal variances was chosen for consistency. Test statistics were compared to the absolute 2-tail distribution values from the statistical tables.

Trend Analysis Comparisons of means do not account for time trends in escapements. Several types of analyses were conducted to investigate potential trends in spawning escapements. Standard linear regressions were calculated for the pre-Treaty and Treaty management periods. During the Treaty management period, more stocks should demonstrate non-negative slopes (i.e. stable or increasing escapements) than during pre-Treaty periods. The number of stocks within periods with positive and negative slopes of the regression lines was tested for statistical significance using the Wilcoxon Signed Rank test.

Escapements during the treaty periods are compared with the linear rebuilding schedule for 36 indicator stocks that have established escapement goals (6 stocks do not have escapement goals). The Stikine River is omitted from this analysis because of conflicting trends between the US and Canadian escapement estimates.

Evaluation of Rebuilding Each evaluation method has its strengths and weaknesses. A combination of these methods is most appropriate for evaluating whether a stock or group of stocks is on or off the rebuilding schedules.

The Chinook Technical Committee used the following criteria to determine which stocks were rebuilding through 1987. A particular indicator stock is considered to be definitely rebuilding if it meets all three criteria and probably rebuilding if it meets two of the three criteria. If a stock met only one criterion we cannot conclude if it is, or is not rebuilding.

1. An increase in mean escapement occurred between pre-Treaty and Treaty time periods. (For purposes of this analysis, the pre-Treaty time period is considered to be 1979-82, except for

Southeast Alaska and Transboundary stocks for which the pre-Treaty period is 1975-80.)

2. Escapement during the three Treaty years (1985-1987) are on or above a linear rebuilding schedule projected from the average pre-Treaty escapement to the escapement goal in 1998.

3. A positive slope of escapements exists from 1984 to 1987, or from 1980 to 1987 for Southeast Alaska and Transboundary stocks.

The following criteria were used to determine which stocks were not rebuilding through 1987. A particular indicator stock is considered to be definitely not rebuilding if it meets all three of the following criteria. A stock is considered probably not rebuilding if it meets two of the three criteria. A stock meeting only one criterion could not be classified.

1. A decrease occurred in mean escapements between pre-Treaty and Treaty time periods.

2. Escapements during the three Treaty years (1985-1987) fell below the linear trend from base period to escapement goal.

3. A negative slope of escapements occurred from 1984 to 1987, or from 1980 to 1987 for Southeast Alaska and Transboundary stocks.

Analysis of Stock Aggregations Statistical comparisons were also conducted on aggregates of stocks based on stock size and run type. Stock size was represented by a stock's escapement goal and the effect of stock size was evaluated on the basis of percentage change in spawning escapement relative to the base period. Run type was aggregated into five groups: spring, spring/summer, summer, summer/fall, and fall timing of spawning migrations. The Kruskal-Wallis test, a robust nonparametric statistic, was used to compare changes between categories. This test statistic is only affected by the overall rank of the values used, not the absolute magnitude. The indicator stocks were ranked by their percentage change of escapements from their base period escapement. The stock with the largest percentage change was given the highest rank value (i.e., 43, which is the number of indicator stocks); the second largest change was assigned a value of 42, and so on. Groups of stocks were compared by averaging their rank values within groups. Differences between run types were also compared based on the rebuilding assessment of each stock. The Kruskal-Wallis test was used for this comparison also, by assigning a rank score of 5 to a Rebuilt stock and a rank of 1 to a stock Not Rebuilding. An assessment of aggregations by region of origin was explored but not undertaken since run type is confounded with region of origin and the data were too limited in some areas.

Interpretive Cautions

1. The procedures employed by the Committee are based upon data provided by reporting agencies. These data can be affected by changes in methodologies and the attention devoted to stock assessment activities. Therefore, the data may not be consistent between years.

2. Escapement can be affected by combinations of numerous factors, such as variation in natural production, hatchery production and straying, survival rates, ocean exploitation rates and terminal area management. The tests used measure the combined effects of all management actions (plus other uncontrollable factors like natural survival rates) not just PSC harvest ceiling impacts.

3. Escapements over a sequence of years may not be statistically independent, thereby affecting statistical comparisons between time periods.

4. Potential problems with the linear regressions stem from the small number of years available for calculating the Treaty period regression equations. With small sample sizes, there is a higher risk that an aberrant year could substantially influence the trend line.

5. Run-type classifications used in these analyses, as specified by each management agency, are not totally consistent in the dates when the different run-types start and stop. The subjective definition of run-type may influence comparisons between the run-types but are not likely to significantly influence our assessment. In future assessments we will attempt to standardize definitions of run-type.

RESULTS

Results presented for the following analyses may report conclusions for different numbers of stocks. Differences are due to three factors: (a) the exclusion of data for Transboundary stocks where application of relevant criteria yields different results depending on whether Canadian or U.S. data are used; (b) the availability of data for individual stocks; and (c) the applicability of relevant criteria to the management strategies employed for individual stocks (for six Washington stocks, with escapement "floors" rather than fixed goals, criteria utilizing fixed escapement goals are not appropriate).

Individual Stock Analysis

For a review of escapement information and analytical results Table 1 lists: (1) each escapement indicator stock by region, (2) their individual escapement goals, (3) mean escapements before and after conservation actions, (4) numerical and percent change of mean escapement, and (5) conclusions from

the comparison of means and trend analysis.

Tabular and Graphical Data Summary The proportion of all stocks with average escapements at or near their goal is greater in the Treaty period than during the pre-Treaty period (Figures 3a,b). Since 1982 the percentage of stocks meeting escapement goals has increased annually from 8% to 42% (Figure 4).

In comparing escapements with a linear rebuilding schedule (Figure 5), escapements for 18 (50%) of the 36 indicator stocks with goals exceeded a straight line rebuilding schedule during all of the three years. Escapement for 7 stocks (19%) were above the line 2 out of 3 years. On the other hand, escapement for 8 stocks (22%) were below the straight line rebuilding schedule for all 3 years and escapement for an additional 3 (8%) stocks were below the line during 2 of the 3 years.

Comparison of Means In total, 34 stocks (79%) showed increases, compared to the pre-Treaty period, while 9 (21% of the total) showed an escapement decrease (Table 1, Figure 6a).

	Number of Stocks		
Escapement Changes	Increase	Decrease	Total
Statistically Significant	18	2	20
Not Statistically Significant	16	7	23
Total	34	9	43

Considered individually, 53% (23) of the indicator stocks did not show statistically significant changes in escapement levels, but 42% (20) showed significant increases. Analysis across all stocks indicate that escapements have increased for a statistically significant number of stocks. ($p<0.01$ Wilcoxon Signed Rank test); (Figures 6a, b).

Trend Analysis In the pre-Treaty time period, no overall increasing or decreasing trends between stocks were evident ($p > 0.25$, Wilcoxon Signed Rank test). In comparison, during the Treaty management period significantly more stocks have increasing escapements trends ($p < 0.01$).

Chinook escapement regression slopes:

Direction of the Slope	Pre-Treaty	Treaty
Positive	20	31
Negative	22	11

Rebuilding Status Based on Escapements Through 1987

Tables 1 and 2 summarize the rebuilding evaluation criteria for 37 indicator stocks with stated escapement goals. For 5 of the 37 stocks, terminal area management actions or data concerns were identified which influenced the rebuilding status assigned to these stocks. These concerns are noted in parentheses in the discussions below. In the Nass River spring/summer and Columbia River summer stocks, the Committee agreed to change the rebuilding status from that determined by the criteria described in the methods section of this report. Table 3 summarizes the Committee's agreed evaluation of each indicator stock grouped by rebuilding status; our evaluation of progress towards overall rebuilding is summarized in Figure 7.

Fifteen indicator stocks (41%) met all three rebuilding criteria and are classified as "Rebuilding". These are the Andrews, Blossom, Keta, Unuk, Chickamin, Skeena, Kitimat, Rivers Inlet, Upper Fraser, Mid-Fraser, Thompson (Fraser), Skagit spring, Stillaguamish, upper Columbia brights and Oregon coastal stocks. (NOTE: Increases in escapements of Stillaguamish summer/fall stock are primarily due to more stringent restrictions on terminal fisheries. With respect to impacts of fisheries operating under PSC regimes, terminal run size data suggest that this stock might more appropriately be placed in the Indeterminate category.)

Nine indicator stocks (24%) meet two of the three rebuilding criteria and are classified as "Probably Rebuilding". These are the King Salmon, Yakoun, Bella Coola, Snohomish, Green, Grays Harbor springs, Grays Harbor falls, Columbia springs and Nass River stocks. (NOTE: Escapement to one of the largest chinook populations in the Nass system was not assessed in 1987. If the past 3 year average escapement for this population (2,070) is added to the reported Nass total, then the rebuilding status improves. The Nass stock was moved from Indeterminate to the Probably Rebuilding category for this reason.)

Two indicator stocks (5%) were classified as "Not Rebuilding". These are the Lower Georgia Strait and West Coast Vancouver Island fall chinook stocks.

Five indicator stocks (14%) met two of the three criteria for not rebuilding and are classified as "Probably Not Rebuilding". These are the Alsek, Taku, Chilkat, Smith Inlet, and Quillayute summers. (NOTE: The reductions in escapement of the Quillayute summers are due to impacts of terminal fisheries. Terminal run sizes of this stock have been increasing, suggesting that this stock might more appropriately be placed in the Probably Rebuilding category.)

Six indicator stocks (16%) met one of the three criteria for either rebuilding and/or not rebuilding and these stocks are classified as "Indeterminate". These are the Situk, Stikine, upper Georgia Strait, Harrison, Skagit summer/fall and Columbia

summers. (NOTE: For the Skagit summer/fall stock, increasing restriction of terminal fisheries resulted in this stock being placed in the Indeterminate category. Terminal run sizes of this stock have been declining since 1985, suggesting that this stock might more appropriately be placed in the "Probably Not Rebuilding" category, with respect to the impacts of fisheries operating under PSC management regimes.) (NOTE: The escapement for Columbia River summer chinook are measured at Bonneville dam. Chinook counted during a fixed time period (June 1 through July 31) have been designated as summer run. During the base period, the daily time series of summer chinook counts at Bonneville appeared to be normally distributed during this counting period. However, in recent years, daily counts during this period appear to be nearly uniform in distribution. This can be attributed to the extremely small summer chinook abundance, coupled with increasing spring and fall bright runs. A portion of the recent increases in summer chinook escapements appear to be an artifact of a fixed counting period and changes in the relative abundance of spring, summer, and fall bright runs. Summers were moved from "Probably Rebuilding" to "Indeterminate" for this reason.)

Indicator Stocks Without Escapement Goals

Washington Coast: Several chinook stocks originating in North Washington coastal river systems are managed for natural production, but fixed spawning escapement goals have not been established because of uncertainties regarding productivity. Terminal fisheries on these stocks are managed for a target in-river harvest rate, provided that spawning escapements do not fall below a floor level as shown below.

STOCK	Run Type	In-River Harvest Rate	Spawning Escapement Floor
Quillayute	Fall	40%	3,000
Hoh	Spring/Summer	31%	900
Hoh	Fall	40%	1,200
Queets	Spring/Summer	30%	700
Queets	Fall	40%	2,500

The intention behind the terminal fishery management strategy for these stocks is to intentionally vary spawning escapements over a wide range, to permit evaluation of a range of escapement levels. Terminal run sizes of these stocks were substantially higher in the 1960's and early 1970's than levels observed in recent years. The decline in terminal run sizes was apparent during the late 1960's through the mid 1970's.

Because the management of these stocks does not depend upon a fixed spawning escapement goal, the criteria used by the Technical Committee to assess progress towards rebuilding cannot be readily applied. Trends in terminal run sizes of these stocks have increased since the inception of the rebuilding program, and

spawning escapement levels for all the above stocks have exceeded floor levels.

Lewis River: The Lewis River fall chinook stock comprises the majority of the natural fall chinook production of the lower Columbia River. Lower Columbia River mainstem fisheries take nearly all the terminal area harvest of this stock. An optimum spawning escapement goal for management of this stock has not been developed, though the appropriate numeric goal is believed to be less than 10,000 adults. Current (treaty period) and base period average spawning escapement for this stock have been greater than 10,000 adults and the stock's status is not depressed.

Analysis of Stock Aggregations

Size of Stock: No apparent differences of rebuilding pattern was observed between large and small stocks. Similarly, the percentage change in escapement level (Figure 8) and the progress which has been made to reduce escapement deficits appear to be occurring across all sizes of indicator stocks.

Run Type: When the magnitude of the percent change in average escapements between Treaty and pre-Treaty is compared, the rebuilding variation between the 5 run-types is statistically significant (Kruskal-Wallis test, $p<0.10$, Figure 9). Stocks migrating into freshwater in the spring and early summer have a greater degree of escapement increase than do the later migrating stocks. However, when run types are grouped by rebuilding categories (Table 4), the variation between run-types is not statistically significant ($P>0.10$,Fig.10). The variability in escapements between stocks and years causes enough uncertainty in categorizing rebuilding status, that each run-type is spread across most rebuilding categories. Consequently, while early run-type stocks have greater increases in average escapements, the various run-types are not statistically different in overall progress towards their rebuilding goals.

SUMMARY AND CONCLUSIONS

1) The distribution of stock status by rebuilding category was:

Category	Number of Stocks	% of Indicators
Rebuilding	15	41%
Probably Rebuilding	9	24
Indeterminate	6	16
Probably Not Rebuilding	5	14
Not Rebuilding	2	5
sub-total	37	100%
Indicators without goals	6	
Total	43	

2) Lower Georgia Strait and the West Coast of Vancouver Island fall chinook stocks continue to decline in escapements and are considered to be definitely not rebuilding.

3) Spawning escapements to the majority of indicator stocks remain below their spawning escapement goals, but the percentage of indicator stocks achieving escapement goals, has increased from 8 percent in 1982 to 42 percent in 1987.

4) For the 43 indicator stocks, average escapements since the Treaty increased over pre-Treaty averages for 34 (79%) and decreased for 9 (21%) stocks. For those stocks which showed an increase, the magnitude of increase was statistically significant ($p = .10$) for 18 stocks. Decreases in average escapements were significant for 2 of the 9 stocks.

5) Significantly more stocks exhibited increasing escapement trends during the Treaty period than for the pre-Treaty period, during which no overall increasing or decreasing trends were evident.

6) Escapement increases and decreases appeared to be randomly distributed across categories based upon stock sizes. Early run-type stocks have significantly greater increases in average escapements than later timing stocks. However, the various run-types are not statistically different in overall progress towards their rebuilding goals.

7) The escapement data available for this assessment should be generally characterized as highly variable and of small sample size.

Table 1. Summary of change in escapements of natural chinook indicator stocks.

	Indicator Stock	Region	Run Type	Escapement Goal	Mean Escapements Base Period	Mean Escapements Treaty Period	Change between periods number	Change between periods %	Change between periods Sign.	Escapement Trends Regression Slope PreTreaty	Escapement Trends Regression Slope Treaty	Treaty Trend Below	Treaty Trend Above
1	Situk	SEAK	spring	2100	1557	1267	-291	-19%	NS	-	+	1	2
2	King Salmon	SEAK	spring	250	95	226	131	137%	S	+	+	1	2
3	Andrews Cr.	SEAK	spring	750	371	650	279	75%	S	-	+	0	3
4	Blossom	SEAK	spring	1300	165	1128	963	584%	S	-	+	0	3
5	Keta	SEAK	spring	800	407	1051	643	158%	S	+	+	0	3
6	Alsek (US est)	TBR	spring	5000	4501	3438	-1063	-24%	NS	+	+	3	0
6	Alsek (CAN est)	TBR	spring	12500	4817	4400	-417	-9%	NS	+	+	3	0
7	Chilkat (US est)	TBR	spring	2000	213	995	782	368%	S	+	-	3	0
8	Taku (US est)	TBR	spring	25600	7978	9657	1679	21%	NS	+	-	3	0
8	Taku (CAN est)	TBR	spring	30000	9967	12086	2119	21%	NS	+	-	3	0
9	Stikine (US est)	TBR	spring	13700	6224	12444	6220	100%	S	+	-	1	2
9	Stikine (CAN est)	TBR	spring	25000	8283	16557	8274	100%	S	+	-	2	1
10	Unuk (US est)	TBR	spring	2900	1283	2352	1068	83%	NS	+	+	0	3
11	Chickamin (US est)	TBR	spring	1400	344	1386	1042	303%	S	-	+	0	3
12	Yakoun	BC/N	spr/sum	1600	788	1333	546	69%	NS	+	+	1	2
13	Nass Area	BC/N	spr/sum	15900	7944	11362	3418	43%	NS	-	-	2	1
14	Skeena Area	BC/N	spr/sum	41800	20883	57562	36679	176%	S	-	+	0	3
15	Kitimat/Butedale	BC/C	summer	14200	7111	14313	7201	101%	NS	+	+	0	3
16	Bella Coola	BC/C	spr/sum	17600	8775	24376	15601	178%	S	-	-	0	3
17	Rivers Inlet	BC/C	summer	5000	2475	5411	2936	119%	S	+	+	0	3
18	Smith Inlet	BC/C	summer	2100	1055	604	-451	-43%	NS	+	+	3	0
19	W. C. Vanc. Is.	WCVI	fall	11600	5814	4277	-1537	-26%	NS	+	-	3	0
20	Upper Geo. Str.	GS	sum/fall	4300	2662	3700	1038	39%	NS	-	-	1	2
21	Lower Geo. Str.	GS	fall	22780	11812	4364	-7448	-63%	NS	-	-	3	0
22	Upper Fraser	FR	spr/sum	24500	12229	36751	24523	201%	S	-	+	0	3
23	Middle Fraser	FR	spr/sum	21100	9216	24091	14875	161%	S	+	+	0	3
24	Thompson	FR	spr/sum	55700	22059	40619	18560	84%	S	-	+	0	3
25	Harrison	FR	fall	233600	116791	129569	na	na	na	na	-	1	2
26	Green	PS	fall	5800	5723	6013	289	5%	NS	-	+	2	1
27	Skagit	PS	sum/fall	14900	13265	14691	1426	11%	NS	-	-	1	2
28	Skagit	PS	spring	3000	1217	2457	1241	102%	S	-	+	0	3
29	Stillaguamish	PS	sum/fall	2000	817	1346	530	65%	S	-	+	0	3
30	Snohomish	PS	sum/fall	5250	5028	5230	202	4%	NS	-	+	2	1
31	Quillayute	WaC	summer	1500	1250	633	-617	-49%	S	-	+	3	0
32	Quillayute	WaC	fall	na	5850	9300	3450	59%	NS	+	+	na	na
33	Hoh	WaC	spr/sum	na	1325	1400	75	6%	NS	+	+	na	na
34	Hoh	WaC	fall	na	2875	3567	692	24%	NS	+	+	na	na
35	Queets	WaC	spr/sum	na	925	733	-192	-21%	NS	-	+	na	na
36	Queets	WaC	fall	na	3875	5867	1992	51%	NS	+	+	na	na
37	Grays Harbor	WaC	spring	1400	450	1267	817	181%	S	+	+	0	3
38	Grays Harbor	WaC	fall	14600	8575	12933	4358	51%	NS	-	+	0	3
39	Columbia brights	CR	fall	40000	28325	120767	92442	326%	S	-	+	0	3
40	Col. upriver	CR	summer	85000	24275	27433	3158	13%	NS	-	+	3	0
41	Col. upriver	CR	spring	84000	28955	37209	8254	29%	NS	+	+	1	2
42	Lewis	CR	fall	na	11801	11067	-734	-6%	NS	-	+	na	na
43	Oregon coastal	OrC	fall	80000	73400	110800	37400	51%	S	+	+	0	3

Notes:(1) Base period = 1979-82 and Treaty period = 1985-87, except SEAK and TBR stocks base period = 1975-80 and Treaty period is 1981-87; Harrison base period = 1984 only; Treaty period regression calculated for 1984-87, except SEAK and TRB stocks calculated for 1980-87.

(2) S = escapement change statistically significant; NS = change not significant (relative to p=0.10).

(3) Treaty Trend presents the number of Treaty period years with escapements above and below linear trend line.

Table 2. Summary of indicator chinook stocks meeting criteria established to determine rebuilding status.
(x indicated that the criterion was met)

				Non-Rebuilding Criteria			Rebuilding Criteria			Rebuilding Status
	Indicator Stock	Region	Run Type	1	2	3	1	2	3	Based on Criteria
1	Situk	SEAK	spring	X				X		Indeterminate
2	King Salmon	SEAK	spring				X	X		Probably Rebuilding
3	Andrews Cr.	SEAK	spring				X	X	X	Rebuilding
4	Blossom	SEAK	spring				X	X	X	Rebuilding
5	Keta	SEAK	spring				X	X	X	Rebuilding
6	Alsek (US est)	TBR	spring	X		X		X		Probably Not Rebuilding
6	Alsek (CAN est)	TBR	spring	X		X		X		Probably Not Rebuilding
7	Chilkat (US est)	TBR	spring		X	X	X			Probably Not Rebuilding
8	Taku (US est)	TBR	spring		X	X	X			Probably Not Rebuilding
8	Taku (CAN est)	TBR	spring		X	X	X			Probably Not Rebuilding
9	Stikine (US est)	TBR	spring		X		X			Indeterminate
9	Stikine (CAN est)	TBR	spring		X		X			Indeterminate
10	Unuk (US est)	TBR	spring				X	X	X	Rebuilding
11	Chickamin (US est)	TBR	spring				X	X	X	Rebuilding
12	Yakoun	BC/N	spr/sum				X	X		Probably Rebuilding
13	Nass Area	BC/N	spr/sum		X		X			Probably Rebuilding (a)
14	Skeena Area	BC/N	spr/sum				X	X	X	Rebuilding
15	Kitimat/Butedale	BC/C	summer				X	X	X	Rebuilding
16	Bella Coola	BC/C	spr/sum		X		X		X	Probably Rebuilding
17	Rivers Inlet	BC/C	summer				X	X	X	Rebuilding
18	Smith Inlet	BC/C	summer	X		X		X		Probably Not Rebuilding
19	W. C. Vanc. Is.	WCVI	fall	X	X	X				Not Rebuilding
20	Upper Geo. Str.	GS	sum/fall		X		X			Indeterminate
21	Lower Geo. Str.	GS	fall	X	X	X				Not Rebuilding
22	Upper Fraser	FR	spr/sum				X	X	X	Rebuilding
23	Middle Fraser	FR	spr/sum				X	X	X	Rebuilding
24	Thompson	FR	spr/sum				X	X	X	Rebuilding
25	Harrison	FR	fall		X		X			Indeterminate
26	Green	PS	fall				X	X		Probably Rebuilding
27	Skagit	PS	sum/fall		X		X			Indeterminate
28	Skagit	PS	spring				X	X	X	Rebuilding
29	Stillaguamish	PS	sum/fall				X	X	X	Rebuilding
30	Snohomish	PS	sum/fall				X	X		Probably Rebuilding
31	Quillayute	WaC	summer	X		X		X		Probably Not Rebuilding
37	Grays Harbor	WaC	spring		X		X		X	Probably Rebuilding
38	Grays Harbor	WaC	fall		X		X		X	Probably Rebuilding
39	Columbia brights	CR	fall				X	X	X	Rebuilding
40	Col. upriver	CR	summer			X	X	X		Indeterminate (b)
41	Col. upriver	CR	spring				X	X		Probably Rebuilding
43	Oregon coastal	OrC	fall				X	X	X	Rebuilding

(a) Based on the rebuilding criteria the Nass rebuiliding status was Indeterminate, however, due to considerations discussed in the text, the status has been revised to Probably Rebuilding.

(b) Based on the rebuilding criteria the Columbia River summer rebuilding status was Probably Rebuilding, however, due to considerations discussed in the text, the status has been revised to Indeterminate.

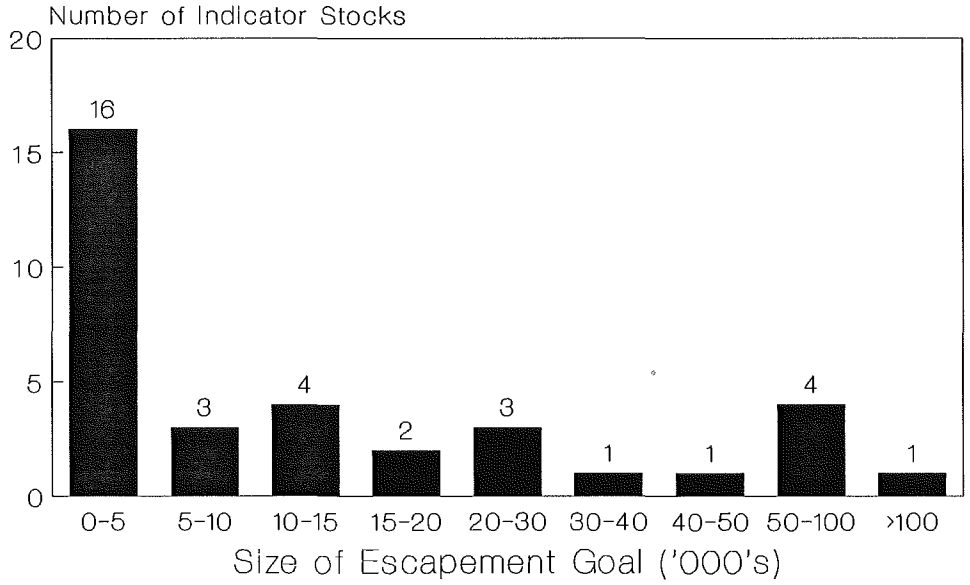
Table 3. Status of naturally spawning chinook indicator stocks based on an examination of available spawning escapement data.

REBUILDING	Region	Run Type
Andrews	SEAK	spring
Blossom	SEAK	spring
Keta	SEAK	spring
Unuk	TBR	spring
Chikamin	TBR	spring
Skeena	N/CBC	spring/summer
Kitimat/Butedale	N/CBC	summer
Rivers Inlet	N/CBC	summer
Upper Fraser	FRASER	spring/summer
Middle Fraser	FRASER	spring/summer
Thompson	FRASER	spring/summer
Skagit	PGT SD	spring
Stillaguamish	PGT SD	summer/fall
Columbia upriver brights	COL R	fall
Oregon Coastal	ORE CST	fall
INDEFINITE		
Probably Rebuilding		
King Salmon	SEAK	spring
Yakoun	N/CBC	spring/summer
Bella Coola	N/CBC	spring/summer
Nass River	N/CBC	spring/summer
Green	PGT SD	fall
Snohomish	PGT SD	summer/fall
Grays Harbor	WA CST	spring
Grays Harbor	WA CST	fall
Columbia R upriver	COL R	spring
Indeterminate		
Situk	SEAK	spring
Stikine	TBR	spring
Upper Georgia Str	GEOR STR	summer/fall
Harrison/Fraser	FRASER	fall
Skagit	PGT SD	summer/fall
Columbia R upriver	COL R	summer
Probably Not Rebuilding		
Alsek	TBR	spring
Chilkat	TBR	spring
Taku	TBR	spring
Smith Inlet	N/CBC	summer
Quillayute	WA CST	summer
NOT REBUILDING		
Lower Georgia Straits	GEOR STR	fall
W Coast Vancouver Is	WCVI	fall

Table 4. Rebuilding status of chinook stocks categorized by run type. Rebuilding status determined by the criteria defined in the text. Stocks without fixed escapement goals are not included in this analysis.

Rebuilding Status	Run Type					Total no. of stocks
	Springs	Spr/Sum	Summers	Sum/Fall	Falls	
Rebuilding	6	4	2	1	2	15
Probably Rebuilding	3	3	0	1	2	9
Indeterminate	2	0	1	2	1	6
Probably Not Rebuilding	3	0	2	0	0	5
Not Rebuilding	0	0	0	0	2	2
Totals	14	7	5	4	7	37

Figure 1. Distribution of indicator stocks by size category



Conflicting transboundary stocks (Alsek and Stikine) and stocks without goals omitted.

Figure 2. Hypothetical escapement pattern under PST rebuilding program.

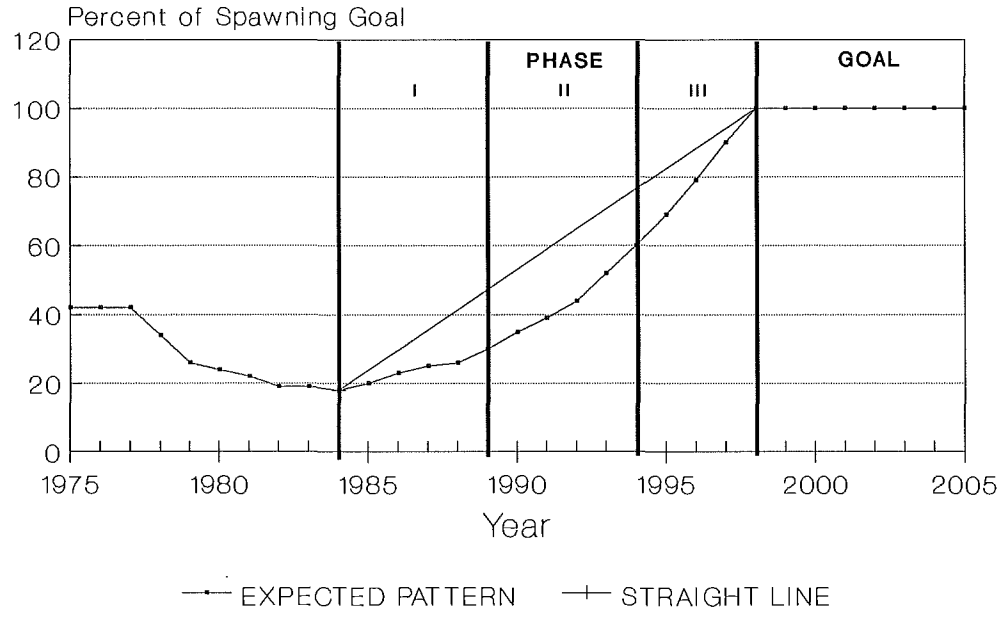
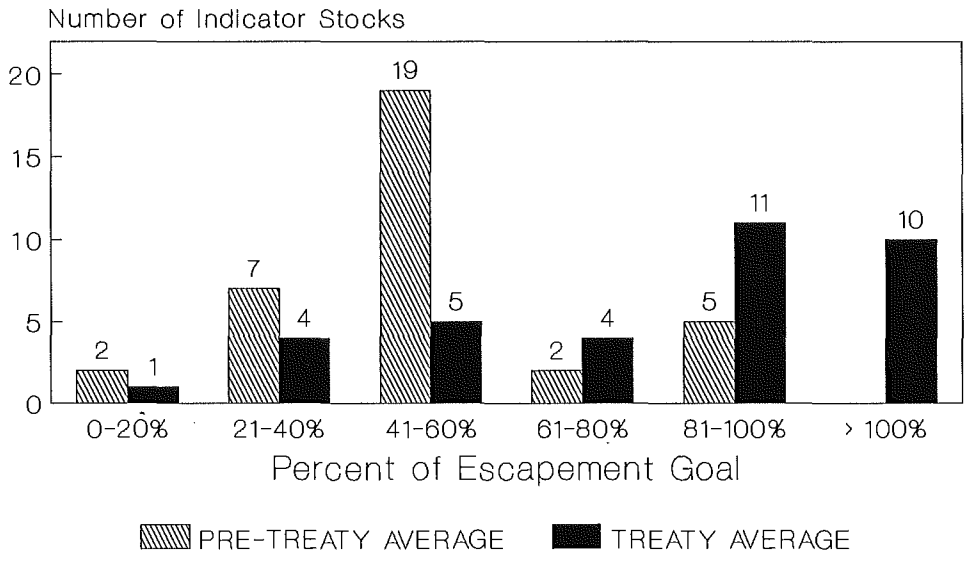
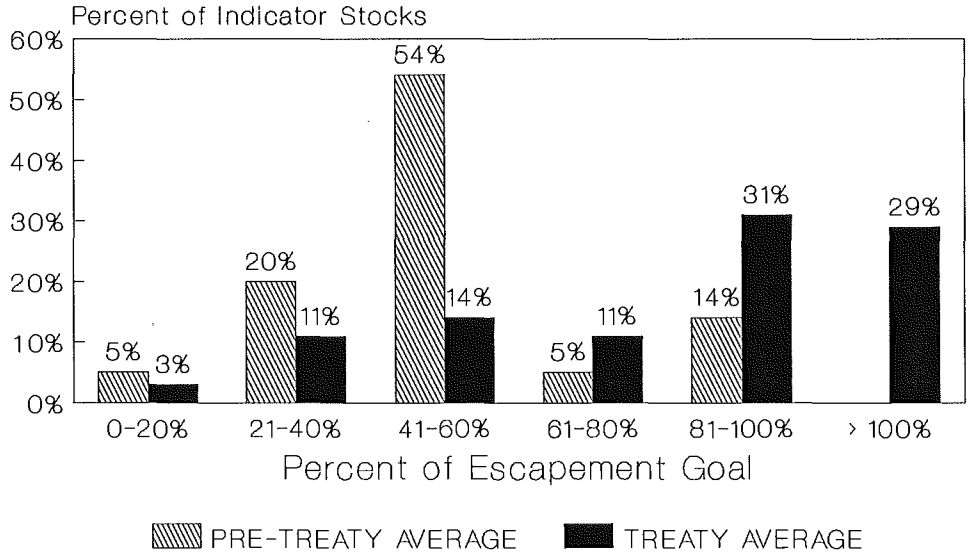


Figure 3a. Number of indicator stocks meeting escapement goals.



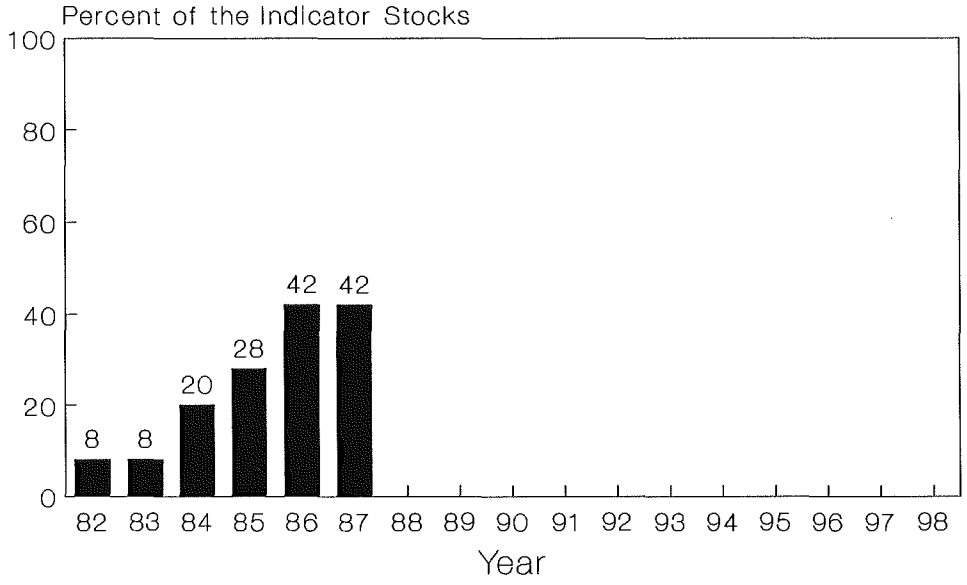
Conflicting Transboundary stocks (Alsek and Stikine) and stocks without goals omitted.

Figure 3b. Percent of indicator stocks meeting escapement goals.



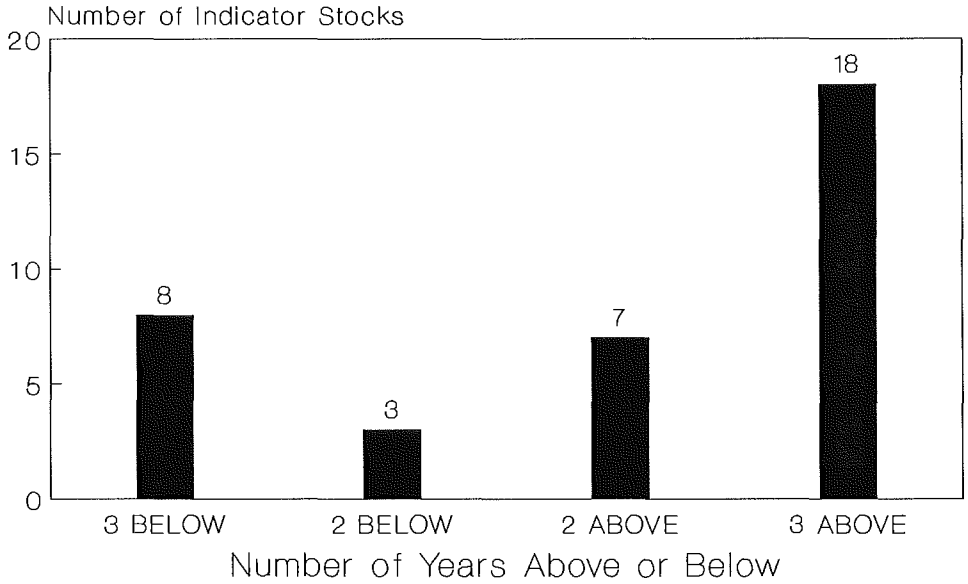
Conflicting Transboundary stocks (Alsek and Stikine) and stocks without goals omitted.

Figure 4. Percent of indicator stocks meeting escapement goals annually



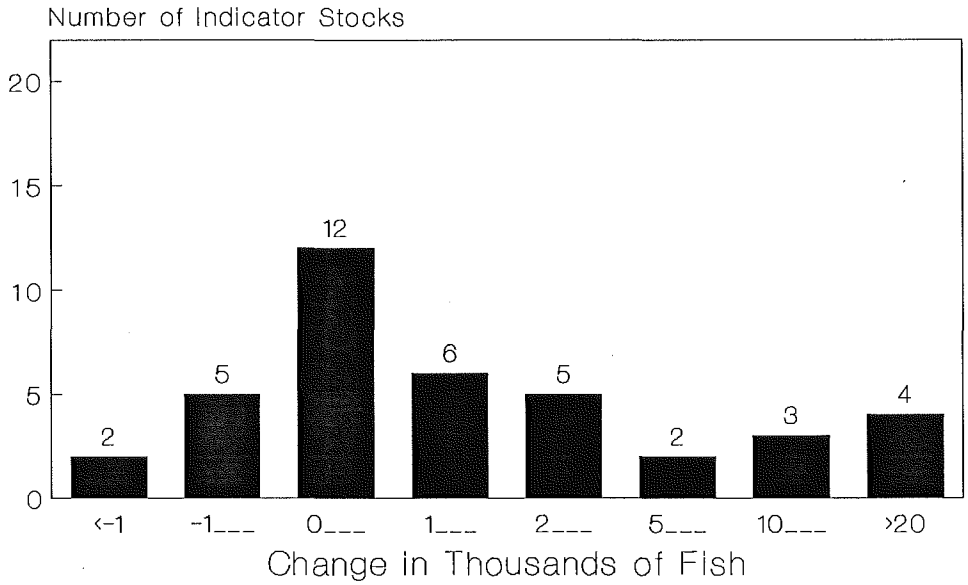
Conflicting transboundary stocks (Stikine) and stocks without goals omitted.

Figure 5. Indicator stock escapement relative to straight line increase.



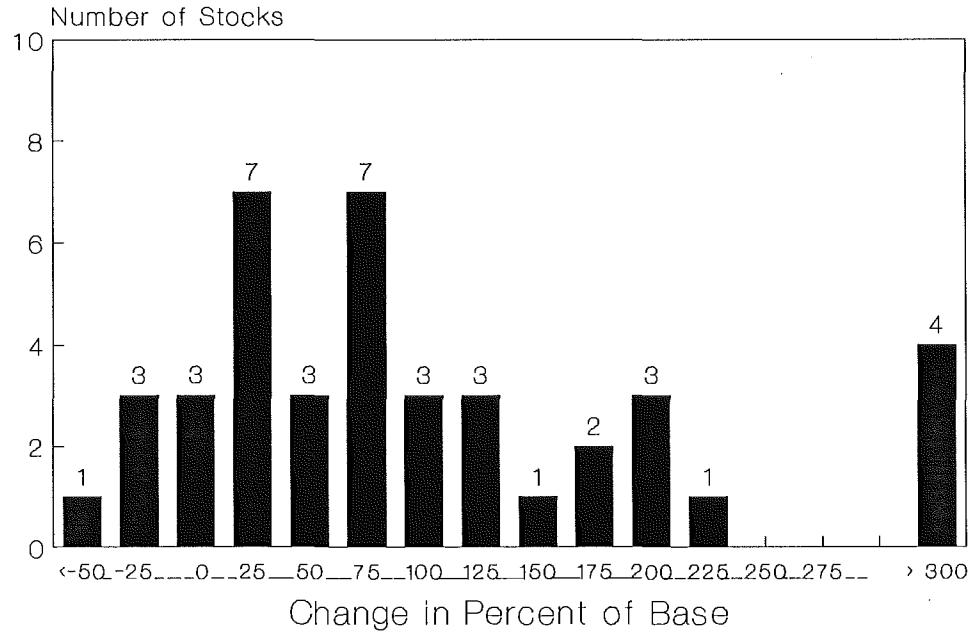
Stocks without goals omitted. Stikine R. omitted due to conflicting trends between US and Canadian estimates.

Figure 6a. Numerical escapement changes between pre-Treaty and Treaty periods.



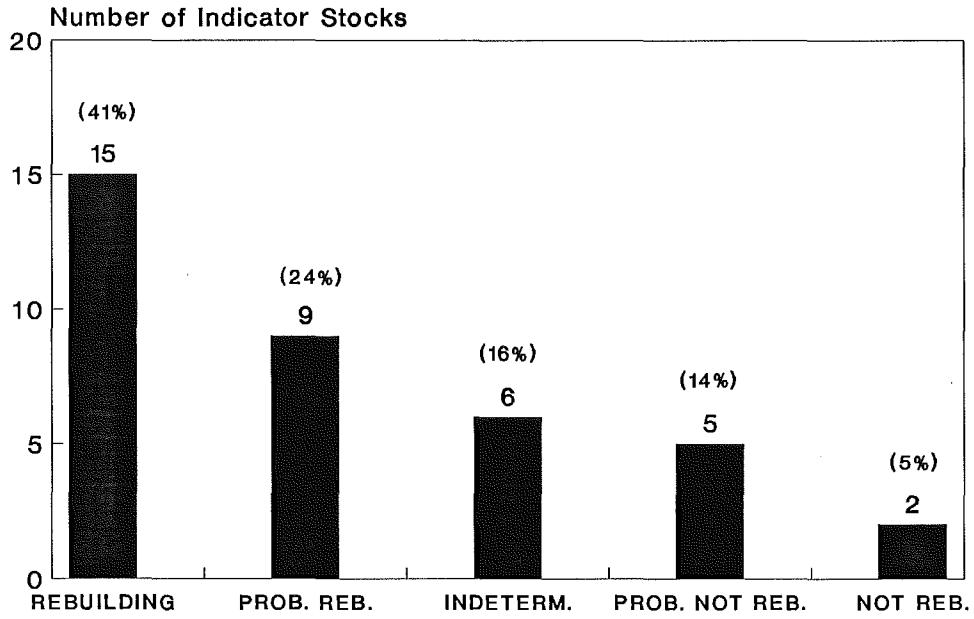
Conflicting transboundary stocks (Alsek, Taku and Stikine) and Harrison River omitted.

Figure 6b. Percent escapement changes between pre-Treaty and Treaty periods.



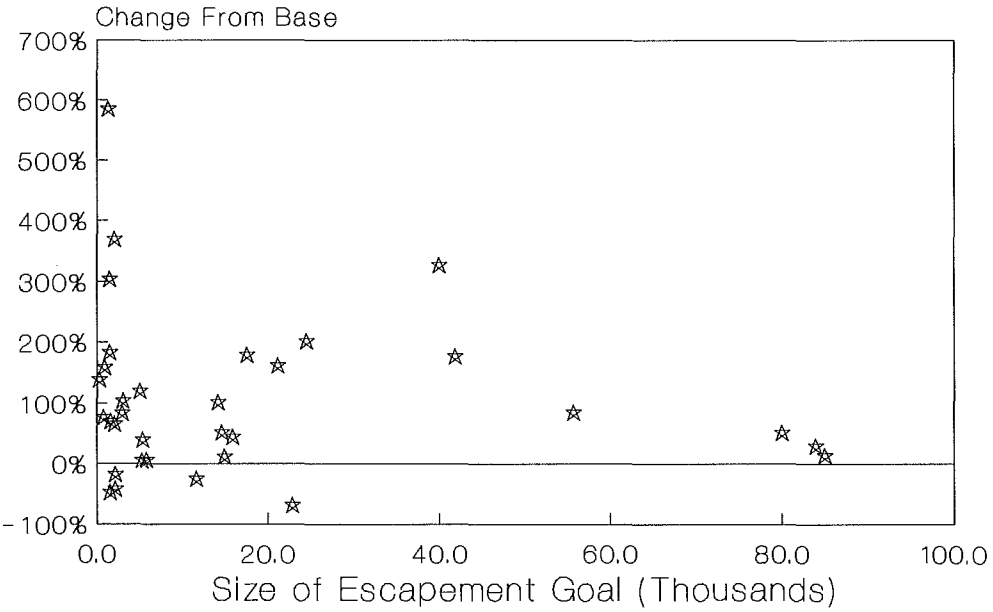
Alsek River and Harrison River omitted.

Figure 7. PSC Natural chinook rebuilding assessment of progress through 1987



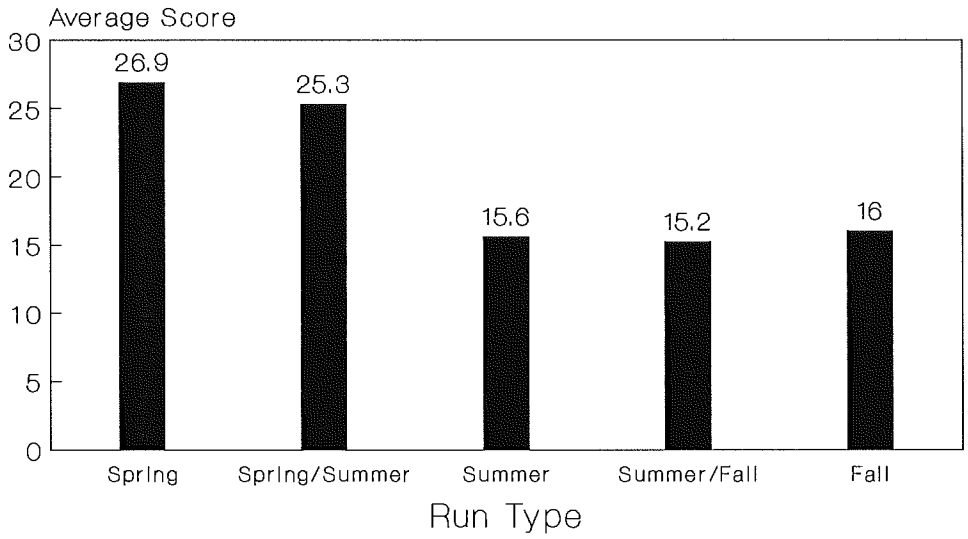
Total # of Indicator Stocks = 37

Figure 8. Escapement changes by size of stock.



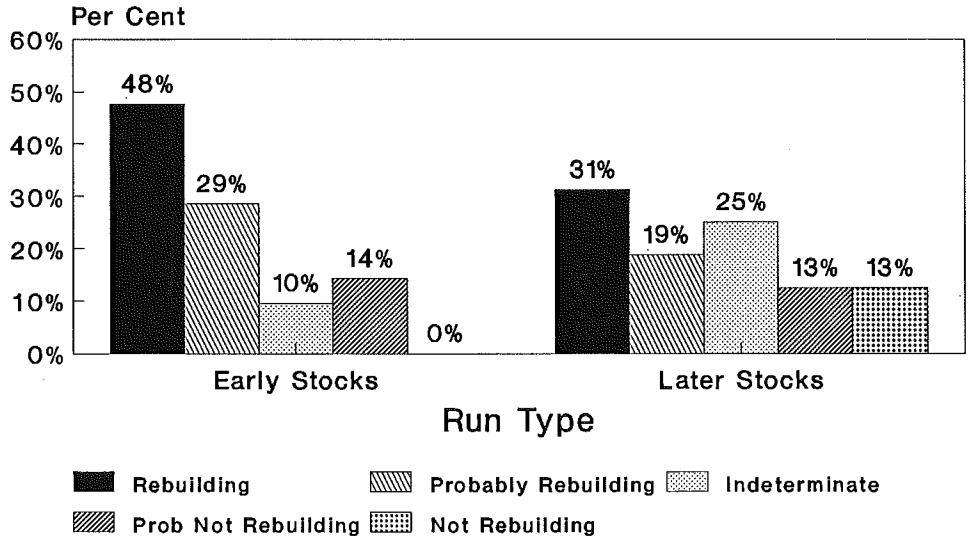
Conflicting transboundary stocks, stocks without goals and Harrison River omitted

Figure 9. Average rank score of escapement changes by run type, since the base period.



A higher score indicates a greater change from base period. Transboundary stocks counted once/Harrison R. omitted

Figure 10. Rebuilding Assessment by Two Major Run-Type Categories



Early Stocks: all spring & spring/summer
Later Stocks: all summer, summer/fall, & fall stocks. Number of stocks=37.

APPENDIX I - SUPPLEMENT A

Basic Data Used in the 1987 Escapement Evaluation

List of Tables

Table

List of Figures

(figures in this supplement are referenced by page number only)

Appendix 1, Supplement A.
List of Figures (continued)

Supplement A, Table A1. Estimated average harvest distribution of selected chinook salmon stocks across certain Pacific coastal fisheries from 1979-83. The percentage harvest distributions are based on coded wire tag recoveries in landed catches only, and are obtained from the 1988 version of the PSC chinook model.

			FISHERIES								
			S.E. AK	N/C BC	WCVI	GEO STR	OTHER	WA/ORE	PGT SD	COL. R.	WA CST
CHINOOK STOCKS	TYPE	AREA	T/N/S	T/N/S	T/S	T/S	BC NET	T/S	N/S	N/S	N
South. S.E. Alaska	SP	SEAK	92.7%	7.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
North/Central B.C.	SP/S	N/C BC	45.2%	47.5%	0.5%	2.7%	4.0%	0.0%	0.0%	0.0%	0.0%
Fraser Early	SP/S	FRASER	33.4%	31.1%	5.5%	7.7%	14.6%	0.0%	7.7%	0.0%	0.0%
Fraser Late	F	FRASER	0.1%	8.0%	18.0%	49.6%	9.3%	8.2%	6.8%	0.0%	0.0%
WCVI Hatchery	F	WCVI	37.2%	33.1%	19.0%	1.0%	9.4%	0.0%	0.2%	0.0%	0.0%
WCVI Natural	F	WCVI	37.2%	33.1%	19.0%	1.0%	9.4%	0.0%	0.2%	0.0%	0.0%
Upper Georgia Str.	S/F	GEO STR	22.7%	57.9%	0.5%	9.5%	9.4%	0.0%	0.0%	0.0%	0.0%
L. Geo. Str. Hatch.	F	GEO STR	0.9%	15.6%	2.0%	72.1%	8.3%	0.0%	1.1%	0.0%	0.0%
L. Geo. Str. Nat.	F	GEO STR	0.9%	15.6%	2.0%	72.1%	8.3%	0.0%	1.1%	0.0%	0.0%
Nooksak Falls	S/F	PUG SD	0.1%	3.8%	15.8%	24.9%	3.7%	2.4%	49.3%	0.0%	0.0%
Puget Sd. Hat. Fing.	S/F	PUG SD	0.2%	2.1%	21.0%	11.1%	3.4%	3.2%	59.0%	0.0%	0.0%
Puget Sd. Nat. Fing.	S/F	PUG SD	0.2%	2.1%	20.7%	10.5%	3.3%	3.2%	60.1%	0.0%	0.0%
Puget Sd. Yearling	S/F	PUG SD	0.2%	5.5%	11.9%	25.6%	5.2%	1.0%	50.6%	0.0%	0.0%
Nooksak Springs	SP	PUG SD	0.0%	4.3%	8.7%	63.6%	15.7%	0.0%	7.7%	0.0%	0.0%
Skagit Wild	S/F	PUG SD	2.2%	22.3%	17.2%	28.2%	6.4%	0.1%	23.6%	0.0%	0.0%
Stilliquamish Wild	S/F	PUG SD	2.0%	27.5%	15.4%	13.4%	9.5%	0.0%	32.3%	0.0%	0.0%
Snohomish Wild	S/F	PUG SD	2.2%	22.3%	17.2%	28.2%	6.4%	0.1%	23.6%	0.0%	0.0%
Quinault Hatchery	F	WA CST	14.7%	22.1%	9.4%	3.9%	1.4%	1.9%	2.5%	0.0%	44.1%
Col. Upriver Brights	F	COL R	32.8%	26.3%	16.4%	2.1%	2.1%	4.9%	2.4%	13.0%	0.0%
Spring Cr. Hatchery	F	COL R	0.0%	0.8%	26.8%	3.0%	2.6%	34.7%	6.5%	24.8%	0.8%
L. Bonneville Hat.	F	COL R	0.4%	3.2%	39.4%	3.0%	2.3%	34.6%	3.9%	13.0%	0.3%
Cowlitz Hat. Falls	F	COL R	6.2%	5.4%	29.5%	0.3%	2.3%	39.9%	1.5%	14.6%	0.2%
Lewis R. Wild	F	COL R	17.1%	11.2%	17.8%	1.0%	1.5%	17.1%	2.1%	31.0%	1.2%
Willamette Springs	SP	COL R	12.0%	23.1%	9.3%	0.5%	0.3%	3.8%	1.9%	49.2%	0.0%
Cowlitz Hat. Springs	SP	COL R	2.5%	6.2%	12.7%	0.8%	0.3%	39.7%	1.4%	36.5%	0.0%
Col. Upriver Summers	S	COL R	20.9%	33.9%	28.8%	3.9%	2.2%	5.5%	0.1%	4.8%	0.0%
Oregon Coastal	F	ORE CST	33.2%	24.8%	8.3%	0.0%	0.1%	3.2%	0.5%	29.9%	0.0%

Note: (1) TYPE NOTATION: SP = SPRING; S = SUMMER; F = FALL.
(2) FISHERIES NOTATION: T = TROLL; N = NET; S = SPORT.

Supplement A, Table A2. Estimated average distribution of total fishing mortalities of selected chinook salmon stocks across certain Pacific coastal fisheries from 1979-83. The percentage mortality distributions are based on coded wire tag recoveries in both landed catches and from estimated incidental mortalities, and are obtained from the 1988 version of the PSC chinook model.

			FISHERIES								
			S.E. AK	N/C BC	WCVI	GEO ST	OTHER	WA/ORE	PGT SD	COL. R.	WA CST
CHINOOK STOCKS	TYPE	AREA	T/N/S	T/N/S	T/S	T/S	BC NET	T/S	N/S	N/S	N
South. S.E. Alaska	SP	SEAK	93.0%	7.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
North/Central B.C.	SP	N/C BC	44.0%	48.8%	0.5%	1.9%	4.9%	0.0%	0.0%	0.0%	0.0%
Fraser Early	SP/S	FRASER	33.2%	32.0%	4.8%	5.4%	16.8%	0.0%	7.7%	0.0%	0.0%
Fraser Late	S/F	FRASER	0.1%	9.1%	19.0%	43.5%	11.6%	8.9%	7.8%	0.0%	0.0%
WCVI Hatchery	F	WCVI	39.1%	34.3%	16.3%	0.7%	9.2%	0.0%	0.3%	0.0%	0.0%
WCVI Natural	F	WCVI	39.1%	34.3%	16.3%	0.7%	9.2%	0.0%	0.3%	0.0%	0.0%
Upper Georgia Str.	S/F	GEO STR	21.0%	62.1%	0.4%	6.1%	10.5%	0.0%	0.0%	0.0%	0.0%
L. Geo. Str. Hatch.	S/F	GEO STR	1.2%	23.4%	2.1%	59.5%	12.6%	0.0%	1.3%	0.0%	0.0%
L. Geo. Str. Nat.	S/F	GEO STR	1.2%	23.4%	2.1%	59.5%	12.6%	0.0%	1.3%	0.0%	0.0%
Nooksak Falls	S/F	PUG SD	0.2%	5.2%	17.0%	22.4%	5.6%	2.7%	47.0%	0.0%	0.0%
Puget Sd. Hat. Fing.	S/F	PUG SD	0.2%	2.7%	21.8%	9.5%	4.9%	3.4%	57.4%	0.0%	0.0%
Puget Sd. Nat. Fing.	S/F	PUG SD	0.2%	2.6%	21.5%	9.0%	4.8%	3.4%	58.5%	0.0%	0.0%
Puget Sd. Yearling	S/F	PUG SD	0.2%	8.2%	12.0%	21.0%	7.6%	1.0%	50.0%	0.0%	0.0%
Nooksak Springs	SP	PUG SD	0.0%	5.8%	8.8%	53.6%	24.2%	0.0%	7.5%	0.0%	0.0%
Skagit Wild	S/F	PUG SD	2.5%	28.4%	16.9%	22.7%	8.8%	0.0%	20.8%	0.0%	0.0%
Stilliquamish Wild	S/F	PUG SD	2.2%	33.9%	13.7%	9.3%	13.1%	0.0%	27.6%	0.0%	0.0%
Snohomish Wild	S/F	PUG SD	2.5%	28.4%	16.9%	22.7%	8.8%	0.0%	20.8%	0.0%	0.0%
Quinault Hatchery	F	WA CST	14.6%	21.1%	8.5%	2.8%	1.8%	1.7%	2.2%	0.0%	47.2%
Col. Upriver Brights	F	COL R	33.0%	30.5%	15.0%	1.6%	2.7%	4.4%	2.2%	10.6%	0.0%
Spring Cr. Hatchery	F	COL R	0.0%	1.0%	27.3%	2.4%	3.8%	35.4%	6.9%	22.2%	1.0%
L. Bonneville Hat.	F	COL R	0.4%	3.6%	39.6%	2.4%	3.3%	35.4%	3.9%	11.1%	0.3%
Cowlitz Hat. Falls	F	COL R	6.7%	6.9%	29.2%	0.3%	3.2%	39.3%	1.8%	12.6%	0.2%
Lewis R. Wild	F	COL R	19.2%	13.0%	18.0%	0.9%	2.0%	16.8%	2.1%	26.5%	1.4%
Willamette Springs	SP	COL R	14.7%	26.0%	9.9%	0.4%	0.4%	4.0%	2.0%	42.5%	0.0%
Cowlitz Hat. Springs	SP	COL R	3.0%	7.6%	13.7%	0.6%	0.5%	41.8%	1.6%	31.0%	0.0%
Col. Upriver Summers	S	COL R	20.7%	37.6%	26.5%	3.1%	3.0%	5.0%	0.1%	4.0%	0.0%
Oregon Coastal	F	ORE CST	36.4%	26.3%	8.4%	0.0%	0.2%	3.1%	0.5%	25.2%	0.0%

Note: (1) TYPE: SP = SPRING; S = SUMMER; F = FALL.
(2) FISHERIES: T = TROLL; N = NET; S = SPORT.

Supplement A, Table A3. Pacific Salmon Commission indicator stock escapements, 1975 - 1987.

Year	Southeast Alaska				
	Situk	King Salmon	Andrews	Blossom	Keta
1975	1557	53	371	245	325
1976	1933	81	404	109	134
1977	1872	168	456	179	368
1978	1103	71	388	229	627
1979	1754	110	327	86	682
1980	1125	88	281	142	307
1981	643	126	511	254	526
1982	434	324	635	552	1206
1983	592	260	366	942	1315
1984	1726	248	355	813	976
1985	1521	146	510	1134	998
1986	2067	249	1131	2045	1104
1987	1884	228	1042	2158	1229
Goal	2100	250	750	1300	800

Year	Transboundary Rivers								
	US Alsek	Canadian Alsek	US Chilkat	US Taku	Canadian Taku	US Stikine	Canadian Stikine	US Unuk	US Chikamin
1975	4501		188	4609	5800	4480	6000	88	562
1976	1944	2500	223	8278	10300	2560	3400	317	195
1977	4913	6300	223	10000	12500	5120	6800	1866	376
1978	4650	6000	214	4987	6200	4045	5400	2824	290
1979	6880	8800	214	6593	8200	7462	9900	922	224
1980	4120	5300	214	13402	16800	13677	18200	1683	418
1981	3302	4200	1670	17889	22400	21338	28400	1170	608
1982	3688	4700	500	8407	10500	18112	24100	2162	806
1983	3938	5100	1080	3018	3800	3802	5100	1770	890
1984	2594	3300	2045	6307	7900	8282	11000	2939	1622
1985	2227	2900	625	10851	13600	10227	13600	1862	1531
1986	4231	5400	170	12178	15200	8026	10700	3402	2683
1987	4086	5200	875	8951	11200	17318	23000	3157	1560
Goal	5000	12500	2000	25600	30000	13700	25000	2900	1400

Supplement A, Table A3(Cont.). Pacific Salmon Commission indicator stock escapements,1975-87

Year	Northern B.C.						
	AREA 1	AREA 3	AREA 4	AREA 6	AREA 8	AREA 9	AREA 10
	Yakoun	Nass	Skeena	Kitimat/ Butedale	Bella Coola	Rivers Inlet	Smith Inlet
1975	1500	6025	20319	5050	8425	3280	960
1976	700	5590	13078	7004	16550	1640	1000
1977	800	9060	29018	3833	15600	2225	1050
1978	600	10190	22661	6512	19000	2800	2100
1979	400	8180	18488	6510	9100	2150	500
1980	600	9072	23429	4908	9729	2325	1200
1981	750	7950	24523	5702	8050	3175	1020
1982	1400	6575	17092	11325	8220	2250	1500
1983	600	8055	23562	2565	9250	3320	1050
1984	300	12620	37598	5314	20020	1400	770
1985	1500	8002	53599	8679	32110	3371	230
1986	500	17390	59968	11493	25062	7623	532
1987	2000	8695	59120	22766	15956	5239	1050
Goal	1600	15900	41800	14200	17600	5000	2100

Year	Southern B.C.			Fraser River			
	West Coast Vancouver Island	Upper Georgia Strait	Lower Georgia Strait	Upper	Middle	Thompson	Harrison
1975	1675	11800	11022	7028	15050	37035	
1976	1275	15150	15280	7612	10975	14875	
1977	3875	3880	14455	10135	13320	30321	
1978	6275	6150	8365	14015	13450	28465	
1979	3058	4127	13517	12495	8595	25145	
1980	6725	1367	11254	15796	9625	19330	
1981	5360	1945	11321	9021	8175	23375	
1982	8112	3210	11156	11603	10470	20385	
1983	4575	3820	9498	17185	15404	20381	
1984	5012	4600	11589	21938	13957	29972	116791
1985	4900	4600	5403	34527	17595	39997	147620
1986	4560	1500	3620	41207	27349	45130	162393
1987	3370	5000	4069	34520	27330	36730	78693
Goal	11600	4300	22800	24500	21100	55700	233600

Supplement A, Table A3(Cont.). Pacific Salmon Commission indicator stock escapements, 1975-87.

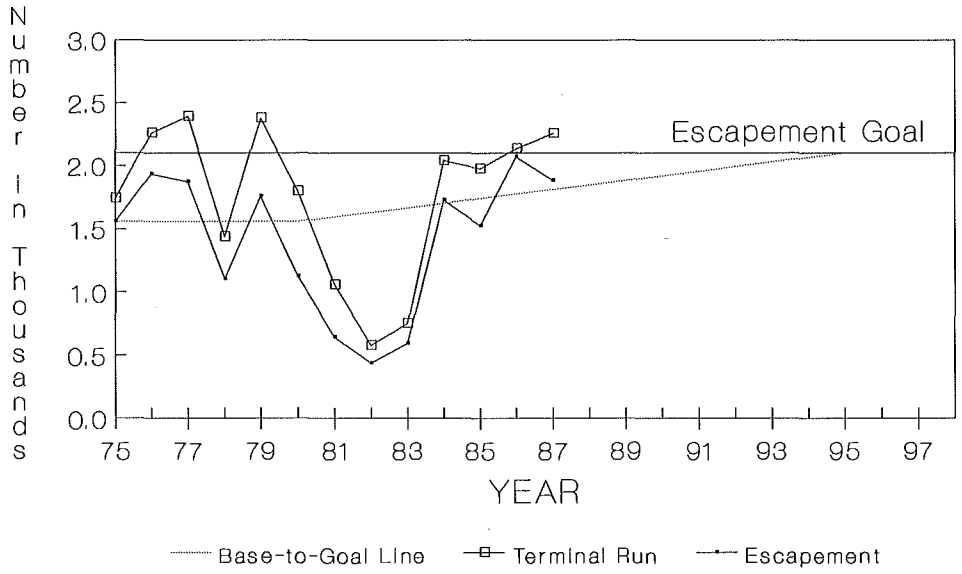
Year	Puget Sound				
	Green River Chinook	Skagit River Sum/fall	Skagit River Springs	Stilla-guamish River	Snohomish River
1975	3394	11555	804	1198	4485
1976	3140	14479	763	2140	5315
1977	3804	9497	916	1475	5565
1978	3304	13209	1079	1232	7931
1979	9704	13605	1032	1042	5903
1980	7743	20345	1842	821	6460
1981	3606	8670	1306	630	3368
1982	1840	10439	686	773	4379
1983	3679	9080	710	387	4549
1984	3353	13239	765	374	3762
1985	2908	16298	3265	1409	6342
1986	4792	18127	1999	1230	4443
1987	10338	9647	2108	1400	4904
Goal	5800	14900	3000	2000	5250

Year	Washington Coast							
	Quillayute Summer	Quillayute Fall	Hoh Spring/ Summer	Hoh Fall	Queets Spring/ Summer	Queets Fall	Grays Harbor Springs	Grays Harbor Falls
1975								
1976	1300	2500	600	2500	500	1200	600	1800
1977	3800	3300	1000	2100	700	3600	800	5200
1978	2300	4700	1400	1900	1100	2200	1000	4600
1979	2100	3900	1400	1700	900	3900	400	9400
1980	900	6700	800	2200	1000	3200	200	11700
1981	800	5700	1500	3100	1000	4300	600	7600
1982	1200	7100	1600	4500	800	4100	600	5600
1983	1400	2900	1800	2500	1000	2600	800	4500
1984	600	9100	1500	1900	1000	3900	1000	21000
1985	600	5500	1000	1700	700	3900	1200	9500
1986	600	10000	1500	5000	900	7700	1800	10500
1987	700	12400	1700	4000	600	6000	800	18800
Goal	1500	NA	NA	NA	NA	NA	1400	14600

Year	Columbia River				Oregon
	Columbia River Brights	Columbia River Summers	Columbia River Springs	Lewis River Falls	Oregon Coastal Falls
1975	29600	33000			
1976	28800	26700			
1977	37600	34100	66062	6930	51400
1978	27300	38400	93300	5363	54500
1979	31200	27700	23088	8023	69600
1980	29900	26900	27612	13882	79200
1981	21100	22400	32436	17946	60400
1982	31100	20100	32683	7353	84400
1983	48700	18000	24705	11756	40500
1984	61200	22300	20124	6847	79000
1985	94300	23400	28254	7500	111700
1986	112700	25900	38973	14500	126500
1987	155300	33000	44400	11200	94000
Goal	40000	85000	84000	NA	80000

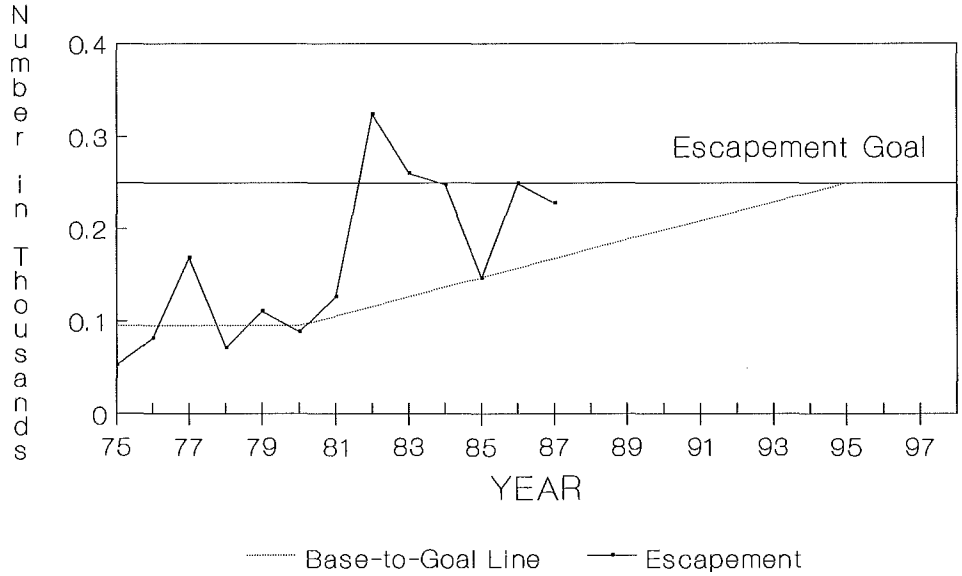
Situk Chinook Escapements

Adult Chinook Salmon



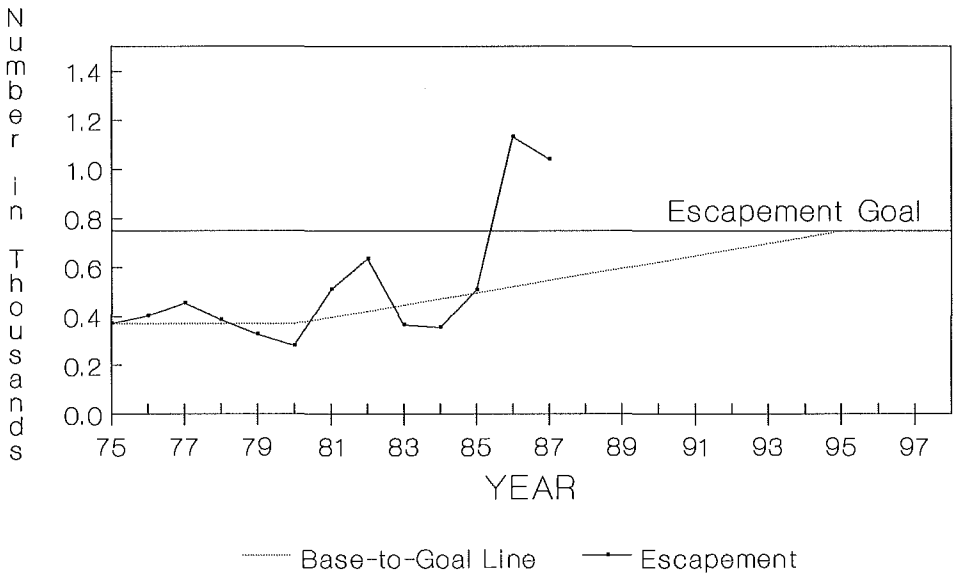
King Salmon Chinook Escpaements

Adult Chinook Salmon



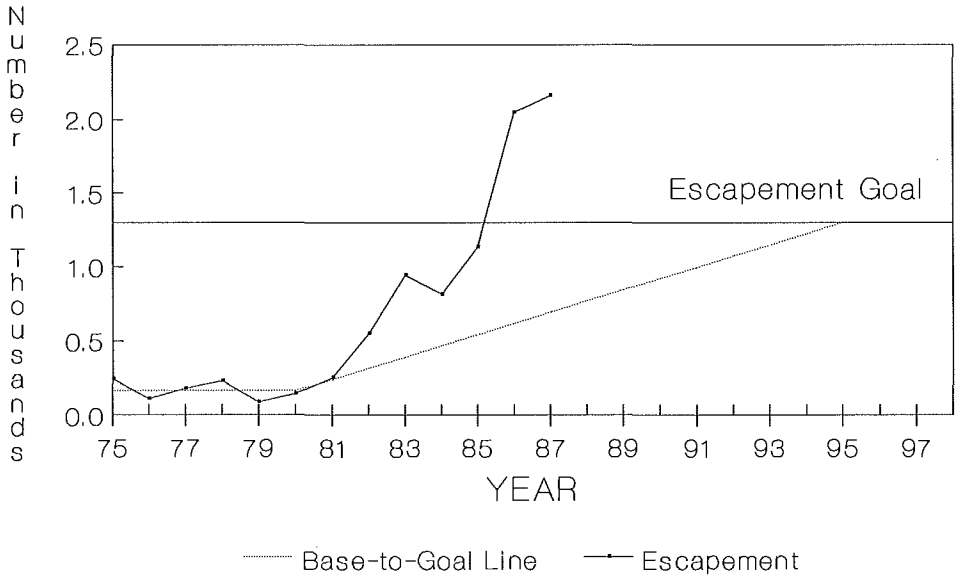
Andrews Chinook Escapements

Adult Chinook Salmon



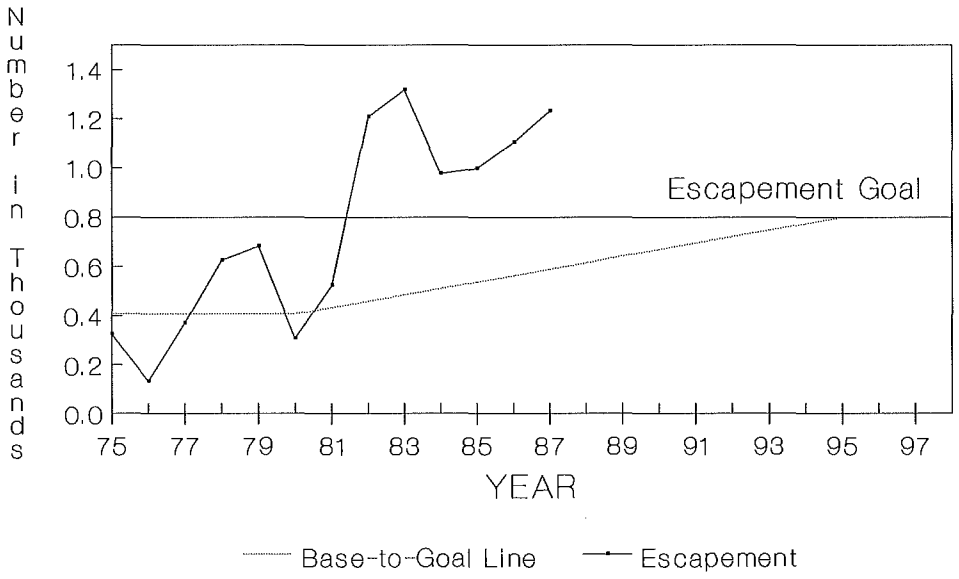
Blossom River Chinook Escapements

Adult Chinook Salmon



Keta River Chinook Escapements

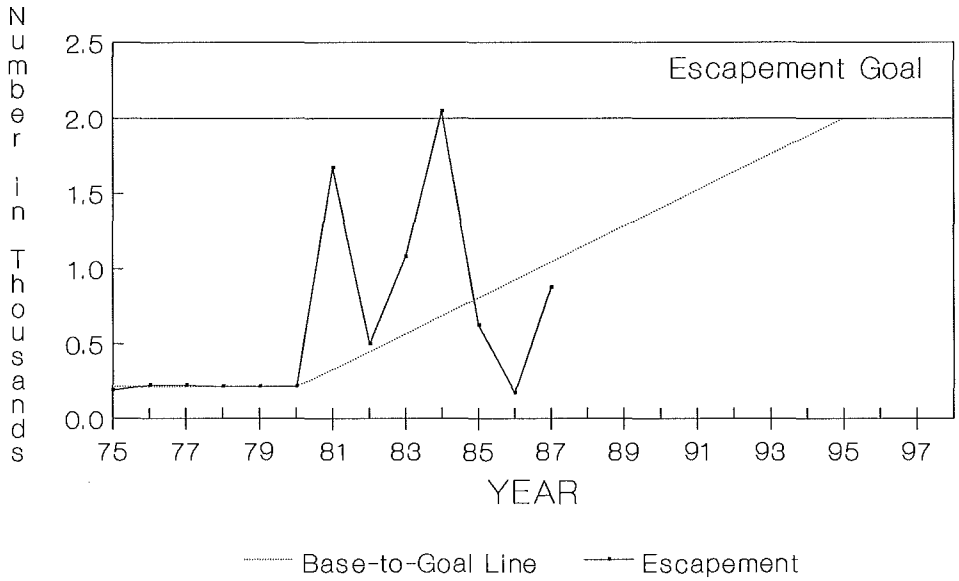
Adult Chinook Salmon



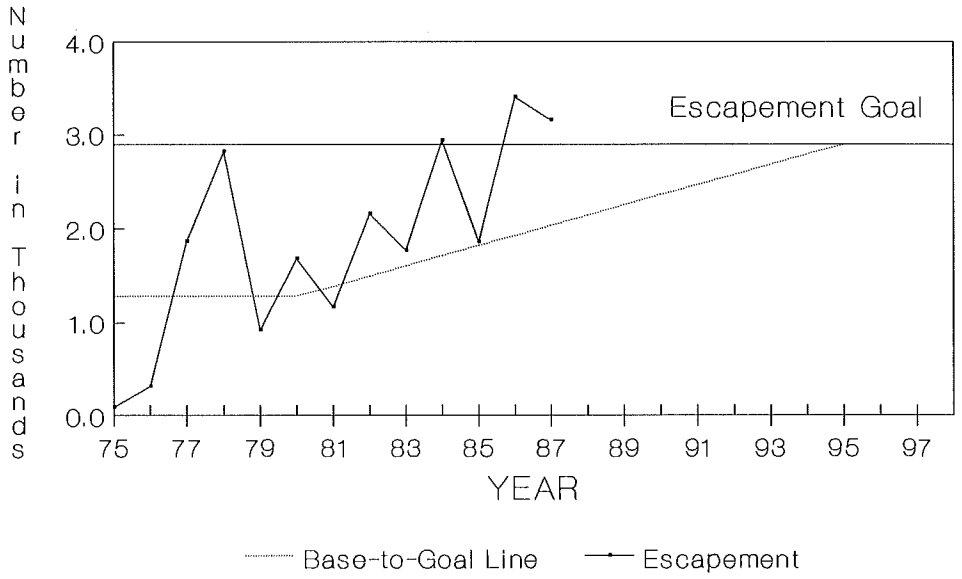
Chilkat River Chinook Escapements

U. S. Estimates and Goals

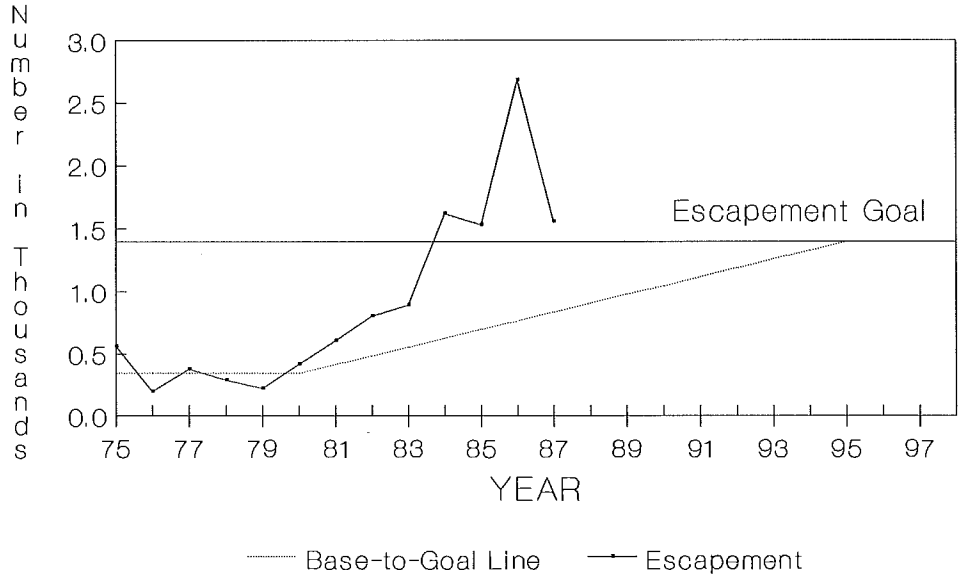
Adult Chinook Salmon



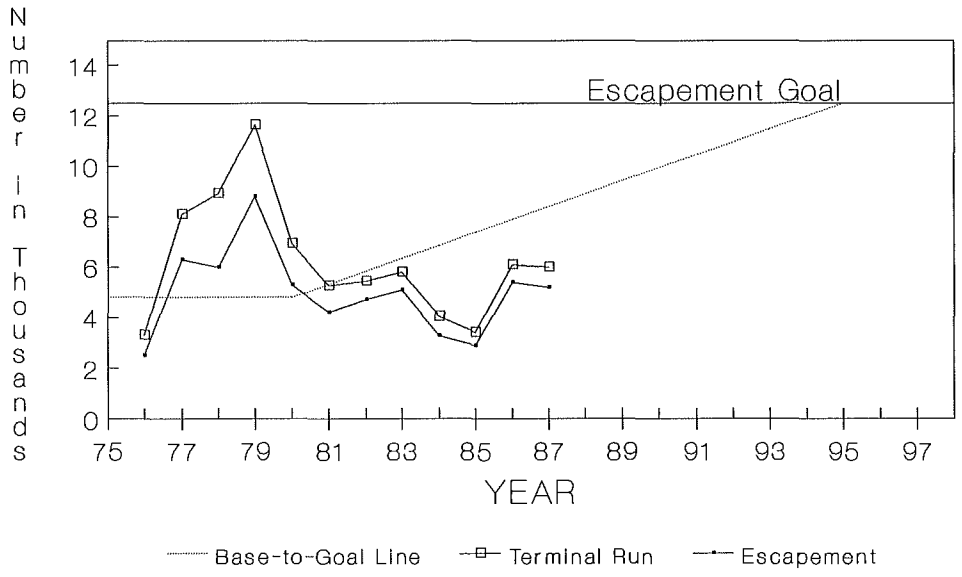
Unuk River Chinook Escapements
U. S. Estimates and Goals
Adult Chinook Salmon



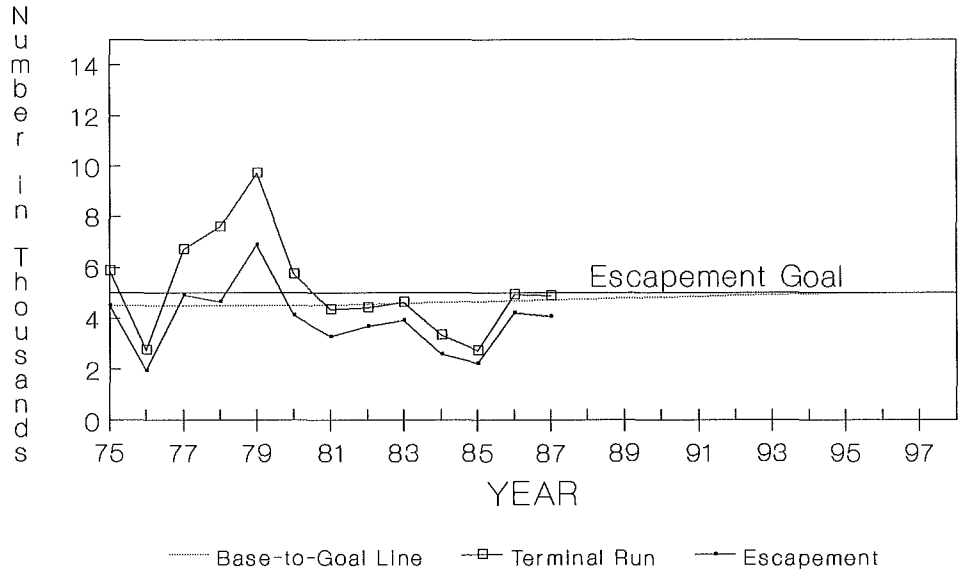
Chikamin R. Chinook Escapements
U. S. Estimates and Goals
Adult Chinook Salmon



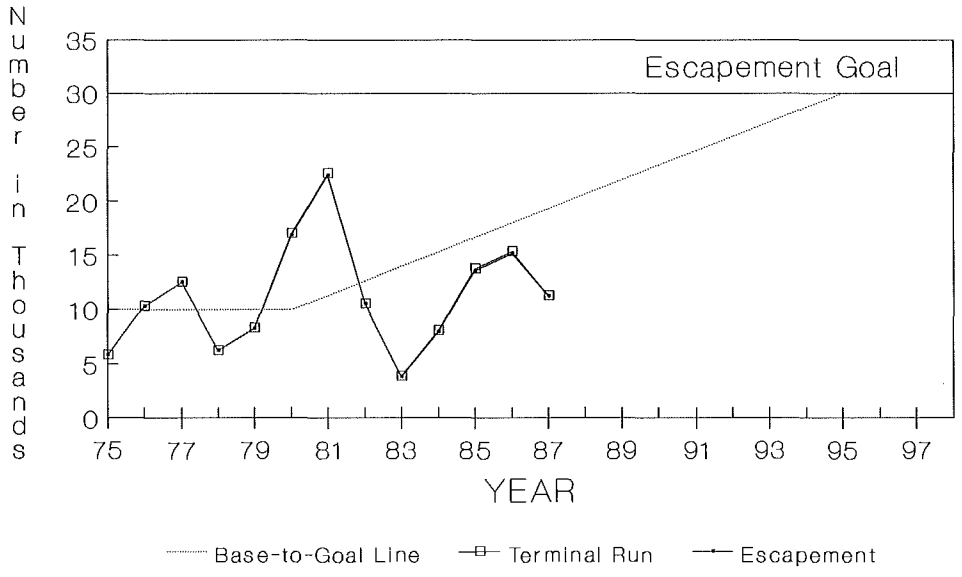
Alsek Chinook Escapements
Canadian Estimates and Goals
Adult Chinook Salmon



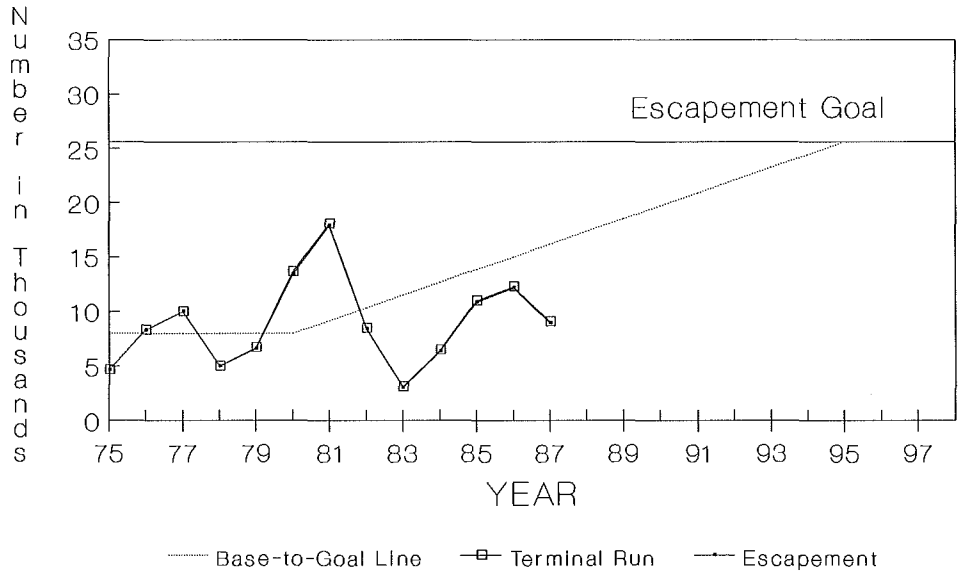
Alsek Chinook Escapements
U. S. Estimates and Goals
Adult Chinook Salmon



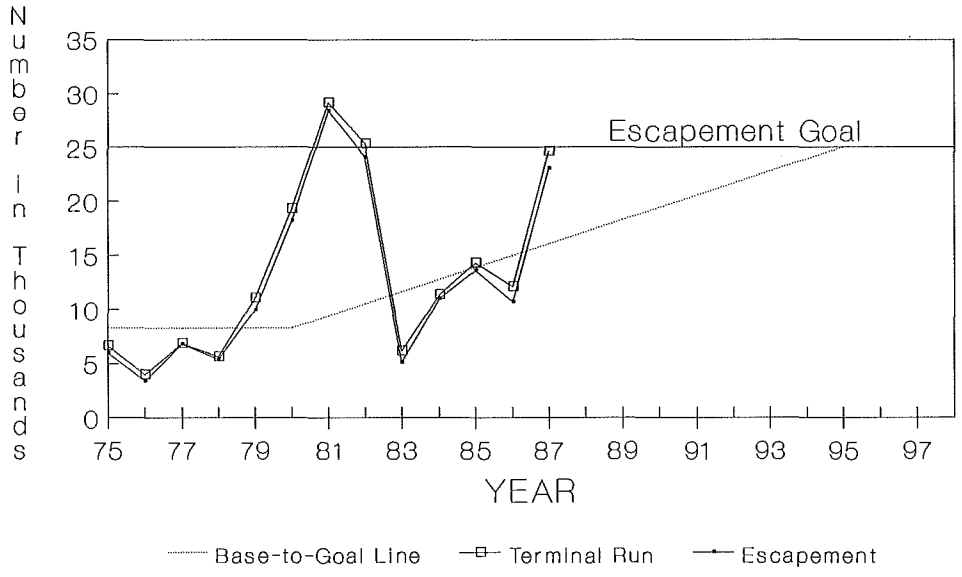
Taku Chinook Escapements
Canadian Estimates and Goals
Adult Chinook Salmon



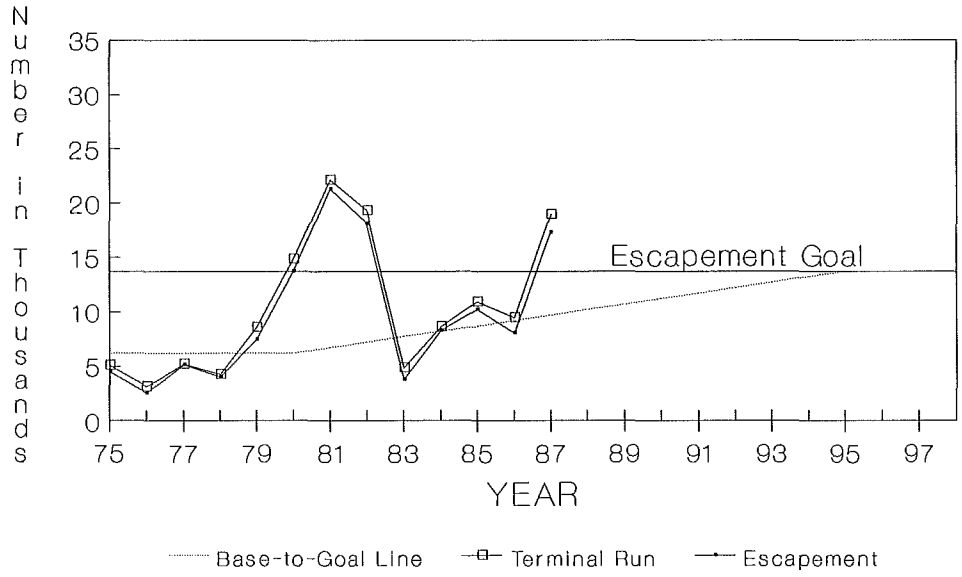
Taku Chinook Escapements
U. S. Estimates and Goals
Adult Chinook Salmon



Stikine Chinook Escapements
Canadian Estimates and Goals
Adult Chinook Salmon

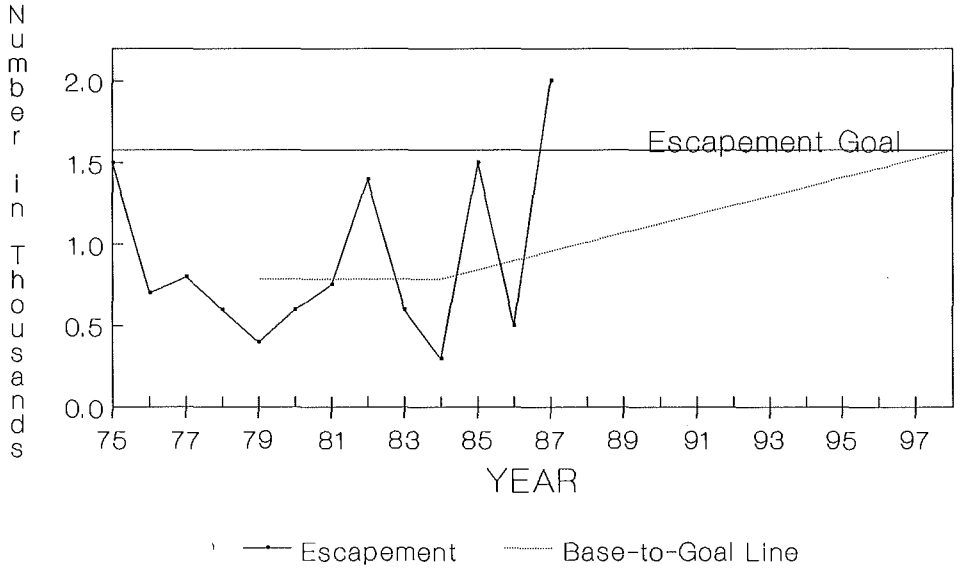


Stikine Chinook Escapements
U. S. Estimates and Goals
Adult Chinook Salmon



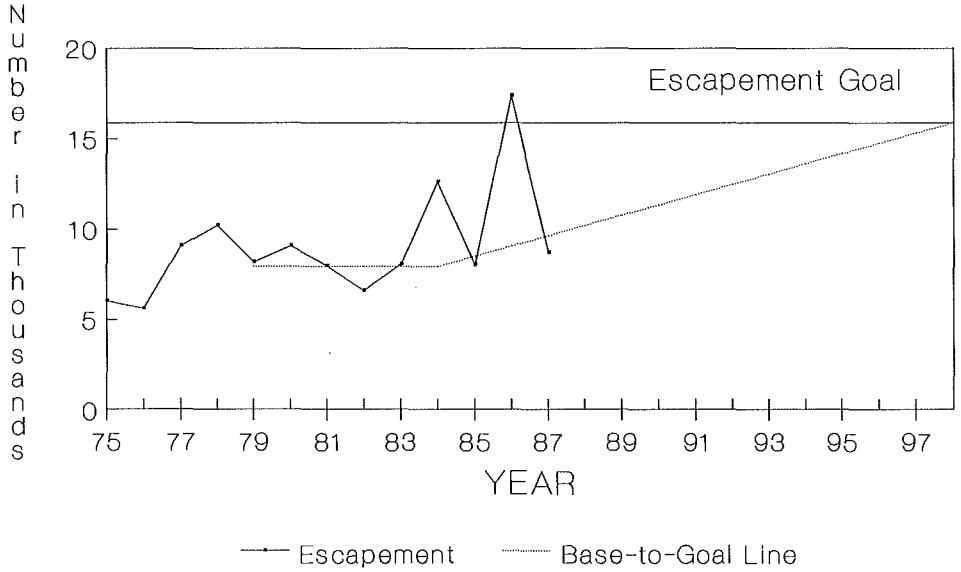
Q.C.I. (Yakoun R.) Escapements

Adult Chinook Salmon



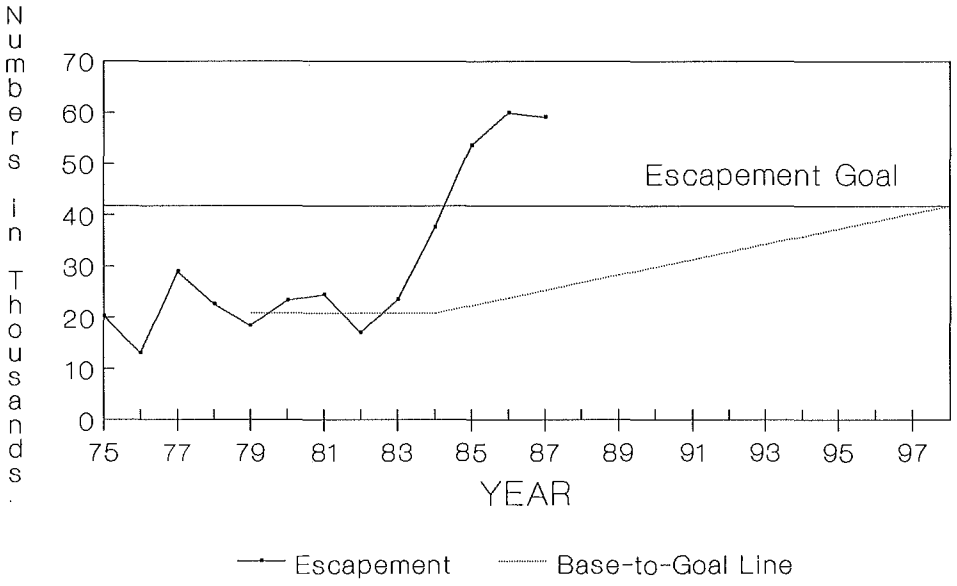
Nass Area Chinook Escapements

Adult Chinook Salmon



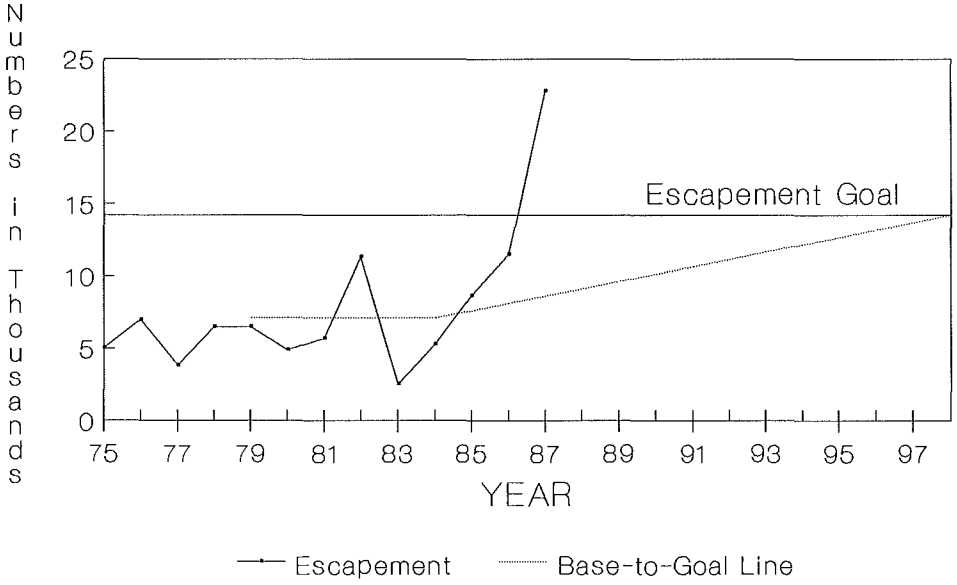
Skeena Area Chinook Escapements

Adult Chinook Salmon



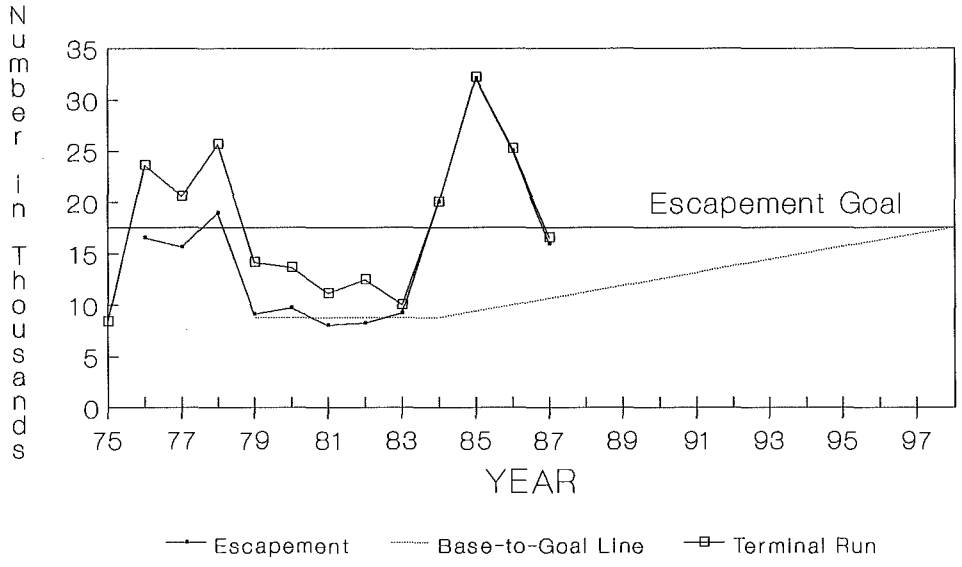
Kitimat/Butedale Chinook Escapements

Adult Chinook Salmon



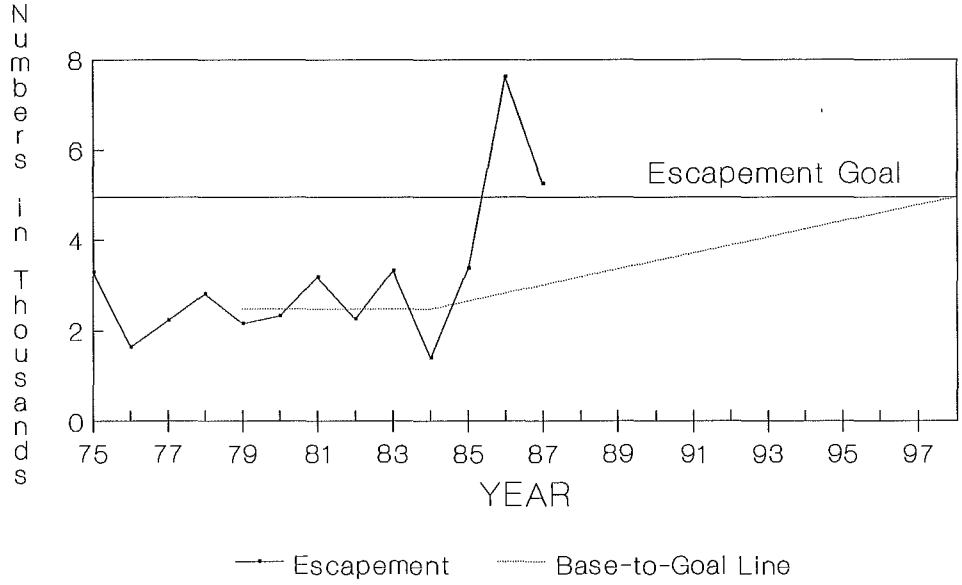
Bella Coola Chinook Escapements

Adult Chinook Salmon



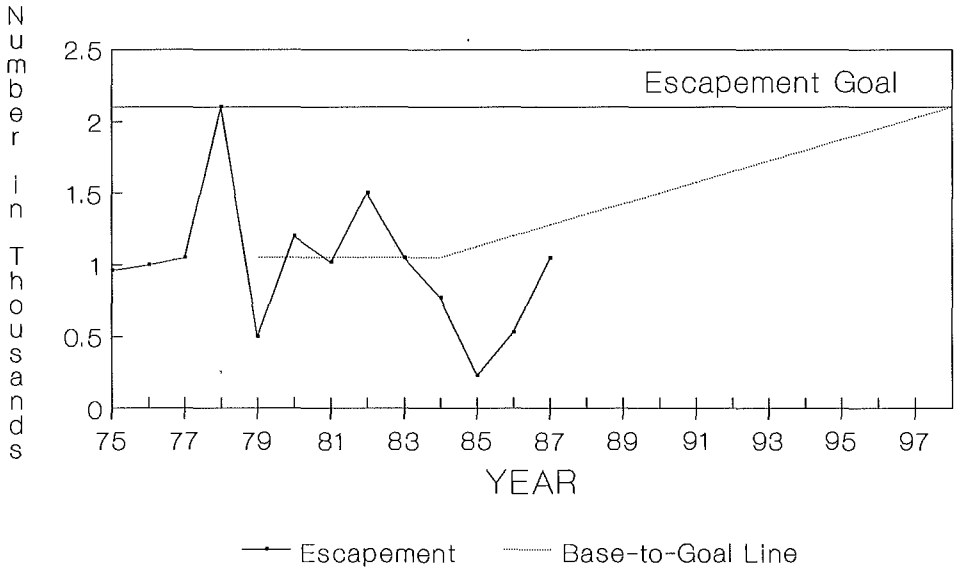
Rivers Inlet Chinook Escapements

Adult Chinook Salmon



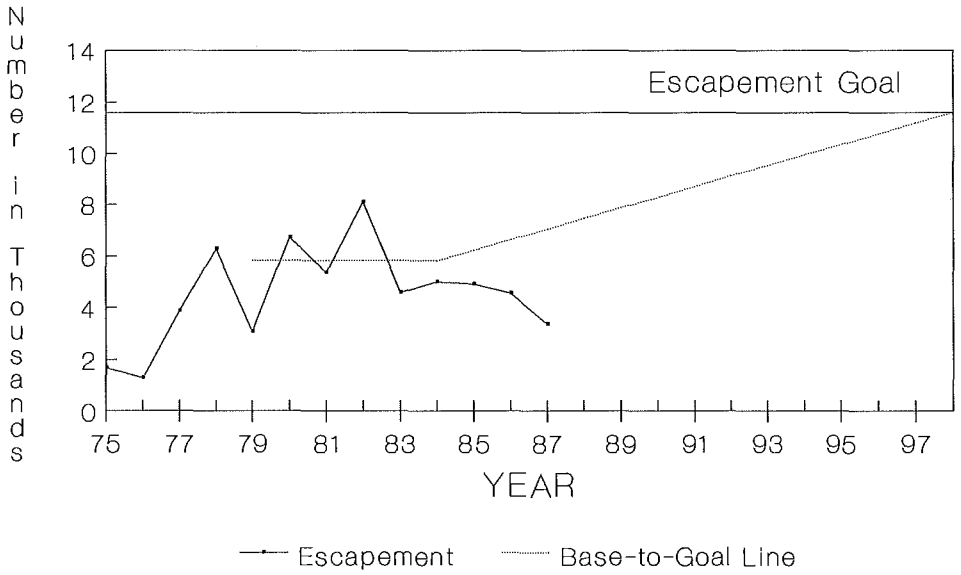
Smith Inlet Chinook Escapements

Adult Chinook Salmon



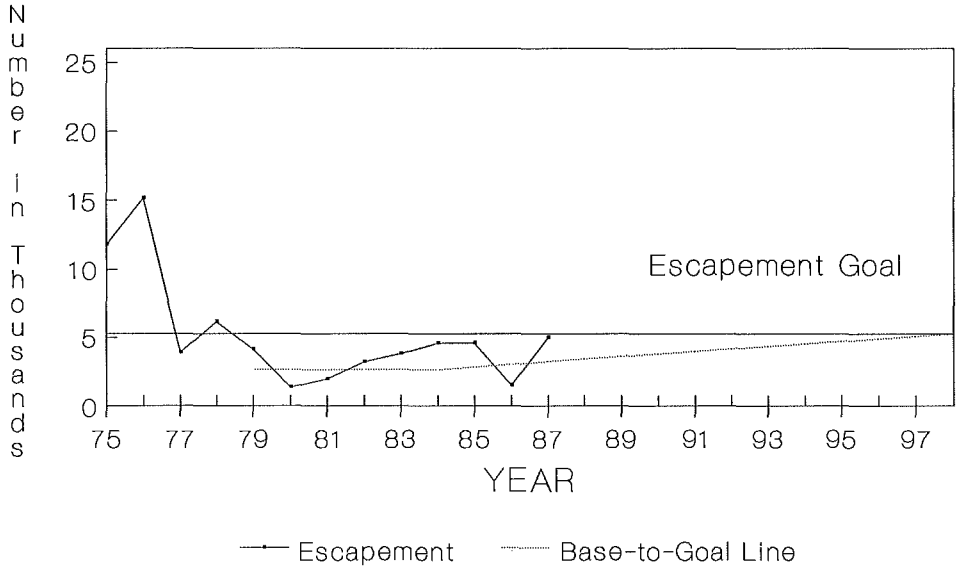
WCVI Chinook Escapements

Adult Chinook Salmon



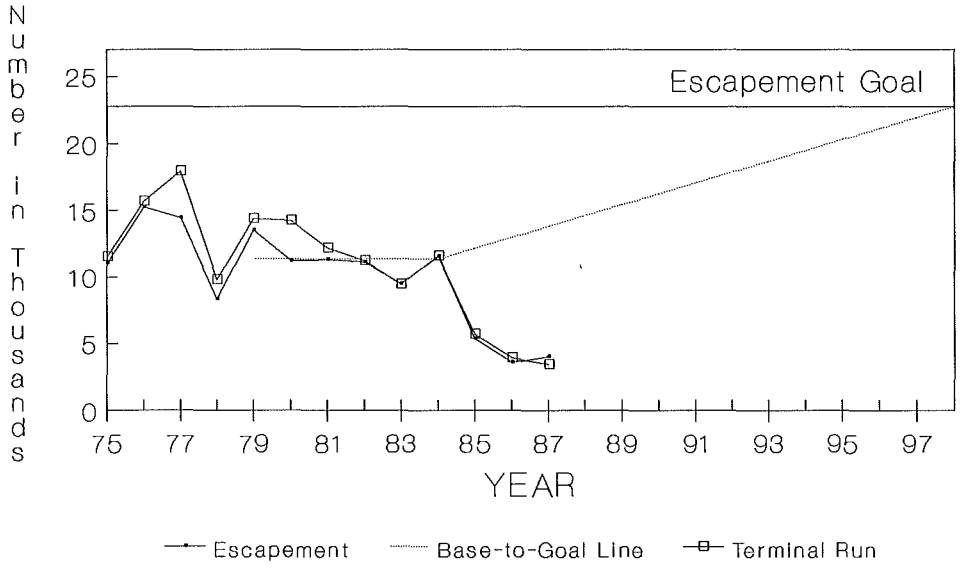
Upper Georgia Str. Chinook Escapements

Adult Chinook Salmon

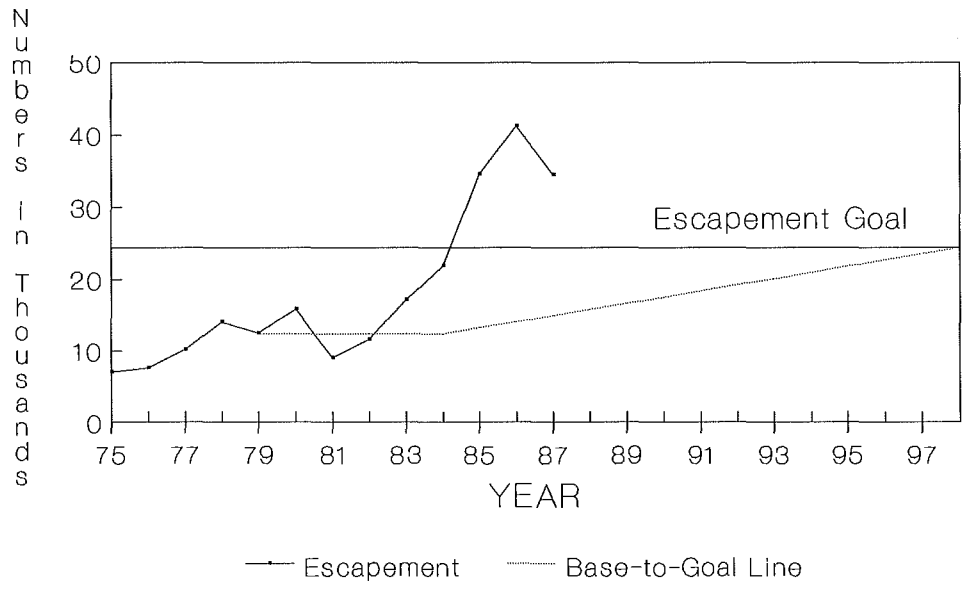


Lower Georgia Str. Chinook Escapements

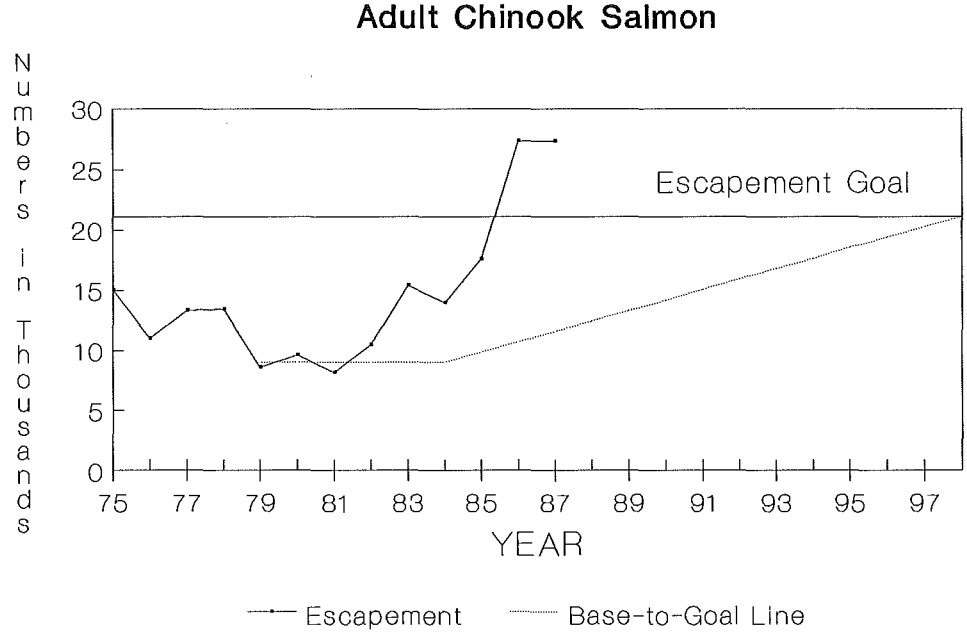
Adult Chinook Salmon



Upper Fraser R. Chinook Escapements

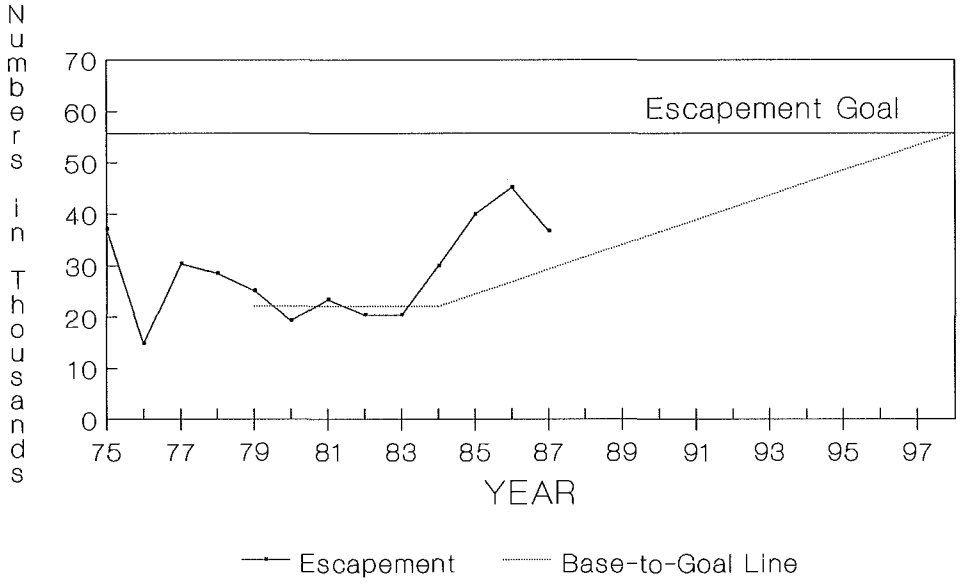


Middle Fraser R. Chinook Escapements



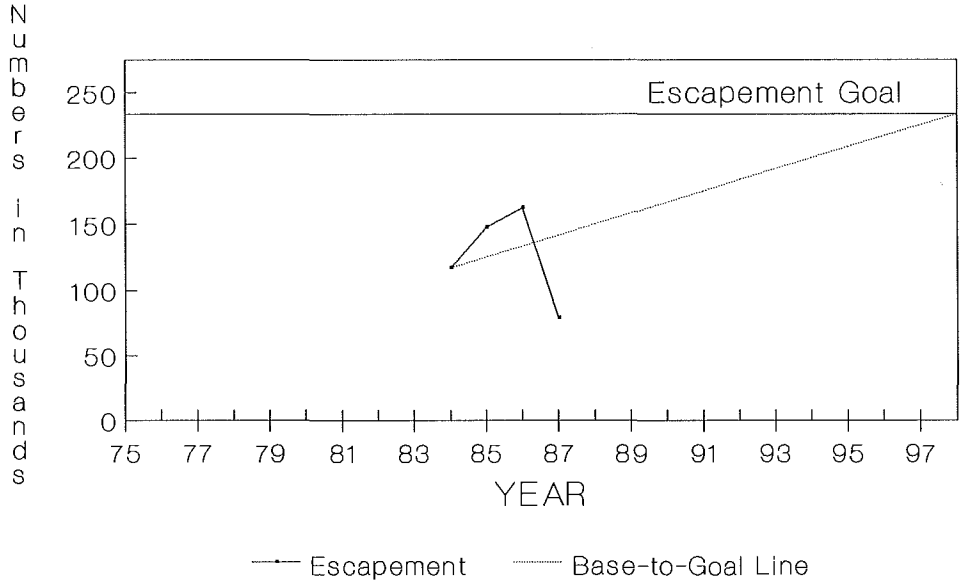
Thompson R. Chinook Escapements

Adult Chinook Salmon



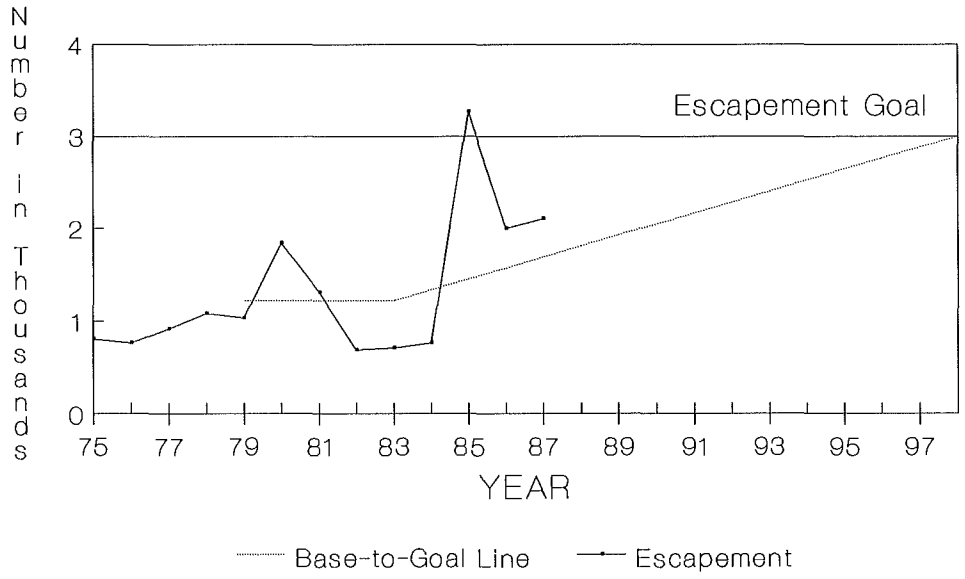
Harrison Chinook Escapements

Adult Chinook Salmon



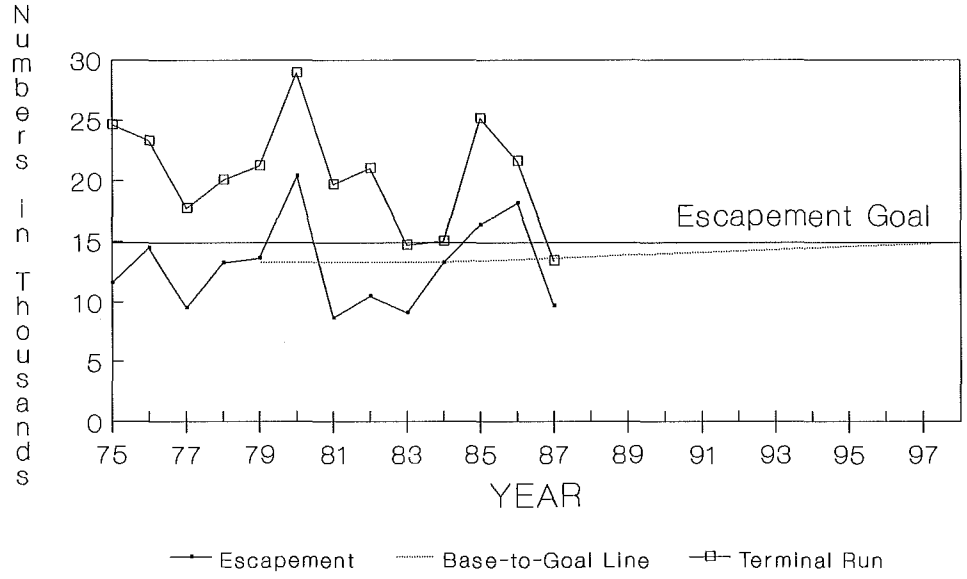
Skagit Spring Chinook Escapements

Adult Chinook Salmon



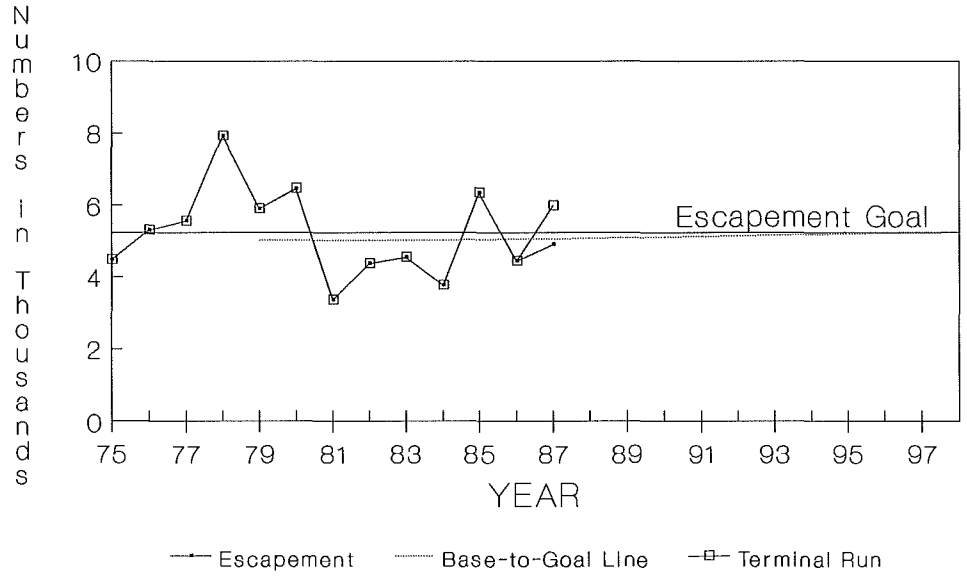
Skagit Sum./Fall Chinook Escapements

Adult Chinook Salmon



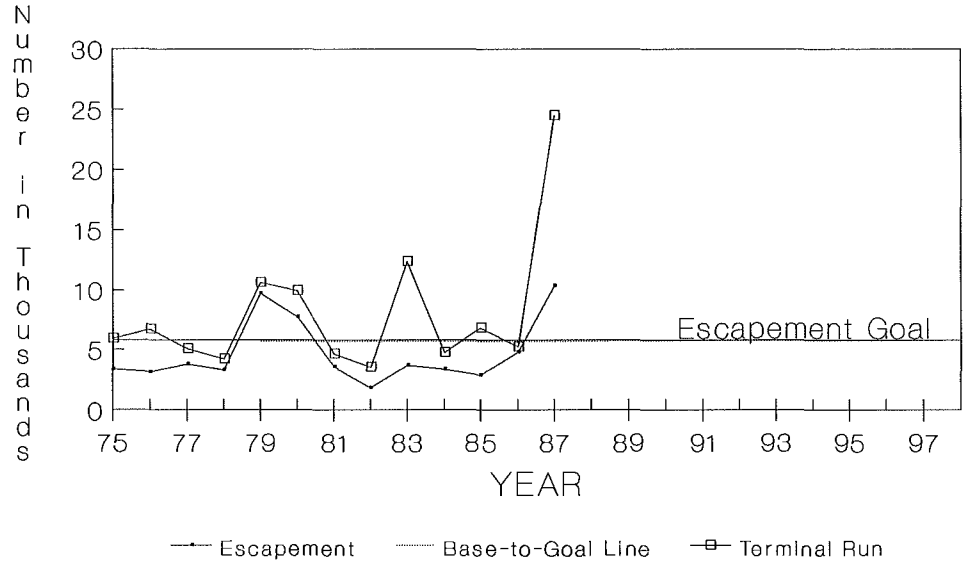
Snohomish River Chinook Escapements

Adult Chinook Salmon



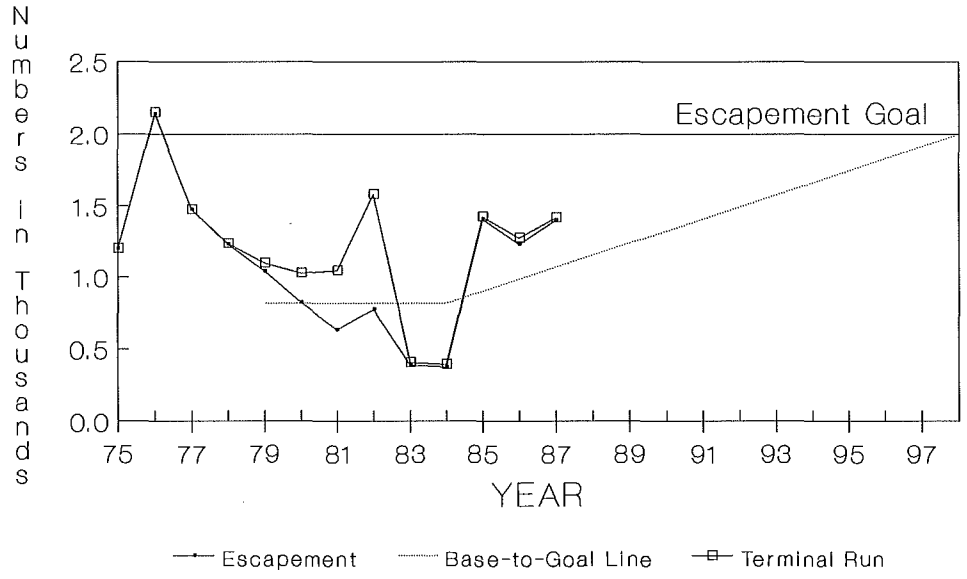
Green River Chinook Escapements

Adult Chinook Salmon



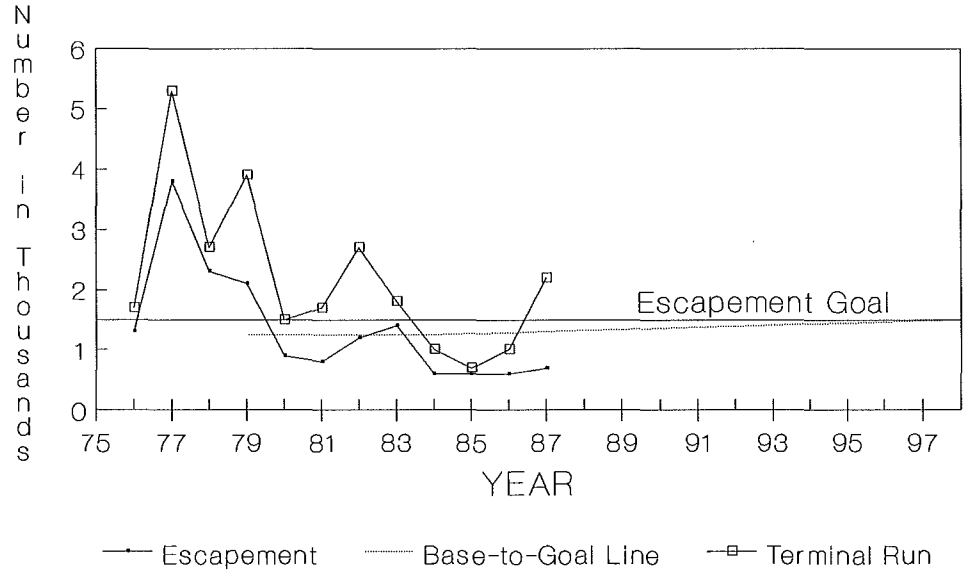
Stillaguamish River Chinook Escapements

Adult Chinook Salmon



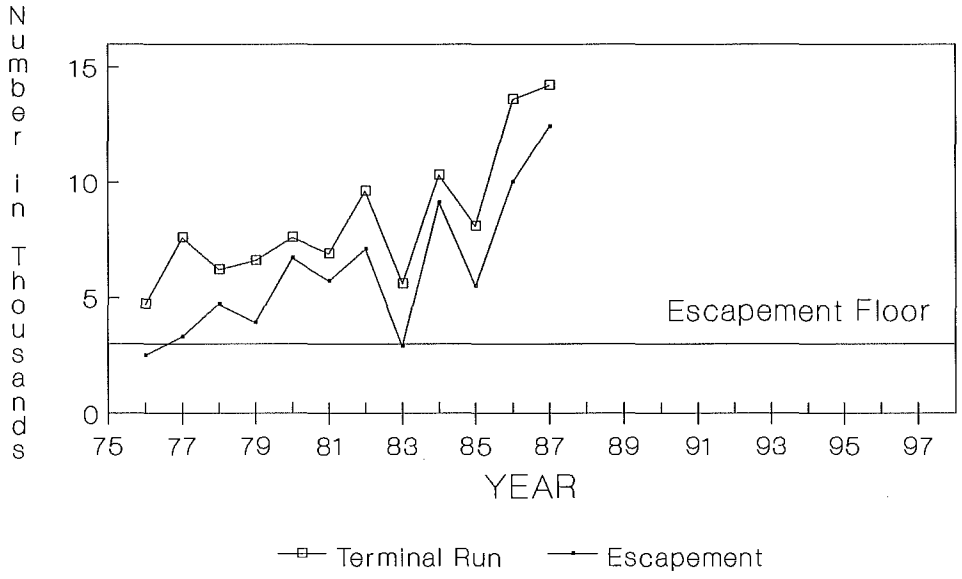
Quillayute Summer Chinook Escapements

Adult Chinook Salmon



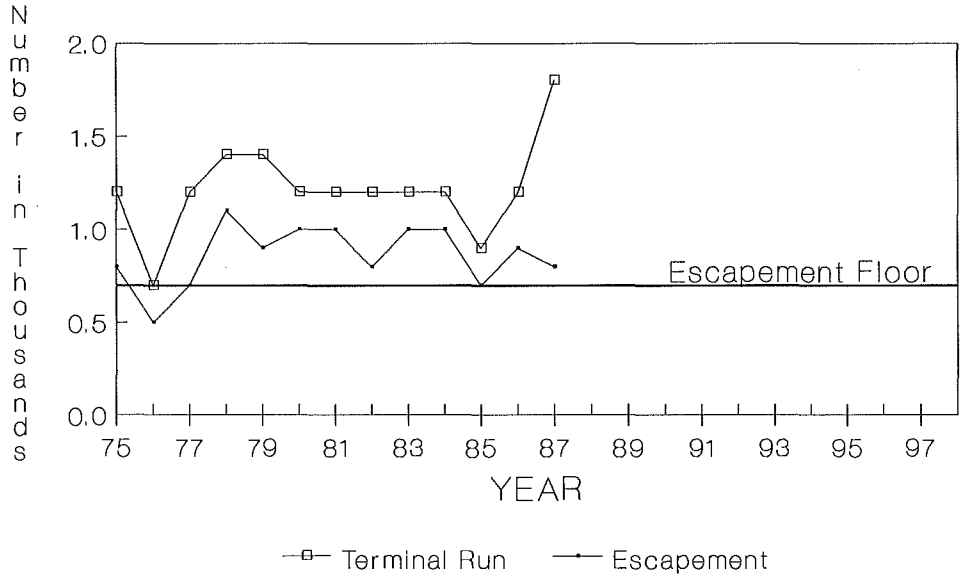
Quillayute Fall Chinook Escapements

Adult Chinook Salmon



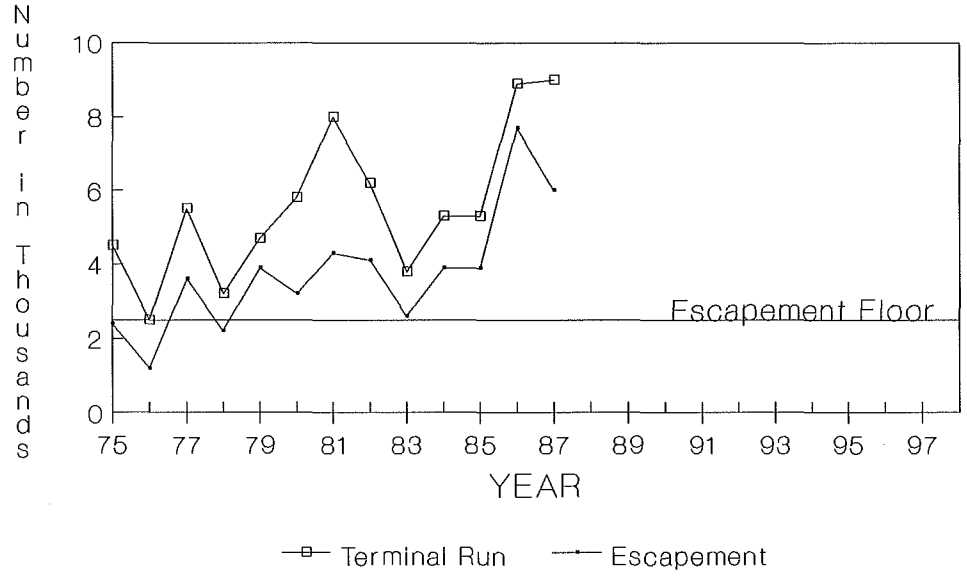
Queets Spr/Sum Chinook Escapements

Adult Chinook Salmon



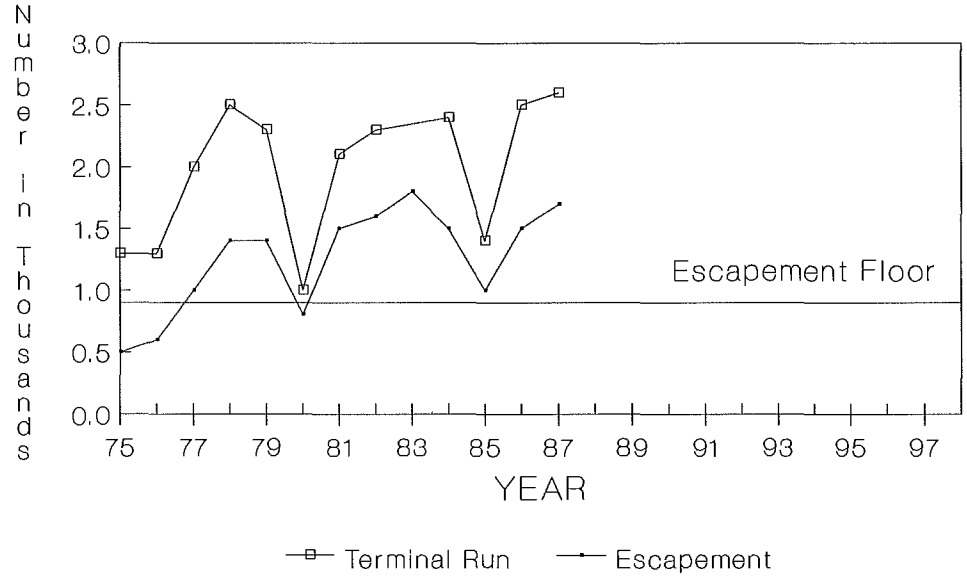
Queets Fall Chinook Escapements

Adult Chinook Salmon



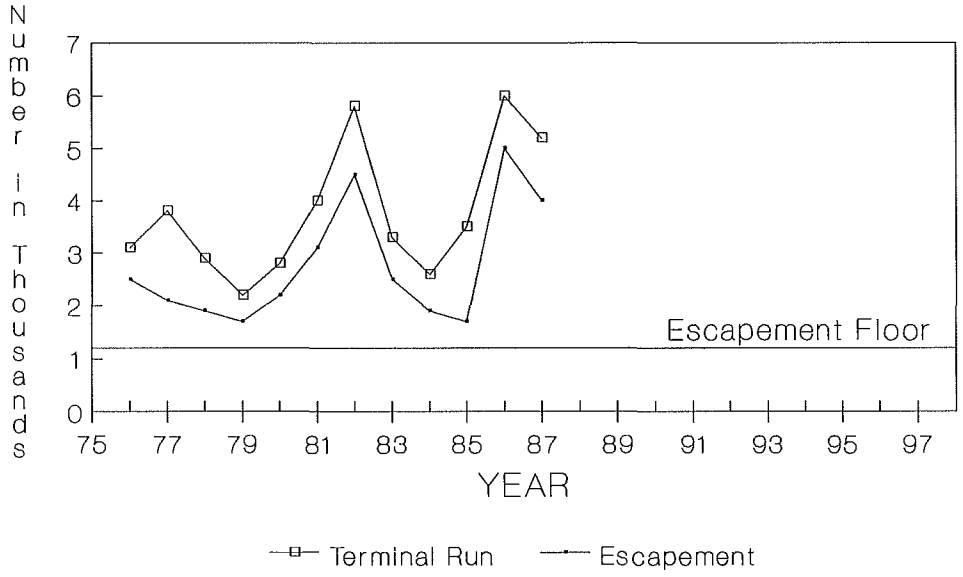
Hoh Spr/Sum Chinook Escapements

Adult Chinook Salmon



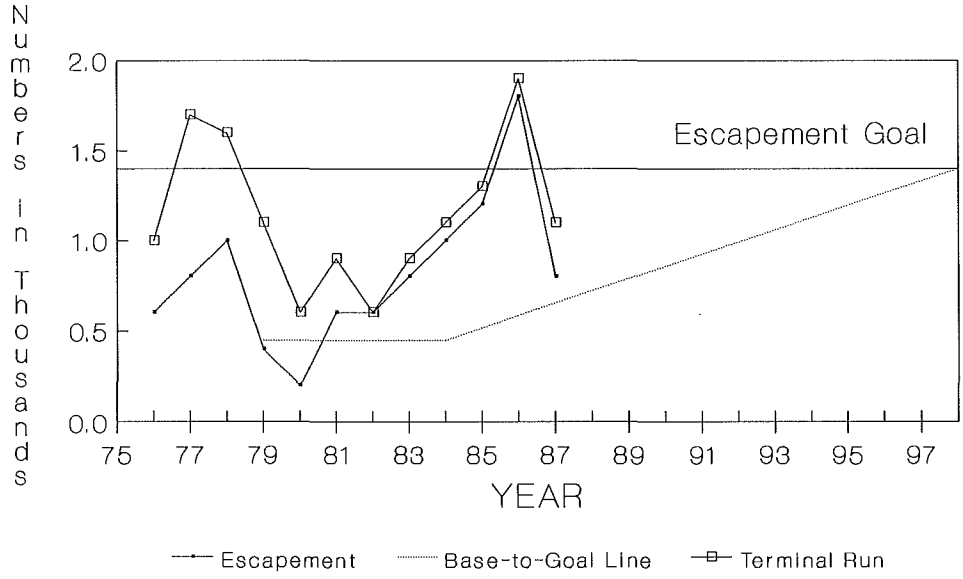
Hoh Fall Chinook Escapements

Adult Chinook Salmon



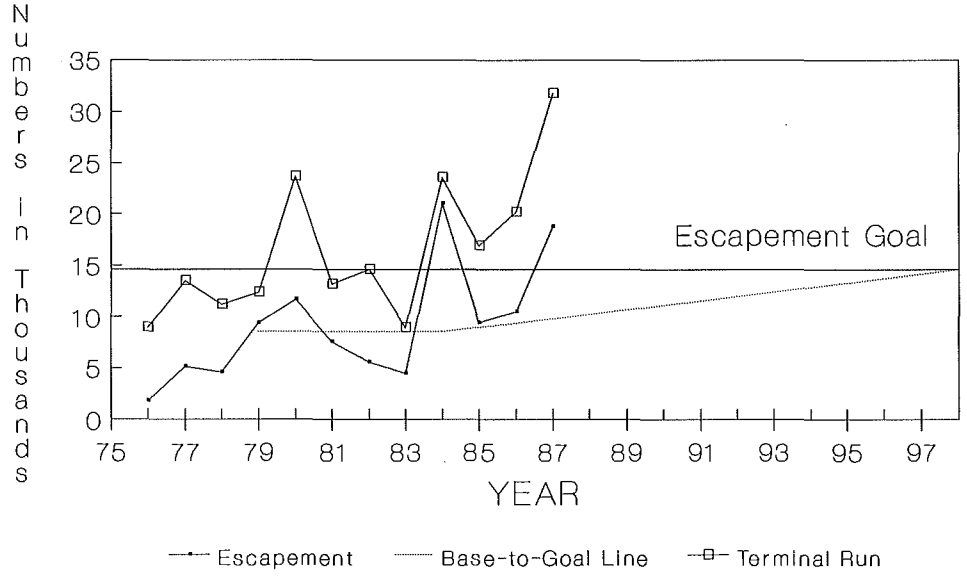
Grays Harbor Spring Chinook Escapements

Adult Chinook Salmon



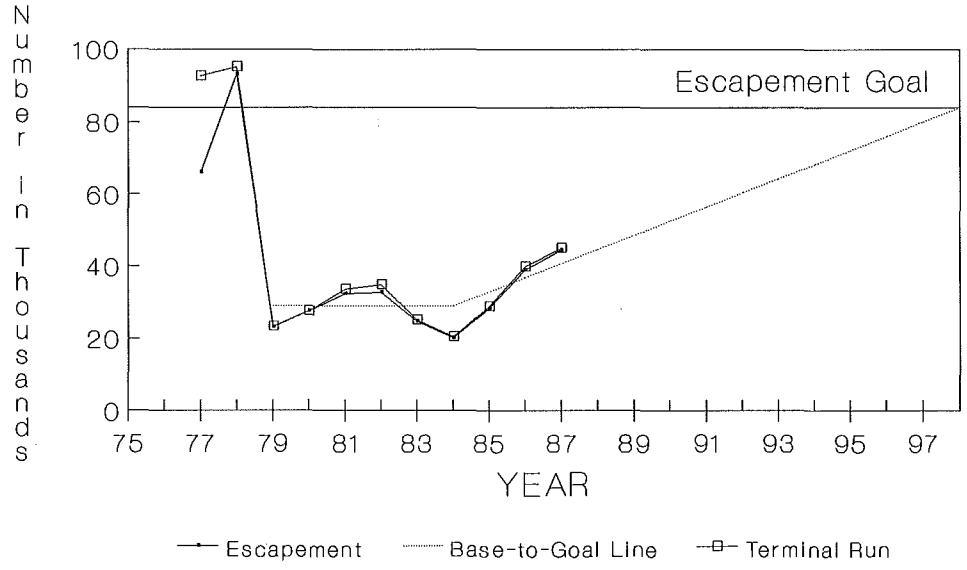
Grays Harbor Fall Chinook Escapements

Adult Chinook Salmon



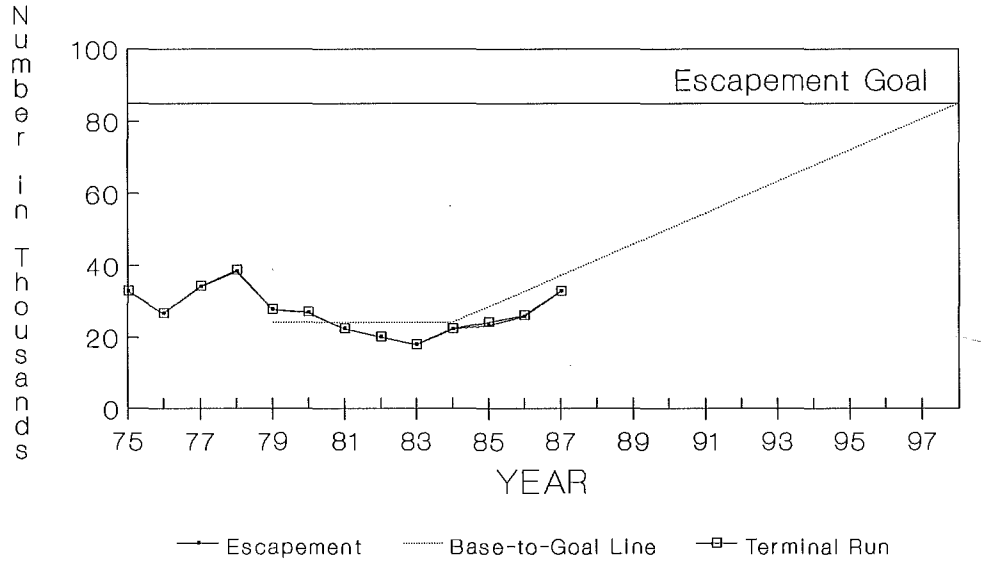
Columbia R. Spring Chinook Escapements

Adult Chinook Salmon



Columbia R. Summer Chinook Escapements

Adult Chinook Salmon



Columbia R. Bright Chinook Escapements

Adult Chinook Salmon