PACIFIC SALMON COMMISSION
JOINT CHINOOK TECHNICAL COMMITTEE
1991 ANNUAL REPORT

REPORT TCCHINOOK (92)-4

November 17, 1992

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a/ Individuals primarily responsible for completion of Chapter 3, Exploitation Rate Analysis

b/ Individuals primarily responsible for completion of Chapter 2, Escapement Assessment

List of Acronyms

ACRONYM	DEFINITIONS
ADF&G	Alaska Department of Fish & Game
AEQ	Adult Equivalent
AWG	Analytical Working Group
CBC	Central British Columbia Fishing area - Kitimat to Cape Caution
CDFO	Canadian Department of Fisheries & Oceans
CNR	Chinook Non Retention - all species except chinook fisheries
CR	Columbia River
CRITFC	Columbia River Intertribal Fish Commission
CTC	Chinook Technical Committee
CWT	Coded Wire Tags
est+fw	Estuary Plus Fresh Water Area
FR	Fraser River
GS	Strait of Georgia
IDFG	Idaho Department of Fish & Game
mar	Marine Area
mar+fw	Marine Plus Fresh Water Area
MSY	Maximum Sustainable Yield for a stock, in adult equivalents
MSY ER	Exploitation Rate sustainable at the escapement goal for a stock, in adult equivalents
NA	Not Available
NBC	Northern British Columbia - Dixon Entrance to Kitimat including Queen Charlotte Islands
NCBC	North Central British Columbia - Dixon Entrance to Cape Caution
NMFS	National Marine Fisheries Service
NOC	Oregon Coastal North Migrating Stocks
NR	Not Representative
NWIFC	Northwest Indian Fisheries Commission
ODFW	Oregon Department of Fish & Wildlife
PFMC	Pacific Fisheries Management Council
PS	Puget Sound
PSC	Pacific Salmon Commission
PST	Pacific Salmon Treaty
QIN	Quinault Nation
SEAK	Southeast Alaska - Cape Suckling to Dixon Entrance
TBR	Transboundary Rivers
USFWS	U.S. Fish & Wildlife Service
UW	University of Washington
WA/OR	Ocean areas off Washington and Oregon North of Cape Falcon
WAC	North Washington Coastal Area (Grays Harbor northward)
WCVI	West Coast Vancouver Island - excluding Area 20
WDF	Washington Department of Fisheries

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INTRODUCTION
THE PACIFIC SALMON TREATY CHINOOK REBUILDING PROGRAM

The Pacific Salmon Treaty 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 is to rebuild depressed naturally-spawning stocks and restore production through progressive increases in spawning escapements achieved through a combination of catch ceilings in selected mixed-stock fisheries and harvest rate restrictions in non-ceiling, pass-through fisheries. The Pacific Salmon Commission instructed the Chinook Technical Committee to "develop procedures to evaluate progress in the rebuilding of naturally spawning chinook stocks". The February 1987 Chinook Technical Committee Report, "Assessing Progress Toward Rebuilding Depressed Chinook Stocks", established an evaluation framework that documented an indicator stock program, identified information requirements, and recommended analytical procedures for the assessment of rebuilding. The Committee also identified a number of policy issues that had to be resolved before final conclusions could be reached regarding the status of rebuilding on a regional or coastwide basis. Agreement on those issues has not yet been reached.

In assessing the status of individual stocks under the rebuilding program, the Committee identified 3 main elements that must be examined: (1) spawning escapement levels; (2) fishery harvest and stock-specific exploitation rates; and (3) production responses to increases in spawning escapements. The Committee recommended that rebuilding assessment be stratified into 3 phases corresponding with three 5-year chinook life-cycles in the rebuilding period: 1984-1988; 1989-1993; and 1994-1998. The Committee felt that a three-phase approach to assessment would address the problems of changing data availability and quality over time.

This report provides an evaluation through the midpoint of the second phase of the rebuilding program using data through 1991. This report includes recent catch in fisheries of concern to the Pacific Salmon Commission (Chapter 1), assessment of spawning escapements for 42 escapement indicator stocks (Chapter 2), fishery harvest and stock-specific exploitation rates based on 40 exploitation rate indicator stocks (Chapter 3), and an integration of Chapters 2 and 3 and results from the chinook model (Chapter 4).

1991 CHINOOK SALMON CATCHES IN FISHERIES WITH CEILINGS

Estimates of 1991 catch for each fishery managed under a harvest ceiling established by the Pacific Salmon Commission (PSC) are presented below.

Area/Fisheries a/	Ceiling	Catch	Difference	
			Numbers	Percent
S.E. Alaska (T,N,S) b/	273	295.6	+22.6	+8.6%
North/Central B.C. (T,N,S) c/	273	303.2	+30.2	+11.1%
West Coast Vancouver Island (T)	360	202.9	-157.1	-43.6%
Strait of Georgia (T,S)	275	147.8	-127.2	-46.3%

a/ T=Troll; N=Net; S=Sport
b/ The actual total catch was 357,100 chinook, including a hatchery add-on of 61,400.
c/ Excludes 6,066 chinook caught in terminal areas in 1991, which Canada proposes to exclude from the ceiling.

CUMULATIVE DEVIATIONS FROM CATCH CEILINGS

A 7.5% cumulative management range was established by the PSC in 1987. Annual catches (without add-on) and deviations from catch ceilings since 1987 (in thousands of fish) are as follows:

Area/Fisheries	Ceiling	Catch					Total Deviation	Cumulative Deviation	
		1987	1988	1989	1990	1991		Numbers	Percent
S.E. Alaska (T,N,S) a/	263 b/	265.2	255.2	264.4	313.2	295.6	+29.6	+29.6	+11.3%c/
North/Central B.C. (T,N,S) d/	263 b/	282.8	245.6	301.2	253.0	303.2	+21.8	+21.8	+8.3% c/
West Coast Vancouver Island (T)	360	379.0	408.7	203.7	298.0	202.9	-307.7	-27.0	-7.5% e/
St. of Georgia (T,S)	275	159.7	138.6	161.3	146.3	147.8	-621.3	-20.6	-7.5% e/

a/ S.E. Alaska catches exclude hatchery add-ons of 16,700, 23,700, 26,700, 48,300, and 61,400 for 1987, 1988, 1989, 1990, and 1991 respectively.
b/ The 1990 ceiling was 302,000, and the 1991 ceiling was 273,000.
c/ These overages exceed the 7.5% management range.
d/ Catches exclude 4,819, 5,549, and 6,066 chinook caught in terminal areas in 1989, 1990, and 1991, respectively, for a total of 16,434.
e/ Negative deviations below the 7.5% management range can not be accumulated.

ESCAPEMENT ASSESSMENT

Our objective is to assess the rebuilding status of each escapement indicator stock through an evaluation of 1) the mean escapement in the base period and the rebuilding period, 2) consistency with a linear approximation of the expected rebuilding pattern, and 3) a positive trend in escapements. As in 1990, 42 naturally spawning escapement indicator stocks were included in the assessment. These stocks represent distinct naturally spawning populations or management groups that originate from individual rivers or watersheds. Some stocks represent several populations aggregated by region and life history type.

The rebuilding response of the escapement indicator stocks is inconsistent with expectations. There has been a general decline in the proportion of stocks that are classified as rebuilding, while the proportion of stocks that are not rebuilding has increased. Furthermore, 29 of the 42 indicator stocks had lower escapements in 1991 than in 1990 and less than half (16 of 36) of the escapement indicator stocks with goals are currently classified as Above Goal, Rebuilding, or Probably Rebuilding. This is especially significant since most stocks are now more than halfway and the remainder are more than two-thirds through their rebuilding programs. Of particular concern are the 15 stocks classified as Not Rebuilding or Probably Not Rebuilding. In 1991, the escapements of all of these stocks were less than 60% of their rebuilding goals and, for seven of these 15 stocks, the average escapement during the rebuilding period has actually declined from the base period level.

STOCKS WITH ESCAPEMENT GOALS				
CATEGORY	Assessment for 1990 with 1991 methods [1]		Actual 1991 Assessment	
	#	%	#	%
Above Goal	12	34%	12	33%
Rebuilding	0	0%	1	3%
Probably Rebuilding	4	12%	3	8%
Indeterminate	9	26%	5	14%
Probably Not Rebuilding	10	29%	12	33%
Not Rebuilding	0	0%	3	8%
TOTAL	35	100%	36	100%

[1] Explanation of the difference between the 1990 and 1991 assessments may be found in Chapter 2, Section 2.3.

The poor response seen in half of the Southeast Alaska (SEAK) and Transboundary (TBR) stocks, primarily the Behm Canal stocks, in 1991 is of particular concern to the CTC since this group has only four years remaining in its rebuilding program. In 1991, five of the ten stocks were classified as either Probably Not Rebuilding (4) or Not Rebuilding (1). These five stocks all declined in status from 1990 and their 1991 escapements ranged from only 30% to 54% of goal.

While the 26 stocks with goals and a target rebuilding date of 1998 still have seven years remaining to rebuild, the CTC is concerned by the large number of these stocks that are classified as Probably Not Rebuilding or Not Rebuilding. Although all six stocks without goals were classified in 1991 as showing a long-term escapement increase, all but the Oregon Coastal stock had declines in escapements from 1990. One of these stocks, Queets spring/summer, had an escapement below its management floor. For those stocks with goals, 58% (15 of 26) were assessed as either Indeterminate (5), Probably Not Rebuilding (8), or Not Rebuilding (2). Five stocks declined in status from 1990 while only one stock improved.

EXPLOITATION RATE ASSESSMENT

The primary purpose of the Exploitation Rate Assessment is to evaluate the effectiveness of management measures in PSC fisheries. The assessment relies upon coded wire tag (CWT) release and recovery data to estimate indices of fishery harvest rates, a CTC suggested passthrough index for depressed natural stocks, brood exploitation rates, and the survival of CWT groups. The utility of the indices is dependent on how representative the indicator stocks are of the actual populations harvested in the fisheries.

A basic premise of the rebuilding program is that fixed ceilings will act in concert with increases in the abundance of chinook to continually reduce harvest rates. In addition, the CTC recommended when the rebuilding program was developed that restrictions in the length of the season, or other restrictions designed to reduce harvest rates, should be implemented in years in which abundance precluded harvesting the full ceiling without an increase in the harvest rate (PSC 1991). Since 1985, the SEAK and North/Central B.C. (NCBC) all gear fisheries and Georgia Strait (GS) troll fishery have been managed primarily through the use of ceilings, while the West Coast Vancouver Island (WCVI) troll and GS sport fisheries have implemented restrictions related to effort or bag limits to control harvest rates.

For all ceiling fisheries, the initial objective was to achieve the 1985 target reduction in harvest rates. Further reductions in harvest rates were expected to occur in subsequent years as abundance increased. The fishery indices indicate that only the NCBC fishery has consistently achieved these objectives. WCVI has shown mixed results with respect to fishery index changes. Since 1985 there have been 3 years with fishery index changes greater than or equal to the 1985 target reduction, 1 year near the target, and 3 years with fishery indices less or much less than the 1985 target reduction. Management measures in the SEAK and GS fisheries have been insufficient to consistently achieve the target harvest rate reductions.

While the 1985 target harvest rate reduction in the SEAK fishery has been achieved for the reported catch, the total harvest rate reduction has not been met due to the high chinook availability and/or abundance and management regime for the SEAK fisheries, including prolonged chinook nonretention (CNR) periods for the troll fishery. In 1991, the length of the general troll summer season was the shortest (7.5 days) since the inception of the PST primarily due to a high abundance and large catch per fleet day. The 1991 CNR period was 64.5 days (1988 to 1990 average was 51.1).

Since 1989, catch in the WCVI fishery has been controlled primarily through restrictions in fishing areas and by limiting the total effort. The 1990 Letter of Transmittal stated that "it is Canada's intention in 1990 to manage this fishery in a manner so as not to exceed the 1985-87 average troll fishery harvest rate". To this end fishing effort, both in terms of days open and total boat days, was restricted to the average 1985-1987 level in each year. Revised estimates of harvest rates included in this report indicate that the commitment to harvest rate reductions was achieved. The 1985-1991 average reduction in the harvest rate of 22% is near the 1985 target reduction of 24%.

Harvest rates in the combined GS sport and troll fishery remain above even the 1985 target level (1985-91 average reduction being 72% of the 1985 target reduction) primarily due to the sport fishery. Management actions which have been taken in the sport fishery are summarized in Chapter 1. Despite these actions, the harvest rate in the sport fishery was estimated to be only 2% less than the base period level. This indicates that management actions taken in this fishery have been insufficient to achieve the 1985 target reduction.

FISHERY	AGE	CHANGE IN TOTAL FISHERY HARVEST RATES FROM BASE PERIOD								
		1985	1986	1987	1988	1989	1990	1991	85-91 AVERAGE	85 TARGET REDUCTION
SEAK Troll	3,4,5	16%	5%	1%	-22%	-30%	-12%	-4%	- 7%	-22%
NCBC Troll	3,4,5	-8%	-20%	-21%	-38%	-31%	-30%	-27%	-25%	-16%
WCVI Troll	3,4	-11%	-4%	-24%	2%	-57%	-19%	-43%	-22%	-24%
Strait of Georgia Sport & Troll	3,4,5	-53%	-27%	-34%	-41%	-18%	-40%	-23%	-34%	-47%

Passthrough indices provided in this report were computed using methods suggested by the CTC in 1992. Although these methods are consistent with assumptions used by the CTC in previous analyses of fishery management regimes, it should be noted that the PSC has not formally provided the CTC with a definition of passthrough which can be used to analytically assess if the passthrough provision of the PST has been satisfied. In addition, the reported indices do not include the WCVI sport fishery and some terminal sport and net fisheries. These fisheries were excluded in instances in which the exploitation rate indicator stock was of hatchery origin and subject to terminal fisheries designed to harvest surplus hatchery production. The analysis indicated that the passthrough commitment has generally been achieved for depressed natural stocks. Exceptions occurred in 1990 for U.S. fisheries (Stillaguamish, Snohomish, and Columbia River Summer stocks), and 1986 and 1989 for Canadian fisheries (Lower GS and Upper GS stocks, respectively).

Implementation of the PST ceilings was expected to reduce brood exploitation rates by 16 percentage points for the Georgia Strait stock and 9 percentage points for the WCVI stock. For reported catch, these targets have now been achieved. Unfortunately, reductions in exploitation associated with reported catch have been offset to a large extent by increases related to incidental mortality. For example, while the average Robertson Creek (exploitation indicator stock for the WCVI) brood exploitation rate for reported catch in ocean fisheries has declined by 11 percentage points, the brood exploitation rate for total mortality in ocean fisheries has declined by 7 percentage points. Similarly, the average Big Qualicum (exploitation indicator stock for Lower GS) brood exploitation rate for reported catch in all fisheries has declined by 20 percentage points, but the brood exploitation rate for total mortality in all fisheries has declined by only 7 percentage points.

The 1982-1987 average brood year ocean exploitation rates for total mortality have declined from base period levels for 13 of the 16 stocks for which adequate data are available. For these stocks, the median decline was 8 percentage points from the base period. The average 1982-1987 brood year ocean exploitation rates increased from base period levels for three stocks. The median decline in total ocean exploitation rates for all stocks was 6.5 percentage points.

INTEGRATED ANALYSIS

The technical basis for development of the PST chinook rebuilding program in 1984 relied upon a chinook model that included four stock types: Columbia Upriver Bright, Columbia River Tule, WCVI fall, and GS fall. The Columbia Upriver Bright stock was used as an indicator for far-north migrating fall-type stocks originating in Washington and Oregon, the Columbia River Tule (Spring Creek Hatchery) stock was an indicator for early-maturing chinook stocks harvested off the coast of the WCVI and Washington, the WCVI was represented by Robertson Creek Hatchery to indicate impacts on far-north, fall-type stocks originating in Canada, and the GS stock was represented by the Big Qualicum stock as an indicator for fall-type stocks that contribute primarily to GS fisheries.

The model was used to evaluate a number of potential management actions, with the objective of identifying a regime that would rebuild depressed natural stocks by 1998 and was acceptable to the Parties. The task of rebuilding WCVI and GS stocks was most critical in the development of the PST's management regime since the Columbia Upriver Bright stock was close to its escapement goal and the Spring Creek stock primarily represented hatchery production. The response of stocks other than WCVI and GS to the PST management regime was expected to vary depending upon stock specific attributes, including distribution and productivity. Realizing the limitations of the data available at the time, and the general objective to "attain by 1998, escapement goals...of naturally spawning chinook stocks, as represented by indicator stocks identified by the Parties", the original chinook chapter recognized that modification of the PST chinook management regime might be required to achieve the rebuilding objective.

As expected, the analysis presented in this chapter indicates that the response of stocks to the PST management regime has been highly variable. Among the stock groups which include more than one escapement indicator stock, there is no instance in which the rebuilding status of all stocks is equivalent, and in some instances, the status ranges from Above Goal to Not Rebuilding.

The CTC provided an integrated assessment of the status of chinook stocks two years ago in the 1989 Annual Report. During the two years since the last assessment, if the rebuilding program were proceeding as expected, we would expect fishery and stock indices to have declined further below the 1985 target levels, further reductions in brood year exploitation rates, chinook abundance in fisheries to have increased, and most of the escapement indicator stocks to be in the upper status categories.

When the results of this assessment are compared with the 1989 Annual Report, it is apparent that these expectations have not been fulfilled.

1) In 1989, the 1985 target reductions were achieved in 3 of the 4 ceiling fisheries, and the average reduction was 34%. In 1991, the 1985 target reductions were achieved in 2 of the fisheries, and the average reduction was 24%.

2) In 1989, average brood exploitation rates for stock groups during the rebuilding period had declined by an average of 12% (8 percentage points). In 1991, brood exploitation rates had declined by an average of 10% (7 percentage points).

3) Comparing the rebuilding status of the 35 escapement indicator stocks with goals used in both the 1989 and 1991 assessments, 29% of the stocks were classified as Probably Not Rebuilding or Not Rebuilding in 1989 and 42% were in these categories in 1991.

4) The estimated model abundance of chinook available to the ceiling fisheries in 1991 was less than in 1989 with the exception of the GS sport and troll fishery.

ATTRIBUTE	1989	1991
Average Reduction in Ceiling Fishery Harvest Rates	34%	24%
Ocean Brood Exploitation Rates (Average Change From Base)	-12%	-10%
Percent of Escapement Indicator Stocks in Probably Not Rebuilding or Not Rebuilding Categories	23%	42%
Abundance Indices		
SEAK Troll	1.35	1.20
NCBC Troll	1.04	0.98
WCVI Troll	0.72	0.61
GS Sport and Troll	0.45	0.57

Bearing in mind the variability observed within the stock groups, several conclusions regarding the rebuilding program may be drawn:

1) **Above Average Survival Benefitted Far North Migrating Stocks.** Progress toward rebuilding was accelerated in the initial years of the PST by survival rates greater than the long term average for stocks for which a majority of the fishing mortality occurs in the NCBC and SEAK ceiling fisheries. In particular, escapements for many components of the Washington Coastal/Columbia River/Oregon summer/fall (WACO) (1983-1984 broods) and SEAK (1980-1982) stock groups showed substantial increases in escapement in the period from 1985 to 1989 which were likely related to good survival. Good survival, and the resultant increases in abundance, acted in conjunction with the ceilings to further increase escapements by reducing

harvest rates. These stock groups may also have benefitted from delayed openings in summer seasons and reductions in the exploitation rates in passthrough fisheries. Although the evidence is less conclusive, similar processes may have affected the NCBC and Upper Fraser stock groups. As survival rates declined, model estimates of abundance in the fisheries stabilized or declined, fishery indices increased, and escapement for many of the stocks also stabilized or declined. The 1989 report noted that "the survival of stocks contributing to the northern fisheries is expected to be poor...Consequently, the harvest rate reductions expected under the rebuilding program are not likely to be achieved." This statement continues to be applicable in 1992 and 1993, as survivals are projected to be substantially below the long-term average.

2) **Rebuilding Progress is Poor For Stocks Harvested in GS.** Escapement indicator stocks in stock groups in which more than 40% of the fishing mortality occurs in GS are classified as Probably Not Rebuilding (Lower GS, Lower Fraser Fall, and Skagit Spring). This is consistent with results from the chinook model, which predicts that the Lower GS stock and the Lower Fraser stock will not rebuild by 1998. The limited response of these stocks is likely due to poor recent survivals and the failure to meet target harvest rate reductions in some ceiling fisheries (the stock index for the Lower GS stock indicates that only 25% of the 1985 target reduction has been achieved). However, brood year total exploitation on the Big Qualicum exploitation indicator stock in Lower GS has been successfully reduced since the base period. Survivals of recent Lower GS broods are expected to remain poor but survival of the Lower Fraser stock is expected to improve relative to recent years. The 1989 CTC report stated that because "an additional [abundance] reduction of 9% is projected for 1990-1991... the 1985 target reductions are not likely to be achieved in 1990 and 1991 unless additional management actions are implemented." Although some additional management actions have been taken in GS (See Discussion, Chapter 3), these actions appear to have been insufficient.

3) **Mixed Progress For Stocks Primarily Harvested in U.S. Passthrough Fisheries.** The two stock groups with more than 40% of the fishing mortality in U.S. non-ceiling fisheries have displayed a mixed response to the PSC management regime. The North Puget Sound (PS) Summer/Fall stock group has responded poorly; all three of the stocks are in the Indeterminate or Not Rebuilding categories and the chinook model predicts that two of the three stocks in the group will not rebuild by 1998. Exploitation rates on these stocks remain high, despite harvest rate reductions in ceiling fisheries and satisfactory achievement of the CTC definition of passthrough. Brood exploitation rates in ocean fisheries alone remain near the MSY ER. In contrast, the South Puget Sound Summer/Fall stock group has shown a marked increase in escapement, perhaps in response to enhancement.

4) **In view of poor recent survivals and failures to at least achieve 1985 target harvest rate reductions in some ceiling fisheries, the CTC concludes that stock groups with all escapement indicator stocks presently categorized in the lower two rebuilding categories (WCVI, Lower GS, Lower Fraser Fall, North PS Spring, and Columbia Upriver Spring) will not rebuild by 1998.** Rebuilding will require sustained increases in productivity (e.g., through habitat improvements or other enhancement activities) or a sustained decrease in fishing mortality of those stocks. Further, projections for continued poor survivals indicate that the required reductions in exploitation will be greater than originally estimated when average survivals were assumed.

5) **Total brood exploitation rates have been reduced for exploitation indicator stocks in most stock groups (no change in SEAK) and are nearing the estimated exploitation rate at the maximum sustainable yield (MSY ER) of associated model stocks (with the exception of the Lower GS and Columbia Upriver Summer stocks).** The lack of a positive response in escapements coupled with reduced brood exploitations indicate that poor survivals are limiting our ability to achieve the escapement goals. Exploitation rates are being reduced but have generally not been adequate for the degree of reduction in survivals. This seems particularly true for the Lower GS and Columbia Upriver Summer stocks. Managers of the summer stock noted problems with freshwater survival and the Lower GS stock has the poorest survival index of the 13 stock groups.

6) **Harvest management of ocean fisheries is not benefitting all stocks equally. Rebuilding some specific stocks should be expected to require more detailed stock-specific investigations (e.g., examination of the biological basis of the escapement goal) and actions (e.g., habitat improvements, supplementation, etc.).** Management of ocean fisheries using catch ceilings must be responsive to changes in abundance and stock productivities in order to achieve target harvest rate reductions but detailed stock-specific actions will likely also be required to rebuild all the indicator stocks.

RECOMMENDATIONS

Stock Status and Fishery Regimes

1. ***Undertake management actions to increase the probability that stocks achieve spawning escapement goals by the end of the rebuilding program.*** The failure to consistently achieve even the 1985 target reductions in harvest rates in all ceiling fisheries except NCBC, the lack of progress toward rebuilding by many stocks, and the expectations for reduced survival indicate that additional management actions will be required if stocks are to meet escapement goals by the target rebuilding dates. The CTC recommends:

   a) Evaluate target fishery harvest rate reductions with respect to projected survival, projected abundance, current estimates of stock productivity, and stock status.

   b) Evaluate alternative management approaches that account for annual variations in abundance and impacts on stock status.

   c) SEAK: Reduce incidental mortality so as to achieve total mortality harvest rate reductions at least equal to the 1985 target levels.

   d) NCBC: Maintain current ceilings and management regime.

   e) WCVI: Manage fishery so as to achieve, at a minimum, the 1985 target reductions. If a catch ceiling is not used to control harvest, develop and utilize a measure of effort which will achieve the target harvest rate for chinook salmon.

   f) GS: Institute additional management actions to at least achieve the 1985 target reductions, account for depressed current survivals, and attain the conservation objectives for the Lower GS stock.

2. ***Resolve policy issues and information needs for interpretation of the passthrough provision.*** The PST should determine if the CTC recommended definition of passthrough is acceptable or provide a definition which can be used to analytically evaluate the impact of nonceiling fisheries on the rebuilding program.

3. ***Continue controls on passthrough fisheries.*** Proposed preseason and inseason management actions in nonceiling fisheries should continue to be evaluated with respect to the passthrough provision.

4. ***Evaluate causes and develop solutions to rebuild stocks classified as Not Rebuilding or Probably Not Rebuilding.*** If the PSC intends to rebuild these stocks, potential causes for the continued poor response must be evaluated and a remedial management plan developed. Stock specific management actions should be considered for stocks which will not rebuild with PST management actions following from 1) above.

5. ***Resolve policy issues of what constitutes rebuilding and rebuilt.*** Southeast Alaska and Transboundary stocks are in the final phase of the 15 year rebuilding program, and the remaining stocks are past the midpoint of the program. Given the limited time prior to the target dates of rebuilding, and the poor progress of some stocks, it is imperative that rebuilding/rebuilt be defined immediately. The definition should include provisions for stocks without escapement goals, or escapement goals should be established for all escapement indicator stocks.

Monitoring and Evaluation

1. ***Eliminate data limitations which are compromising the ability of the CTC to complete the escapement and exploitation rate analyses.*** General research needs of the CTC will be addressed in detail in a separate report currently in preparation. Data needs for the annual report that have not been completely satisfied include the following:

   a) ***Report estimated CWT recoveries to the PSMFC by July of the year following the fishery.*** As requested by the PSC, the CTC is currently conducting the Exploitation Rate analysis on a year-out basis to allow agencies sufficient time to collect and report recovery data. However, the following data were still not available from the PSMFC: i) Estimated recoveries for the 1990 and 1991 Puget Sound sport fisheries; ii) 1991 tributary sport recoveries in the Columbia River; iii) escapement recoveries for most southern U.S stocks; and iv) expansion factors for CWT recoveries by Alaskan sport fisheries for all years.

   b) ***Collect and provide information on the age and sex composition of escapement.*** Age and sex specific escapement data are essential to evaluate brood production, stock productivity, and escapement goals. Age specific data also improve the quality of the calibration of the CTC Chinook Model.

   c) ***Tag representative Exploitation Rate indicator stocks at sufficient levels.*** The CTC is especially concerned about the adequate representation of spring and summer stocks and the lack of an indicator stock (with escapement data) for the Harrison River stock.

   d) ***Establish consistent and standardized recovery programs for CWT fish at hatcheries and on spawning grounds.*** Accurate estimates of escapement are essential for the Exploitation Rate Analysis. The CTC is concerned that: i) Pilot studies have indicated that many tagged fish may not be successfully identified at hatcheries; ii) CWT fish which do not return to the hatchery may not be accounted for on a consistent basis; and iii) standard procedures to estimate escapement are not used by some hatcheries in SEAK. In addition, standardized procedures should be instituted for enumeration of marked and unmarked releases and tag retention rates.

   e) ***Provide estimates of sublegal encounter rates in troll fisheries and legal and sublegal encounter rates in chinook non-retention and net fisheries.*** The CTC has estimated that non-landed catch mortality is approximately 30-50% of the reported catch (TCCHINOOK (87)-5). However, sampling programs to determine the magnitude and stock composition of the non-landed catch mortality are virtually nonexistent.

f) ***Provide estimates of nonreported chinook catches by Canadian Native fisheries and the WCVI sport fishery.*** The CTC is unable to fully evaluate impacts of these fisheries on chinook stocks and the rebuilding program until these data are provided.

CHAPTER 1. 1991 CHINOOK CATCH

1.1 1991 CHINOOK SALMON CATCHES IN FISHERIES WITH CEILINGS

Estimates of 1991 catch for each fishery managed under a harvest ceiling established by the Pacific Salmon Commission (PSC) are presented below. Catches in all chinook fisheries of interest to the PSC are documented in Table 1.

Area/Fisheries a/	Ceiling	Catch	Difference	
			Numbers	Percent
Southeast Alaska (T,N,S) b/	273	295.6	+22.6	+8.6%
North/Central B.C. (T,N,S) c/	273	303.2	+30.2	+11.1%
West Coast Vancouver Island (T)	360	202.9	-157.1	-43.6%
Strait of Georgia (T,S)	275	147.8	-127.2	-46.3%

a/ T=Troll; N=Net; S=Sport
b/ The actual total catch was 357,100 chinook, including a hatchery add-on of 61,400.
c/ Excludes 6,066 chinook caught in terminal areas in 1991, which Canada proposes to exclude from the ceiling.

Catches in all chinook fisheries of interest to the PSC are documented in Table 1 for the years 1988 - 1991 and in Appendix I for the years 1975-1991.

1.2 CUMULATIVE DEVIATIONS FROM CATCH CEILINGS

A 7.5% cumulative management range was established by the PSC in 1987. Annual catches (without add-on) and deviations from catch ceilings since 1987 (in thousands of fish) are as follows:

Area/Fisheries	Ceiling	Catch					Total Deviation	Cumulative Deviation	
		1987	1988	1989	1990	1991		Numbers	Percent
Southeast Alaska (T,N,S) a/	263 b/	265.2	255.2	264.4	313.2	295.6	+29.6	+29.6	+11.3%c/
North/Central B.C. (T,N,S) d/	263 b/	282.8	245.6	301.2	253.0	303.2	+21.7	+21.8	+8.3% c/
West Coast Vancouver Island (T)	360	379.0	408.7	203.7	298.0	202.9	-307.7	-27.0	-7.5% e/
St. of Georgia (T,S)	275	159.7	138.6	161.3	146.3	147.8	-621.3	-20.6	-7.5% e/

a/ Southeast Alaska catches exclude hatchery add-ons of 16,700, 23,700, 26,700, 48,300, and 61,400 for 1987, 1988, 1989, 1990, and 1991 respectively.
b/ The 1990 ceiling was 302,000, and the 1991 ceiling was 273,000.
c/ These overages exceed the 7.5% management range.
d/ Catches exclude 4,819, 5,549, and 6,066 chinook caught in terminal areas in 1989, 1990, and 1991, respectively, for a total of 16,434.
e/ Negative deviations below the 7.5% management range can not be accumulated.

1.3 REVIEW OF FISHERIES WITH CATCH CEILINGS

1.3.1 Southeast Alaska Fisheries

In 1991, SEAK fisheries were managed under the following provisions established by the PSC:

1. An all-gear base catch ceiling of 273,000 chinook salmon.

2. An Alaska hatchery add-on calculated on the basis of coded-wire-tag sampling.

3. A 7.5% management range, calculated in numbers of fish, for cumulative deviations from the base catch ceiling beginning in 1987. This is equivalent to +/- 19,700 chinook salmon for a 263,000 base catch ceiling.

Catch data for 1991 indicate the following:

1. The total all-gear catch (commercial and recreational) was 357,100 chinook salmon, including a hatchery add-on of 61,400.

2. The total estimated catch of Alaska hatchery produced chinook salmon was 70,000 (19.6% of the total catch). The add-on was calculated by reducing this by 5,000 for the estimated pre-Treaty harvest of Alaska hatchery chinook and by 3,600 for risk adjustment.

3. The deviation of the 1991 SEAK chinook salmon catch from the catch ceiling was +22,600. The cumulative deviation from 1987 on is 29,600.

The 1991 SEAK all-gear harvest of 357,100 consisted of a commercial catch of 296,600 and a recreational harvest of 60,500.

Troll Fisheries: The troll fishery harvested 263,800 chinook salmon as follows:

	Catch	AK Hatchery %
Winter Fishery (October 1, 1990 to April 14,1991)	42,400	23.8%
Hatchery Access (June 5-7 and June 21 and 22)	46,400	19.7%
Experimental and Terminal	20,000	63.0%
Summer Fishery (July 1-8)	155,000	3.2%

Daily catches in the hatchery access and summer fisheries were the highest recorded (10,200 and 20,600 respectively). Alaska hatchery percentages were also the highest seen in the winter, hatchery access, and experimental fisheries. Chinook nonretention was implemented beginning at noon on July 8 and continued throughout the rest of the fishery except for 10 days during August when the entire fishery was closed. As in past years, areas with high chinook abundance were closed during this period.

Net Fisheries: The 1991 commercial net catch included 32,800 chinook salmon harvested incidentally of which 42.2% were from Alaskan hatcheries. Chinook salmon represent less than .1% of the 70,000,000 1991 net harvest. Net harvest of chinook salmon in the purse seine fishery is limited by a 28 inch minimum size limit and CNR regulations. Net harvest for the gillnet fisheries is limited by early season closures and night closures.

Recreational Fisheries: The recreational fishery harvested 60,500 chinook salmon of which 31.1% were from Alaskan hatcheries. Recreational fisheries are managed under a two chinook salmon per day bag limit and a 28 inch minimum size limit.

1.3.2 Canadian Fisheries

The minimum size limit for troll fisheries remained at 62 cm fork length in the Strait of Georgia and at 67 cm fork length in all other areas. Catch statistics for commercial fisheries are based on sales slips accumulated through October 16, 1992.

North/Central B.C.: The 1991 NCBC fisheries were managed under the following provisions:

1. An all-gear base catch ceiling of 263,000 plus 10,000 chinook salmon.
2. A 7.5% management range, with cumulative deviations calculated since 1987. Based on preliminary 1990 catch estimates and terminal exclusion calculation procedures, the cumulative deviation at the beginning of the 1991 season was estimated at -8,459.

The estimated 1991 all-gear catch was 303,188, excluding terminal exclusions of 6,066. These catch statistics indicate a 1991 catch deviation of +30,188, and a cumulative deviation through 1991 of +21,729 chinook (+8.3% of the catch ceiling). This overage exceeds the 7.5% management range.

Terminal exclusions, as allowed in the Letter of Transmittal, are calculated as follows:

Area	Base	1991 Catch	1991 Exclusion
Skeena	2,900	7,286	4,386
Bella Coola	2,950	4,629	1,679
Kitimat	2,400	2,166	0
Total			6,066

Troll Fisheries: The 1991 troll fishery opened for all species on June 28. There was a four day closure from August 7 through August 10, prior to opening for retention of Fraser River bound sockeye. The management objective for the troll fishery in 1991 was a chinook catch ceiling of 203,300. A number of management actions were taken during the troll fishery to meet this objective, including:

1. The west coast of Queen Charlotte Islands south of Buck Point and Areas 107-2, 107-3, 108-111 and 11 were closed to all trolling August 20-24.

2. On August 27 all of Area 2W, Area 142, and the area known as the "Red Line" in Area 1 were closed to trolling to slow the chinook catch rate.

3. On September 3, the entire North Coast (Areas 1-11, 30) was closed to possession and retention of chinook.

4. Also, on September 3 a large portion of Hecate Strait was closed to avoid a CNR fishery.

Trolling for all species closed on September 30, for a total of 27 days of CNR. The catch of chinook in NCBC troll fisheries was 220,625.

Net Fisheries: Catch of chinook in NCBC areas was 56,100. Catches by fishery were 7,000 in the Queen Charlotte Islands, 32,100 for the Skeena/Nass and 17,500 in Central British Columbia (CBC). These catches are the estimated total catches of chinook >5 lb. including the catch eligible for terminal exclusion.

Recreational Fisheries: The tidal water sport fishery catch of chinook was 32,500. Catch by fishery was 15,000 for the Queen Charlotte Islands, 4,500 for the Skeena/Nass and 13,000 for the CBC.

West Coast Vancouver Island (WCVI) Troll: In light of the below average forecast of chinook abundance to the WCVI troll fishery in 1991, Canada's main objective for the WCVI troll fishery was to manage the fishery in a manner consistent with the intent of the Treaty and the rebuilding program. In addition, due to Canada's concern for the Harrison River chinook stock, the intent was to manage the fishery to maintain the 1985-1987 average harvest rate. It was estimated that a fishery of approximately 77 days open for chinook retention would maintain the 1985-1987 average harvest rate. The fishery opened on June 28 with all areas open except Areas F1, G and S (same areas as Fig. 1, page 11, CTC 1991b). There were four major area/time closures on the west coast of Vancouver Island in 1991:

1. Areas F1 and G closed from June 28 to July 14. This area closure was implemented in order to moderate the coho catch rate early in the fishery. Area F1 opened July 14. Area G opened for the duration of the sockeye fishery only (August 11 through August 20).

2. Complete closure to all trolling from August 7 through August 10 prior to the sockeye fishery.

3. Complete closure to all trolling from August 21 through August 23 following the sockeye fishery.

4. Areas F1, G and the waters easterly of Loran-C line 5990-Z-14740 closed on August 24. This action was taken initially to slow coho catch rate. Following closure for coho retention on September 6, the area closure was maintained in order to avoid a coho nonretention fishery.

Trolling closed on September 18, for a total of 76 days open to chinook fishing. There was no CNR period in 1991. Chinook catch in 1991 for the WCVI troll fishery was 202,910.

Strait of Georgia:

Troll: The management objective was a domestic catch ceiling of 31,000 chinook. The ceiling was reduced to this level in 1988 to achieve a 20% harvest rate reduction, relative to 1987 levels, as part of a conservation plan for lower GS chinook.

The troll fishery was open for chinook retention from June 27 to August 1. When the early season catch ceiling of 29,000 was reached, CNR and nonpossession with single barbless hooks was implemented (August 2 through August 9). While the sockeye fishery was open, August 10 through August 19, barbed hooks were allowed, but nonretention and nonpossession of chinook was still in effect. On August 20, retention of chinook salmon was again permitted. The objective was to allow for incidental chinook catch during the remainder of the 1991 season. The chinook catch rate proceeded at a faster rate than anticipated and the ceiling of 31,000 was obtained September 12. Beginning September 13 and continuing until the season closed September 30, chinook nonpossession and CNR was in effect. There was a total of 36 CNR days. Chinook catch by trollers was 32,228.

Recreational: The 1991 management objective for the GS recreational fishery was to maintain a 20% harvest rate reduction, relative to 1987 levels, on lower GS chinook. Consequently, the management plan implemented in 1989 was continued in 1991. This plan consists of the following management actions:

1. An annual bag limit of 15 chinook and a size limit of 62 cm was implemented for the area north of Cadboro Point (north of Victoria in Statistical area 19B), including Johnstone Strait. These measures represent an increase in the bag limit (from 8 to 15) for the GS recreational fishery compared to 1988.

2. For Johnstone Strait, the daily bag limit was reduced from 4 to 2 chinook, the season limit was reduced from 30 to 15, and the size limit was increased from 45 cm to 62 cm, relative to 1988.

The estimated 1991 catch in the creel survey area (including the Victoria area, but excluding Johnstone Strait) was 115,500. Effort in 1991 totalled 466,700 boat trips, which is about 20% less than the 1986-1990 average effort level.

An evaluation of the lower GS chinook conservation program is currently in progress.

1.4 REVIEW OF OTHER FISHERIES

1.4.1 Canadian Fisheries

Transboundary Rivers: Chinook catch in the Canadian gillnet fishery was: Taku River, 1,177 chinook adults and 432 jacks, and Stikine River, 850 chinook adults and 400 jacks. The catch of chinook in these rivers is limited to incidental catch during fisheries targeting on sockeye salmon.

Southern B.C. Commercial Net:

Area (Stat. Area)	Catch (chinook > 5 lb.)
Johnstone Strait (11-13)	13,333
Strait of Georgia (14-19) and Fraser River (28,29)	15,071
Juan de Fuca Strait (20)	8,136
Barkley Sound (23)	58,688
Other WCVI (21,22,24-27)	685

The catch of chinook in all of these net fisheries is limited to incidental catch during fisheries targeting on sockeye, pink, or chum, with the exception of the August/September gillnet fishery in Alberni Inlet (Area 23). This fishery is a terminal gillnet fishery for returns to the Robertson Creek Hatchery. Small numbers of chinook may also be harvested incidentally during gillnet and seine fisheries on sockeye salmon in Barkley Sound in July. Management of southern B.C. net fisheries has an objective to reduce the base period harvest rate on chinook by 25% (an obligation in the PSC chinook rebuilding program). Further, the Johnstone Strait net fisheries have the added objective of reducing harvest rates since 1987 by an additional 20% as part of the conservation program for chinook stocks in the lower GS.

In all the fisheries, regulations and research programs are attempting to limit the incidental mortality of juvenile chinook and coho. Fishing time, location, and gear are limited in southern B.C. net fisheries to conserve juvenile and adult chinook salmon. In Johnstone and Juan de Fuca straits, known areas of high chinook vulnerability are closed and minimum depth strata are set to reduce the catch of juvenile chinook and coho. In Juan de Fuca, a maximum number of juvenile chinook and coho salmon per set has been established, beyond which the fishing area is further restricted or even closed. Chinook catch in the Fraser River area is usually limited to gillnet fishing and chinook catch is incidental.

Area 12 Troll: Catch is reported as 1,200 chinook. This fishery is a small localized group of trollers at the southern limit of Queen Charlotte Sound. The fishery is limited to a catch ceiling of 5,000 chinook.

Tidal Recreational: The catch estimate for the 1991 Barkley Sound recreational fishery is 80,200, of which 43,400 were taken in the terminal fishery inside Alberni Canal and 36,800 in Barkley Sound. The survey period covered from July 15 through September 30. The early to mid-summer fishery primarily occurs in outer Barkley Sound and is limited by size limit, catch per day, and possession limits. The Alberni Canal portion occurs primarily in August and is directed on returns to the Robertson Creek Hatchery. A creel survey was conducted in Johnstone Strait in 1991. The catch was estimated to be 10,000 for this sport fishery. Catch estimates for sport fisheries off WCVI are not available.

Nontidal Recreational: Nontidal recreational fisheries occur in most B.C. rivers, including the Alsek, Skeena, Nass, Kitimat, Bella Coola, Somass and Fraser Rivers and various streams on the east coast of Vancouver Island. Most of these are small, localized fisheries to provide the local public with some access to salmon fishing. Recent fisheries in the Fraser River have been limited to the larger chinook populations which have responded well to the chinook rebuilding program and most are managed to catch ceilings.

Chinook catch was estimated at 388 in the Alsek, 8,000 in northern B.C. rivers (Areas 1-10), and 1,457 in the upper Fraser (Bowron, Quesnel, Bridge, Clearwater, Shuswap, South Thompson, Thompson). Sport fisheries also occur in the Vedder-Chilliwack River and lower Fraser mainstem, but were not assessed in 1991 due to inadequate resources.

Indian Food Fisheries:

Fishing Area	Adult Catches	Jack Catch
North/Central B.C.	26,800	-
Somass River	23,800	-
Fraser River	16,869	-
Stikine	753	310
Alsek	336	-
Cowichan	200	-
Squamish	1,095	-

The 1991 Fraser River catch was equal to the 1981-1990 average of 16,700. The Squamish River catch was similar to 1990 but well above the 1981-1990 average of 368.

Each of these fisheries involves directed chinook fishing periods and the incidental catch of chinook during fisheries on other species. Small portions of the catch may be taken in marine waters, with the exception of the Stikine and Alsek catches. Catch in these fisheries is mostly limited by fishing time, but allocation to meet Native food fishing requirements is the first priority use of allowable catches.

1.4.2 U.S. Fisheries

Strait of Juan de Fuca: As in previous years, management measures were taken in the Strait of Juan de Fuca and other mixed stock areas to protect depressed spring chinook stocks. No directed spring chinook fisheries were permitted and no commercial fisheries were permitted during the spring chinook management period (April 15-June 15). Recreational fisheries were also restricted by a maximum size limit of 30 inches. Further actions were taken in all mixed stock areas to protect depressed summer/fall stocks from Puget Sound. It was recognized that the combined actions for chinook salmon should also serve to protect depressed Canadian-origin chinook stocks (primarily Fraser River runs).

Estimates of 1991 net catch in the Strait of Juan de Fuca total 3,200 chinook, compared to 5,200 in 1990. These fisheries take chinook incidental to the harvest of other species. Estimates of 1991 tribal troll catch in the Straits (Areas 4B, 5, and 6C) total 34,700 chinook compared to 45,700 caught in 1990. This is a chinook directed fishery. Note that tribal troll catch estimates from this area do not include tribal catch in Area 4B during the May 1-September 30 Pacific Fishery Management council (PFMC) management period; catches during this period are included in the North of Cape Falcon troll summary.

Recreational catch estimates for 1991 in Areas 5 and 6 are not available at this time. In 1991, about 400 chinook were caught in the Area 4B state waters fishery, after the PFMC fishery, compared to 400 in 1990. The 1990 recreational chinook catch for Areas 5 and 6 is estimated at 50,500, compared to 53,400 in 1989.

San Juan Islands: Estimates of chinook net catch for 1991 in the San Juan Islands total 13,800, compared to 9,300 in 1990. The recreational catch estimate for 1991 in Area 7 is not available at this time. The 1990 recreational chinook catch for Area 7 is estimated at 7,400, compared to 10,300 in 1989.

Puget Sound: The status of Puget Sound spring chinook stocks continued to be poor in 1991. As in past years, recreational and commercial fisheries in Puget Sound were regulated by time and area closures to avoid all direct harvest and minimize incidental harvest of these depressed stocks. Some directed harvest was allowed on a few Puget Sound summer/fall stocks. However, several terminal areas, including Area 8 (located near the mouth of the Stillaguamish and Snohomish Rivers), did not have directed chinook net fisheries in order to protect depressed summer/fall stocks.

Net catch of chinook was down considerably in 1991 due to a combination of poor catch rates and management actions taken to protect both chinook and coho. Estimates of 1991 net catch in Puget Sound marine areas total 70,400 chinook, compared to 150,300 in 1990. Estimates of 1991 net catch in Puget Sound freshwater areas total 18,400 chinook, compared to 28,700 in 1990.

Puget Sound recreational catch estimates for 1991 are not available at this time. Recreational fisheries were managed in the same general manner as in recent years. Puget Sound marine and freshwater recreational chinook catch for 1990 is estimated at 70,500, compared to 75,400 in 1989.

Washington Coast: In 1991, terminal runs of northern Washington coastal stocks were expected to be above minimum spawning levels, allowing both commercial and recreational directed chinook fisheries in terminal areas. Returns were generally lower than expected, and one stock (Queets spring/summer) was harvested below its escapement floor. The 1991 estimates of Grays Harbor and Willapa Bay net catch total 41,500 chinook, compared to 41,600 in 1990. The 1991 estimates of commercial net fisheries in north coastal rivers total 12,700 chinook, compared to 16,300 in 1990.

Washington coastal recreational catch estimates for 1991 are not available at this time. The 1990 catch estimates for coastal rivers total 4,500, compared to 5,900 in 1989.

A small recreational fishery has historically occurred in the Grays Harbor estuary. In 1991, effort and catch in this fishery increased significantly in response to the large coho run returning to Grays Harbor. This fishery was sampled through September 29, and the estimated catch is approximately 400 chinook. Catch from this fishery is not included in Table 1.

Ocean Fisheries North of Cape Falcon: In 1991, ocean commercial and recreational fisheries operating in the PFMC region north of Cape Falcon were constrained by domestic quotas for both chinook and coho salmon. Chinook quotas were established taking into account the need to protect several severely depressed chinook stocks, particularly Upper Columbia River runs. Separate quotas were established for the tribal troll and nontribal fisheries.

Under PFMC quota management, ocean fisheries are terminated either when coho or chinook quotas are achieved or when seasons expire. Overall, in 1991, chinook catch success was poor, consistent with 1991 preseason expectations for low abundance of key stocks. Fisheries closed when coho quotas were reached and chinook quotas were not fully harvested. Estimates of 1991 tribal troll chinook catch total 21,400, 65% of the 33,000 chinook quota and down from 31,400 in 1990. Recreational catches are estimated at 13,300 (1,000 Oregon and 12,300 Washington), about 34% of the 40,000 chinook quota and down from 33,100 in 1990. Estimates of nontribal troll chinook catch total 29,700 (900 Oregon and 28,800 Washington), about 74% of the 40,000 chinook quota and down from 33,100 in 1990. Approximately 27,300 of these nontribal troll caught chinook were taken during the early season chinook fishery (May 1 through June 15, 1991).

In 1991, there was no experimental fishery conducted in the inside ocean waters north of Destruction Island to Cape Alava. In 1990, this fishery harvested a total of 11 chinook.

Columbia River: Since 1988, all inriver management of Columbia River fish runs and fisheries has been directly based on the Columbia River Fish Management Plan (CRFMP). "The purpose of this management plan is to provide a framework....to protect, rebuild, and enhance upper Columbia River fish runs while providing harvest for both treaty Indian and non-Indian fisheries" (CRFMP, 1988, p.2). The CRFMP specifies management goals, season timing, catch limits, and maximum incidental impacts for all depressed upriver runs of anadromous fish in the Columbia River.

The 1991 inriver commercial catch of chinook was 106,843, compared to 147,300 in 1990 and 275,000 in 1989. Total freshwater recreational catch in 1991 (including a Buoy 10 catch of 11,588) is estimated to be 77,986 compared to 94,820 in 1990 and 96,878 in 1989.

The 1991 total catch of upriver spring chinook was 6,427 fish, consisting of 2,433 caught in the non-Indian sport and commercial fisheries and 3,994 caught in tribal ceremonial and subsistence fisheries. The CRFMP limits harvest impacts on upriver spring chinook run sizes between 50,000 and 128,800 to 4.1% of the run in the lower river non-Indian catch and 7.0% of the run in tribal ceremonial and subsistence fisheries. The estimated 1991 impacts were 4.1% and 6.7% respectively.

There has not been a targeted inriver fishery on upriver summer chinook since 1964. In the past, incidental harvest of summer chinook has occurred during commercial sockeye fisheries. However, no commercial sockeye fisheries have occurred below McNary Dam since 1988. There is a very small C&S catch of summer chinook. The total catch in 1991 is believed to be less than 50 fish.

Commercial catch of fall chinook in 1991 totaled 93,220 (41,550 in lower river non-Indian fisheries below Bonneville Dam). Management constraints imposed by the CRFMP included achieving the Spring Creek hatchery escapement goal of 8,200 adult chinook, an adult escapement of 40,000 Upriver Bright (including a Snake River component) chinook over McNary Dam, and providing a 50% share of the harvestable portion of the upriver fall chinook run to the treaty Indian fisheries. The Upriver Bright escapement goal for inriver management was increased by 5,000 chinook to 45,000 adults for 1990 and 1991 on an interim basis by agreement of the CRFMP parties to account for increased broodstock hatchery needs and because of concern for the Snake River wild component.

Ocean Fisheries Cape Falcon to Humbug Mountain: Ocean fisheries off Oregon's central coast primarily harvest a mixture of southern chinook stocks not involved in the PSC rebuilding program; these stocks do not migrate north into PSC jurisdiction to any great extent. Some stocks that spawn in Oregon coastal streams do migrate into PSC fisheries, including the Northern Oregon Coastal (NOC) stock aggregate. These north migrating stocks are harvested incidentally (probably <10%) in Oregon ocean fisheries. The only troll fishery that predominately harvests the NOC stock aggregate is the late season near-shore fishery off the mouth of the Elk River. In both 1990 and 1991, this Elk River fishery was not conducted due to conservation concerns. Recreational catch estimates for 1991 are not available at this time.

Table 1-1. Summary of the 1988-1991 chinook catches in fisheries relevant to the U.S./Canada Pacific Salmon Treaty (numbers in thousands of fish). Note: Catch estimates for 1991 are the based on the best available data to date (as of 17-Oct-92).

	Troll				Net				Sport				Total			
Area	1991	1990	1989	1988	1991	1990	1989	1988	1991	1990	1989	1988	1991	1990	1989	1988
S.E. ALASKA a/	264	288	236	231	33	28	24	21	60	51	31	26	357	367	291	278
BRITISH COLUMBIA b/c/																
North/Cent. Coast	221	179	225	182	50	42	41	44	32	31	35	19	303	252	301	246
W. Vanc. Island d/	203	298	204	409	60	30	40	15	80	61	48	33	343	389	292	457
Georgia St./Fraser e/	32	34	28	20	15	15	24	8	116	112	133	119	163	161	185	147
Johnstone St.	1	2	2	2	13	18	29	6	10	10	10	10	24	30	41	18
Juan de fuca Strait	0	0	0	0	8	7	21	4					8	7	21	4
sub-total	457	513	459	613	146	112	155	77	238	214	226	181	841	839	840	872
WASHINGTON INSIDE f/																
Strait (mar) g/	35	46	65	49	3	5	10	10	NA	NA	52	39	NA	NA	127	98
San Juans (mar) h/	0	1	1	0	14	9	16	32	NA	NA	9	9	NA	NA	26	41
Other PS (mar+fw) i/	0	0	0	0	130	179	156	133	NA	NA	70	63	NA	NA	226	196
Coastal (mar+fw) i/	0	0	0	0	54	58	85	74	NA	NA	6	7	NA	NA	91	81
sub-total	35	47	66	49	201	251	267	249	NA	NA	137	118	NA	NA	470	416
COLUMBIA RIVER j/k/	-	-	-	-	107	147	275	489	78	95	97	110	185	242	372	599
WA/OR N OF FALCON l/	51	65	75	108	0	0	1	3	14	33	21	19	65	98	97	130
OREGON																
Inside Waters m/	0	0	5	4	-	-	-	-	45	38	45	49	45	38	50	54
GRAND TOTAL	807	913	841	1005	487	538	722	839	NA	NA	557	503	NA	NA	2120	2349

a/ Southeast Alaska troll chinook catches shown for Oct. 1 - Sept. 30 catch counting year.
b/ British Columbia net catches includes only fish over 5 lb. round weight. Native food fishery catches are not included. 1989, 1990, and 1991 exclude catch from terminal gillnet fisheries (3 year total of 16,434 which are excluded from the catch ceiling.
c/ Sport catches are for tidal waters only.
d/ Estimates of WCVI tidal sport catches are from creel surveys in Barkley Sound only. Survey times and areas may vary from year to year.
e/ Georgia Strait sport catches include Juan de Fuca Strait sport catches.
f/ All WA inside sport numbers adjusted for punch card bias. See "1988 WA State Sport Catch Report" for details.
g/ Strait troll catch includes all catch in areas 5 and 6C and catch in area 4B outside of the PFMC management period (Jan.- May and Oct.- Dec.).
h/ San Juan net catch includes catch in areas 6, 6A, 7 and 7A; sport catch includes area 7.
i/ Coastal and Puget Sound sport catches include marine and freshwater, but only adults in freshwater.
j/ Columbia River net catches include Oregon, Washington and treaty catches, but not ceremonial.
k/ Columbia River sport catches include adults only, for Washington, Oregon, Idaho and Buoy 10 anglers.
l/ North of Falcon troll catch includes catch in area 4B during the PFMC management period (May-Sept.).
m/ Troll = late season troll off Elk River mouth (Cape Blanco); sport = estuary and inland (preliminary for 1990).

CHAPTER 2. ESCAPEMENT ASSESSMENT OF REBUILDING THROUGH 1991

2.1 INTRODUCTION

In this chapter, we present the results of a rebuilding assessment based upon escapement information. Our objective is to assess the rebuilding status of each escapement indicator stock. The escapement is a product of the brood year adult abundance, freshwater and marine survival rates and fishery harvest rates, while sources of error may be introduced by counting or estimation procedures. Consequently, to determine if management actions under the PST have been effective in rebuilding, the results of this assessment should be considered together with the Exploitation Rate Assessment in Chapter 3 and the Integrated Analysis in Chapter 4.

Escapement information has been compiled for a set of indicator stocks representing the majority of naturally spawning chinook stocks from central Oregon to SEAK. Spawning escapements of these stocks were assessed as one measure of rebuilding progress since implementation of management actions under the PST. The assessment first identified stocks with escapements greater than their goal in recent years. For the remaining stocks, the assessment focused on: (1) changes in average escapements since the base period years; (2) comparison of recent escapements with a linear escapement trend from the base period to the goal at the rebuilding target date; and (3) trends in escapements since PST implementation.

For SEAK and TBR stocks, conservation actions began in 1981 as part of a 15-year rebuilding program. For all other stocks, a 15-year rebuilding program was implemented in 1984. These rebuilding programs were divided into three 5-year phases (CTC 1987) with slightly more stringent assessment criteria used in each successive phase. In 1991, the SEAK and TBR stocks were in the first year of Phase III (1991-1995) and in the eleventh year of the rebuilding program. The remainder of the stocks were in Phase II (1989-1993) and in the eighth year of the rebuilding program.

Caution is urged against directly comparing escapement levels or goals among stocks since escapements are measured in different units. Where available, annual escapement estimates used were measures of stock abundance. However, for many stocks, escapements are indices of abundance and differences in escapements may not represent differences among stocks in terms of population abundance or fishery contribution levels.

2.2 FRAMEWORK

2.2.1 Escapement Indicator Stocks

Indicator Stocks: As in 1990, 42 naturally spawning escapement indicator stocks were included in the assessment (excluding the Chilkat River, see section 2.6.2). These stocks represent distinct naturally spawning populations or management groups that originate from individual rivers or watersheds. Some stocks represent several populations aggregated by region and life history type. Distribution of the indicator stocks by run timing and area of origin is:

AREA OF ORIGIN	RUN TIMING[1]					
	Spring	Spring/ Summer	Summer	Summer/ Fall	Fall	Total
Southeast Alaska	5					5
Transboundary	5					5
North/Central B.C.	1	3	3			7
Southern B.C.	1	1	1	1	3	7
Washington/Oregon/Idaho	3	2	2	3	8	18
TOTALS	15	6	6	4	11	42

[1] These run timings are determined by management agencies; criteria used for categorization may differ among agencies.

Changes Relative to the 1990 Annual Report:

West Coast Vancouver Island: A 1991 review resulted in revising the constituent stocks in the WCVI indicator stock group from those used in 1990 (CTC 1991). A subsequent review in 1992 recommended a return to the 1989 stock groupings. Consequently, in this report, the WCVI indicator stock group is composed of Kennedy, Burman, Gold, Tahsis, Kaouk, Tahsish, and Marble River populations.

2.2.2 Escapement and Terminal Run Data

Data Sources: The escapement and terminal run data used in this report were provided by management agencies in each jurisdiction. As in 1990, data were not provided for the Chilkat River pending review of the estimation method. Data for the other systems are presented in Appendix A tables and in Appendix B graphs.

Estimation Methods: Methods varied depending on river characteristics and agency resources. Most escapement estimates used were measures of actual spawner abundance, where available, or estimates (or indices) of abundance measured at a point of migration beyond the effect of major fisheries. Estimates were made using weirs and counting fences, aerial or foot surveys, dam passage counts, electronic counting devices, or mark-recapture studies. Escapements of Oregon coastal north-migrating stocks are not numerical estimates of abundance; instead they are estimates of the density of spawners per river mile for standard survey areas.

Some estimates are adjusted for hatchery production to make them direct measures of natural stock escapements:

1. For upper Columbia River stocks, mainstem dam counts adjusted for hatchery fish were used.

2. For some stocks, adjustments were made to reduce enhancement related bias. Methods used include: using coded-wire-tag (CWT) data to subtract hatchery-origin fish from the escapement estimate (e.g., some Puget Sound stocks), excluding spawners removed for hatchery brood stock, and excluding rivers with major enhancement influence (e.g., Kitimat River and adjacent tributaries in Area 6 and Bella Coola River in Area 8).

3. For the Quillayute summer stock, escapements represent a composite of naturally spawning fish from the summer stock and strays from spring stock enhancement. Data are not sufficient to allow complete separation of naturally spawning fish (see Section 2.6.5).

Changes Relative to the 1990 Annual Report: Changes in escapement data relative to 1990 (CTC 1991) are summarized below. Minor updates to catch and escapement data, including updates to preliminary estimates for the most recent years, are not described.

Columbia Upriver Brights: Escapement data (1985-1990) were updated to account for sport harvest of adult fall chinook above McNary Dam. Annual sport catches ranging from 2,400 to 4,400 adults were deducted from the previously reported McNary Dam counts to give a more accurate accounting of actual spawning escapement. Sport fisheries for adult fall chinook in the area above McNary Dam were closed prior to 1985 because of low escapements in the late 1970s and early 1980s.

Columbia Upriver Summers: Escapement for this stock is the Bonneville Dam count reduced by estimated catches upriver of the dam. The escapements for the years 1985 to 1988 were updated to take into account incidental catch of summer chinook during commercial sockeye fisheries that occurred above Bonneville Dam. The incidental catch ranged from 230 to 1,160 adult summer chinook during that period.

2.2.3 Escapement Goals

Origin of Goals: The escapement goals provided by each management agency define long-term stock rebuilding objectives. Most of these goals were established by the managing agency(ies) for each stock. The Transboundary Technical Committee (TTC) jointly determined goals for the three major transboundary rivers in 1991 (TTC 1991). Where possible, goals were based on estimates of stock productivity, usable spawning habitat, or other factors, and represent estimates of escapement levels that produce maximum average production or sustained harvest (e.g., Columbia Upriver spring, summer and bright). For most stocks, interim escapement goals were developed recognizing the uncertainty in data used for establishing goals. For example, Canadian goals are interim targets based on a doubling of base period average escapements. Goals may change as new information is acquired.

Six of the indicator stocks have no escapement goals: Oregon Coastal, Quillayute fall, Hoh spring/summer, Hoh fall, Queets spring/summer and Queets fall. These six stocks, referred to as stocks without goals, are discussed separately from stocks with goals throughout this report. The five Washington coastal stocks are managed on the basis of escapement floors and inriver harvest rates; when terminal runs exceed the floor, terminal fisheries are managed on the basis of harvest rates.

Changes Relative to the 1990 Annual Report: In 1991, three changes were made:

West Coast Vancouver Island: The escapement goal for this stock was revised to reflect the new populations included as the WCVI stock. The escapement goal of 11,665 is calculated as twice the base period (1979-1982) average escapement.

Lewis River: WDF adopted an escapement goal for the Lewis River stock of 5,700 adult fall chinook based on spawner-recruit techniques applied by McIsaac (1990). The stock was previously analyzed as a stock without goal.

Transboundary Rivers: The TTC established joint escapement goals for index systems on the Alsek, Taku, and Stikine Rivers. These goals replace the river-wide escapement goals previously used. The index systems and goals for the three rivers are:

Transboundary River	Index System(s)	Escapement Goal
Alsek	Klukshu	4,700
Taku	Nakina, Kowatua Tatsamenie, Tseta, Dudidontu, Nahlin	13,200
Stikine	Little Tahltan	5,300

The index system escapement goals have not been expanded to represent the river-wide drainages, as was done previously by the two Parties, since there are insufficient data to develop such expansions. See TTC 1991 for a more complete explanation of the methods used in developing the new joint goals.

2.2.4 Assessment Time Frame

For assessment purposes, a base period and a rebuilding assessment period were established for each stock. The rebuilding assessment period includes all years to date, when management actions were taken as part of the chinook rebuilding program. The base period includes years prior to implementation of management actions. Base and rebuilding assessment periods differ among stocks as follows:

SEAK and TBR Stocks: For SEAK and TBR stocks, a 15-year rebuilding program was initiated in 1981, prior to implementation of the PST. The target date for completion of rebuilding is 1995. For these stocks, the base period includes the years 1975-1980 and the rebuilding assessment period includes the years 1981-1991.

Harrison Stock: Escapement data pre-1984 are unavailable for the Harrison stock. Consequently, the Harrison base period is defined as 1984 and the rebuilding assessment period includes the years 1985-1991.

All Other Stocks: For all other stocks, a 15-year rebuilding program was established for the years 1984-1998. For these stocks, the base period includes the years 1979-1982 and the rebuilding assessment period includes the years 1984-1991.

2.3 ASSESSMENT METHOD

2.3.1 Stock Assessment and Scoring

Changes Relative to the 1990 Report: In the 1990 report, it was footnoted in Table 2-3a that several stocks had escapements above their escapement goals for several years. The CTC believes that it is informative to separate these stocks from the stocks judged by the standard criteria. New criteria were established to define an "Above Goal" category. Therefore, a new category, Above Goal, was established for the 1991 analysis. Criteria were defined for identifying the Above Goal stocks, and stocks meeting the criteria were not further assessed.

Stocks With Escapement Goals: All escapement indicator stocks were first assessed according to criteria developed for a new Above Goal category. A stock was classified as Above Goal and not evaluated further if it had escapements that have: (a) been above goal for four of the last five years, and (b) averaged more than the escapement goal, over the last four years.

Stocks that did not meet these Above Goal criteria were evaluated based on the following three assessment criteria:

1. The <u>mean criterion</u> assessed the magnitude of escapement changes by comparing averages of the base period and rebuilding assessment period escapements for each stock. A difference between the two time periods of greater than 10% was accepted as a change between periods. Stocks were scored as follows: (a) stocks with increases of greater than 10% were scored +1; (b) stocks with decreases of greater than 10% were scored -1; and (c) stocks with changes of 10% or less were judged to show no response and scored 0.

2. The <u>line criterion</u> assessed escapements for consistency with a linear approximation of the expected rebuilding schedule. For each stock, a base period average escapement was established. A straight line was drawn from this base period average across the 15-year rebuilding program to the escapement goal in 1995 for SEAK and TBR stocks and 1998 for all other stocks.

   For each stock, the most recent three escapements (1989-1991) were compared with the linear approximation. Stocks were scored as follows: (a) stocks with all three escapements on or above the line were scored +1; (b) stocks with all three points below the line were scored -1; and (c) stocks that did not meet either condition were scored 0.

   Regardless of escapement levels at the initiation of the rebuilding program, the linear approximation assumes for each stock that; (a) the escapement goal will be achieved at the target date (not before or after); and (b) escapement will increase by a constant number in each year until that time. Neither assumption is consistent with theoretical effects of harvest rate reductions or observed escapement trends. Development of more realistic rebuilding schedules would require more information about stock productivity and future marine survivals, as well as policy decisions concerning rebuilding. In the absence of this information, a straight line was selected as a surrogate.

3. The <u>trend criterion</u> identified escapement trends since PST implementation. Slopes were calculated for 1984-1991 escapement data. R-squared values were used as a measure of the strength of a linear trend in the data. R-squared values vary from 0 to 1, with a higher value

indicating a stronger linear trend. Stocks were scored as follows: (a) stocks that had positive slopes with r-squared values of greater than 0.25 were scored +1; (b) stocks that had negative slopes with r-squared values of greater than 0.25 were scored -1; and (c) all other stocks were scored 0.

An r-squared value was selected to identify stocks with and without minimal positive or negative linear trends in escapement during the rebuilding assessment period. The selection of the r-squared value was not intended to measure statistical confidence in the slope values.

Stocks Without Escapement Goals: Stocks without escapement goals were assessed using the mean and the trend criteria. Evaluation of these two criteria was the same as for stocks with escapement goals. These stocks could not be assessed for the line criterion since base-to-goal lines could not be drawn.

2.3.2 Stock Classification

Stocks With Escapement Goals: Because each criterion addresses a different aspect of stock status, a classification system based on all three criteria was developed for stocks not classified as Above Goal:

1. For each stock, scores were summed across all three criteria.

2. Stocks were classified according to the following system (SEAK and TBR stocks are in Phase III, other stocks are in Phase II):

STATUS OF STOCK	TOTAL SCORE OF CRITERIA		
	Phase I[1]	Phase II[2]	Phase III[3]
Rebuilding	+3	+3	+3
Probably Rebuilding	+2	+2	+2
Indeterminate	+1,0,-1	+1,0	
Probably Not Rebuilding	-2	-1,-2	+1,0,-1
Not Rebuilding	-3	-3	-2,-3

[1] 1981-1985 for SEAK and TBR, 1984-1988 for others
[2] 1986-1990 for SEAK and TBR, 1989-1993 for others
[3] 1991-1995 for SEAK and TBR, 1994-1998 for others

This system uses more stringent criteria in Phases II and III, reflecting our recognition that as the rebuilding target date approaches, our expectations for improvement increase and the time remaining for rebuilding diminishes.

3. After completing steps (1) and (2), the resulting classifications were evaluated by the CTC, and stocks classified as Indeterminate were considered for possible status changes.

Stocks Without Escapement Goals: For the six stocks without escapement goals, classifications such as Rebuilding or Not Rebuilding are inappropriate. Stocks were evaluated as follows:

1. For each stock, scores were summed across the mean and trend criteria.

2. Stocks were classified according to the following system:

Phase II Status	Total Score
Increasing	+2,+1
Indeterminate	0
Decreasing	-1,-2

Changes Relative to the 1990 Report: For stocks with goals, the Indeterminate category was eliminated in stocks in Phase III. Last year's report indicated that a score of +1 would give an indeterminate status. No SEAK or TBR stocks received a score of + 1 in 1991.

2.4 RESULTS

2.4.1 Rebuilding Categories

Stocks With Escapement Goals: Individual stock results for the rebuilding criteria are shown in Table 2-1a while the assessment scores and subsequent ranks assigned to each stock are shown in Table 2-2a. Distribution of the stocks within the six rebuilding categories follows:

Above Goal: Twelve stocks (33%) met the criteria for being classified as Above Goal, including three of 10 stocks (30%) in the eleventh year of rebuilding and nine of 26 stocks (35%) in the eighth year of rebuilding.

Rebuilding and Probably Rebuilding: Four stocks (11%) were assessed in these two categories compared to four (11%) in 1990 (based on 1991 techniques). These included two of 10 stocks (20%) in the eleventh year of rebuilding and only two of 26 stocks (8%) in the eighth year of rebuilding.

Indeterminate: Five stocks (14%) were classified as Indeterminate, compared to nine stocks (26%) in 1990. All of these were in the eighth year of rebuilding as this category was eliminated for Phase III stocks.

Probably Not Rebuilding: Twelve stocks (33%) were classified as Probably Not Rebuilding, compared to 10 stocks (29%) in 1990. These included 4 of 10 stocks (40%) in the eleventh year of rebuilding and eight of 26 stocks (31%) in the eighth year of rebuilding.

Not Rebuilding: Three stocks (8%) were classified as Not Rebuilding compared to none in 1990, including one in the eleventh year of rebuilding.

Results relative to past years for stocks with escapement goals are graphed in Figure 2-1.

STOCKS WITH ESCAPEMENT GOALS						
CATEGORY	Actual 1990 Assessment		Assessment for 1990 with 1991 methods		Actual 1991 Assessment	
	#	%	#	%	#	%
Above Goal	N/A[1]	N/A	12	34%	12	33%
Rebuilding	4	12%	0	0%	1	3%
Probably Rebuilding	10	30%	4	12%	3	8%
Indeterminate	9	27%	9	26%	5	14%
Probably Not Rebuilding	10	30%	10	29%	12	33%
Not Rebuilding	0	0%	0	0%	3	8%
TOTAL[2]	33	100%	35	100%	36	100%

[1] The Above Goal category was not used in the actual 1990 assessment.

[2] Situk and Quillayute summers were not included in 1990 because base period escapements were above goal. Chilkat was not included in 1990 or 1991 because escapement data were not provided. Lewis River was added as a stock with an escapement goal in 1991.

Stocks Without Escapement Goals: The six stocks without escapement goals were evaluated using the mean and trend criterion. As in 1990, all of these stocks were classified as Increasing (Tables 2-2b, 2-3b).

2.4.2 Status Changes Relative to 1990

Stocks With Escapement Goals: Ten of 36 classified stocks (28%) showed status declines relative to the actual 1990 assessment (Table 2-2a), while one stock (3%) showed an improvement. In addition, four stocks moved from Rebuilding last year to Above Goal this year and five more stocks moved from Probably Rebuilding to Above Goal.

Stocks Without Escapement Goals: No stocks showed status changes relative to 1990 (Table 2-2b). However, five of six stocks had substantial reductions in escapement compared to 1990, the exception being the Oregon Coastal Stock. Lewis River was moved to Stocks with Escapement Goals.

2.4.3 1991 Escapements Relative to Escapement Goals

Escapements relative to escapement goals for 1991 are summarized in Table 2-1a. In 1991, 18 of 36 (50%) stocks with goals had escapements that were less than 60% of their escapement goal. Of the remaining stocks, 10 (28%) had 1991 escapements that were above their escapement goals.

TABLE 2-1a. Assessment results through 1991 for natural chinook indicator stocks with escapement goals. Stocks categorized as "Above Goal" were not assessed by the three criteria.

							MEAN CRITERION				LINE CRITERION		TREND CRITERION	
							Mean Escapement		Change Between Periods		Comparison with line		1984-1991 Trend	
	Stock Name	Region	Run type	Esc. Goal	1991 Esc.	1991 % of Goal	Base Period	Rebuild. Period	Number	Percent	# Above	# Below	Slope	r2
	Situk	SEAK	spring	600	875	146%								
	King Salmon	SEAK	spring	250	134	54%	92	204	113	123%	1	2	-10	0.34
	Andrew Creek	SEAK	spring	750	640	85%								
PHASE III	Blossom	SEAK	spring	1280	382	30%	163	896	733	449%	0	3	-151	0.27
	Keta	SEAK	spring	800	435	54%								
	Alsek	TBR	spring	4700	2153	46%	2697	2027	-670	-25%	0	3	58	0.10
	Taku	TBR	spring	13200	10153	77%	4582	7414	2832	62%	1	2	925	0.75
	Stikine	TBR	spring	5300	4506	85%	1945	4343	2398	123%	3	0	331	0.29
	Unuk	TBR	spring	2880	1221	42%	1469	2120	651	44%	0	3	-260	0.47
	Chickamin	TBR	spring	1440	779	54%	338	1320	982	290%	1	2	-165	0.48
	Yakoun	NBC	summer	1580	1900	120%								
	Nass	NBC	spr/sum	15900	4017	25%	7944	11014	3069	39%	2	1	-662	0.17
	Skeena	NBC	spr/sum	41770	52753	126%								
	Area 6 Index	CBC	summer	5520	709	13%	2761	1595	-1166	-42%	0	3	-212	0.29
	Area 8 Index	CBC	spring	5450	2470	45%	2725	2889	164	6%	0	3	-342	0.47
	Rivers Inlet	CBC	spr/sum	4950	6635	134%	2475	4500	2025	82%	2	1	311	0.15
	Smith Inlet	CBC	summer	2110	500	24%	1055	608	-447	-42%	0	3	-17	0.02
	W. Coast Van. Is.	WCVI	fall	11665	5756	49%	5520	5467	-53	-1%	1	2	268	0.22
	Upper Geor. St.	GS	sum/fall	5100	3276	64%	2546	3988	1443	57%	1	2	-104	0.02
	Lower Geor. St.	GS	fall	22280	12895	58%	10968	7029	-3939	-36%	0	3	490	0.11
	Upper Fraser	FR	spring	24460	27317	112%								
PHASE II	Middle Fraser	FR	spr/sum	21130	21170	100%								
	Thompson	FR	summer	55710	36460	65%	22059	39384	17325	79%	2	1	510	0.05
	Harrison	FR	fall	241700	90638	38%	120837	114258	-6579	-5%	1	2	-6013	0.08
	Skagit spring	PS	spring	3000	1411	47%	1217	1911	694	57%	0	3	-34	0.01
	Skagit sum/fall	PS	sum/fall	14900	6014	40%	13265	12408	-857	-6%	1	2	-926	0.24
	Stillaguamish	PS	sum/fall	2000	1632	82%	817	1048	231	28%	1	2	47	0.07
	Snohomish	PS	sum/fall	5250	2783	53%	5028	4063	-965	-19%	0	3	-173	0.31
	Green	PS	fall	5800	10548	182%								
	Quillayute summer	WAC	summer	1200	1200	100%								
	Grays Harbor spr.	WAC	spring	1400	1300	93%	450	1713	1263	281%	3	0	75	0.05
	Grays Harbor fall	WAC	fall	14600	11600	79%								
	Col. UpR. spring	CR	spring	84000	15500	18%	28050	28763	713	3%	0	3	-577	0.03
	Col. UpR. summer	CR	summer	85000	18800	22%	23100	25294	2194	9%	0	3	-24	0.00
	Col. UpR. bright	CR	fall	40000	44400	111%								
	Lewis River	CR	fall	5700	9066	159%								

TABLE 2-1b. Assessment results through 1991 for natural chinook indicator stocks without escapement goals.

Stock Name	Region	Run type	Esc. Floor 1/	1991 Esc.	MEAN CRITERION: Mean Escapement Base Period	Rebuild. Period	Change Between Periods Number	Percent	TREND CRITERION: 1984-1991 Trend Slope	r2
Quillayute	WAC	fall	3000	6300	5850	10350	4500	77%	252	0.04
Hoh	WAC	spr/sum	900	1100	1325	2250	925	70%	264	0.22
Hoh	WAC	fall	1200	1400	2875	3438	563	20%	106	0.03
Queets	WAC	spr/sum	700	600	925	1238	313	34%	104	0.13
Queets	WAC	fall	2500	4500	3875	6550	2675	69%	474	0.25
Oregon Coastal 2/	NOC	fall		169	91	145	54	59%	7	0.22

1/ Washington Coastal stocks are managed for escapement floors.

2/ Oregon Coastal assessment is based upon index escapement.

TABLE 2-2a. Assessment scores and status through 1991 of natural chinook indicator stocks with escapement goals.

	Stock Name	Region	Run type	Assessment Scores Mean	Line	Trend	Total	Rebuilding Status Through 1991	Status Change from 1990
	Situk	SEAK	spring					Above Goal	
	King Salmon	SEAK	spring	1	0	-1	0	Probably Not Rebuilding	Decline
	Andrew Creek	SEAK	spring					Above Goal	
PHASE III	Blossom	SEAK	spring	1	-1	-1	-1	Probably Not Rebuilding	Decline
	Keta	SEAK	spring					Above Goal	
	Alsek	TBR	spring	-1	-1	0	-2	Not Rebuilding	Decline
	Taku	TBR	spring	1	0	1	2	Probably Rebuilding	
	Stikine	TBR	spring	1	1	1	3	Rebuilding	
	Unuk	TBR	spring	1	-1	-1	-1	Probably Not Rebuilding	Decline
	Chickamin	TBR	spring	1	0	-1	0	Probably Not Rebuilding	Decline
	Yakoun	NBC	summer					Above Goal	
	Nass	NBC	spr/sum	1	0	0	1	Indeterminate	Decline
	Skeena	NBC	spr/sum					Above Goal	
	Area 6 Index	NBC	summer	-1	-1	-1	-3	Not Rebuilding	Decline
	Area 8 Index	CBC	spring	0	-1	-1	-2	Probably Not Rebuilding	
	Rivers Inlet	CBC	spr/sum	1	0	0	1	Probably Rebuilding 1/	Improvement
	Smith Inlet	CBC	summer	-1	-1	0	-2	Probably Not Rebuilding	
	W. Coast Van. Is.	WCVI	fall	0	0	0	0	Probably Not Rebuilding 1/	
	Upper Geor. St.	GS	sum/fall	1	0	0	1	Indeterminate	
	Lower Geor. St.	GS	fall	-1	-1	0	-2	Probably Not Rebuilding	
	Upper Fraser	FR	spring					Above Goal	
PHASE II	Middle Fraser	FR	spr/sum					Above Goal	
	Thompson	FR	summer	1	0	0	1	Indeterminate	Decline
	Harrison	FR	fall	0	0	0	0	Probably Not Rebuilding 1/	
	Skagit spring	PS	spring	1	-1	0	0	Probably Not Rebuilding 1/	Decline
	Skagit sum/fall	PS	sum/fall	0	0	0	0	Indeterminate	
	Stillaguamish	PS	sum/fall	1	0	0	1	Indeterminate	
	Snohomish	PS	sum/fall	-1	-1	-1	-3	Not Rebuilding	Decline
	Green	PS	fall					Above Goal	
	Quillayute summer	WAC	summer					Above Goal	
	Grays Harbor spring	WAC	spring	1	1	0	2	Probably Rebuilding	
	Grays Harbor fall	WAC	fall					Above Goal	
	Col. UpR. spring	CR	spring	0	-1	0	-1	Probably Not Rebuilding	
	Col. UpR. summer	CR	summer	0	-1	0	-1	Probably Not Rebuilding	
	Col. UpR. bright	CR	fall					Above Goal	
	Lewis River	CR	fall					Above Goal	

1/ The status of these stocks was changed from Indeterminate due to stock-specific circumstances.

TABLE 2-2b. Assessment scores and status through 1991 of natural chinook indicator stocks without escapement goals.

Stock Name	Region	Run type	Assessment Scores Mean	Trend	Total	Rebuilding Status Through 1991	Status Change from 1990
Quillayute	WAC	fall	1	0	1	Increasing	None
Hoh	WAC	spr/summer	1	0	1	Increasing	None
Hoh	WAC	fall	1	0	1	Increasing	None
Queets	WAC	spr/summer	1	0	1	Increasing	None
Queets	WAC	fall	1	0	1	Increasing	None
Oregon	NOC	fall	1	0	1	Increasing	None

2.5 STOCKS WITH STATUS CHANGED BY THE CTC

The CTC examined each stock in the Indeterminate category and considered whether to change its status to Probably Rebuilding or Probably Not Rebuilding. A decision was made to change the status of the following stocks.

2.5.1 Rivers Inlet

The CTC changed the Rivers Inlet stock classification to Probably Rebuilding because: (a) although the rebuilding pattern has been erratic, escapement has dropped below the base to goal trend line only once since 1975; and (b) the 1991 escapement was 134% of goal.

2.5.2 West Coast Vancouver Island

The CTC revised the WCVI stock classification to Probably Not Rebuilding because: (a) average escapement has not increased since the base period; and (b) except for 1989, all escapements since 1983 have been below the base-to-goal line. The Marble River stock has been enhanced since 1981, with production increasing and peaking in 1985 and 1986. Consequently, the 1989 escapement was the largest recorded since enhancement commenced and was probably due in large part to the enhanced and not the wild component. Therefore, the CTC concluded that this result was not representative of the WCVI stock group.

2.5.3 Harrison

The CTC revised the Harrison stock classification to Probably Not Rebuilding because: (a) the average escapement has not increased since the base period; (b) the 1991 escapement was only 38% of goal; and (c) the marginal Line Criterion test result reflected the large 1990 escapement. The 1991 escapement was well below the base to goal line and, based on the 1991 age three escapement, the 1992 escapement is expected to be below the base to goal line.

2.5.4 Skagit Spring

The CTC revised the Skagit Spring stock classification to Probably Not Rebuilding because: (a) although the average escapement has increased from the base period, escapements have remained static or declined in each of the last six years; and (b) the 1991 escapement was only 47% of the goal.

2.6 OTHER STOCK SPECIFIC NOTES

2.6.1 Situk River

The escapement goal for the Situk River was changed from 2,100 to 600 chinook salmon in 1990. This change was based upon a spawner-recruit analysis of 1976-1984 data. The CTC will review and report on documentation of the basis for the escapement goal change.

2.6.2 Chilkat River

As in the 1990 Annual Report, this stock has been removed from all tables and is again not assessed by the CTC. The escapement estimation methods for the Chilkat River are still under review by the Alaska Department of Fish & Game (ADF&G) and results of the review are expected in 1993.

2.6.3 Behm Canal

Three indicator stocks from SEAK and TBR (Blossom, Unuk, and Chickamin) lie within the Behm Canal system. All three of these stocks showed an initial increase from base levels at the start of the rebuilding period (1981) to above-goal levels in 1986 and 1987. Since then, escapements have decreased again to near base period levels. It is not immediately apparent why this decline in escapements is occurring as the commercial harvest of chinook in this area remains heavily restricted.

2.6.4 Thompson River

Despite a strong initial response to the rebuilding program, Thompson escapements have remained relatively static for seven consecutive years. As a result, the stock status evaluation has declined for two consecutive years to Indeterminate in 1991. The CTC is concerned that additional increases in escapement have not resulted from elevated 1984-1986 escapement levels.

2.6.5 Stillaguamish River

Management actions taken in the terminal area to protect the Stillaguamish stock have been in effect since 1985. However, run reconstruction methods used to estimate terminal harvest have not yet been updated to reflect these management changes. As such, reported terminal run sizes (and thus terminal catches) for 1985-1991 are likely overestimated.

2.6.6 Quillayute Summers

The designation "summer" is used to distinguish this native stock from an earlier run nonnative enhanced spring stock. While the summer run is managed for natural production, run timing of the two stocks overlaps to some extent. Because data are not available to separate the natural and enhanced components, future inclusion of this stock as an escapement indicator stock is currently under review.

2.6.7 Lewis River

The CTC will review and report on documentation of the basis for the 5,700 Lewis River escapement goal.

2.6.8 Columbia Upriver Springs and Summers

The CTC is concerned with the lack of response to the rebuilding program by Columbia Upriver springs and summers. Both of these stocks continue to be classified as Probably Not Rebuilding. In fact, the 1991 terminal runs of both stocks were well below base period escapement levels and the Snake River portion of the spring/summer run has recently been listed as threatened under the U.S. Endangered Species Act (ESA).

2.6.9 Columbia Upriver Brights

While Upriver Brights are classified as Above Goal, the stock has shown recent escapement declines to near base period levels and the Snake river portion of the stock has been listed under the ESA.

2.7 SUMMARY OF ESCAPEMENT TRENDS

2.7.1 General

The rebuilding response of the escapement indicator stocks is inconsistent with expectations. There has been a general decline in the proportion of stocks that are classified as rebuilding, while the proportion of stocks that are not rebuilding has increased (Figure 2-1). Furthermore, 29 of the 42 indicator stocks had lower escapements in 1991 than in 1990 and less than half (16 of 36) of the escapement indicator stocks with goals are currently classified as Above Goal, Rebuilding, or Probably Rebuilding. This is especially discouraging since most stocks are now more than halfway and the remainder are more than two-thirds through their rebuilding programs. Of particular concern are the 15 stocks classified as Not Rebuilding or Probably Not Rebuilding. In 1991, the escapements of all of these stocks were less than 60% of their rebuilding goals, and for seven of these 15 stocks, the average escapement during the rebuilding period has actually declined from the base period level (Table 2-1a).

In this report, the escapements of 36 stocks (Table 2-2a) have been assessed for rebuilding status. Three of these stocks are not considered to have been depressed at the start of the rebuilding program since escapements were above goal levels during the pre-Treaty base period. One of these stocks, Situk, had its escapement goal reassessed a year ago and the goal was lowered to the current level. The second stock, Quillayute summer, initially had an incorrect escapement goal used in the evaluation; the error was corrected in the 1989 report. The third stock, Lewis River, was just assigned an escapement goal this year. All three are currently in the Above Goal category and will continue to be monitored. The 33 remaining stocks had base period escapement levels below goal.

Of these 33 stocks, nine are currently in the Above Goal category. These nine stocks include Andrew Creek and Keta River in SEAK, Yakoun and Skeena Rivers in northern B.C., the upper and middle Fraser River stocks, Green River in Puget Sound, Grays Harbor falls from the Washington Coast, and the Columbia Upriver Bright stock. These include three spring stocks, three summer stocks, and three fall stocks. All but one of these stocks achieved goal levels within four years of the start of the rebuilding program; Andrew Creek achieved its goal in six years. Terminal catches have also been up in most years for those four stocks that report terminal catches: Skeena, Green, Grays Harbor, and Columbia Upriver Brights, (see graphs in Appendix B).

Four stocks are showing relatively steady increases that should allow the stocks to reach their escapement goals by the target date. These include the Stikine and Taku TBR stocks, Rivers Inlet in central B.C., and Grays Harbor springs from the Washington Coast. All four are spring or spring/summer stocks. The two TBR stocks have shown escapement trends consistent with the straight line approximation for base to goal rebuilding. Rivers Inlet and Grays Harbor springs, similar to the Above Goal stocks, showed a rapid increase in the early years of the rebuilding program. Unlike the Above Goal stocks, however, escapements of these two stocks have since varied above and below escapement goal levels and they are currently assessed as Rebuilding or Probably Rebuilding.

Two stocks, King Salmon in SEAK and Thompson in the Fraser River, also show this pattern of rapid increase in the first few years of the rebuilding program followed by a leveling off in subsequent years. For these two stocks, leveling off occurred below the escapement goal. Both of these stocks were classified as Probably Rebuilding in the early years, but are now classified as Probably Not Rebuilding and Indeterminate.

The four Behm Canal stocks all showed increases to above goal levels during the first six years of rebuilding, with the highest escapements seen in 1986 and 1987. Since then, escapements have declined to levels near or below base period levels. One other stock with this escapement pattern is Skagit River spring. This stock showed an increase to above goal levels in 1985, and then a marked decrease in 1986 followed by a slow decline since then. The terminal catch on this stock has remained very low or nonexistent. All four of these stocks are currently assessed as Probably Not Rebuilding. One additional stock, Columbia Upriver Brights, also shows this escapement pattern, but it is currently classified in the Above Goal category.

Eleven stocks have escapement levels that remain near or below base period levels. These include the TBR Alsek stock, stocks from Areas 6, 8, and Smith Inlet in central B.C., the West Coast Vancouver Island stock, the Lower Strait of Georgia stock, the Harrison stock from the Fraser River, the Stillaguamish and Snohomish stocks from Puget Sound, and the Upriver Spring and Summer stocks from the Columbia River. Under current survival and management conditions, these stocks are unlikely to rebuild by the end of the rebuilding program. Four have terminal fisheries with catches reported in this document. These catches have varied with escapements. Even the terminal runs to the Lower GS and Harrison have been below escapement goal levels. Of these 11 stocks, all are currently classified as Probably Not Rebuilding or Not Rebuilding, except for the Stillaguamish, which is classified as Indeterminate.

The three remaining stocks all have escapement patterns in which the annual variability is greater than the amount of increase needed to reach the goal from the base period level. The Nass in northern B.C., the Upper Strait of Georgia stock, and the Skagit summer/fall stock in Puget Sound all have shown escapement variation from below base period levels to above goal levels, showing no apparent pattern during the rebuilding period. All three of these stocks are currently classified as Indeterminate.

2.7.2 Special Concerns

The poor response seen in half of the SEAK and TBR stocks, primarily the Behm Canal stocks, in 1991 is of particular concern to the CTC since this group has only four years remaining in its rebuilding program. In 1991, five of the ten stocks were classified as either Probably Not Rebuilding (4) or Not Rebuilding (1). These five stocks all declined in status from 1990 and their 1991 escapements ranged from only 30% to 54% of their goals.

While the 26 stocks with goals and a target rebuilding date of 1998 still have seven years remaining to rebuild, the CTC is concerned by the large number of these stocks that are classified as Probably Not Rebuilding or Not Rebuilding. Although all six stocks without goals were classified in 1991 as showing a long term escapement increase, all but the Oregon Coastal stock had declines in escapements from 1990. One of these stocks, Queets spring/summer, had an escapement below its management floor. For those stocks with goals, 58% (15 of 26) were assessed as either Indeterminate

(5), Probably Not Rebuilding (8), or Not Rebuilding (2). Five stocks declined in status from 1990 while only one stock improved.

Table 2-3a. Rebuilding status through 1991 of natural chinook indicator stocks with escapement goals.

STOCKS IN 11TH YEAR OF REBUILDING (Phase III)		
ABOVE GOAL	REGION	RUN TYPE
Situk	SEAK	spring
Andrew Creek	SEAK	spring
Keta	SEAK	spring
REBUILDING		
Stikine	TBR	spring
PROBABLY REBUILDING		
Taku	TBR	spring
PROBABLY NOT REBUILDING		
King Salmon	SEAK	spring
Blossom	SEAK	spring
Unuk	TBR	spring
Chickamin	TBR	spring
NOT REBUILDING		
Alsek	TBR	spring
STOCKS IN 8TH YEAR OF REBUILDING (Phase II)		
ABOVE GOAL		
Yakoun		
Skeena	NBC	summer
Upper Fraser	NBC	spring/summer
Middle Fraser	FR	spring
Green	FR	spring/summer
Quillayute summer	PS	fall
Grays Harbor Fall	WAC	summer
Col. Upriver Brights	WAC	fall
Lewis River	CR	fall
	CR	fall
PROBABLY REBUILDING		
Rivers Inlet 1/		
Grays Harbor spring	CBC	spring/summer
	WAC	spring
INDETERMINATE		
Nass		
Upper Georgia Strait	NBC	spring/summer
Thompson	GS	summer/fall
Skagit summer/fall	FR	summer
Stillaguamish	PS	summer/fall
	PS	summer/fall
PROBABLY NOT REBUILDING		
Area 8 Index		
Smith Inlet	CBC	spring
W. Coast Vancouver Island 1/	CBC	summer
Lower Georgia Strait	WCVI	fall
Harrison 1/	GS	fall
Skagit spring 1/	FR	fall
Col. Upriver spring	PS	spring
Col. Upriver summer	CR	spring
	CR	summer
NOT REBUILDING		
Area 6 Index		
Snohomish	NBC	summer
	PS	summer/fall

1/ Status of these stocks was altered from Indeterminate (see text for details).

Table 2-3b. Rebuilding status through 1991 of natural chinook indicator stocks without escapement goals.

STOCK STATUS	REGION	RUN TYPE
INCREASING		
Quillayute fall	WAC	fall
Hoh spring/summer	WAC	spring/summer
Hoh fall	WAC	fall
Queets spring/summer	WAC	spring/summer
Queets fall	WAC	fall
Oregon Coastal	NOC	fall

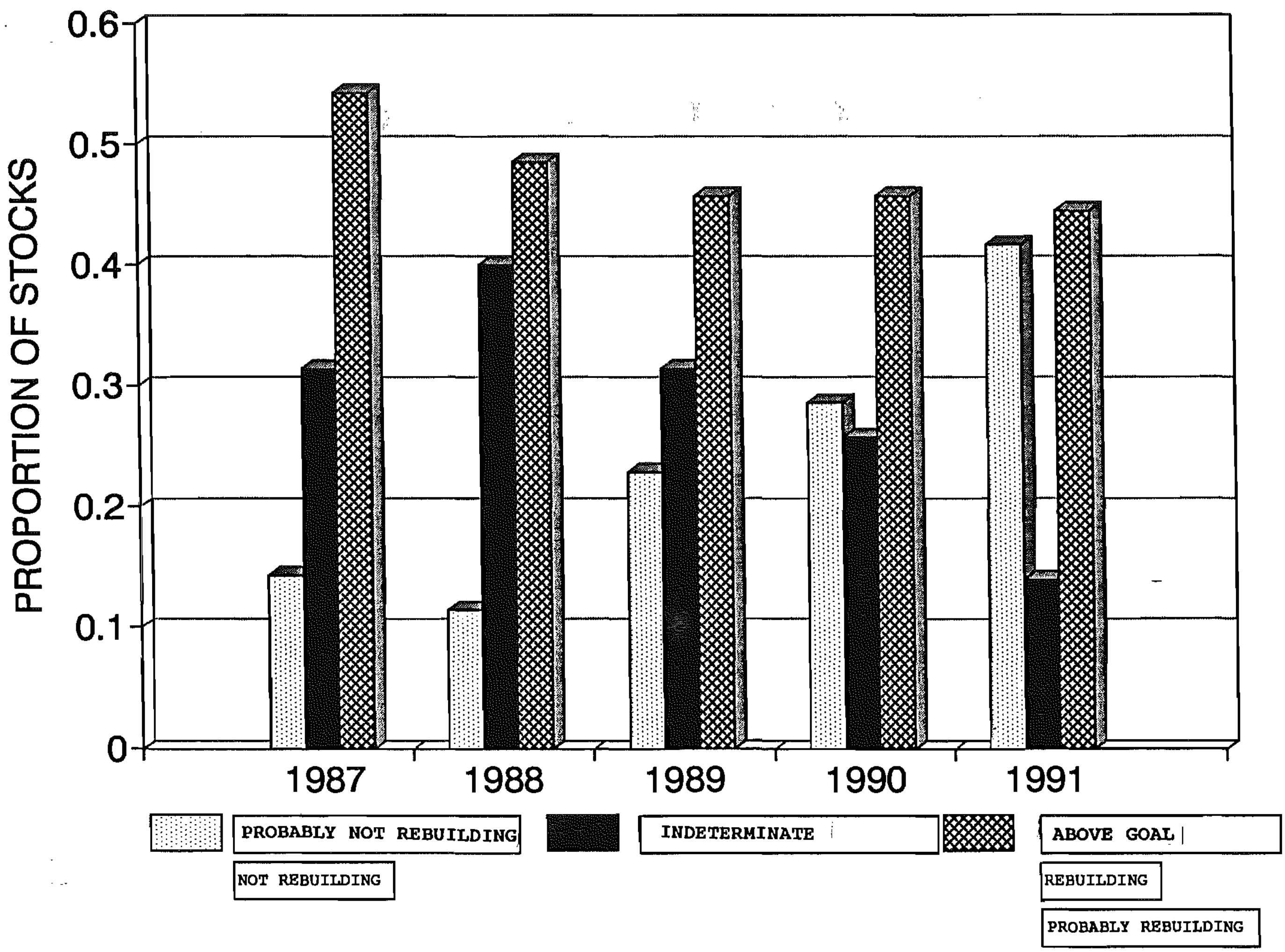

Fig. 2-1. Proportion of escapement indicator stocks by rebuilding category, 1987-1991.

[1] The proportions for each category (Above Goal, Rebuilding, etc.) were calculated by re-evaluating previous years with correct database status and using the phase system as developed in 1990. For this reason, the results will differ from previous CTC annual reports.

CHAPTER 3. EXPLOITATION RATE ASSESSMENT
Based on CWT Recovery Data Through Calendar Year 1991

3.1 INTRODUCTION

The Exploitation Rate Assessment provided in this chapter relies upon coded-wire-tag (CWT) release and recovery data to estimate harvest rate indices for the ceiling fisheries, a CTC recommended passthrough index for depressed natural stocks harvested in nonceiling fisheries, brood exploitation rates, survival rate indices, a stock index for ceiling fisheries, and the distribution of catch and total mortality among fisheries. With the exception of the passthrough index, the types of data and indices presented are similar to those previously reported in the 1989 annual report (CTC 1990). The suggested passthrough index, which is a new addition to the assessment, is described in sections 3.1.1 and 3.2.1.

3.1.1 Overview

The 1991 assessment evaluated 40 exploitation rate indicator stocks (Table 3-1), including 1 from Southeast Alaska, 7 from British Columbia, 17 from Puget Sound, 5 from the Washington Coast, 9 from the Columbia River, and 1 from the Oregon Coast. As in previous years, these indicators are dominated by fall stocks (adult migration to terminal areas during the fall months). The analysis includes 7 spring stocks, 2 spring/summer stocks, 1 summer stock, 12 summer/fall stocks, and 18 fall stocks.

Five new indicator stocks were used in this analysis: the Squaxin Pens Fall Yearling (net pen production in south Puget Sound), Tulalip Fall Fingerling (from a hatchery located between the Stillaguamish River and the Snohomish River), Quillayute Summer (north Washington Coast), Hanford Wild (on the Columbia River), and Salmon River (Oregon Coast). Additional stocks are likely to be added as data needs are identified and recoveries become available.

The Squaxin Pens, Tulalip, and Quillayute stocks are tagged as part of an exploitation rate indicator program initiated in Washington in 1985 and discussed in an earlier report (CTC 1987). The tagged Hanford Wild stock is an Upriver bright stock which spawns naturally in the Hanford Reach section of the Columbia River. Juveniles are collected with seines for tagging prior to emigration in the spring. The Salmon River stock was added to the analysis to represent north migrating chinook salmon from the Oregon coast.

Data for some stocks are inadequate for use in all analyses of the exploitation rate assessment. Table 3-2 identifies the stocks used for each type of analysis and Table 3-3 indicates the brood years with available CWT data for each exploitation rate indicator stock. In addition, three stocks in Idaho (Sawtooth Spring, Rapid River Spring, and McCall Summer) are not included because of the extremely limited number of recoveries in ocean fisheries.

The Exploitation Rate Assessment presented in this report consists of six components. The potential use of each component and computational procedures are discussed briefly below.

Table 3-1. List of exploitation rate indicator stocks.

Stock Name	Location	Description
Alaska Spring	Southeast Alaska	Spring Yearling
Snootli Creek	North/Central BC	Spring/Summer Fingerling
Kitimat River	North/Central BC	Spring/Summer Fingerling
Robertson Creek	WCVI	Fall Fingerling
Quinsam	Georgia Strait	Fall Fingerling
Big Qualicum	Georgia Strait	Fall Fingerling
Chehalis (Harrison Stock)	Lower Fraser River	Fall Fed Fry
Chilliwack (Harrison Stock)	Lower Fraser River	Fall Fingerling
South Puget Sound Fall Yearling	South Puget Sound	Summer/Fall Yearling
Squaxin Pens Fall Yearling *	South Puget Sound	Summer/Fall Yearling
University of Washington Accelerated	Central Puget Sound	Summer/Fall Fingerling
Samish Fall Fingerling	North Puget Sound	Summer/Fall Fingerling
Lummi Ponds Fall Fingerling	North Puget Sound	Summer/Fall Fingerling
Stillaguamish Fall Fingerling	Central Puget Sound	Summer/Fall Fingerling
Tulalip Fall Fingerling *	Central Puget Sound	Summer/Fall Fingerling
George Adams Fall Fingerling	Hood Canal	Summer/Fall Fingerling
South Puget Sound Fall Fingerling	South Puget Sound	Summer/Fall Fingerling
Kalama Creek Fall Fingerling	South Puget Sound	Summer/Fall Fingerling
Elwha Fall Fingerling	Strait of Juan de Fuca	Summer/Fall Fingerling
Hoko Fall Fingerling	Strait of Juan de Fuca	Summer/Fall Fingerling
Skagit Spring Yearling	Central Puget Sound	Spring Yearling
Nooksack Spring Yearling	North Puget Sound	Spring Yearling
Skookum Spring Fingerling	North Puget Sound	Spring Yearling
Quilcene Spring Yearling	Hood Canal	Spring Yearling
White River Spring Yearling	South Puget Sound	Spring Yearling
Sooes Fall Fingerling	North Washington Coast	Fall Fingerling
Quinault Fall Fingerling	North Washington Coast	Fall Fingerling
Queets Fall Fingerling	North Washington Coast	Fall Fingerling
Humptulips Fall Fingerling	Grays Harbor	Fall Fingerling
Quillayute Summers *	North Washington Coast	Summer Presmolt
Cowlitz Tule	Columbia River (WA)	Fall Tule Fingerling
Spring Creek Tule	Columbia River (WA)	Fall Tule Fingerling
Bonneville Tule	Columbia River (OR)	Fall Tule Fingerling
Stayton Pond Tule	Columbia River (OR)	Fall Tule Fingerling
Upriver Bright	Upper Columbia River	Fall Bright Fingerling
Hanford Wild *	Upper Columbia River	Fall Bright
Lewis River Wild	Lower Columbia River	Fall Bright
Lyons Ferry	Snake River	Fall Bright Fingerling
Willamette Spring	Lower Columbia River	Spring Yearling
Salmon River *	North Oregon Coast	Fall Fingerling

* Indicates stocks added for the 1991 analysis.

Table 3-2. Indicator stocks, associated stock group, analyses in which each indicator stock is used, and the availability of quantitative escapement recoveries and base period tagging data. (PT Index, CTC recommended passthrough index; Brood Exp, brood exploitation rates; Esc, quantitative estimates of escapement. Stocks used for survival analysis are also used in distribution analysis.)

Stock Name	Stock Group[1/]	Fishery Index	PT Index	Brood Exp	Survival Index	Esc	Base Tagging
Alaska Spring	SEAK Spring	yes	- -	yes	yes	yes	yes
Snootli Creek	NCBC Spring/Summer	- -	- -	- -	yes	- -	- -
Kitimat River	NCBC Spring/Summer	- -	- -	- -	yes	- -	- -
Robertson Creek	WCVI Fall	yes	- -	yes	yes	yes[2/]	yes
Quinsam	Upper GS Summer/Fall	yes	yes	yes	yes	yes	yes
Big Qualicum	Lower GS Fall	yes	yes	yes	yes	yes	yes
Chehalis	Lower FR Fall	- -	- -	- -	yes	- -	- -
Chilliwack[3/]	Lower FR Fall	- -	- -	- -	yes	- -	- -
South Puget Sound Fall Yearling		yes	- -	yes	yes	yes	yes
Squaxin Pens Fall Yearling		- -	- -	- -	yes	- -	- -
Univ of Washington Accelerated		yes	- -	yes	yes	yes	yes
Samish Fall Fingerling	North PS Summer/Fall	yes	yes	yes	yes	yes	yes
Lummi Ponds Fall Fingerling	North PS Summer/Fall	- -	- -	- -	yes	- -	yes
Stillaguamish Fall Fingerling	North PS Summer/Fall	- -	- -	- -	yes	- -	- -
Tulalip Fall Fingerling	North PS Summer/Fall	- -	- -	- -	yes	- -	- -
George Adams Fall Fingerling		yes	- -	yes	yes	yes	yes
South Puget Sound Fall Fingering	South PS Summer/Fall	yes	- -	yes	yes	yes	yes
Kalama Creek Fall Fingerling	South PS Summer/Fall	- -	- -	- -	yes	- -	yes
Elwha Fall Fingerling		- -	- -	- -	yes	- -	- -
Hoko Fall Fingerling		- -	- -	- -	yes	- -	- -
Skagit Spring Yearling	North PS Spring	- -	- -	yes	yes	yes	- -
Nooksack Spring Yearling	North PS Spring	- -	- -	yes	yes	yes	- -
Skookum Spring Fingerling	North PS Spring	- -	- -	- -	yes	- -	- -
Quilcene Spring Yearling		- -	- -	yes	yes	yes	- -
White River Spring Yearling		yes	- -	yes	yes	yes	yes
Sooes Fall Fingerling	WACO[4/]	- -	- -	yes	yes	yes	- -
Quinault Fall Fingerling	WACO	- -	- -	- -	yes	- -	- -
Queets Fall Fingerling	WACO	- -	- -	- -	yes	- -	yes
Humptulips Fingerling	WACO	- -	- -	- -	yes	- -	- -
Quillayute Summers	WACO	- -	- -	- -	yes	- -	- -
Cowlitz Tule	CR Hatchery Tule Fall	yes	- -	yes	yes	yes	yes
Spring Creek Tule	CR Hatchery Tule Fall	yes	- -	yes	yes	yes	yes
Bonneville Tule	CR Hatchery Tule Fall	yes	- -	yes	yes	yes	yes
Stayton Pond Tule	CR Hatchery Tule Fall	yes	- -	yes	yes	yes	yes
Upriver Bright	WACO	yes	yes	yes	yes	yes	yes
Hanford Wild	WACO	yes	- -	yes	yes	yes	- -
Lewis River Wild	WACO	yes	yes	yes	yes	yes	yes
Lyons Ferry	WACO	- -	- -	yes	yes	yes	- -
Willamette Spring		yes	- -	yes	yes	yes	yes
Salmon River	WACO	yes	yes	yes	yes	yes	yes

1/ Stock groupings are used for passthrough index, regional survival indices, and in Chapter 4.

2/ Only hatchery rack recoveries are included in escapement.

3/ Harrison stock only.

4/ WACO - Washington Coastal Spring/Summer/Fall, non-Tule Columbia River Fall, North Oregon Coast.

Table 3-3. Brood years included by stock for Exploitation Rate Assessment (x = valid; o = tagged but no recoveries).

Stock Name	Youngest Age	Oldest Age	Brood Year																		
			71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89
Alaska Spring	3	6	-	-	-	-	-	-	-	x	x	x	x	x	x	x	x	x	x	x	-
Snootli Creek	2	6	-	-	-	-	x	x	x	x	-	-	x	x	x	x	x	x	x	x	x
Kitimat River	2	6	-	-	-	-	-	-	x	x	x	x	x	x	x	x	x	x	x	x	x
Robertson Creek	2	5	-	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Quinsam	2	6	-	-	-	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Big Qualicum	2	5	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Chehalis	2	5	-	-	-	-	-	-	-	-	-	-	x	x	x	x	x	x	x	x	x
Chilliwack	2	5	-	-	-	-	-	-	-	-	-	-	x	x	x	x	x	x	x	x	x
South Puget Sound Fall Yearling	2	5	-	-	-	-	-	-	-	x	x	x	x	-	-	-	-	x	x	x	x
Squaxin Pens Fall Yearling	2	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	x	x	x	x
Univ of Washington Accelerated	2	5	-	-	-	-	x	x	x	x	x	x	x	x	x	x	-	-	-	-	-
Samish Fall Fingerling	2	5	-	-	-	-	x	-	-	-	x	-	-	-	-	-	x	x	x	x	x
Lummi Ponds Fall Fingerling	2	5	-	-	-	-	x	x	x	x	x	x	x	-	-	-	x	x	x	x	x
Stillaguamish Fall Fingerling	2	5	-	-	-	-	-	-	-	-	-	x	x	x	x	-	-	x	x	x	x
Tulalip Fall Fingerling	2	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	x	x	x	x
George Adams Fall Fingerling	2	5	-	-	-	-	x	-	-	x	x	x	x	-	-	-	x	x	x	x	x
SPS Fall Fingerling	2	5	-	-	-	-	x	-	-	x	x	x	x	x	x	x	x	x	x	x	x
Kalama Fall Fingerling	2	5	-	-	-	-	-	-	-	-	x	x	x	x	x	x	x	x	x	x	x
Elwha Fall Fingerling	2	5	-	-	-	-	-	-	-	-	-	-	-	x	x	x	x	x	-	x	x
Hoko Fall Fingerling	2	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	x	x	x	-	o
Skagit Spring Yearling	2	5	-	-	-	-	-	-	-	-	-	-	x	x	x	x	x	x	x	-	-
Nooksack Spring Yearling	2	5	-	-	-	-	-	-	-	-	-	-	x	x	-	x	-	x	x	x	x
Skookum Spring Fingerling	2	5	-	-	-	-	-	-	-	-	-	x	-	x	x	x	x	x	x	x	-
Quilcene Spring Yearling	2	5	-	-	-	-	-	-	-	-	-	-	x	x	x	-	x	x	x	x	x
White River Spring Yearling	2	5	-	-	-	-	-	-	-	-	x	x	x	x	x	x	x	x	x	x	x
Sooes Fall Fingerling	2	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	x	x	x	-	x
Quinault Fall Fingerling	2	6	-	-	-	-	x	x	x	x	x	x	-	x	x	x	x	x	x	x	x
Queets Fall Fingerling	2	6	-	-	-	-	-	-	x	x	x	x	x	x	x	-	x	x	x	x	o
Quillayute Summers	2	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	x	x	x	x	x
Humptulips Fall Fingerling	2	6	-	-	-	-	-	-	-	-	-	-	-	x	-	x	x	x	x	x	x
Cowlitz Tule	2	5	-	-	-	-	-	-	x	x	x	x	x	x	x	x	x	x	x	x	x
Spring Creek Tule	2	5	-	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Bonneville Tule	2	5	-	-	-	-	-	x	x	x	x	x	x	x	x	x	-	-	-	-	-
Stayton Pond Tule	2	5	-	-	-	-	-	-	-	x	x	x	x	x	x	x	x	x	x	x	x
Upriver Bright	2	5	-	-	-	-	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Hanford Wild	2	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	x	x	x	x
Lewis River Wild	2	5	-	-	-	-	-	-	x	x	x	-	-	x	x	x	x	x	x	x	x
Lyons Ferry	2	5	-	-	-	-	-	-	-	-	-	-	-	-	-	x	x	x	x	x	x
Willamette Spring	3	6	-	-	-	-	x	x	x	x	x	x	x	x	x	x	x	x	x	x	-
Salmon River	2	5	-	-	-	-	-	-	x	x	x	x	x	x	x	x	x	x	x	x	x

Fishery Indices: It was anticipated when the PST was negotiated that catch ceilings and increases in stock abundance would result in reduced harvest rates in fisheries managed under PST established catch ceilings. The fishery index provides a means to assess changes in fishery harvest rates. The fishery index combines stock and age specific exploitation rates in a fishery to express an index of fishery harvest rate changes relative to a 1979-1982 base period. A fishery index less than 1.00 represents a decrease in harvest rate from the base period while a fishery index greater than 1.00 indicates an increase. The relative magnitude of the change is the difference of the index from 1.00.

Fishery indices are presented for both reported catch and total (reported catch plus incidental loss) mortalities, both expressed in terms of adult equivalents (AEQ). Adult equivalence is defined as the probability that, in the absence of fishing, a fish of a given age would leave the ocean to spawn. The total mortality index provides a consistent means of representing changes in reported catch and incidental mortalities, including those associated with regulatory measures such as minimum size limits and non-retention periods.

Fishery indices were calculated separately for the GS sport and troll fisheries, with the PSC catch ceiling apportioned to the two fisheries according to Canadian domestic allocation decisions. The fishery indices reported for the SEAK and NCBC fisheries include only troll recoveries, although the ceilings include all gear types. This approach was used since the majority of the catch (and the most reliable CWT sampling) occurs in the troll fisheries. In the SEAK fishery, a greater proportion of the catch was harvested by the sport fishery in 1991, and the index may underestimate the harvest impact of all gear types. The CTC is evaluating whether additional gear types should be included in the indices for the SEAK and NCBC fisheries.

Passthrough Indices: The passthrough provision of the PST requires that "the bulk of depressed stocks preserved by the conservation program ... principally accrue to escapement." The CTC has not been provided a definition of passthrough which can be used to analytically assess if this provision of the PST has been satisfied. As an interim measure, this report includes the passthrough index previously suggested by the CTC (CTC 1991). The index compares the expected adult equivalent catches (assuming base period exploitation rates and current abundance) with the observed adult equivalent catches on a calendar year basis overall nonceiling fisheries of a Party. Index values greater than 1.0 for U.S. nonceiling fisheries indicate that the passthrough provision has not been satisfied under the definition proposed by the CTC. Consistent with Canadian commitments, passthrough in Canadian net fisheries was evaluated with respect to a 25% reduction in harvest rates from the base period.

Brood Exploitation Rates: Brood year exploitation rates provide the best measure of the cumulative impact of fisheries upon all age classes of a stock. Implementation of the PST chinook rebuilding program was expected to reduce brood exploitation rates by 16 percentage points for the GS stock and 9 percentage points for the WCVI stock by 1998 (PSC 1991). The extent of the reduction necessary to achieve the exploitation rate sustainable at the escapement goal will depend upon the productivity of the stock, current escapement relative to the goal, and the target rebuilding date.

In this report, brood exploitation rates are presented for ocean fisheries (generally marine sport, troll, and recoveries of age 2 and 3 chinook in nonterminal net fisheries) and in total for all fisheries (marine and freshwater sport, marine troll, marine and freshwater net). The rates are expressed in adult equivalents and partitioned into reported catch and incidental mortality components. Rates are expressed as a proportion of the total fishing mortality plus escapement. The values presented in the tables and figures are actual proportions, not indices.

Stock Indices: Stock indices provide information on the annual impact of fisheries for a specific stock relative to the 1979-1982 base period. The index is computed for the ceiling fisheries by dividing the total exploitation rate in all fisheries in a given year by the average total exploitation rate during the base period. An index greater than 1.0 indicates that impacts have increased relative to the base period. The stock indices computed in the Exploitation Rate Assessment are reported in Chapter 4.

Survival Indices: A survival index was computed for ocean ages 2 and 3 of each stock using CWT release and recovery data. The survival index was calculated as the sum of CWT catch recoveries plus escapement of a given age divided by the number of tagged fish released for the brood. For stocks with no escapement data, the survival index was computed using only catch recoveries. This will affect the validity of the index if changes in harvest rates are large compared to changes in survival rates.

Separate indices for the two ages were used instead of a single estimate based on total survival in order to include the 1989 brood year in the analysis. On average, the ocean age 3 estimate provides a better index for total survival; however, past experience has shown that both indices fluctuate in a similar manner for most stocks although fluctuations are more pronounced for age 3 returns.

The stock specific indices were combined to provide a projection of survival trends for regional stock groups using the methods previously described (CTC 1990). Stocks included in each stock group are indicated in Table 3-2. The index provides an indication of survival trends for broods contributing to fisheries in 1992-1993.

The CTC has investigated the potential for bias in the procedures used to estimate the survival indices. Since the current index does not account for changes in exploitation rates, and all age 2 and 3 chinook do not mature, it appeared likely that a negative bias might exist in the index if exploitation rates declined. Several alternative indices were constructed and compared with the current survival index using a simulation model. Three of the indices tested required an estimate of the maturation rates for each brood and age. Since maturity rates can only be calculated for broods for which all ages have returned (a complete brood return), use of these indices for incomplete broods required the use of average maturation rates.

Results from the simulation showed that variation in maturity rates of the magnitude seen in the exploitation rate indicator stocks degrades the performance of the indices which require the use of average maturation rates. The index currently used is the best available estimator of survival rate. The CTC will continue to investigate other alternatives.

Stock Catch Distribution: The distributions of reported catch and of total mortalities for each indicator stock are presented for nine fishery categories: one for each set of fisheries operating under a PSC ceiling and one for each gear type of Canadian and U.S. fisheries that do not operate under PSC ceilings. Distributions are presented as percentages of both the reported catch and the total fishing mortality (expressed in AEQ). Distributions were computed only for calendar years in which CWT recovery data was present for at least three brood years.

In addition, for each ceiling fishery, Appendix H reports the percentage of the catch in the fishery which each stock comprises and the proportion of the total mortality of the stock which occurs in that fishery. These estimates were obtained from the November 1992 calibration of the CTC chinook model.

3.1.2 CWT Data Used

Sources of CWT recovery data and expansion procedures employed in the Exploitation Rate Assessment are summarized below.

In a few cases, small samples from commercial fisheries have resulted in very large expansion factors. To avoid very large expansion factors associate with small samples, expansion factors were constrained to the range of 1 to 50.

Canadian Commercial Fisheries: Estimated recoveries for commercial fisheries in Canada were obtained from the Mark-Recovery Database maintained by the CDFO at the Pacific Biological Station.

Canadian Sport Fisheries: Observed recoveries for sport fisheries in Canada were obtained from the Mark-Recovery Database maintained by the CDFO at the Pacific Biological Station. As in the 1989 and 1990 analyses, expansion factors were computed using the following procedures. Starting in 1980, recoveries made in GS during the summer months (May-September) were expanded as documented in Kuhn et al. (1988). Recoveries made in other months were expanded using the average expansion factor for the summer period in the same recovery year. Recoveries in areas outside of GS used the corresponding expansion factor for the GS, unless an expansion factor based on creel survey data was available. Recoveries made prior to 1980 continued to be expanded by the default value of four.

GS sport recoveries were expanded using these procedures because of potential tag expansion biases associated with inadequate sampling and infrequent overflights of the sport fishery during winter months. The application of GS expansion factors to sport recoveries in other areas was necessary because reliable catch and mark incidence estimates are normally unavailable for these areas.

Estimated recoveries from the GS sport fishery were reestimated from 1980 through 1991 due to a new stratification into three sub-areas: north GS (Statistical areas 13-16); southern GS (Statistical areas 17-19A (Saanich Inlet), 28 & 29); and Statistical areas 19B (San Juan through Victoria) & 20, the Juan de Fuca Strait. These sub-areas were developed due to differences in stock compositions, characteristics of the fisheries, and recent regulatory measures which differed in 19B & 20 from the other areas. Tags were estimated within sub-areas and then summed for total recoveries in the area previously defined as the GS sport fishery. This revision resulted in minor changes to the total number of estimated tags.

Canadian Escapement: Escapement data for Canadian stocks were determined directly from hatchery records, from the Salmon Stock Assessment database at the Pacific Biological Station, and from documents prepared through the Canadian key stream program. Details regarding the source of escapement data for each of the three Canadian hatcheries used in the fishery index analysis are as follows.

Robertson Creek. A proportion of the tagged fish returning to the Robertson Creek Hatchery spawn in the Stamp River; however, fish in the river have been sampled only since 1984. These recoveries have not been included in the exploitation rate analysis because comparable sampling was not conducted in the base period. Because exploitation rate analysis for this stock assumes that a consistent portion of the returns enter the hatchery, the exploitation rate will be overestimated. Further, native catch in the Somass River has increased recently, but this fishery is not sampled for coded-wire tags or included in the exploitation rate analysis. This non-reported catch will result in an overestimation of ocean exploitation rates and an under-estimation of the total exploitation.

Big Qualicum. Since 1971, escapement for the Big Qualicum River has been enumerated and checked for CWTs at a counting fence with two exceptions. Prior to 1988, the early part of the run, which was allowed to spawn naturally, was not sampled for CWTs. This was accounted for by expanding the sampled fraction of the run to represent the total run (expansions were stratified by adult and jacks). In addition, a few hundred fish occasionally spawn below the fence (which is less than 1 kilometer above tidewater). These are unsampled and the total number is only visually estimated. No adjustment was made to account for these fish.

Quinsam Hatchery. The Quinsam Hatchery obtains brood stock primarily by seining spawning adults from both the Campbell River (the main river) and the Quinsam River (a relatively small tributary). Brood stock captures are examined for marks and are added to the estimates of CWT escapement to the rivers. These are also stratified by sex for the purposes of sample expansions and for adjustments for lost pins and no data recoveries. Chinook entering the hatchery have not been an important factor until 1989. In addition, hatchery staff have sampled the carcasses in the river for CWT from 1978 to 1983. Since 1984, escapement has been estimated by a mark recapture program (Andrew et al. 1988; Bocking et al. 1990; Bocking 1991; Bocking in prep.; Shardlow et al. 1986). Estimates of the CWT escapement to each river were made by expanding the CWTs recovered during the dead pitch by the fraction of the estimated total escapement which was sampled. Both the escapement and the dead pitch were stratified by sex, combining adult and jack males into a single stratum. CWTs recovered during carcass recovery prior to 1984 were expanded by using the average fraction sampled from the period 1984 to 1990, stratified by river with both sexes combined.

Alaskan Fisheries: Recoveries from Alaskan commercial fisheries were obtained from the PSMFC with the exception of recoveries in the fall of 1978. The 1978 commercial data and all estimated sport recoveries were obtained from ADF&G. The lack of reporting of sport recoveries to PSMFC by the Alaska Division of Sport Fisheries creates considerable unnecessary work for the CTC.

Data anomalies were corrected using procedures discussed in Appendix II of the 1987 CTC Annual Report (CTC 1988). Several of the more important adjustments are summarized below.

1. CWT recoveries from commercial fisheries were expanded to account for unsampled catches by multiplying by the ratio of the total catch to the sampled catch. For troll gear, the total accounting year (1 Oct.-30 Sept.) catch for SEAK was adjusted as a single stratum. For net and trap gear, adjustments were computed for a district or group of districts by calendar year.

2. CWT recovery data for the SEAK sport fishery during the 1979-1982 base period are of poor quality due to very limited sampling. The sport fishery sampling program expanded substantially from 1983 to 1986, resulting in more reliable estimates in recent years. To

estimate CWT recoveries for this fishery in years prior to 1987, sport recoveries were estimated from troll recoveries and the relative size of the sport and troll catch (CTC 1990).

Alaskan Escapement: Methods used to compute the escapement for Alaskan tag groups are summarized below in instances in which modifications from the PSMFC database occurred. The escapement to Southern Southeast Regional Aquaculture Association (SSRAA) facilities includes recoveries from cost recovery fisheries since the catch in these terminal area fisheries is not included in the Alaska ceiling.

Deer Mountain. Total returns of CWT were known for all years; however, returns in 1980, 1982, and 1983 were broken down only by brood year (1978, 1979, and 1980) and not by tag code. The recoveries by tag code were estimated as follows:

1) For each return year-brood year combination, an initial estimate of the recoveries by tag code was obtained by multiplying the total recoveries of the brood by the proportion of the tagged brood release that belonged to each tag code.

2) The estimated recoveries for each tag code were then expanded by the ratio of the tagged release to the total production associated with that release and summed over the tag codes.

3) The estimate of the total recoveries for the entire brood was made by dividing the total tagged recoveries by the proportion of the brood which was tagged.

4) The sum of the tag code recoveries obtained in (2) above was modified to equal the estimate obtained in (3) by adjusting the estimates of the tagged recoveries by code until the two sums matched.

This method assumes that all tag codes in a brood year had equal survival from release.

SSRAA. The sampling for marks in SSRAA hatcheries was performed using one of two methods:

1) Random sampling of fish for marks was conducted during each distinct time period (the length of the periods varied) throughout the return. The target number of CWTs was 200, but the actual numbers varied. Unfortunately, the number of fish examined for marks was not always recorded.

2) Marked fish were deliberately selected from the return during each time period. The number of fish examined to obtain this select sample was not recorded. These marked fish were then randomly sampled for approximately 200 CWTs.

Neither of these methods provides a usable estimate of mark incidence. Hence the recoveries by tag code for these hatcheries were estimated as follows:

1) The tagged recoveries in each sample were expanded by the marked to total release ratio and summed across tag codes.

2) The total return (tagged and untagged) during each time period was then multiplied by the proportion of the expanded sum which belonged to each tag code. These estimates were then summed for all the return periods to obtain a total estimated return for each tag code.

3) As a result of this estimation procedure, the return estimates for each tag code include both the marked and unmarked portions of the release. To estimate the number of returning tags, this total estimate was divided by the release ratio.

This method assumes that the survival of marked and unmarked fish was equal. The SSRAA should determine the potential for providing data which permit direct estimation of the number of recoveries.

Southern U.S. Fisheries: Recoveries by Washington, Oregon, and California fisheries were obtained from the database maintained by the PSMFC with the following exceptions: 1991 terminal sport recovery data for the Willamette Spring and Stayton Pond Tule stocks were obtained from the ODFW, 1990 and 1991 Puget Sound sport catch/sample expansion factors were obtained from the WDF, and 1990 and 1991 terminal sport data for the Upriver Bright, Lewis River Wild, Hanford Wild, Cowlitz Tule, and Lyons Ferry stocks came from the WDF.

Data were obtained directly from WDF or the ODFW only when that data had not yet been provided to the PSMFC. It should remain a high priority of all agencies to provide this information in a timely manner to PSMFC since the work of the CTC is slowed considerably when data must be sought and integrated from a number of individual agencies.

Southern U.S. Escapement: Escapement recovery data for southern U.S. stocks were obtained from the PSMFC database with the following exceptions:

1) Recoveries for WDF and tribal facilities in Puget Sound and on the Washington Coast for 1990 and 1991 were obtained from WDF.

2) Recoveries at the University of Washington for return years prior to 1985 were obtained from the WDF.

3) Recoveries to the U.S. Fish and Wildlife Service (USFWS) facilities (Quilcene National Fish Hatchery, Makah National Fish Hatchery, and Quinault National Fish Hatchery) in 1991 were obtained from the USFWS.

4) 1991 escapement data for Spring Creek tules came from the USFWS, 1991 escapement recovery data for the Willamette springs and Stayton Pond tules came from ODFW, and 1990 and 1991 escapement recoveries for Upriver Brights, Lewis River Wild, Hanford Wild, Cowlitz Fall Tule, and Lyons Ferry stocks were obtained from the WDF.

5) Methods for calculating dam conversion rates and interdam loss (IDL, one minus the dam conversion rate) were changed since the 1990 annual report. Currently, the conversion from Bonneville Dam to McNary Dam for Columbia Upriver Brights and Hanford Wild (URBs) is calculated for the exploitation rate analysis as

$$\frac{\mathit{McNary\ Count}}{(\mathit{Bonneville\ URBs}) - (\mathit{Zone\ 6\ Comm\ Catch}) - (\mathit{Deschutes\ Turnoff})}$$

Bonneville upriver bright counts are calculated by the WDF by first calculating the stock composition (URBs vs. mid-Columbia brights or MCBs) of all brights above Bonneville Dam, and then applying the proportion of URBs in the upriver run to the Bonneville Dam counts of brights based on visual observation of skin color. Zone 6 commercial catches are taken from the Columbia River Status Report (WDF and ODFW); ceremonial, subsistence, and sport catches above Bonneville Dam are not accounted for and result in a slight overestimate of IDL. The number of fish returning to the Deschutes River is estimated annually by ODFW. Fish entering other tributaries are not accounted for and will again result in a slight overestimate of IDL.

For Lyons Ferry Hatchery fish, conversion is calculated by multiplying the conversion rate of URBs by an additional conversion rate for losses between McNary Dam (the last dam before the Snake River) and Ice Harbor Dam (the first dam on the Snake River and where Lyons Ferry escapement is measured for the exploitation analysis). There is not a direct estimate because of straying and fallback over Ice Harbor Dam, so the average of the Bonneville Dam to McNary Dam per project conversion and the Lower Monumental Dam to Lower Granite Dam per dam conversion was used. The per project conversion rates were calculated as the cube root of the total conversion between counting sites; each total conversion incorporates three interdam pools. Escapements of tagged fish above Ice Harbor were adjusted for IDL according to methods being documented by Schaller and Berkson (pers. comm.).

3.1.3 Estimates of Incidental Catch Mortality

Parameters used to estimate incidental catch mortality have been provided by regional management agencies and are listed in Appendix C.

3.2 ESTIMATION OF EXPLOITATION RATES

3.2.1 Theory and Procedures

For fisheries operating under PSC ceiling management, successful completion of the rebuilding program depends upon a substantial initial reduction in fishery harvest rates and stock exploitation rates combined with progressive reductions over time. Components of the Exploitation Rate Assessment were developed to evaluate the effectiveness of management measures and trends in stock survival. Theory and procedures employed in the Exploitation Rate Assessment are consistent with those used in previous years (CTC 1988; CTC 1989; CTC 1990) except as noted below:

1) A change was made in the criteria used to determine which age classes were included in the stock index for ceiling fisheries. For the 1989 analysis, a fishery aggregate was included if at least one of the following criteria was satisfied: a) the exploitation rate averaged at least 3% during the base period; b) the exploitation rate averaged at least 3% from 1979-1989; or c) the exploitation rate in any single year was least at 10%. For the 1991 analysis, the same age classes were included in the stock index as used in the fishery indices.

2) Review of the cohort analysis indicated that the estimated incidental mortalities in Canadian and Alaskan net fisheries were greater than observed in field sampling programs.

The larger than expected incidence of shakers results from the computational procedure used to estimate shakers. Data used to estimate size at age was derived largely from CWT recoveries by seine nets, the least size selective gear. Using a size limit effectively truncates some of the recoveries as being non-vulnerable; however, all CWT recoveries are included in the cohort analysis regardless of the size of the fish. This can result in a substantial over estimation of the number of shakers in net gears since they do not usually operate under a size limit. For instance, use of size limit for age 2 fish may imply that 95% of the population was not vulnerable to a gear. Consequently, any CWT recovery would be assumed to come from only 5% of the population while 95% of the population would be subject to incidental mortalities. An encounter rate estimate of 20 times the actual value could result.

To correct this problem, encounter rates were adjusted to be consistent with field observations from southern B.C. seine fisheries between 1985 - 1990 (Nagtegaal et al. 1988, 1990; Riddell pers. comm.). These programs indicate that small chinook over the entire size range of age 2 fish are recovered in these fisheries and size limits are inappropriate. The expansion of age 2 fish was corrected by increasing the proportion vulnerable until the encounter rates were consistent with the field observations (reduced by approximately 90%). The revised proportion was applied to Canadian and Alaskan seine and mixed net gear fisheries (seine and gillnet). The inclusion of the mixed gear was required since CWT sampling frequently can not separate which gear a recovery came from. However, the inclusion of gillnets will have minimal influence on the incidental mortalities since very few age 2 chinook are caught with this gear.

3) A passthrough index was computed using methods previously recommended by the CTC (CTC 1991). Since most of the depressed natural stocks subject to the passthrough provision are not tagged, the index was computed using representative stocks (primarily of hatchery origin) which are believed to have a similar catch distribution. The exploitation rate indicator stocks used to represent depressed natural stocks in each region are given in Table 3-2. Passthrough fisheries included in the analysis are listed below.

U.S. - Washington/Oregon/California troll, Puget Sound northern net, Puget Sound other net (except for the Samish Fall Fingerling stock), Washington Coastal net, Washington/Oregon/California ocean sport, Puget Sound northern sport, Puget Sound southern sport.

Canadian - WCVI net, Juan de Fuca Net, Johnstone net, Fraser net. Consistent with Canadian commitments, passthrough in these fisheries was evaluated with respect to a 25% reduction in harvest rates from the base period.

Some fisheries subject to the passthrough provision are not included in the index:

a) The WCVI sport fishery was not included because catch estimates and CWT recoveries are not available for all components of this fishery.

b) Passthrough indices excluded terminal fisheries when exploitation rate indicator stocks were subject to different fishery patterns than the associated natural stocks. For example, exploitation rate indicator stocks may be of hatchery origin and subjected to fisheries designed to harvest surplus hatchery production. In other instances, depressed natural stocks may be subjected to net or sport fisheries that do not impact the associated exploitation rate indicator stock. Information on terminal fishery harvest rates on natural stocks is presented in Chapter 4.

In some instances, a low exploitation rate (or limited number of fish tagged) resulted in few CWT recoveries in the passthrough fisheries. To reduce the variability of the estimates, only stock-fishery combinations were included which satisfied the minimum average recovery criteria used to select stocks for inclusion in the fishery index.

The natural stocks subject to the passthrough provision were identified from the list of escapement indicator stocks provided in Chapter 2. A stock was included in the analysis if the escapement goal was not achieved and the stock was harvested in passthrough fisheries.

4) In the 1990 annual report, the number of fish encountered during the 1990 SEAK CNR fishery was estimated by multiplying the number of encounters during the retention period by the ratio of the number of days of retention to nonretention and a selectivity parameter. The selectivity parameter was included to account for changes in fishing methods which occurred during the CNR fishing period. An assumption of this procedure is that the number of days fished is proportional to the fishing effort expended. Effort data provided by ADF&G in 1992 indicate that this assumption is not valid. Effort during the CNR period was generally less than would be predicted by simply multiplying effort during the retention period by the ratio of CNR days to retention days.

   In this report, the number of legal encounters in the CNR fishing periods in 1990 and 1991 was estimated from a regression equation which relied upon field sampling data collected by ADF&G from 1985-1990 (Appendix C). The predictor variable in the regression was the product of the encounter rate during the retention period and the number of gear days during the CNR fishing period.

3.2.2 Assumptions of the Analyses

Assumptions for the cohort analysis and other procedures used in the Exploitation Rate Assessment are summarized below. Detailed discussions of assumptions and parameter values have been reported previously (CTC 1988).

Cohort Analysis: Cohort analysis is the computational procedure used to reconstruct a cohort from CWT recoveries. All subsequent analyses rely upon parameters estimated from the cohort analysis. The primary assumptions of the cohort analysis are listed below.

1. Fishery and escapement CWT recovery data are obtained in a consistent manner from year to year or can be adjusted to make them comparable. Many of the analyses rely upon indices which are computed as the ratio of a statistic in a particular year to the value associated with a base period. Use of ratios may reduce or eliminate the effect of data biases which are consistent from year to year.

2. For age 2 and older fish, natural mortality is constant for each age class in all years.

3. All stocks within a fishery have the same size distribution for each age and the size distribution at age is constant among years.

4. The distribution of sub-legal sized fish is the same as legal-sized fish.

5. Incidental mortality rates per encounter are constant and are equal to 30% for troll and sport fisheries and 90% for net fisheries.

6. In the absence of an independent estimate of incidental mortality loss during non-retention periods, the procedure for estimating the mortality of CWT fish of legal size assumes that the stock distribution remains unchanged from the period of legal catch retention. Gear and/or area restrictions during the CNR fishery are believed to reduce the number of encounters of legal sized fish. To account for this, the number of legal encounters during the nonretention fishery was adjusted by a selectivity factor. A factor of 0.34 was used for the WCVI and GS troll fisheries. This value is the average selectivity factor calculated from 3 years of observer data in the Alaska troll fishery (Mel Seibel, pers. comm.). A factor of 0.20 is used in the NCBC troll fishery. This factor corresponds to the proportion of fishing areas which remain open during nonretention periods.

Fishery Indices: The temporal and spatial distributions of stocks in and between fisheries are assumed to be stable from year to year.

Survival Rate Indices: Fishery exploitation rates, incidental mortality rates, and stock maturation rates are constant from year to year. Variations in fishery exploitation rates which are small compared to changes in survival should not adversely effect the survival index. Considerable variation in exploitation rates may occur when a large proportion of the age 2 or 3 fishing mortality occurs in fisheries directed at other species.

3.2.3 Reported Catch Versus Total Mortalities

Fishery indices are presented for both reported catch and total mortality. Management strategies have changed considerably for fisheries constrained by PSC catch ceilings. Regulatory changes which have been implemented include size limit changes and extended periods of CNR. These changes are not reflected in CWT recovery data, yet are crucially important for assessment of total fishery impacts. Procedures to estimate these incidental mortality losses and incorporate them into the Exploitation Rate Assessment have been previously described (CTC 1988).

3.3 FISHERY INDICES

3.3.1 Overview

Detailed exploitation rates and fishery index data and graphs are provided in Appendix D. The appendix includes stock specific indices for total mortality for each fishery. Figures presented in Appendix D depict fishery indices based on total fishing mortality over time. The heavy black line indicates the estimated fishery index; the light vertical bars are used to display the central range[2] of fishery indices observed among individual stocks. Large variability is often evident when comparing indices of several stocks. This variation may be due to sampling, departures from assumptions, and differential harvest rates.

A summary of the fishery indices for total fishing mortality is presented in Table 3-4. The table provides a comparison of estimated fishery indices for each year since 1985 as well as the 1985 target reduction. The 1985 target reductions indicated in the last column were computed by subtracting the ratio of the 1985 catch ceiling to 1979-1982 average catch from one. The 1985 target reduction represents the expected change in the fishery index which would result from imposition of the ceiling if stock abundance were equal to the 1979-1982 average. Further reductions in harvest rates for PSC ceilinged fisheries were expected as the rebuilding program progressed due to decreases in fishing mortality and increases in production resulting from higher spawning escapements. The 1985 target reduction is used as a minimum expectation and is compared with present reductions because a method has not been developed to compute the time trend of expected reductions in harvest rates. Separate indices are presented for the NBC and CBC troll fisheries in order to evaluate the effects of effort shifts between the two regions. Separate fishery indices were computed for age 3 and age 4 fish in the WCVI troll fishery to evaluate the impact of the size limit change in 1987.

Table 3-4. Percent change from the 1979-1982 base in the fishery index for total adult equivalent mortality and 1985 target reductions.

FISHERY	AGE	CHANGE IN TOTAL FISHERY HARVEST RATES FROM BASE PERIOD								
		1985	1986	1987	1988	1989	1990	1991	85-91 AVERAGE	85 TARGET REDUCTION
SEAK Troll	3,4,5	16%	5%	1%	-22%	-30%	-12%	-4%	- 7%	-22%
NCBC Troll	3,4,5	-8%	-20%	-21%	-38%	-31%	-30%	-27%	-25%	-16%
NBC Troll	3,4,5	44%	-17%	-3%	-16%	0%	-8%	-11%	-1%	a/
CBC Troll	3,4,5	-75%	-33%	-51%	-83%	-90%	-63%	-56%	-65%	a/
WCVI Troll	3,4	-11%	-4%	-24%	2%	-57%	-19%	-43%	-22%	-24%
"	3	-14%	-9%	-22%	-12%	-61%	-8%	-51%	-25%	-24%
"	4	-9%	-1%	-26%	11%	-55%	-24%	-39%	-20%	-24%
Strait of Georgia										
Sport & Troll	3,4,5	-53%	-27%	-34%	-41%	-18%	-40%	-23%	-34%	-47%
Troll	3,4	-85%	-49%	-74%	-92%	-87%	-57%	-67%	-73%	-79% b/
Sport	3,4,5	-37%	-10%	-17%	-28%	14%	-30%	-2%	-16%	-20% b/

a/ Target reductions were not specified independently for NBC and CBC troll fisheries.
b/ Using Canadian domestic catch allocation decisions.

[2] The central range is defined as follows:

Stock-Age Combinations	Central Range
<10	the range of indices
10 to 19	the range remaining after the lowest and highest values are excluded
20 to 29	the range remaining after the two lowest and two highest values are excluded

3.3.2 Southeast Alaska

Fishery indices for 1988 and 1989 indicate that harvest rates had dropped by approximately 25% from the base period level. The fishery index increased in subsequent years; the estimated reduction was 12% in 1990 and 4% in 1991. The 1985-1991 average fishery index showed a reduction of 7% from the base period level, 15 percentage points less than the 1985 target reduction under the PSC regimes.

3.3.3 North/Central B.C.

Consistent with expectations, the NCBC fishery indices declined from 1985 through 1988. The 1988 index declined by 38%, and the estimated reduction in the harvest rate was approximately 30% in each of the years from 1989 through 1991. Since implementation of the PST, harvest rates have been reduced by an average of 25% from the base period level.

The reduction has been disproportionate between the NBC and CBC troll fisheries, with reductions in the CBC fishery ranging from 33% to 90%, and averaging 65% from 1985 through 1991. In contrast, harvest rates in the NBC troll fishery decreased by an average of 1% from 1985 through 1991.

3.3.4 West Coast Vancouver Island Troll

The fishery index for age 3 and 4 fish in the WCVI troll fishery from 1985 through 1988 showed an average reduction of approximately 9% from the base period. Reductions in 1989, 1990, and 1991 were more substantial: 57% in 1989, 19% in 1990, and 43% in 1991. Since 1985, the harvest rate for the WCVI troll fishery has been reduced on average by 22%. The target reduction for 1985 was 24%.

The change in the minimum size limit for the WCVI troll fishery from 62 cm to 67 cm in 1987 appears to have had a consistent differential impact upon age 3 and age 4 chinook. In three of the five years since initiation of the new larger size limit, age 3 chinook have had a greater reduction in the index than for age 4 fish. Also, in 1987, one of the years for which the age 3 index did not show a greater reduction, the increased size limit did not come into effect until well into the fishing season.

3.3.5 Strait of Georgia

Sport and Troll Combined: The 1985 target reduction for the GS sport and troll fishery has not been achieved since 1985. The estimated reduction of 23% for 1991 is approximately one half of the 1985 target reduction of 47%. The average reduction since 1985 was 34%.

Troll: The harvest rate in the GS troll fishery in 1991 declined by 67% from the base period. This is less than the 1985 target reduction of 79% (based upon Canadian domestic catch allocation decisions). The average reduction since 1985 was 73%.

Sport: The estimated reduction in the harvest rate for the GS sport fishery in 1991 was only 2%. This is less than the 1985-1991 average reduction of 16%, and less than the 1985 target reduction of 20% (based upon Canadian domestic catch allocation decisions).

3.3.6 Comparison Of Total Mortality and Reported Catch Indices

The fishery index was computed for reported catch and total mortality. The total mortality index includes the mortality from CNR fisheries and from discarding fish that are smaller than the legal size limit. Given a stable age structure, the reported catch index and the total mortality index should give similar results in the absence of major regulatory changes. Results from the comparison of the two indices are consistent with this expectation. In fisheries in which management actions have not increased incidental mortality, the indices based on the 2 methods are similar (Table 3-5).

Table 3-5. Comparison of fishery indices based on reported catch and total mortality.

YEAR	SEAK TROLL AGES 3-5		NCBC TROLL AGES 3-5		WCVI TROLL AGES 3-4		GS SPORT/TROLL AGES 3-5	
	REPORTED	TOTAL	REPORTED	TOTAL	REPORTED	TOTAL	REPORTED	TOTAL
1979	1.02	0.98	0.96	0.97	0.98	0.98	0.76	0.76
1980	1.03	1.00	1.07	1.08	1.03	1.02	1.19	1.19
1981	1.09	1.07	1.19	1.18	0.83	0.83	1.42	1.41
1982	0.89	0.95	0.78	0.77	1.12	1.12	0.77	0.77
1983	1.35	1.39	0.90	0.89	1.17	1.17	0.89	0.89
1984	0.95	1.02	1.00	0.98	1.51	1.49	1.02	1.02
1985	1.01	1.16	0.93	0.92	0.88	0.89	0.47	0.47
1986	0.99	1.05	0.79	0.80	0.98	0.96	0.70	0.73
1987	0.84	1.01	0.75	0.79	0.67	0.76	0.66	0.66
1988	0.75	0.78	0.59	0.62	0.93	1.02	0.59	0.59
1989	0.60	0.70	0.68	0.69	0.40	0.43	0.74	0.82
1990	0.80	0.88	0.67	0.70	0.75	0.81	0.53	0.60
1991	0.77	0.96	0.70	0.73	0.54	0.57	0.67	0.77

The effect of CNR regulations on total mortalities are apparent for the SEAK troll fishery, and the effects of CNR and size limit changes are apparent for the NCBC troll fishery, the WCVI troll fishery, and the GS sport and troll fisheries. The largest difference between the catch and total mortality indices occurred in the SEAK fishery. In 1991, the prolonged chinook nonretention fishery (64.5 days) and the high encounter rates resulted in a 19 percentage point difference between the indices. While CNR fisheries in the NCBC fishery have generally been of shorter duration than in the SEAK fishery, CNR fisheries have resulted in an average increase in the fishery index of 3 percentage points since 1987. The increased length of nonretention in the GS troll fishery in 1991, and the change in the size limit in the GS sport fishery, resulted in a 10 percentage point difference between the fishery index for the reported catch and total mortality index for the GS sport and troll fishery in 1991.

3.4 PASSTHROUGH INDICES

Estimates of the passthrough index for U.S. fisheries and Canadian fisheries are presented in Table 3-6. For U.S. nonceiling fisheries, values of the passthrough index which are less than or equal to 1.0 indicate that the CTC definition of passthrough was satisfied for the fisheries included in the index. All U.S. passthrough fisheries are included in the index with the exception of terminal net and sport fisheries (see section 3.2.1).

Table 3-6. Passthrough indices for depressed natural stocks in US and Canadian fisheries (na: stock-fishery combination does not meet selection criteria).

EXPLOITATION INDICATOR STOCK GROUP	DEPRESSED NATURAL STOCK	COUNTRY	PASSTHROUGH INDEX							
			1985	1986	1987	1988	1989	1990	1991	MEAN
Upper GS Summer/Fall	Upper GS	U.S.	na	na	na 1/	na	na 1/	na	na	na
		Canada	0.8	0.5	0.7 1/	0.3	0.9 1/	0.3	0.3	0.5
Lower GS Fall	Lower GS	U.S.	na	na	na	na	na	na	na	na
		Canada	0.6	0.8	0.3	0.3	0.5	0.6	0.4	0.5
North PS Summer/Fall	Skagit Summer/Fall 2/	U.S.	2,3/	2,3/	0.7	0.7	0.8	1.4 2/	1.0	0.9
	Stillaguamish Snohomish	Canada	2,3/	2,3/	na	na	na	na 2/	na	na
WACO	Grays Harbor Fall 4/	U.S.	0.4	0.5	0.6 4/	0.9 4/	0.7 4/	1.3 4/	0.4	0.7
	Columbia River Summer	Canada	na	na	na	na	na	na	na	na

1/ Escapement greater than goal in 1987 and 1989; passthrough provision not applicable.
2/ Escapement greater than goal in 1985, 1986, and 1990; passthrough provision not applicable.
3/ No CWT groups.
4/ Escapement greater than goal in 1987-1990; passthrough provision not applicable.

The passthrough index for depressed U.S. stocks harvested in U.S. fisheries was less than or equal to 1.0 with the exception of the North Puget Sound Summer/Fall and WACO stock groups in 1990. The average value of the passthrough index was 0.9 for the North Puget Sound Summer/Fall stock group and 0.7 for the WACO stock group. Recoveries were insufficient to compute the passthrough index for the GS stocks in U.S. fisheries.

Consistent with Canadian commitments, passthrough evaluation of Canadian net fisheries incorporated a 25% reduction from the base period. The WCVI sport fishery is not included in the CTC passthrough index for Canadian fisheries since estimated recoveries are not available. Mean values of the index for Canadian stocks were less than 0.75, although year specific indices exceeded the target value in two of the 12 stock-year combinations. Recoveries were insufficient to compute the passthrough index for U.S. stocks in Canadian fisheries.

3.5 BROOD EXPLOITATION RATES

Brood year exploitation rates for the indicator stocks are presented in Table 3-7 (ocean exploitation) and Table 3-8 (total exploitation). The tables provide estimates of the average brood exploitation rates during the base period, brood exploitation rates for brood years 1982-1987, and the average brood exploitation rate for brood years 1982-1987 (the 1983 brood is excluded for Robertson Creek as very poor survival likely resulted in a biased estimate of incidental mortality). The base period is defined as the 1976-1979 brood years for fall stocks (for Quinsam the base period is 1976-1980 due to the presence of an extra age class) and 1975-1978 for spring or yearling type stocks. Changes from base period levels are expressed both in terms of percentage point reductions and percent reductions (e.g., if the brood year exploitation rates during the base period and 1987 were estimated at 50% and 45% respectively, the percentage point change would be -5 and the percent change would be -10%). Although 25 indicator stocks are included in the tables, comparisons with the base period can be made for only 16 of the stocks. Seven of the stocks had no base period information, and two of the stocks have no CWT data after the 1984 brood year. Total brood exploitation rates are not reported for the Salmon River stock as freshwater sport recovery data are combined with escapement. Graphs of ocean exploitation rates on a brood years basis are presented in Appendix E.

The 1982-1987 average brood year <u>ocean</u> exploitation rates for total mortality have declined from base period levels for 13 of the 16 stocks for which adequate data are available (Table 3-7). The median decline in total ocean exploitation rates for all stocks was 7 percentage points. Reductions ranged from 1 (Salmon River) to 21 (Spring Creek Tule) percentage points. The average 1982-1987 brood year ocean exploitation rates increased from base period levels for the Alaska Spring (+1), George Adams (+1), and White River Spring (+6) stocks.

Average ocean incidental fishing mortalities increased for 10 of the indicator stocks. Two of these stocks showed increases in incidental mortality of over 150% compared to the base period. The Big Qualicum stock increased 13 percentage points (163%) and the White River Spring stock increased 3 percentage points (123%). Average incidental mortalities decreased for two stocks. The largest decrease was 5 percentage points (South Puget Sound Fall Yearling).

The 1982-1987 average brood year <u>total</u> (ocean and terminal) exploitation rates for total mortality have declined for 11 of the 15 indicator stocks that have adequate data (Table 3-8). The median reduction for all stocks was 3 percentage points. For stocks with a reduction, the median decline was 6 percentage points, with values ranging from -1 (Lewis River Wild) to -21 (White River Spring Yearling). Average total exploitation rates increased for four indicator stocks. For these stocks, the median increase was 12.5 percentage points, ranging from +1 (George Adams Fall Fingerling) to +22 (Upriver Bright).

Table 3-7. Brood year ocean exploitation rates for the exploitation rate indicator stocks. Incomplete brood years are designated by an asterisk. See text for definition of brood years in the base period for individual stocks. The 1982-1987 average for Robertson Creek does not include the 1983 brood.

Stock	Base Period	Brood Year 1982	1983	1984	1985	1986	1987	Avg 82-87	Change from Base: Percentage Points	%
Alaska Spring										
Reported Catch	40%	35%	29%	28%	26%	47%*	N/A	33%	-7	-18%
Incidental Mortalities	12%	20%	18%	21%	20%	23%	N/A	20%	8	66%
Total Mortalities	52%	55%	46%	49%	46%	70%	N/A	53%	1	2%
Robertson Creek										
Reported Catch	52%	45%	26%	35%	39%	43%	42%*	41%	-11	-21%
Incidental Mortalities	13%	32%	59%	11%	11%	14%	19%	17%	4	31%
Total Mortalities	65%	77%	86%	46%	50%	56%	60%	58%	-7	-11%
Quinsam										
Reported Catch	61%	44%	39%	34%	32%	36%	N/A	37%	-24	-39%
Incidental Mortalities	11%	13%	29%	22%	21%	21%	N/A	21%	10	95%
Total Mortalities	72%	57%	69%	56%	54%	57%	N/A	59%	-14	-19%
Big Qualicum										
Reported Catch	69%	54%	62%	40%	50%	47%	40%*	49%	-20	-29%
Incidental Mortalities	8%	15%	15%	24%	19%	20%	35%	21%	13	163%
Total Mortalities	77%	69%	77%	64%	69%	68%	76%	70%	-6	-8%
South Puget Sound Fall Yearling										
Reported Catch	66%	N/A	N/A	N/A	N/A	50%	56%*	53%	-13	-20%
Incidental Mortalities	19%	N/A	N/A	N/A	N/A	13%	13%	13%	-5	-29%
Total Mortalities	84%	N/A	N/A	N/A	N/A	63%	69%	66%	-19	-22%
University of Washington Accelerated										
Reported Catch	46%	41%	36%	35%	N/A	N/A	N/A	38%	N/A	N/A
Incidental Mortalities	21%	15%	12%	12%	N/A	N/A	N/A	13%	N/A	N/A
Total Mortalities	67%	57%	49%	47%	N/A	N/A	N/A	51%	N/A	N/A
Squaxin Pens										
Reported Catch	N/A	N/A	N/A	N/A	N/A	51%	49%*	50%	N/A	N/A
Incidental Mortalities	N/A	N/A	N/A	N/A	N/A	12%	14%	13%	N/A	N/A
Total Mortalities	N/A	N/A	N/A	N/A	N/A	63%	64%	63%	N/A	N/A
Samish Fall Fingerling										
Reported Catch	51%	N/A	N/A	N/A	42%	45%	44%*	44%	-7	-15%
Incidental Mortalities	6%	N/A	N/A	N/A	9%	12%	11%	11%	4	71%
Total Mortalities	57%	N/A	N/A	N/A	51%	57%	55%	54%	-3	-5%
George Adams Fall Fingerling										
Reported Catch	46%	N/A	N/A	N/A	42%	56%	44%*	48%	1	2%
Incidental Mortalities	11%	N/A	N/A	N/A	10%	13%	12%	11%	0	2%
Total Mortalities	58%	N/A	N/A	N/A	52%	69%	56%	59%	1	2%
South Puget Sound Fall Fingerling										
Reported Catch	59%	51%	40%	47%	31%	49%	45%*	44%	-15	-25%
Incidental Mortalities	10%	11%	10%	14%	11%	11%	14%	12%	2	15%
Total Mortalities	69%	62%	50%	61%	42%	60%	59%	56%	-13	-19%
Skagit Spring Yearling										
Reported Catch	N/A	68%	57%	39%	37%	48%	45%*	49%	N/A	N/A
Incidental Mortalities	N/A	10%	9%	11%	6%	9%	14%	10%	N/A	N/A
Total Mortalities	N/A	78%	67%	50%	43%	57%	59%	59%	N/A	N/A
Nooksack Spring Yearling										
Reported Catch	N/A	67%	N/A	47%	N/A	34%	38%*	46%	N/A	N/A
Incidental Mortalities	N/A	8%	N/A	8%	N/A	7%	11%	8%	N/A	N/A
Total Mortalities	N/A	75%	N/A	55%	N/A	41%	49%	55%	N/A	N/A

Table 3-7. Continued

Stock	Base Period	1982	1983	1984	1985	1986	1987	Avg 82-87	Change from Base Percentage Points	%
Quilcene Spring Yearling										
Reported Catch	N/A	14%	54%	N/A	45%	64%	62%*	48%	N/A	N/A
Incidental Mortalities	N/A	3%	13%	N/A	9%	14%	15%	11%	N/A	N/A
Total Mortalities	N/A	17%	67%	N/A	54%	78%	77%	59%	N/A	N/A
White River Spring Yearling										
Reported Catch	41%	46%	54%	48%	43%	43%	35%*	45%	4	110%
Incidental Mortalities	9%	10%	9%	14%	11%	12%	13%	12%	3	133%
Total Mortalities	50%	55%	64%	62%	54%	55%	48%	56%	6	112%
Sooes										
Reported Catch	N/A	N/A	N/A	N/A	41%	25%	N/A	33%	N/A	N/A
Incidental Mortalities	N/A	N/A	N/A	N/A	10%	8%	N/A	9%	N/A	N/A
Total Mortalities	N/A	N/A	N/A	N/A	51%	33%	N/A	42%	N/A	N/A
Cowlitz Fall Tule										
Reported Catch	53%	39%	32%	31%	36%	32%	32%*	33%	-20	-37%
Incidental Mortalities	9%	6%	5%	9%	12%	13%	14%	10%	0	5%
Total Mortalities	63%	45%	37%	39%	47%	45%	46%	43%	-19	-31%
Spring Creek Tule										
Reported Catch	54%	31%	26%	37%	46%	35%	39%*	36%	-18	-34%
Incidental Mortalities	13%	11%	10%	9%	8%	9%	10%	10%	-3	-25%
Total Mortalities	67%	41%	36%	46%	54%	44%	50%	45%	-21	-32%
Bonneville Tule										
Reported Catch	57%	46%	29%	36%	N/A	N/A	N/A	37%	N/A	N/A
Incidental Mortalities	11%	12%	13%	20%	N/A	N/A	N/A	15%	N/A	N/A
Total Mortalities	69%	58%	43%	56%	N/A	N/A	N/A	52%	N/A	N/A
Stayton Pond Tule										
Reported Catch	53%	42%	44%	43%	43%	49%	45%*	44%	-9	-17%
Incidental Mortalities	12%	11%	9%	16%	22%	16%	10%	14%	2	19%
Total Mortalities	65%	54%	54%	58%	65%	65%	55%	58%	-7	-11%
Columbia River Upriver Bright										
Reported Catch	34%	27%	33%	28%	22%	24%	10%*	24%	-9	-28%
Incidental Mortalities	8%	8%	8%	10%	15%	15%	17%	12%	5	63%
Total Mortalities	41%	35%	41%	38%	38%	40%	28%	37%	-5	-11%
Lyons Ferry										
Reported Catch	N/A	N/A	N/A	27%	28%	36%	10%*	25%	N/A	N/A
Incidental Mortalities	N/A	N/A	N/A	8%	7%	9%	14%	9%	N/A	N/A
Total Mortalities	N/A	N/A	N/A	35%	35%	45%	24%	35%	N/A	N/A
Hanford Wild Brights										
Reported Catch	N/A	N/A	N/A	N/A	N/A	27%	15%*	21%	N/A	N/A
Incidental Mortalities	N/A	N/A	N/A	N/A	N/A	8%	10%	9%	N/A	N/A
Total Mortalities	N/A	N/A	N/A	N/A	N/A	35%	24%	30%	N/A	N/A
Lewis River Wild										
Reported Catch	29%	22%	27%	19%	21%	20%	18%*	21%	-8	-27%
Incidental Mortalities	6%	4%	5%	5%	5%	5%	8%	5%	0	-7%
Total Mortalities	35%	26%	32%	24%	25%	26%	26%	26%	-8	-24%
Willamette Spring										
Reported Catch	28%	14%	26%	14%	8%	16%*	N/A	16%	-12	-43%
Incidental Mortalities	8%	10%	10%	9%	5%	6%	N/A	8%	0	-3%
Total Mortalities	36%	24%	36%	23%	14%	22%	N/A	24%	-12	-34%
Salmon River										
Reported Catch	36%	36%	22%	31%	34%	40%	25%*	31%	-5	-13%
Incidental Mortalities	7%	12%	6%	10%	12%	12%	15%	11%	4	54%
Total Mortalities	43%	48%	27%	41%	46%	52%	40%	42%	-1	-2%

Table 3-8. Brood year <u>total</u> exploitation rates for the exploitation rate indicator stocks. Incomplete brood years are designated by an asterisk. See text for definition of brood years in the base period for individual stocks. The 1982-1987 average for Robertson Creek does not include the 1983 brood.

Stock	Base Period	Brood Year 1982	1983	1984	1985	1986	1987	Avg 82-87	Change from Base Percentage Points	%
Alaska Spring										
Reported Catch	41%	37%	32%	31%	29%	50%*	N/A	36%	-5	-13%
Incidental Mortalities	12%	20%	18%	21%	21%	24%	N/A	21%	9	70%
Total Mortalities	53%	58%	50%	52%	49%	74%	N/A	57%	3	6%
Robertson Creek										
Reported Catch	73%	54%	30%	60%	75%	75%	64%*	66%	-7	-10%
Incidental Mortalities	14%	33%	59%	12%	12%	14%	20%	18%	4	29%
Total Mortalities	87%	87%	89%	73%	87%	89%	84%	84%	3	-3%
Quinsam										
Reported Catch	75%	60%	45%	45%	44%	46%	N/A	48%	-27	-36%
Incidental Mortalities	11%	16%	30%	24%	24%	23%	N/A	23%	12	111%
Total Mortalities	86%	75%	75%	68%	68%	69%	N/A	71%	-15	-17%
Big Qualicum										
Reported Catch	73%	59%	66%	45%	53%	50%	42%*	52%	-20	-28%
Incidental Mortalities	8%	15%	16%	24%	19%	21%	35%	22%	14	168%
Total Mortalities	81%	74%	81%	69%	72%	71%	77%	74%	-7	-8%
South Puget Sound Fall Yearling										
Reported Catch	74%	N/A	N/A	N/A	N/A	76%	74%*	75%	1	1%
Incidental Mortalities	19%	N/A	N/A	N/A	N/A	16%	15%	16%	-4	-20%
Total Mortalities	94%	N/A	N/A	N/A	N/A	93%	88%	91%	-3	-3%
University of Washington Accelerated										
Reported Catch	54%	57%	70%	71%	N/A	N/A	N/A	66%	N/A	N/A
Incidental Mortalities	23%	20%	15%	16%	N/A	N/A	N/A	17%	N/A	N/A
Total Mortalities	77%	77%	85%	87%	N/A	N/A	N/A	83%	N/A	N/A
Squaxin Pens										
Reported Catch	N/A	N/A	N/A	N/A	N/A	80%	78%*	79%	N/A	N/A
Incidental Mortalities	N/A	N/A	N/A	N/A	N/A	17%	19%	18%	N/A	N/A
Total Mortalities	N/A	N/A	N/A	N/A	N/A	97%	97%	97%	N/A	N/A
Samish Fall Fingerling										
Reported Catch	81%	N/A	N/A	N/A	86%	71%	66%*	74%	-7	-8%
Incidental Mortalities	8%	N/A	N/A	N/A	11%	14%	12%	12%	4	55%
Total Mortalities	89%	N/A	N/A	N/A	97%	85%	78%	86%	-2	-3%
George Adams Fall Fingerling										
Reported Catch	74%	N/A	N/A	N/A	77%	79%	71%*	76%	2	2%
Incidental Mortalities	15%	N/A	N/A	N/A	12%	15%	16%	14%	-1	-7%
Total Mortalities	89%	N/A	N/A	N/A	89%	94%	86%	90%	1	1%
South Puget Sound Fall Fingerling										
Reported Catch	76%	58%	52%	59%	50%	76%	73%*	61%	-15	-20%
Incidental Mortalities	12%	12%	13%	14%	11%	12%	17%	13%	2	15%
Total Mortalities	88%	71%	65%	73%	61%	88%	90%	75%	-13	-15%
Skagit Spring Yearling										
Reported Catch	N/A	74%	81%	66%	61%	64%	57%*	67%	N/A	N/A
Incidental Mortalities	N/A	10%	10%	12%	7%	10%	15%	11%	N/A	N/A
Total Mortalities	N/A	84%	92%	78%	68%	74%	72%	78%	N/A	N/A
Nooksack Spring Yearling										
Reported Catch	N/A	67%	N/A	57%	N/A	81%	45%*	62%	N/A	N/A
Incidental Mortalities	N/A	8%	N/A	10%	N/A	8%	11%	9%	N/A	N/A
Total Mortalities	N/A	75%	N/A	67%	N/A	89%	56%	72%	N/A	N/A

Table 3-8. Continued

Stock	Base Period	1982	1983	1984	1985	1986	1987	Avg 82-87	Change from Base Percentage Points	%
Quilcene Spring Yearling										
Reported Catch	N/A	85%	61%	N/A	67%	69%	62%*	69%	N/A	N/A
Incidental Mortalities	N/A	8%	13%	N/A	10%	14%	15%	12%	N/A	N/A
Total Mortalities	N/A	93%	74%	N/A	78%	83%	77%	81%	N/A	N/A
White River Spring Yearling										
Reported Catch	80%	64%	67%	55%	53%	60%	45%*	57%	-23	-29%
Incidental Mortalities	11%	11%	11%	15%	12%	14%	16%	13%	2	18%
Total Mortalities	91%	75%	78%	70%	65%	74%	60%	70%	-21	-23%
Sooes										
Reported Catch	N/A	N/A	N/A	N/A	45%	30%	N/A	37%	N/A	N/A
Incidental Mortalities	N/A	N/A	N/A	N/A	10%	8%	N/A	9%	N/A	N/A
Total Mortalities	N/A	N/A	N/A	N/A	55%	37%	N/A	46%	N/A	N/A
Cowlitz Fall Tule										
Reported Catch	64%	63%	67%	60%	62%	40%	38%*	55%	-9	-14%
Incidental Mortalities	10%	8%	8%	12%	16%	15%	15%	12%	2	24%
Total Mortalities	74%	71%	75%	72%	78%	56%	53%	67%	-6	-9%
Spring Creek Tule										
Reported Catch	73%	53%	66%	61%	79%	64%	61%*	64%	-9	-12%
Incidental Mortalities	15%	14%	14%	13%	11%	14%	14%	13%	-2	-12%
Total Mortalities	88%	67%	80%	74%	90%	78%	74%	77%	-11	-12%
Bonneville Tule										
Reported Catch	67%	53%	39%	55%	N/A	N/A	N/A	49%	N/A	N/A
Incidental Mortalities	12%	13%	17%	24%	N/A	N/A	N/A	18%	N/A	N/A
Total Mortalities	79%	67%	55%	79%	N/A	N/A	N/A	67%	N/A	N/A
Stayton Pond Tule										
Reported Catch	60%	45%	52%	62%	51%	51%	45%*	51%	-9	-15%
Incidental Mortalities	12%	12%	10%	18%	24%	16%	11%	15%	3	24%
Total Mortalities	72%	57%	63%	80%	75%	67%	56%	66%	-6	-8%
Columbia River Upriver Bright										
Reported Catch	40%	60%	62%	68%	60%	51%	25%*	55%	14	35%
Incidental Mortalities	8%	10%	12%	14%	17%	20%	21%	16%	8	96%
Total Mortalities	48%	71%	73%	83%	77%	71%	46%	70%	22	45%
Lyons Ferry										
Reported Catch	N/A	N/A	N/A	48%	52%	55%	33%*	47%	N/A	N/A
Incidental Mortalities	N/A	N/A	N/A	12%	10%	10%	17%	12%	N/A	N/A
Total Mortalities	N/A	N/A	N/A	60%	62%	65%	50%	59%	N/A	N/A
Hanford Wild Brights										
Reported Catch	N/A	N/A	N/A	N/A	N/A	59%	42%*	50%	N/A	N/A
Incidental Mortalities	N/A	N/A	N/A	N/A	N/A	10%	12%	11%	N/A	N/A
Total Mortalities	N/A	N/A	N/A	N/A	N/A	69%	54%	61%	N/A	N/A
Lewis River Wild										
Reported Catch	45%	52%	60%	42%	40%	36%	32%*	44%	-2	-4%
Incidental Mortalities	7%	6%	9%	7%	10%	9%	9%	8%	1	17%
Total Mortalities	53%	59%	68%	49%	50%	44%	42%	52%	-1	-1%
Willamette Spring										
Reported Catch	58%	55%	69%	56%	57%	55%*	N/A	58%	0	0%
Incidental Mortalities	15%	13%	18%	15%	10%	13%	N/A	14%	-1	-10%
Total Mortalities	74%	68%	87%	71%	67%	68%	N/A	72%	-2	-2%
Salmon River										
Reported Catch	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Incidental Mortalities	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total Mortalities	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Average total incidental mortalities increased compared to the base period for 11 stocks and decreased for four stocks. The largest increase over the base period was 14 percentage points (Big Qualicum). Of the four stocks with decreased incidental mortalities, the South Puget Sound Fall Yearling stock showed the largest decrease (4 percentage points).

3.6 SURVIVAL RATE INDICES

Projected survival indices of major stock groups are provided in Table 3-9 (survival indices for individual stocks are graphed in Appendix F). For each stock group, the table includes projections of survival indices for the 1987-88 broods (1990 analysis) and 1988-89 broods (1991 analysis). Fisheries with PSC ceilings which account for at least 10% of a stock group's total fishing mortality are also noted. All stock groups are projected to have survivals below the long term average, with the largest reductions for North PS Springs (-95%), Lower GS Falls (-90%), South PS Summer/Falls (-85%) and Upper GS Summer/Falls (-82%). Three of these stock groups contribute to GS fisheries; however, all ceiling fisheries will harvest stocks with survivals below the long term average.

Table 3-9. Short-term survival index projections of stock groups to fisheries operating under PSC ceilings.

Stock Group	1990 Analysis	1991 Analysis	Fisheries			
			SEAK	NCBC	WCVI	GS
SEAK Spring	-59%	-75%	X			
NCBC Spring/Summer	-86%	-76%	X	X		
WCVI Fall	+6%	-15%	X	X		
Upper GS Summer/Fall	-68%	-82%	X	X		
Lower GS Fall	-90%	-90%	X	X		X
Lower FR (Harrison) Fall	-33%	-3%			X	X
North PS Spring	-31%	-95%				X
North PS Summer/Fall	-38%	-45% 1/			X	X
South PS Summer/Fall	-76%	-85%			X	X
WACO	-54%	-43%	X	X	X	
CR Hatchery Tule Fall	-64%	-53%			X	

1/ A greater reduction (-94%) is estimated if only stocks with escapement data are utilized.

Since these projections are for survival indices of major hatchery stocks, their applicability to associated wild stocks is uncertain. However, at the very least, reduced abundance of hatchery stocks contributing to fisheries operating under PSC ceilings suggests that exploitation rates on commingled natural stocks would be expected to increase in the short-term.

3.7 STOCK CATCH DISTRIBUTION

The annual distribution of reported catch and total fishing mortality of the exploitation rate indicator stocks may be found in Appendix G.

3.8 DISCUSSION AND SUMMARY

Analyses in this Chapter are specific to the 40 exploitation indicator stocks. Extrapolation of results to similar stocks and/or generalizations about fishery impacts will only be appropriate to the extent that these indicator stocks are representative of the stocks harvested in the fisheries or the natural stocks which they represent.

3.8.1 Fishery Indices

A basic premise of the rebuilding program is that fixed ceilings will act in concert with increases in the abundance of chinook to continually reduce harvest rates. In addition, the CTC recommended when the rebuilding program was developed that restrictions in the length of the season, or other restrictions designed to reduce harvest rates, should be implemented in years in which abundance precluded harvesting the full ceiling without an increase in the harvest rate (PSC 1991). Since 1985, the SEAK and NCBC all gear fisheries and Georgia Strait (GS) troll fishery have been managed primarily through the use of ceilings, while the WCVI troll and GS sport fisheries have implemented restrictions related to effort or bag limits to control harvest rates.

For all ceiling fisheries, the initial objective was to achieve the 1985 target reduction in harvest rates. Further reductions in harvest rates were expected to occur in subsequent years as abundance increased. The fishery indices indicate that only the NCBC fishery has consistently achieved these objectives. WCVI has shown mixed results with respect to fishery index changes. Since 1985 there have been 3 years with fishery index changes greater than or equal to the 1985 target reduction, 1 year near the target, and 3 years with fishery indices less or much less than the 1985 target reduction. Management measures in the SEAK and GS fisheries have been insufficient to consistently achieve the target harvest rate reductions.

While the 1985 target harvest rate reduction in the SEAK fishery has been achieved for the reported catch, the total harvest rate reduction has not been met due to the high chinook availability and/or abundance and management regime for the SEAK fisheries, including prolonged CNR periods for the troll fishery. In 1991, the length of the general troll summer season was the shortest (7.5 days) since the inception of the PST primarily due to a high abundance and large catch per fleet day. The 1991 CNR period was 64.5 days (1988 to 1990 average was 51.1).

Since 1989, catch in the WCVI fishery has been controlled primarily through restrictions in fishing areas and by limiting the total effort. The 1990 Letter of Transmittal stated that "it is Canada's intention in 1990 to manage this fishery in a manner so as not to exceed the 1985-87 average troll fishery harvest rate". To this end fishing effort, both in terms of days open and total boat days, was restricted to the average 1985-1987 level in each year. Revised estimates of harvest rates included in this report indicate that the commitment to harvest rate reductions was achieved. The 1985-1991 average reduction in the harvest rate of 22% is near the 1985 target reduction of 24%.

Harvest rates in the combined GS sport and troll fishery remain above even the 1985 target level (1985-91 average reduction being 72% of the 1985 target reduction) primarily due to the sport fishery. Management actions which have been taken in the sport fishery are summarized in Chapter 1. Despite these actions, the harvest rate in the sport fishery was estimated to be only 2% less than the base period level. This indicates that management actions taken in this fishery have been insufficient to achieve the 1985 target reduction.

3.8.2 Passthrough Indices

The passthrough provision of the Chinook Annex of the PST requires that fisheries in Alaska, British Columbia, Washington, and Oregon be managed "so that the bulk of depressed stocks preserved by the conservation program set out herein principally accrue to the spawning escapement." The provision was included to assure that reductions in the harvest of depressed natural stocks resulting from the imposition of catch ceilings in some fisheries would not be offset by increased harvest rates in nonceiling fisheries.

Passthrough indices included in this chapter were computed using methods suggested by the CTC in 1991. Although these methods are consistent with assumptions used by the CTC in previous analyses of fishery management regimes, it should be noted that the PSC has not formally provided the CTC with a definition of passthrough which can be used to analytically assess if the passthrough provision of the PST has been satisfied. In addition, the indices reported in this chapter do not include the WCVI sport fishery and some terminal sport and net fisheries. These fisheries were excluded in instances in which the exploitation rate indicator stock was of hatchery origin and subject to terminal fisheries designed to harvest surplus hatchery production. Additional information on harvest rates in terminal fisheries may be found in Chapter 4.

The analysis indicated that the passthrough commitment has generally been achieved for depressed natural stocks. Exceptions occurred in 1990 for U.S. fisheries (Stillaguamish, Snohomish, and Columbia River Summer stocks), and 1986 and 1989 for Canadian fisheries (Lower GS and Upper GS stocks, respectively).

3.8.3 Brood Exploitation Rates

Implementation of the PST ceilings was expected to reduce brood exploitation rates by 16 percentage points for the Georgia Strait stock and 9 percentage points for the WCVI stock. For reported catch, these targets have now been achieved. Unfortunately, reductions in exploitation associated with reported catch have been offset to a large extent by increases related to incidental mortality. For example, while the average Robertson Creek (exploitation indicator stock for the WCVI) brood exploitation rate for reported catch in ocean fisheries has declined by 11 percentage points, the brood exploitation rate for total mortality in ocean fisheries has declined by 7 percentage points. Similarly, the average Big Qualicum (exploitation indicator stock for Lower GS) brood exploitation rate for reported catch in all fisheries has declined by 20 percentage points, but the brood exploitation rate for total mortality in all fisheries has declined by only 7 percentage points.

The technical analyses upon which the current ceiling levels are based assumed that exploitation rates associated with incidental fishing mortality would decline at the same rate as for reported catch. It is apparent that this assumption was not justified given subsequent management regimes. Compared to the base period, 1982-1887 average ocean incidental mortality increased for 10 stocks, decreased for 2 stocks, and showed no change for 4 stocks. The median increase in incidental mortality for all stocks was 3 percentage points (range -5 to +13 points). Incidental mortality on Alaskan and Canadian stocks increased an average of 9 percentage points over the base period.

3.8.4 Survival Indices

The Committee emphasizes that to maintain reductions or further reduce brood year exploitation rates under a fixed catch ceiling policy, the abundance of chinook in the fishing areas must equal or exceed recent abundances. Future abundances will be determined by the escapement of natural stocks, hatchery production, and survival rates. The Exploitation Rate Assessment provides survival indices for indicator stocks and broods which will contribute to fisheries in 1992 and 1993. Although most of the indicator stocks are of hatchery origin, natural stocks will display a similar trend if factors regulating survival are similar to those affecting hatchery stocks; further, reduced contributions of hatchery fish to fisheries operating under PSC ceilings will increase harvest rates on all commingled stocks.

The results of the Exploitation Rate Assessment indicate that survival rates for most stocks will be well below the long term average for broods contributing to fisheries in 1992 and 1993. The abundance of fish in a particular fishery will depend upon the mixture of stocks present. For the SEAK and NCBC fisheries, reduced survivals ranging from -15% to -90% below average are projected for the major stock groups contributing to this fishery. For the WCVI and GS fisheries, survival for the major stock groups contributing to these fisheries are projected to range from -3% to approximately -90% below average. The magnitude of these reductions are of significant concern to the CTC.

CHAPTER 4. INTEGRATION OF CTC ANALYSES

4.1 INTRODUCTION

This chapter integrates information from 3 sources to evaluate the status and effectiveness of the PSC chinook rebuilding program: (1) predictions from the PSC chinook model; (2) results from the Rebuilding Assessment based upon patterns in spawning escapements (Chapter 2); and (3) results from the Exploitation Rate Assessment (Chapter 3).

The PSC chinook model is used to provides estimates of the average abundance available to ceiling fisheries in 1985-1989, 1990-1991, and the projected abundance in 1992-1993 relative to a long-term average. The abundance projections may be used to infer expected exploitation rates in each fishery and ultimately, upon the rate of rebuilding.

Status of rebuilding and factors which may be affecting progress toward rebuilding are summarized for 13 stock groups delineated by geographic proximity or similar catch distributions. Grouping stocks is advantageous in that: (1) the consistency of the response of stocks within the group may be evaluated; (2) data gaps within a particular stock may be filled from other stocks within the group; (3) multiple observations per stock group reduce the variability of the estimates; and (4) results are easier to present and summarize. Variation in the rebuilding response of stocks within a group is likely due to factors other than fishing mortality in the ceiling fisheries.

Data are summarized for the stock groups listed below:

- SE Alaska Spring
- Transboundary and Situk Spring
- North/Central BC Spring/Summer
- WCVI Fall
- Upper Strait of Georgia Summer/Fall
- Lower Strait of Georgia Fall
- Upper Fraser River Spring/Summer
- Lower Fraser (Harrison) Fall
- North Puget Sound Spring
- North Puget Sound Summer/Fall
- South Puget Sound Summer/Fall
- Columbia Upriver Spring
- Washington Coastal Spring/Summer/Fall, Columbia River Summer/Fall, and Oregon Coastal Fall North Migrating

4.2 METHODS

Analytical methods used in the integrated analysis were described in detail in the 1989 Annual Report (CTC 1990). The following sections provide a brief description of the information presented in this chapter and note changes which have occurred since the 1989 assessment.

4.2.1 Model Estimates of Abundance

The May 1992 calibration of the PSC chinook model was used to project the abundance of chinook salmon available to fisheries in 1992-1993. Abundance was estimated using the methods described in "Notes on Index Development", provided by the AWG to the Chinook Work Group in November, 1989. An index of abundance was computed by expressing each annual abundance relative to the long-term (1979-1991) average.

4.2.2 Explanation of Summary Table

Information contained in the summary tables is divided into three major parts: Part A - Analysis of Escapement, Terminal Harvest Rates, and Brood Exploitation Rates; Part B - Total Mortality Distribution and Fishery Impacts; and Part C - Survival and Escapement Indices. Note that in the summary tables, the notation NA indicates that the data are not available while NR indicates that the data are not representative for the escapement indicator stocks.

Part A - Analysis of Escapement, Terminal Harvest Rates, and Brood Exploitation Rates.

Escapement Analysis. The Escapement Analysis section of the table includes a list of the escapement indicator stocks included in each stock group and their stock status as assessed in Chapter 2. The stocks are ordered by rebuilding status separately for stocks with and without fixed numeric spawning escapement goals.

The stock status is followed by an index of the harvest rate in the terminal area relative to the 1979-1982 base period used in the Exploitation Rate Assessment. The annual terminal harvest rate estimates are converted to an index by dividing the observed harvest rate for each year by the average harvest rate during 1979-1982. These annual indices are then averaged for years with valid data during the 1985-1991 period. The terminal harvests reported in Part A of the summary tables have been excluded in the passthrough indices computed in Part B of the summary tables.

PSC Chinook Model. Information from stocks included in the PSC chinook model is presented in this section of the summary tables. The first column lists stocks included in the PSC chinook model which are associated with the stock group.

The second column reports the predicted year in which the stock will rebuild or the percentage of the escapement goal achieved in 1998. The year rebuilt is defined as the earliest year in which the spawning escapement goal is achieved and met in each subsequent year through 1998.

The rebuilding predictions are dependent upon several assumptions used in the model run, including: (1) ceilings are fixed at the levels negotiated and are not exceeded from 1993-1998; (2) size limits are not changed after 1992; (3) season structure is not substantively changed from the base period; (4) chinook non-retention will occur after ceilings are reached; and (5) stock productivity and marine survival are equal to the average of all available estimates for each model stock beginning with the 1979 brood.

The next column reports the adult equivalent exploitation rate (MSY ER) that is sustainable when spawning escapement is maintained at the established escapement goal for a stock. The estimates of the MSY ER are dependent upon the stock specific productivity estimate used in the chinook model. These estimates were derived using the following procedure:

1. Estimate the stock specific intrinsic rate of increase (Ricker A value) for a Ricker type stock/recruitment function. A procedure was developed for estimating the relative stock productivity using available information on harvest rates and trends in abundance (CTC-AWG Model Documentation 1989). This approach uses the following key assumptions:

    a. harvest rates (as estimated from CWT recovery data on the stock group of interest) were constant during the base period and the four years prior to the base period;

    b. escapement is estimated in a consistent manner and without bias; and

    c. the escapement goals supplied by the agencies are optimum goals and are expressed in units consistent with spawning escapement estimates.

2. During the calibration phase of the model, the productivity function is adjusted (by brood year) by fitting observed stock abundance data. This provides a time series of correction factors for the initial productivity estimate and incorporates variations in year to year survival.

Exploitation Rate Assessment. This section of the summary tables lists the associated exploitation rate indicator stocks and the estimated brood exploitation rates. The stocks reported in the list may be used to compute the brood exploitation rates in Part A or the distribution of total mortality, stock indices, passthrough indices, and survival indices in Part B and Part C of the summary tables. Stocks used in each component may be ascertained from Table 3-2.

The average brood exploitation rates for the stock group are partitioned into ocean and total mortality. The exploitation rate is reported for brood years contributing to the base period and the rebuilding period. Comparing the exploitation rates for each period gives an indication of the change under the PSC management regimes. The amount by which the total value exceeds the estimate of MSY ER rate for the associated model stocks provides an indication of the degree to which total exploitation must be reduced to achieve rebuilding.

Part B - Total Mortality Distribution and Fishery Impacts.

This section of the summary tables presents additional results from the Exploitation Rate Assessment including the distribution of total fishing mortality, the stock index, the CTC passthrough index, and the fishery index.

Distribution of Total Fishing Mortality. The first row reports the 1985-1991 average distribution of total fishing mortality (in adult equivalents) for the exploitation rate indicator stocks. The left half of the row shows the total fishing mortality distribution among fisheries operating under PSC ceilings and non-ceiling fisheries, while the right half shows the distribution of total fishing mortality among the ceiling fisheries.

For the SEAK and NCBC fisheries, all gear types are included in the distribution calculations while the fishery index is reported for the troll only. Therefore, caution should be used when comparing the fishery index with the catch distribution information. A list of fisheries included in the total fishing mortality distribution and the fishery index is provided below.

Ceiling Fishery	Fisheries Included in Distribution of Total Mortality	Fisheries Included in Fishery Index
Southeast Alaska	Troll, Net, Sport	Troll
North/Central British Columbia	Troll, Net, Sport	Troll
West Coast Vancouver Island	Troll	Troll
Strait of Georgia	Troll, Sport	Troll, Sport

The total fishing mortality distribution data presented in the summary tables differ from those referenced in Section 3.7. Terminal catches are not included in instances when the exploitation rate indicator stock (generally a hatchery stock) was subject to terminal fisheries from which the associated natural stock was exempt. Fisheries excluded from total fishing mortality distribution and stock index data are identified below:

Stock(s)	Excluded Fishery(ies)
Robertson Creek	Mortality distribution does not include WCVI net and WCVI sport fisheries.
Samish, Lummi Ponds, Stillaguamish, Tulalip, South Puget Sound Fingerling, Kalama Creek	Mortality distribution does not include Puget Sound terminal net fisheries.
Quinault, Queets, Humptulips, Sooes, Quillayute	Mortality distribution does not include Washington coastal net fisheries.
Columbia River Upriver Bright, Lewis River, Wells Hatchery, Lyons Ferry, Hanford Bright	Mortality distribution does not include Columbia River net and sport fisheries.

<u>Stock And Passthrough Indices.</u> The remaining rows of this section compare observed and 1985 target reductions for the stock index and the CTC passthrough index. The 1985-1991 average observed stock index represents the average of the indices for the exploitation rate indicator stocks and includes all gear types for each of the ceiling fisheries.

The 1985 target reduction for the ceiling component of the stock index is similar in concept to the 1985 target reduction used to evaluate the fishery index for the ceiling fisheries. In the case of the stock index, however, the target reductions for each ceiling fishery are weighted by the distribution of total fishing mortality to obtain a composite target reduction for the stock. The 1985 target reductions are then averaged across the PSC model stocks associated with each stock group.

Passthrough indices are obtained from Section 3.4

Fishery Index. The 1985-1991 average observed fishery index is compared to the 1985 target fishery index for a subset of gear types within the PSC ceiling fisheries. Values in this portion of the summary tables are extracted from Table 3-4.

Part C - Survival and Escapement Relative to Long-Term Averages.

This part of the summary table presents data comparing indices of survival and escapement for three time periods: the base period, the rebuilding period, and the projected period.

Brood years included in each time period for different stock groups are listed below:

Time Period	SEAK	Quinsam	All Other Stocks
Base	1978	1976-1980	1976-1979
Rebuilding	1981-1986	1982-1986	1982-1987
Projected	1987-1988	1987-1989	1988-1989

These brood years were selected to represent cohorts that are primary contributors to catch and escapement during the years associated with each period.

Survival. Survival indices are based upon CWT recovery data for exploitation rate indicator stocks and computed using the methods discussed in Section 3.1.1. The indices are presented to provide an indication of changes in survival of associated exploitation rate indicator stocks relative to a long-term average. The projected index is the average of indices computed for the brood years that are expected to complete their life cycles in the years 1991-1992.

Escapement. Escapement indices for escapement indicator stocks are provided for the purposes of summarizing changes in relative spawning escapement levels and potential changes in natural stock production resulting from those spawning escapements. Indices are presented for two time periods: (1) prior to the rebuilding period (1979-1982); and (2) the rebuilding period (1985-1991).

For each year, an index is computed as the ratio between the observed escapement and the long-term (1979-1991, for years with usable escapement data) average.

4.3 STOCK ABUNDANCE

4.3.1 Model Projections of Stock Abundance by Fishery

The model projections for average stock abundance are shown in Table 4-1 for the SEAK troll fishery, the NCBC troll fishery, the WCVI troll fishery, and the GS sport and troll fishery.

Table 4-1. Abundance index for 1985-1989, 1990-1991, and the projected index for 1992-1993 by fishery.

Time Period	SEAK	NCBC	WCVI	GS
1985-1989	1.22	1.04	0.99	0.71
1990-1991	1.22	0.98	0.69	0.59
1992-1993	1.20	0.99	0.78	0.59

The abundance of chinook available to 3 of the 4 fisheries (SEAK troll and NCBC troll, and GS sport and troll) in 1992-1993 is projected to remain stable (within 2%) relative to the average in 1990-1991, while the abundance in the WCVI troll fishery is projected to increase by 13%. The SEAK troll fishery is the only fishery for which the abundance is projected to above the long-term average. The abundance of chinook remains the most depressed in the GS sport and troll fishery, where abundance is projected to be 41% below the long-term average.

4.4 RESULTS BY STOCK GROUP

4.4.1 Southeast Alaska Spring (SEAK)

Synopsis. Stocks in this group have shown a mixed response to the rebuilding program. Two stocks are above goal while four are classified as Probably Not Rebuilding. These stocks are harvested almost entirely in SEAK fisheries, although some harvest does occur in the NCBC fisheries. Survival has been above the long-term average during the rebuilding period, but it is now projected to fall substantially below the long-term average. The brood year ocean exploitation rate on this stock group has declined slightly from the base period while the brood year total exploitation rate has remained static. The stock index (Age 4) has decreased (10%) from the base period, but has not reached the 1985 target reduction of 22%.

A. Analysis of Escapement, Terminal Harvest Rates, and Brood Exploitation Rates

Escapement Analysis			PSC Chinook Model			Exploitation Rate Analysis				
Indicator Stocks	Status	1985-91 Terminal HR Index	Indicator Stocks	Yr Rebuilt or % in 1998	MSY ER	Indicator Stocks	Brood Exploitation Ocean Base	Brood Exploitation Ocean 81-86	Brood Exploitation Total Base	Brood Exploitation Total 81-86
Andrew Creek	Above Goal	NA	Alaska South SE	1996	0.48	Alaska Spring	0.52	0.49	0.53	0.53
Keta	Above Goal	NA								
King Salmon	Prob Not Reb	NA								
Chickamin	Prob Not Reb	NA								
Unuk	Prob Not Reb	NA								
Blossom	Prob Not Reb	NA								

B. Total Mortality Distribution and Fishery Impacts from Exploitation Rate Analysis

	Major Fishery Categories: All Ceiling	Canada Non-Ceiling	US Non-Ceiling	Ceiling Fisheries: SEAK	NCBC	WCVI	GS
1985-91 Average AEQ Total Mortality Distribution	100.0%	0.0%	0.0%	96.9%	3.1%	0.0%	0.0%
(% Change from Base)	Stock Index	Passthrough Index		Fishery Index			
1985-91 Observed Index (Age 4)	-10%	NA	NA	-7%	-25%	-22%	-34%
1985 Target Index	-22%	0%	0%	-22%	-16%	-24%	-47%

C. Survival and Escapement Indices (% Difference from Long-Term Average)

	Survival	Escapement
Base Period:	-76%	-38%
Rebuilding Period:	3%	19%
Projected Period:	-75%	NA

Comments. Five of the six stocks (excluding the Keta River) are known to rear in inside SEAK waters. The three Behm Canal (Chickamin, Unuk, Blossom) stocks initially showed a positive response to terminal area closures but escapements began to decrease in 1986 and 1987. Current escapements to the Behm Canal systems are near the base period levels. The reason for the low escapements to the Behm Canal systems is not completely understood and ADF&G is currently investigating these systems to determine what factors have hampered efforts to rebuild the stocks.

4.4.2 Transboundary and Situk Spring (TBR+Situk)

Synopsis. *Three of the four stocks in this group have shown positive responses to the rebuilding program. These stocks are harvested in the SEAK fisheries, and Canadian inriver fisheries. There are no exploitation rate indicator stocks for this group. Consequently, it is not possible to draw conclusions about harvest impacts on these stocks.*

A. Analysis of Escapement, Terminal Harvest Rates, and Brood Exploitation Rates

Escapement Analysis			PSC Chinook Model			Exploitation Rate Analysis		
Indicator Stocks	Status	1985-91 Terminal HR Index	Indicator Stocks	Yr Rebuilt or % in 1998	MSY ER	Indicator Stocks	Brood Exploitation Ocean Base 85-91	Brood Exploitation Total Base 85-91
Situk	Above Goal	0.74	None			None		
Stikine	Rebuilding	NA						
Taku	Prob Rebuild	NA						
Alsek	Not Rebuild	NA						

B. Total Mortality Distribution and Fishery Impacts from Exploitation Rate Analysis

	Major Fishery Categories All Ceiling	Major Fishery Categories Canada Non-Ceiling	Major Fishery Categories US Non-Ceiling	Ceiling Fisheries SEAK	Ceiling Fisheries NCBC	Ceiling Fisheries WCVI	Ceiling Fisheries GS
1985-91 Average AEQ Total Mortality Distribution	NA	NA	NA	NA	NA	NA	NA
(% Change from Base)	Stock Index	Passthrough Index		Fishery Index			
1985-91 Observed Index	NA	NA	NA	-7%	-25%	-22%	-34%
1985 Target Index	NA	0%	0%	-22%	-16%	-24%	-47%

C. Survival and Escapement Indices (% Difference from Long-Term Average)

	Survival	Escapement
Base Period:	NA	1%
Rebuilding Period:	NA	8%
Projected Period:	NA	NA

Comments. Indirect evidence suggests that ocean harvest rate on these stocks is probably low. Earlier tagging by ADF&G on Taku River wild chinook indicated that the tagged stock rears in waters outside of SEAK. Harvest of the Situk and Alsek stocks occur primarily in-river (U.S. fisheries in the Situk and Canadian fisheries in the Alsek). Delayed openings of the troll fishery since the early 1980s have likely reduced ocean harvest on these two stocks. Ocean harvests of Taku and Stikine stocks are also thought to be significantly reduced although some harvest does occur in the limited June troll openings and in sport fisheries. Canadian in-river fisheries harvest chinook in both the Taku and Stikine rivers.

4.4.3 North/Central B.C. Spring/Summer (NCBC)

Synopsis. *Rebuilding response in this groups has been variable. Overall, the earlier run timing components are showing a positive response; however, concern remains for the four spring/summer stocks in CBC. The stock group is not represented by exploitation indicator stocks so direct determination of fishing impacts cannot be made. Survival indices indicate continued poor survival in this group. Inriver sport catch accounts for the Canadian non-ceiling fishery mortalities, and have been increasing.*

A. Analysis of Escapement, Terminal Harvest Rates, and Brood Exploitation Rates Rate Analyses

Escapement Analysis			PSC Chinook Model			Exploitation Rate Analysis					
		1985-91		Yr Rebuilt				Brood Exploitation			
Indicator		Terminal	Indicator	or	MSY	Indicator		Ocean		Total	
Stocks	Status	HR Index	Stocks	% in 1998	ER	Stocks		Base	82-86	Base	82-86
Yakoun	Above Goal	NA	North/Cent BC	1992	0.56	Snootli Crk	>	NA	NA	NA	NA
Skeena	Above Goal	0.75				Kitimat	>				
Rivers Inlet	Prob Rebuild	NA									
Nass	Indeterminate	1.77									
Area 8 Index	Prob Not Reb	NA									
Smith Inlet	Prob Not Reb	NA									
Area 6 Index	Not Rebuild	NA									

B. Total Mortality Distribution and Fishery Impacts from Exploitation Rate Analysis

	Major Fishery Categories			Ceiling Fisheries			
	All Ceiling	Canada Non-Ceiling	US Non-Ceiling	SEAK	NCBC	WCVI	GS
1985-91 Average AEQ Total Mortality Distribution	88.3%	11.7%	0.0%	45.9%	42.2%	0.2%	0.0%
(% Change from Base)	Stock Index	Passthrough Index		Fishery Index			
1985-91 Observed Index	NA	NA	NA	-7%	-25%	-22%	-34%
1985 Target Index	-20%	0%	0%	-22%	-16%	-24%	-47%

C. Survival and Escapement Indices (% Difference from Long-Term Average)

	Survival	Escapement
Base Period:	119%	-10%
Rebuilding Period:	-55%	10%
Projected Period:	-76%	NA

Comments. Of the seven escapement indicator stocks in this group, three are classified in the top three rebuilding categories, one is Indeterminate, and three are Probably Not Rebuilding or Not Rebuilding. Terminal harvest indices are presently available for only two stocks. Terminal harvest has increased in the Nass River but decreased in the Skeena. Terminal area exclusion catches have been included in the terminal run and harvest rate estimates.

Exploitation rates on the indicator stocks can not be estimated due to a lack of escapement recoveries. It is not possible, therefore, to draw conclusions regarding causes for the variable rebuilding. The distribution of stock mortality indicates that most mortality occurs in the SEAK and NCBC fisheries. These stocks may have benefitted from delays in opening of summer troll fisheries and possibly from effort shifts in both the SEAK and NCBC fisheries to more outside waters, since tag recoveries from some Central Coast hatcheries have been largely concentrated in the inside waters of SEAK (TCCHINOOK (92)-1).

This stock group covers a large geographic area and wide variety of chinook stocks. The information basis for assessing this group is relatively weak compared to the other groups, but should improve as more effort is focused on stock assessment under co-management agreements between Native groups and CDFO. Exploitation rate indicator stocks are needed to improve the assessment of this stock group.

4.4.4 West Coast Vancouver Island Fall (WCVI)

Synopsis. *This stock group is classified as Probably Not Rebuilding, but is predicted to be within 13 percent of the goal by 1998 if stock productivity remains near the long-term average. However, continued survivals below the long-term average for the 1988-1989 broods may result in slowing the rebuilding of this stock (see Comments).*

A. Analysis of Escapement, Terminal Harvest Rates, and Brood Exploitation Rates

Escapement Analysis			PSC Chinook Model			Exploitation Rate Analysis				
		1985-91		Yr Rebuilt			Brood Exploitation			
							Ocean		Total	
Indicator Stocks	Status	Terminal HR Index	Indicator Stocks	or % in 1998	MSY ER	Indicator Stocks	Base	82-87	Base	82-87
WCVI	Prob Not Reb	NA	WCVI wild	87%	0.65	Robertson Cr	0.65	0.63	NR	NR

Footnote: Terminal HR and Total Brood Exploitation are designated Not Representative (NR) because of a large terminal harvest on the Exploitation Rate Indicator stock but not on the WCVI Natural populations represented by this indicator stock.

B. Total Mortality Distribution and Fishery Impacts from Exploitation Rate Analysis

	Major Fishery Categories			Ceiling Fisheries			
	All Ceiling	Canada Non-Ceiling	US Non-Ceiling	SEAK	NCBC	WCVI	GS
1985-91 Average AEQ Total Mortality Distribution	96.3%	2.6%	1.1%	53.8%	32.5%	8.7%	1.3%
(% Change from Base)	Stock Index	Passthrough Index		Fishery Index			
1985-91 Observed Index	-4%	NA	NA	-7%	-25%	-22%	-34%
1985 Target Index	-20%	0%	NA	-22%	-16%	-24%	-47%

C. Survival and Escapement Indices (% Difference from Long-Term Average)

	Survival	Escapement
Base Period:	41%	3%
Rebuilding Period:	-52%	3%
Projected Period:	-15%	NA

Comments. Uncertainty exists in the rebuilding assessment for this stock group since the effect of small-scale enhancement on many of the streams used in calculating the escapement index is unknown. No terminal harvest rate data are available but small terminal harvests occur in sport and native fisheries. The brood year ocean exploitation rate for this stock group is slightly less than the MSY ER level. However, expanding sport fisheries in coastal inlets may be increasing the exploitation of some stocks to above MSY ER levels. When calculating the ocean exploitation rate for this stock group, the 1983 brood was eliminated due to very poor survival and possible bias in the estimation of incidental mortalities in this brood year.

The two fisheries that heavily impact the stock group (SEAK and NCBC) show reductions in the fishery index from the base period. Exploitation rate on age 3 and 4 fish of the indicator stock has decreased in ocean fisheries. However, recent increases in age 5 fishery indices likely explains why the stock index shows only a small decrease over all ages. As noted for the NCBC stock group, there has been a general shift in effort for the SEAK and NCBC troll fisheries to more outside waters. Tag recoveries for this stock group tend to be concentrated in outside waters and this may partially explain why the reductions in exploitation rates on this stock are minimal, in spite of substantial overall reductions in harvest rates in these fisheries.

Improved survival of the Robertson Creek stock, noted in previous CTC reports, is not expected to continue. The short term survival projection has decreased 21% points to -15%. Further, Canadian members reported that the survival of the 1991 brood is expected to be extremely poor following the 1992 El Nino event. In 1992, CDFO researchers have observed extensive predation by mackerel in Barkley Sound and an almost complete absence of juvenile chinook.

4.4.5 Upper Strait of Georgia Summer/Fall (UGS)

Synopsis. *Exploitation rates on the indicator stock have been substantially reduced but the rebuilding assessment based on the escapement indicator stocks is Indeterminate. The passthrough index indicates that the 1985 target has been exceeded. Survival is projected to decline substantially in broods contributing to 1992 & 1993 returns. This reduction in survival could slow the rate of rebuilding. There is concern that the Quinsam exploitation indicator stock does not adequately represent this stock group.*

A. Analysis of Escapement, Terminal Harvest Rates, and Brood Exploitation Rates

Escapement Analysis			PSC Chinook Model			Exploitation Rate Analysis				
		1985-91		Yr Rebuilt			Brood Exploitation			
Indicator		Terminal	Indicator	or	MSY	Indicator	Ocean		Total	
Stocks	Status	HR Index	Stocks	% in 1998	ER	Stocks	Base	82-86	Base	82-86
Upper Geor St	Indeterminate	NA	Upper Geor St	1996	0.69	Quinsam	0.72	0.59	0.86	0.71

B. Total Mortality Distribution and Fishery Impacts from Exploitation Rate Analysis

	Major Fishery Categories			Ceiling Fisheries			
	All Ceiling	Canada Non-Ceiling	US Non-Ceiling	SEAK	NCBC	WCVI	GS
1985-91 Average AEQ Total Mortality Distribution	92.7%	7.2%	0.1%	54.0%	32.3%	0.6%	5.9%
(% Change from Base)	Stock Index	Passthrough Index		Fishery Index			
1985-91 Observed Index	-19%	-52%	NA	-7%	-25%	-22%	-34%
1985 Target Index	-21%	-25%	NA	-22%	-16%	-24%	-47%

C. Survival and Escapement Indices (% Difference from Long-Term Average)

	Survival	Escapement
Base Period:	30%	-36%
Rebuilding Period:	-13%	15%
Projected Period:	-82%	NA

Comments. No terminal harvest rate data are available, but terminal harvests are believed to be small on these natural stocks. There have been substantial decreases in both ocean and total brood year exploitation rates on the associated exploitation indicator stock. In addition, the stock index for ceiling fisheries is near the 1985 target level. However, a large reduction in survival is projected and is cause for concern.

There is some question whether the Quinsam stock adequately represents this stock group. The natural stocks include mainland inlet populations and Nimpkish River chinook. These stocks have an earlier adult return timing than the Quinsam Hatchery stock, and some differences in catch distributions have been observed in the few tag groups released from these natural populations. However, suitable alternatives or additional indicators are currently not available.

4.4.6 Lower Strait of Georgia Fall (LGS)

Synopsis. *Rebuilding of this stock group is limited by poor survival and exploitation rates above the 1985 target levels in GS fisheries managed under PSC ceilings. The passthrough index indicates that the 1985 target has been exceeded. Brood year exploitation rates remain substantially above the MSY ER estimated for the 1975 to 1991 periods. In view of the projected poor survival and present exploitation pressures, it seems unlikely that this stock will rebuild by 1998 without additional management actions.*

A. Analysis of Escapement, Terminal Harvest Rates, and Brood Exploitation Rates

Escapement Analysis			PSC Chinook Model			Exploitation Rate Analysis					
Indicator Stocks	Status	1985-91 Terminal HR Index	Indicator Stocks	Yr Rebuilt or % in 1998	MSY ER	Indicator Stocks		Brood Exploitation Ocean Base	Brood Exploitation Ocean 82-87	Brood Exploitation Total Base	Brood Exploitation Total 82-87
Lower Geor St	Prob Not Reb	2.11	Lower Geor St	92%	0.62	Big Qualicum	>	0.77	0.70	0.81	0.74

B. Total Mortality Distribution and Fishery Impacts from Exploitation Rate Analysis

	Major Fishery Categories: All Ceiling	Major Fishery Categories: Canada Non-Ceiling	Major Fishery Categories: US Non-Ceiling	Ceiling Fisheries: SEAK	Ceiling Fisheries: NCBC	Ceiling Fisheries: WCVI	Ceiling Fisheries: GS
1985-91 Average AEQ Total Mortality Distribution	89.7%	8.4%	1.9%	20.5%	16.5%	3.6%	49.2%
(% Change from Base)	Stock Index	Passthrough Index		Fishery Index			
1985-91 Observed Index	-11%	-57%	NA	-7%	-25%	-22%	-34%
1985 Target Index	-41%	-25%	0%	-22%	-16%	-24%	-47%

C. Survival and Escapement Indices (% Difference from Long-Term Average)

	Survival	Escapement
Base Period:	48%	31%
Rebuilding Period:	-81%	-23%
Projected Period:	-90%	NA

Comments. Exploitation on this stock has been reduced but remains above the exploitation rate estimated to be needed for rebuilding. The stock group is harvested primarily in the GS sport and troll fishery (Chapter 3 indicates that the vast majority of this harvest occurs in the sport fishery). The fishery index for the GS ceiling fisheries indicates that harvest rate has been reduced but remains above the 1985 target index of -47%. The stock index for ceiling fisheries has declined, but remains substantially greater than the 1985 target level. The passthrough index for Canada non-ceiling fisheries (mainly Johnstone Strait net for this stock) has declined beyond the 25% reduction target and may have achieved the additional reduction (another 20% from 1987 levels) imposed by the lower GS rebuilding program. Terminal harvest has increased in the 1985-91 period. Terminal harvest is a small portion of the total harvest on this stock group and includes recent increases in brood stock removed from natural spawning populations for enhancement; but these removals now average 14.2%

and 14.4%, Native catch and brood stock respectively, of the terminal run. The increase in terminal harvest is largely due to increased brood stock removals since the HR Index for native fisheries would only be 1.34.

Survival rates remain 80-90% less than the long-term average, and less than the level assumed during design of the rebuilding program. Survival is projected to remain poor for broods contributing to escapement in 1992-1993. In view of the projected poor survival and present exploitation pressures, it seems unlikely that this stock will rebuild by 1998 without additional management actions.

4.4.7 Upper Fraser Spring/Summer (UFR)

Synopsis. *Two of the stocks within this group are classified as Above Goal and one as Indeterminate. Escapements of all three stocks have increased substantially relative to the base period. The good progress toward rebuilding in this stock group has likely been achieved due to reductions in ocean exploitation and terminal harvest rates, and changes in fishing seasons that have benefitted spring and summer stocks. However, this stock group is not represented by an exploitation indicator stock so direct measures of changes in exploitation cannot be made.*

A. Analysis of Escapement, Terminal Harvest Rates, and Brood Exploitation Rates

Escapement Analysis			PSC Chinook Model			Exploitation Rate Analysis		
Indicator Stocks	Status	1985-91 Terminal HR Index	Indicator Stocks	Yr Rebuilt or % in 1998	MSY ER	Indicator Stocks	Brood Exploitation Ocean Base 85-87	Brood Exploitation Total Base 85-87
Upper Fraser	Above Goal >		Fraser early	1985**	0.62	None		
Middle Fraser	Above Goal >	0.49						
Thompson	Indeterminate >	0.51*						

* Terminal HR Index calculated including Fraser River native fisheries.
** Stock group has achieved aggregate escapement goal in four of the last six years.

B. Total Mortality Distribution and Fishery Impacts from Exploitation Rate Analysis

	Major Fishery Categories: All Ceiling	Canada Non-Ceiling	US Non-Ceiling	Ceiling Fisheries: SEAK	NCBC	WCVI	GS
1985-91 Average AEQ Total Mortality Distribution	64.8%	22.3%	12.9%	32.9%	23.8%	3.9%	4.2%
(% Change from Base)	Stock Index	Passthrough Index		Fishery Index			
1985-91 Observed Index	NA	NA	NA	-7%	-25%	-22%	-34%
1985 Target Index	-22%	-25%	0%	-22%	-16%	-24%	-47%

C. Survival and Escapement Indices (% Difference from Long-Term Average)

	Survival	Escapement
Base Period:	NA	-42%
Rebuilding Period:	NA	30%
Projected Period:	NA	NA

Comments. Terminal harvest rates cannot be estimated for these stocks individually; however, a composite terminal harvest index for all stocks shows a terminal harvest rate decline of about 50% from the base period. This has resulted from management actions which reduced catches by both the native food fishery and the terminal gillnet fishery. Estimates of the 1985-1991 distribution from the chinook model, which relies upon wild chinook tagging programs conducted in the upper Fraser and Thompson rivers in the late 1970s for base period data, indicate that most fishing mortality on this stock group occurs in the SEAK and NCBC ceiling fisheries and in the Canada non-ceiling fisheries. The effects of these fisheries on this group can not be directly estimated, however, because a representative exploitation rate indicator stock does not currently exist.

4.4.8 Lower Fraser (Harrison) Fall (LFR)

Synopsis. *The Harrison River stock is classified as Probably Not Rebuilding. Consistent with this assessment, the chinook model predicts that the stock will achieve only 70% of the escapement goal in 1998. This stock is primarily harvested in the GS and WCVI fisheries, fisheries that have not achieved the 1985 target reductions. Survival during the rebuilding period has been poor, and is projected to improve, but remain below the long-term average. In view of the poor survival and the lack of sufficient reductions in exploitation rates, this stock, like the Lower GS stock group, is unlikely to rebuild under current management regimes. Exploitation rates on this stock can not be estimated due to the lack of escapement recoveries in the indicator stocks; consequently direct measures of changes in exploitation cannot be made.*

A. Analysis of Escapement, Terminal Harvest Rates, and Brood Exploitation Rates

Escapement Analysis			PSC Chinook Model			Exploitation Rate Analysis					
								Brood Exploitation			
								Ocean		Total	
Indicator Stocks	Status	1985-91 Terminal HR Index	Indicator Stocks	Yr Rebuilt or % in 1998	MSY ER	Indicator Stocks		Base	82-87	Base	82-87
Harrison	Prob Not Reb	0.53 0.51*	Fraser Late	70%	0.70	Chehalis Chilliwack	> >	NA	NA	NA	NA

* Terminal HR Index calculated including Fraser River native fisheries.

B. Total Mortality Distribution and Fishery Impacts from Exploitation Rate Analysis

	Major Fishery Categories: All Ceiling	Canada Non-Ceiling	US Non-Ceiling	Ceiling Fisheries: SEAK	NCBC	WCVI	GS
1985-91 Average AEQ Total Mortality Distribution	70.6%	7.9%	21.5%	1.2%	3.4%	25.3%	40.7%
(% Change from Base)	Stock Index	Passthrough Index		Fishery Index			
1985-91 Observed Index	NA	NA	NA	-7%	-25%	-22%	-34%
1985 Target Index	-38%	-25%	0%	-22%	-16%	-24%	-47%

C. Survival and Escapement Index (% Difference from Long-Term Average)

	Survival	Escapement
Base Period:	NA	NA
Rebuilding Period:	-53%	-1%
Projected Period:	-3%	NA

Comments. The terminal index for this stock, calculated relative to the 1984 terminal harvest rate, has shown a decline due to efforts to reduce terminal harvest.

Data for the associated exploitation indicator stocks are only sufficient to provide distribution estimates of total fishing related mortality. These estimates show that most of the mortality occurs in the GS and WCVI ceiling fisheries and U.S. non-ceilinged fisheries. The GS fishery index remains above the 1985 target. It is not known if exploitation on this stock has changed in the passthrough fisheries since escapement data is lacking for the exploitation rate indicator stocks. It is likely that decreases in exploitation rates for Canadian non-ceiling fisheries would be similar to those reported for the lower GS stock group (which has exceeded the -25% target).

Some inferences about the changes in exploitation rates on this stock can be made from the data provided for the LGS stock group because the distribution data indicate that a large proportion of the harvest on the Harrison stock also occurs in two GS fisheries. The LGS stock group shows decreases in both the total exploitation estimates and in the stock index, but the decreases are less than those required for stock rebuilding. The situation is also likely true for the Lower Fraser stock group particularly because, outside of GS, exploitation on the Harrison stock occurs mainly in the WCVI troll fishery, while that on the LGS stock group occurs mainly in the NBC and CBC fisheries. The WCVI troll fishery index has met or exceeded the target reduction in three of the seven years of the rebuilding program, while the fishery index for NCBC troll fisheries has declined substantially. Further, troll fisheries in NCBC have moved north and outside, suggesting that impacts would be reduced in the inside waters where LGS are more prevalent.

Survival of this stock during the rebuilding period was very low; future survival is projected to improve, although it is still expected to remain below the long-term average. Further, of the stocks harvested in the GS and WCVI fisheries, the Harrison stock is the only stock where survivals are expected to improve over recent levels. Reduced overall abundance in fisheries managed under catch ceilings may result in an increased harvest rate on the contributing stocks. Increased harvest rates would further limit rebuilding progress of this stock.

4.4.9 North Puget Sound Spring (NPS-Sp)

Synopsis. *The Skagit stock is classified as Probably Not Rebuilding. This stock is harvested primarily by the GS fishery, where exploitation rates remain 38% above 1985 target levels, and by U.S. non-ceiling fisheries. Although an estimate of the MSY exploitation rate is not available, it is likely that it is lower than the average observed brood exploitation rate of 75%. Given that survival rates are projected to decline substantially, stock status is not likely to improve unless additional management actions are taken.*

A. Analysis of Escapement, Terminal Harvest Rates, and Brood Exploitation Rates

Escapement Analysis			PSC Chinook Model			Exploitation Rate Analysis					
Indicator Stocks	Status	1985-89 Terminal HR Index	Indicator Stocks	Yr Rebuilt or % in 1998	MSY ER	Indicator Stocks		Brood Exploitation Ocean Base	Brood Exploitation Ocean 82-87	Brood Exploitation Total Base	Brood Exploitation Total 82-87
Skagit	Prob Not Reb	NA	Nooksack	NR	NR	Nooksack	>				
						Skagit	>	NA	0.57	NA	0.75
						Skookum	>				

B. Total Mortality Distribution and Fishery Impacts from Exploitation Rate Analysis

	Major Fishery Categories: All Ceiling	Major Fishery Categories: Canada Non-Ceiling	Major Fishery Categories: US Non-Ceiling	Ceiling Fisheries: SEAK	Ceiling Fisheries: NCBC	Ceiling Fisheries: WCVI	Ceiling Fisheries: GS
1985-91 Average AEQ Total Mortality Distribution	51.1%	11.3%	37.2%	0.2%	3.8%	4.2%	42.9%
(% Change from Base)	Stock Index	Passthrough Index		Fishery Index			
1985-91 Observed Index	NA	NA	NA	-7%	-25%	-22%	-34%
1985 Target Index	-44%	0%	0%	-22%	-16%	-24%	-47%

C. Survival and Escapement Indices (% Difference from Long-Term Average)

	Survival	Escapement
Base Period:	NA	-24%
Rebuilding Period:	-3%	29%
Projected Period:	-77%	NA

Comments. In the 1989 annual report, the Nooksack Spring stock was used as the associated model stock for this group. Terminal run data used to model the Nooksack stock are of poor quality and rebuilding predictions from the model are not considered accurate. For this reason, model estimates of the MSY exploitation rate and the predicted date of rebuilding are not reported in this section. The CTC anticipates replacing the Nooksack model stock with a Skagit spring stock during the next year.

Given the large proportion of the mortality of this stock which occurs in U.S. non-ceiling fisheries, it would be desirable to compute the CTC index of passthrough. Unfortunately, the index cannot currently be computed because of the lack of base period data.

The Skagit spring stock, along with the Stillaguamish and Snohomish summer/fall stocks, has been classified as "overfished" under the PFMC definition of overfishing, indicating that the stocks failed to achieve the escapement objectives for three consecutive years. A review group concluded that the "chronically depressed status ... is likely due to a combination of exploitation rates which are too great and reduced productivity due to degradation of habitat" (PSSSRG 1992).

4.4.10 North Puget Sound Summer/Fall (NPS-S/E)

Synopsis. *The current management regime may not be sufficient to rebuild all stocks within this group by 1998. The stock index indicates that the 1985 target reductions for ceiling fisheries have been met and the passthrough index indicates that reductions greater than those required by the CTC definition of passthrough have occurred (terminal harvest rates reduced by 30-40% and the index for preterminal fisheries by 9%). Despite this, brood exploitation rates in ocean fisheries alone remain near the MSY ER level and the stocks are classified as Indeterminate or Not Rebuilding. Since survival rates are projected to decline, additional harvest restrictions or management measures will likely be necessary to assure rebuilding by 1998.*

A. Analysis of Escapement, Terminal Harvest Rates, and Brood Exploitation Rates

Escapement Analysis			PSC Chinook Model			Exploitation Rate Analysis				
Indicator Stocks	Status	1985-91 Terminal HR Index	Indicator Stocks	Yr Rebuilt or % in 1998	MSY ER	Indicator Stocks	Brood Exploitation Ocean Base	Ocean 82-87	Total Base	Total 82-87
Skagit Sum/Fall	Indeterminate	0.60	Skagit	1996	0.53	Samish >				
Stillaguamish	Indeterminate	0.64	Stillaguamish	79%	0.50	Lummi Ponds >	0.57	0.54	NR	NR
Snohomish	Not Rebuild	0.77	Snohomish	99%	0.63	Stillaguamish >				
						Tulalip >				

B. Total Mortality Distribution and Fishery Impacts from Exploitation Rate Analysis

	Major Fishery Categories: All Ceiling	Canada Non-Ceiling	US Non-Ceiling	Ceiling Fisheries: SEAK	NCBC	WCVI	GS
1985-91 Average AEQ Total Mortality Distribution	52.6%	6.5%	40.7%	2.2%	2.7%	24.5%	23.2%
(% Change from Base)	Stock Index	Passthrough Index		Fishery Index			
1985-91 Observed Index	-35%	NA	-9%	-7%	-25%	-22%	-34%
1985 Target Index	-29%	0%	0%	-22%	-16%	-24%	-47%

C. Survival and Escapement Indices (% Difference from Long-Term Average)

	Survival	Escapement
Base Period:	131%	3%
Rebuilding Period:	-21%	5%
Projected Period:	-45%	NA

Comments. In this group, the Stillaguamish is the only stock for which the average escapement has increased relative to the base period. The increased escapement of the Stillaguamish may result from an enhancement (natural stock supplementation) program conducted in this system. Preliminary analysis indicates that a significant portion of the escapement in 1991 originated from supplementation.

The PS summer/fall stocks are unusual in that a large proportion of the mortality occurs in the U.S. nonceiling fisheries. Because of this, reductions in the exploitation rates in ceiling fisheries benefit escapement less than for many other stocks.

The PSC chinook model predicts that 2 of the 3 stocks will be within 1% of the escapement goal by 1998. These model predictions are likely optimistic though since brood exploitation rates in ocean fisheries remain near the MSY ER level. This suggests that total exploitation rates would exceed the MSY ER level since terminal harvest occurs.

4.4.11 South Puget Sound Summer/Fall (SPS)

Synopsis. *Escapement of the Green River stock, which is classified as Above Goal, has increased substantially since the commencement of the PSC management regime. This increase may be attributed to reductions in exploitation rates in ceiling fisheries and enhancement (supplementation) of the natural run. Brood exploitation rates for ocean fisheries have been reduced by an average of 13 percentage points since the base period. However, survival indices indicate that return per spawner is projected to decline substantially in 1992 and 1993.*

A. Analysis of Escapement, Terminal Harvest Rates, and Brood Harvest Rates

Escapement Analysis			PSC Chinook Model			Exploitation Rate Analysis				
Indicator Stocks	Status	1985-89 Terminal HR Index	Indicator Stocks	Yr Rebuilt or % in 1998	MSY ER	Indicator Stocks	Brood Exploitation Ocean Base	Brood Exploitation Ocean 82-87	Brood Exploitation Total Base	Brood Exploitation Total 82-87
Green	Above Goal	1.04	P Sound Finglng	NR	NR	Kalama Creek > SPS Fingerling >	0.69	0.56	NR	NR

B. Total Mortality Distribution and Fishery Impacts from Exploitation Rate Analysis

	Major Fishery Categories: All Ceiling	Major Fishery Categories: Canada Non-Ceiling	Major Fishery Categories: US Non-Ceiling	Ceiling Fisheries: SEAK	Ceiling Fisheries: NCBC	Ceiling Fisheries: WCVI	Ceiling Fisheries: GS
1985-91 Average AEQ Total Mortality Distribution	35.0%	3.7%	61.3%	0.3%	2.3%	21.6%	10.8%
(% Change from Base)	Stock Index	Passthrough Index		Fishery Index			
1985-91 Observed Index	-35%	NA	NA	-7%	-25%	-22%	-34%
1985 Target Index	-30%	0%	0%	-22%	-16%	-24%	-47%

C. Survival and Escapement Indices (% Difference from Long-Term Average)

	Survival	Escapement
Base Period:	28%	-13%
Rebuilding Period:	-27%	20%
Projected Period:	-85%	NA

Comments. Like the North PS summer/fall stock group, these stocks are unusual in that a large proportion of the mortality occurs in the U.S. nonceiling fisheries. Because of this, reductions in the exploitation rates in ceiling fisheries benefit escapement less than for many other stocks.

4.4.12 Columbia Upriver Spring (CUS)

Synopsis. *This stock group is classified as Probably Not Rebuilding. No usable exploitation rate or model information is available for this stock due to very few tag recoveries in ocean fisheries. This may suggest low ocean exploitation rates. Snake River components of this stock have been tagged at levels of 300,000 for several years. Improved survival to fishery recruitment is needed to enable tagging programs to provide usable information for CTC assessment. Although the terminal harvest rate has increased over base period levels, it is typically less than 10%. Given the poor escapements and already low exploitation rates, it is likely that other actions to increase survival and productivity in addition to harvest management will be necessary to rebuild this stock.*

A. Analysis of Escapement, Terminal Harvest Rates, and Brood Exploitation Rates

Escapement Analysis			PSC Chinook Model			Exploitation Rate Analysis		
Indicator Stocks	Status	1985-91 Terminal HR Index	Indicator Stocks	Yr Rebuilt or % in 1998	MSY ER	Indicator Stocks	Brood Exploitation Ocean Base 82-87	Brood Exploitation Total Base 82-87
Col UpR spr	Prob Not Reb	1.66	None			None		

B. Total Mortality Distribution and Fishery Impacts from Exploitation Rate Analysis

	Major Fishery Categories: All Ceiling	Canada Non-Ceiling	US Non-Ceiling	Ceiling Fisheries: SEAK	NCBC	WCVI	GS
1985-91 Average AEQ Total Mortality Distribution	NA	NA	NA	NA	NA	NA	NA
(% Change from Base)	Stock Index	Passthrough Index		Fishery Index			
1985-91 Observed Index	NA	NA	NA	-7%	-25%	-22%	-34%
1985 Target Index	NA	0%	0%	-22%	-16%	-24%	-47%

C. Survival and Escapement Indices (% Difference from Long-Term Average)

	Survival	Escapement
Base Period:	NA	2%
Rebuilding Period:	NA	5%
Projected Period:	NA	NA

Comments. Although the escapement index shows a slight increase, four years of declining escapements resulted in the 1991 terminal run of 17,300 wild Columbia upriver spring chinook being less than the *escapement* during the base period. The Snake River component of this stock group has been listed as threatened under the United States Endangered Species Act (in combination with Snake River summer chinook, which have a similar life history).

4.4.13 Washington Coastal Spring/Summer/Fall, Columbia River Summer/Fall, and Oregon Coastal Fall North Migrating

Synopsis. With the exception of the Columbia Upriver Summer stock, all escapement indicator stocks within this group are currently classified as Above Goal, Probably Rebuilding, or Increasing. These stocks benefitted from survival rates greater than the long-term average during the early years of the rebuilding program and reductions in exploitation rates in the SEAK and NCBC fisheries. Although only 67% of the 1985 target reduction for the stock index has been achieved, brood exploitation rates for total mortality in ocean fisheries have been reduced by 5 percentage points (12%) relative to the base period. Survival rates have declined in recent years, and terminal runs for most stocks have declined for 2 to 4 consecutive years.

The escapement status of the Columbia Upriver Summer stock is inconsistent with the remainder of the stock group. This is likely due to extremely poor juvenile survival which reduces the MSY ER to a level more than 50% below other stocks in this group. The passthrough index for this stock indicates a 32% reduction in preterminal fisheries relative to the CTC definition, and harvest rates in terminal fisheries have declined by an additional 32%. The chinook model predicts that the stock will achieve only 39% of its escapement goal by 1998 with the current management regime. Additional actions to increase survival and productivity will be required to rebuild the Columbia Upriver Summer stock. The Snake River components of the Columbia Upriver Summer and Columbia Upriver Bright stocks have been listed as threatened under the U.S. Endangered Species Act.

A. Analysis of Escapement, Terminal Harvest Rates, and Brood Exploitation Rates

Escapement Analysis

Indicator Stocks	Status	1985-91 Terminal HR Index
Quillayute Sum	Above Goal	0.70
Grays Hbr Fall	Above Goal	1.06
Col UpR Bright	Above Goal	1.92
Lewis River	Above Goal	1.21
Grays Hbr Spr	Prob Rebuild	0.17
Col UpR Sum	Prob Not Reb	0.68
Quillayute Fall	Increasing	1.21
Hoh Spr/Sum	Increasing	1.17
Hoh Fall	Increasing	1.61
Queets Spr/Sum	Increasing	1.15
Queets Fall	Increasing	0.68
Oregon Coastal	Increasing	NA

PSC Chinook Model

Indicator Stocks	Yr Rebuilt or % in 1998	MSY ER
WA Coastal wild	1992	0.76
Col UpR sum	39%	0.29
Col UpR bright	1993	0.92
Lewis	1986	0.72
Oregon Coastal	NA	NA

Exploitation Rate Analysis

Indicator Stocks		Brood Exploitation Ocean Base	Ocean 82-87	Total Base	Total 82-87
Quinault	>				
Queets	>				
Humptulips	>				
Col UpR bright	>				
Lewis River	>	0.40	0.35	NR	NR
Lyons Ferry	>				
Salmon River	>				
Hanford Wild	>				
Sooes	>				
Quillayute	>				

B. Total Mortality Distribution and Fishery Impacts from Exploitation Rate Analysis

	Major Fishery Categories All Ceiling	Canada Non-Ceiling	US Non-Ceiling	Ceiling Fisheries SEAK	NCBC	WCVI	GS
1985-91 Average AEQ Total Mortality Distribution	88.7%	2.4%	8.9%	40.4%	28.3%	19.4%	0.6%
(% Change from Base)	Stock Index	Passthrough Index		Fishery Index			
1985-91 Observed Index	-14%	NA	-32%	-7%	-25%	-22%	-34%
1985 Target Index	-21%	0%	0%	-22%	-16%	-24%	-47%

C. Survival and Escapement Indices (% Difference from Long-Term Average)

	Survival	Escapement
Base Period:	23%	-25%
Rebuilding Period:	-2%	20%
Projected Period:	-43%	NA

Comments. The 1991 terminal run of the Columbia Upriver Summer stock (Snake River and other summer chinook combined) of 18,900 was the second lowest since 1970. Although its life history is more similar to that of Columbia upriver springs, Snake River summer chinook escapement is included in the escapement goal for Columbia River summers due to their concurrent run timing. Snake River summer chinook have been listed as threatened under the U.S. Endangered Species Act (in combination with Snake River springs).

No usable exploitation rate indicator stock is currently available to represent the Columbia Upriver Summer stock. Wells Hatchery summer brood stock has been contaminated with fall chinook and very few recoveries are obtained from the McCall Hatchery tagging program even though approximately 300,000 are now tagged on annual basis. Improved survival to fishery recruitment or an increase in the number of fish tagged is needed to enable Snake River tagging programs to provide usable information for CTC assessments.

The Snake River fall stock has also been listed as threatened. The Lyons Ferry Hatchery (fingerling) exploitation indicator stock is assumed to be representative of Snake River falls. The Snake River Fall stock is currently being added to the PSC chinook model. Snake River fall chinook are subject to extremely high non-fishing mortality during all phases of freshwater residency. Upriver migration mortality has resulted in an average passage loss of 68% of the returning spawners during the last 5 years.

The MSY ER for Columbia Upriver Brights is above the range observed for most other stocks. This may be due to a positive bias introduced by combining mid-Columbia bright production and Priest Rapids Hatchery production with Hanford Reach natural production. The problem has recently been exacerbated because the proportion in the catch of mid-Columbia brights has increased relative to upriver brights. Efforts are being made to separate these three components in the chinook model.

4.5 STOCK COMPOSITION, DISTRIBUTION OF MORTALITY, AND STOCK STATUS

Ceilings were established by the PSC in order to rebuild natural stocks. Not all natural stocks occur in each ceiling fishery and the rebuilding response of stocks has been variable. To facilitate review of natural stock distribution and status, Appendix H summarizes chinook model estimates of the stock composition of total mortality in ceiling fisheries (1985-1991 average), proportion of total stock mortality occurring in the fishery (1985-1991 average), and the status of the associated escapement indicator stock. Note that the estimates of stock composition are expressed as a percentage of the mortality of stocks included in the model. Stocks not included in the model may also contribute to the fishery

4.6 DISCUSSION

The technical basis for development of the PST chinook rebuilding program in 1984 relied upon a chinook model that included four stock types: Columbia Upriver Bright, Columbia River Tule, WCVI fall, and GS fall. The Columbia Upriver Bright stock was used as an indicator for far-north migrating fall-type stocks originating in Washington and Oregon, the Columbia River Tule (Spring Creek Hatchery) stock was an indicator for early-maturing chinook stocks harvested off the coast of the WCVI and Washington, the WCVI was represented by Robertson Creek Hatchery to indicate impacts on far-north, fall-type stocks originating in Canada, and the GS stock was represented by the Big Qualicum stock as an indicator for fall-type stocks that contribute primarily to GS fisheries.

The model was used to evaluate a number of potential management actions, with the objective of identifying a regime that would rebuild depressed natural stocks by 1998 and was acceptable to the Parties. The task of rebuilding WCVI and GS stocks was most critical in the development of the PST's management regime since the Columbia Upriver Bright stock was close to its escapement goal and the Spring Creek stock primarily represented hatchery production. The response of stocks other than WCVI and GS to the PST management regime was expected to vary depending upon stock specific attributes, including distribution and productivity. Realizing the limitations of the data available at the time, and the general objective to "attain by 1998, escapement goals...of naturally spawning chinook stocks, as represented by indicator stocks identified by the Parties", the original chinook chapter recognized that modification of the PST chinook management regime might be required to achieve the rebuilding objective.

As expected, the analysis presented in this chapter indicates that the response of stocks to the PST management regime has been highly variable. Among the stock groups which include more than one escapement indicator stock, there is no instance in which the rebuilding status of all stocks is equivalent, and in some instances, the status ranges from Above Goal to Not Rebuilding.

The CTC provided an integrated assessment of the status of chinook stocks two years ago in the 1989 Annual Report. During the two years since the last assessment, if the rebuilding program were proceeding as expected, we would expect fishery and stock indices to have declined further below the 1985 target levels, further reductions in brood year exploitation rates, chinook abundance in fisheries to have increased, and most of the escapement indicator stocks to be in the upper status categories. When the results of this assessment are compared with the 1989 Annual Report, it is apparent that these expectations have not been fulfilled.

1) In 1989, the 1985 target reductions were achieved in 3 of the 4 ceiling fisheries, and the average reduction was 34%. In 1991, the 1985 target reductions were achieved in 2 of the fisheries, and the average reduction was 24%.

2) In 1989, average brood exploitation rates for stock groups during the rebuilding period had declined by an average of 12% (8 percentage points). In 1991, brood exploitation rates had declined by an average of 10% (7 percentage points).

3) Comparing the rebuilding status of the 35 escapement indicator stocks with goals used in both the 1989 and 1991 assessments, 29% of the stocks were classified as Probably Not Rebuilding or Not Rebuilding in 1989 and 42% were in these categories in 1991.

4) The estimated model abundance of chinook available to the ceiling fisheries in 1991 was less than in 1989 with the exception of the GS sport and troll fishery.

ATTRIBUTE	1989	1991
Average Reduction in Ceiling Fishery Harvest Rates	34%	24%
Ocean Brood Exploitation Rates (Average Change From Base)	-12%	-10%
Percent of Escapement Indicator Stocks in Probably Not Rebuilding or Not Rebuilding Categories	23%	42%
Abundance Indices		
SEAK Troll	1.35	1.20
NCBC Troll	1.04	0.98
WCVI Troll	0.72	0.61
GS Sport and Troll	0.45	0.57

Bearing in mind the variability observed within the stock groups, several conclusions regarding the rebuilding program may be drawn:

1) **Above Average Survival Benefitted Far North Migrating Stocks.** Progress toward rebuilding was accelerated in the initial years of the PST by survival rates greater than the long term average for stocks for which a majority of the fishing mortality occurs in the NCBC and SEAK ceiling fisheries. In particular, escapements for many components of the WACO (1983-1984 broods) and SEAK (1980-1982) stock groups showed substantial increases in escapement in the period from 1985 to 1989 which were likely related to good survival. Good survival, and the resultant increases in abundance, acted in conjunction with the ceilings to further increase escapements by reducing harvest rates. These stock groups may also have benefitted from delayed openings in summer seasons and reductions in the exploitation rates in passthrough fisheries. Although the evidence is less conclusive, similar processes may have affected the NCBC and Upper Fraser stock groups. As survival rates declined, model estimates of abundance in the fisheries stabilized or declined, fishery indices increased, and escapement for many of the stocks

also stabilized or declined. The 1989 report noted that "the survival of stocks contributing to the northern fisheries is expected to be poor...Consequently, the harvest rate reductions expected under the rebuilding program are not likely to be achieved." This statement continues to be applicable in 1992 and 1993, as survivals are projected to be substantially below the long-term average.

2) **Rebuilding Progress is Poor For Stocks Harvested in GS.** Escapement indicator stocks in stock groups in which more than 40% of the fishing mortality occurs in GS are classified as Probably Not Rebuilding (Lower GS, Lower Fraser Fall, and Skagit Spring). This is consistent with results from the chinook model, which predicts that the Lower GS stock and the Lower Fraser stock will not rebuild by 1998. The limited response of these stocks is likely due to poor recent survivals and the failure to meet target harvest rate reductions in some ceiling fisheries (the stock index for the Lower GS stock indicates that only 25% of the 1985 target reduction has been achieved). However, brood year total exploitation on the Big Qualicum exploitation indicator stock in Lower GS has been successfully reduced since the base period. Survivals of recent Lower GS broods are expected to remain poor but survival of the Lower Fraser stock is expected to improve relative to recent years. The 1989 CTC report stated that because "an additional [abundance] reduction of 9% is projected for 1990-1991... the 1985 target reductions are not likely to be achieved in 1990 and 1991 unless additional management actions are implemented." Although some additional management actions have been taken in GS (See Discussion, Chapter 3), these actions appear to have been insufficient.

3) **Mixed Progress For Stocks Primarily Harvested in U.S. Passthrough Fisheries.** The two stock groups with more than 40% of the fishing mortality in U.S. non-ceiling fisheries have displayed a mixed response to the PSC management regime. The North PS Summer/Fall stock group has responded poorly; all three of the stocks are in the Indeterminate or Not Rebuilding categories and the chinook model predicts that two of the three stocks in the group will not rebuild by 1998. Exploitation rates on these stocks remain high, despite harvest rate reductions in ceiling fisheries and satisfactory achievement of the CTC definition of passthrough. Brood exploitation rates in ocean fisheries alone remain near the MSY ER. In contrast, the South Puget Sound Summer/Fall stock group has shown a marked increase in escapement, perhaps in response to enhancement.

4.7 CONCLUSIONS

In view of poor recent survivals and failures to at least achieve 1985 target harvest rate reductions in some ceiling fisheries, the CTC concludes that stock groups with all escapement indicator stocks presently categorized in the lower two rebuilding categories (WCVI, Lower GS, Lower Fraser Fall, North PS Spring, and Columbia Upriver Spring) will not rebuild by 1998. Rebuilding will require sustained increases in productivity (e.g., through habitat improvements or other enhancement activities) or a sustained decrease in fishing mortality of those stocks. Further, projections for continued poor survivals indicate that the required reductions in exploitation will be greater than originally estimated when average survivals were assumed.

Total brood exploitation rates have been reduced for exploitation indicator stocks in most stock groups (no change in SEAK) and are nearing the estimated MSY ER of associated model stocks (with the exception of the Lower GS and Columbia Upriver Summer stocks). The lack of a positive response in escapements coupled with reduced brood exploitations indicate that poor survivals are limiting our ability to achieve the escapement goals. Exploitation rates are being reduced but have generally not been adequate for the degree of reduction in survivals. This seems particularly true for the Lower GS and Columbia Upriver Summer stocks. Managers of the summer stock noted problems with freshwater survival and the Lower GS stock has the poorest survival index of the 13 stock groups.

Harvest management of ocean fisheries is not benefitting all stocks equally. Rebuilding some specific stocks should be expected to require more detailed stock-specific investigations (e.g., examination of the biological basis of the escapement goal) and actions (e.g., habitat improvements, supplementation, etc.). Management of ocean fisheries using catch ceilings must be responsive to changes in abundance and stock productivities in order to achieve target harvest rate reductions but detailed stock-specific actions will likely also be required to rebuild all the indicator stocks.

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APPENDIX A

Tables of Escapements and Terminal Runs

Escapements and terminal runs of PSC Chinook Technical Committee natural chinook escapement indicator stocks, 1975-1991.

Year	Southeast Alaska					
	Situk esc.	Situk t.run	King Salmon esc.	Andrew esc.	Blossom esc.	Keta esc.
1975	1510	2099	53	416	234	325
1976	1433	2676	81	404	109	134
1977	1732	2833	168	456	179	368
1978	814	1456	71	388	229	627
1979	1400	2735	89	327	86	682
1980	905	2284	88	281	142	307
1981	702	1752	113	536	254	526
1982	434	772	286	672	552	1206
1983	592	1043	245	366	942	1315
1984	1726	2439	250	389	813	976
1985	1521	2597	171	510	1134	998
1986	2067	2393	245	1131	2045	1104
1987	1390	2698	193	1261	2158	1229
1988	885	1453	206	760	614	920
1989	652	1081	238	848	550	1848
1990	700	1115	168	1062	411	970
1991	875	1976	134	640	382	435
Goal	600		250	750	1280	800

Year	Transboundary Rivers				
	Alsek (Klukshu) esc.	Taku (6 stocks) esc.	Stikine (L.Tahltan) esc.	Unuk esc.	Chickamin esc.
1975		2089	1400	1469	588
1976	1153	4726	800	1469	147
1977	2894	5671	1600	1558	363
1978	2676	3305	1264	1770	290
1979	4274	4156	2332	922	224
1980	2487	7544	4274	1626	418
1981	1963	9786	6668	1170	614
1982	1969	4813	5660	2162	1015
1983	2237	2062	1188	1800	922
1984	1572	3909	2588	2939	1763
1985	1283	7208	3114	1894	1530
1986	2607	7520	2891	3402	2683
1987	2491	5743	4783	3157	1560
1988	1994	8626	7292	2794	1258
1989	2289	9480	4715	1838	1494
1990	1742	12249	4392	946	902
1991	2153	10153	4506	1221	779
Goal	4700	13200	5300	2880	1440

Escapements and terminal runs of PSC Chinook Technical Committee natural chinook escapement indicator stocks, 1975-1991 (continued).

Year	Northern B.C.								
	AREA 1 Yakoun esc.	AREA 3 Nass esc.	AREA 3 Nass t.run	AREA 4 Skeena esc.	AREA 4 Skeena t.run	AREA 6 Index	AREA 8 Index	AREA 9 Rivers Inlet	AREA 10 Smith Inlet
1975	1500	6025		20319		2225	4425	3280	960
1976	700	5590		13078		2765	3550	1640	1000
1977	800	9060	11460	29018	39606	1820	3600	2225	1050
1978	600	10190	11975	22661	35055	3912	4000	2800	2100
1979	400	8180	9788	18488	28166	3455	4600	2150	500
1980	600	9072	11186	23429	38626	1935	2529	2325	1200
1981	750	7950	9443	24523	42018	1502	3550	3175	1020
1982	1400	6575	8426	17092	35185	4150	220	2250	1500
1983	600	8055	13949	23562	39510	2845	650	3320	1050
1984	300	12620	14380	37598	53516	1914	4700	1400	770
1985	1500	8002	11121	53599	76544	1509	4550	3371	230
1986	500	17390	22775	59968	87566	2615	3362	7623	532
1987	2000	11431	15849	59120	76349	1566	1456	5239	1050
1988	2000	10000	14140	68705	102563	3165	1650	4429	1050
1989	2800	12525	17526	57202	83439	998	2535	3265	225
1990	2000	12123	15607	55976	89447	281	2385	4039	510
1991	1900	4017	12162	52753	79343	709	2470	6635	500
Goal	1580	15890		41770		5520	5450	4950	2110

Year	Southern B.C.				Fraser River					
	W. Coast Vancouver I. esc.	Lower Geo. Strait esc.	Lower Geo. Strait t.run	Upper Geo. Strait esc.	Upper Fraser esc.	Middle Fraser esc.	Thompson esc.	Fraser spr/sum t.run	Harrison esc.	Harrison t.run
1975	1675	9525	10940	11800	7028	15050	37035	119081		
1976	1275	9240	10640	15150	7612	10975	14875	98691		
1977	3875	10655	12665	3880	10135	13320	30321	132553		
1978	6275	8035	8975	6150	14015	13450	28465	109119		
1979	3058	12400	13271	3610	12495	8595	25145	104568		
1980	6392	11530	13847	1367	15796	9625	19330	68973		
1981	5108	10420	12980	1945	9021	8175	23375	65677		
1982	7523	9520	10916	3260	11603	10470	20385	82820		
1983	3824	9080	10102	3820	17185	15404	20381	72999		
1984	5012	11150	12292	4600	21938	13957	29972	95878	120837	131757
1985	4900	5010	6518	4600	34527	17595	39997	124380	174778	179255
1986	4810	3038	4955	1630	41207	27349	45130	145652	162596	176740
1987	3520	2630	4729	5700	39420	27330	36730	127582	78038	81025
1988	5500	7040	9353	3300	34400	24164	47103	126894	35116	39487
1989	8480	6830	9589	6607	25310	15095	37975	107136	74685	75090
1990	5760	7635	10367	2200	35552	25510	41704	132831	177375	180758
1991	5756	12895	16138	3276	27317	21170	36460	112524	90638	93472
Goal	11665	22280		5100	24460	21130	55710		241700	

Escapements and terminal runs of PSC Chinook Technical Committee natural chinook escapement indicator stocks, 1975-1991 (continued).

Year	Puget Sound									
	Skagit spring		Skagit sum/fall		Stillaguamish		Snohomish		Green	
	esc.	t.run	esc.	t.run	esc.	t.run	esc.	t.run	esc	t.run
1975	804	804	11555	24625	1198	1635	4485	6123	3394	6217
1976	763	763	14479	23306	2140	4002	5315	9889	3140	7679
1977	716	716	9497	17693	1475	2549	5565	9618	3804	5339
1978	1079	1079	13209	20030	1232	1959	7931	12591	3304	4337
1979	1032	1032	13605	21243	1042	2366	5903	12706	9704	10725
1980	1842	1842	20345	28938	821	2647	6460	16688	7743	10537
1981	1306	1306	8670	19675	630	2783	3368	8968	3606	4898
1982	686	686	10439	21022	773	3058	4379	8470	1840	3822
1983	710	710	9080	14671	387	925	4549	10386	3679	13244
1984	765	765	13239	15005	374	883	3762	8480	3353	5339
1985	3265	3265	16298	25075	1409	2641	4873	9005	2908	7417
1986	1995	1995	18127	21585	1277	2416	4534	8267	4792	5770
1987	2108	2108	9647	13037	1321	1906	4689	6670	10338	11666
1988	1988	1988	11954	14647	717	1176	4513	7389	7994	9185
1989	1853	2262	6776	12787	811	1642	3138	6142	11512	14993
1990	1902	1937	17206	19172	842	1739	4209	8345	7035	15195
1991	1411	1452	6014	8408	1632	3026	2783	5156	10548	14944
Goal	3000		14900		2000		5250		5800	

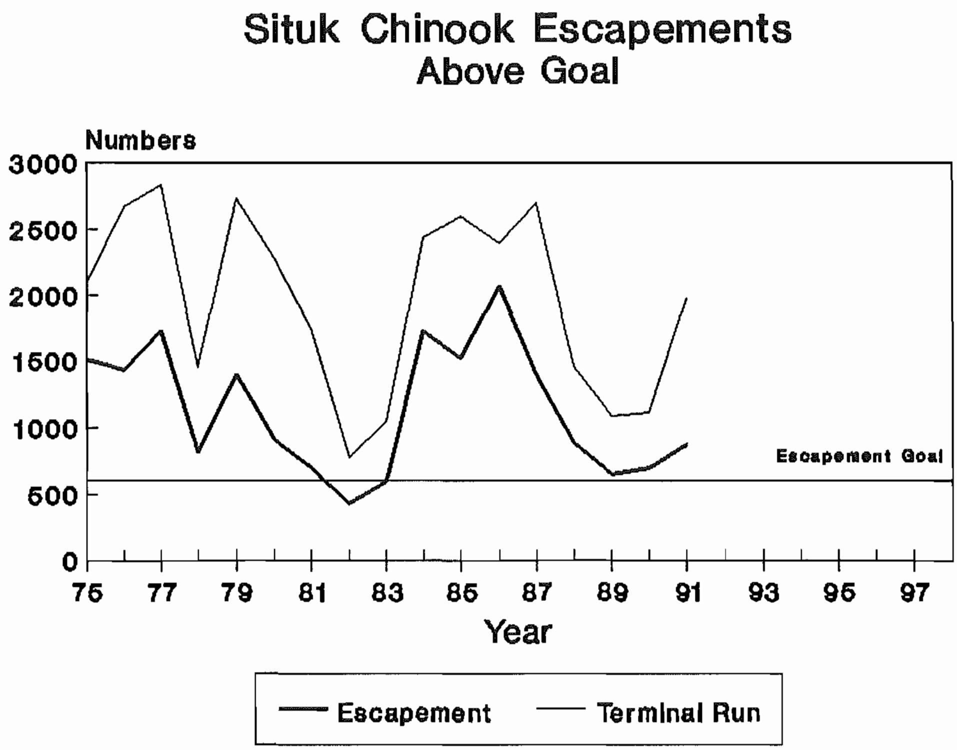
Year	Washington Coast															
	Quillayute summer		Quillayute fall		Hoh spr/sum		Hoh fall		Queets spr/sum		Queets fall		Grays Harbor spring		Grays Harbor fall	
	esc.	t.run	esc.	t.run	esc.	t.run	esc.	t.run	esc.	t.run	esc	t.run	esc.	t.run	esc.	t.run
1975																
1976	1300	1700	2500	4700	600	1300	2500	3100	500	700	1200	2500	600	1000	1800	8900
1977	3800	5300	3300	7600	1000	2000	2100	3800	700	1200	3600	5500	800	1700	5200	13200
1978	2300	2700	4700	6200	1400	2500	1900	2900	1100	1400	2200	3100	1000	1600	4600	10600
1979	2100	3900	3900	6600	1400	2300	1700	2200	900	1400	3900	4700	400	1100	9400	12100
1980	900	1500	6700	7600	800	1000	2200	2800	1000	1200	3200	5800	200	600	11700	22000
1981	800	1700	6000	7100	1500	2100	3100	4000	1000	1300	4300	8000	600	900	7600	12400
1982	1200	2700	7100	9700	1600	2300	4500	5800	800	1200	4100	6200	600	700	5600	13700
1983	1400	1800	3100	5500	1800	1800	2500	3300	1000	1200	2600	3800	800	900	5500	9100
1984	600	1000	9100	10400	1500	2400	1900	2600	1000	1200	3900	5300	1100	1100	21000	22600
1985	600	700	6100	8400	1000	1400	1800	2900	700	900	3900	5300	1200	1200	9400	15000
1986	600	1000	10000	13500	1500	2500	5000	6000	900	1200	7700	8900	2000	2000	10500	17500
1987	600	1600	12400	20700	1700	2600	4000	6100	600	1600	6000	9600	900	1100	18800	31200
1988	1300	2600	15200	22200	2600	3900	4100	6900	1800	2300	7600	10400	3500	3600	28200	39100
1989	2400	3400	10000	17100	4700	7000	5100	8700	2500	3800	8700	11300	2100	2400	26400	56000
1990	1500	1900	13700	16800	3900	5800	4200	6400	1800	2500	10100	12300	1600	1700	17500	39600
1991	1200	1500	6300	7600	1100	1800	1400	2600	600	800	4500	5900	1300	1500	11600	27100
Goal	1200		NA		NA		NA		NA		NA		1400		14600	

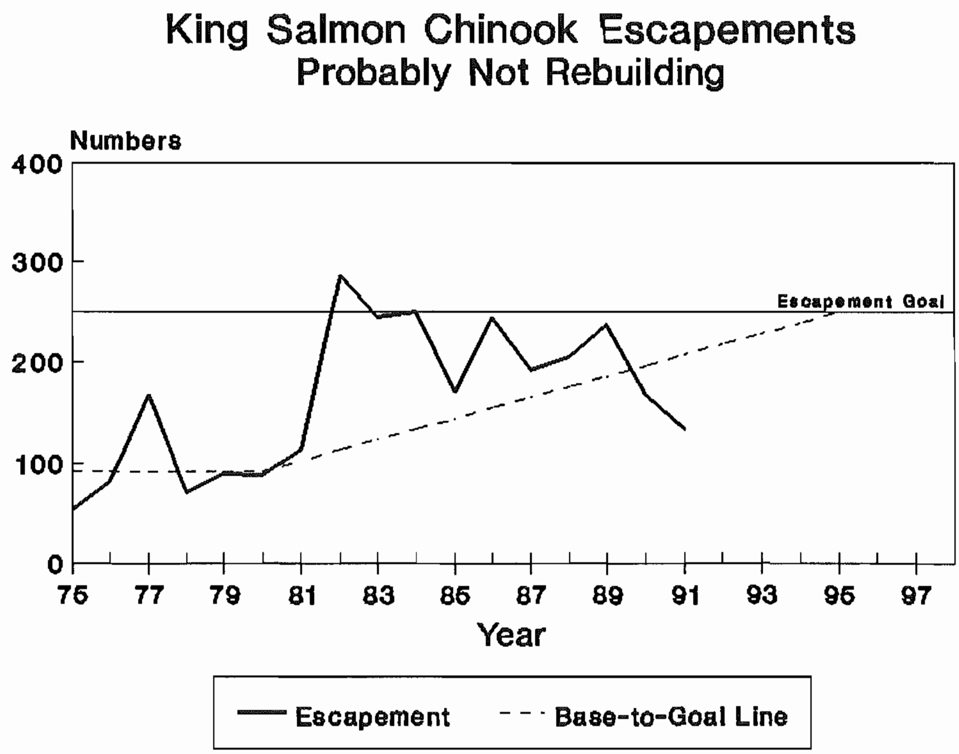
Escapements and terminal runs of PSC Chinook Technical Committee natural chin escapement indicator stocks, 1975-1991 (continued).

Year	Columbia River								Oregon
	Col. Upriver spring		Col. Upriver summer		Col. Upriver bright		Lewis River		Oregon Coastal
	esc.	t.run	esc.	t.run	esc.	t.run	esc.	t.run	Index esc.
1975			33000	33000	29600	112500	13859	36800	60
1976			26600	26700	28800	115100	3371	14900	50
1977	64900	92700	33300	34300	37600	95100	6930	29800	73
1978	89600	95300	37600	38700	27300	85300	5363	18500	77
1979	22300	23300	26700	27800	31200	89200	8023	32700	90
1980	26700	27600	25800	27000	29900	76800	16394	38800	95
1981	31500	33700	21100	22400	21100	66600	19297	25000	81
1982	31700	34800	18800	20100	31100	79000	8370	13000	99
1983	23600	25200	17700	18000	48700	86100	13540	16800	49
1984	18600	20400	22100	22400	61000	131400	7132	13300	100
1985	27200	28800	22400	24200	90800	196400	7491	13300	133
1986	36500	39800	25500	26200	109900	281500	11983	24500	135
1987	41400	45000	30900	33000	149700	420700	12935	37900	131
1988	35100	40700	29000	31300	110400	339900	12059	41700	221
1989	27000	30000	28700	28800	92900	261100	21199	38600	151
1990	28800	32800	25000	25000	55200	153100	17506	20300	125
1991			18800	18900	44400	102200	9066	19900	169
Goal	84000		85000		40000		5700		NA

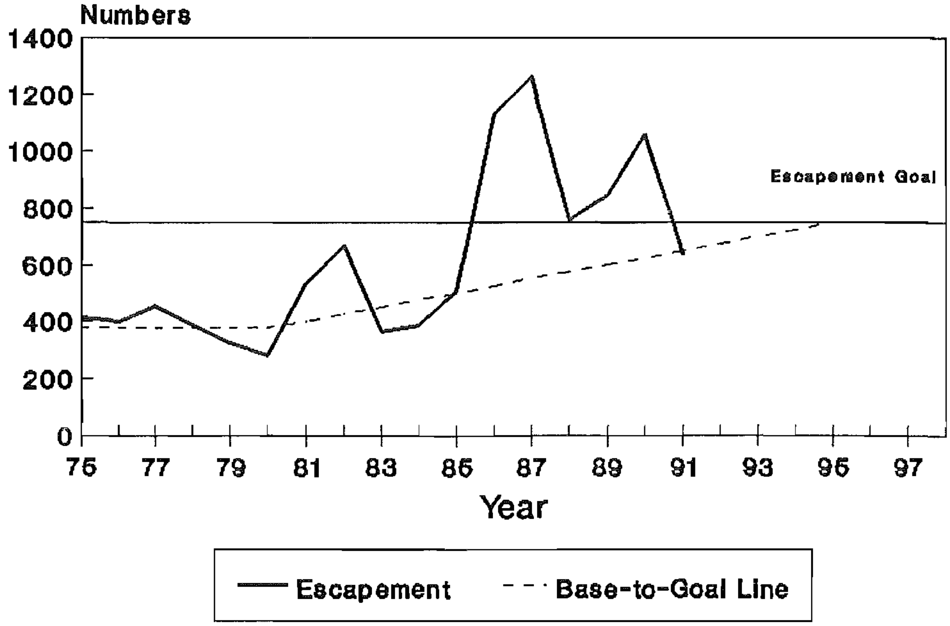
APPENDIX B

Stock Specific Chinook Escapement Figures

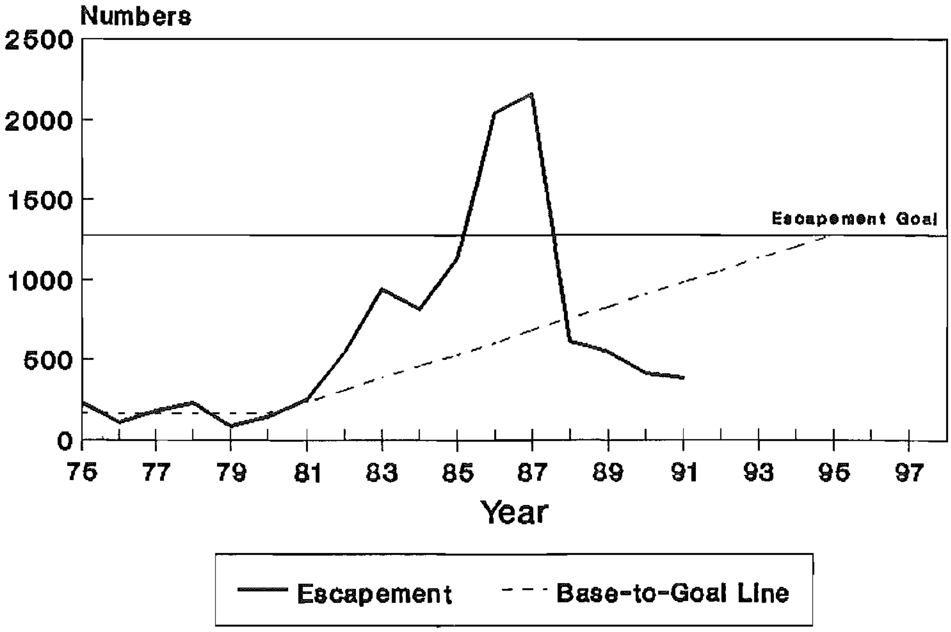

Situk Chinook Escapements
Above Goal
Numbers
3000
2500
2000
1500
1000
500
0
Escapement Goal
75
77
79
81
83
85
87
89
91
93
95
97
Year
Escapement
Terminal Run


King Salmon Chinook Escapements
Probably Not Rebuilding
Numbers
400
300
200
100
0
Escapement Goal
75
77
79
81
83
85
87
89
91
93
95
97
Year
Escapement
Base-to-Goal Line

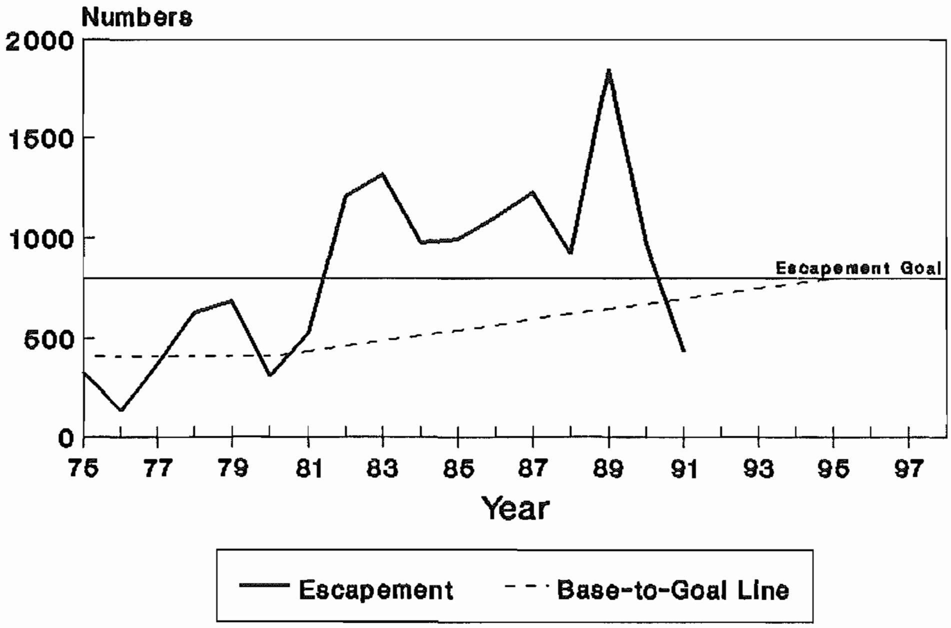
Andrew Creek Chinook Escapements
Above Goal



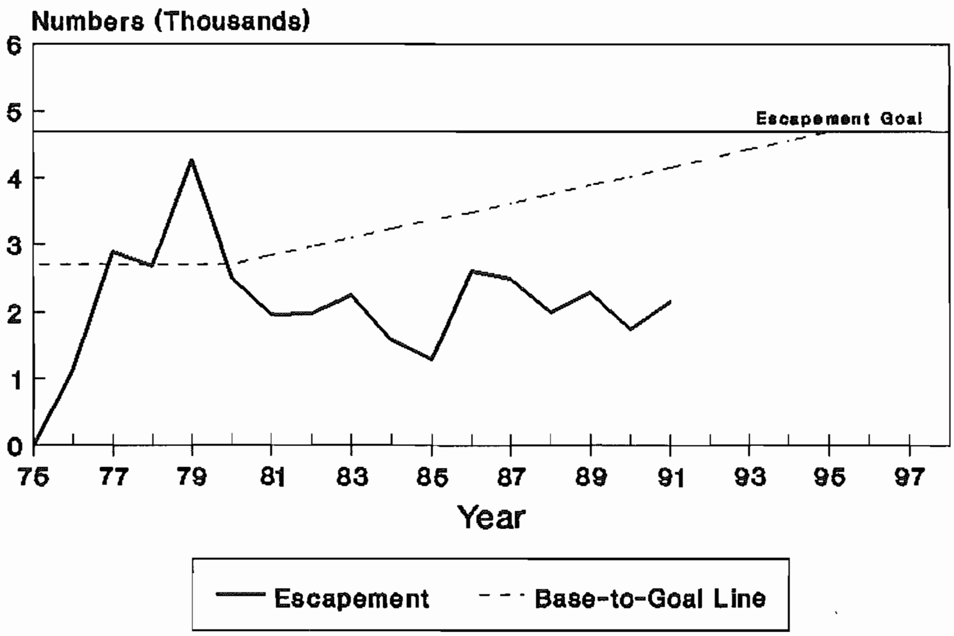
Blossom River Chinook Escapements
Probably Not Rebuilding



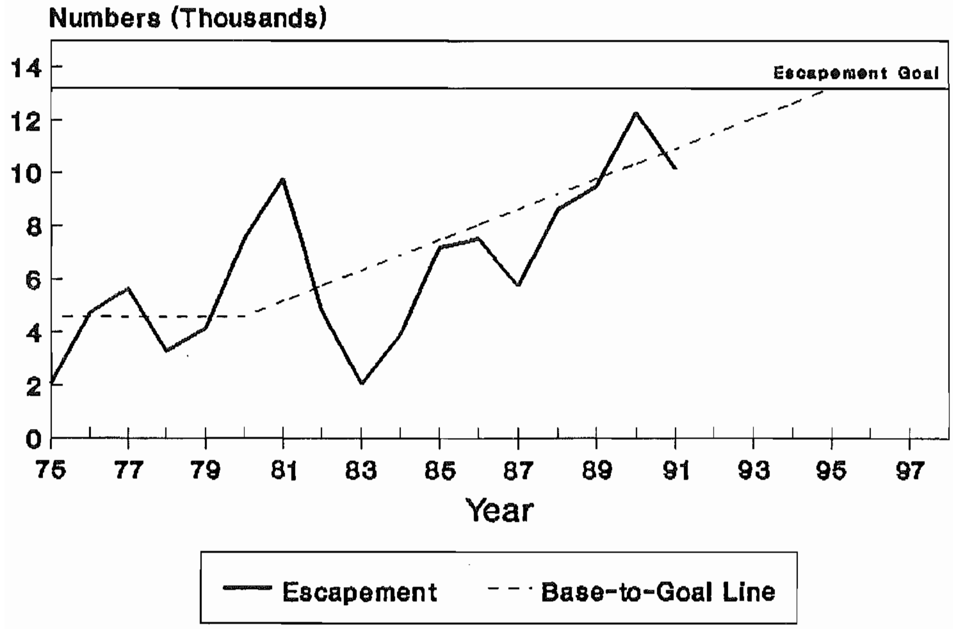
Keta River Chinook Escapements
Above Goal



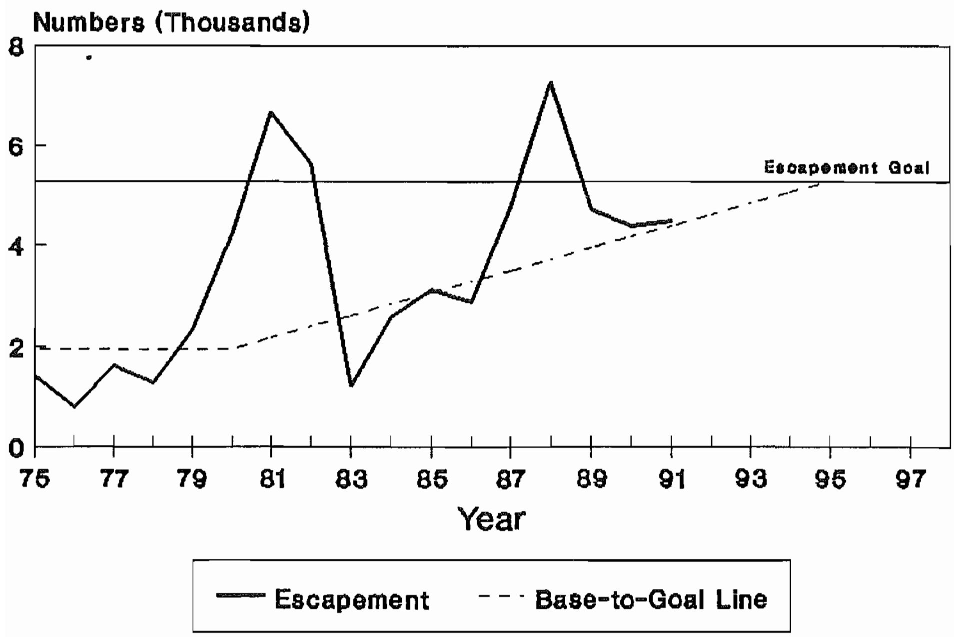
Alsek R. Chinook Escapements
Not Rebuilding

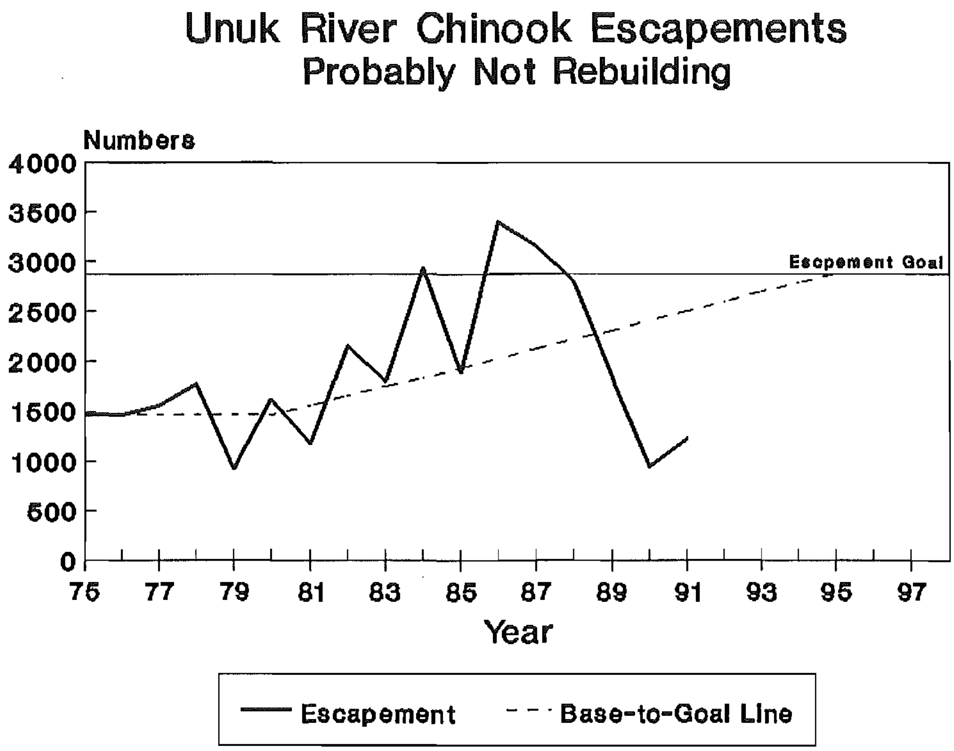


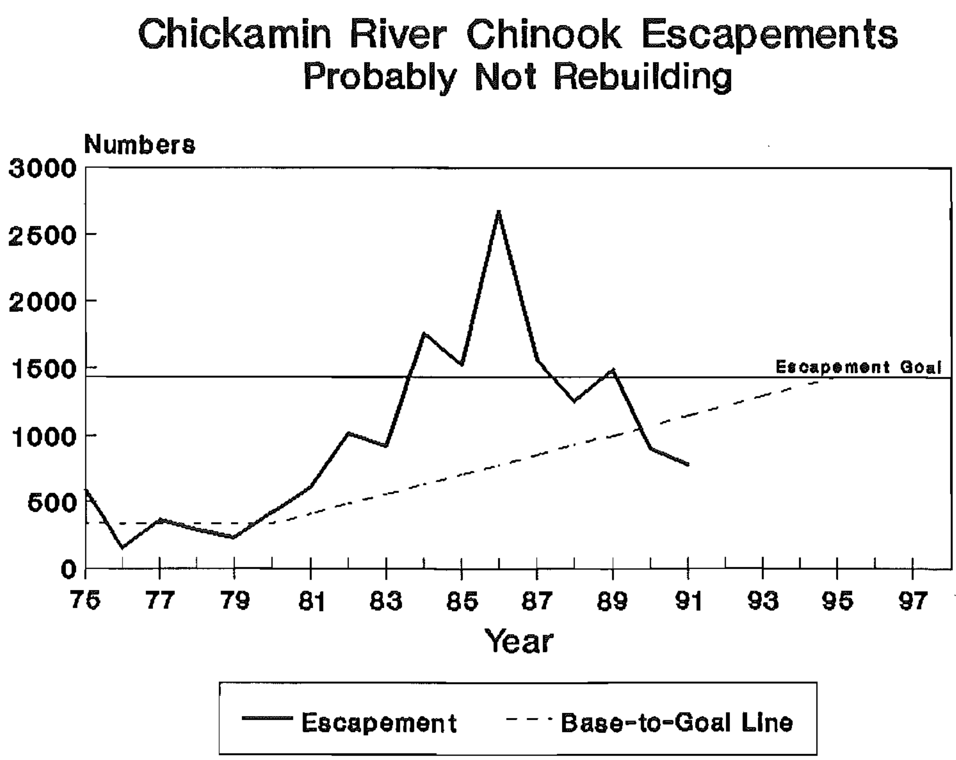
Taku Chinook Escapements
Probably Rebuilding



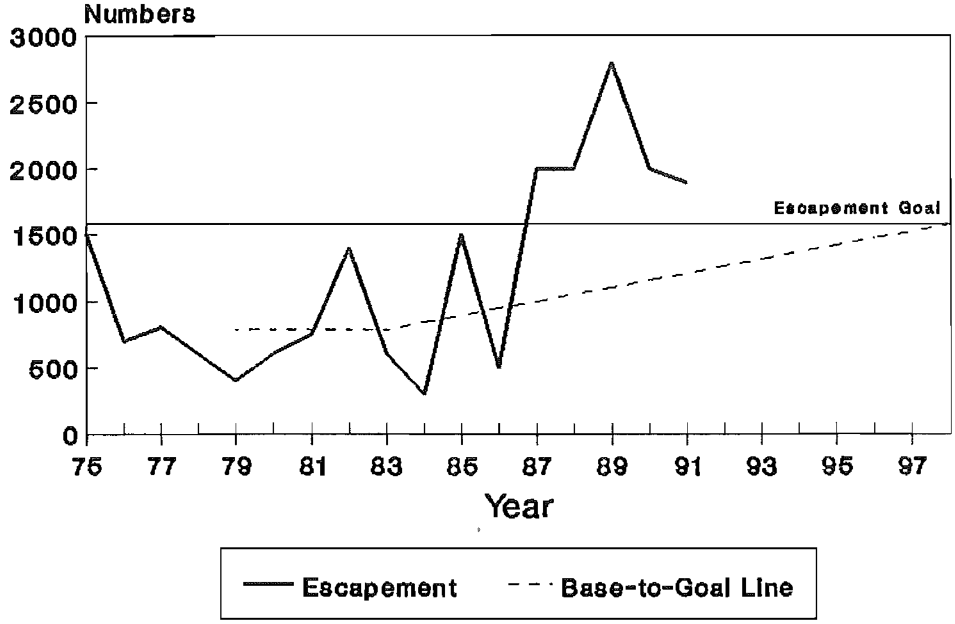
Stikine River Chinook Escapements
Rebuilding



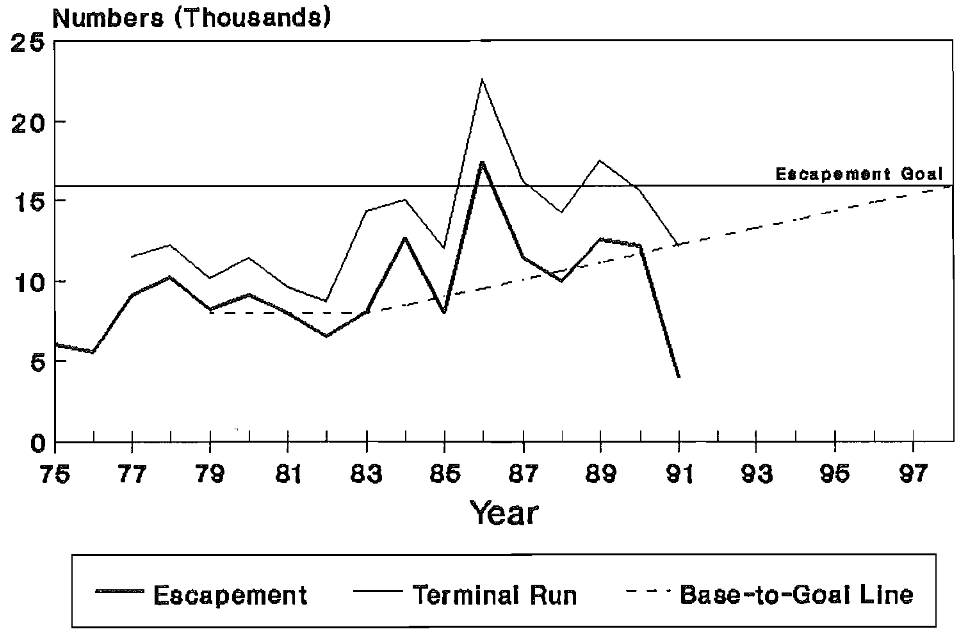

Unuk River Chinook Escapements
Probably Not Rebuilding
Numbers
4000
3500
3000
2500
2000
1500
1000
500
0
75
77
79
81
83
85
87
89
91
93
95
97
Year
Escapement Goal
Escapement
Base-to-Goal Line

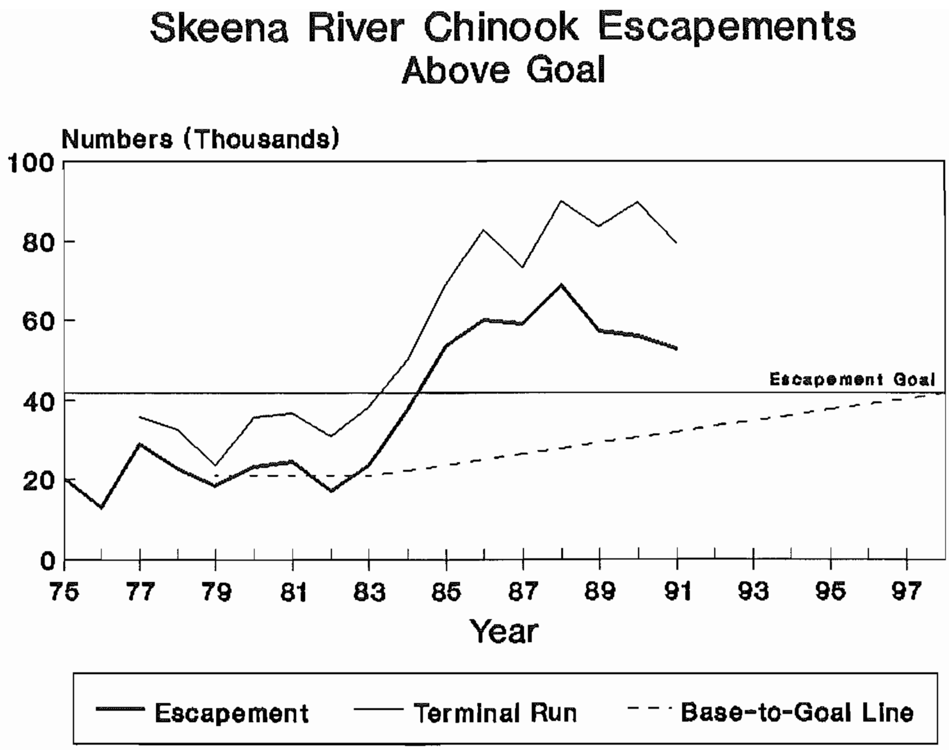

Chickamin River Chinook Escapements
Probably Not Rebuilding
Numbers
3000
2500
2000
1500
1000
500
0
75
77
79
81
83
85
87
89
91
93
95
97
Year
Escapement Goal
Escapement
Base-to-Goal Line

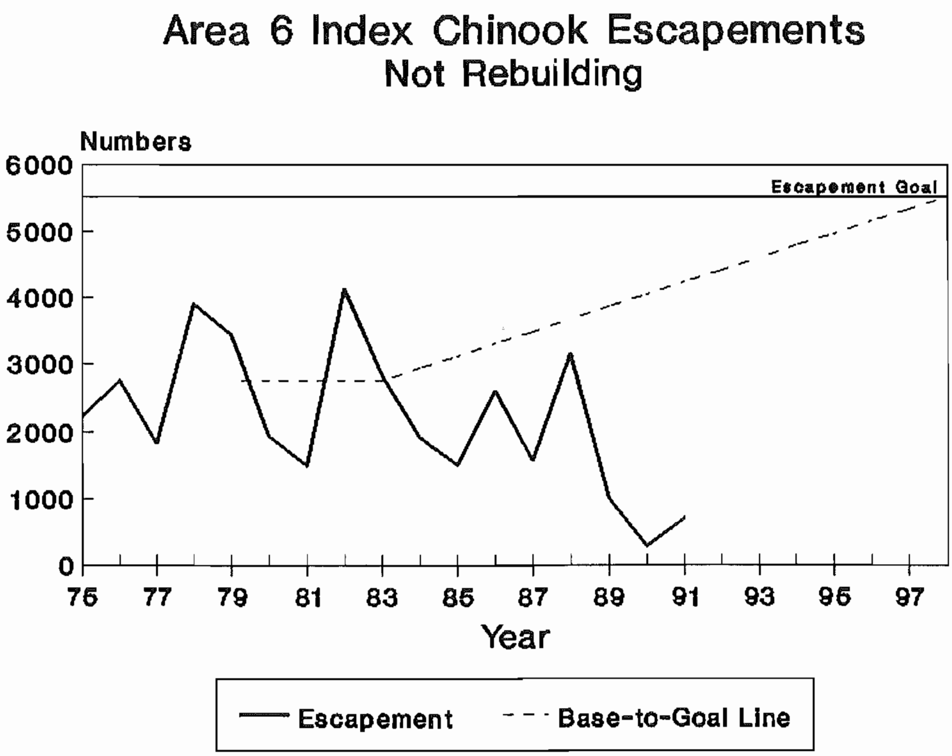
Yakoun River Chinook Escapements
Above Goal



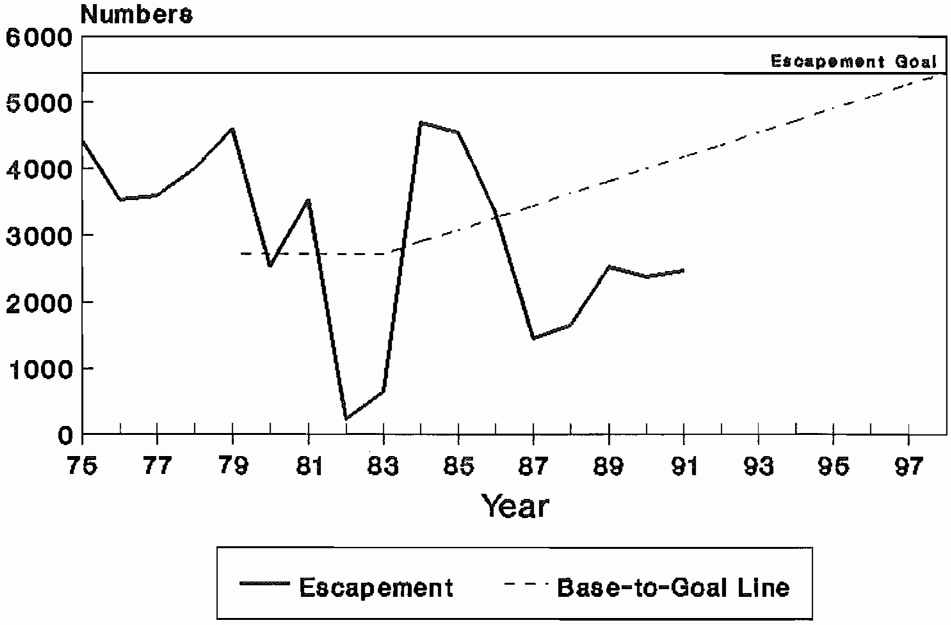
Nass River Chinook Escapements
Indeterminate



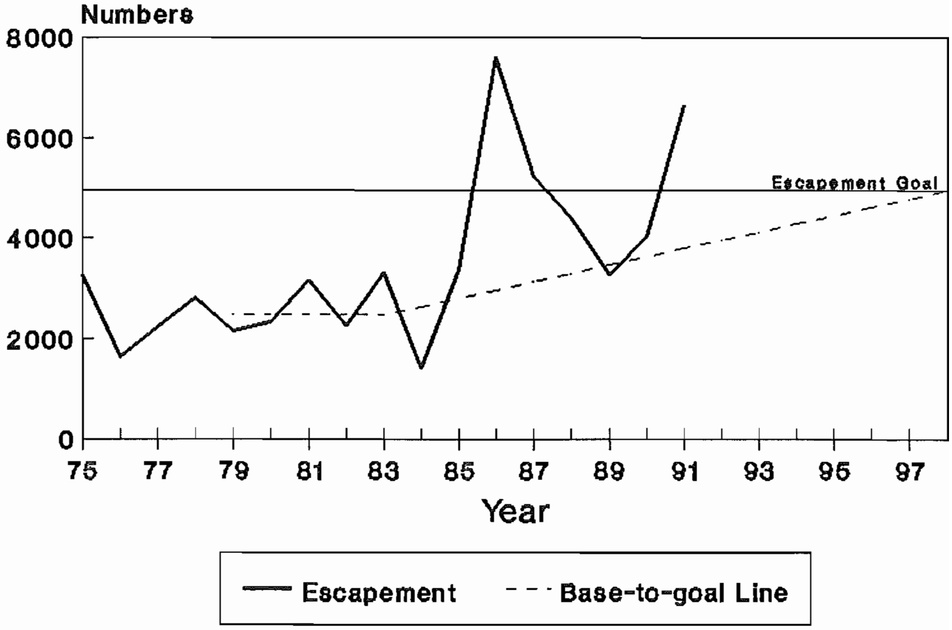

Skeena River Chinook Escapements
Above Goal
Numbers (Thousands)
100
80
60
40
20
0
Escapement Goal
75
77
79
81
83
85
87
89
91
93
95
97
Year
Escapement
Terminal Run
Base-to-Goal Line


Area 6 Index Chinook Escapements
Not Rebuilding
Numbers
6000
5000
4000
3000
2000
1000
0
Escapement Goal
75
77
79
81
83
85
87
89
91
93
95
97
Year
Escapement
Base-to-Goal Line

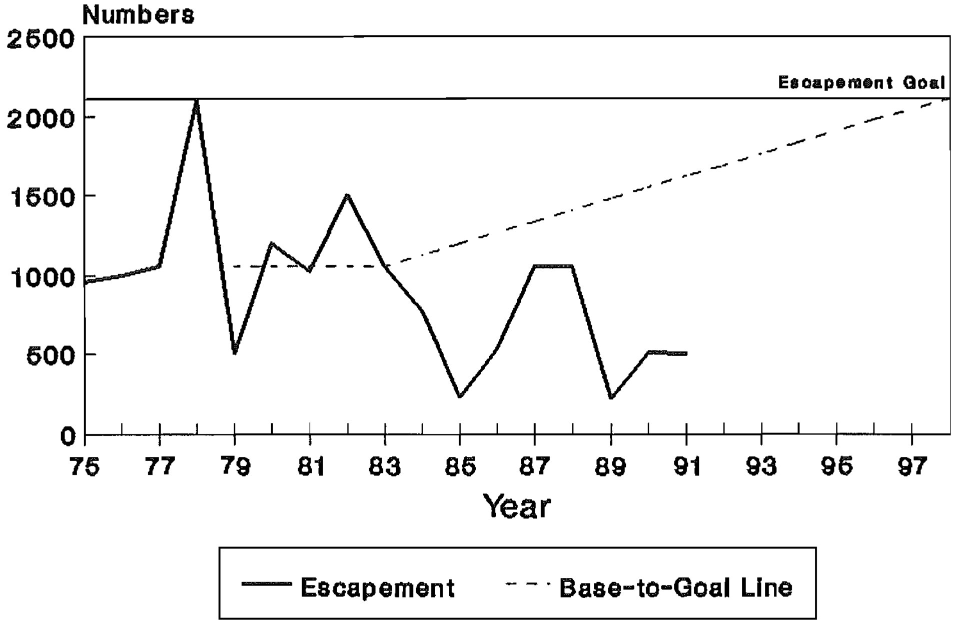
Area 8 Index Chinook Escapements
Probably Not Rebuilding



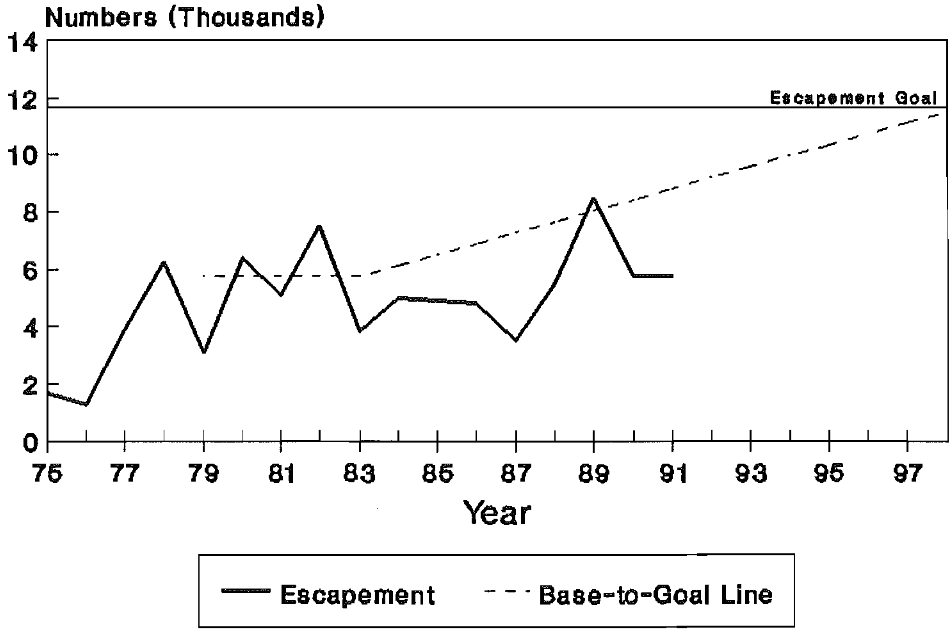
Rivers Inlet Chinook Escapements
Probably Rebuilding



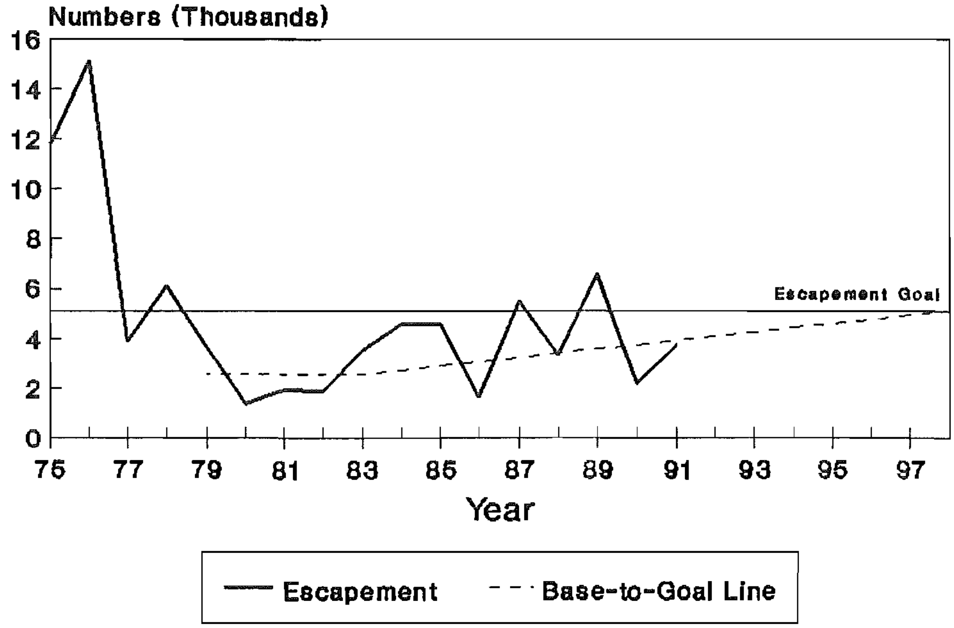
Smith Inlet Chinook Escapements
Probably Not Rebuilding



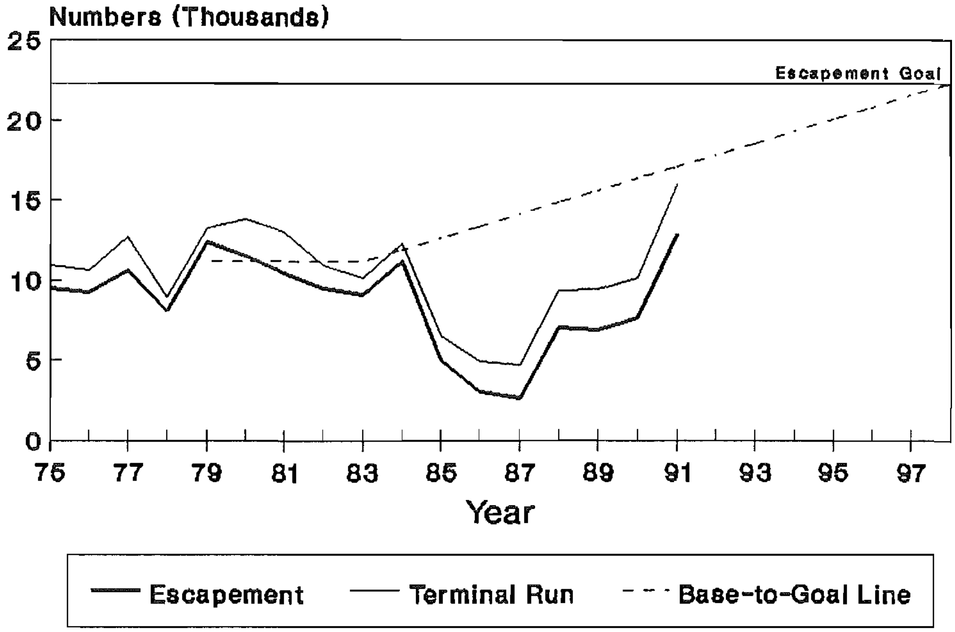
WCVI Chinook Escapements
Probably Not Rebuilding



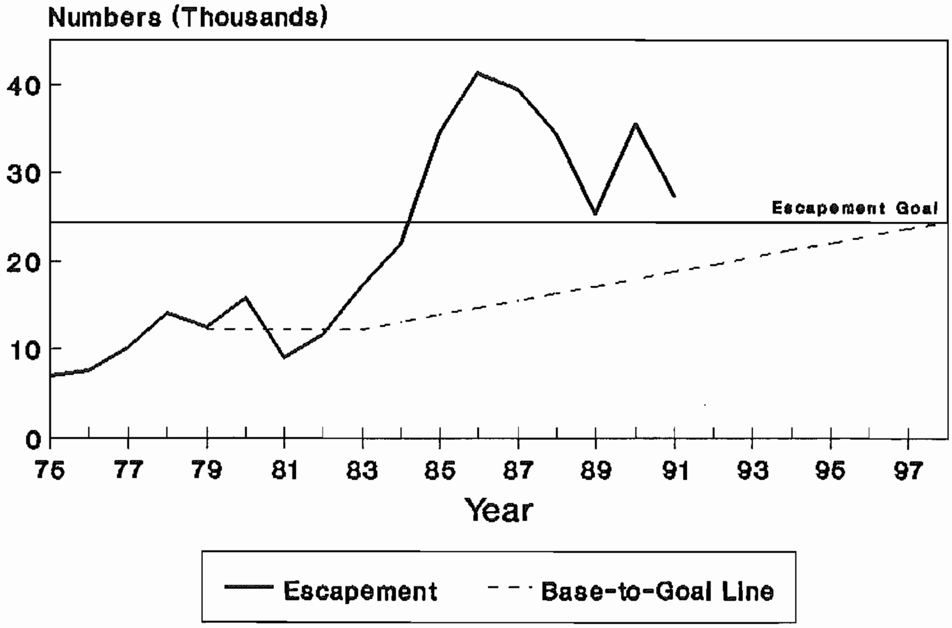
Upper Georgia Str. Chinook Escapements
Indeterminate



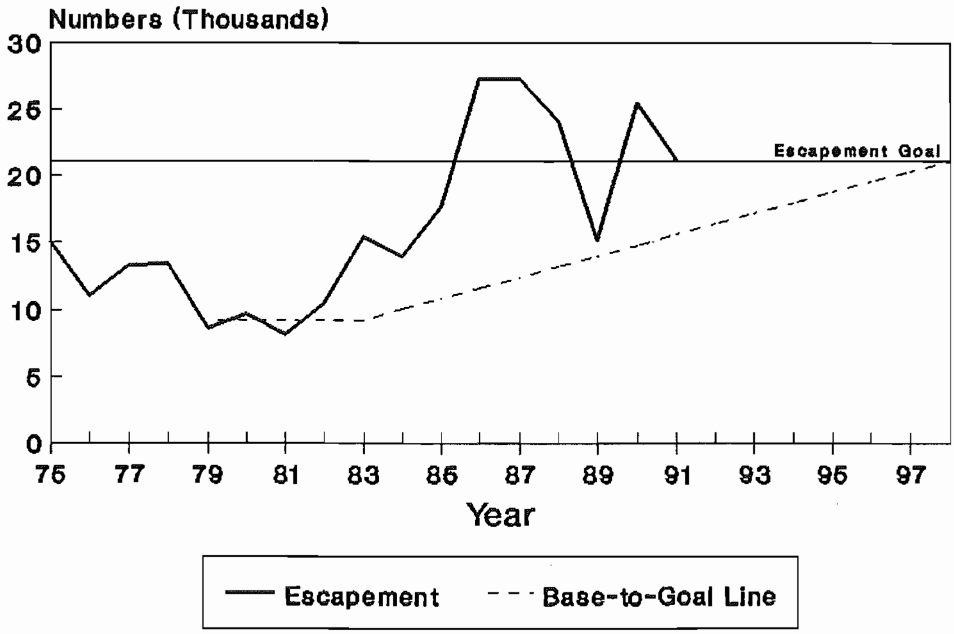
Lower Georgia Str. Chinook Escapements
Probably Not Rebuilding



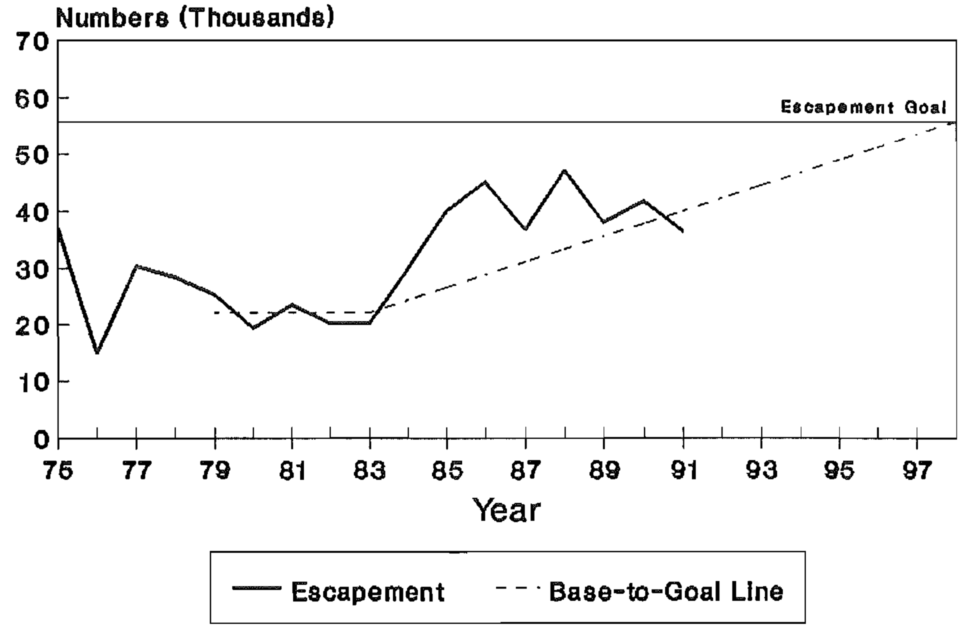
Upper Fraser R. Chinook Escapements
Above Goal



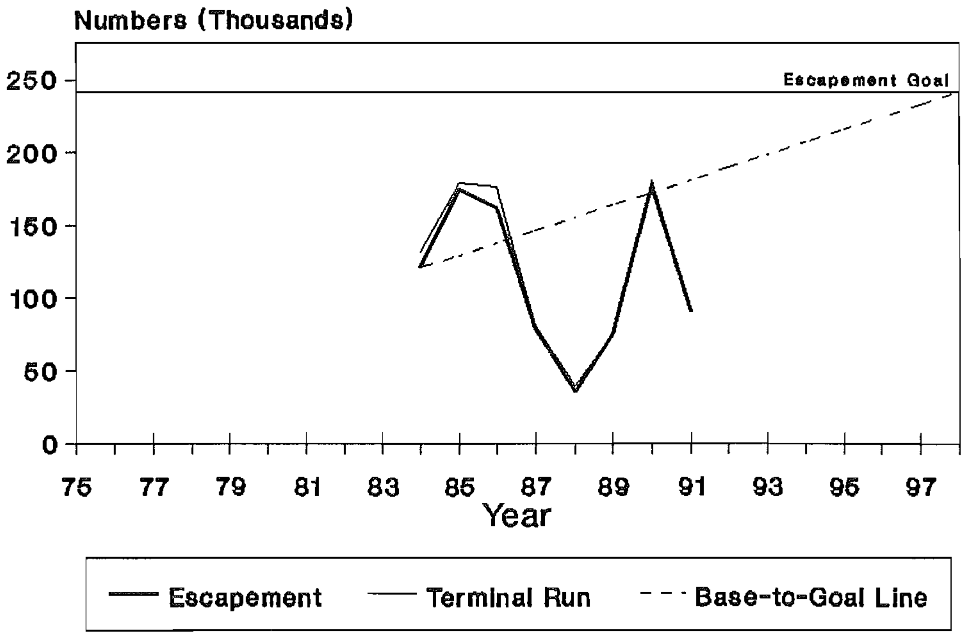
Middle Fraser R. Chinook Escapements
Above Goal



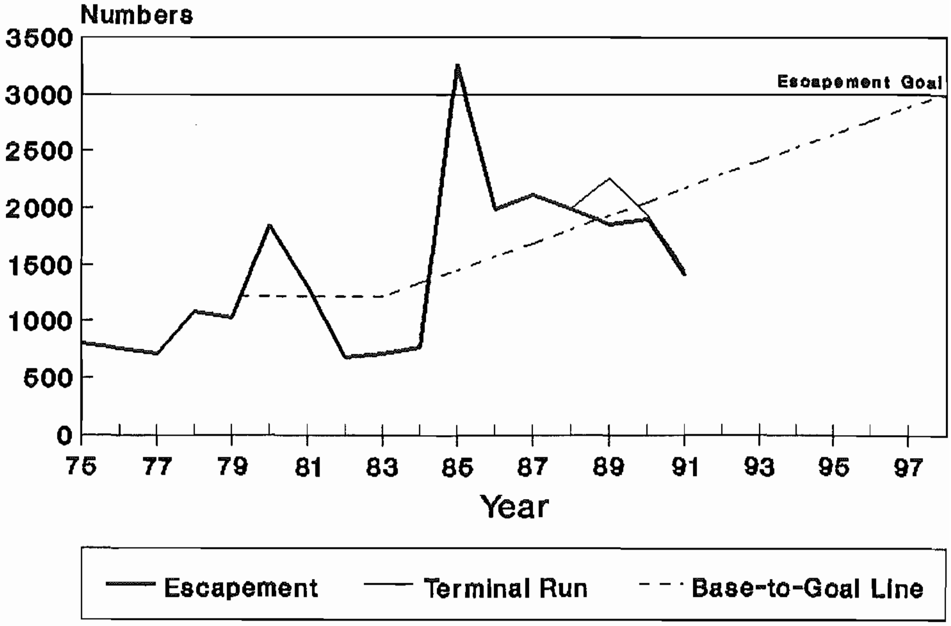
Thompson R. Chinook Escapements
Indeterminate



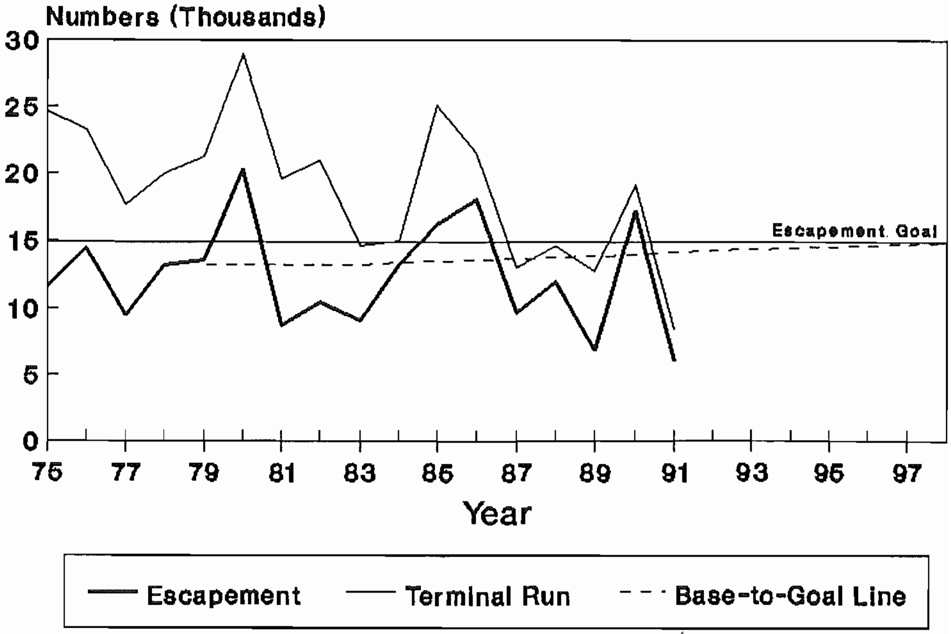
Harrison R. Chinook Escapements
Probably Not Rebuilding



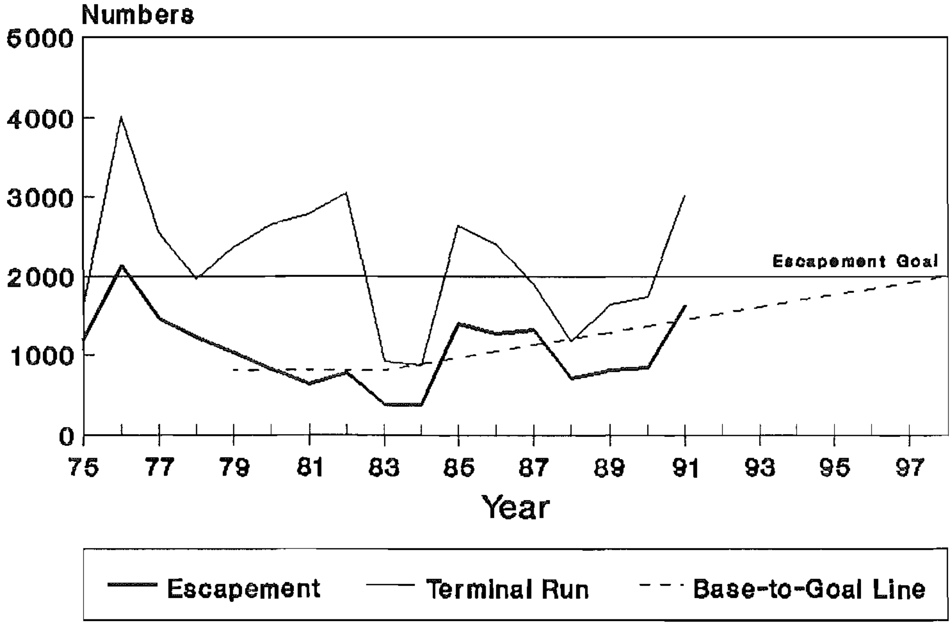
Skagit Spring Chinook Escapements
Probably Not Rebuilding



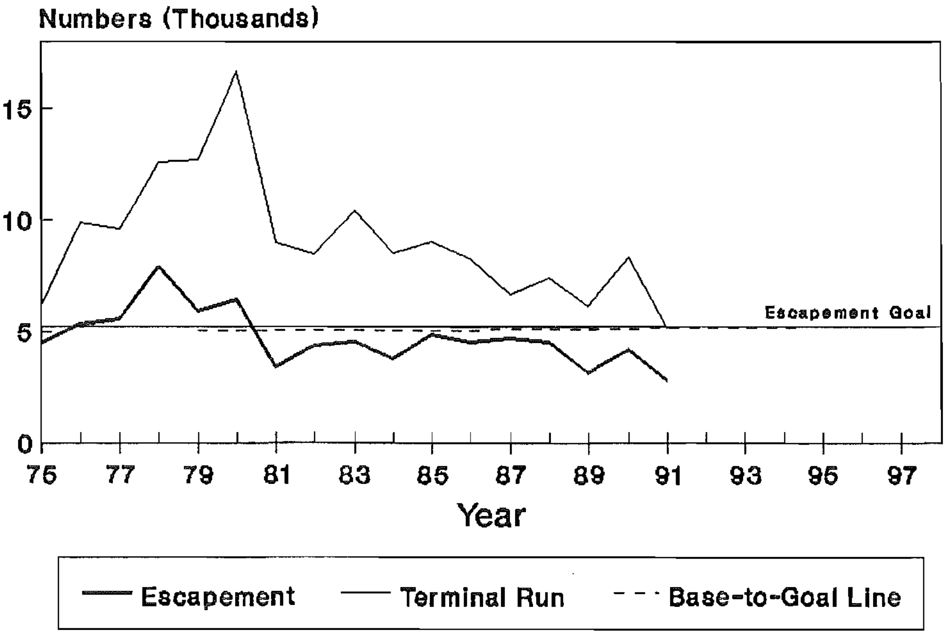
Skagit Sum./Fall Chinook Escapements
Indeterminate



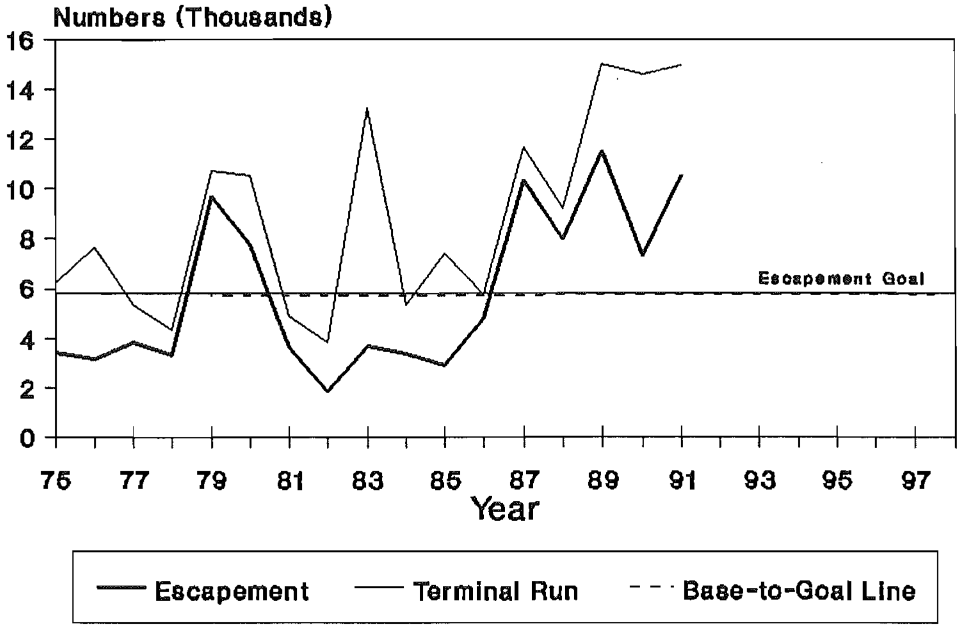
Stillaguamish River Chinook Escapements
Indeterminate



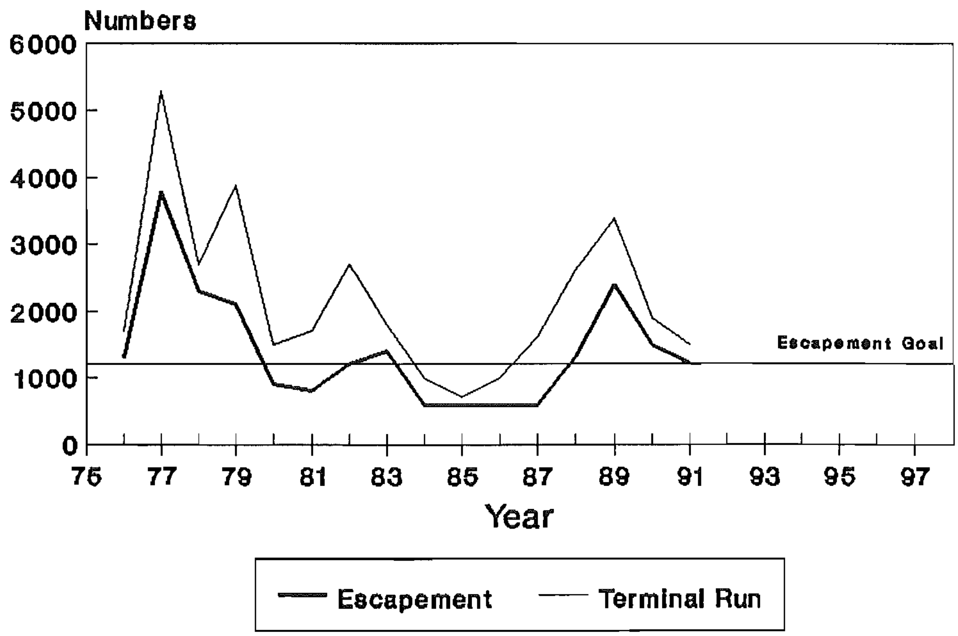
Snohomish River Chinook Escapements
Not Rebuilding



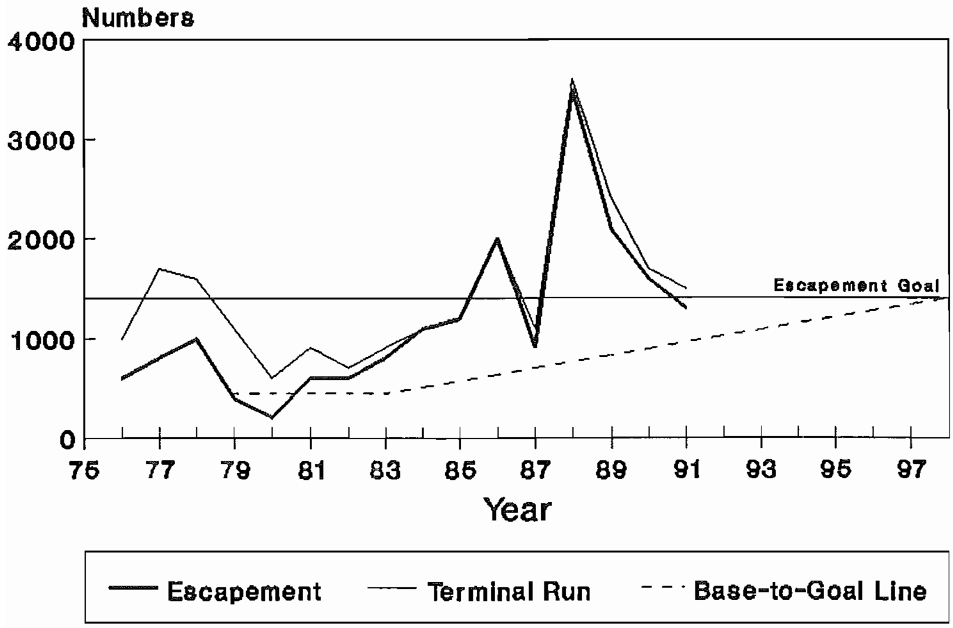
Green River Chinook Escapements
Above Goal



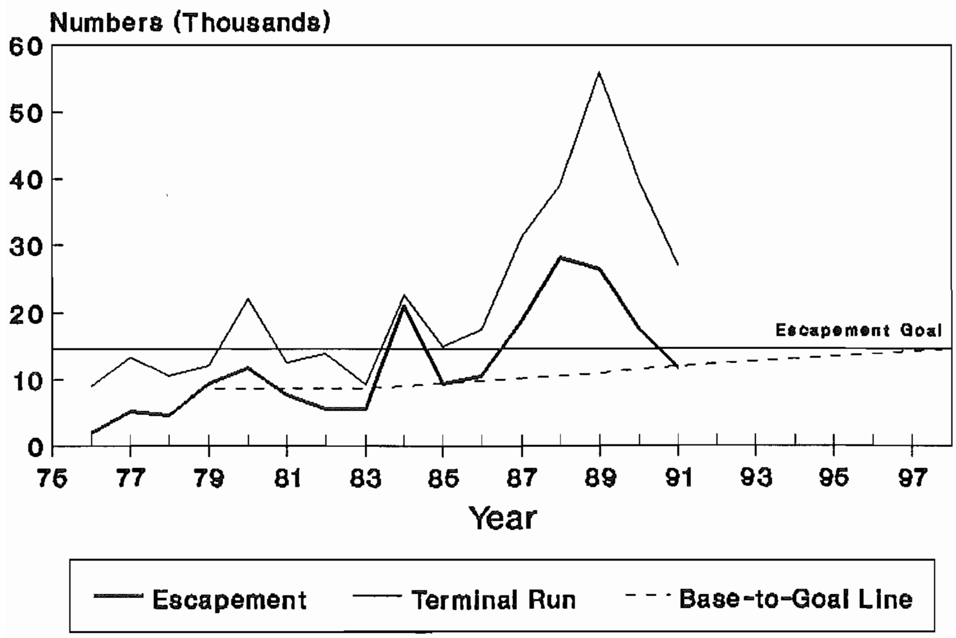
Quillayute Summer Chinook Escapements
Above Goal

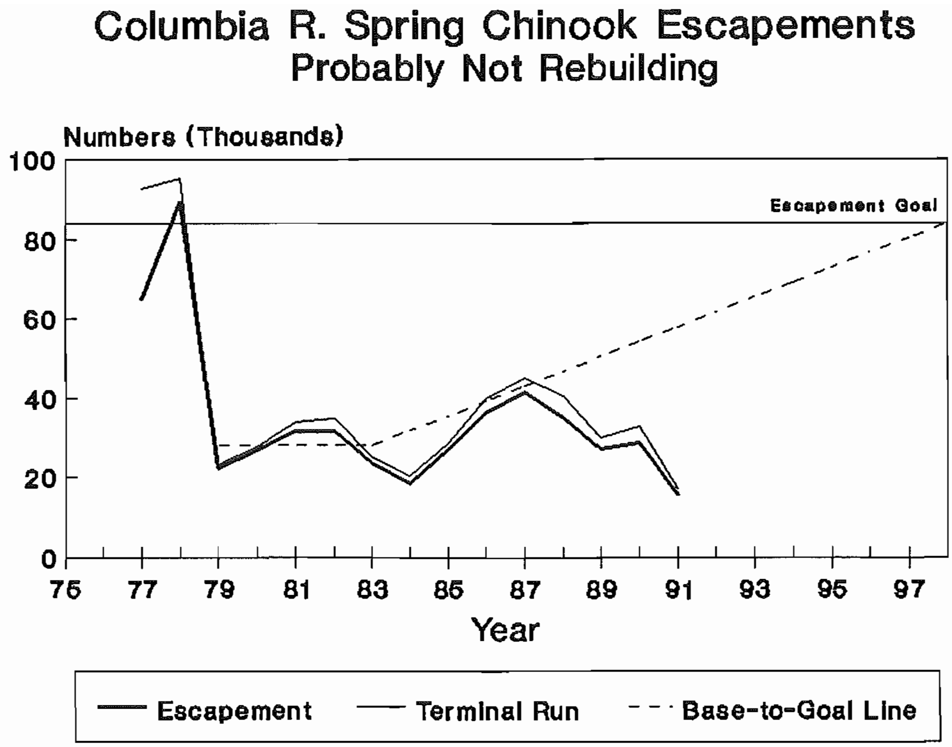


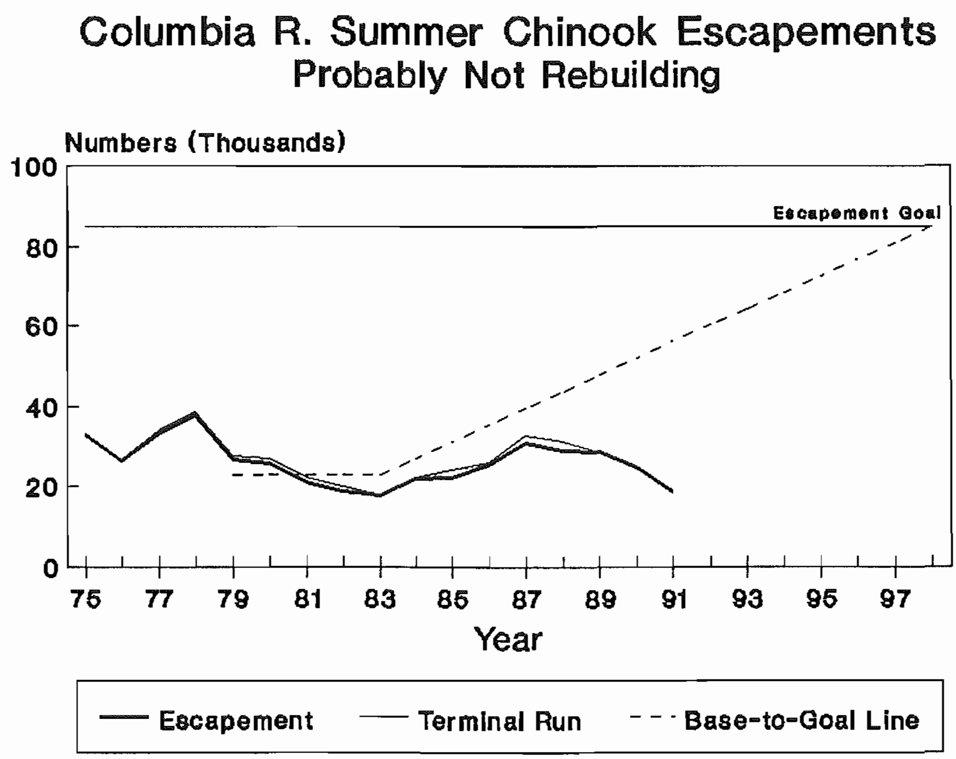
Grays Harbor Spring Chinook Escapement
Probably Rebuilding



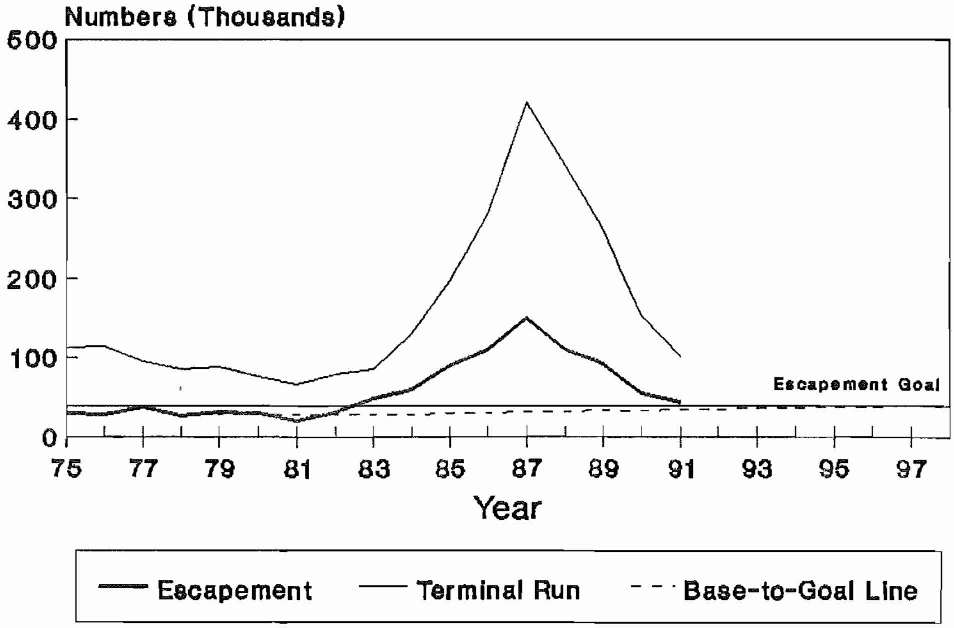
Grays Harbor Fall Chinook Escapements
Above Goal



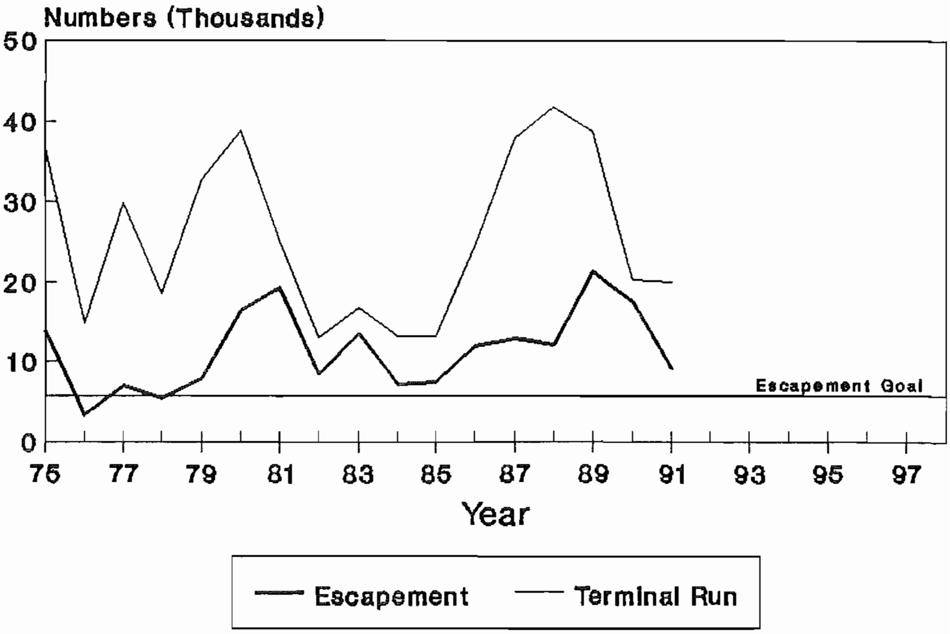

Columbia R. Spring Chinook Escapements
Probably Not Rebuilding
Numbers (Thousands)
100
80
60
40
20
0
Escapement Goal
75
77
79
81
83
85
87
89
91
93
95
97
Year
Escapement
Terminal Run
Base-to-Goal Line


Columbia R. Summer Chinook Escapements
Probably Not Rebuilding
Numbers (Thousands)
100
80
60
40
20
0
Escapement Goal
75
77
79
81
83
85
87
89
91
93
95
97
Year
Escapement
Terminal Run
Base-to-Goal Line

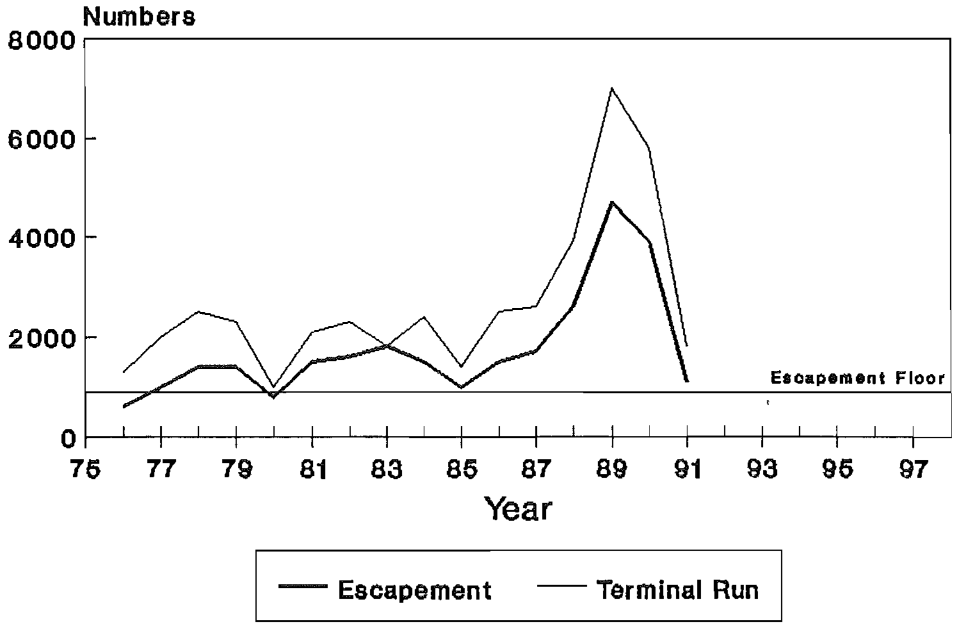
Columbia R. Bright Chinook Escapements Above Goal



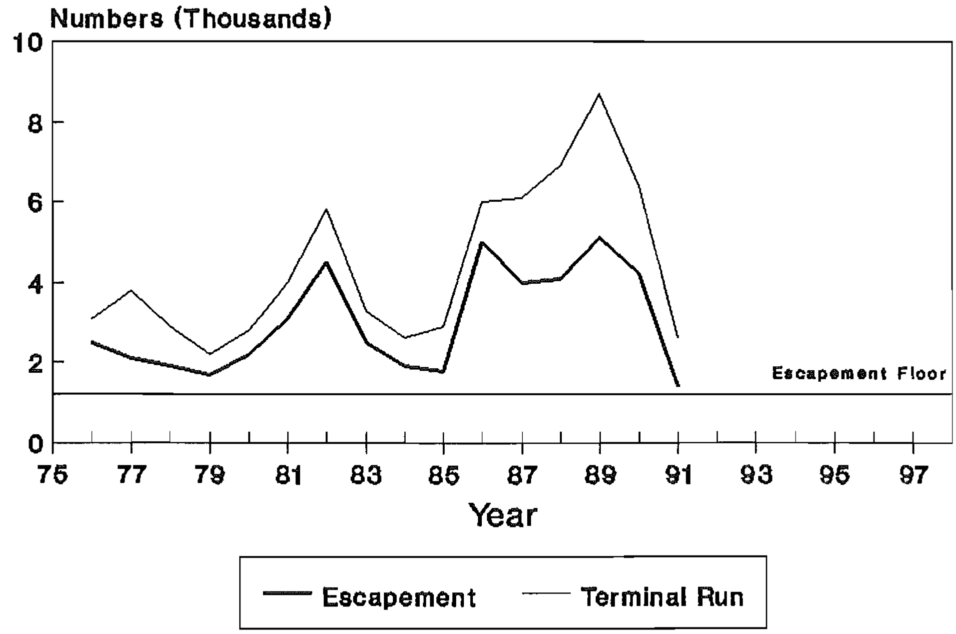
Lewis R. Fall Chinook Escapements Above Goal



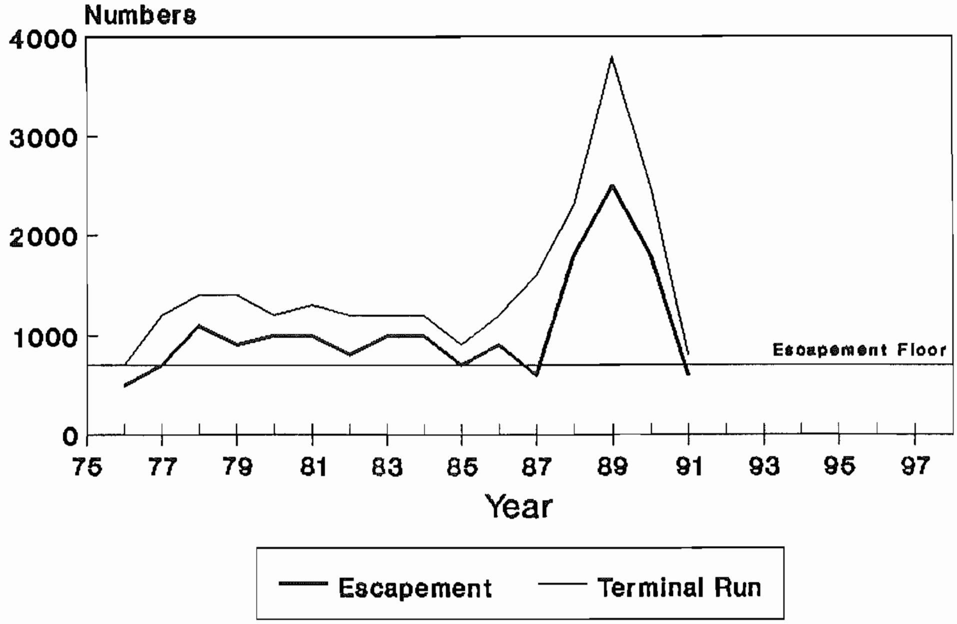
Hoh Spr/Sum Chinook Escapements
Increasing



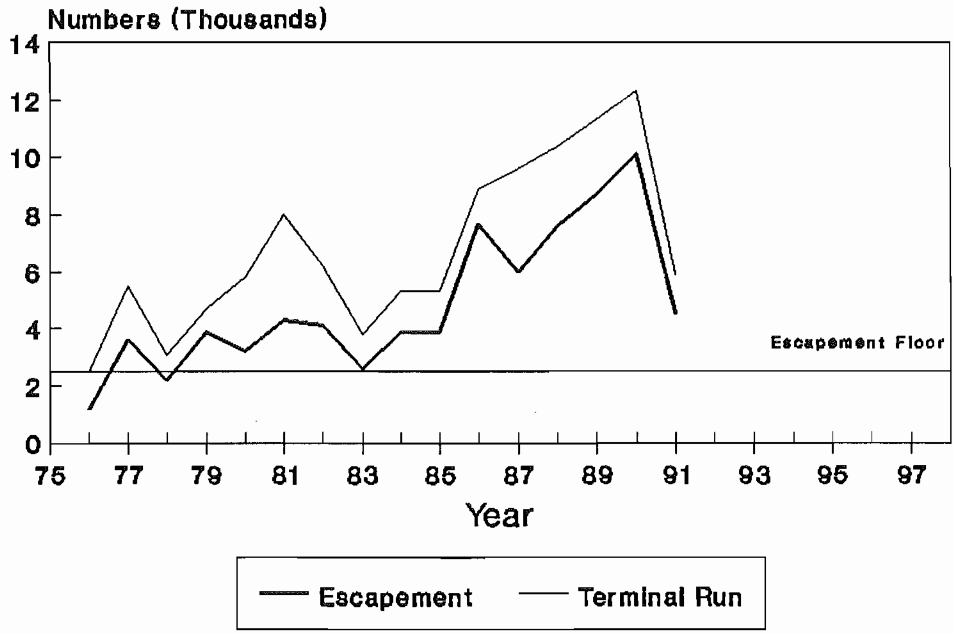
Hoh Fall Chinook Escapements
Increasing

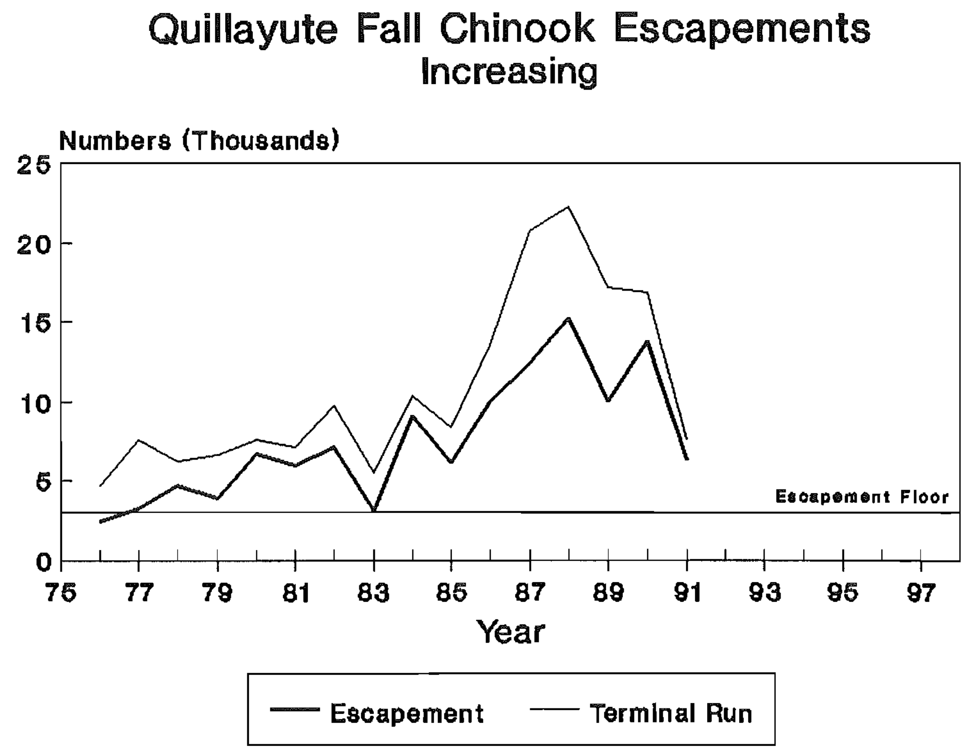


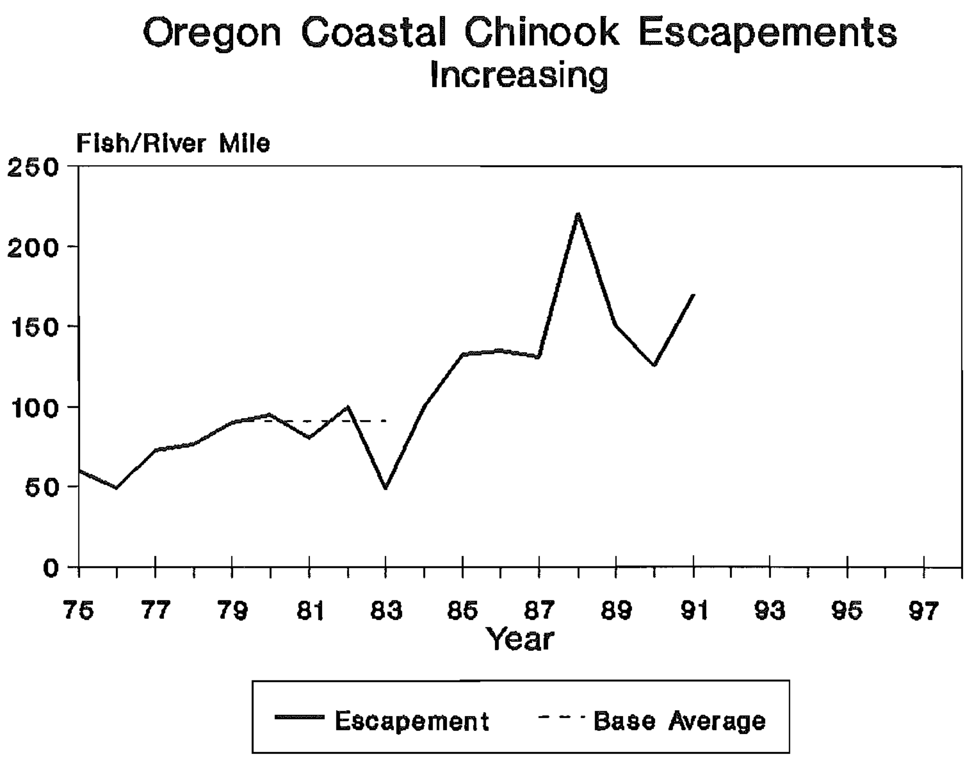
Queets Spr/Sum Chinook Escapements Increasing



Queets Fall Chinook Escapements Increasing




Quillayute Fall Chinook Escapements
Increasing
Numbers (Thousands)
25
20
15
10
5
0
Escapement Floor
75
77
79
81
83
85
87
89
91
93
95
97
Year
Escapement
Terminal Run


Oregon Coastal Chinook Escapements
Increasing
Fish/River Mile
250
200
150
100
50
0
75
77
79
81
83
85
87
89
91
93
95
97
Year
Escapement
Base Average

APPENDIX C

Estimates and Sources of Chinook Nonretention Mortality

Sources and estimates of legal and sublegal encounters in the SEAK troll fishery during chinook nonretention fisheries.

Year	Legal CNR Encounters	Sublegal CNR Encounters	Source
1981	18,225	18,578	a/
1982	89,100	90,827	a/
1983	74,925	76,378	a/
1984	87,075	88,763	a/
1985	118,191	131,011	b/
1986	78,763	104,820	c/
1987	191,956	171,156	d/
1988	60,900	91,200	e/
1989	150,600	162,900	f/
1990	121,258	143,330	g/
1991	184,901	218,558	g/

a/ Alaska Dept. Fish and Game and National Marine Fisheries Service. 1987. Associated fishing induced mortalities of chinook salmon in southeast Alaska. Alaska Dept. Fish Game, unpublished report.

b/ Davis, A., J. Kelley, and M. Seibel. 1986. Observations on chinook salmon hook and release in the 1985 southeast Alaska troll fishery. Alaska Dept. Fish Game, unpublished report.

c/ Davis, A., J. Kelley, and M. Seibel. 1987. Observations on chinook salmon hook and release in the 1986 southeast Alaska troll fishery. Alaska Dept. Fish Game, unpublished report.

d/ Seibel, M., A. Davis, J. Kelley, and J.E. Clark. 1988. Observations on chinook salmon hook and release in the 1987 southeast Alaska troll fishery. Alaska Dept. Fish Game, unpublished report.

e/ Seibel, M., A. Davis, J. Kelley, and J.E. Clark. 1989. Observations on chinook salmon hook and release in the 1988 southeast Alaska troll fishery. Alaska Dept. Fish Game, unpublished report.

f/ Data collected from a limited survey of the chinook nonretention fishery in 1989 indicated that encounter rates were similar to those which had occurred in previous years. For this reason, the number of encounters was estimated by multiplying the 1985-1988 average CNR encounters per gear day times the gear days for 1989. (Spreadsheet CNR90.WQ1, J. Carlile ADFG, 2/2/91)

g/ The number of encounters during the CNR fishery in 1990 were estimated from a regression with a predictor variable of the product of the encounter rate during the retneiotn period and the number of gear days during the CNR fishing period.

Sources and estimates of legal and sublegal encounters in the SEAK net fishery during chinook nonretention fisheries.

Year	Legal CNR Encounters	Sublegal CNR Encounters	Source
1985	12,352	60,506	a/
1986	13,773	26,850	b/
1987	4,497	13,923	c/
1988	9,429	31,184	d/
1989	10,096	33,392	d/
1990	11,760	38,640	d/
1991	13,860	45,450	d/

a/ Van Alen, B.W. and M. Seibel. 1986. Observations on chinook salmon non-retention in the 1985 Southeast Alaska purse seine fishery. In, 1985 salmon research conducted in Southeast Alaska by the Alaska Department of Fish and Game in conjunction with the National Marine Fisheries Service Auke Bay Laboratory for joint U.S./Canada interception studies. Final Report Contract No./ 85-ABC-00142. Juneau, Alaska.

b/ Van Alen, B.W. and M. Seibel. 1987. Observations on chinook salmon non-retention in the 1986 Southeast Alaska purse seine fishery. In, 1986 salmon research conducted in Southeast Alaska by the Alaska Department of Fish and Game in conjunction with the National Marine Fisheries Service Auke Bay Laboratory for joint U.S./Canada interception studies. Final Report. Contract No. NA-87-ABH-00025. Juneau, Alaska.

c/ Rowse, M.L. and S. Marshall. 1988. Estimates of catch and mortality of chinook salmon in the 1987 southeast Alaska purse seine fishery. Alaska Department of Fish and Game, Regional Information Report 1J88-18.

d/ Computed by multiplying 1985-1987 average ratio of legal (or sublegal) encounters by the reported catch.

Number of days (or gear days) of chinook retention, chinook nonretention fishery, and source of information for the NBC troll fishery.

Year	Chinook Retention	Chinook Nonretention	Source
1987	60	9	a/
1988	43	17	b/
1989	66	9	c/
1990	18,964	6,431	d/
1991	26,754	3,042	d/

a/ Chinook Technical Committee. 1987. Chinook Technical Committee report to the November, 1987 meeting of the Pacific Salmon Commission. Pacific Salmon Commission, TCCHINOOK (87)-5.

b/ Chinook Technical Committee. 1988. Preliminary review of 1988 fisheries. Pacific Salmon Commission, TCCHINOOK (88)-3.

c/ Chinook Technical Committee. 1990. 1989 annual report. Pacific Salmon Commission, TCCHINOOK (90)-3.

d/ Computed by multiplying the number of days during the chinook retention fishery by the ratio of the number of boat days during the nonretention fishery to the number of boat days during the chinook retention fishery.

Number of days or gear days of chinook retention, chinook nonretention fishery, and source of information for the CBC troll fishery.

Year	Chinook Retention	Chinook Nonretention	Source
1987	60	9	a/
1988	43	17	b/
1989	66	9	c/
1990	6,032	1,591	d/
1991	4,891	641	d/

a/ Chinook Technical Committee. 1987. Chinook Technical Committee report to the November, 1987 meeting of the Pacific Salmon Commission. Pacific Salmon Commission, TCCHINOOK (87)-5.

b/ Chinook Technical Committee. 1988. Preliminary review of 1988 fisheries. Pacific Salmon Commission, TCCHINOOK (88)-3.

c/ Chinook Technical Committee. 1990. 1989 annual report. Pacific Salmon Commission, TCCHINOOK (90)-3.

d/ Computed by multiplying the number of days during the chinook retention fishery by the ratio of the number of boat days during the nonretention fishery to the number of boat days during the chinook retention fishery.

Number of days of chinook retention, chinook nonretention fishery, and source of information for the WCVI troll fishery.

Year	Chinook Retention	Chinook Nonretention	Source
1985	105	5	a/
1987	47	7	b/
1988	55	15	c/

a/ Anonymous. 1986. 1985 Canadian agency report on chinook salmon. Canadian Department of Fisheries and Oceans, unpublished report.

b/ Chinook Technical Committee. 1987. Chinook Technical Committee report to the November, 1987 meeting of the Pacific Salmon Commission. Pacific Salmon Commission, TCCHINOOK (87)-5.

c/ Chinook Technical Committee. 1988. Preliminary review of 1988 fisheries. Pacific Salmon Commission, TCCHINOOK (88)-3.

Sources and estimates of CNR parameters for the GS troll fishery.

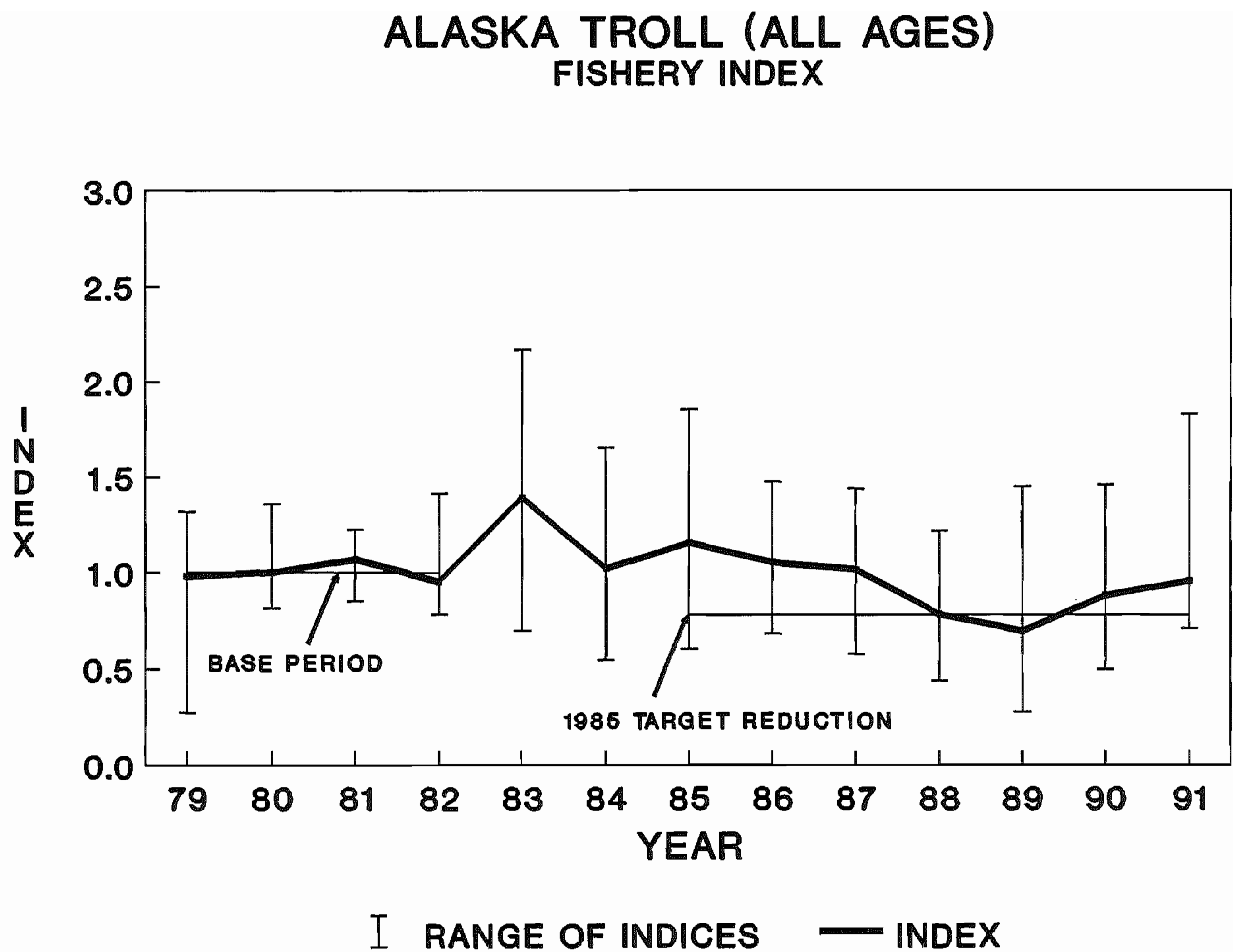
Year	Legal CNR	Sublegal CNR	Source
1985	12,412	12,184	a/
1986	5,151	17,834	a/
1991	4,589	1,867	b/

a/ Anonymous. 1986. Data Report on Unaccounted for Sources of Fishing Associated Mortalities of Chinook Salmon in B.C. Fisheries (1977-1986). Canadian Department of Fisheries and Oceans, unpublished report. 47p. Data reported is number of encounters.

b/ Computed by multiplying the number of days during the chinook retention fishery by the ratio of the number of boat days during the nonretention fishery to the number of boat days during the chinook retention fishery.

APPENDIX D

Detailed Exploitation Rate and Fishery Index Data and Graphs


ALASKA TROLL (ALL AGES)
FISHERY INDEX
3.0
2.5
2.0
1.5
1.0
0.5
0.0
INDEX
BASE PERIOD
1985 TARGET REDUCTION
79
80
81
82
83
84
85
86
87
88
89
90
91
YEAR
RANGE OF INDICES
INDEX

Fishery: Southeast Alaska Troll (All Ages)

TOTAL MORTALITY EXPLOITATION RATES

Year	AKS Age 4	QUI Age 3	QUI Age 4	QUI Age 5	RBT Age 3	RBT Age 4	RBT Age 5	SRH Age 3	SRH Age 4	SRH Age 5	URB Age 3	URB Age 4	URB Age 5	WSH Age 4
79	NA	0.015	0.025	0.090	0.056	0.253	0.492	NA	NA	NA	0.013	0.148	NA	NA
80	NA	0.013	0.107	0.058	0.075	0.272	0.342	0.040	NA	NA	0.045	0.136	0.251	0.138
81	NA	0.013	0.100	0.107	0.080	0.339	0.364	0.042	0.128	NA	NA	0.188	0.235	0.087
82	0.137	0.022	0.127	0.149	0.069	0.270	0.292	0.012	0.120	0.144	0.025	0.141	0.205	0.080
83	0.203	0.023	0.195	0.202	0.072	0.307	0.454	0.027	0.051	0.421	0.019	0.217	NA	0.109
84	0.107	0.012	0.108	0.201	0.116	0.309	0.249	NA	0.063	0.115	0.023	0.200	0.331	0.055
85	0.091	0.029	0.161	0.239	0.115	0.147	0.351	0.019	NA	0.266	0.017	0.157	0.257	0.185
86	0.192	0.023	0.094	0.149	NA	0.335	NA	0.021	0.142	NA	0.014	0.112	0.175	NA
87	0.085	0.021	0.130	0.145	0.040	NA	NA	0.028	0.050	0.207	0.028	0.134	0.242	0.133
88	0.106	0.016	0.110	0.087	0.013	0.162	NA	NA	0.067	0.255	0.022	0.067	0.193	0.057
89	0.091	0.019	0.115	0.153	0.026	0.170	0.207	0.016	0.033	0.209	NA	0.042	0.172	0.040
90	0.200	0.017	0.154	0.111	0.066	0.201	0.295	0.026	0.060	0.163	NA	0.131	0.114	0.094
91	0.152	0.015	0.071	0.135	0.062	0.254	0.293	0.073	0.100	0.263	NA	NA	0.163	0.043
Base	0.137	0.016	0.090	0.101	0.070	0.284	0.373	0.031	0.124	0.144	0.028	0.153	0.230	0.102

TOTAL MORTALITY EXPLOITATION RATE INDEX

Year	AKS Age 4	QUI Age 3	QUI Age 4	QUI Age 5	RBT Age 3	RBT Age 4	RBT Age 5	SRH Age 3	SRH Age 4	SRH Age 5	URB Age 3	URB Age 4	URB Age 5	WSH Age 4	Fishery
79	NA	0.964	0.275	0.891	0.797	0.894	1.321	NA	NA	NA	0.477	0.967	NA	NA	0.981
80	NA	0.815	1.192	0.579	1.072	0.960	0.919	1.280	NA	NA	1.615	0.888	1.090	1.360	1.001
81	NA	0.837	1.117	1.056	1.145	1.195	0.976	1.343	1.034	NA	NA	1.227	1.019	0.851	1.069
82	1.000	1.385	1.417	1.473	0.985	0.952	0.784	0.377	0.966	1.000	0.908	0.918	0.891	0.789	0.952
83	1.481	1.473	2.168	2.001	1.033	1.081	1.217	0.875	0.413	2.929	0.696	1.416	NA	1.074	1.393
84	0.778	0.753	1.202	1.989	1.657	1.091	0.669	NA	0.505	0.798	0.846	1.300	1.437	0.545	1.020
85	0.661	1.853	1.791	2.364	1.648	0.517	0.942	0.617	NA	1.851	0.603	1.021	1.114	1.817	1.156
86	1.401	1.475	1.052	1.479	NA	1.180	NA	0.681	1.143	NA	0.499	0.729	0.758	NA	1.053
87	0.622	1.331	1.442	1.432	0.575	NA	NA	0.905	0.400	1.441	1.017	0.874	1.052	1.308	1.014
88	0.777	1.040	1.219	0.866	0.182	0.572	NA	NA	0.540	1.770	0.811	0.439	0.836	0.563	0.782
89	0.663	1.182	1.274	1.519	0.365	0.600	0.554	0.509	0.264	1.451	NA	0.276	0.747	0.391	0.696
90	1.461	1.054	1.710	1.096	0.946	0.709	0.792	0.827	0.479	1.130	NA	0.853	0.496	0.928	0.879
91	1.112	0.958	0.789	1.333	0.894	0.897	0.786	2.317	0.809	1.829	NA	NA	0.709	0.422	0.955

Stock Identifiers

AKS = ALASKA SPRING
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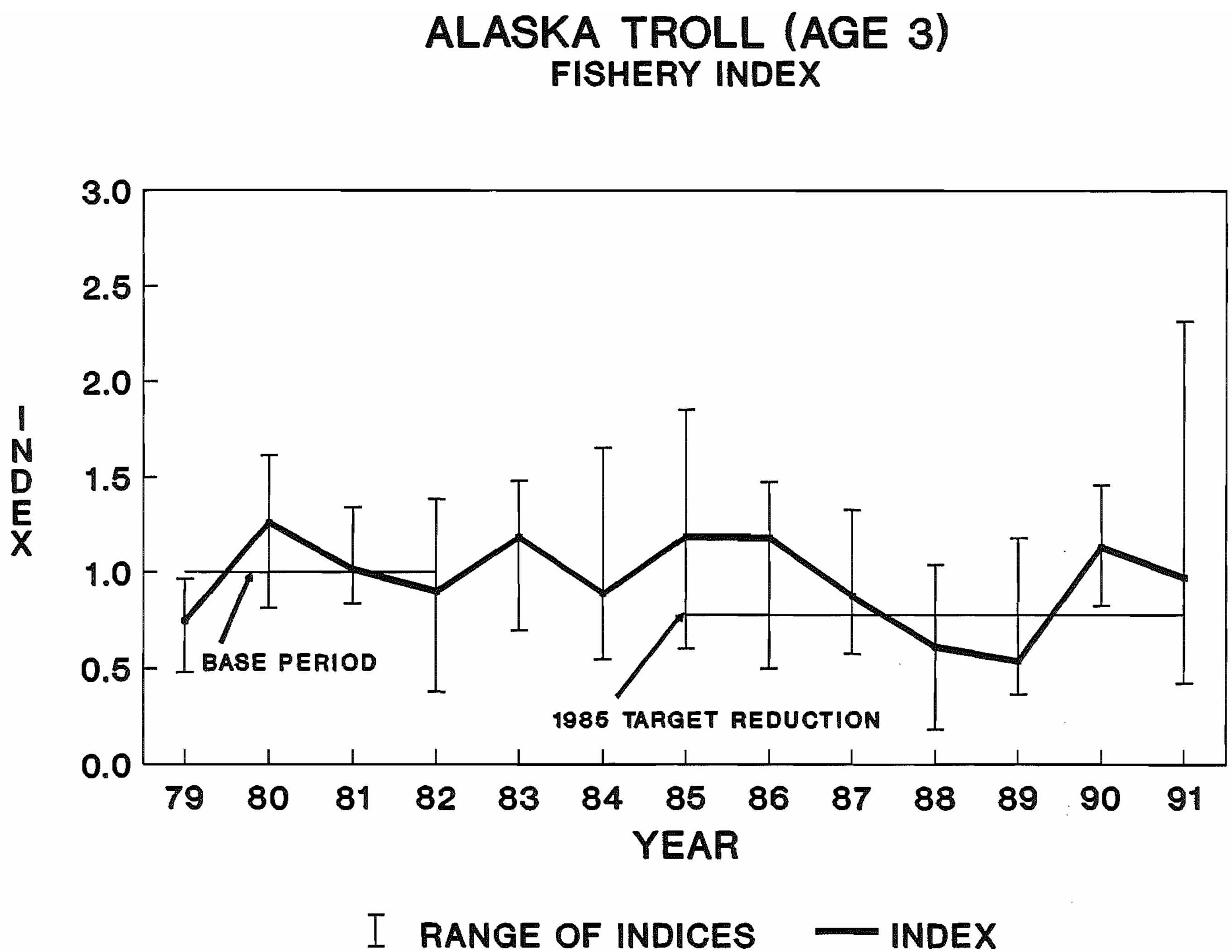
SRH = SALMON RIVER
URB = COLUMBIA RIVER UPRIVER BRIGHT
WSH = WILLAMETTE SPRING


ALASKA TROLL (AGE 3)
FISHERY INDEX
3.0
2.5
2.0
1.5
1.0
0.5
0.0
INDEX
BASE PERIOD
1985 TARGET REDUCTION
79
80
81
82
83
84
85
86
87
88
89
90
91
YEAR
RANGE OF INDICES
INDEX

Fishery: Southeast Alaska Troll (Age 3)

TOTAL MORTALITY EXPLOITATION RATES

Year	AKS Age 4	QUI Age 3	RBT Age 3	SRH Age 3	URB Age 3	WSH Age 4
79	NA	0.015	0.056	NA	0.013	NA
80	NA	0.013	0.075	0.040	0.045	0.138
81	NA	0.013	0.080	0.042	NA	0.087
82	0.137	0.022	0.069	0.012	0.025	0.080
83	0.203	0.023	0.072	0.027	0.019	0.109
84	0.107	0.012	0.116	NA	0.023	0.055
85	0.091	0.029	0.115	0.019	0.017	0.185
86	0.192	0.023	NA	0.021	0.014	NA
87	0.085	0.021	0.040	0.028	0.028	0.133
88	0.106	0.016	0.013	NA	0.022	0.057
89	0.091	0.019	0.026	0.016	NA	0.040
90	0.200	0.017	0.066	0.026	NA	0.094
91	0.152	0.015	0.062	0.073	NA	0.043
Base	0.137	0.016	0.070	0.031	0.028	0.102

TOTAL MORTALITY EXPLOITATION RATE INDEX

Year	AKS Age 4	QUI Age 3	RBT Age 3	SRH Age 3	URB Age 3	WSH Age 4	Fishery
79	NA	0.964	0.797	NA	0.477	NA	0.742
80	NA	0.815	1.072	1.280	1.615	1.360	1.262
81	NA	0.837	1.145	1.343	NA	0.851	1.015
82	1.000	1.385	0.985	0.377	0.908	0.789	0.899
83	1.481	1.473	1.033	0.875	0.696	1.074	1.185
84	0.778	0.753	1.657	NA	0.846	0.545	0.889
85	0.661	1.853	1.648	0.617	0.603	1.817	1.189
86	1.401	1.475	NA	0.681	0.499	NA	1.182
87	0.622	1.331	0.575	0.905	1.017	1.308	0.876
88	0.777	1.040	0.182	NA	0.811	0.563	0.611
89	0.663	1.182	0.365	0.509	NA	0.391	0.536
90	1.461	1.054	0.946	0.827	NA	0.928	1.133
91	1.112	0.958	0.894	2.317	NA	0.422	0.972

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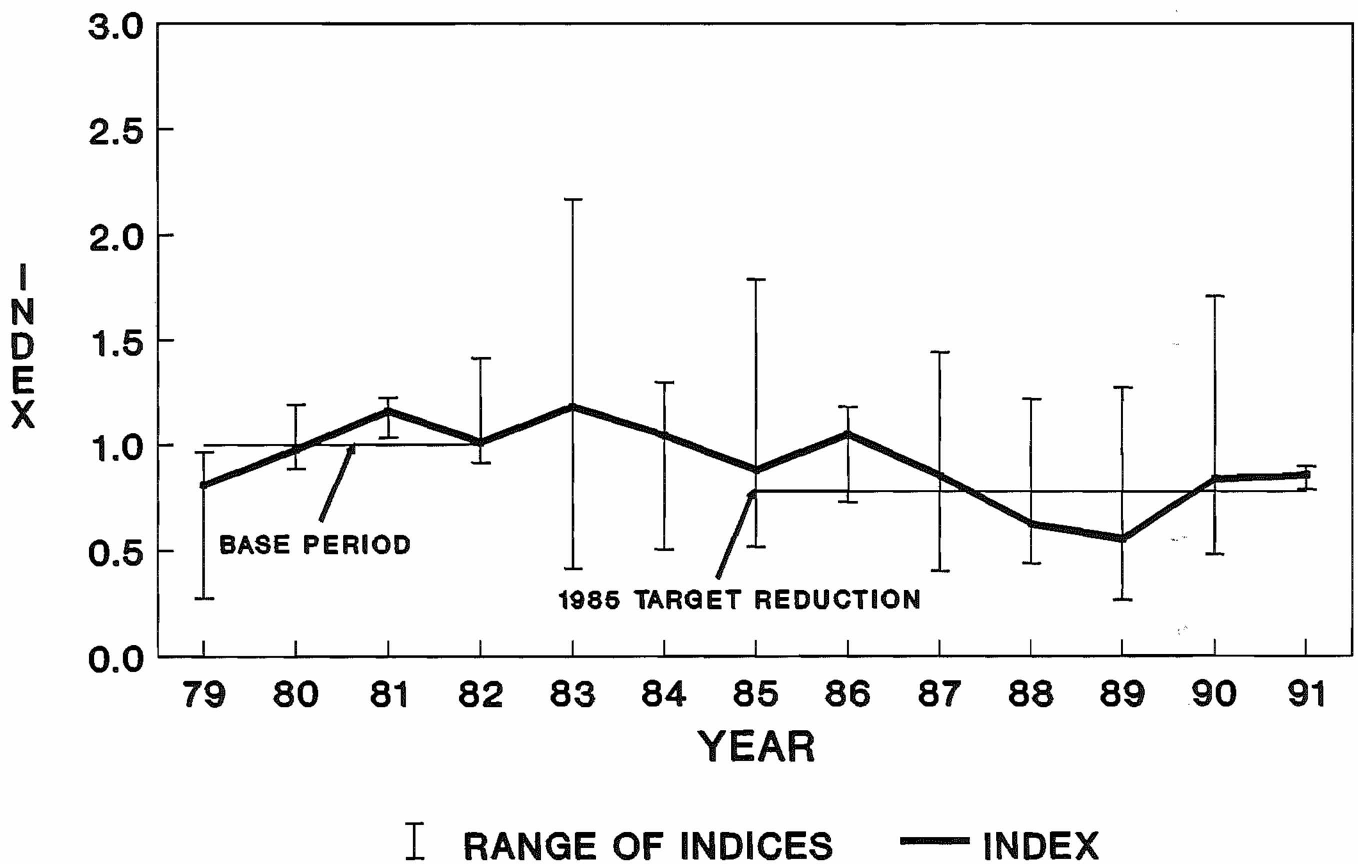
WSH = WILLAMETTE SPRING

ALASKA TROLL (AGE 4)
FISHERY INDEX



Fishery: Southeast Alaska Troll (Age 4)

TOTAL MORTALITY EXPLOITATION RATES				
	QUI	RBT	SRH	URB
Year	Age 4	Age 4	Age 4	Age 4
79	0.025	0.253	NA	0.148
80	0.107	0.272	NA	0.136
81	0.100	0.339	0.128	0.188
82	0.127	0.270	0.120	0.141
83	0.195	0.307	0.051	0.217
84	0.108	0.309	0.063	0.200
85	0.161	0.147	NA	0.157
86	0.094	0.335	0.142	0.112
87	0.130	NA	0.050	0.134
88	0.110	0.162	0.067	0.067
89	0.115	0.170	0.033	0.042
90	0.154	0.201	0.060	0.131
91	0.071	0.254	0.100	NA
Base	-0.090	0.284	0.124	0.153

TOTAL MORTALITY EXPLOITATION RATE INDEX					
	QUI	RBT	SRH	URB	
Year	Age 4	Age 4	Age 4	Age 4	Fishery
79	0.275	0.894	NA	0.967	0.809
80	1.192	0.960	NA	0.888	0.979
81	1.117	1.195	1.034	1.227	1.161
82	1.417	0.952	0.966	0.918	1.011
83	2.168	1.081	0.413	1.416	1.183
84	1.202	1.091	0.505	1.300	1.044
85	1.791	0.517	NA	1.021	0.881
86	1.052	1.180	1.143	0.729	1.049
87	1.442	NA	0.400	0.874	0.853
88	1.219	0.572	0.540	0.439	0.624
89	1.274	0.600	0.264	0.276	0.553
90	1.710	0.709	0.479	0.853	0.837
91	0.789	0.897	0.809	NA	0.855

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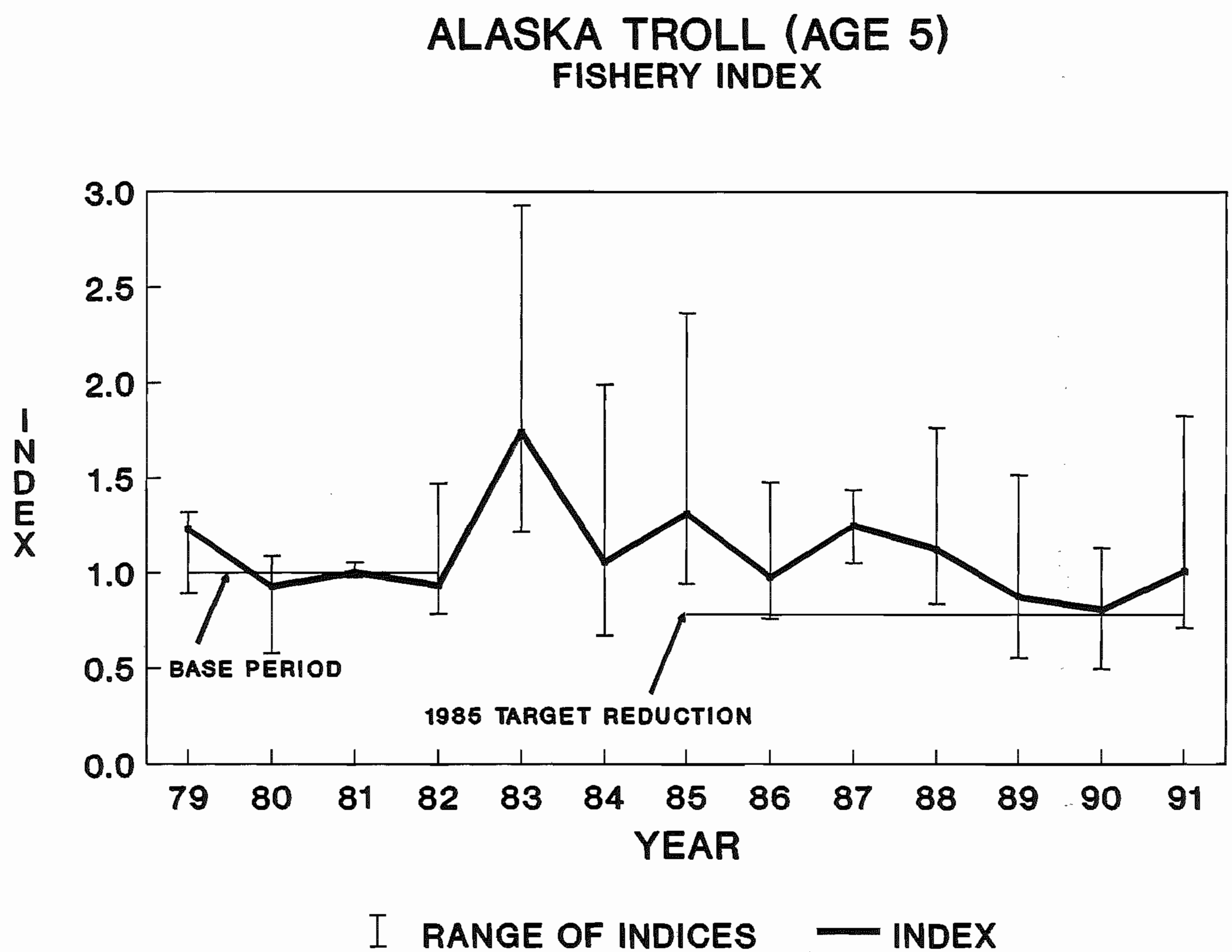
ALASKA TROLL (AGE 5)
FISHERY INDEX
3.0
2.5
2.0
1.5
1.0
0.5
0.0
INDEX
BASE PERIOD
1985 TARGET REDUCTION
79
80
81
82
83
84
85
86
87
88
89
90
91
YEAR
RANGE OF INDICES
INDEX

Fishery: Southeast Alaska Troll (Age 5)

TOTAL MORTALITY EXPLOITATION RATES

Year	QUI Age 5	RBT Age 5	SRH Age 5	URB Age 5
79	0.090	0.492	NA	NA
80	0.058	0.342	NA	0.251
81	0.107	0.364	NA	0.235
82	0.149	0.292	0.144	0.205
83	0.202	0.454	0.421	NA
84	0.201	0.249	0.115	0.331
85	0.239	0.351	0.266	0.257
86	0.149	NA	NA	0.175
87	0.145	NA	0.207	0.242
88	0.087	NA	0.255	0.193
89	0.153	0.207	0.209	0.172
90	0.111	0.295	0.163	0.114
91	0.135	0.293	0.263	0.163
Base	-0.101	0.373	0.144	0.230

TOTAL MORTALITY EXPLOITATION RATE INDEX

Year	QUI Age 5	RBT Age 5	SRH Age 5	URB Age 5	Fishery
79	0.891	1.321	NA	NA	1.230
80	0.579	0.919	NA	1.090	0.926
81	1.056	0.976	NA	1.019	1.001
82	1.473	0.784	1.000	0.891	0.932
83	2.001	1.217	2.929	NA	1.744
84	1.989	0.669	0.798	1.437	1.057
85	2.364	0.942	1.851	1.114	1.312
86	1.479	NA	NA	0.758	0.977
87	1.432	NA	1.441	1.052	1.250
88	0.866	NA	1.770	0.836	1.125
89	1.519	0.554	1.451	0.747	0.874
90	1.096	0.792	1.130	0.496	0.805
91	1.333	0.786	1.829	0.709	1.007

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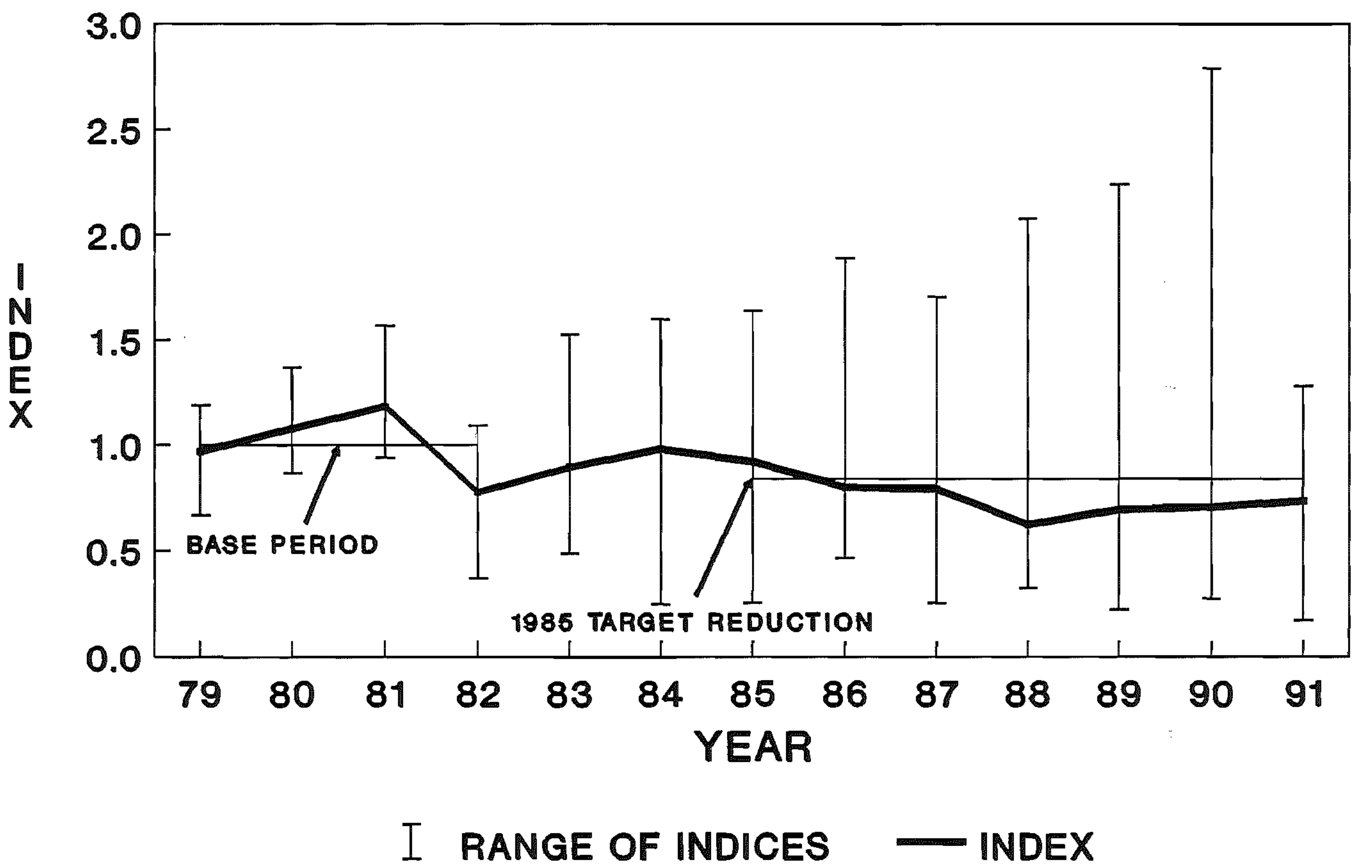
URB = COL UPRIVER BRIGHT

NORTH/CENTRAL B.C. TROLL (ALL AGES)
FISHERY INDEX



Fishery: North/Central B.C. Troll (All Ages)

TOTAL MORTALITY EXPLOITATION RATES

Year	AKS Age 4	BQR Age 3	BQR Age 4	QUI Age 3	QUI Age 4	QUI Age 5	RBT Age 3	RBT Age 4	RBT Age 5	SRH Age 3	SRH Age 4	SRH Age 5	URB Age 3	URB Age 4	URB Age 5	WSH Age 4
79	NA	0.083	0.099	0.047	0.170	0.114	0.093	0.166	0.109	NA	NA	NA	0.011	0.089	NA	NA
80	NA	0.093	0.079	0.046	0.162	0.216	0.087	0.131	0.158	0.078	NA	NA	0.028	0.070	0.071	0.138
81	NA	0.094	0.089	0.076	0.165	0.185	0.062	0.141	0.265	0.115	0.160	NA	NA	0.080	0.085	0.110
82	0.005	0.066	0.098	0.033	0.078	0.116	0.070	0.164	0.124	0.027	0.120	0.086	0.028	0.045	NA	0.031
83	0.014	NA	0.098	0.061	0.144	0.214	0.081	0.122	0.080	0.036	0.099	0.099	0.034	0.074	NA	0.030
84	0.006	0.062	NA	0.011	0.063	0.073	0.040	0.152	0.263	NA	0.093	0.309	0.025	0.104	NA	0.023
85	0.004	0.034	NA	0.015	0.043	0.036	0.080	0.247	0.208	0.043	NA	0.245	0.020	0.082	0.075	0.023
86	0.009	0.059	0.194	0.048	0.079	0.082	NA	0.133	NA	0.020	0.065	NA	0.020	0.061	0.083	NA
87	0.003	0.011	0.062	0.026	0.074	0.121	0.052	NA	NA	0.031	0.069	0.204	0.038	0.102	0.111	0.023
88	0.010	NA	NA	0.016	0.048	0.021	0.035	0.089	NA	NA	0.056	0.190	0.018	0.056	0.094	0.035
89	0.004	0.027	NA	0.023	0.034	0.035	0.035	0.107	0.169	0.019	0.040	0.193	NA	0.053	0.196	0.018
90	0.016	0.027	0.084	0.020	0.091	0.047	0.035	0.113	0.104	0.023	0.038	0.241	NA	0.063	0.112	0.019
91	0.002	0.014	NA	0.019	0.081	0.085	0.047	0.130	0.210	0.027	0.060	0.211	NA	NA	NA	0.009
Base	0.005	0.084	0.091	0.050	0.144	0.158	0.078	0.151	0.164	0.073	0.140	0.086	0.022	0.071	0.078	0.093

TOTAL MORTALITY EXPLOITATION RATE INDEX

Year	AKS Age 4	BQR Age 3	BQR Age 4	QUI Age 3	QUI Age 4	QUI Age 5	RBT Age 3	RBT Age 4	RBT Age 5	SRH Age 3	SRH Age 4	SRH Age 5	URB Age 3	URB Age 4	URB Age 5	WSH Age 4	Fishery
79	NA	0.990	1.088	0.931	1.181	0.723	1.190	1.102	0.667	NA	NA	NA	0.501	1.253	NA	NA	0.969
80	NA	1.103	0.866	0.914	1.127	1.372	1.116	0.867	0.961	1.061	NA	NA	1.247	0.983	0.912	1.483	1.078
81	NA	1.123	0.974	1.507	1.148	1.172	0.793	0.939	1.615	1.570	1.143	NA	NA	1.130	1.088	1.181	1.184
82	1.000	0.785	1.072	0.647	0.544	0.733	0.901	1.092	0.757	0.369	0.857	1.000	1.252	0.635	NA	0.336	0.774
83	2.855	NA	1.074	1.213	1.003	1.358	1.037	0.812	0.487	0.495	0.709	1.149	1.528	1.035	NA	0.324	0.895
84	1.291	0.732	NA	0.210	0.441	0.461	0.520	1.010	1.601	NA	0.664	3.576	1.131	1.466	NA	0.247	0.982
85	0.826	0.410	NA	0.303	0.302	0.227	1.030	1.642	1.270	0.583	NA	2.833	0.901	1.156	0.964	0.252	0.920
86	1.889	0.699	2.131	0.946	0.549	0.519	NA	0.884	NA	0.273	0.466	NA	0.887	0.854	1.063	NA	0.798
87	0.518	0.133	0.686	0.516	0.513	0.767	0.668	NA	NA	0.427	0.493	2.359	1.708	1.430	1.425	0.251	0.789
88	2.076	NA	NA	0.324	0.332	0.133	0.450	0.588	NA	NA	0.400	2.199	0.798	0.793	1.205	0.379	0.621
89	0.805	0.318	NA	0.456	0.236	0.221	0.452	0.711	1.032	0.258	0.287	2.240	NA	0.746	2.525	0.189	0.693
90	3.382	0.327	0.919	0.404	0.634	0.301	0.445	0.748	0.634	0.314	0.272	2.791	NA	0.887	1.441	0.201	0.705
91	0.438	0.170	NA	0.381	0.561	0.536	0.604	0.864	1.282	0.372	0.426	2.448	NA	NA	NA	0.101	0.731

Stock Identifiers

AKS = ALASKA SPRING
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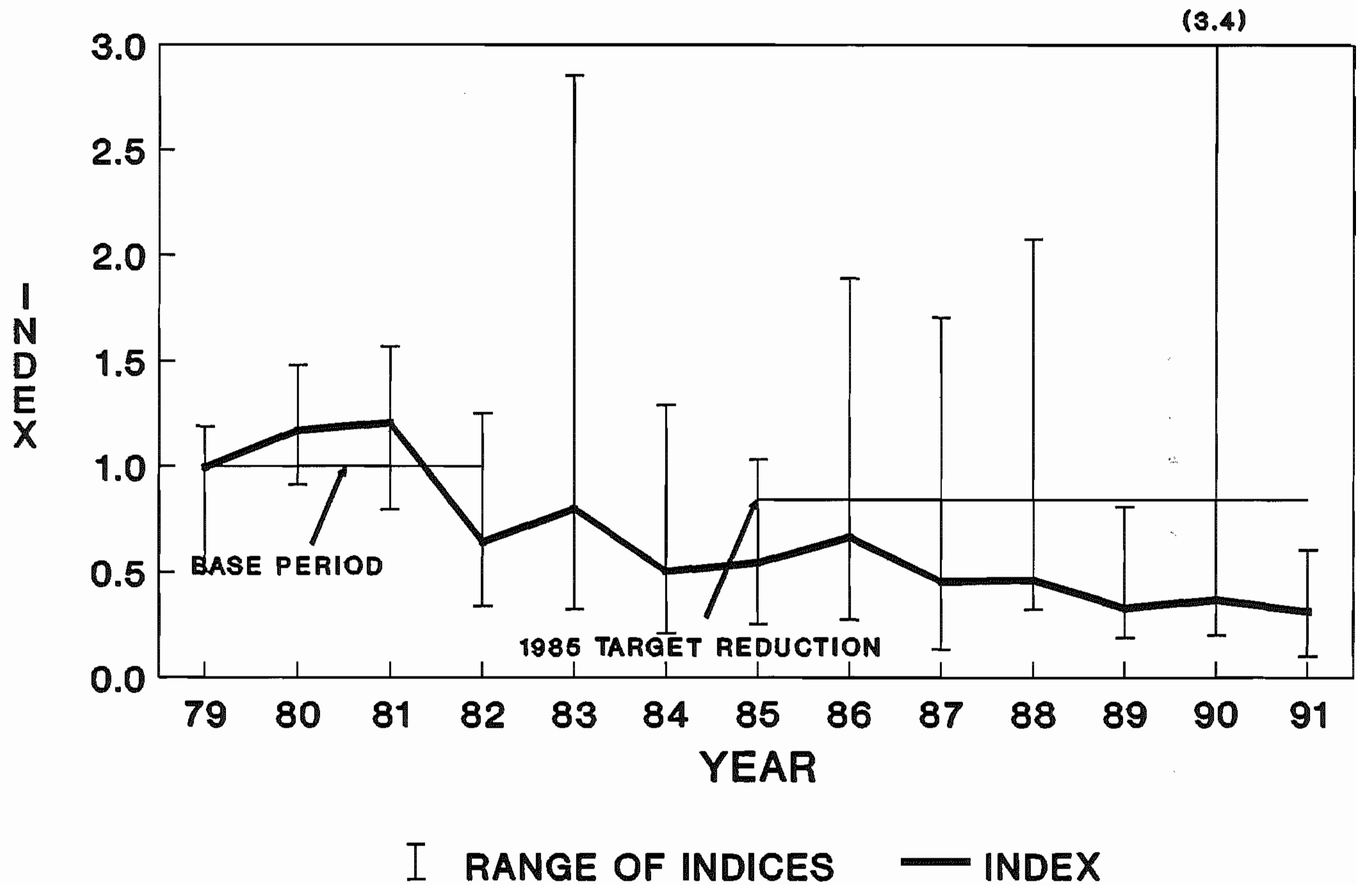
QUI = QUINSAM
RBT = ROBERTSON CREEK
SRH = SALMON RIVER
URB = COLUMBIA RIVER UPRIVER BRIGHT
WSH = WILLAMETTE SPRING

NORTH/CENTRAL B.C. TROLL (AGE 3)
FISHERY INDEX



Fishery: North/Central B.C. Troll (Age 3)

TOTAL MORTALITY EXPLOITATION RATES

Year	AKS Age 4	BQR Age 3	QUI Age 3	RBT Age 3	SRH Age 3	URB Age 3	WSH Age 4
79	NA	0.083	0.047	0.093	NA	0.011	NA
80	NA	0.093	0.046	0.087	0.078	0.028	0.138
81	NA	0.094	0.076	0.062	0.115	NA	0.110
82	0.005	0.066	0.033	0.070	0.027	0.028	0.031
83	0.014	NA	0.061	0.081	0.036	0.034	0.030
84	0.006	0.062	0.011	0.040	NA	0.025	0.023
85	0.004	0.034	0.015	0.080	0.043	0.020	0.023
86	0.009	0.059	0.048	NA	0.020	0.020	NA
87	0.003	0.011	0.026	0.052	0.031	0.038	0.023
88	0.010	NA	0.016	0.035	NA	0.018	0.035
89	0.004	0.027	0.023	0.035	0.019	NA	0.018
90	0.016	0.027	0.020	0.035	0.023	NA	0.019
91	0.002	0.014	0.019	0.047	0.027	NA	0.009
Base	0.005	0.084	0.050	0.078	0.073	0.022	0.093

TOTAL MORTALITY EXPLOITATION RATE INDEX

Year	AKS Age 4	BQR Age 3	QUI Age 3	RBT Age 3	SRH Age 3	URB Age 3	WSH Age 4	Fishery
79	NA	0.990	0.931	1.190	NA	0.501	NA	0.998
80	NA	1.103	0.914	1.116	1.061	1.247	1.483	1.170
81	NA	1.123	1.507	0.793	1.570	NA	1.181	1.207
82	1.000	0.785	0.647	0.901	0.369	1.252	0.336	0.640
83	2.855	NA	1.213	1.037	0.495	1.528	0.324	0.796
84	1.291	0.732	0.210	0.520	NA	1.131	0.247	0.502
85	0.826	0.410	0.303	1.030	0.583	0.901	0.252	0.543
86	1.889	0.699	0.946	NA	0.273	0.887	NA	0.662
87	0.518	0.133	0.516	0.668	0.427	1.708	0.251	0.454
88	2.076	NA	0.324	0.450	NA	0.798	0.379	0.460
89	0.805	0.318	0.456	0.452	0.258	NA	0.189	0.327
90	3.382	0.327	0.404	0.445	0.314	NA	0.201	0.367
91	0.438	0.170	0.381	0.604	0.372	NA	0.101	0.311

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SRH = SALMON RIVER
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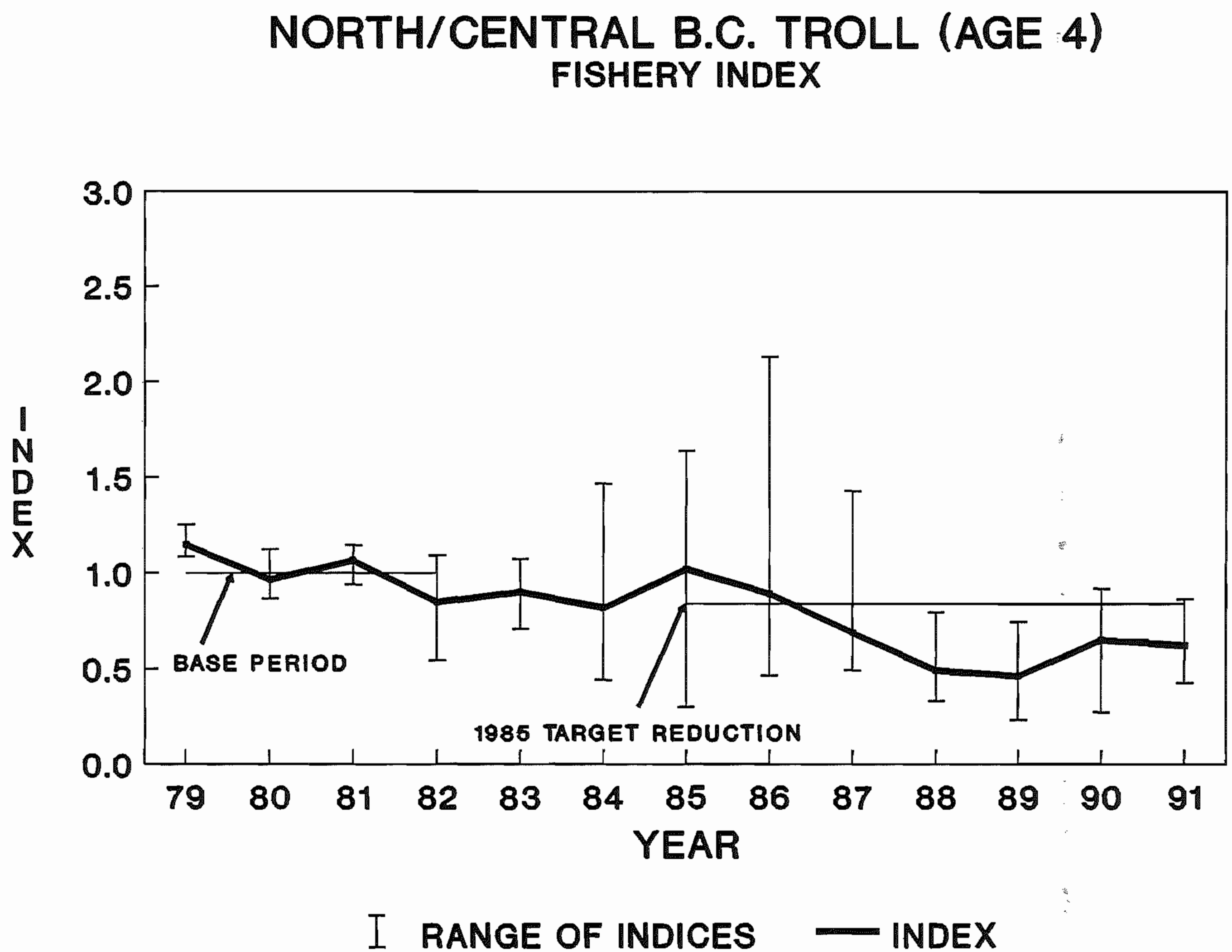
WSH = WILLAMETTE SPRING


NORTH/CENTRAL B.C. TROLL (AGE 4)
FISHERY INDEX
INDEX
3.0
2.5
2.0
1.5
1.0
0.5
0.0
BASE PERIOD
1985 TARGET REDUCTION
79
80
81
82
83
84
85
86
87
88
89
90
91
YEAR
RANGE OF INDICES
INDEX

Fishery: North/Central B.C. Troll (Age 4)

TOTAL MORTALITY EXPLOITATION RATES

Year	BQR Age 4	QUI Age 4	RBT Age 4	SRH Age 4	URB Age 4
79	0.099	0.170	0.166	NA	0.089
80	0.079	0.162	0.131	NA	0.070
81	0.089	0.165	0.141	0.160	0.080
82	0.098	0.078	0.164	0.120	0.045
83	0.098	0.144	0.122	0.099	0.074
84	NA	0.063	0.152	0.093	0.104
85	NA	0.043	0.247	NA	0.082
86	0.194	0.079	0.133	0.065	0.061
87	0.062	0.074	NA	0.069	0.102
88	NA	0.048	0.089	0.056	0.056
89	NA	0.034	0.107	0.040	0.053
90	0.084	0.091	0.113	0.038	0.063
91	NA	0.081	0.130	0.060	NA
Base	0.091	0.144	0.151	0.140	0.071

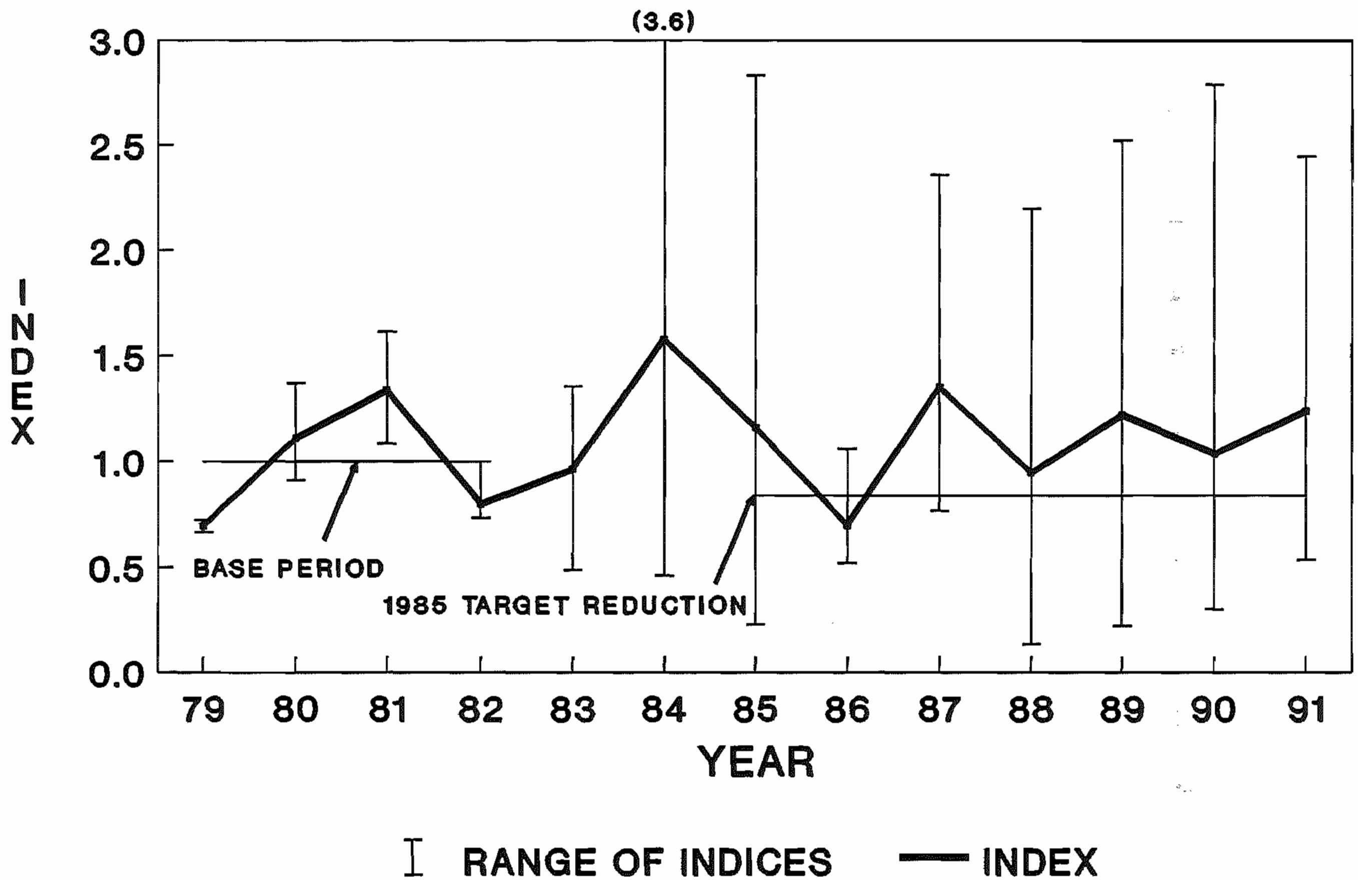
TOTAL MORTALITY EXPLOITATION RATE INDEX

Year	BQR Age 4	QUI Age 4	RBT Age 4	SRH Age 4	URB Age 4	Fishery
79	1.088	1.181	1.102	NA	1.253	1.148
80	0.866	1.127	0.867	NA	0.983	0.967
81	0.974	1.148	0.939	1.143	1.130	1.066
82	1.072	0.544	1.092	0.857	0.635	0.847
83	1.074	1.003	0.812	0.709	1.035	0.901
84	NA	0.441	1.010	0.664	1.466	0.816
85	NA	0.302	1.642	NA	1.156	1.020
86	2.131	0.549	0.884	0.466	0.854	0.892
87	0.686	0.513	NA	0.493	1.430	0.688
88	NA	0.332	0.588	0.400	0.793	0.492
89	NA	0.236	0.711	0.287	0.746	0.463
90	0.919	0.634	0.748	0.272	0.887	0.651
91	NA	0.561	0.864	0.426	NA	0.622

Stock Identifiers

BQR = BIG QUALICUM
QUI = QUINSAM
RBT = ROBERTSON CREEK
SRH = SALMON RIVER
URB = COLUMBIA UPRIVER BRIGHT

NORTH/CENTRAL B.C. TROLL (AGE 5)
FISHERY INDEX



Fishery: North/Central B.C. Troll (Age 5)

TOTAL MORTALITY EXPLOITATION RATES

Year	QUI Age 5	RBT Age 5	SRH Age 5	URB Age 5
79	0.114	0.109	NA	NA
80	0.216	0.158	NA	0.071
81	0.185	0.265	NA	0.085
82	0.116	0.124	0.086	NA
83	0.214	0.080	0.099	NA
84	0.073	0.263	0.309	NA
85	0.036	0.208	0.245	0.075
86	0.082	NA	NA	0.083
87	0.121	NA	0.204	0.111
88	0.021	NA	0.190	0.094
89	0.035	0.169	0.193	0.196
90	0.047	0.104	0.241	0.112
91	0.085	0.210	0.211	NA
Base	0.158	0.164	0.086	0.078

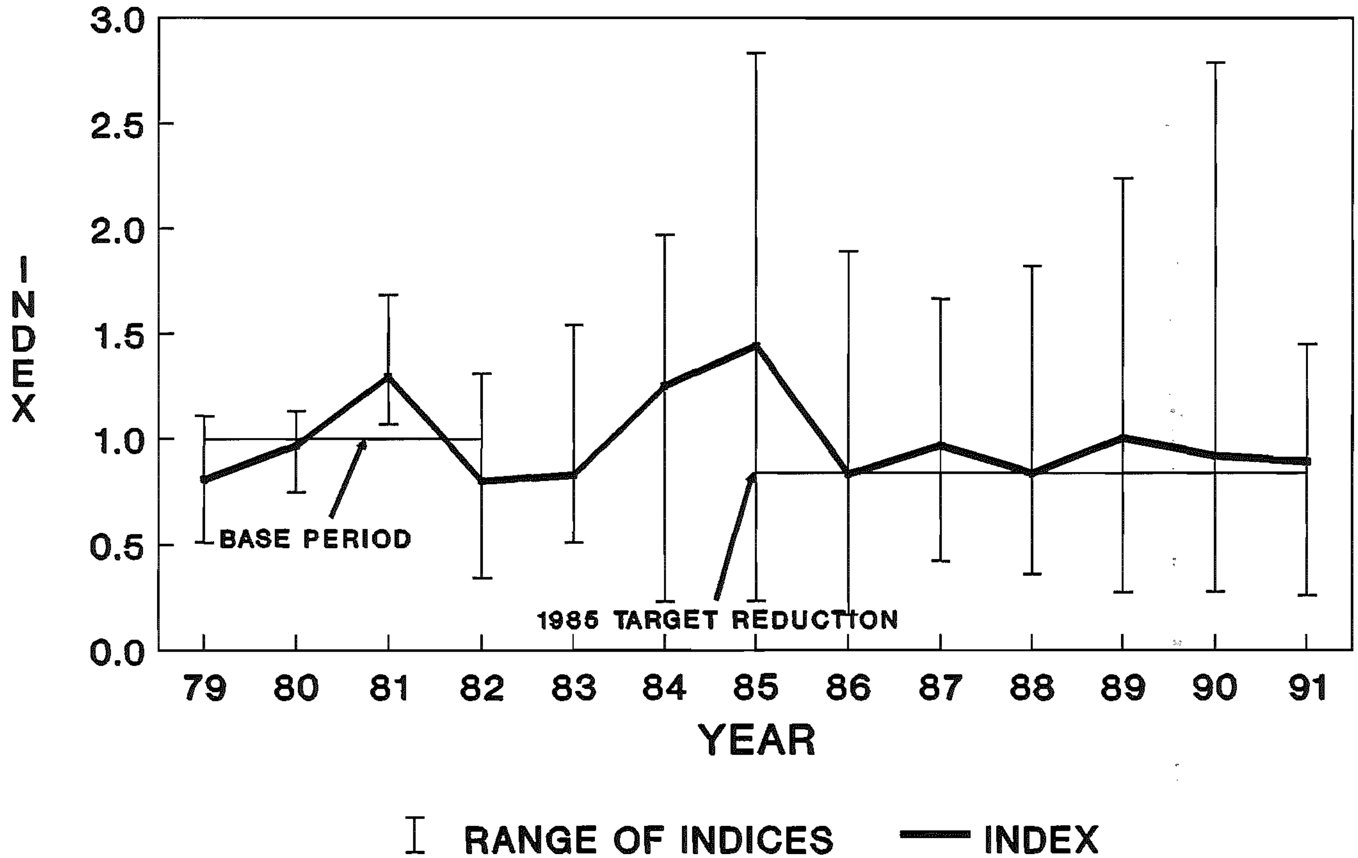
TOTAL MORTALITY EXPLOITATION RATE INDEX

Year	QUI Age 5	RBT Age 5	SRH Age 5	URB Age 5	Fishery
79	0.723	0.667	NA	NA	0.694
80	1.372	0.961	NA	0.912	1.114
81	1.172	1.615	NA	1.088	1.338
82	0.733	0.757	1.000	NA	0.799
83	1.358	0.487	1.149	NA	0.964
84	0.461	1.601	3.576	NA	1.578
85	0.227	1.270	2.833	0.964	1.160
86	0.519	NA	NA	1.063	0.699
87	0.767	NA	2.359	1.425	1.353
88	0.133	NA	2.199	1.205	0.946
89	0.221	1.032	2.240	2.525	1.222
90	0.301	0.634	2.791	1.441	1.038
91	0.536	1.282	2.448	NA	1.241

Stock Identifiers

QUI = QUINSAM
RBT = ROBERTSON CREEK
SRH = SALMON RIVER
URB = COL UPRIVER BRIGHT

NORTH B.C. TROLL (ALL AGES)
FISHERY INDEX



Fishery: North B.C. Troll (All Ages)

TOTAL MORTALITY EXPLOITATION RATES

Year	AKS Age 4	QUI Age 3	QUI Age 4	RBT Age 3	RBT Age 4	RBT Age 5	SRH Age 3	SRH Age 4	SRH Age 5	URB Age 3	URB Age 4	URB Age 5	WSH Age 4
79	NA	0.021	NA	0.048	0.081	0.070	NA	NA	NA	0.009	0.055	NA	NA
80	NA	0.027	0.057	0.048	0.053	0.089	0.071	NA	NA	0.021	0.053	0.059	0.135
81	NA	0.068	0.076	0.033	0.089	0.191	0.115	0.153	NA	NA	0.067	0.073	0.106
82	0.005	0.028	0.029	0.044	0.109	NA	0.018	0.120	0.086	0.025	0.045	NA	0.031
83	0.014	0.040	0.083	0.048	0.064	0.059	0.036	0.093	0.099	0.029	0.062	NA	0.030
84	0.006	0.008	0.026	0.031	0.124	0.230	NA	0.084	0.270	0.017	0.090	NA	0.021
85	0.004	0.008	0.027	0.071	0.247	0.208	0.036	NA	0.245	0.019	0.079	0.075	0.021
86	0.009	0.029	0.038	NA	0.133	NA	0.011	0.065	NA	0.017	0.058	0.073	NA
87	0.003	0.015	0.033	0.036	NA	NA	0.029	0.069	0.204	0.029	0.092	0.107	0.021
88	0.010	0.010	0.036	0.025	0.079	NA	NA	0.056	0.157	0.016	0.052	0.090	0.033
89	0.004	0.016	0.023	0.030	0.102	0.154	0.019	0.040	0.193	NA	0.050	0.196	0.018
90	0.016	0.013	0.050	0.027	0.093	0.093	0.022	0.038	0.241	NA	0.058	0.105	0.016
91	0.002	0.009	0.024	0.035	0.100	0.170	0.027	0.059	0.207	NA	NA	NA	0.009
Base	0.005	0.036	0.054	0.043	0.083	0.117	0.068	0.136	0.086	0.019	0.055	0.066	0.091

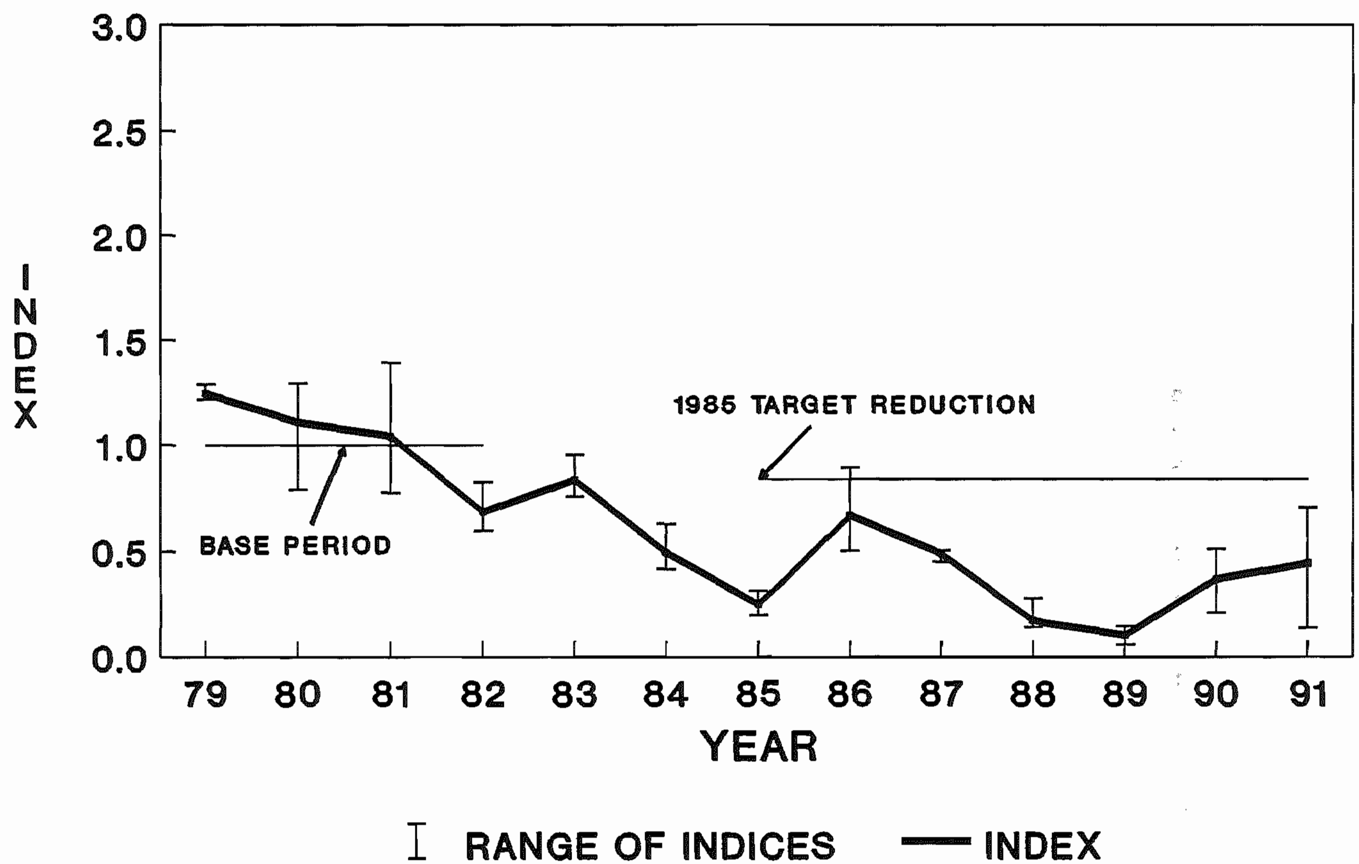
TOTAL MORTALITY EXPLOITATION RATE INDEX

Year	AKS Age 4	QUI Age 3	QUI Age 4	RBT Age 3	RBT Age 4	RBT Age 5	SRH Age 3	SRH Age 4	SRH Age 5	URB Age 3	URB Age 4	URB Age 5	WSH Age 4	Fishery
79	NA	0.576	NA	1.111	0.981	0.599	NA	NA	NA	0.512	1.009	NA	NA	0.809
80	NA	0.749	1.053	1.102	0.635	0.763	1.042	NA	NA	1.135	0.960	0.896	1.484	0.969
81	NA	1.893	1.411	0.761	1.073	1.638	1.688	1.120	NA	NA	1.212	1.104	1.172	1.296
82	1.000	0.782	0.536	1.026	1.311	NA	0.269	0.880	1.000	1.353	0.820	NA	0.344	0.800
83	2.855	1.120	1.535	1.104	0.768	0.510	0.532	0.682	1.149	1.542	1.129	NA	0.328	0.828
84	1.291	0.217	0.480	0.710	1.497	1.968	NA	0.616	3.133	0.913	1.634	NA	0.230	1.251
85	0.826	0.223	0.505	1.654	2.988	1.785	0.532	NA	2.833	1.019	1.444	1.136	0.233	1.442
86	1.889	0.816	0.709	NA	1.608	NA	0.168	0.479	NA	0.926	1.048	1.107	NA	0.833
87	0.518	0.421	0.607	0.844	NA	NA	0.428	0.507	2.359	1.584	1.668	1.619	0.235	0.968
88	2.076	0.284	0.660	0.589	0.955	NA	NA	0.411	1.823	0.842	0.943	1.364	0.362	0.837
89	0.805	0.449	0.418	0.698	1.233	1.318	0.277	0.294	2.240	NA	0.906	2.974	0.193	1.006
90	3.340	0.355	0.920	0.634	1.128	0.794	0.322	0.280	2.791	NA	1.054	1.591	0.181	0.920
91	0.438	0.262	0.438	0.817	1.203	1.452	0.400	0.432	2.394	NA	NA	NA	0.103	0.893

Stock Identifiers

AKS = ALASKA SPRING
QUI = QUINSAM
RBT = ROBERTSON CREEK
SRH = SALMON RIVER
URB = COLUMBIA UPRIVER BRIGHT
WSH = WILLAMETTE SPRING

CENTRAL B.C. TROLL (ALL AGES)
FISHERY INDEX



Fishery: Central B.C. Troll (All Ages)

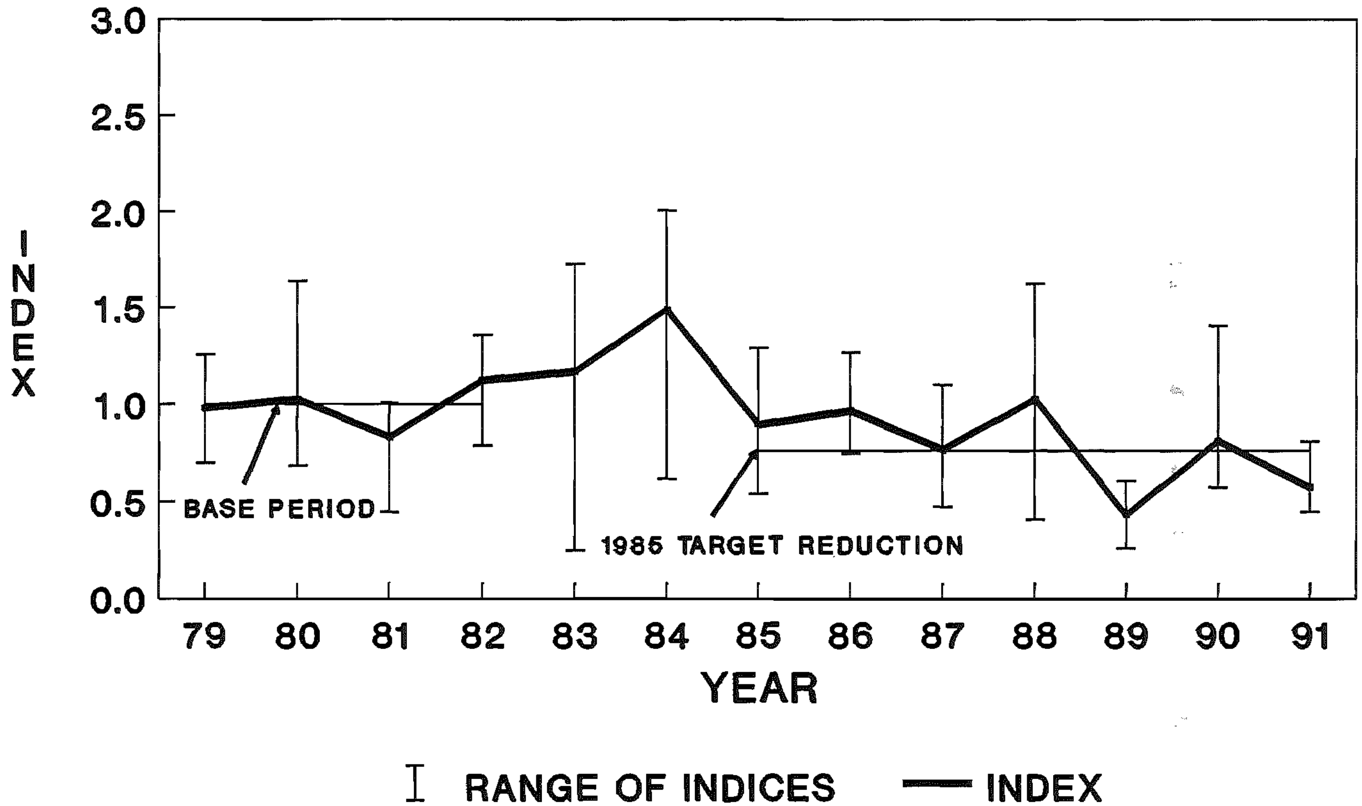
TOTAL MORTALITY EXPLOITATION RATES				
	BQR	QUI	RBT	RBT
Year	Age 3	Age 4	Age 3	Age 4
79	0.072	NA	0.045	0.085
80	0.047	0.105	0.039	0.078
81	0.083	0.089	0.029	0.053
82	0.035	0.049	0.026	0.056
83	NA	0.061	0.033	0.059
84	0.037	0.038	NA	0.028
85	0.019	0.016	NA	NA
86	0.053	0.041	NA	NA
87	NA	0.041	0.016	NA
88	NA	0.012	0.010	0.009
89	0.003	0.011	0.005	0.005
90	NA	0.041	0.007	0.019
91	0.008	0.057	0.012	0.031
Base	0.059	0.081	0.035	0.068

TOTAL MORTALITY EXPLOITATION RATE INDEX					
	BQR	QUI	RBT	RBT	
Year	Age 3	Age 4	Age 3	Age 4	Fishery
79	1.218	NA	1.289	1.249	1.246
80	0.792	1.297	1.133	1.151	1.110
81	1.395	1.096	0.833	0.776	1.042
82	0.595	0.607	0.744	0.824	0.684
83	NA	0.757	0.954	0.866	0.834
84	0.630	0.463	NA	0.416	0.495
85	0.314	0.199	NA	NA	0.247
86	0.894	0.502	NA	NA	0.667
87	NA	0.505	0.449	NA	0.488
88	NA	0.150	0.276	0.140	0.170
89	0.057	0.139	0.145	0.074	0.102
90	NA	0.511	0.209	0.285	0.370
91	0.136	0.703	0.337	0.450	0.442

Stock Identifiers

BQR = BIG QUALICUM
QUI = QUINSAM
RBT = ROBERTSON CREEK

WEST COAST VANCOUVER ISLAND TROLL
(ALL AGES)
FISHERY INDEX



Fishery: West Coast Vancouver Island Troll (All Ages)

TOTAL MORTALITY EXPLOITATION RATES

Year	BON Age 3	BON Age 4	CWF Age 4	GAD Age 3	GAD Age 4	LRW Age 4	RBT Age 3	RBT Age 4	SAM Age 3	SAM Age 4	SPR Age 3	SPR Age 4	SPS Age 3	SPS Age 4	STP Age 3	STP Age 4	URB Age 3	URB Age 4	UWA Age 3	UWA Age 4	WSH Age 4
79	0.222	NA	NA	NA	NA	NA	0.035	0.074	NA	0.312	0.197	0.149	NA	0.256	NA	NA	0.045	0.091	0.070	0.167	NA
80	0.110	0.152	NA	NA	NA	NA	0.043	0.100	NA	NA	0.251	0.284	NA	NA	NA	NA	0.042	0.052	0.152	0.131	0.063
81	0.177	0.159	0.130	0.046	NA	0.060	0.020	0.026	NA	NA	0.188	0.170	0.050	NA	0.216	NA	NA	0.052	0.092	0.174	0.013
82	0.279	0.352	0.201	0.078	0.214	0.086	0.024	0.035	0.060	NA	0.191	0.247	0.106	0.242	0.204	0.194	0.033	0.028	0.141	0.220	0.039
83	0.340	0.328	0.230	NA	0.271	0.070	0.012	0.035	NA	0.198	0.287	0.208	0.124	0.261	0.284	0.341	0.010	0.021	0.088	0.209	0.006
84	0.279	0.584	0.216	0.118	NA	NA	0.052	0.053	NA	NA	0.249	0.317	0.111	0.230	0.367	0.390	0.023	0.061	0.201	0.160	0.024
85	0.263	NA	0.150	NA	0.177	NA	0.028	NA	NA	NA	0.112	0.243	0.058	0.162	0.187	0.154	0.022	0.049	0.103	0.223	0.015
86	NA	NA	0.210	NA	NA	0.032	NA	NA	NA	NA	0.213	0.159	0.065	0.265	0.174	0.152	0.040	0.057	0.100	0.241	NA
87	0.217	NA	0.138	NA	NA	0.105	0.014	NA	NA	NA	0.070	NA	0.071	0.148	0.230	NA	0.034	0.049	0.056	0.095	0.020
88	NA	0.266	0.154	0.034	NA	0.084	0.021	0.044	0.059	NA	0.200	NA	0.029	0.183	0.261	0.315	0.016	0.099	NA	0.175	0.019
89	NA	NA	0.092	0.024	0.108	0.044	0.008	0.021	0.021	0.085	0.116	0.094	0.035	0.092	0.052	0.110	NA	0.046	NA	NA	0.015
90	NA	NA	0.140	0.087	0.194	0.092	0.028	0.042	0.046	0.180	0.172	0.151	0.080	0.228	0.192	0.064	NA	0.081	NA	NA	0.024
91	NA	NA	NA	NA	0.202	0.057	0.025	0.041	0.029	0.139	0.096	0.128	0.047	0.123	0.108	NA	NA	NA	NA	NA	0.004
Base	0.197	0.221	0.166	0.062	0.214	0.073	0.031	0.059	0.060	0.312	0.207	0.213	0.078	0.249	0.210	0.194	0.040	0.056	0.114	0.173	0.038

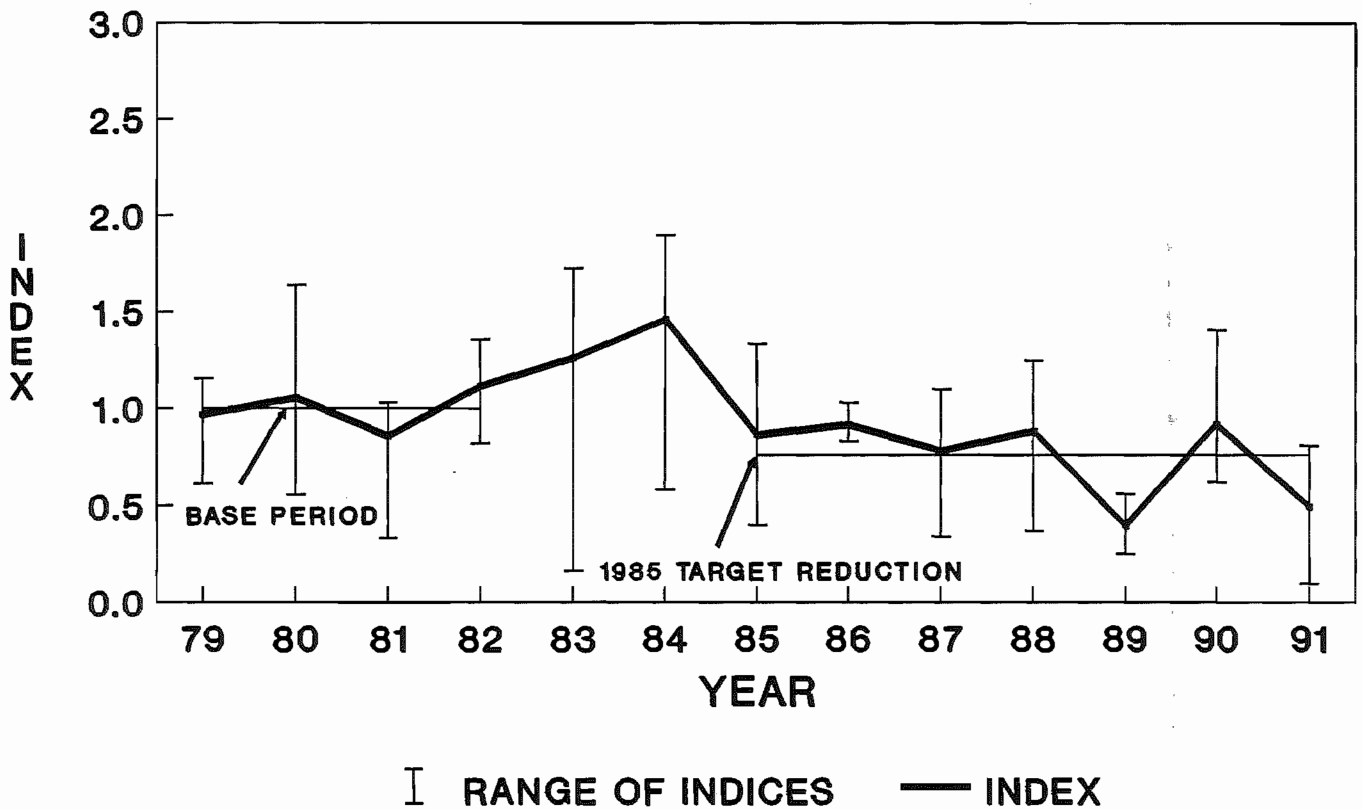
TOTAL MORTALITY EXPLOITATION RATE INDEX

Year	BON Age 3	BON Age 4	CWF Age 4	GAD Age 3	GAD Age 4	LRW Age 4	RBT Age 3	RBT Age 4	SAM Age 3	SAM Age 4	SPR Age 3	SPR Age 4	SPS Age 3	SPS Age 4	STP Age 3	STP Age 4	URB Age 3	URB Age 4	UWA Age 3	UWA Age 4	WSH Age 4	Fishery
79	1.127	NA	NA	NA	NA	NA	1.156	1.255	NA	1.000	0.951	0.701	NA	1.028	NA	NA	1.120	1.634	0.614	0.964	NA	0.981
80	0.558	0.687	NA	NA	NA	NA	1.399	1.709	NA	NA	1.216	1.336	NA	NA	NA	NA	1.060	0.928	1.333	0.757	1.639	1.024
81	0.899	0.718	0.787	0.738	NA	0.821	0.659	0.448	NA	NA	0.907	0.800	0.643	NA	1.030	NA	NA	0.934	0.810	1.008	0.331	0.830
82	1.416	1.595	1.213	1.262	1.000	1.179	0.787	0.588	1.000	NA	0.925	1.163	1.357	0.972	0.970	1.000	0.821	0.503	1.242	1.271	1.030	1.121
83	1.724	1.485	1.390	NA	1.266	0.958	0.400	0.600	NA	0.636	1.390	0.980	1.589	1.048	1.352	1.752	0.247	0.379	0.771	1.209	0.162	1.169
84	1.416	2.644	1.302	1.897	NA	NA	1.690	0.897	NA	NA	1.203	1.493	1.429	0.925	1.749	2.008	0.584	1.094	1.770	0.925	0.616	1.489
85	1.335	NA	0.904	NA	0.827	NA	0.907	NA	NA	NA	0.542	1.141	0.748	0.649	0.889	0.793	0.548	0.873	0.903	1.289	0.400	0.893
86	NA	NA	1.268	NA	NA	0.442	NA	NA	NA	NA	1.032	0.747	0.838	1.065	0.829	0.783	1.010	1.011	0.878	1.392	NA	0.964
87	1.100	NA	0.831	NA	NA	1.441	0.474	NA	NA	NA	0.339	NA	0.918	0.593	1.096	NA	0.843	0.870	0.489	0.548	0.534	0.765
88	NA	1.203	0.930	0.548	NA	1.154	0.690	0.754	0.985	NA	0.970	NA	0.369	0.735	1.245	1.622	0.407	1.767	NA	1.010	0.497	1.023
89	NA	NA	0.554	0.387	0.503	0.607	0.257	0.352	0.350	0.273	0.560	0.442	0.447	0.368	0.247	0.565	NA	0.814	NA	NA	0.384	0.432
90	NA	NA	0.844	1.404	0.908	1.263	0.921	0.712	0.759	0.575	0.830	0.710	1.031	0.917	0.914	0.330	NA	1.440	NA	NA	0.620	0.811
91	NA	NA	NA	NA	0.943	0.778	0.808	0.691	0.481	0.447	0.462	0.601	0.608	0.495	0.516	NA	NA	NA	NA	NA	0.097	0.573

Stock Identifiers

BON = BONNEVILLE TULE
CWF = COWLITZ FALL TULE
GAD = G ADAMS FALL FING
LRW = LEWIS RIVER WILD
RBT = ROBERTSON CREEK
SAM = SAMISH FALL FING
SPR = SPRING CREEK TULE
SPS = SO SOUND FALL FING
STP = STAYTON POND TULE
URB = COLUMBIA UPRIVER BRIGHT
UWA = U OF W FALL ACCEL
WSH = WILLAMETTE SPRING

WEST COAST VANCOUVER ISLAND TROLL
(AGE 3)
FISHERY INDEX



Fishery: West Coast Vancouver Island Troll (Age 3)

TOTAL MORTALITY EXPLOITATION RATES

Year	BON Age 3	GAD Age 3	RBT Age 3	SAM Age 3	SPR Age 3	SPS Age 3	STP Age 3	URB Age 3	UWA Age 3	WSH Age 4
79	0.222	NA	0.035	NA	0.197	NA	NA	0.045	0.070	NA
80	0.110	NA	0.043	NA	0.251	NA	NA	0.042	0.152	0.063
81	0.177	0.046	0.020	NA	0.188	0.050	0.216	NA	0.092	0.013
82	0.279	0.078	0.024	0.060	0.191	0.106	0.204	0.033	0.141	0.039
83	0.340	NA	0.012	NA	0.287	0.124	0.284	0.010	0.088	0.006
84	0.279	0.118	0.052	NA	0.249	0.111	0.367	0.023	0.201	0.024
85	0.263	NA	0.028	NA	0.112	0.058	0.187	0.022	0.103	0.015
86	NA	NA	NA	NA	0.213	0.065	0.174	0.040	0.100	NA
87	0.217	NA	0.014	NA	0.070	0.071	0.230	0.034	0.056	0.020
88	NA	0.034	0.021	0.059	0.200	0.029	0.261	0.016	NA	0.019
89	NA	0.024	0.008	0.021	0.116	0.035	0.052	NA	NA	0.015
90	NA	0.087	0.028	0.046	0.172	0.080	0.192	NA	NA	0.024
91	NA	NA	0.025	0.029	0.096	0.047	0.108	NA	NA	0.004
Base	0.197	0.062	0.031	0.060	0.207	0.078	0.210	0.040	0.114	0.038

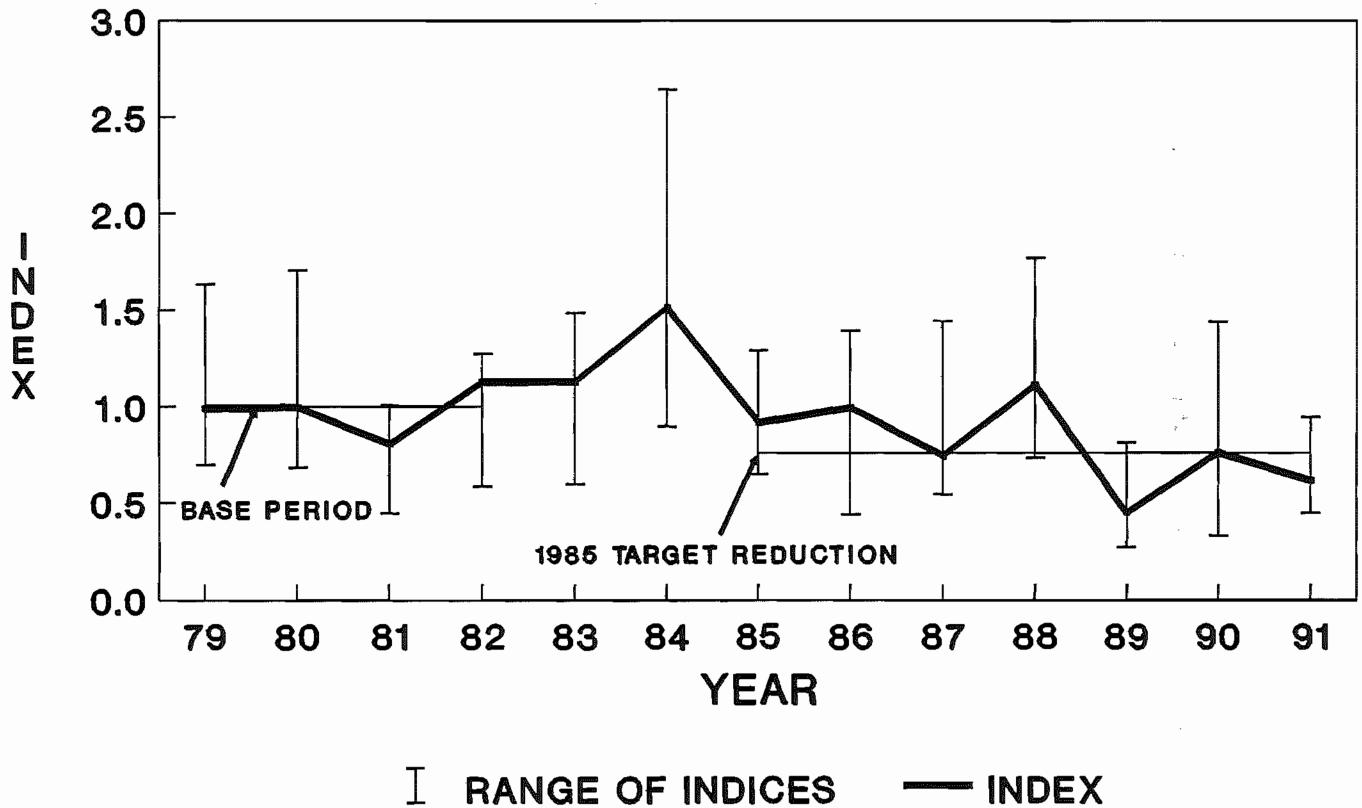
TOTAL MORTALITY EXPLOITATION RATE INDEX

Year	BON Age 3	GAD Age 3	RBT Age 3	SAM Age 3	SPR Age 3	SPS Age 3	STP Age 3	URB Age 3	UWA Age 3	WSH Age 4	Fishery
79	1.127	NA	1.156	NA	0.951	NA	NA	1.120	0.614	NA	0.967
80	0.558	NA	1.399	NA	1.216	NA	NA	1.060	1.333	1.639	1.055
81	0.899	0.738	0.659	NA	0.907	0.643	1.030	NA	0.810	0.331	0.856
82	1.416	1.262	0.787	1.000	0.925	1.357	0.970	0.821	1.242	1.030	1.115
83	1.724	NA	0.400	NA	1.390	1.589	1.352	0.247	0.771	0.162	1.259
84	1.416	1.897	1.690	NA	1.203	1.429	1.749	0.584	1.770	0.616	1.458
85	1.335	NA	0.907	NA	0.542	0.748	0.889	0.548	0.903	0.400	0.862
86	NA	NA	NA	NA	1.032	0.838	0.829	1.010	0.878	NA	0.915
87	1.100	NA	0.474	NA	0.339	0.918	1.096	0.843	0.489	0.534	0.780
88	NA	0.548	0.690	0.985	0.970	0.369	1.245	0.407	NA	0.497	0.882
89	NA	0.387	0.257	0.350	0.560	0.447	0.247	NA	NA	0.384	0.394
90	NA	1.404	0.921	0.759	0.830	1.031	0.914	NA	NA	0.620	0.917
91	NA	NA	0.808	0.481	0.462	0.608	0.516	NA	NA	0.097	0.495

Stock Identifiers

BON = BONNEVILLE TULE
GAD = G ADAMS FALL FING
RBT = ROBERTSON CREEK
SAM = SAMISH FALL FING
SPR = SPRING CREEK TULE
SPS = SO SOUND FALL FING
STP = STAYTON POND TULE
URB = COLUMBIA UPRIVER BRIGHT
UWA = U OF W FALL ACCEL
WSH = WILLAMETTE SPRING

WEST COAST VANCOUVER ISLAND TROLL
(AGE 4)
FISHERY INDEX



Fishery: West Coast Vancouver Island Troll (Age 4)

TOTAL MORTALITY EXPLOITATION RATES

Year	BON Age 4	CWF Age 4	GAD Age 4	LRW Age 4	RBT Age 4	SAM Age 4	SPR Age 4	SPS Age 4	STP Age 4	URB Age 4	UWA Age 4
79	NA	NA	NA	NA	0.074	0.312	0.149	0.256	NA	0.091	0.167
80	0.152	NA	NA	NA	0.100	NA	0.284	NA	NA	0.052	0.131
81	0.159	0.130	NA	0.060	0.026	NA	0.170	NA	NA	0.052	0.174
82	0.352	0.201	0.214	0.086	0.035	NA	0.247	0.242	0.194	0.028	0.220
83	0.328	0.230	0.271	0.070	0.035	0.198	0.208	0.261	0.341	0.021	0.209
84	0.584	0.216	NA	NA	0.053	NA	0.317	0.230	0.390	0.061	0.160
85	NA	0.150	0.177	NA	NA	NA	0.243	0.162	0.154	0.049	0.223
86	NA	0.210	NA	0.032	NA	NA	0.159	0.265	0.152	0.057	0.241
87	NA	0.138	NA	0.105	NA	NA	NA	0.148	NA	0.049	0.095
88	0.266	0.154	NA	0.084	0.044	NA	NA	0.183	0.315	0.099	0.175
89	NA	0.092	0.108	0.044	0.021	0.085	0.094	0.092	0.110	0.046	NA
90	NA	0.140	0.194	0.092	0.042	0.180	0.151	0.228	0.064	0.081	NA
91	NA	NA	0.202	0.057	0.041	0.139	0.128	0.123	NA	NA	NA
Base	0.221	0.166	0.214	0.073	0.059	0.312	0.213	0.249	0.194	0.056	0.173

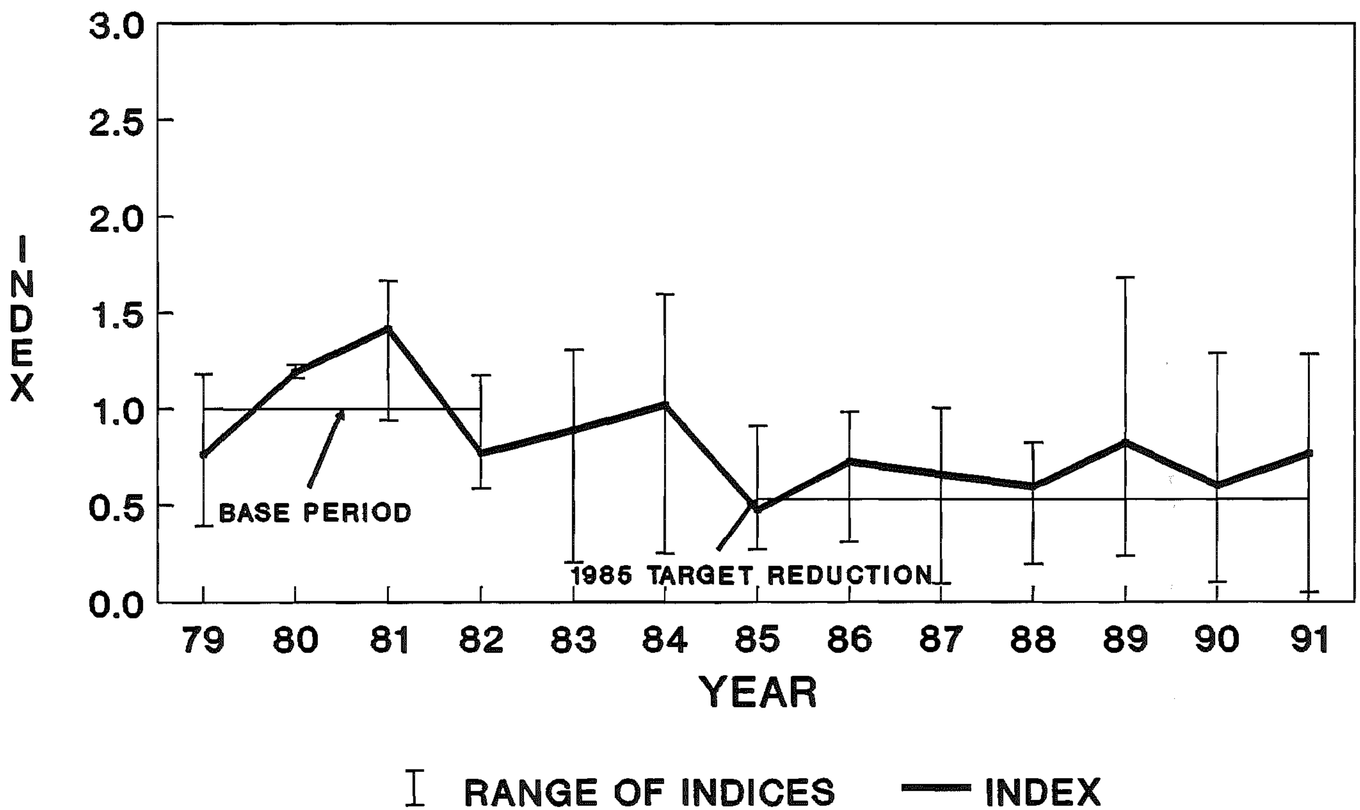
TOTAL MORTALITY EXPLOITATION RATE INDEX

Year	BON Age 4	CWF Age 4	GAD Age 4	LRW Age 4	RBT Age 4	SAM Age 4	SPR Age 4	SPS Age 4	STP Age 4	URB Age 4	UWA Age 4	Fishery
79	NA	NA	NA	NA	1.255	1.000	0.701	1.028	NA	1.634	0.964	0.988
80	0.687	NA	NA	NA	1.709	NA	1.336	NA	NA	0.928	0.757	0.997
81	0.718	0.787	NA	0.821	0.448	NA	0.800	NA	NA	0.934	1.008	0.804
82	1.595	1.213	1.000	1.179	0.588	NA	1.163	0.972	1.000	0.503	1.271	1.125
83	1.485	1.390	1.266	0.958	0.600	0.636	0.980	1.048	1.752	0.379	1.209	1.126
84	2.644	1.302	NA	NA	0.897	NA	1.493	0.925	2.008	1.094	0.925	1.512
85	NA	0.904	0.827	NA	NA	NA	1.141	0.649	0.793	0.873	1.289	0.915
86	NA	1.268	NA	0.442	NA	NA	0.747	1.065	0.783	1.011	1.392	0.993
87	NA	0.831	NA	1.441	NA	NA	NA	0.593	NA	0.870	0.548	0.745
88	1.203	0.930	NA	1.154	0.754	NA	NA	0.735	1.622	1.767	1.010	1.109
89	NA	0.554	0.503	0.607	0.352	0.273	0.442	0.368	0.565	0.814	NA	0.450
90	NA	0.844	0.908	1.263	0.712	0.575	0.710	0.917	0.330	1.440	NA	0.763
91	NA	NA	0.943	0.778	0.691	0.447	0.601	0.495	NA	NA	NA	0.616

Stock Identifiers

BON = BONNEVILLE TULE
CWF = COWLITZ FALL TULE
GAD = G ADAMS FALL FING
LRW = LEWIS RIVER WILD
RBT = ROBERTSON CREEK
SAM = SAMISH FALL FING
SPR = SPRING CREEK TULE
SPS = SO SOUND FALL FING
STP = STAYTON POND TULE
URB = COL UPRIVER BRIGHT
UWA = U OF W FALL ACCEL

STRAIT OF GEORGIA TROLL & SPORT
(ALL AGES)
FISHERY INDEX



Fishery: Strait of Georgia Troll and Sport (All Ages)

TOTAL MORTALITY EXPLOITATION RATES

Year	BQR Age 3	BQR Age 4	QUI Age 5	SAM Age 3	SAM Age 4	SPS Age 3	SPS Age 4	UWA Age 3
79	0.228	0.179	0.060	NA	0.094	NA	0.060	0.041
80	0.296	0.316	NA	NA	NA	NA	NA	0.042
81	0.295	0.433	0.254	NA	NA	0.091	NA	0.032
82	0.155	0.160	0.143	0.107	NA	0.067	0.085	0.022
83	0.319	0.256	0.086	NA	0.103	0.030	0.015	0.034
84	0.389	NA	0.038	NA	NA	0.058	0.054	0.054
85	0.164	0.074	0.045	NA	NA	NA	0.053	0.031
86	0.240	0.200	0.047	NA	NA	NA	NA	0.024
87	0.151	0.250	0.015	NA	NA	0.065	NA	0.035
88	0.201	0.189	0.049	0.054	NA	0.015	NA	NA
89	0.193	0.302	0.060	0.071	0.158	0.019	0.037	NA
90	0.188	0.183	0.016	0.050	0.122	0.018	0.038	NA
91	0.218	0.316	0.008	0.137	0.062	0.015	0.027	NA
Base	0.244	0.272	0.152	0.107	0.094	0.079	0.073	0.035

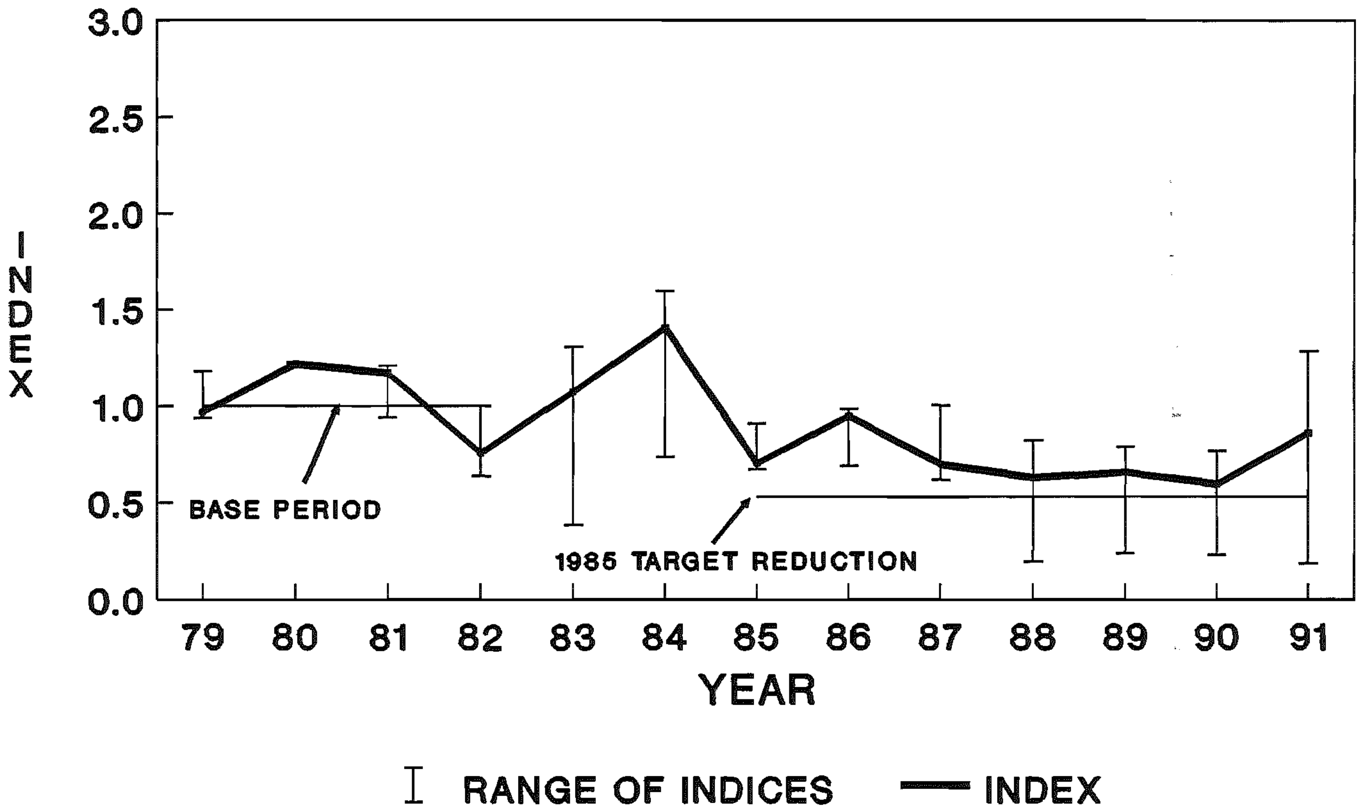
TOTAL MORTALITY EXPLOITATION RATE INDEX

Year	BQR Age 3	BQR Age 4	QUI Age 5	SAM Age 3	SAM Age 4	SPS Age 3	SPS Age 4	UWA Age 3	Fishery
79	0.936	0.660	0.394	NA	1.000	NA	0.828	1.181	0.762
80	1.215	1.161	NA	NA	NA	NA	NA	1.231	1.189
81	1.211	1.591	1.666	NA	NA	1.155	NA	0.939	1.414
82	0.638	0.588	0.940	1.000	NA	0.845	1.172	0.650	0.770
83	1.308	0.940	0.563	NA	1.095	0.385	0.204	0.989	0.889
84	1.595	NA	0.253	NA	NA	0.737	0.743	1.558	1.019
85	0.675	0.271	0.298	NA	NA	NA	0.729	0.910	0.474
86	0.984	0.736	0.310	NA	NA	NA	NA	0.690	0.727
87	0.619	0.918	0.097	NA	NA	0.820	NA	1.003	0.658
88	0.826	0.696	0.321	0.501	NA	0.195	NA	NA	0.595
89	0.791	1.109	0.397	0.663	1.682	0.239	0.514	NA	0.823
90	0.772	0.672	0.104	0.468	1.291	0.231	0.519	NA	0.602
91	0.894	1.161	0.051	1.284	0.660	0.185	0.373	NA	0.767

Stock Identifiers

BQR = BIG QUALICUM
QUI = QUINSAM
SAM = SAMISH FALL FING
SPS = SO SOUND FALL FING
UWA = U OF W FALL ACCEL

STRAIT OF GEORGIA TROLL & SPORT
(AGE 3)
FISHERY INDEX



Fishery: Strait of Georgia Troll and Sport (Age 3)

TOTAL MORTALITY EXPLOITATION RATES

Year	BQR Age 3	SAM Age 3	SPS Age 3	UWA Age 3
79	0.228	NA	NA	0.041
80	0.296	NA	NA	0.042
81	0.295	NA	0.091	0.032
82	0.155	0.107	0.067	0.022
83	0.319	NA	0.030	0.034
84	0.389	NA	0.058	0.054
85	0.164	NA	NA	0.031
86	0.240	NA	NA	0.024
87	0.151	NA	0.065	0.035
88	0.201	0.054	0.015	NA
89	0.193	0.071	0.019	NA
90	0.188	0.050	0.018	NA
91	0.218	0.137	0.015	NA
Base	0.244	0.107	0.079	0.035

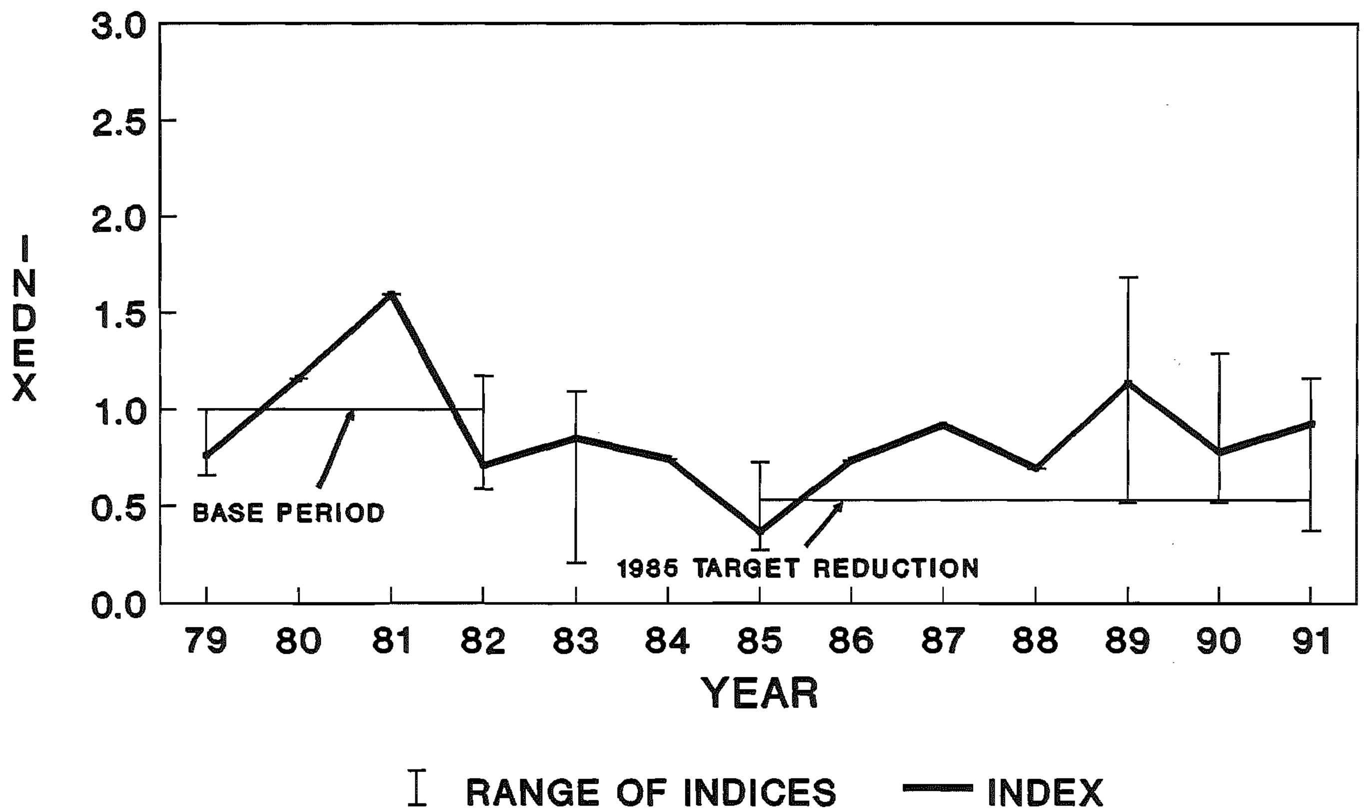
TOTAL MORTALITY EXPLOITATION RATE INDEX

Year	BQR Age 3	SAM Age 3	SPS Age 3	UWA Age 3	Fishery
79	0.936	NA	NA	1.181	0.967
80	1.215	NA	NA	1.231	1.217
81	1.211	NA	1.155	0.939	1.172
82	0.638	1.000	0.845	0.650	0.757
83	1.308	NA	0.385	0.989	1.073
84	1.595	NA	0.737	1.558	1.402
85	0.675	NA	NA	0.910	0.704
86	0.984	NA	NA	0.690	0.947
87	0.619	NA	0.820	1.003	0.700
88	0.826	0.501	0.195	NA	0.629
89	0.791	0.663	0.239	NA	0.658
90	0.772	0.468	0.231	NA	0.597
91	0.894	1.284	0.185	NA	0.861

Stock Identifiers

BQR = BIG QUALICUM
SAM = SAMISH FALL FING
SPS = SO SOUND FALL FING
UWA = U OF W FALL ACCEL

STRAIT OF GEORGIA TROLL & SPORT
(AGE 4)
FISHERY INDEX



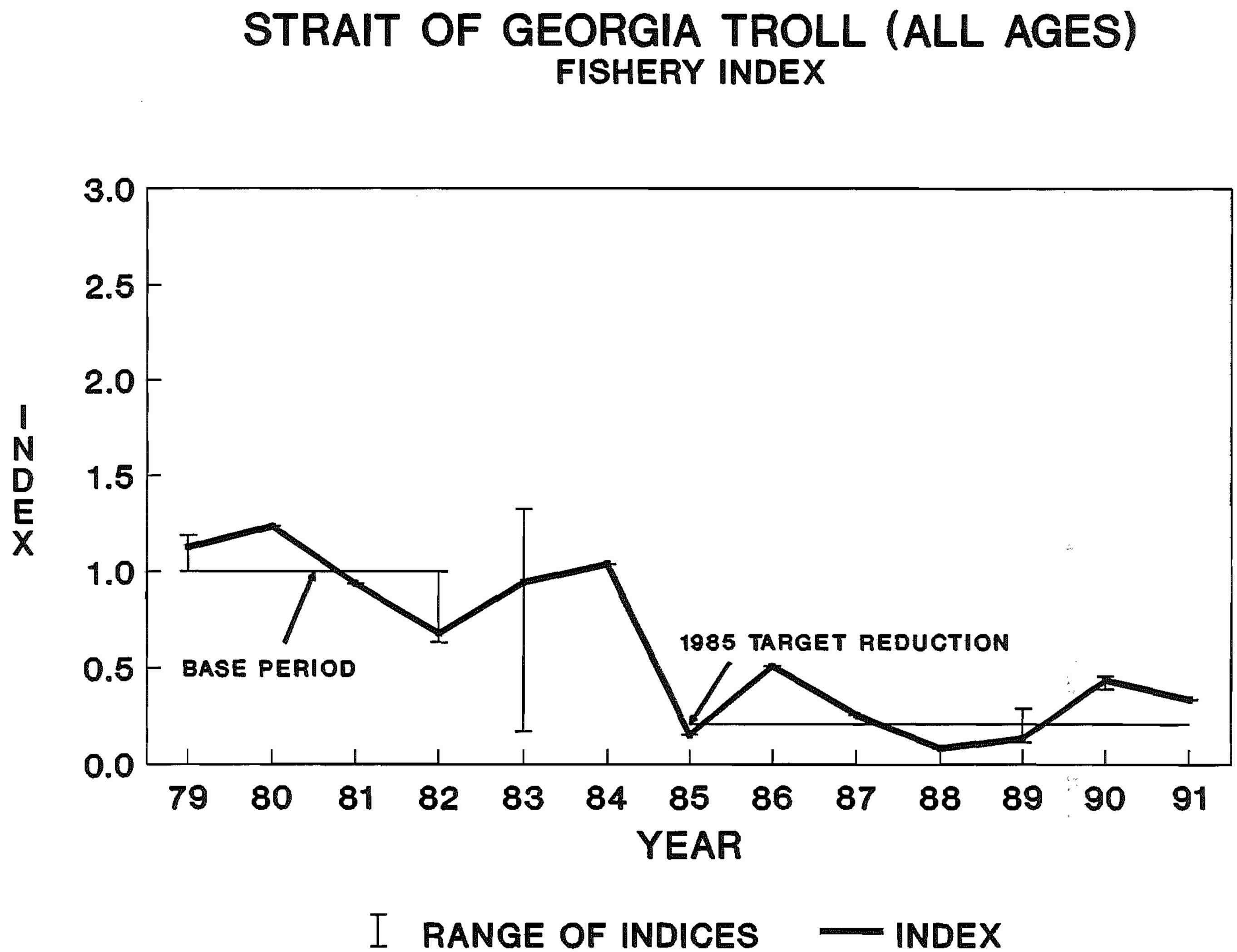
Fishery: Strait of Georgia Troll and Sport (Age 4)

TOTAL MORTALITY EXPL RATES			
	BQR	SAM	SPS
Year	Age 4	Age 4	Age 4
79	0.179	0.094	0.060
80	0.316	NA	NA
81	0.433	NA	NA
82	0.160	NA	0.085
83	0.256	0.103	0.015
84	NA	NA	0.054
85	0.074	NA	0.053
86	0.200	NA	NA
87	0.250	NA	NA
88	0.189	NA	NA
89	0.302	0.158	0.037
90	0.183	0.122	0.038
91	0.316	0.062	0.027
Base	0.272	0.094	0.073

TOTAL MORTALITY EXPL RATE INDEX				
	BQR	SAM	SPS	
Year	Age 4	Age 4	Age 4	Fishery
79	0.660	1.000	0.828	0.761
80	1.161	NA	NA	1.161
81	1.591	NA	NA	1.591
82	0.588	NA	1.172	0.711
83	0.940	1.095	0.204	0.851
84	NA	NA	0.743	0.743
85	0.271	NA	0.729	0.367
86	0.736	NA	NA	0.736
87	0.918	NA	NA	0.918
88	0.696	NA	NA	0.696
89	1.109	1.682	0.514	1.133
90	0.672	1.291	0.519	0.779
91	1.161	0.660	0.373	0.923

Stock Identifiers

BQR = BIG QUALICUM
SAM = SAMISH FALL FING
SPS = SO SOUND FALL FING



STRAIT OF GEORGIA TROLL (ALL AGES)
FISHERY INDEX
INDEX
3.0
2.5
2.0
1.5
1.0
0.5
0.0
BASE PERIOD
1985 TARGET REDUCTION
79
80
81
82
83
84
85
86
87
88
89
90
91
YEAR
RANGE OF INDICES
INDEX

Fishery: Strait of Georgia Troll (All Ages)

TOTAL MORTALITY EXPL RATES

Year	BQR Age 3	SAM Age 3	SAM Age 4
79	0.143	NA	0.059
80	0.149	NA	NA
81	0.113	NA	NA
82	0.076	0.017	NA
83	0.159	NA	0.010
84	0.125	NA	NA
85	0.019	NA	NA
86	0.061	NA	NA
87	0.031	NA	NA
88	0.010	NA	NA
89	0.013	0.005	NA
90	0.055	NA	0.023
91	0.040	NA	NA
Base	0.120	0.017	0.059

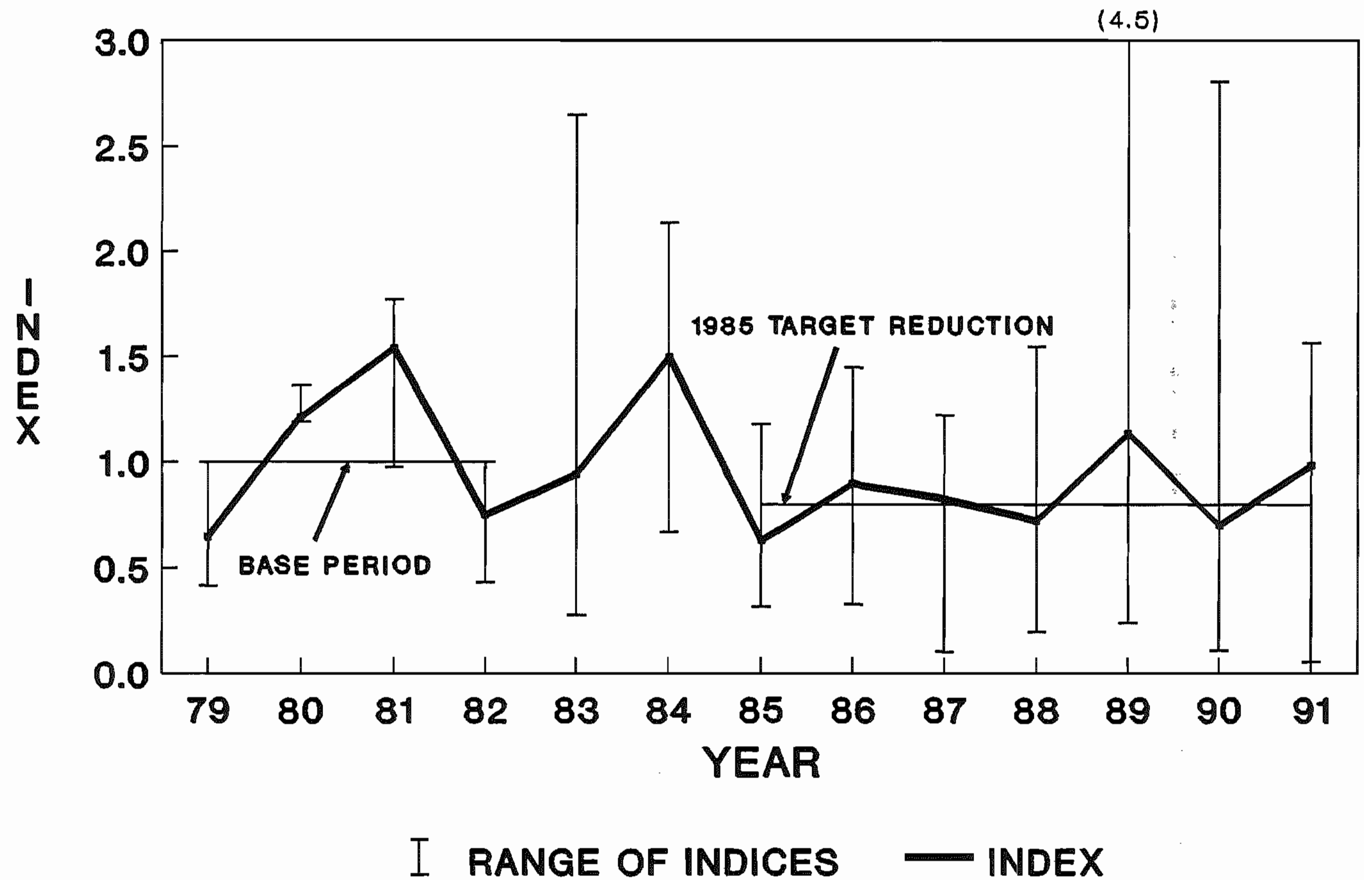
TOTAL MORTALITY EXPL RATE INDEX

Year	BQR Age 3	SAM Age 3	SAM Age 4	Fishery
79	1.190	NA	1.000	1.128
80	1.238	NA	NA	1.238
81	0.937	NA	NA	0.937
82	0.634	1.000	NA	0.680
83	1.327	NA	0.169	0.945
84	1.038	NA	NA	1.038
85	0.154	NA	NA	0.154
86	0.507	NA	NA	0.507
87	0.256	NA	NA	0.256
88	0.082	NA	NA	0.082
89	0.111	0.289	NA	0.134
90	0.457	NA	0.389	0.435
91	0.335	NA	NA	0.335

Stock Identifiers

BQR = BIG QUALICUM
SAM = SAMISH FALL FING

STRAIT OF GEORGIA SPORT (ALL AGES)
FISHERY INDEX



Fishery: Strait of Georgia Sport (All Ages)

TOTAL MORTALITY EXPLOITATION RATES

Year	BQR Age 3	BQR Age 4	QUI Age 5	SAM Age 3	SAM Age 4	SPS Age 3	SPS Age 4	UWA Age 3
79	0.085	0.119	0.060	NA	0.035	NA	0.051	0.026
80	0.147	0.244	NA	NA	NA	NA	NA	0.040
81	0.183	0.356	0.228	NA	NA	0.085	NA	0.028
82	0.079	0.087	0.143	0.090	NA	0.062	0.051	0.022
83	0.159	0.214	0.086	NA	0.093	0.029	0.014	0.024
84	0.264	NA	NA	NA	NA	0.049	0.054	0.048
85	0.146	0.074	0.045	NA	NA	NA	0.049	0.031
86	0.179	0.197	0.047	NA	NA	NA	NA	0.024
87	0.120	0.246	0.015	NA	NA	0.065	NA	0.025
88	0.191	0.149	0.049	0.052	NA	0.015	NA	NA
89	0.179	0.302	0.060	0.066	0.158	0.018	0.033	NA
90	0.133	0.183	0.016	0.025	0.099	0.014	0.035	NA
91	0.178	0.316	0.008	0.116	0.052	0.011	0.027	NA
Base	0.124	0.201	0.144	0.090	0.035	0.073	0.051	0.029

TOTAL MORTALITY EXPLOITATION RATE INDEX

Year	BQR Age 3	BQR Age 4	QUI Age 5	SAM Age 3	SAM Age 4	SPS Age 3	SPS Age 4	UWA Age 3	Fishery
79	0.689	0.590	0.417	NA	1.000	NA	1.001	0.904	0.645
80	1.193	1.210	NA	NA	NA	NA	NA	1.366	1.216
81	1.477	1.770	1.586	NA	NA	1.156	NA	0.977	1.541
82	0.641	0.431	0.996	1.000	NA	0.844	0.999	0.753	0.750
83	1.291	1.064	0.596	NA	2.652	0.393	0.277	0.818	0.942
84	2.138	NA	NA	NA	NA	0.669	1.052	1.659	1.498
85	1.181	0.366	0.315	NA	NA	NA	0.954	1.082	0.629
86	1.448	0.978	0.328	NA	NA	NA	NA	0.820	0.898
87	0.972	1.223	0.103	NA	NA	0.885	NA	0.878	0.826
88	1.549	0.738	0.340	0.585	NA	0.199	NA	NA	0.722
89	1.452	1.498	0.421	0.735	4.511	0.239	0.646	NA	1.137
90	1.078	0.907	0.110	0.274	2.809	0.187	0.673	NA	0.701
91	1.439	1.568	0.054	1.290	1.484	0.152	0.528	NA	0.985

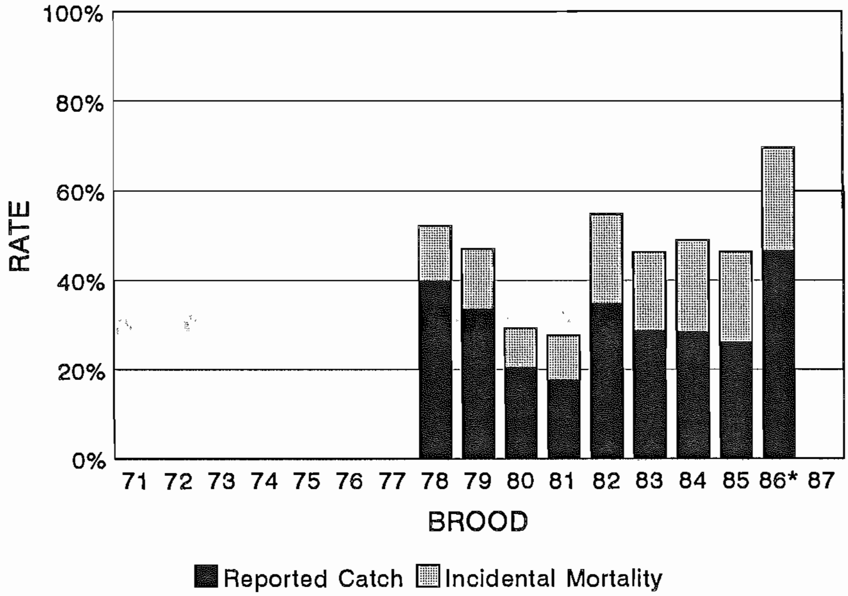
Stock Identifiers

BQR = BIG QUALICUM
QUI = QUINSAM
SAM = SAMISH FALL FING
SPS = SO SOUND FALL FING
UWA = U OF W FALL ACCEL

APPENDIX E

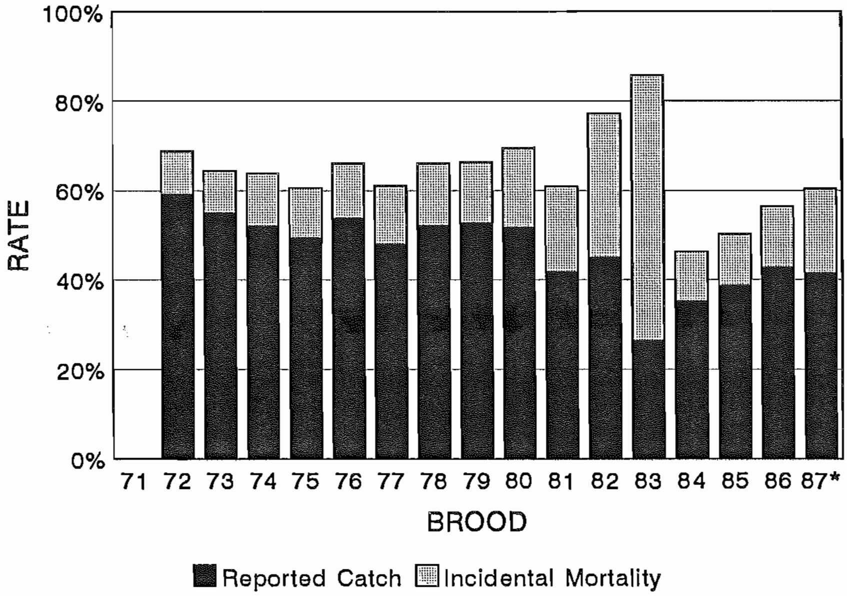
Brood Year Ocean Exploitation Rate Figures

ALASKA SPRING
BROOD YEAR OCEAN EXPLOITATION RATE



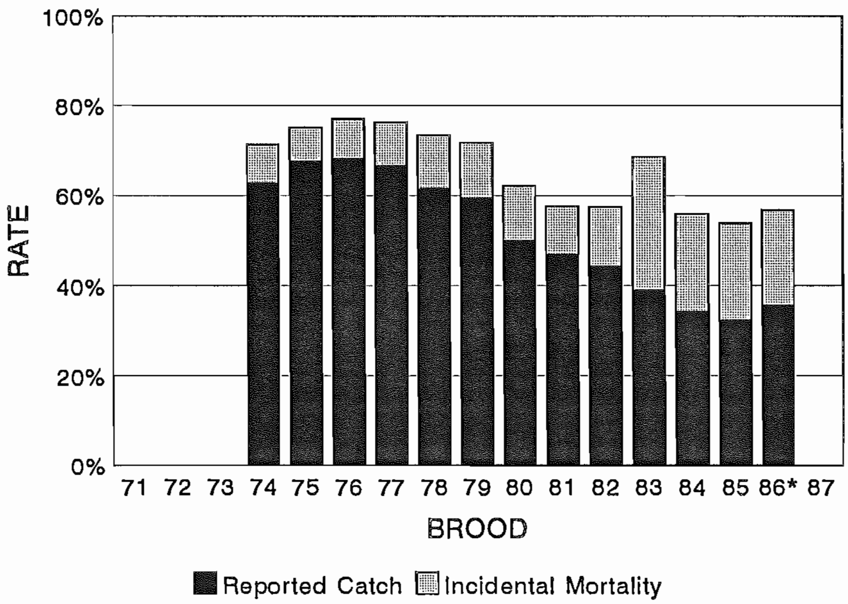
*1986 Brood Year is incomplete

ROBERTSON CREEK
BROOD YEAR OCEAN EXPLOITATION RATE



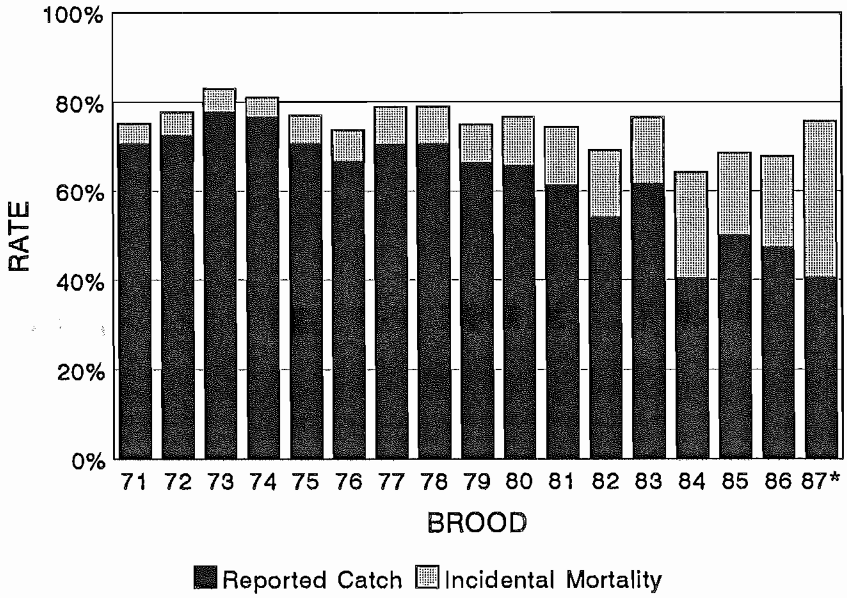
*1987 Brood Year is incomplete

QUINSAM
BROOD YEAR OCEAN EXPLOITATION RATE



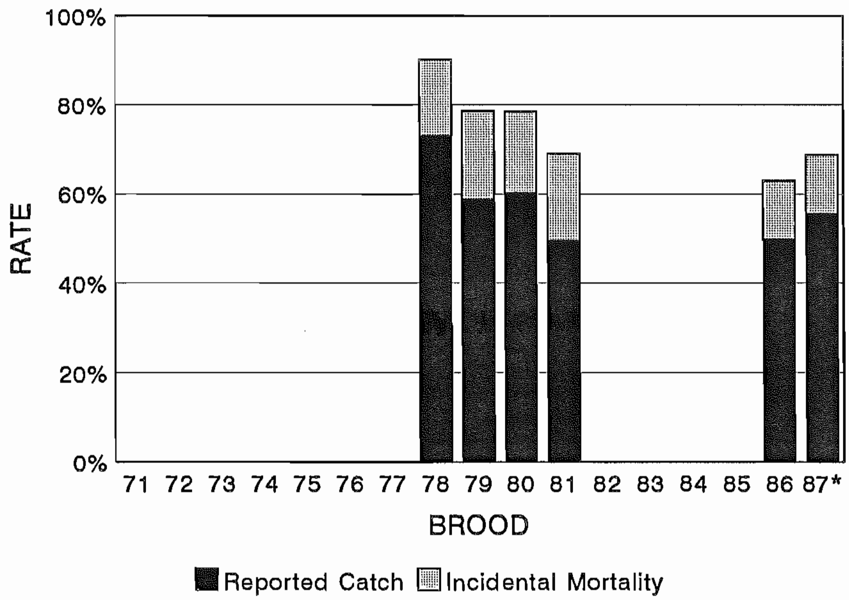
*1986 Brood Year is incomplete

BIG QUALICAM
BROOD YEAR OCEAN EXPLOITATION RATE



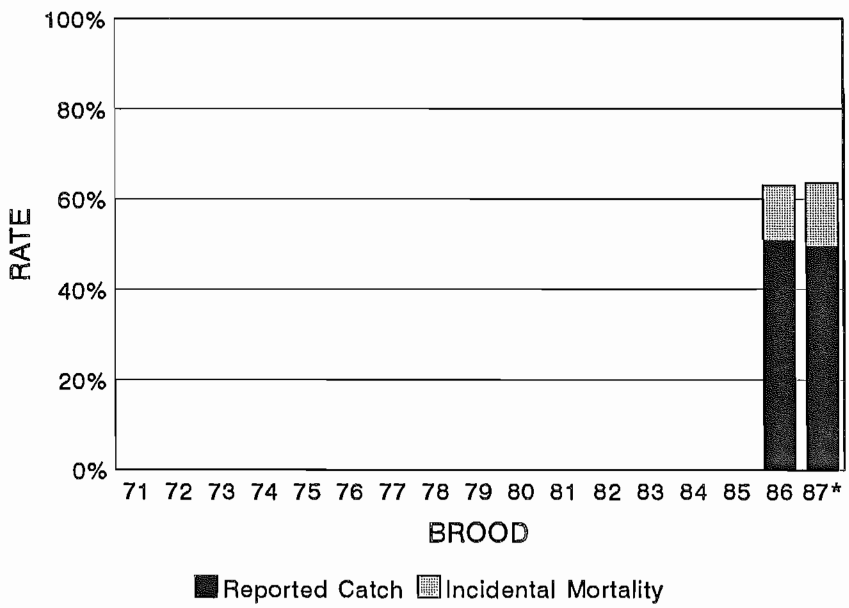
*1987 Brood Year is incomplete

SOUTH PUGET SOUND FALL YEARLING
BROOD YEAR OCEAN EXPLOITATION RATE



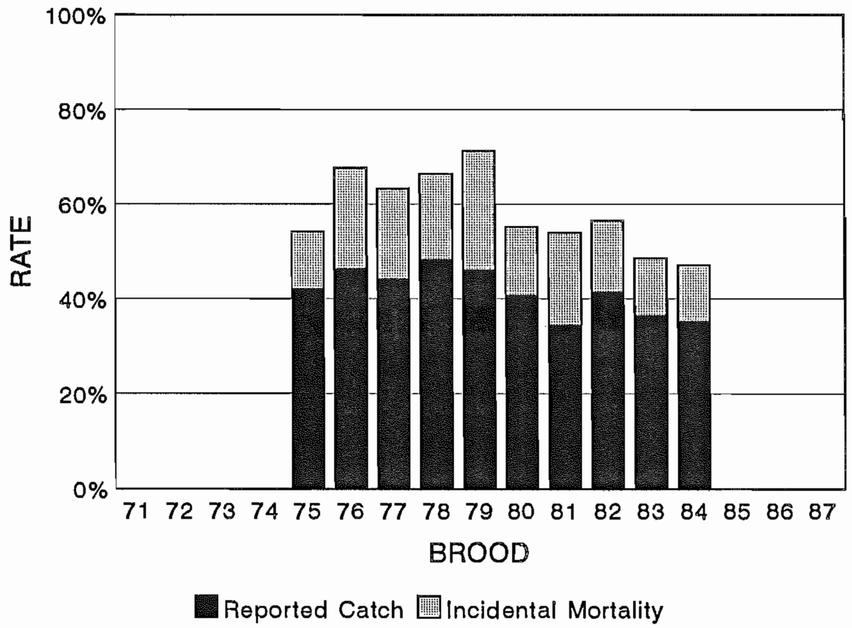
*1987 Brood Year is incomplete

SQUAXIN PENS FALL YEARLING
BROOD YEAR OCEAN EXPLOITATION RATE

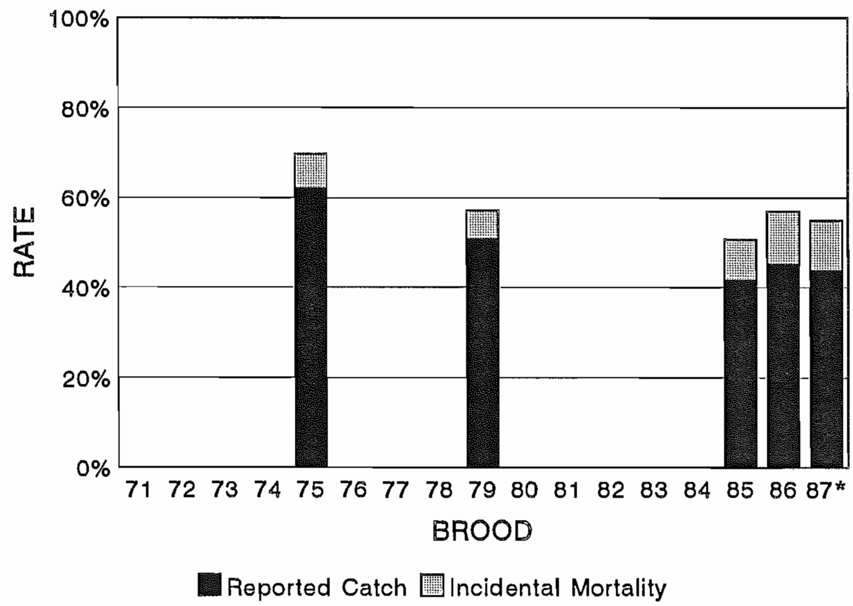


*1987 Brood Year is incomplete

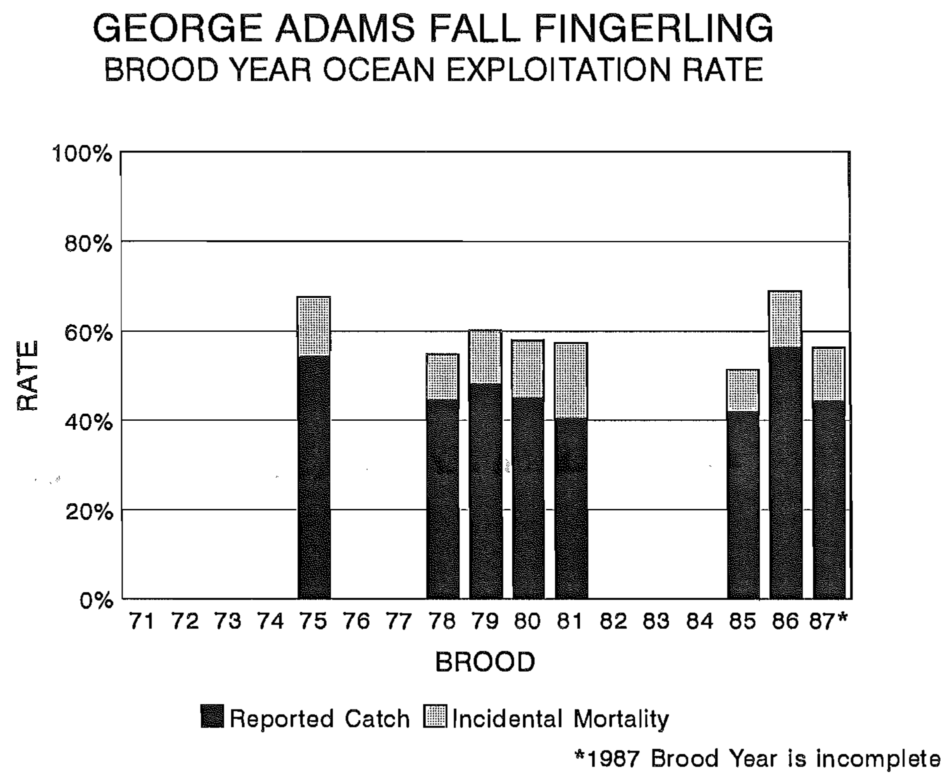
UNIVERSITY OF WASHINGTON ACCELERATED
BROOD YEAR OCEAN EXPLOITATION RATE

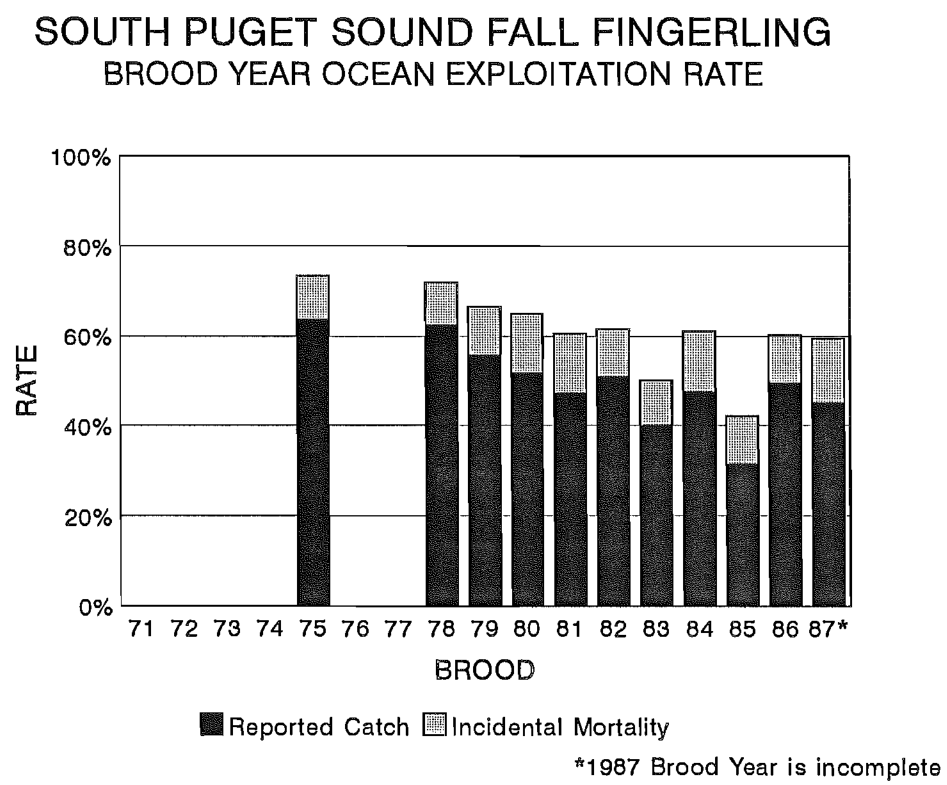


SAMISH FALL FINGERLING
BROOD YEARD OCEAN EXPLOITATION RATE

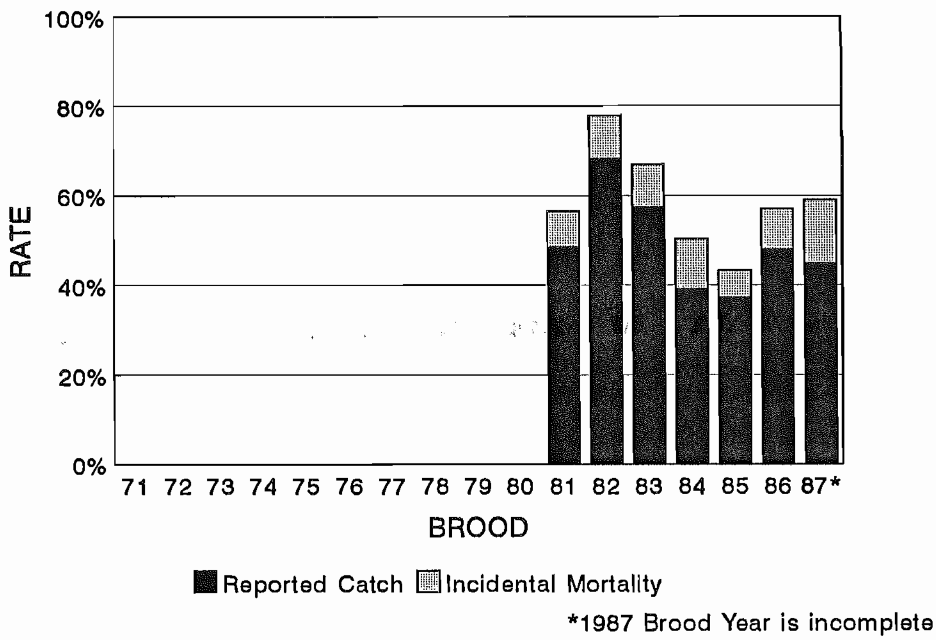


*1987 Brood Year is incomplete

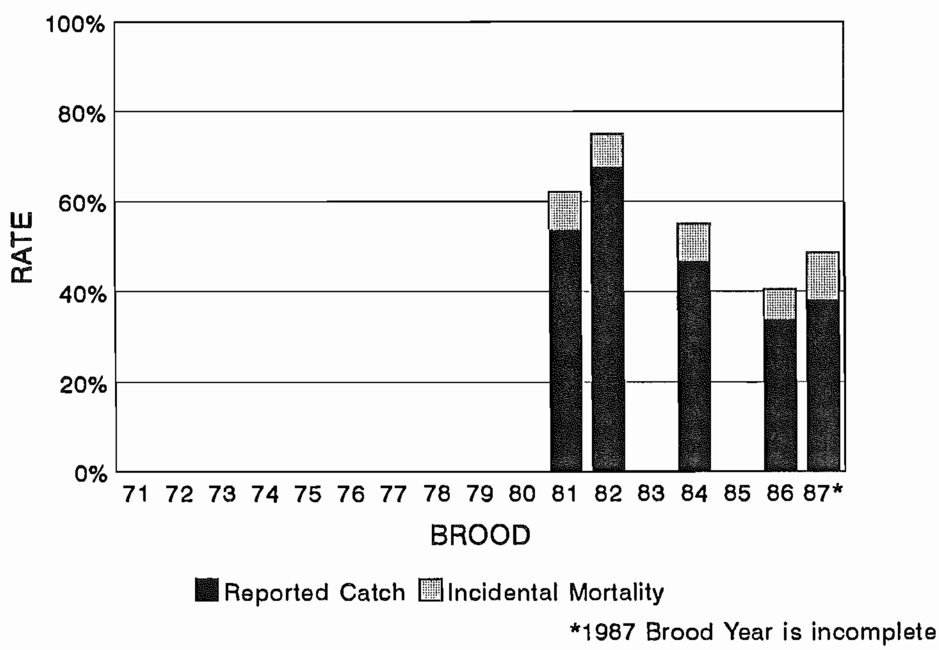

GEORGE ADAMS FALL FINGERLING
BROOD YEAR OCEAN EXPLOITATION RATE
100%
80%
60%
40%
20%
0%
RATE
71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87*
BROOD
Reported Catch
Incidental Mortality
*1987 Brood Year is incomplete


SOUTH PUGET SOUND FALL FINGERLING
BROOD YEAR OCEAN EXPLOITATION RATE
100%
80%
60%
40%
20%
0%
RATE
71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87*
BROOD
Reported Catch
Incidental Mortality
*1987 Brood Year is incomplete

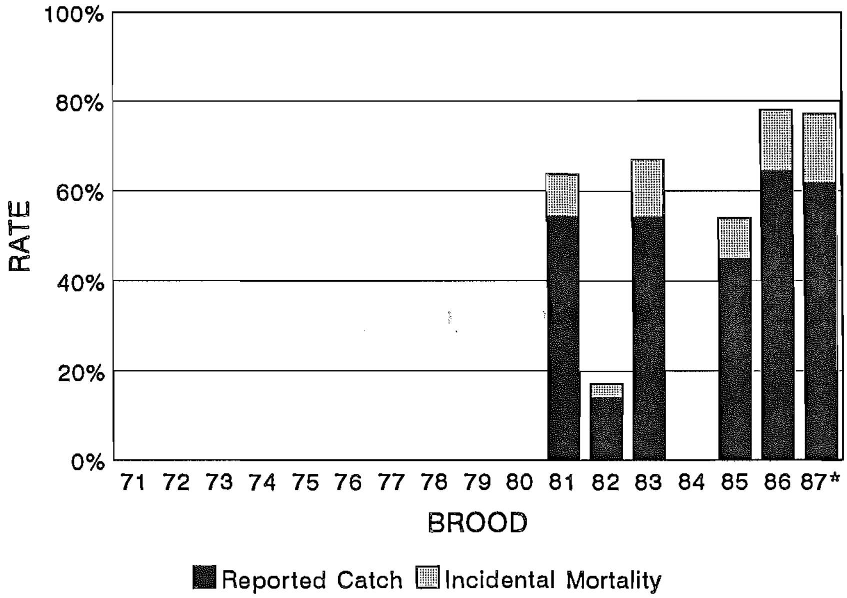
SKAGIT SPRING YEARLING
BROOD YEAR OCEAN EXPLOITATION RATE



NOOKSACK SPRING YEARLING
BROOD YEAR OCEAN EXPLOITATION RATE

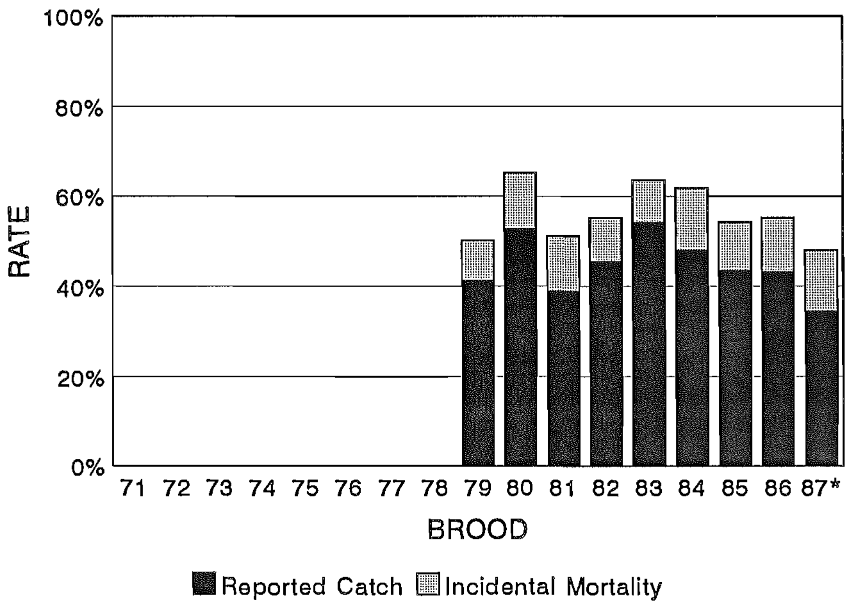


QUILCENE SPRING YEARLING
BROOD YEAR OCEAN EXPLOITATION RATE



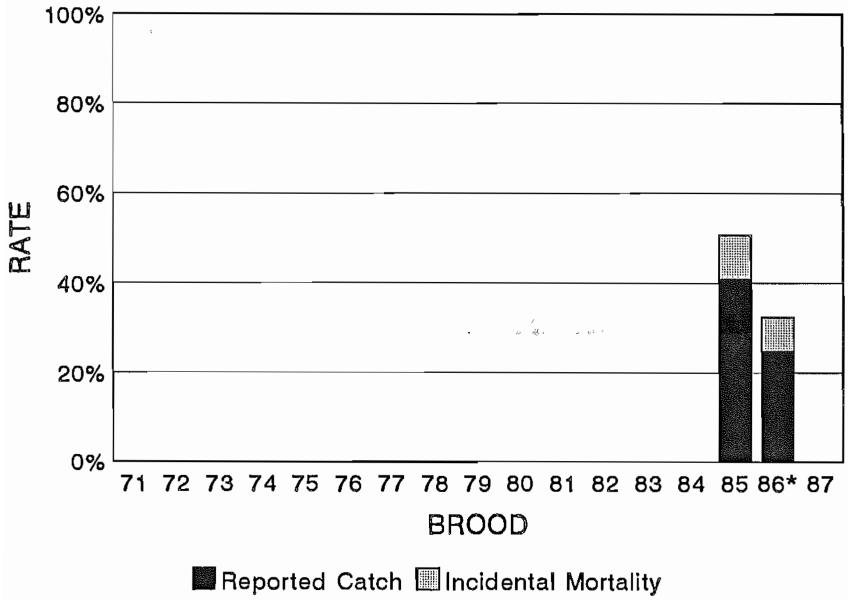
*1987 Brood Year is incomplete

WHITE RIVER SPRING YEARLING
BROOD YEAR OCEAN EXPLOITATION RATE

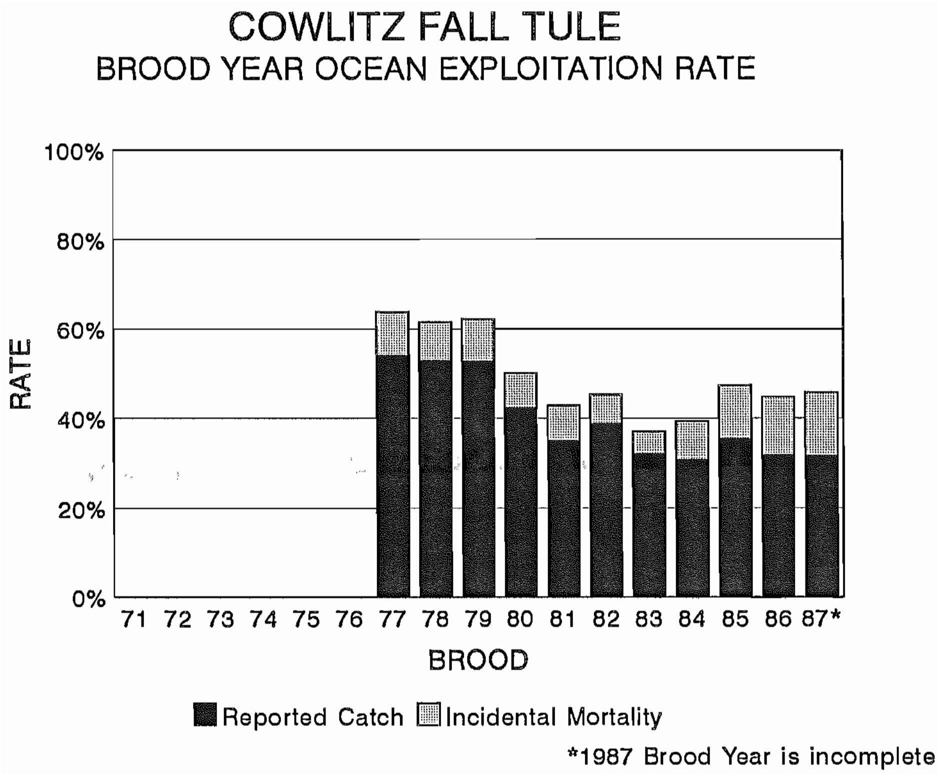


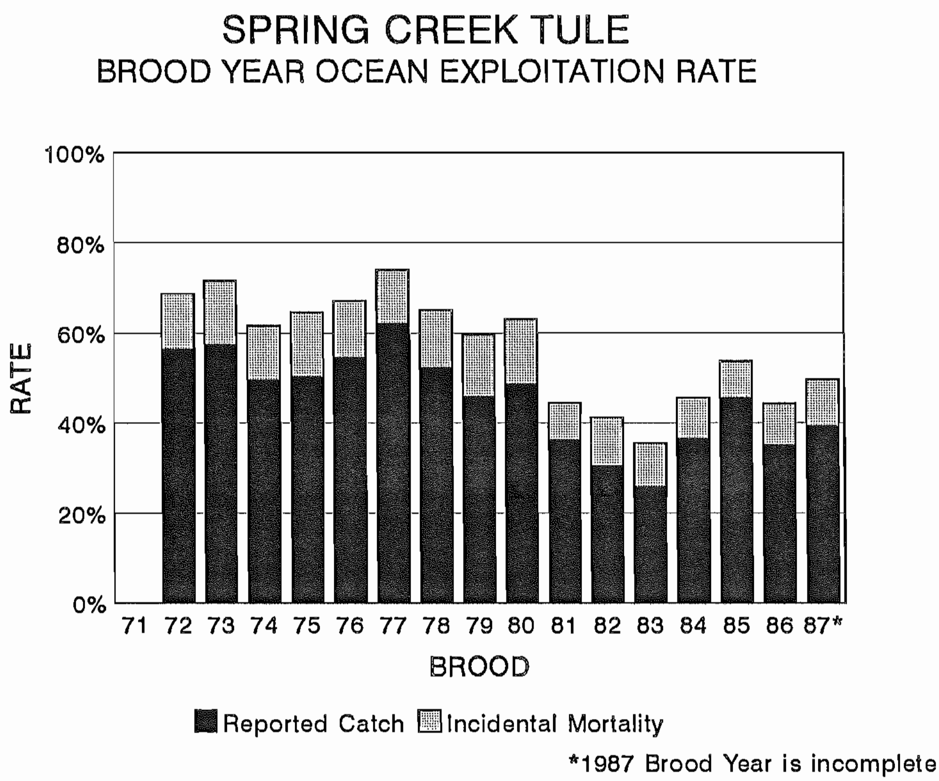
*1987 Brood Year is incomplete

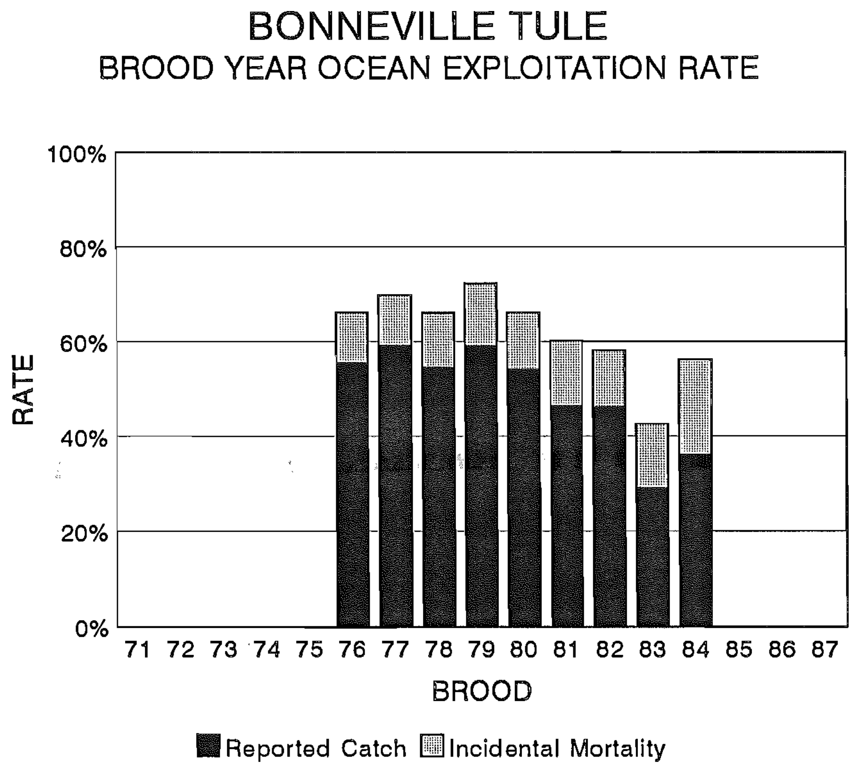
SOOES FALL FINGERLING
BROOD YEAR OCEAN EXPLOITATION RATE

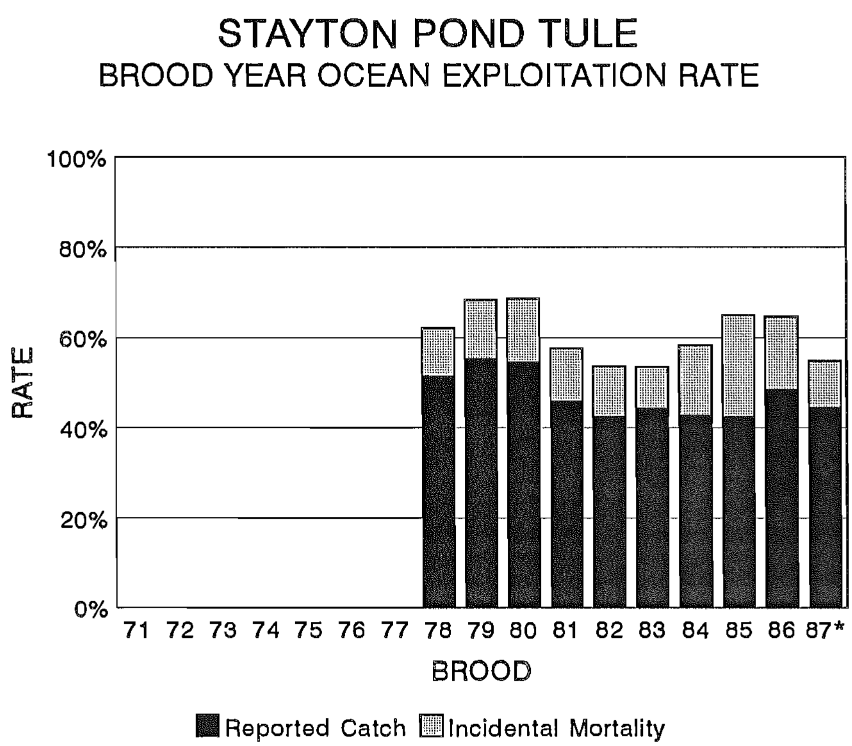


*1986 Brood Year is incomplete


COWLITZ FALL TULE
BROOD YEAR OCEAN EXPLOITATION RATE
100%
80%
60%
40%
20%
0%
RATE
71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87*
BROOD
Reported Catch
Incidental Mortality
*1987 Brood Year is incomplete

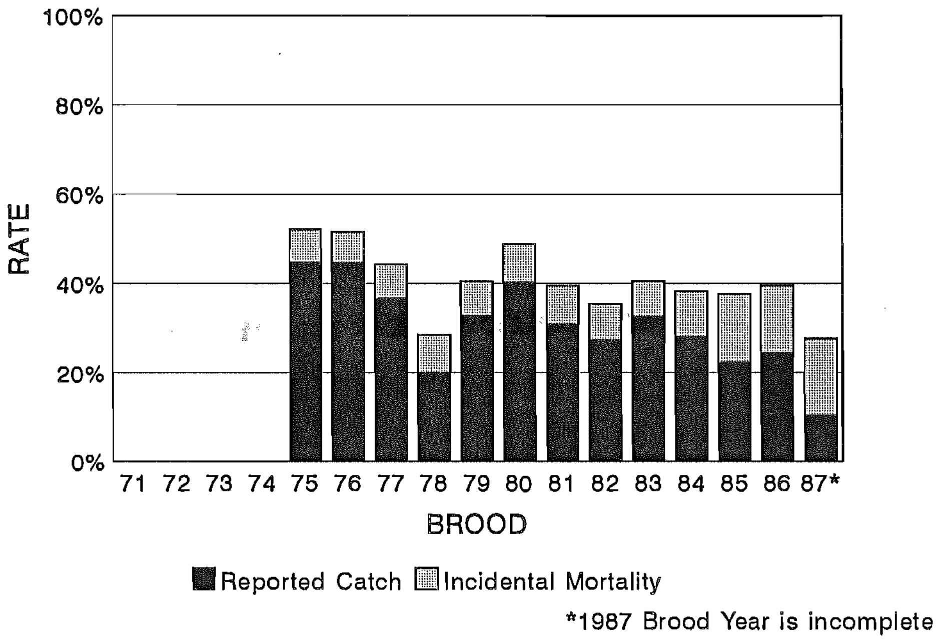

SPRING CREEK TULE
BROOD YEAR OCEAN EXPLOITATION RATE
100%
80%
60%
40%
20%
0%
RATE
71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87*
BROOD
Reported Catch
Incidental Mortality
*1987 Brood Year is incomplete



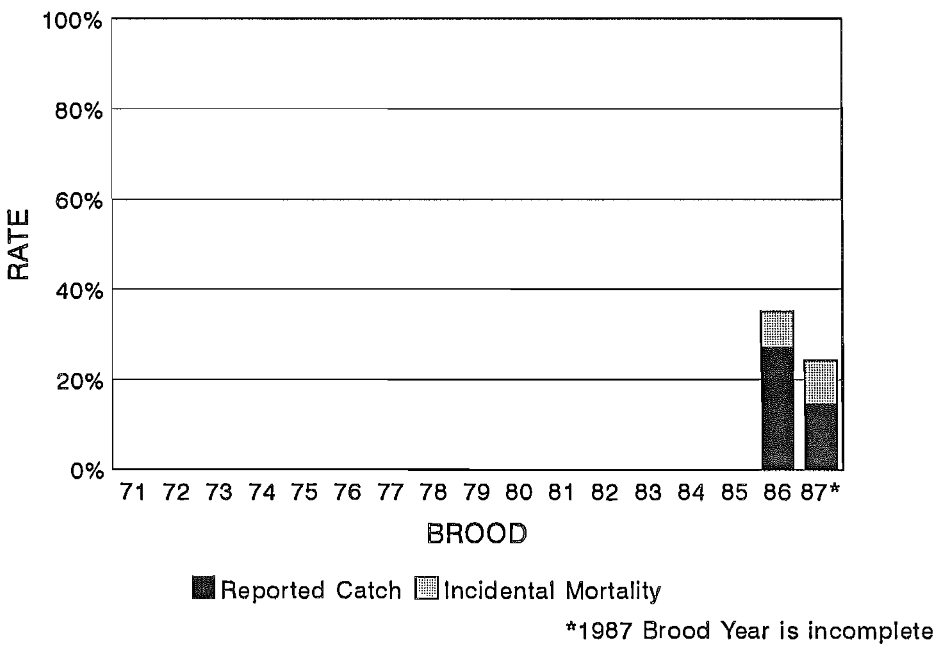


*1987 Brood Year is incomplete

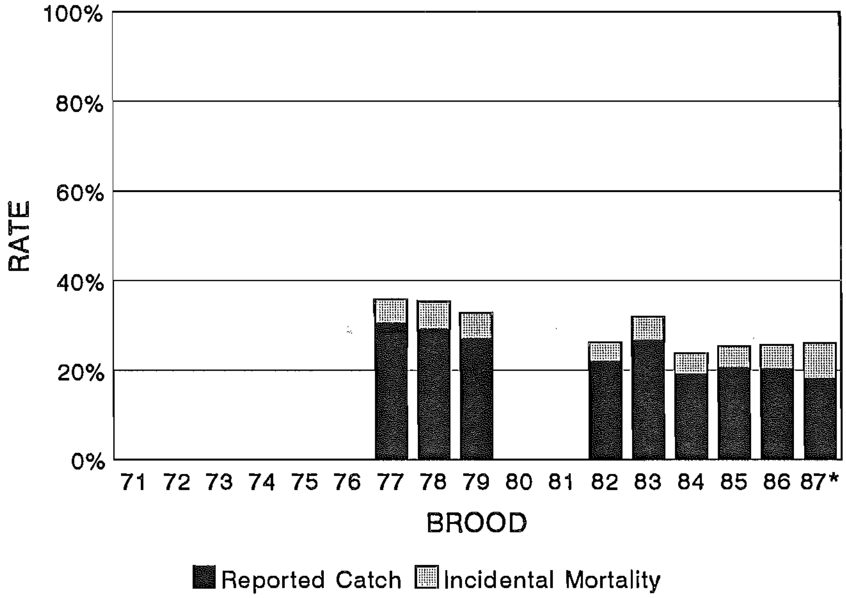
COLUMBIA RIVER UPRIVER BRIGHT
BROOD YEAR OCEAN EXPLOITATION RATE



HANFORD WILD
BROOD YEAR OCEAN EXPLOITATION RATE

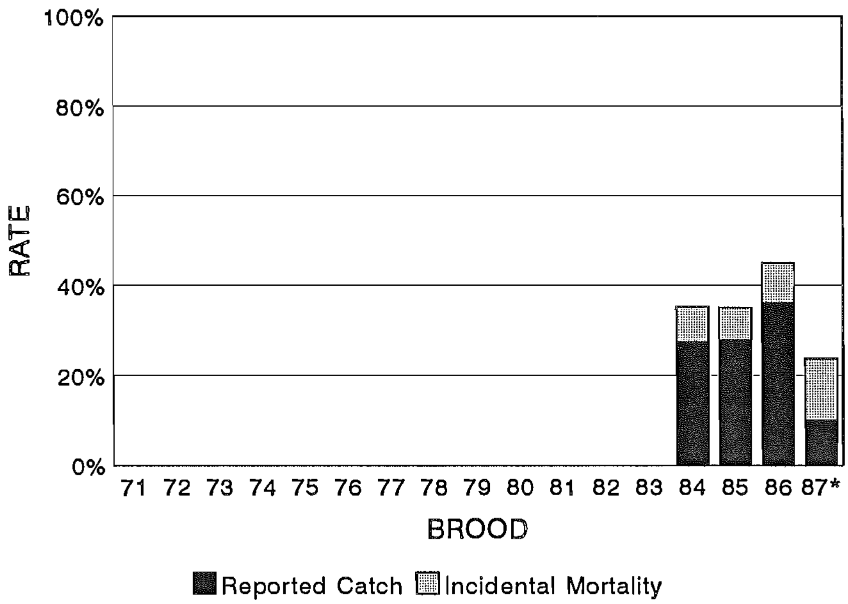


LEWIS RIVER WILD
BROOD YEAR OCEAN EXPLOITATION RATE

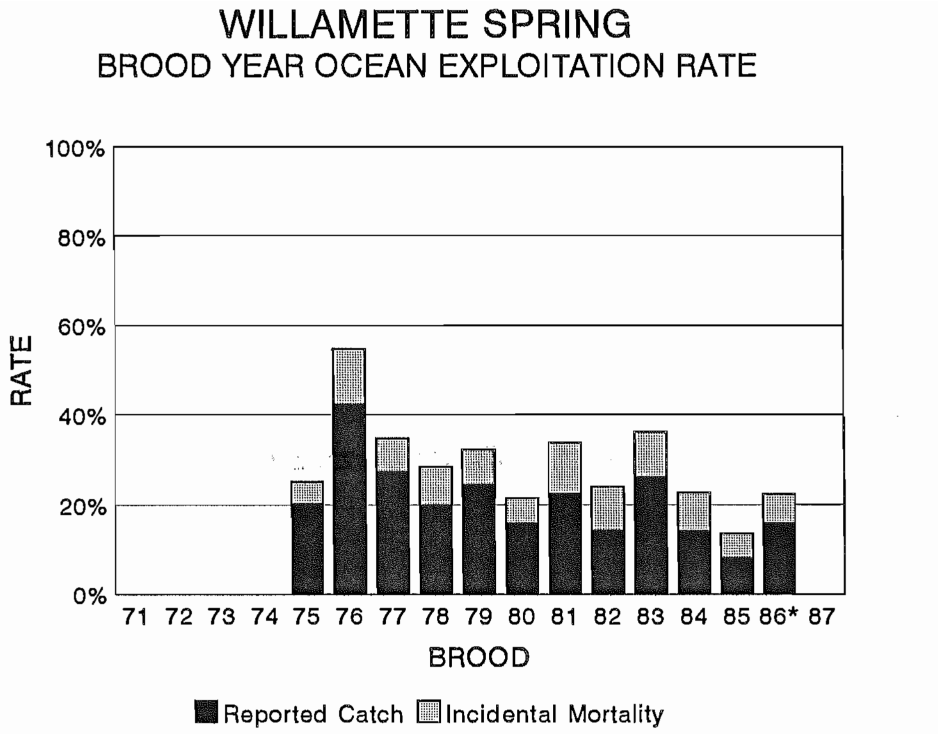


*1987 Brood Year is incomplete

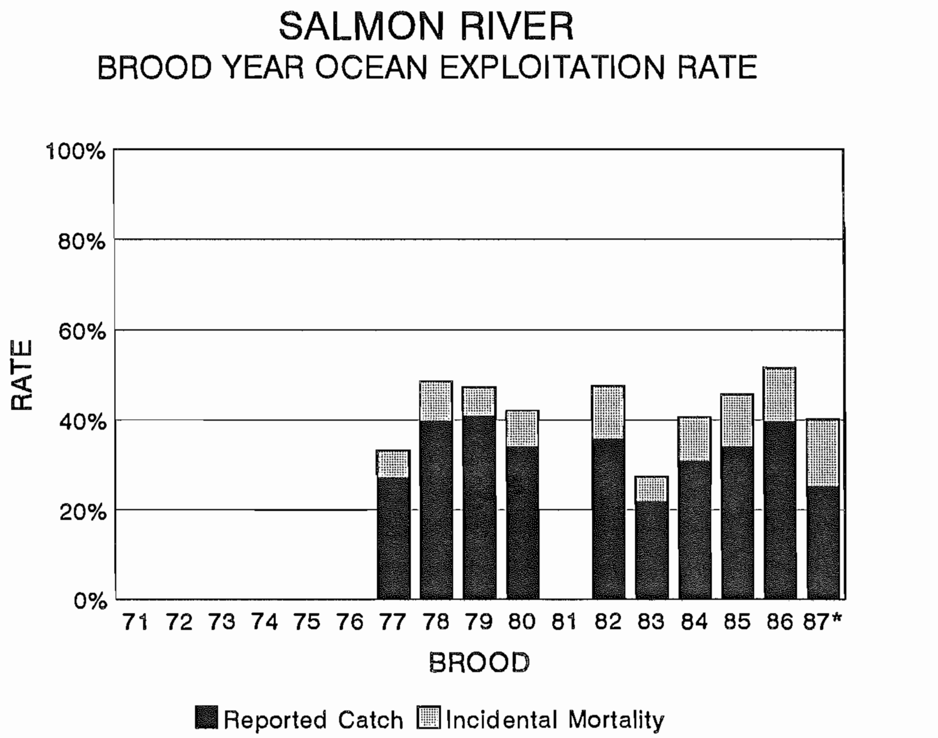
LYONS FERRY
BROOD YEAR OCEAN EXPLOITATION RATE



*1987 Brood Year is incomplete



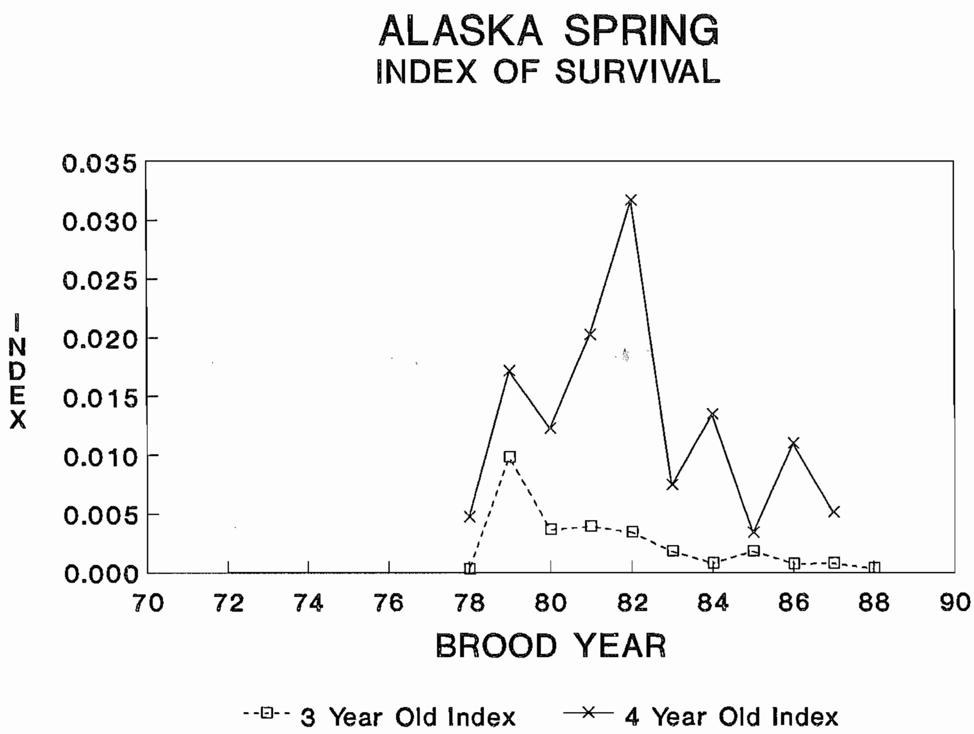
*1986 Brood Year is incomplete

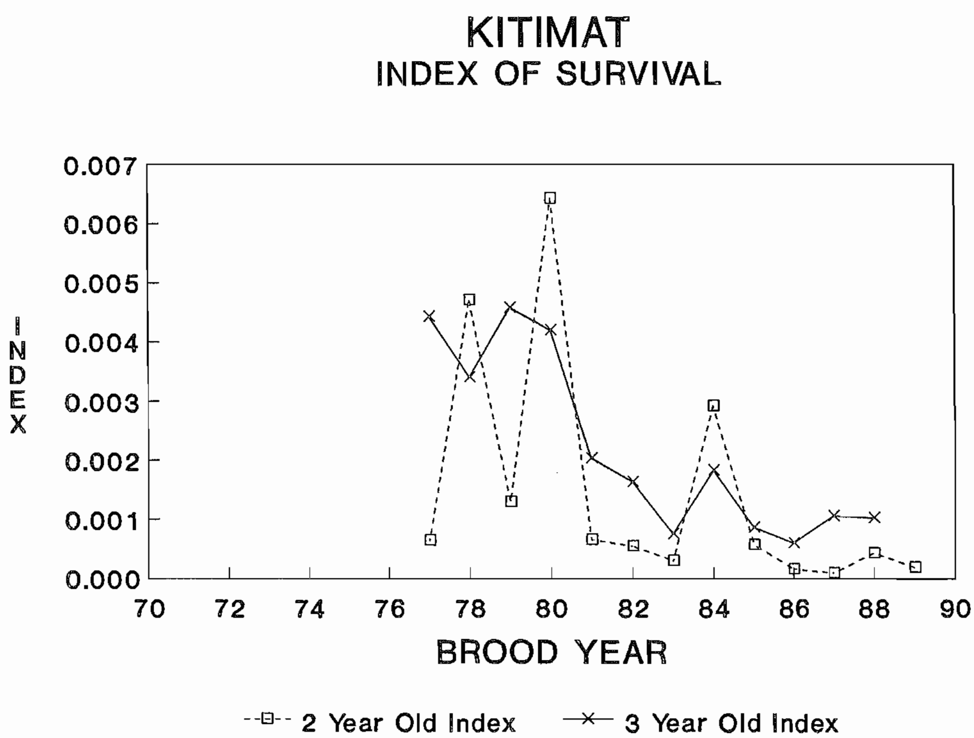


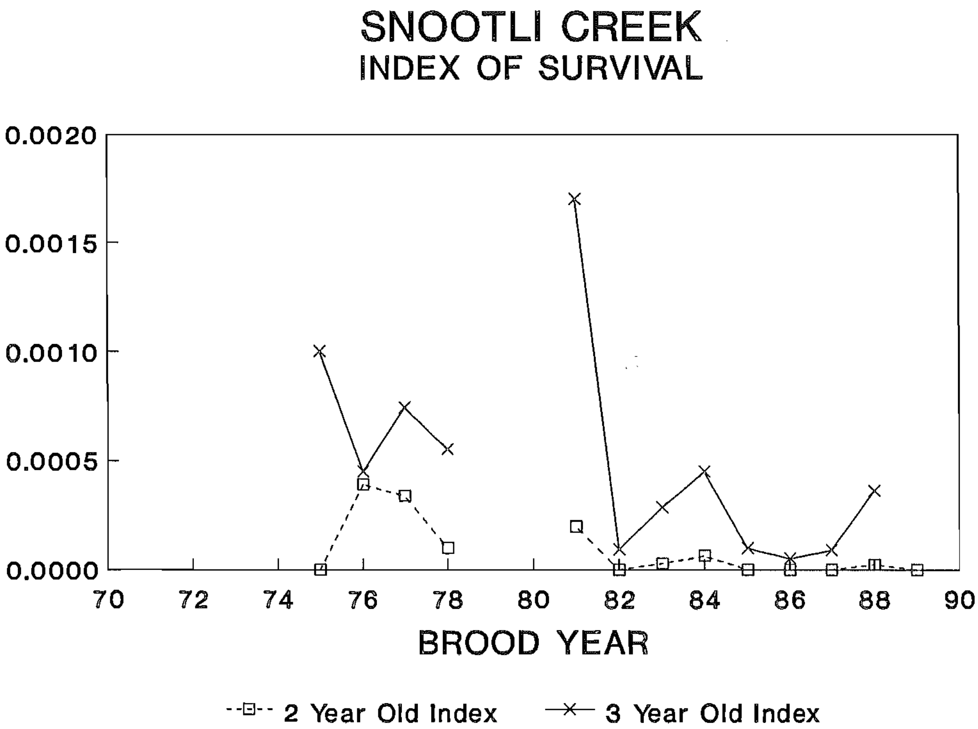
*1987 Brood Year is incomplete

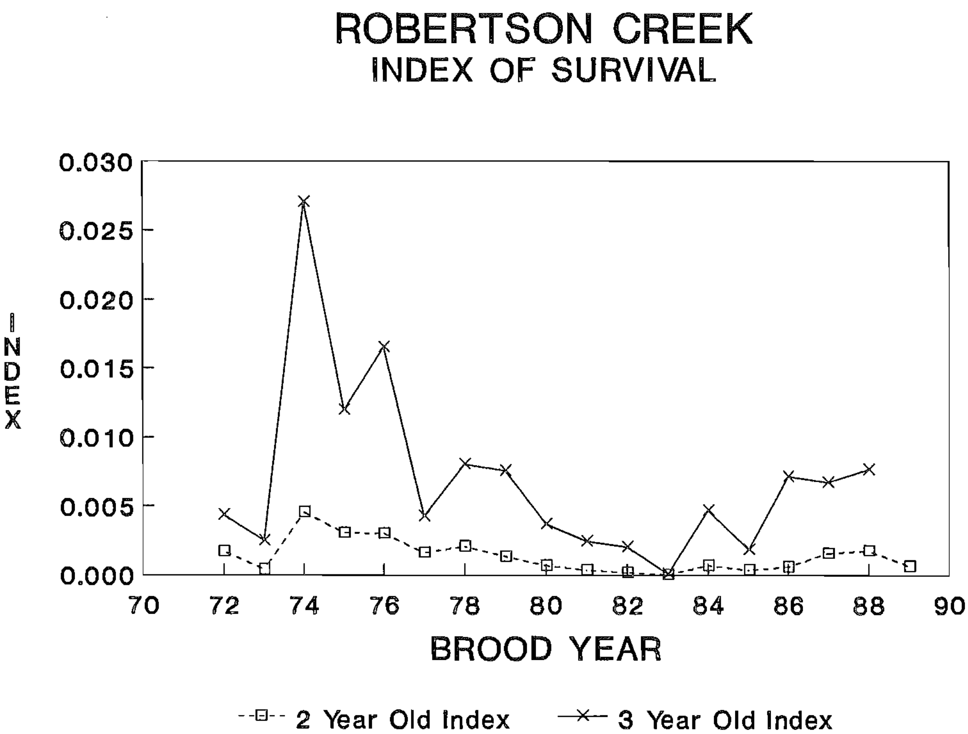
APPENDIX F

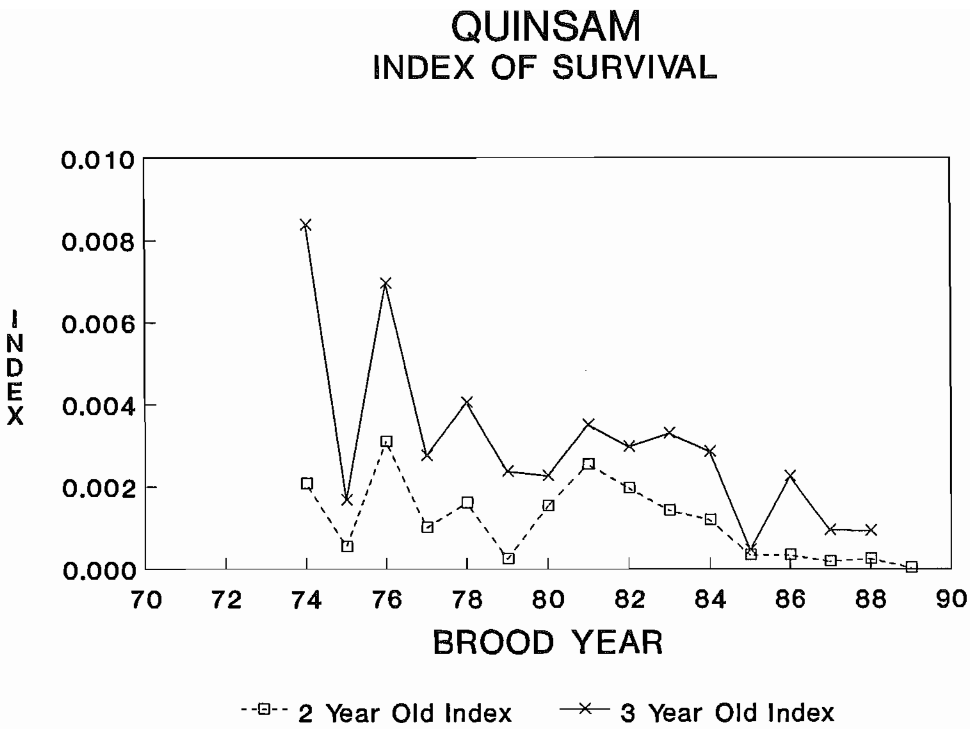
Survival Rate Figures

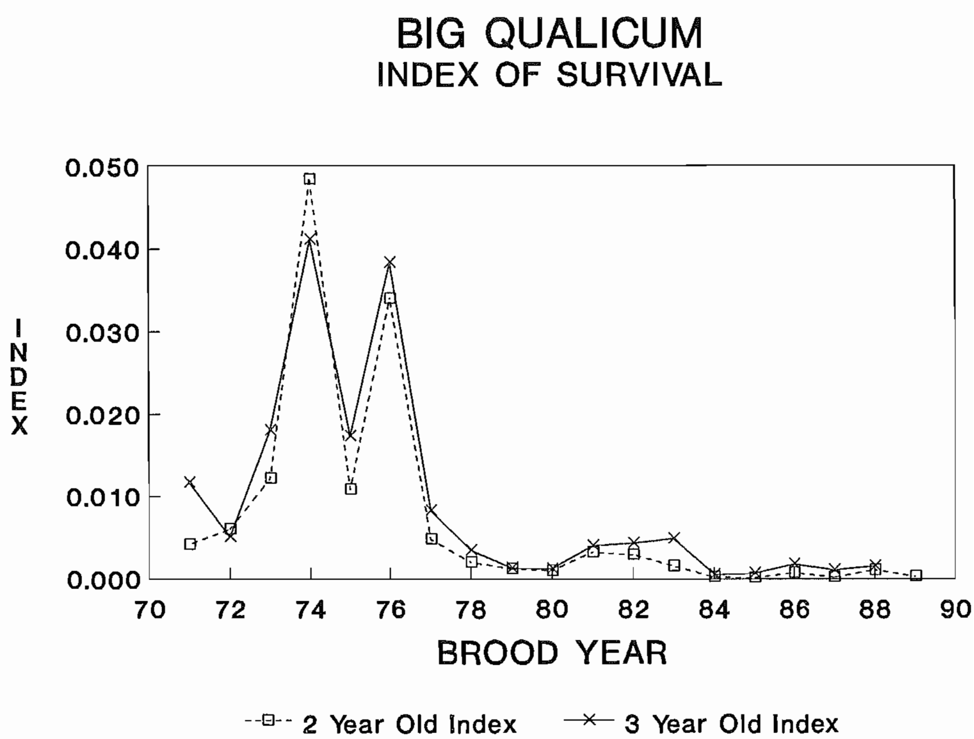

ALASKA SPRING
INDEX OF SURVIVAL
INDEX
0.035
0.030
0.025
0.020
0.015
0.010
0.005
0.000
70
72
74
76
78
80
82
84
86
88
90
BROOD YEAR
3 Year Old Index
4 Year Old Index

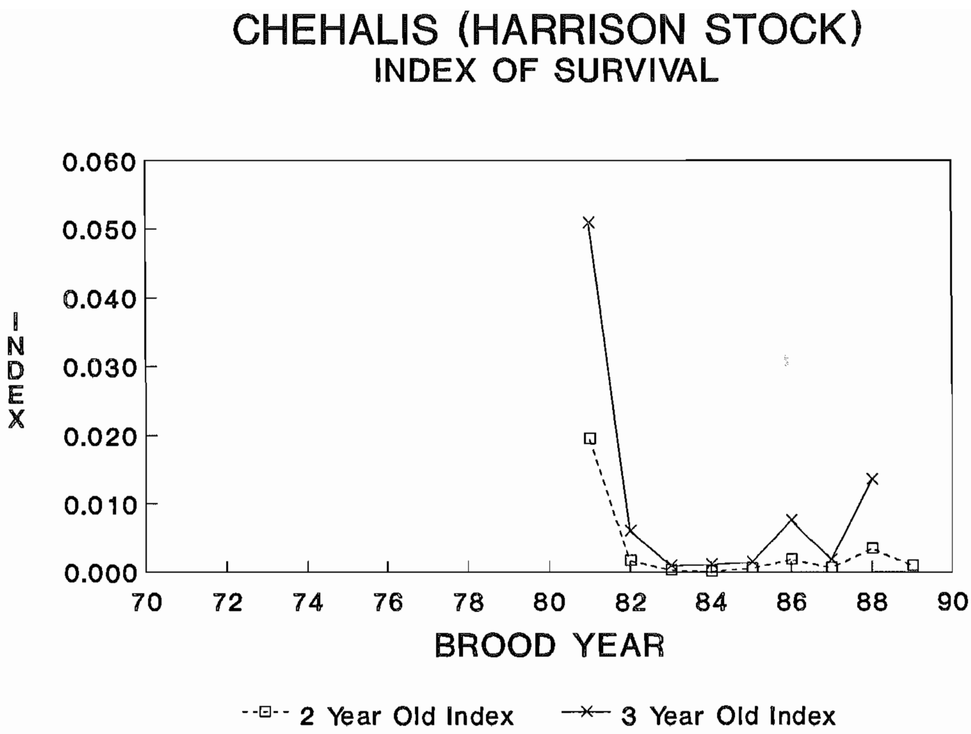

KITIMAT
INDEX OF SURVIVAL
INDEX
0.007
0.006
0.005
0.004
0.003
0.002
0.001
0.000
70
72
74
76
78
80
82
84
86
88
90
BROOD YEAR
2 Year Old Index
3 Year Old Index

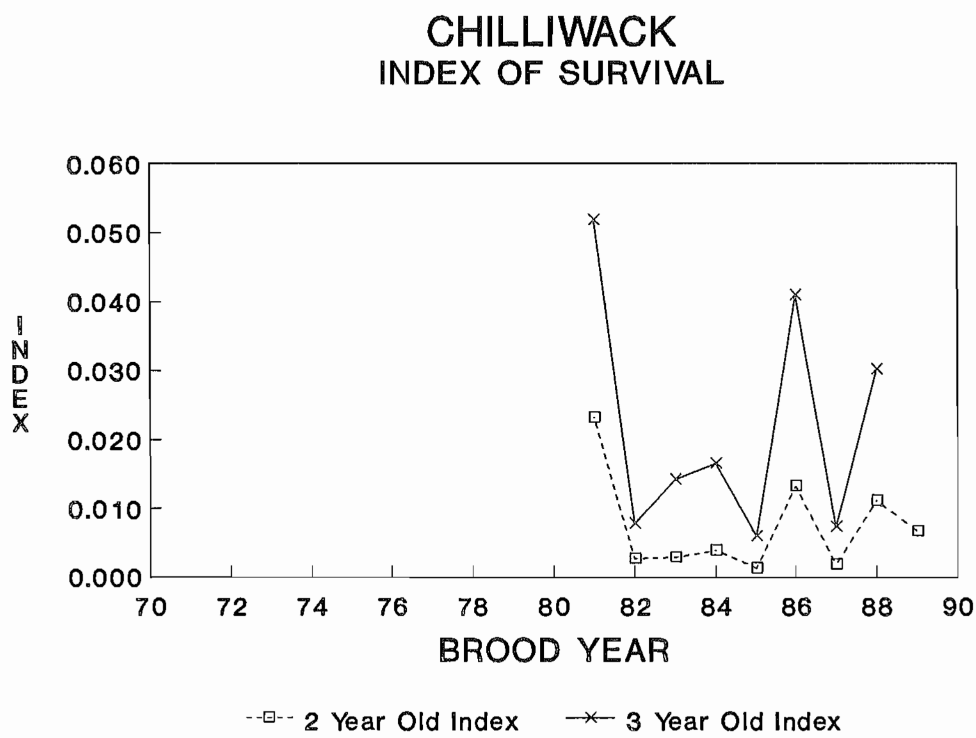

SNOOTLI CREEK
INDEX OF SURVIVAL
0.0020
0.0015
0.0010
0.0005
0.0000
70
72
74
76
78
80
82
84
86
88
90
BROOD YEAR
2 Year Old Index
3 Year Old Index

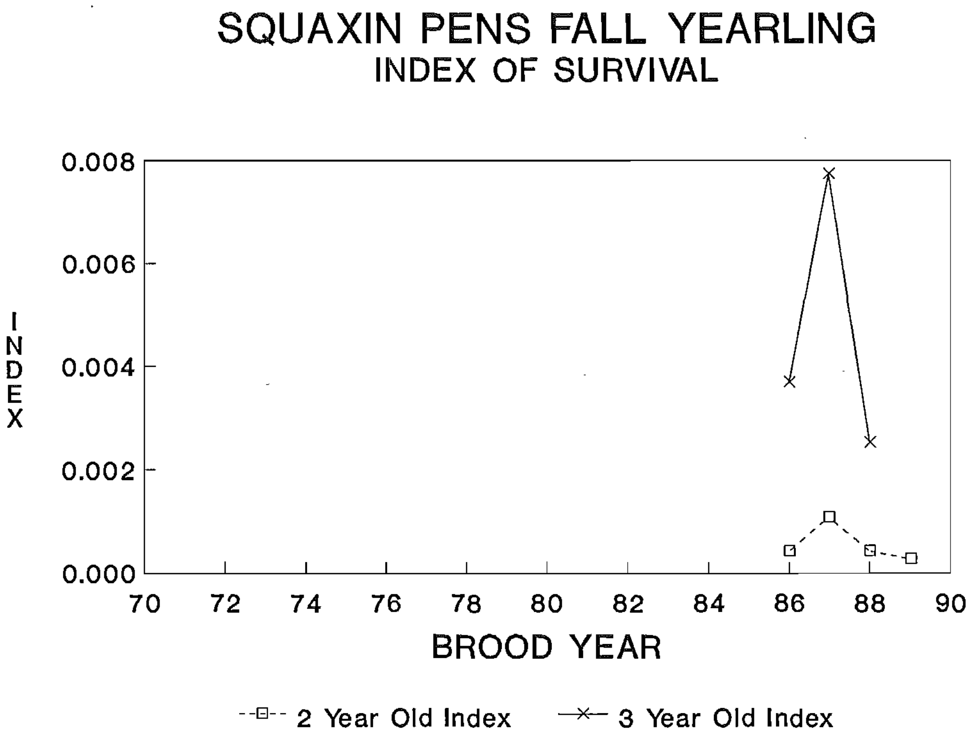

ROBERTSON CREEK
INDEX OF SURVIVAL
INDEX
0.030
0.025
0.020
0.015
0.010
0.005
0.000
70
72
74
76
78
80
82
84
86
88
90
BROOD YEAR
2 Year Old Index
3 Year Old Index


QUINSAM
INDEX OF SURVIVAL
0.010
0.008
0.006
0.004
0.002
0.000
INDEX
70
72
74
76
78
80
82
84
86
88
90
BROOD YEAR
2 Year Old Index
3 Year Old Index

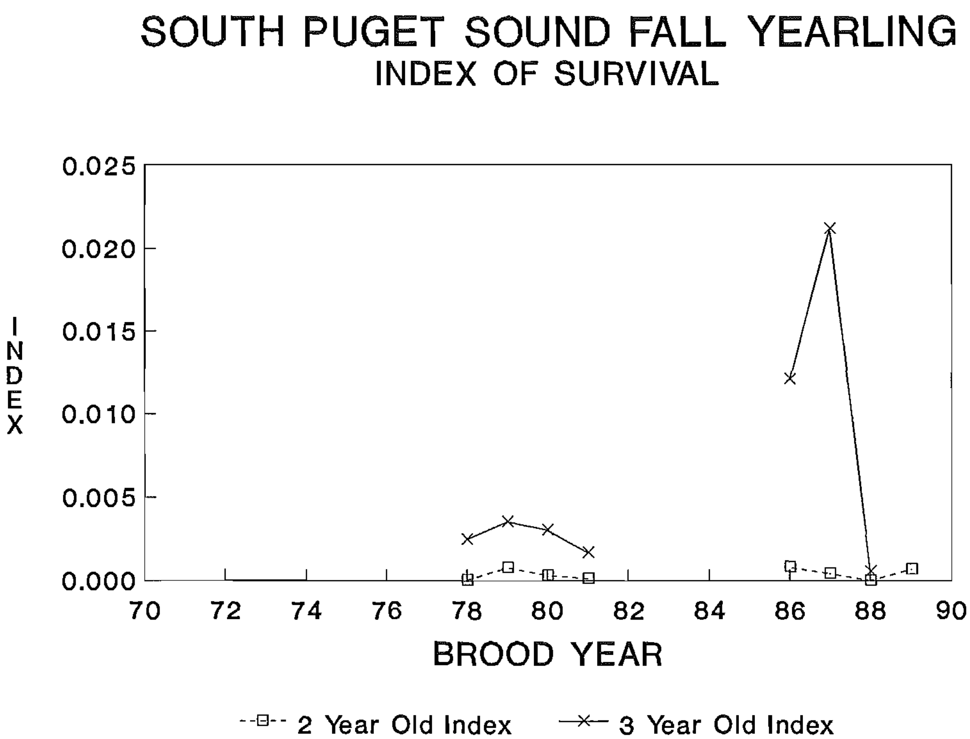

BIG QUALICUM
INDEX OF SURVIVAL
0.050
0.040
0.030
0.020
0.010
0.000
INDEX
70
72
74
76
78
80
82
84
86
88
90
BROOD YEAR
2 Year Old Index
3 Year Old Index


CHEHALIS (HARRISON STOCK)
INDEX OF SURVIVAL
INDEX
0.060
0.050
0.040
0.030
0.020
0.010
0.000
70
72
74
76
78
80
82
84
86
88
90
BROOD YEAR
2 Year Old Index
3 Year Old Index


CHILLIWACK
INDEX OF SURVIVAL
INDEX
0.060
0.050
0.040
0.030
0.020
0.010
0.000
70
72
74
76
78
80
82
84
86
88
90
BROOD YEAR
2 Year Old Index
3 Year Old Index

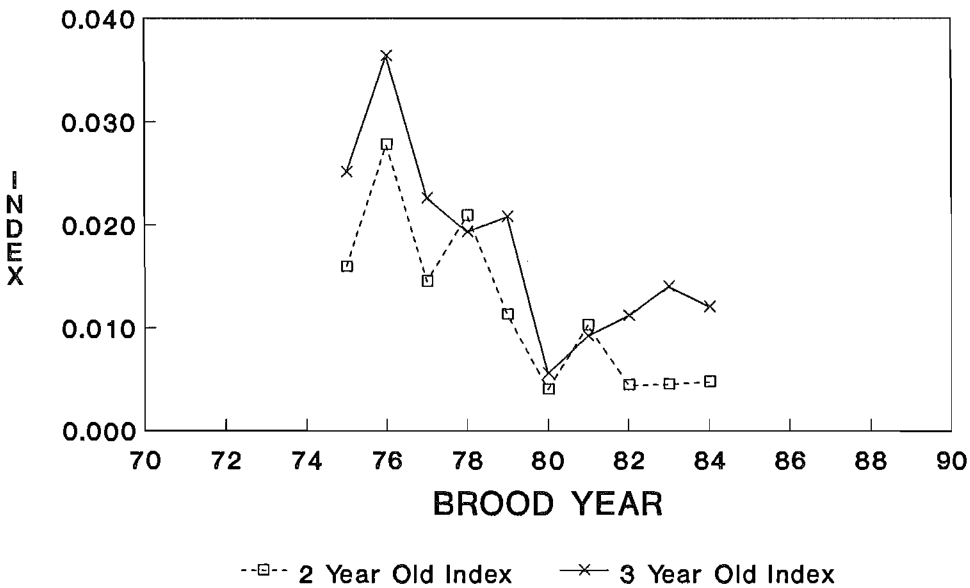


SQUAXIN PENS FALL YEARLING
INDEX OF SURVIVAL
0.008
0.006
0.004
0.002
0.000
INDEX
70
72
74
76
78
80
82
84
86
88
90
BROOD YEAR
2 Year Old Index
3 Year Old Index

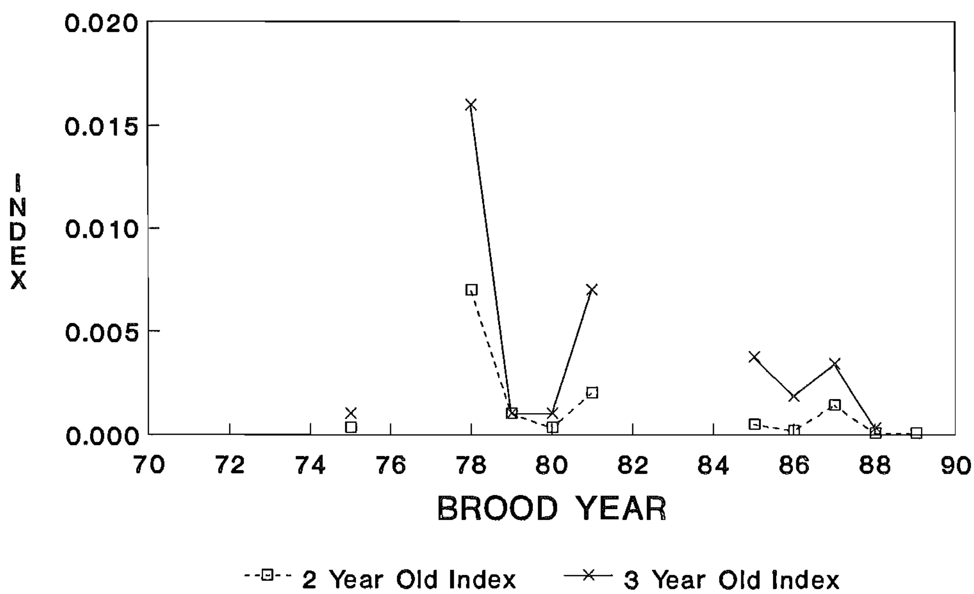


SOUTH PUGET SOUND FALL YEARLING
INDEX OF SURVIVAL
0.025
0.020
0.015
0.010
0.005
0.000
INDEX
70
72
74
76
78
80
82
84
86
88
90
BROOD YEAR
2 Year Old Index
3 Year Old Index

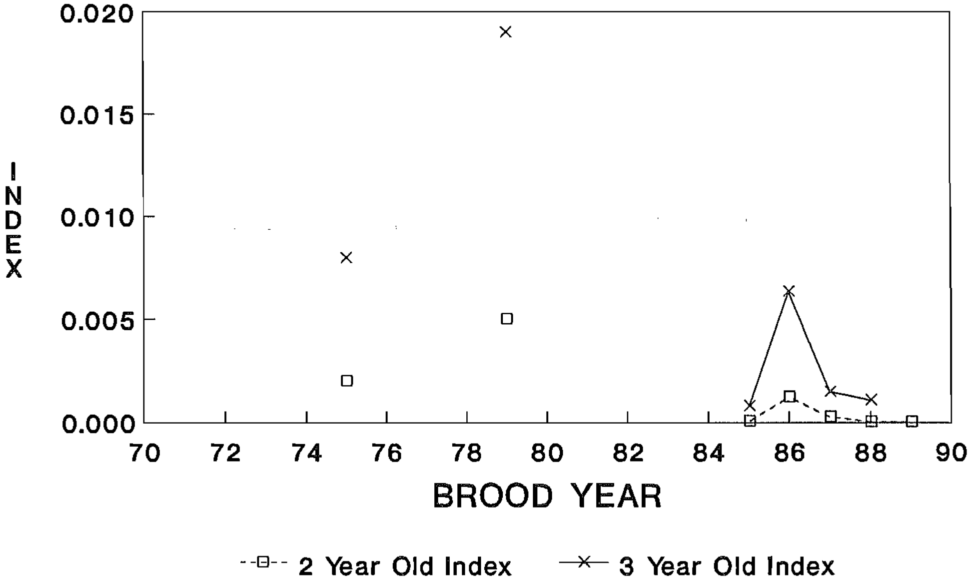
UNIVERSITY OF WASHINGTON ACCELERATED
INDEX OF SURVIVAL



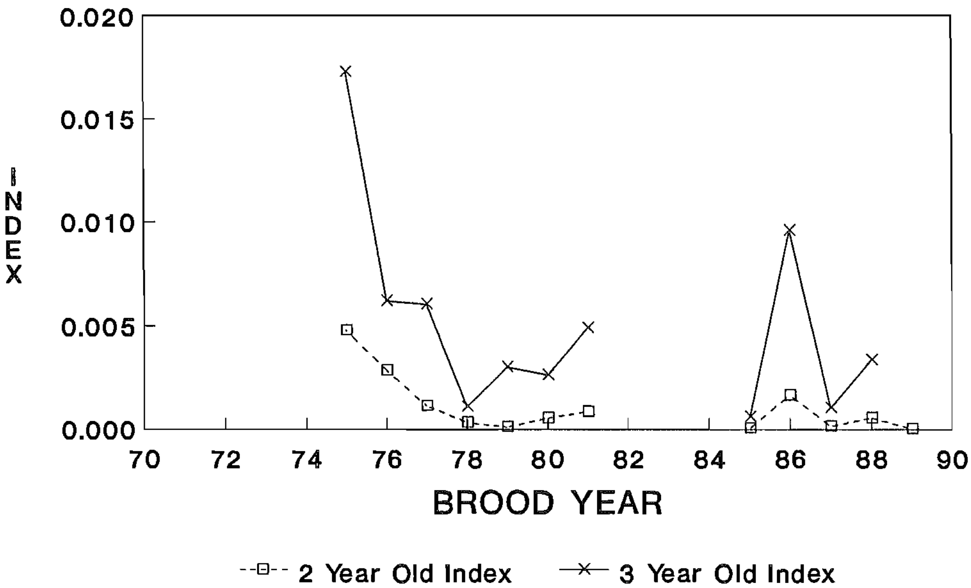
GEORGE ADAMS FALL FINGERLING
INDEX OF SURVIVAL



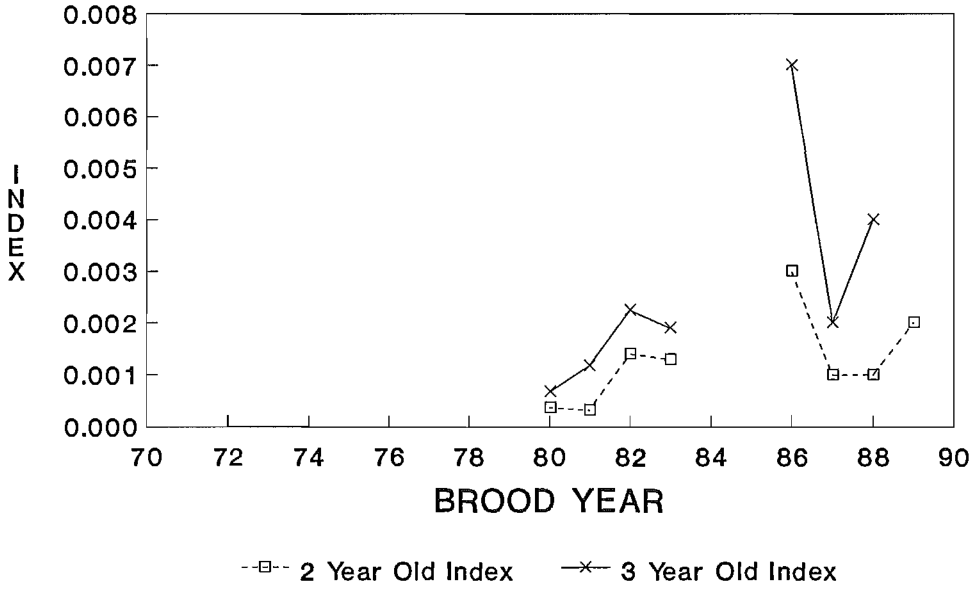
SAMISH FALL FINGERLING
INDEX OF SURVIVAL



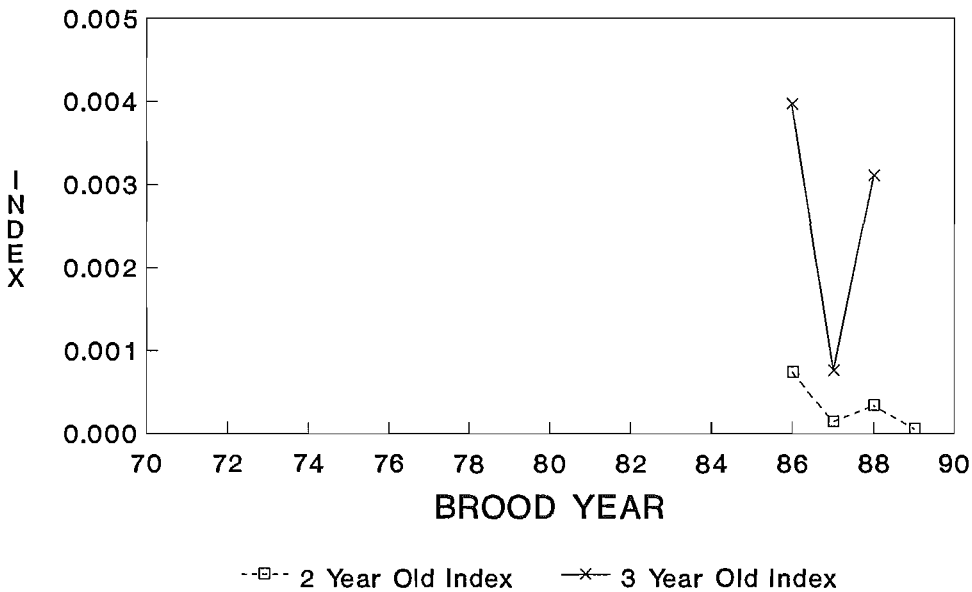
LUMMI PONDS FALL FINGERLING
INDEX OF SURVIVAL

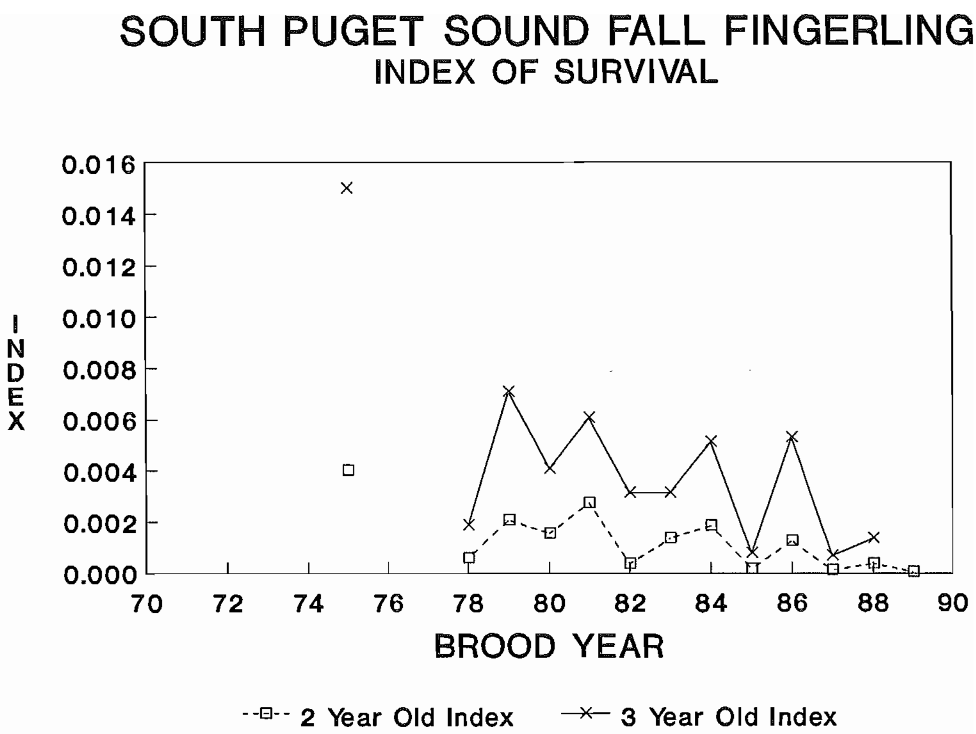


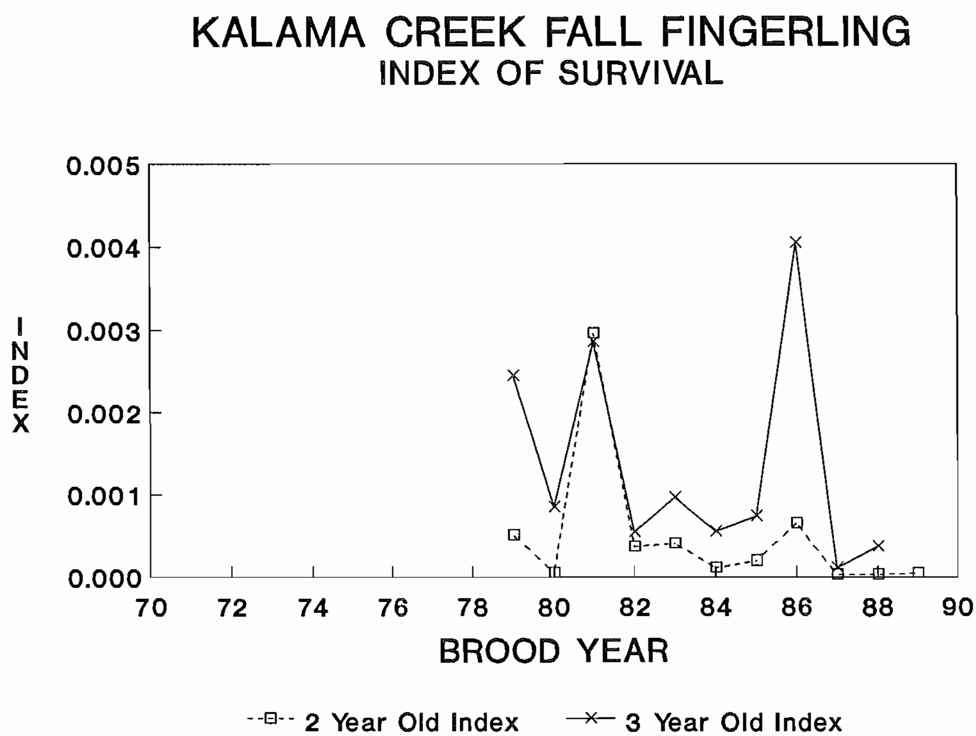
STILLAGUAMISH FALL FINGERLING
INDEX OF SURVIVAL

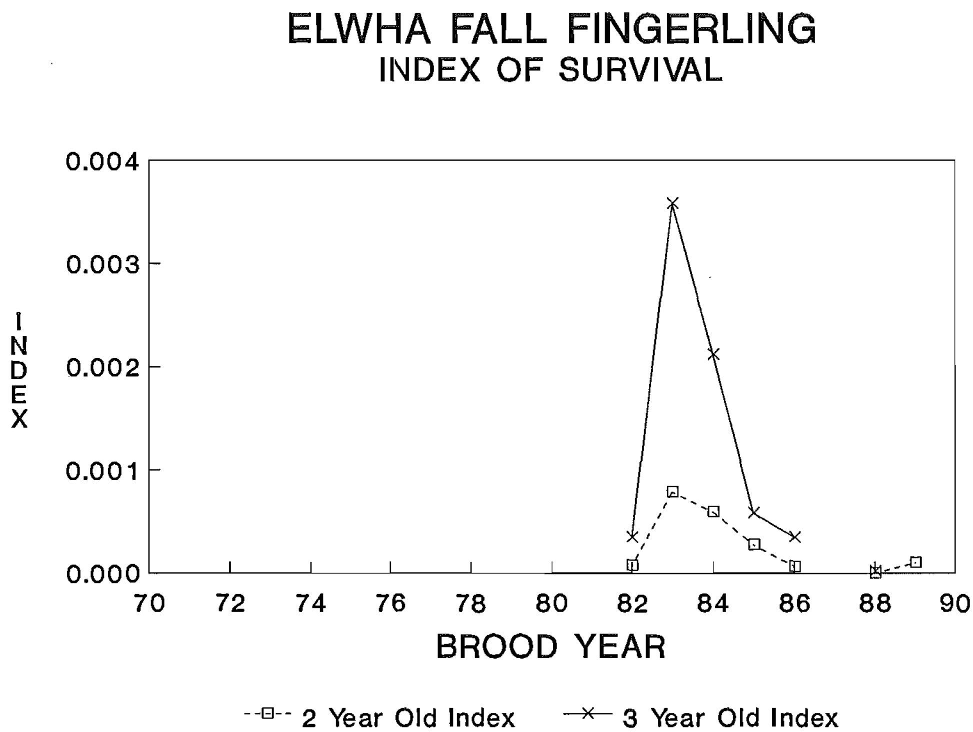


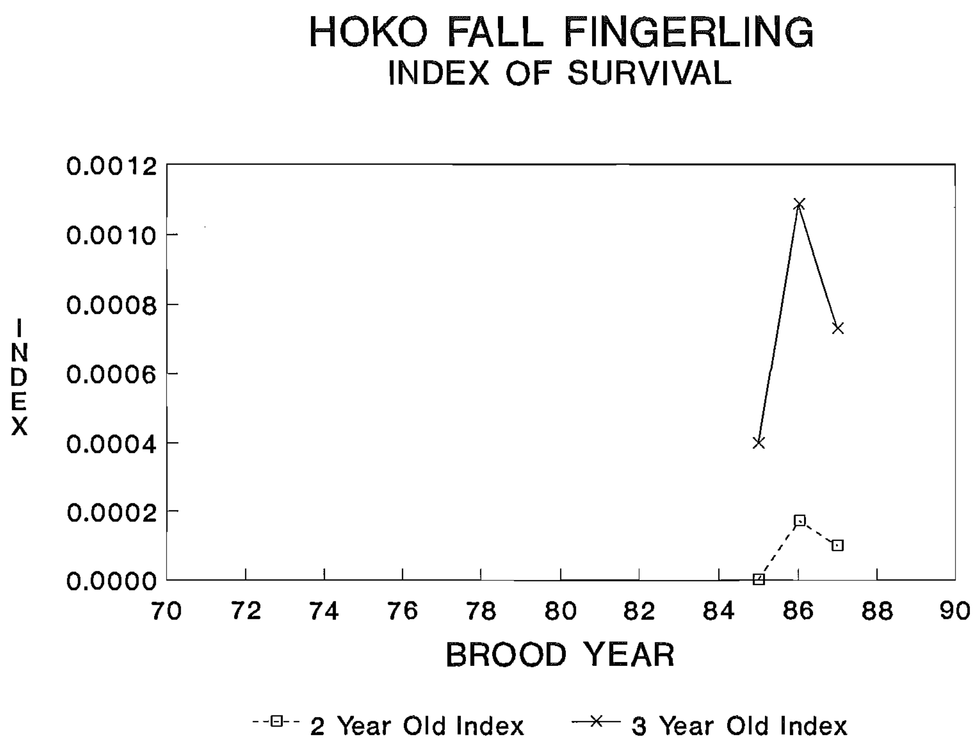
TULALIP FALL FINGERLING
INDEX OF SURVIVAL



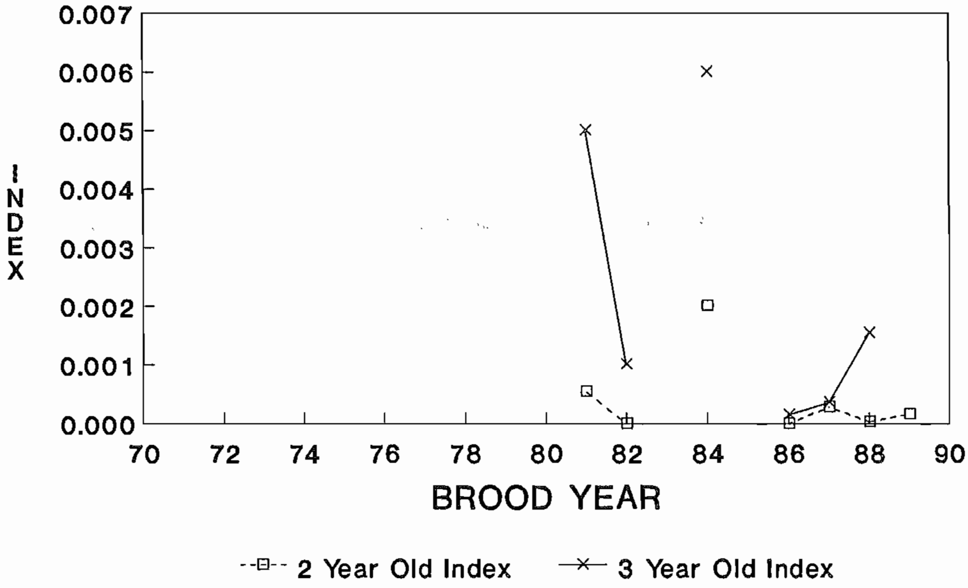

SOUTH PUGET SOUND FALL FINGERLING
INDEX OF SURVIVAL
INDEX
0.016
0.014
0.012
0.010
0.008
0.006
0.004
0.002
0.000
70
72
74
76
78
80
82
84
86
88
90
BROOD YEAR
2 Year Old Index
3 Year Old Index


KALAMA CREEK FALL FINGERLING
INDEX OF SURVIVAL
INDEX
0.005
0.004
0.003
0.002
0.001
0.000
70
72
74
76
78
80
82
84
86
88
90
BROOD YEAR
2 Year Old Index
3 Year Old Index

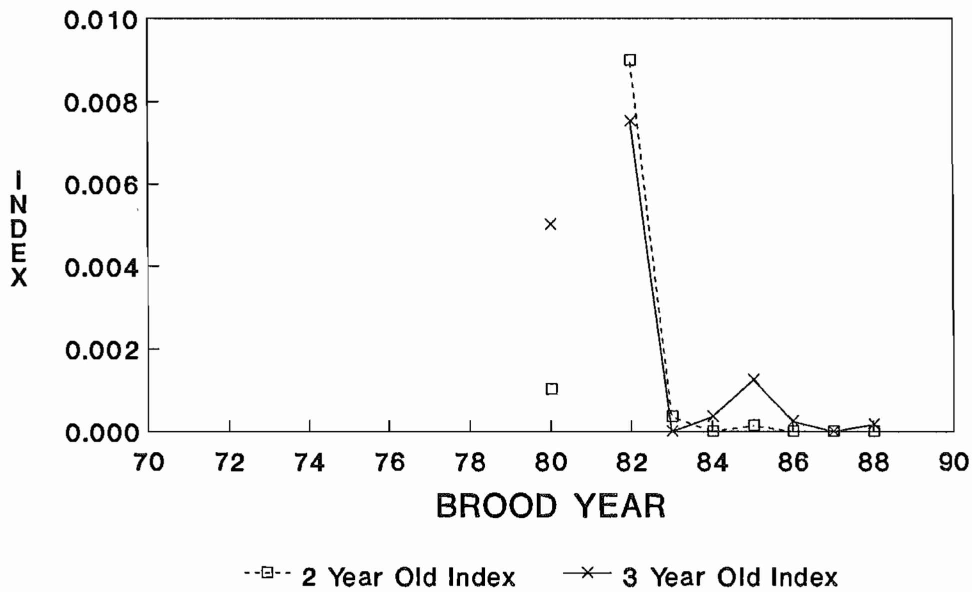

ELWHA FALL FINGERLING
INDEX OF SURVIVAL
0.004
0.003
0.002
0.001
0.000
INDEX
70
72
74
76
78
80
82
84
86
88
90
BROOD YEAR
2 Year Old Index
3 Year Old Index

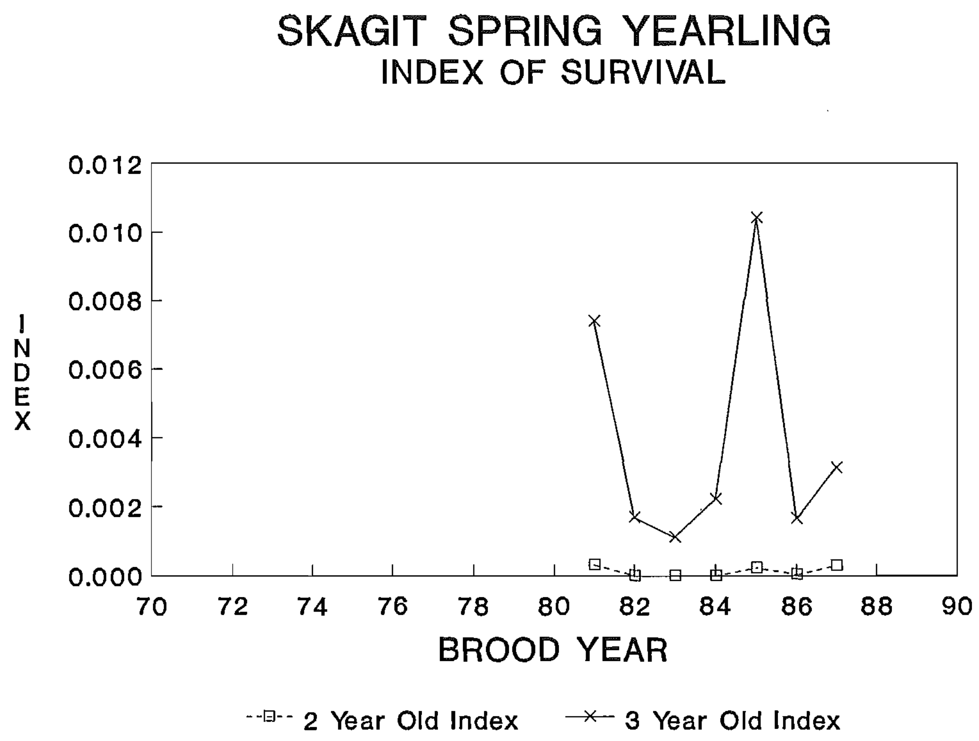

HOKO FALL FINGERLING
INDEX OF SURVIVAL
0.0012
0.0010
0.0008
0.0006
0.0004
0.0002
0.0000
INDEX
70
72
74
76
78
80
82
84
86
88
90
BROOD YEAR
2 Year Old Index
3 Year Old Index

NOOKSACK SPRING YEARLING
INDEX OF SURVIVAL

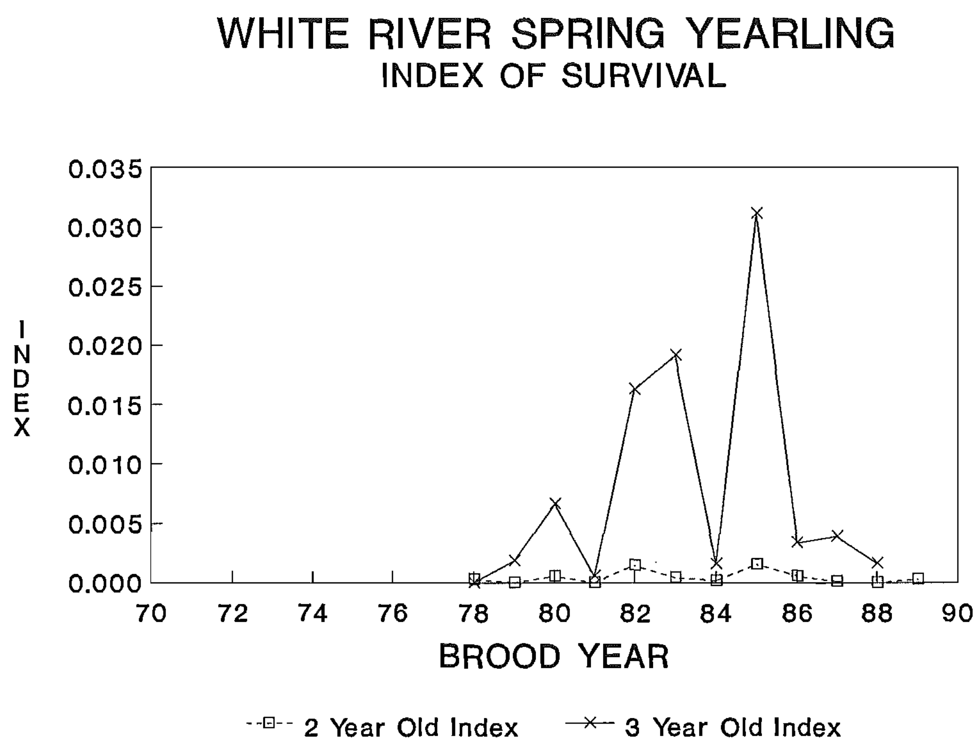


SKOOKUM SPRING FINGERLING
INDEX OF SURVIVAL

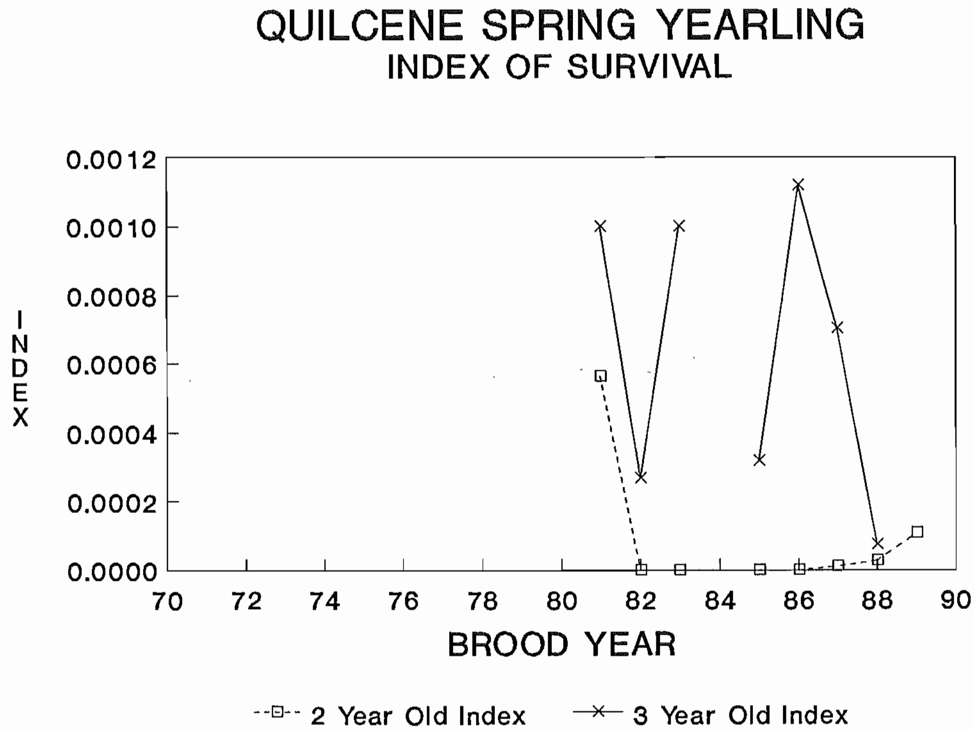


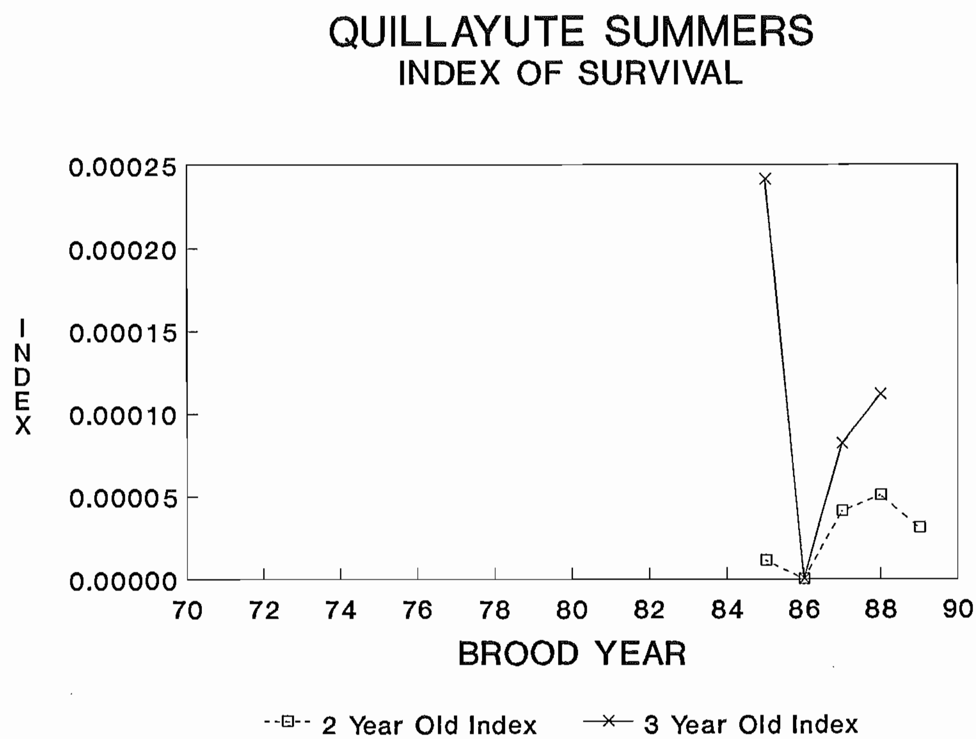


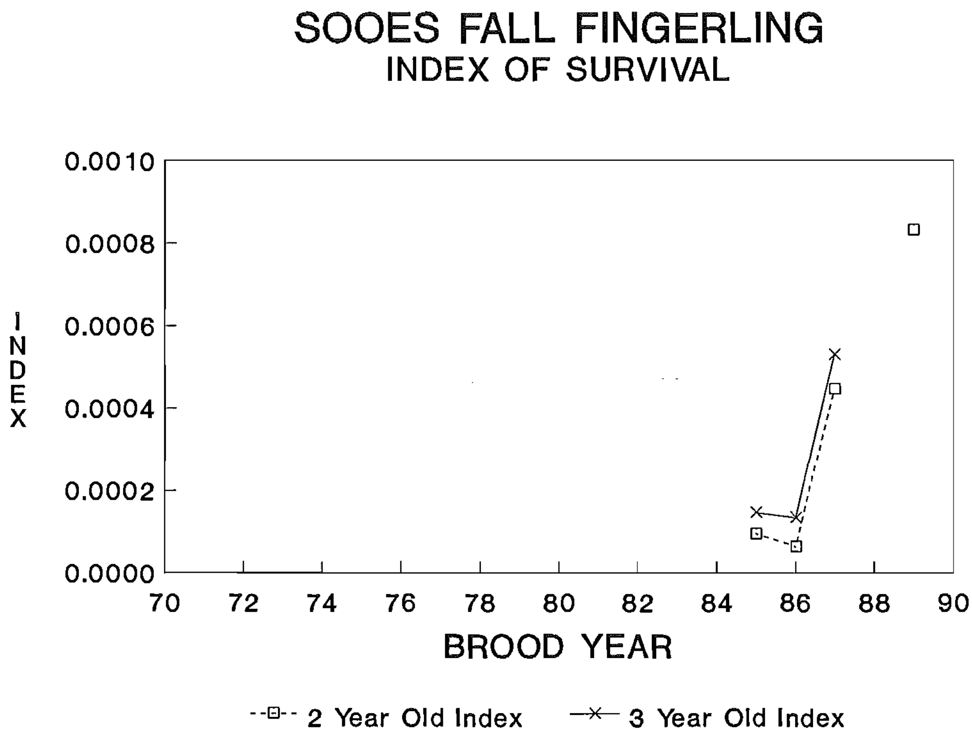
SKAGIT SPRING YEARLING
INDEX OF SURVIVAL
0.012
0.010
0.008
0.006
0.004
0.002
0.000
INDEX
70
72
74
76
78
80
82
84
86
88
90
BROOD YEAR
2 Year Old Index
3 Year Old Index

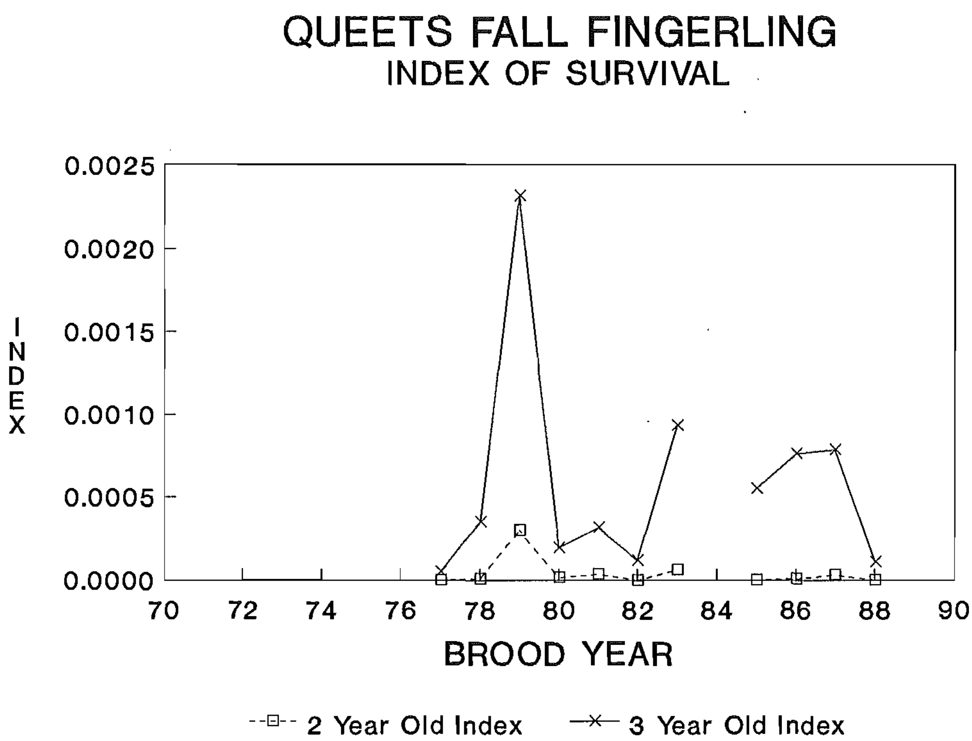


WHITE RIVER SPRING YEARLING
INDEX OF SURVIVAL
0.035
0.030
0.025
0.020
0.015
0.010
0.005
0.000
INDEX
70
72
74
76
78
80
82
84
86
88
90
BROOD YEAR
2 Year Old Index
3 Year Old Index

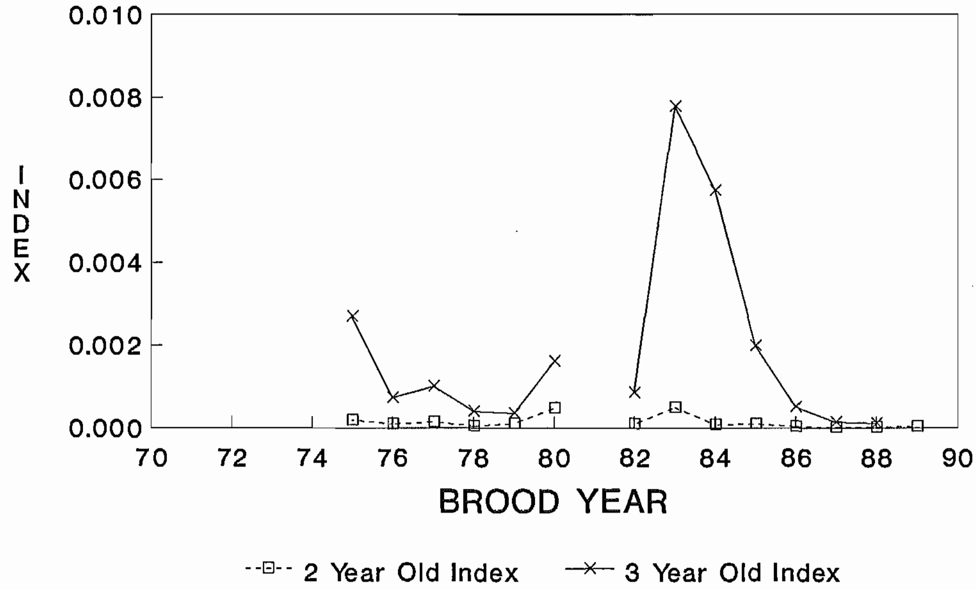

QUILCENE SPRING YEARLING
INDEX OF SURVIVAL
0.0012
0.0010
0.0008
0.0006
0.0004
0.0002
0.0000
INDEX
70 72 74 76 78 80 82 84 86 88 90
BROOD YEAR
2 Year Old Index
3 Year Old Index


QUILLAYUTE SUMMERS
INDEX OF SURVIVAL
0.00025
0.00020
0.00015
0.00010
0.00005
0.00000
INDEX
70 72 74 76 78 80 82 84 86 88 90
BROOD YEAR
2 Year Old Index
3 Year Old Index

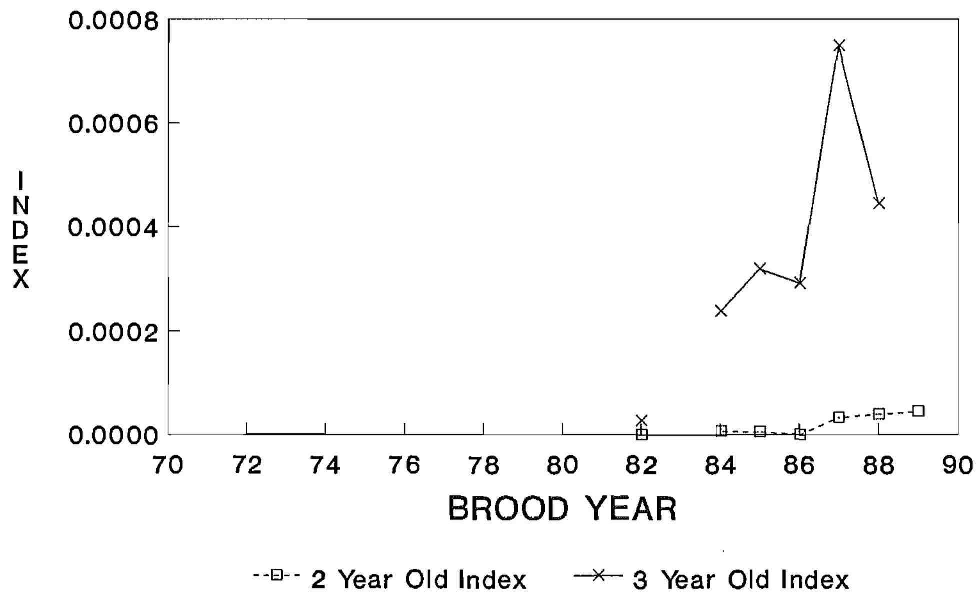

SOOES FALL FINGERLING
INDEX OF SURVIVAL
INDEX
0.0010
0.0008
0.0006
0.0004
0.0002
0.0000
70
72
74
76
78
80
82
84
86
88
90
BROOD YEAR
2 Year Old Index
3 Year Old Index

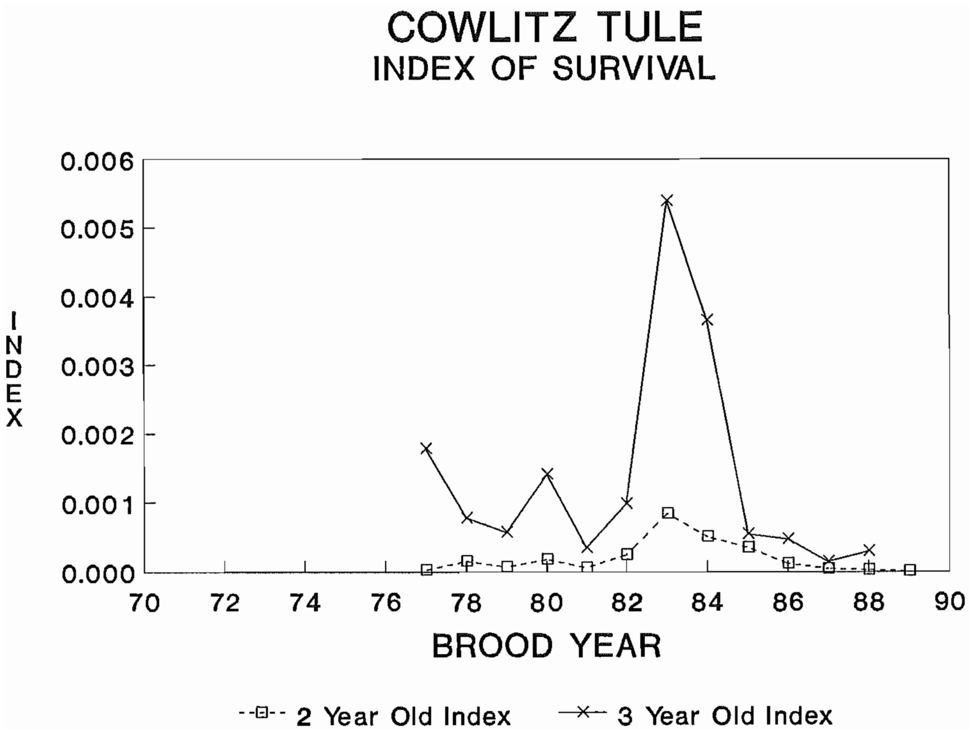

QUEETS FALL FINGERLING
INDEX OF SURVIVAL
INDEX
0.0025
0.0020
0.0015
0.0010
0.0005
0.0000
70
72
74
76
78
80
82
84
86
88
90
BROOD YEAR
2 Year Old Index
3 Year Old Index

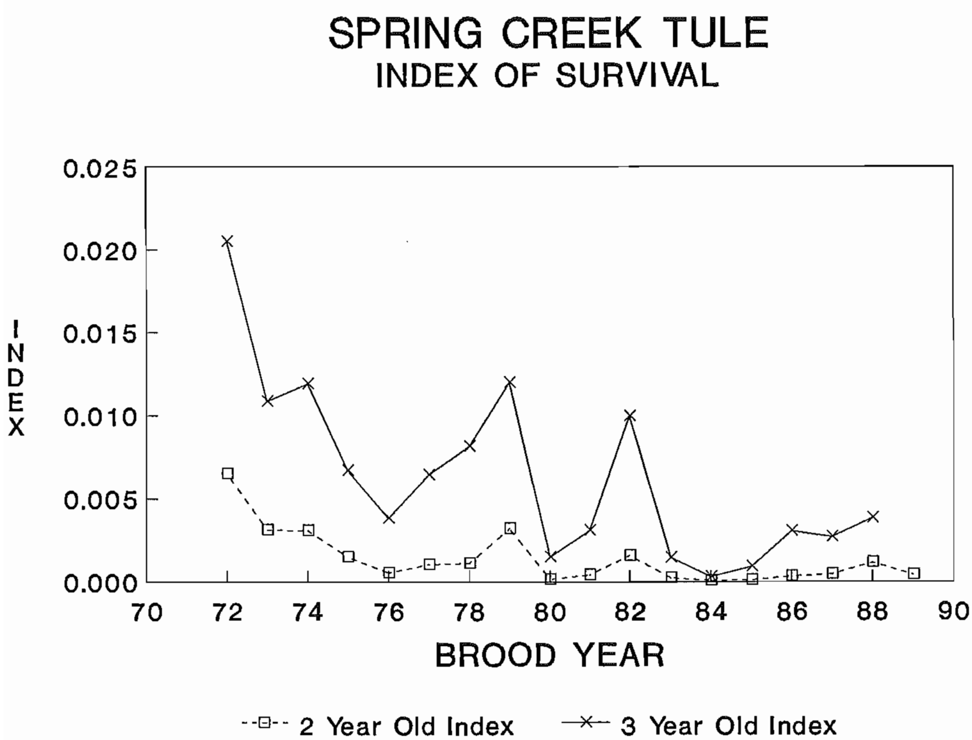
QUINAULT FALL FINGERLING
INDEX OF SURVIVAL



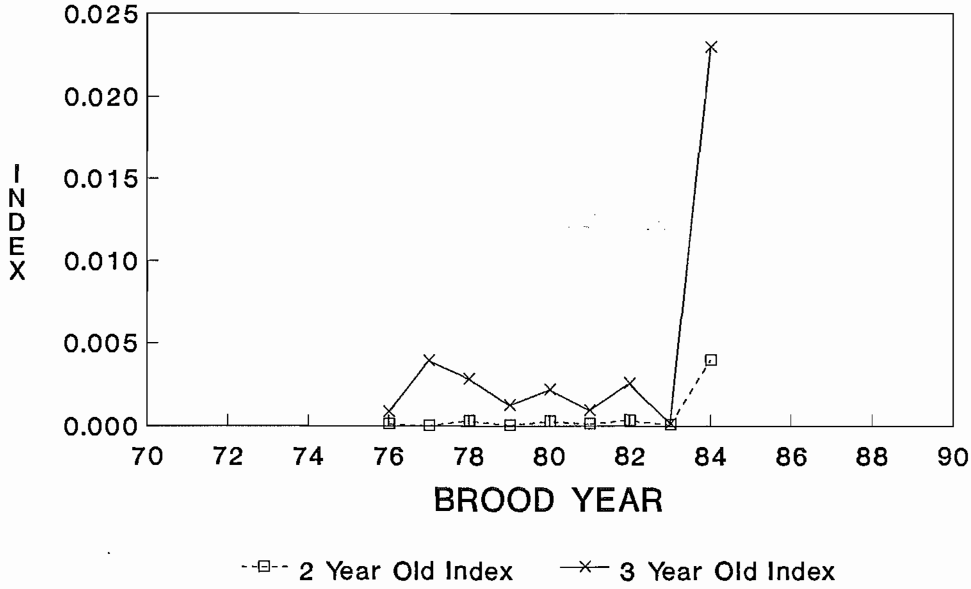
HUMPTULIPS FALL FINGERLING
INDEX OF SURVIVAL



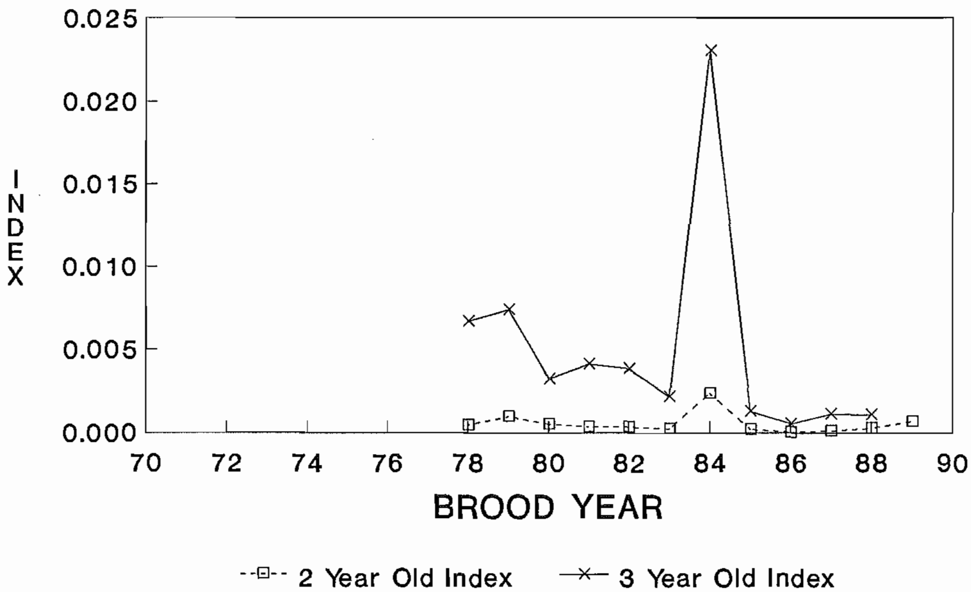

COWLITZ TULE
INDEX OF SURVIVAL
0.006
0.005
0.004
0.003
0.002
0.001
0.000
INDEX
70
72
74
76
78
80
82
84
86
88
90
BROOD YEAR
2 Year Old Index
3 Year Old Index


SPRING CREEK TULE
INDEX OF SURVIVAL
0.025
0.020
0.015
0.010
0.005
0.000
INDEX
70
72
74
76
78
80
82
84
86
88
90
BROOD YEAR
2 Year Old Index
3 Year Old Index

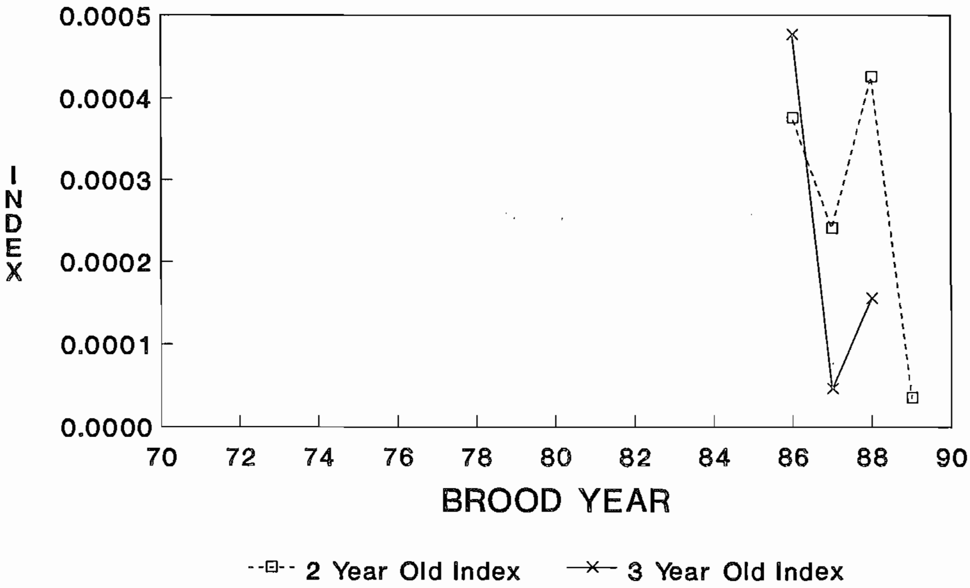
BONNEVILLE TULE
INDEX OF SURVIVAL



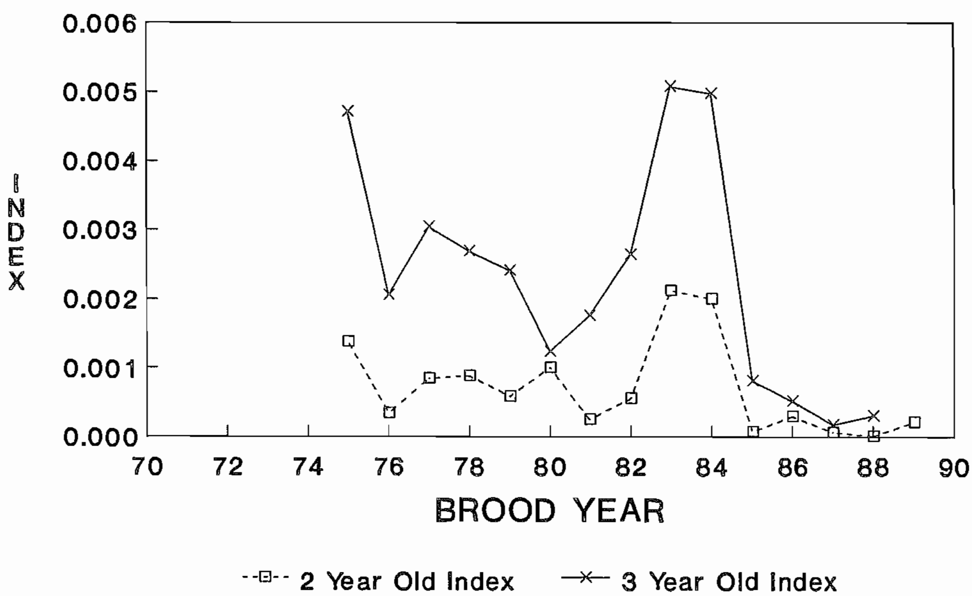
STAYTON POND TULE
INDEX OF SURVIVAL

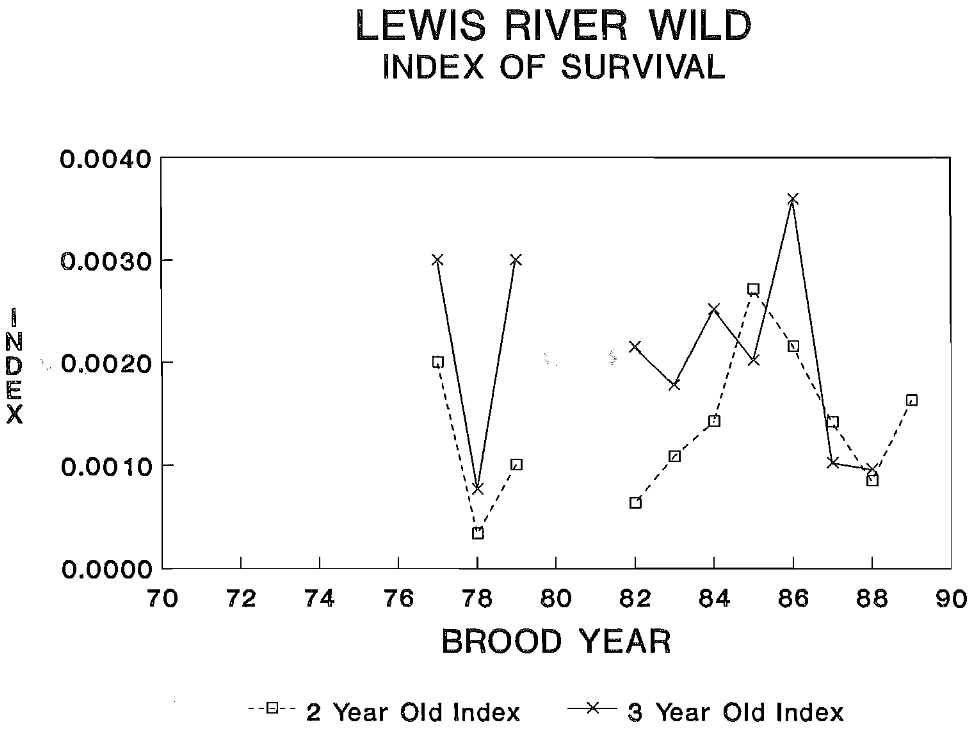


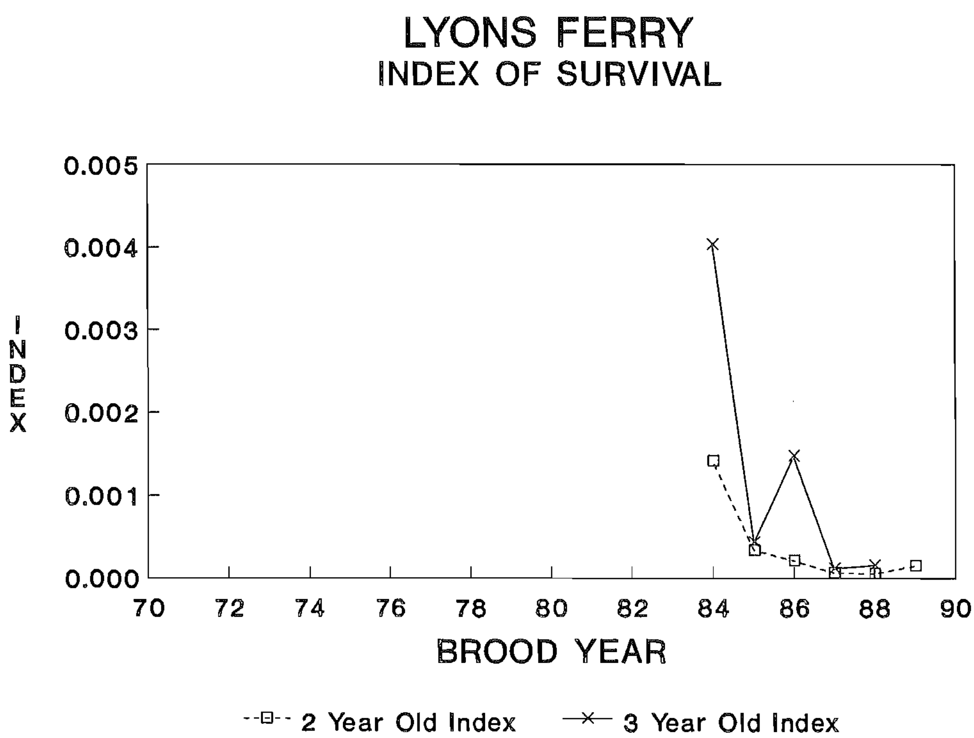
HANFORD WILD BRIGHTS
INDEX OF SURVIVAL

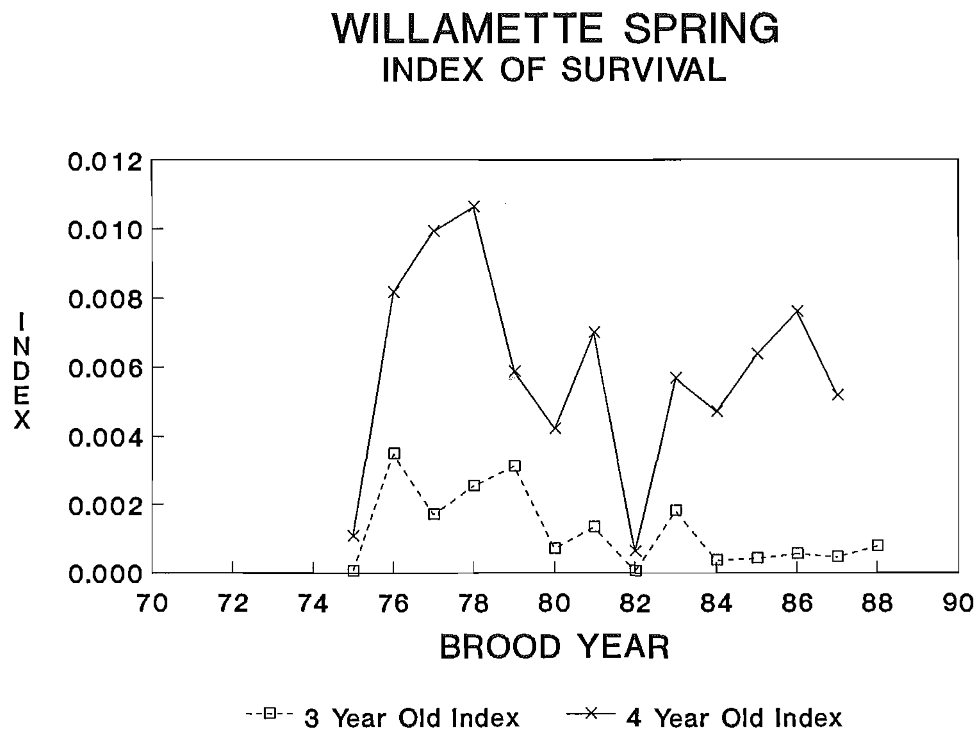


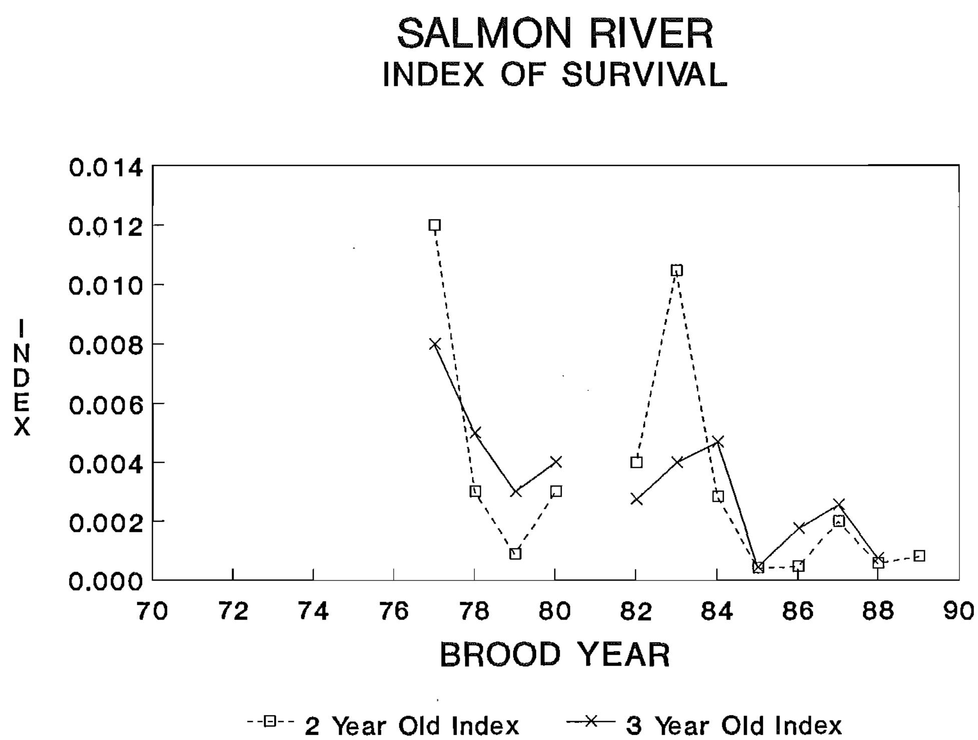
COLUMBIA RIVER UPRIVER BRIGHT
INDEX OF SURVIVAL




LEWIS RIVER WILD
INDEX OF SURVIVAL
INDEX
0.0040
0.0030
0.0020
0.0010
0.0000
70
72
74
76
78
80
82
84
86
88
90
BROOD YEAR
2 Year Old Index
3 Year Old Index


LYONS FERRY
INDEX OF SURVIVAL
INDEX
0.005
0.004
0.003
0.002
0.001
0.000
70
72
74
76
78
80
82
84
86
88
90
BROOD YEAR
2 Year Old Index
3 Year Old Index


WILLAMETTE SPRING
INDEX OF SURVIVAL
INDEX
0.012
0.010
0.008
0.006
0.004
0.002
0.000
70
72
74
76
78
80
82
84
86
88
90
BROOD YEAR
3 Year Old Index
4 Year Old Index


SALMON RIVER
INDEX OF SURVIVAL
INDEX
0.014
0.012
0.010
0.008
0.006
0.004
0.002
0.000
70
72
74
76
78
80
82
84
86
88
90
BROOD YEAR
2 Year Old Index
3 Year Old Index

APPENDIX G

**Annual Distribution of Reported Catch
and Total Fishing Mortality
by Stock**

Stock: Alaska Spring

Reported Catch Only

Catch Year	Fisheries with ceilings: All Alaska	All Nth/Cent	WCVI Troll	Total Geo St	Other Canada Net	Other Canada Sport	Other U.S. Troll	Other U.S. Net	Other U.S. Sport
83	93.5%	6.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
84	94.1%	5.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
85	95.2%	4.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
86	95.8%	4.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
87	97.0%	3.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
88	95.9%	4.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
89	95.5%	4.3%	0.0%	0.0%	0.0%	0.0%	0.2%	0.0%	0.0%
90	95.1%	4.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
91	97.7%	2.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
(83-91)	95.5%	4.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
(85-91)	96.0%	4.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Total Mortalities

Catch Year	Fisheries with ceilings: All Alaska	All Nth/Cent	WCVI Troll	Total Geo St	Other Canada Net	Other Canada Sport	Other U.S. Troll	Other U.S. Net	Other U.S. Sport
83	94.5%	5.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
84	95.7%	4.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
85	96.6%	3.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
86	97.1%	2.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
87	98.2%	1.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
88	96.7%	3.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
89	96.5%	3.4%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%
90	95.7%	4.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
91	98.3%	1.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
(83-91)	96.6%	3.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
(85-91)	97.0%	3.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Stock: Snootli Crk

Reported Catch Only

Catch Year	Fisheries with ceilings: All Alaska	All Nth/Cent	WCVI Troll	Total Geo St	Other Canada Net	Other Canada Sport	Other U.S. Troll	Other U.S. Net	Other U.S. Sport
79	55.6%	15.9%	0.0%	17.8%	10.7%	0.0%	0.0%	0.0%	0.0%
80	26.0%	70.7%	0.0%	3.3%	0.0%	0.0%	0.0%	0.0%	0.0%
81	32.8%	53.7%	0.0%	3.8%	9.8%	0.0%	0.0%	0.0%	0.0%
82	32.1%	63.1%	4.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
83	47.2%	52.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
84	27.1%	72.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
85	36.6%	61.9%	0.0%	0.0%	1.6%	0.0%	0.0%	0.0%	0.0%
86	13.2%	86.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
87	20.8%	79.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
88	27.1%	72.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
89	18.3%	80.0%	1.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
90	32.8%	67.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
91	17.5%	82.3%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
(79-91)	29.8%	66.1%	0.5%	1.9%	1.7%	0.0%	0.0%	0.0%	0.0%
(85-91)	23.8%	75.8%	0.3%	0.0%	0.2%	0.0%	0.0%	0.0%	0.0%

Total Mortalities

Catch Year	Fisheries with ceilings: All Alaska	All Nth/Cent	WCVI Troll	Total Geo St	Other Canada Net	Other Canada Sport	Other U.S. Troll	Other U.S. Net	Other U.S. Sport
79	54.6%	20.9%	0.0%	15.2%	9.4%	0.0%	0.0%	0.0%	0.0%
80	32.1%	65.0%	0.6%	2.2%	0.1%	0.0%	0.0%	0.0%	0.0%
81	39.4%	49.1%	0.2%	3.1%	8.2%	0.0%	0.0%	0.0%	0.0%
82	36.7%	58.8%	4.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
83	48.3%	51.6%	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%
84	34.4%	65.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
85	50.0%	48.9%	0.0%	0.0%	1.0%	0.0%	0.0%	0.0%	0.0%
86	24.9%	74.4%	0.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
87	35.1%	64.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
88	33.4%	66.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
89	25.7%	72.5%	1.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
90	40.2%	59.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
91	23.5%	76.3%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
(79-91)	36.8%	59.6%	0.6%	1.6%	1.4%	0.0%	0.0%	0.0%	0.0%
(85-91)	33.3%	66.2%	0.4%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%

Stock: Kitimat River

Reported Catch Only

Catch Year	------Fisheries with ceilings------- All Alaska	All Nth/Cent	WCVI Troll	Total Geo St	Other Canada Net	Other Canada Sport	Other U.S. Troll	Other U.S. Net	Other U.S. Sport
81	31.5%	64.8%	0.0%	3.4%	0.3%	0.0%	0.0%	0.0%	0.0%
82	45.8%	54.0%	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%
83	42.4%	57.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
84	59.2%	40.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
85	77.1%	22.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
86	17.4%	82.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
87	38.9%	61.0%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%
88	64.9%	35.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
89	26.6%	73.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
90	46.8%	53.1%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%
91	41.3%	58.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
(81-91)	44.7%	54.9%	0.0%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%
(85-91)	44.7%	55.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Total Mortalities

Catch Year	------Fisheries with ceilings------- All Alaska	All Nth/Cent	WCVI Troll	Total Geo St	Other Canada Net	Other Canada Sport	Other U.S. Troll	Other U.S. Net	Other U.S. Sport
81	36.3%	60.4%	0.0%	3.0%	0.3%	0.0%	0.0%	0.0%	0.0%
82	47.9%	52.0%	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%
83	47.7%	52.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
84	65.5%	34.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
85	88.0%	12.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
86	42.2%	57.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
87	57.9%	42.0%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%
88	70.5%	29.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
89	38.3%	61.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
90	54.8%	45.1%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%
91	57.3%	42.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
(81-91)	55.1%	44.5%	0.0%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%
(85-91)	58.4%	41.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Stock: Robertson Creek

Reported Catch Only

Catch Year	------Fisheries with ceilings------- All Alaska	All Nth/Cent	WCVI Troll	Total Geo St	Other Canada Net	Other Canada Sport	Other U.S. Troll	Other U.S. Net	Other U.S. Sport
79	25.6%	45.5%	13.5%	2.6%	2.8%	9.9%	0.0%	0.2%	0.0%
80	40.3%	24.8%	12.3%	0.0%	15.2%	6.9%	0.1%	0.4%	0.0%
81	38.1%	29.4%	6.1%	0.6%	16.6%	8.6%	0.0%	0.6%	0.0%
82	34.5%	30.5%	6.7%	1.2%	17.9%	8.2%	0.1%	0.7%	0.2%
83	43.7%	24.8%	5.8%	0.5%	19.6%	5.4%	0.0%	0.2%	0.0%
84	39.7%	23.7%	9.0%	1.2%	20.3%	5.8%	0.0%	0.2%	0.0%
85	37.4%	40.5%	3.4%	0.7%	5.9%	7.3%	0.0%	4.9%	0.0%
86	40.8%	28.5%	9.9%	0.0%	2.3%	18.1%	0.0%	0.0%	0.4%
87	28.7%	34.4%	7.0%	1.9%	3.1%	24.1%	0.0%	0.4%	0.4%
88	29.7%	24.0%	9.3%	1.5%	17.4%	16.9%	0.0%	0.8%	0.4%
89	20.4%	19.1%	2.9%	1.1%	34.6%	21.6%	0.0%	0.1%	0.1%
90	37.0%	22.4%	9.8%	1.1%	19.2%	10.3%	0.0%	0.0%	0.1%
91	31.1%	23.1%	7.3%	0.9%	24.4%	13.1%	0.1%	0.0%	0.1%
(79-91)	34.4%	28.5%	7.9%	1.0%	15.3%	12.0%	0.0%	0.7%	0.1%
(85-91)	32.2%	27.4%	7.1%	1.0%	15.3%	15.9%	0.0%	0.9%	0.2%

Total Mortalities

Catch Year	------Fisheries with ceilings------- All Alaska	All Nth/Cent	WCVI Troll	Total Geo St	Other Canada Net	Other Canada Sport	Other U.S. Troll	Other U.S. Net	Other U.S. Sport
79	32.2%	42.2%	12.9%	2.0%	2.3%	8.1%	0.0%	0.2%	0.0%
80	42.5%	24.9%	12.4%	0.0%	13.3%	6.2%	0.1%	0.6%	0.0%
81	42.7%	28.6%	6.0%	0.5%	14.1%	7.4%	0.0%	0.6%	0.0%
82	40.3%	29.0%	6.5%	1.1%	15.2%	7.0%	0.1%	0.8%	0.2%
83	48.9%	23.3%	5.5%	0.4%	16.9%	4.7%	0.0%	0.3%	0.0%
84	44.5%	22.5%	8.7%	1.1%	17.8%	5.1%	0.0%	0.3%	0.0%
85	50.6%	32.3%	2.8%	0.5%	4.5%	5.4%	0.0%	4.0%	0.0%
86	48.9%	25.7%	8.7%	0.0%	1.8%	14.5%	0.0%	0.0%	0.3%
87	38.1%	33.1%	7.0%	1.5%	2.3%	17.2%	0.0%	0.4%	0.4%
88	37.3%	24.0%	9.6%	1.4%	13.4%	13.2%	0.0%	0.9%	0.4%
89	31.3%	19.3%	2.9%	1.4%	27.5%	17.4%	0.0%	0.1%	0.1%
90	45.3%	21.5%	9.1%	1.2%	14.7%	8.1%	0.0%	0.0%	0.1%
91	41.4%	21.8%	6.9%	0.8%	18.8%	10.1%	0.1%	0.0%	0.1%
(79-91)	41.9%	26.8%	7.6%	0.9%	12.5%	9.6%	0.0%	0.6%	0.1%
(85-91)	41.8%	25.4%	6.7%	1.0%	11.8%	12.3%	0.0%	0.8%	0.2%

Stock: Quinsam

Reported Catch Only

Catch Year	------Fisheries with ceilings------- All Alaska	All Nth/Cent	WCVI Troll	Total Geo St	Other Canada Net	Other Canada Sport	Other U.S. Troll	Other U.S. Net	Other U.S. Sport
79	19.4%	62.6%	0.0%	11.4%	6.7%	0.0%	0.0%	0.0%	0.0%
80	29.7%	50.8%	0.0%	10.4%	9.0%	0.0%	0.0%	0.0%	0.0%
81	20.6%	57.3%	0.5%	14.8%	6.8%	0.0%	0.0%	0.0%	0.0%
82	42.4%	42.2%	0.4%	7.4%	7.6%	0.0%	0.0%	0.0%	0.0%
83	36.4%	46.5%	0.8%	7.6%	8.7%	0.0%	0.0%	0.0%	0.0%
84	41.0%	38.2%	1.2%	10.8%	8.8%	0.0%	0.0%	0.0%	0.0%
85	48.5%	33.5%	0.2%	6.8%	10.9%	0.0%	0.0%	0.0%	0.0%
86	28.1%	56.6%	0.0%	7.9%	7.4%	0.0%	0.0%	0.0%	0.0%
87	28.2%	55.0%	0.6%	5.9%	10.1%	0.2%	0.0%	0.0%	0.0%
88	52.4%	31.1%	1.4%	6.7%	7.3%	0.7%	0.0%	0.0%	0.4%
89	40.0%	25.0%	0.5%	12.5%	21.8%	0.0%	0.0%	0.3%	0.0%
90	43.5%	42.8%	1.7%	5.2%	6.8%	0.0%	0.0%	0.0%	0.0%
91	31.9%	54.7%	0.6%	6.1%	5.8%	1.0%	0.0%	0.0%	0.0%
(79-91)	35.5%	45.9%	0.6%	8.7%	9.0%	0.1%	0.0%	0.0%	0.0%
(85-91)	38.9%	42.7%	0.7%	7.3%	10.0%	0.3%	0.0%	0.0%	0.1%

Total Mortalities

Catch Year	------Fisheries with ceilings------- All Alaska	All Nth/Cent	WCVI Troll	Total Geo St	Other Canada Net	Other Canada Sport	Other U.S. Troll	Other U.S. Net	Other U.S. Sport
79	24.0%	60.0%	0.1%	9.5%	6.4%	0.0%	0.0%	0.0%	0.0%
80	31.3%	51.3%	0.0%	9.0%	8.5%	0.0%	0.0%	0.0%	0.0%
81	22.7%	57.2%	0.5%	13.1%	6.4%	0.0%	0.0%	0.0%	0.0%
82	45.4%	40.1%	0.4%	7.1%	6.9%	0.0%	0.0%	0.0%	0.0%
83	38.9%	44.9%	0.7%	7.5%	7.9%	0.0%	0.0%	0.0%	0.0%
84	43.7%	36.8%	1.2%	10.2%	8.1%	0.0%	0.0%	0.0%	0.0%
85	63.6%	24.0%	0.1%	4.9%	7.4%	0.0%	0.0%	0.0%	0.0%
86	48.1%	40.3%	0.0%	6.6%	5.0%	0.0%	0.0%	0.0%	0.0%
87	50.0%	39.2%	0.5%	3.7%	6.3%	0.1%	0.0%	0.0%	0.0%
88	60.6%	26.2%	1.2%	5.5%	5.6%	0.5%	0.0%	0.0%	0.4%
89	53.5%	19.4%	0.4%	11.1%	15.4%	0.0%	0.0%	0.2%	0.0%
90	53.6%	35.2%	1.4%	4.8%	5.0%	0.0%	0.0%	0.0%	0.0%
91	48.1%	41.6%	0.5%	5.0%	4.0%	0.7%	0.0%	0.0%	0.0%
(79-91)	44.9%	39.7%	0.6%	7.5%	7.2%	0.1%	0.0%	0.0%	0.0%
(85-91)	54.0%	32.3%	0.6%	5.9%	7.0%	0.2%	0.0%	0.0%	0.1%

Stock: Big Qualicum

Reported Catch Only

Catch Year	------Fisheries with ceilings------- All Alaska	All Nth/Cent	WCVI Troll	Total Geo St	Other Canada Net	Other Canada Sport	Other U.S. Troll	Other U.S. Net	Other U.S. Sport
79	6.1%	20.8%	2.7%	58.4%	11.5%	0.1%	0.0%	0.4%	0.1%
80	3.1%	21.4%	4.0%	60.8%	10.0%	0.0%	0.1%	0.3%	0.2%
81	4.5%	20.2%	2.0%	61.3%	10.9%	0.2%	0.0%	0.3%	0.6%
82	9.2%	23.4%	4.1%	44.8%	16.8%	0.0%	0.0%	1.0%	0.7%
83	4.8%	16.2%	0.1%	62.0%	16.9%	0.0%	0.0%	0.0%	0.0%
84	0.1%	15.8%	1.4%	77.0%	5.8%	0.0%	0.0%	0.0%	0.0%
85	7.5%	21.1%	1.7%	50.3%	14.7%	0.0%	0.0%	4.7%	0.0%
86	6.4%	32.8%	1.4%	49.6%	9.9%	0.0%	0.0%	0.0%	0.0%
87	26.1%	14.6%	5.3%	46.4%	5.4%	0.0%	1.7%	0.5%	0.0%
88	8.0%	20.9%	5.0%	56.0%	7.8%	0.4%	0.0%	1.8%	0.0%
89	14.3%	12.1%	5.8%	54.6%	11.4%	0.0%	0.4%	0.0%	1.3%
90	24.6%	19.0%	6.4%	32.6%	12.9%	0.0%	2.0%	0.0%	2.5%
91	8.8%	12.2%	3.5%	64.8%	10.5%	0.0%	0.0%	0.0%	0.0%
(79-91)	9.5%	19.3%	3.3%	55.3%	11.1%	0.1%	0.3%	0.7%	0.4%
(85-91)	13.7%	19.0%	4.2%	50.6%	10.4%	0.1%	0.6%	1.0%	0.5%

Total Mortalities

Catch Year	------Fisheries with ceilings------- All Alaska	All Nth/Cent	WCVI Troll	Total Geo St	Other Canada Net	Other Canada Sport	Other U.S. Troll	Other U.S. Net	Other U.S. Sport
79	8.5%	22.8%	3.1%	53.9%	11.0%	0.1%	0.0%	0.5%	0.1%
80	3.8%	22.7%	4.7%	58.0%	10.1%	0.0%	0.2%	0.4%	0.2%
81	5.2%	21.6%	2.2%	58.8%	11.0%	0.2%	0.0%	0.3%	0.7%
82	11.0%	23.3%	4.2%	44.1%	15.5%	0.0%	0.0%	1.2%	0.7%
83	6.1%	15.8%	0.1%	63.6%	14.4%	0.0%	0.0%	0.0%	0.1%
84	0.1%	15.4%	1.4%	78.0%	5.1%	0.0%	0.0%	0.0%	0.0%
85	11.4%	20.0%	1.6%	49.4%	12.6%	0.0%	0.0%	4.9%	0.0%
86	10.9%	31.4%	1.4%	47.4%	8.9%	0.0%	0.0%	0.0%	0.0%
87	35.1%	13.2%	5.1%	40.1%	4.4%	0.0%	1.5%	0.5%	0.0%
88	13.3%	17.9%	4.9%	55.3%	6.1%	0.4%	0.0%	2.1%	0.0%
89	22.5%	9.5%	4.8%	54.5%	7.4%	0.0%	0.4%	0.0%	0.9%
90	36.7%	14.3%	4.6%	32.7%	8.5%	0.0%	1.5%	0.0%	1.7%
91	13.1%	9.2%	2.8%	68.2%	6.7%	0.0%	0.0%	0.0%	0.0%
(79-91)	13.7%	18.2%	3.1%	54.2%	9.4%	0.1%	0.3%	0.8%	0.3%
(85-91)	20.5%	16.5%	3.6%	49.7%	7.8%	0.1%	0.5%	1.1%	0.4%

Stock: Chehalis (Harrison Stock)

Reported Catch Only

Catch Year	------Fisheries with ceilings------- All Alaska	All Nth/Cent	WCVI Troll	Total Geo St	Other Canada Net	Other Canada Sport	Other U.S. Troll	Other U.S. Net	Other U.S. Sport
85	0.1%	5.3%	29.9%	46.9%	5.6%	0.6%	1.0%	4.3%	6.3%
86	2.4%	8.4%	16.8%	53.7%	12.7%	0.7%	0.0%	1.1%	4.3%
87	0.6%	0.9%	16.5%	67.4%	3.6%	0.0%	2.3%	7.0%	1.8%
88	2.4%	6.2%	5.6%	47.5%	9.4%	1.8%	6.7%	16.0%	4.4%
89	0.1%	1.8%	26.5%	33.9%	12.9%	0.5%	9.1%	8.4%	6.9%
90	0.6%	5.4%	27.1%	24.5%	4.1%	0.7%	14.3%	6.4%	16.9%
91	0.2%	3.0%	36.0%	22.2%	11.6%	0.0%	11.6%	5.9%	9.6%
(85-91)	0.9%	4.4%	22.6%	42.3%	8.5%	0.6%	6.4%	7.0%	7.2%
(85-91)	0.9%	4.4%	22.6%	42.3%	8.5%	0.6%	6.4%	7.0%	7.2%

Total Mortalities

Catch Year	------Fisheries with ceilings------- All Alaska	All Nth/Cent	WCVI Troll	Total Geo St	Other Canada Net	Other Canada Sport	Other U.S. Troll	Other U.S. Net	Other U.S. Sport
85	0.5%	5.4%	28.9%	48.5%	5.3%	0.5%	0.9%	4.3%	5.6%
86	3.0%	8.0%	16.9%	54.7%	11.5%	0.7%	0.0%	1.1%	4.2%
87	0.8%	0.9%	16.6%	66.0%	3.3%	0.0%	2.3%	8.3%	1.7%
88	5.2%	6.1%	5.0%	43.0%	6.5%	1.6%	5.5%	18.3%	8.8%
89	0.1%	1.6%	26.5%	40.7%	9.4%	0.4%	8.2%	7.5%	5.6%
90	0.7%	4.8%	25.2%	27.9%	3.6%	0.6%	12.7%	9.2%	15.3%
91	0.7%	2.5%	37.9%	26.0%	9.2%	0.0%	10.7%	5.1%	7.9%
(85-91)	1.6%	4.2%	22.4%	43.8%	7.0%	0.5%	5.8%	7.7%	7.0%
(85-91)	1.6%	4.2%	22.4%	43.8%	7.0%	0.5%	5.8%	7.7%	7.0%

Stock: Chilliwack (Harrison Stock)

Reported Catch Only

Catch Year	------Fisheries with ceilings------- All Alaska	All Nth/Cent	WCVI Troll	Total Geo St	Other Canada Net	Other Canada Sport	Other U.S. Troll	Other U.S. Net	Other U.S. Sport
85	0.4%	4.4%	35.1%	34.9%	8.6%	0.0%	4.0%	4.4%	8.1%
86	0.0%	5.3%	25.3%	36.7%	13.8%	0.0%	3.7%	7.3%	7.9%
87	0.1%	2.5%	24.5%	55.0%	2.8%	0.5%	5.6%	5.3%	3.6%
88	1.2%	0.3%	39.2%	37.7%	4.7%	0.0%	8.4%	5.5%	3.0%
89	0.6%	1.1%	35.7%	33.6%	7.8%	0.0%	11.0%	7.4%	2.8%
90	2.0%	3.5%	15.1%	27.9%	7.9%	0.5%	9.0%	24.0%	10.3%
91	0.7%	2.6%	27.5%	34.3%	5.5%	1.0%	11.2%	8.1%	9.1%
(85-91)	0.7%	2.8%	28.9%	37.1%	7.3%	0.3%	7.6%	8.8%	6.4%
(85-91)	0.7%	2.8%	28.9%	37.1%	7.3%	0.3%	7.6%	8.8%	6.4%

Total Mortalities

Catch Year	------Fisheries with ceilings------- All Alaska	All Nth/Cent	WCVI Troll	Total Geo St	Other Canada Net	Other Canada Sport	Other U.S. Troll	Other U.S. Net	Other U.S. Sport
85	0.5%	4.2%	33.2%	36.1%	7.3%	0.0%	3.9%	6.4%	8.4%
86	0.0%	5.2%	24.6%	37.7%	12.0%	0.0%	3.6%	8.2%	8.8%
87	0.1%	2.7%	27.9%	52.4%	2.5%	0.4%	5.8%	5.0%	3.2%
88	1.3%	0.4%	37.0%	36.5%	4.3%	0.0%	7.8%	7.5%	5.1%
89	0.5%	0.7%	34.4%	42.3%	5.0%	0.0%	9.5%	5.4%	2.1%
90	2.4%	2.4%	14.0%	35.2%	5.0%	0.3%	8.3%	23.7%	8.8%
91	1.3%	2.3%	26.9%	38.7%	4.3%	0.8%	10.3%	7.8%	7.6%
(85-91)	0.9%	2.5%	28.3%	39.8%	5.8%	0.2%	7.0%	9.1%	6.3%
(85-91)	0.9%	2.5%	28.3%	39.8%	5.8%	0.2%	7.0%	9.1%	6.3%

Stock: South Puget Sound Fall Yearling

Reported Catch Only

Catch Year	Fisheries with ceilings: All Alaska	All Nth/Cent	WCVI Troll	Total Geo St	Other Canada Net	Other Canada Sport	Other U.S. Troll	Other U.S. Net	Other U.S. Sport
82	0.0%	2.5%	3.0%	3.7%	0.0%	0.0%	1.1%	19.7%	70.0%
83	0.0%	1.5%	5.6%	0.3%	0.0%	0.0%	0.0%	10.7%	81.8%
84	0.0%	0.0%	7.6%	2.0%	0.0%	0.0%	0.0%	37.7%	52.7%
90	0.0%	0.1%	0.1%	0.0%	0.6%	0.0%	0.6%	36.2%	62.4%
91	0.0%	0.0%	6.3%	0.9%	0.0%	0.0%	3.0%	14.0%	75.7%
(82-91)	0.0%	0.8%	4.5%	1.4%	0.1%	0.0%	0.9%	23.7%	68.5%
(85-91)	0.0%	0.0%	3.2%	0.5%	0.3%	0.0%	1.8%	25.1%	69.1%

Total Mortalities

Catch Year	Fisheries with ceilings: All Alaska	All Nth/Cent	WCVI Troll	Total Geo St	Other Canada Net	Other Canada Sport	Other U.S. Troll	Other U.S. Net	Other U.S. Sport
82	0.0%	2.1%	3.3%	3.0%	0.0%	0.0%	0.8%	17.4%	73.3%
83	0.0%	1.5%	5.7%	0.3%	0.0%	0.0%	0.0%	10.0%	82.4%
84	0.0%	0.0%	7.8%	2.0%	0.0%	0.0%	0.0%	38.4%	51.9%
90	0.0%	0.1%	0.8%	0.2%	0.6%	0.0%	0.8%	36.4%	61.2%
91	0.0%	0.0%	5.8%	1.0%	0.0%	0.0%	2.8%	12.0%	78.5%
(82-91)	0.0%	0.7%	4.7%	1.3%	0.1%	0.0%	0.9%	22.8%	69.5%
(85-91)	0.0%	0.0%	3.3%	0.6%	0.3%	0.0%	1.8%	24.2%	69.9%

Stock: Squaxin Pens Fall Yearling

Reported Catch Only

Catch Year	------Fisheries with ceilings------- All Alaska	All Nth/Cent	WCVI Troll	Total Geo St	Other Canada Net	Other Canada Sport	Other U.S. Troll	Other U.S. Net	Other U.S. Sport
90	0.0%	0.1%	3.4%	0.8%	1.2%	0.2%	4.7%	34.7%	54.9%
91	0.0%	0.0%	3.8%	1.4%	0.5%	0.0%	6.4%	30.3%	57.6%
(90-91)	0.0%	0.0%	3.6%	1.1%	0.8%	0.1%	5.5%	32.5%	56.3%
(90-91)	0.0%	0.0%	3.6%	1.1%	0.8%	0.1%	5.5%	32.5%	56.3%

Total Mortalities

Catch Year	------Fisheries with ceilings------- All Alaska	All Nth/Cent	WCVI Troll	Total Geo St	Other Canada Net	Other Canada Sport	Other U.S. Troll	Other U.S. Net	Other U.S. Sport
90	0.0%	0.1%	3.6%	1.0%	1.1%	0.2%	4.5%	35.3%	54.3%
91	0.0%	0.0%	3.9%	1.6%	0.5%	0.0%	6.3%	29.5%	58.3%
(90-91)	0.0%	0.0%	3.7%	1.3%	0.8%	0.1%	5.4%	32.4%	56.3%
(90-91)	0.0%	0.0%	3.7%	1.3%	0.8%	0.1%	5.4%	32.4%	56.3%

Stock: University of Washington Accelerated

Reported Catch Only

Catch Year	------Fisheries with ceilings------- All Alaska	All Nth/Cent	WCVI Troll	Total Geo St	Other Canada Net	Other Canada Sport	Other U.S. Troll	Other U.S. Net	Other U.S. Sport
79	0.0%	0.4%	18.4%	8.0%	5.2%	0.1%	2.3%	7.2%	58.4%
80	0.0%	0.5%	11.2%	6.8%	2.3%	0.3%	2.1%	18.5%	58.2%
81	0.0%	0.6%	10.8%	5.5%	4.3%	0.1%	2.4%	12.4%	63.9%
82	0.2%	0.4%	23.3%	5.8%	1.2%	0.2%	3.2%	20.7%	45.0%
83	0.0%	1.6%	13.3%	6.5%	2.0%	0.1%	0.6%	33.9%	41.9%
84	0.0%	0.7%	25.2%	7.1%	1.4%	0.4%	2.4%	30.7%	32.1%
85	0.0%	0.5%	21.4%	7.0%	7.0%	1.8%	3.0%	21.1%	38.4%
86	0.0%	0.8%	22.3%	5.3%	9.2%	1.4%	1.8%	31.8%	27.4%
87	0.4%	0.4%	12.7%	7.4%	0.4%	1.9%	4.7%	56.7%	15.7%
(79-87)	0.1%	0.7%	17.6%	6.6%	3.7%	0.7%	2.5%	25.9%	42.3%
(85-91)	0.1%	0.5%	18.8%	6.6%	5.5%	1.7%	3.2%	36.5%	27.2%

Total Mortalities

Catch Year	------Fisheries with ceilings------- All Alaska	All Nth/Cent	WCVI Troll	Total Geo St	Other Canada Net	Other Canada Sport	Other U.S. Troll	Other U.S. Net	Other U.S. Sport
79	0.0%	0.4%	17.5%	6.8%	4.7%	0.1%	2.4%	7.4%	60.8%
80	0.0%	0.5%	10.8%	4.5%	1.7%	0.2%	2.1%	15.9%	64.3%
81	0.0%	0.5%	9.1%	3.8%	3.3%	0.1%	2.1%	10.2%	71.0%
82	0.1%	0.4%	23.7%	5.4%	1.1%	0.2%	3.5%	20.6%	44.9%
83	0.0%	1.3%	11.2%	5.8%	1.6%	0.1%	0.5%	33.0%	46.4%
84	0.0%	0.7%	23.2%	6.6%	1.2%	0.4%	2.2%	30.1%	35.7%
85	0.0%	0.6%	19.7%	6.8%	6.0%	1.5%	2.8%	20.3%	42.3%
86	0.0%	0.6%	21.5%	5.2%	7.8%	1.4%	2.0%	30.5%	31.0%
87	0.5%	0.5%	14.8%	7.0%	0.3%	1.7%	5.2%	55.1%	14.7%
(79-87)	0.1%	0.6%	16.8%	5.8%	3.1%	0.6%	2.5%	24.8%	45.7%
(85-91)	0.2%	0.6%	18.7%	6.3%	4.7%	1.6%	3.3%	35.3%	29.4%

Stock: Samish Fall Fingerling

Reported Catch Only

Catch Year	Fisheries with ceilings: All Alaska	Fisheries with ceilings: All Nth/Cent	Fisheries with ceilings: WCVI Troll	Fisheries with ceilings: Total Geo St	Other Canada Net	Other Canada Sport	Other U.S. Troll	Other U.S. Net	Other U.S. Sport
89	0.0%	1.4%	5.2%	24.9%	4.6%	0.8%	9.7%	40.7%	12.8%
90	0.2%	0.7%	21.8%	15.6%	1.3%	0.7%	20.4%	33.3%	6.1%
91	0.0%	0.7%	19.9%	18.7%	2.3%	3.5%	8.7%	32.6%	13.7%
(89-91)	0.1%	1.0%	15.6%	19.7%	2.7%	1.6%	12.9%	35.5%	10.9%
(89-91)	0.1%	1.0%	15.6%	19.7%	2.7%	1.6%	12.9%	35.5%	10.9%

Total Mortalities

Catch Year	Fisheries with ceilings: All Alaska	Fisheries with ceilings: All Nth/Cent	Fisheries with ceilings: WCVI Troll	Fisheries with ceilings: Total Geo St	Other Canada Net	Other Canada Sport	Other U.S. Troll	Other U.S. Net	Other U.S. Sport
89	0.0%	1.3%	8.6%	26.8%	3.9%	0.7%	11.2%	35.9%	11.5%
90	0.2%	0.8%	22.7%	15.9%	1.2%	0.6%	20.7%	31.9%	6.0%
91	0.0%	0.7%	20.7%	20.5%	2.2%	3.3%	8.9%	30.2%	13.4%
(89-91)	0.1%	0.9%	17.3%	21.1%	2.4%	1.6%	13.6%	32.7%	10.3%
(89-91)	0.1%	0.9%	17.3%	21.1%	2.4%	1.6%	13.6%	32.7%	10.3%

Stock: Lummi Ponds Fall Fingerling

Reported Catch Only

Catch Year	Fisheries with ceilings: All Alaska	Fisheries with ceilings: All Nth/Cent	Fisheries with ceilings: WCVI Troll	Fisheries with ceilings: Total Geo St	Other Canada Net	Other Canada Sport	Other U.S. Troll	Other U.S. Net	Other U.S. Sport
79	0.4%	11.0%	26.7%	16.0%	4.6%	0.0%	0.0%	30.0%	11.3%
80	0.0%	3.4%	25.4%	26.8%	2.3%	0.5%	2.3%	35.5%	3.8%
81	0.0%	3.1%	15.8%	30.1%	1.5%	0.0%	2.0%	45.1%	2.5%
82	0.3%	2.8%	14.1%	17.4%	1.7%	0.0%	0.0%	55.0%	8.8%
83	0.3%	1.8%	17.4%	28.4%	8.3%	0.0%	1.4%	24.5%	17.6%
84	0.0%	6.7%	15.6%	37.5%	2.9%	1.1%	0.0%	30.9%	5.2%
89	0.0%	0.5%	3.6%	26.5%	6.7%	0.8%	9.7%	44.5%	7.7%
90	0.2%	1.2%	18.2%	15.2%	1.6%	1.1%	12.3%	45.4%	4.8%
91	0.1%	1.0%	11.1%	12.5%	0.8%	1.3%	7.1%	57.9%	8.3%
(79-91)	0.1%	3.5%	16.4%	23.4%	3.4%	0.5%	3.9%	41.0%	7.8%
(85-91)	0.1%	0.9%	11.0%	18.0%	3.0%	1.0%	9.7%	49.3%	6.9%

Total Mortalities

Catch Year	Fisheries with ceilings: All Alaska	Fisheries with ceilings: All Nth/Cent	Fisheries with ceilings: WCVI Troll	Fisheries with ceilings: Total Geo St	Other Canada Net	Other Canada Sport	Other U.S. Troll	Other U.S. Net	Other U.S. Sport
79	0.3%	11.1%	28.3%	15.1%	4.5%	0.1%	0.4%	28.9%	11.3%
80	0.0%	3.5%	27.1%	25.7%	2.3%	0.5%	2.5%	34.6%	3.8%
81	0.0%	3.2%	16.4%	29.6%	1.5%	0.0%	2.1%	44.8%	2.6%
82	0.2%	3.4%	14.6%	19.0%	1.7%	0.0%	0.0%	51.9%	9.4%
83	0.5%	1.6%	17.7%	28.9%	6.7%	0.0%	1.3%	21.4%	22.0%
84	0.2%	7.1%	16.0%	36.4%	2.9%	1.2%	0.0%	31.2%	5.2%
89	0.0%	0.5%	6.4%	28.6%	5.7%	0.7%	10.5%	40.5%	7.0%
90	0.3%	1.2%	19.0%	17.4%	1.6%	1.1%	12.4%	41.9%	5.1%
91	0.4%	1.0%	12.7%	15.1%	0.7%	1.2%	7.7%	53.6%	7.7%
(79-91)	0.2%	3.6%	17.6%	24.0%	3.1%	0.5%	4.1%	38.8%	8.2%
(85-91)	0.2%	0.9%	12.7%	20.4%	2.7%	1.0%	10.2%	45.3%	6.6%

Stock: Stillaguamish Fall Fingerling

Reported Catch Only

Catch Year	------Fisheries with ceilings------- All Alaska	All Nth/Cent	WCVI Troll	Total Geo St	Other Canada Net	Other Canada Sport	Other U.S. Troll	Other U.S. Net	Other U.S. Sport
84	0.0%	34.7%	8.3%	17.4%	20.7%	0.0%	0.0%	4.1%	14.9%
85	18.6%	6.8%	27.1%	8.5%	9.3%	5.9%	0.0%	11.0%	14.4%
86	5.4%	4.3%	31.2%	22.6%	0.0%	0.0%	0.0%	16.1%	19.4%
90	0.9%	18.1%	26.2%	11.2%	5.6%	4.4%	7.5%	9.7%	16.5%
91	0.6%	0.3%	15.5%	12.6%	2.6%	5.2%	10.3%	25.5%	27.7%
(84-91)	5.1%	12.8%	21.6%	14.4%	7.6%	3.1%	3.6%	13.3%	18.6%
(85-91)	6.4%	7.4%	25.0%	13.7%	4.4%	3.9%	4.4%	15.6%	19.5%

Total Mortalities

Catch Year	------Fisheries with ceilings------- All Alaska	All Nth/Cent	WCVI Troll	Total Geo St	Other Canada Net	Other Canada Sport	Other U.S. Troll	Other U.S. Net	Other U.S. Sport
84	2.6%	29.4%	9.8%	16.3%	17.6%	0.7%	0.0%	3.9%	19.0%
85	19.7%	6.1%	25.9%	7.5%	8.2%	5.4%	0.0%	9.5%	16.3%
86	7.1%	4.1%	31.6%	21.4%	0.0%	0.0%	0.0%	15.3%	19.4%
90	1.0%	16.6%	25.1%	15.1%	4.8%	4.0%	8.0%	9.8%	15.3%
91	0.7%	0.2%	13.5%	18.7%	1.8%	4.3%	8.8%	23.6%	28.5%
(84-91)	6.2%	11.3%	21.2%	15.8%	6.5%	2.9%	3.4%	12.4%	19.7%
(85-91)	7.1%	6.8%	24.0%	15.7%	3.7%	3.4%	4.2%	14.6%	19.9%

Stock: Tulalip Fall Fingerling

Reported Catch Only

Catch Year	Fisheries with ceilings: All Alaska	Fisheries with ceilings: All Nth/Cent	Fisheries with ceilings: WCVI Troll	Fisheries with ceilings: Total Geo St	Other Canada Net	Other Canada Sport	Other U.S. Troll	Other U.S. Net	Other U.S. Sport
90	0.2%	0.7%	13.6%	3.5%	1.3%	1.6%	17.7%	51.3%	10.1%
91	0.5%	0.2%	11.7%	5.8%	1.6%	2.8%	5.6%	55.2%	16.7%
(90-91)	0.4%	0.5%	12.6%	4.6%	1.5%	2.2%	11.7%	53.2%	13.4%
(90-91)	0.4%	0.5%	12.6%	4.6%	1.5%	2.2%	11.7%	53.2%	13.4%

Total Mortalities

Catch Year	Fisheries with ceilings: All Alaska	Fisheries with ceilings: All Nth/Cent	Fisheries with ceilings: WCVI Troll	Fisheries with ceilings: Total Geo St	Other Canada Net	Other Canada Sport	Other U.S. Troll	Other U.S. Net	Other U.S. Sport
90	0.3%	0.8%	13.7%	4.7%	1.3%	1.6%	17.1%	49.5%	11.0%
91	0.7%	0.2%	12.6%	7.1%	1.5%	2.6%	6.2%	53.0%	16.2%
(90-91)	0.5%	0.5%	13.1%	5.9%	1.4%	2.1%	11.6%	51.3%	13.6%
(90-91)	0.5%	0.5%	13.1%	5.9%	1.4%	2.1%	11.6%	51.3%	13.6%

Stock: George Adams Fall Fingerling

Reported Catch Only

Catch Year	------Fisheries with ceilings------- All Alaska	All Nth/Cent	WCVI Troll	Total Geo St	Other Canada Net	Other Canada Sport	Other U.S. Troll	Other U.S. Net	Other U.S. Sport
82	0.0%	1.2%	27.7%	6.1%	0.4%	0.0%	4.4%	48.3%	11.9%
83	0.0%	3.5%	17.8%	5.5%	5.0%	0.5%	0.2%	36.1%	31.4%
84	0.1%	5.8%	21.2%	7.4%	1.5%	0.0%	2.7%	37.0%	24.2%
89	0.1%	0.3%	9.7%	4.4%	5.5%	1.0%	14.8%	44.3%	19.8%
90	0.2%	1.6%	21.3%	5.7%	0.9%	1.5%	19.1%	29.6%	20.1%
91	0.4%	0.0%	22.1%	2.9%	0.5%	3.5%	9.8%	39.4%	21.5%
(82-91)	0.1%	2.1%	20.0%	5.4%	2.3%	1.1%	8.5%	39.1%	21.5%
(85-91)	0.2%	0.6%	17.7%	4.4%	2.3%	2.0%	14.6%	37.7%	20.5%

Total Mortalities

Catch Year	------Fisheries with ceilings------- All Alaska	All Nth/Cent	WCVI Troll	Total Geo St	Other Canada Net	Other Canada Sport	Other U.S. Troll	Other U.S. Net	Other U.S. Sport
82	0.0%	1.3%	26.7%	6.4%	0.5%	0.0%	4.1%	46.4%	14.7%
83	0.0%	2.4%	13.2%	4.8%	3.2%	0.5%	0.2%	30.0%	45.8%
84	0.2%	5.8%	21.8%	7.1%	1.5%	0.0%	2.8%	37.4%	23.5%
89	0.4%	0.4%	11.7%	5.7%	4.8%	1.1%	14.8%	40.5%	20.6%
90	0.3%	1.7%	24.0%	6.3%	0.8%	1.3%	20.0%	27.6%	18.1%
91	0.5%	0.0%	22.5%	2.9%	0.5%	3.4%	9.8%	39.2%	21.2%
(82-91)	0.2%	1.9%	20.0%	5.5%	1.9%	1.0%	8.6%	36.8%	24.0%
(85-91)	0.4%	0.7%	19.4%	5.0%	2.0%	1.9%	14.8%	35.8%	20.0%

Stock: South Puget Sound Fall Fingerling

Reported Catch Only

Catch Year	------Fisheries with ceilings------- All Alaska	All Nth/Cent	WCVI Troll	Total Geo St	Other Canada Net	Other Canada Sport	Other U.S. Troll	Other U.S. Net	Other U.S. Sport
82	0.4%	1.1%	24.0%	16.2%	2.0%	0.3%	2.8%	24.1%	29.1%
83	0.0%	3.2%	23.2%	6.2%	3.3%	0.4%	0.9%	28.7%	33.9%
84	0.3%	3.0%	24.9%	11.1%	1.2%	0.3%	1.9%	31.3%	25.9%
85	1.1%	1.0%	22.7%	7.4%	1.5%	0.7%	2.4%	37.3%	25.9%
86	0.0%	1.6%	24.5%	11.6%	2.1%	0.0%	6.5%	17.0%	36.7%
87	0.0%	0.0%	23.4%	21.3%	4.4%	0.0%	12.2%	21.0%	17.8%
88	0.4%	3.7%	11.6%	13.2%	5.0%	1.1%	9.7%	35.8%	19.6%
89	0.1%	1.3%	11.5%	5.8%	5.7%	2.8%	15.4%	34.1%	23.3%
90	0.2%	1.7%	26.0%	4.6%	1.4%	1.6%	19.7%	31.4%	13.3%
91	0.4%	0.0%	15.9%	3.2%	1.2%	1.3%	13.1%	42.1%	22.8%
(82-91)	0.3%	1.7%	20.8%	10.1%	2.8%	0.8%	8.5%	30.3%	24.8%
(85-91)	0.3%	1.3%	19.4%	9.6%	3.0%	1.1%	11.3%	31.3%	22.8%

Total Mortalities

Catch Year	------Fisheries with ceilings------- All Alaska	All Nth/Cent	WCVI Troll	Total Geo St	Other Canada Net	Other Canada Sport	Other U.S. Troll	Other U.S. Net	Other U.S. Sport
82	0.4%	1.3%	23.3%	14.6%	1.7%	0.2%	2.5%	22.7%	33.2%
83	0.0%	3.0%	22.6%	5.9%	2.8%	0.4%	1.0%	26.8%	37.5%
84	0.4%	3.1%	25.7%	10.6%	1.1%	0.3%	2.1%	31.3%	25.4%
85	1.3%	1.0%	22.7%	7.3%	1.6%	0.7%	2.4%	37.1%	26.0%
86	0.0%	1.5%	23.7%	11.4%	2.0%	0.0%	6.2%	15.0%	40.2%
87	0.0%	0.0%	29.2%	19.8%	3.6%	0.0%	13.0%	16.7%	17.8%
88	0.6%	3.8%	16.3%	16.5%	3.4%	0.8%	9.7%	25.4%	23.6%
89	0.1%	1.6%	13.6%	7.1%	5.1%	2.5%	16.7%	31.6%	21.7%
90	0.3%	1.8%	27.1%	5.1%	1.4%	1.5%	19.8%	29.5%	13.5%
91	0.6%	0.0%	17.8%	3.8%	1.1%	1.2%	13.8%	39.7%	22.0%
(82-91)	0.4%	1.7%	22.2%	10.2%	2.4%	0.8%	8.7%	27.6%	26.1%
(85-91)	0.4%	1.4%	21.5%	10.1%	2.6%	1.0%	11.6%	27.9%	23.5%

Stock: Kalama Creek Fall Fingerling

Reported Catch Only

Catch Year	Fisheries with ceilings: All Alaska	All Nth/Cent	WCVI Troll	Total Geo St	Other Canada Net	Other Canada Sport	Other U.S. Troll	Other U.S. Net	Other U.S. Sport
83	0.0%	1.2%	20.6%	9.2%	5.2%	0.0%	1.4%	15.0%	47.4%
84	0.0%	0.0%	26.9%	3.5%	2.1%	0.0%	2.6%	40.2%	24.8%
85	0.0%	0.0%	34.2%	0.0%	4.6%	0.3%	2.2%	34.1%	24.6%
86	0.0%	0.0%	18.8%	19.0%	1.2%	0.0%	0.0%	52.2%	8.9%
87	0.0%	4.8%	18.1%	11.7%	0.6%	0.0%	4.1%	42.4%	18.2%
88	0.0%	11.2%	8.8%	24.2%	4.9%	0.0%	12.9%	21.6%	16.4%
89	0.0%	1.0%	5.3%	2.8%	3.4%	3.1%	13.2%	51.4%	19.8%
90	0.0%	0.2%	22.5%	3.5%	0.2%	1.7%	23.0%	36.8%	12.3%
91	0.0%	2.7%	10.9%	4.9%	2.7%	1.9%	14.6%	30.7%	31.4%
(83-91)	0.0%	2.3%	18.5%	8.8%	2.8%	0.8%	8.2%	36.0%	22.6%
(85-91)	0.0%	2.8%	16.9%	9.5%	2.5%	1.0%	10.0%	38.5%	18.8%

Total Mortalities

Catch Year	Fisheries with ceilings: All Alaska	All Nth/Cent	WCVI Troll	Total Geo St	Other Canada Net	Other Canada Sport	Other U.S. Troll	Other U.S. Net	Other U.S. Sport
83	0.0%	0.9%	16.5%	7.4%	4.0%	0.0%	1.2%	14.3%	55.8%
84	0.0%	0.0%	26.7%	3.2%	1.9%	0.0%	2.6%	39.5%	26.0%
85	0.0%	0.0%	33.6%	0.0%	3.9%	0.2%	2.2%	30.3%	29.5%
86	0.0%	0.0%	20.1%	19.7%	1.1%	0.0%	0.0%	49.2%	9.7%
87	0.0%	5.0%	20.2%	11.7%	0.5%	0.0%	4.2%	38.7%	19.7%
88	0.0%	11.8%	7.8%	22.7%	3.7%	0.0%	10.6%	21.1%	22.4%
89	0.0%	1.0%	6.3%	3.4%	3.1%	2.9%	15.0%	49.6%	18.6%
90	0.0%	0.2%	23.5%	3.5%	0.2%	1.6%	23.3%	35.7%	12.0%
91	0.0%	2.8%	11.2%	5.6%	2.5%	1.9%	14.7%	28.9%	32.3%
(83-91)	0.0%	2.4%	18.4%	8.6%	2.3%	0.7%	8.2%	34.1%	25.1%
(85-91)	0.0%	3.0%	17.5%	9.5%	2.2%	1.0%	10.0%	36.2%	20.6%

Stock: Elwha Fall Fingerling

Reported Catch Only

Catch Year	------Fisheries with ceilings------- All Alaska	All Nth/Cent	WCVI Troll	Total Geo St	Other Canada Net	Other Canada Sport	Other U.S. Troll	Other U.S. Net	Other U.S. Sport
86	15.0%	17.9%	26.2%	5.8%	3.3%	1.7%	2.8%	11.6%	15.5%
87	8.1%	19.1%	19.1%	17.6%	0.6%	4.1%	4.0%	7.8%	19.5%
88	16.0%	8.9%	24.7%	0.0%	1.2%	3.4%	9.9%	21.2%	14.8%
89	13.7%	20.3%	12.5%	0.0%	0.0%	0.0%	11.6%	24.2%	17.6%
90	0.0%	24.1%	29.3%	0.0%	0.0%	0.0%	0.0%	25.9%	20.7%
91	0.0%	5.9%	14.7%	0.0%	0.0%	0.0%	0.0%	79.4%	0.0%
(86-91)	8.8%	16.0%	21.1%	3.9%	0.8%	1.6%	4.7%	28.3%	14.7%
(86-91)	8.8%	16.0%	21.1%	3.9%	0.8%	1.6%	4.7%	28.3%	14.7%

Total Mortalities

Catch Year	------Fisheries with ceilings------- All Alaska	All Nth/Cent	WCVI Troll	Total Geo St	Other Canada Net	Other Canada Sport	Other U.S. Troll	Other U.S. Net	Other U.S. Sport
86	18.1%	17.9%	24.9%	6.1%	2.8%	1.9%	3.5%	9.8%	15.0%
87	10.8%	19.2%	21.1%	16.0%	0.5%	3.7%	4.1%	6.7%	17.9%
88	18.4%	9.0%	26.3%	0.0%	1.0%	3.1%	9.6%	19.2%	13.4%
89	21.1%	18.6%	11.7%	0.0%	0.0%	0.0%	10.6%	22.0%	15.9%
90	0.0%	25.0%	31.7%	0.0%	0.0%	0.0%	0.0%	25.0%	20.0%
91	0.0%	8.6%	14.3%	0.0%	0.0%	0.0%	0.0%	77.1%	0.0%
(86-91)	11.4%	16.4%	21.6%	3.7%	0.7%	1.4%	4.6%	26.7%	13.7%
(86-91)	11.4%	16.4%	21.6%	3.7%	0.7%	1.4%	4.6%	26.7%	13.7%

Stock: Hoko Fall Fingerling

Reported Catch Only

Catch Year	------Fisheries with ceilings------- All Alaska	All Nth/Cent	WCVI Troll	Total Geo St	Other Canada Net	Other Canada Sport	Other U.S. Troll	Other U.S. Net	Other U.S. Sport
89	7.0%	19.5%	15.0%	2.5%	22.5%	0.0%	1.0%	1.0%	31.5%
90	29.5%	16.4%	24.9%	1.8%	2.8%	0.0%	2.6%	1.3%	21.0%
(89-90)	18.3%	18.0%	20.0%	2.1%	12.7%	0.0%	1.8%	1.2%	26.3%
(89-91)	18.3%	18.0%	20.0%	2.1%	12.7%	0.0%	1.8%	1.2%	26.3%

Total Mortalities

Catch Year	------Fisheries with ceilings------- All Alaska	All Nth/Cent	WCVI Troll	Total Geo St	Other Canada Net	Other Canada Sport	Other U.S. Troll	Other U.S. Net	Other U.S. Sport
89	19.7%	18.7%	17.1%	2.3%	14.8%	0.0%	1.0%	1.0%	25.2%
90	37.3%	15.4%	22.9%	1.4%	2.3%	0.0%	2.3%	1.1%	17.3%
(89-90)	28.5%	17.0%	20.0%	1.8%	8.6%	0.0%	1.6%	1.0%	21.2%
(89-91)	28.5%	17.0%	20.0%	1.8%	8.6%	0.0%	1.6%	1.0%	21.2%

Stock: Skagit Spring Yearling

Reported Catch Only

Catch Year	------Fisheries with ceilings------- All Alaska	All Nth/Cent	WCVI Troll	Total Geo St	Other Canada Net	Other Canada Sport	Other U.S. Troll	Other U.S. Net	Other U.S. Sport
85	0.0%	0.0%	7.3%	32.7%	29.1%	0.0%	0.0%	10.9%	20.9%
86	2.3%	13.5%	7.6%	52.6%	3.5%	7.0%	0.0%	4.1%	9.9%
87	0.0%	14.6%	4.9%	14.6%	7.3%	0.0%	2.4%	29.3%	25.6%
88	0.0%	8.0%	2.3%	19.3%	10.3%	3.1%	2.3%	36.3%	18.0%
89	0.0%	1.3%	5.2%	24.0%	4.8%	1.3%	6.5%	44.6%	12.1%
90	0.0%	5.1%	7.0%	22.4%	5.5%	3.6%	5.7%	18.4%	32.3%
(85-90)	0.4%	7.1%	5.7%	27.6%	10.1%	2.5%	2.8%	23.9%	19.8%
(85-91)	0.4%	7.1%	5.7%	27.6%	10.1%	2.5%	2.8%	23.9%	19.8%

Total Mortalities

Catch Year	------Fisheries with ceilings------- All Alaska	All Nth/Cent	WCVI Troll	Total Geo St	Other Canada Net	Other Canada Sport	Other U.S. Troll	Other U.S. Net	Other U.S. Sport
85	0.0%	0.8%	7.6%	32.8%	26.9%	0.0%	0.0%	10.1%	21.0%
86	3.7%	12.7%	7.4%	51.3%	3.2%	6.3%	0.0%	3.7%	11.1%
87	0.0%	11.0%	3.4%	15.8%	4.8%	0.0%	1.4%	19.2%	44.5%
88	0.0%	7.9%	3.3%	19.3%	9.8%	3.0%	2.8%	35.4%	18.4%
89	0.0%	1.4%	5.6%	29.9%	4.5%	1.3%	6.7%	37.9%	12.9%
90	0.0%	5.0%	7.2%	23.5%	5.4%	3.4%	6.0%	18.1%	31.0%
(85-90)	0.6%	6.5%	5.7%	28.8%	9.1%	2.3%	2.8%	20.7%	23.2%
(85-91)	0.6%	6.5%	5.7%	28.8%	9.1%	2.3%	2.8%	20.7%	23.2%

Stock: Nooksack Spring Yearling

Reported Catch Only

Catch Year	------Fisheries with ceilings------- All Alaska	All Nth/Cent	WCVI Troll	Total Geo St	Other Canada Net	Other Canada Sport	Other U.S. Troll	Other U.S. Net	Other U.S. Sport
89	0.0%	0.0%	0.0%	27.7%	0.0%	0.0%	0.0%	51.1%	21.3%
90	0.0%	6.5%	0.0%	25.8%	16.1%	0.0%	0.0%	6.5%	45.2%
91	0.0%	1.0%	3.6%	50.5%	10.7%	7.9%	0.3%	15.7%	10.2%
(89-91)	0.0%	2.5%	1.2%	34.7%	8.9%	2.6%	0.1%	24.4%	25.5%
(89-91)	0.0%	2.5%	1.2%	34.7%	8.9%	2.6%	0.1%	24.4%	25.5%

Total Mortalities

Catch Year	------Fisheries with ceilings------- All Alaska	All Nth/Cent	WCVI Troll	Total Geo St	Other Canada Net	Other Canada Sport	Other U.S. Troll	Other U.S. Net	Other U.S. Sport
89	0.0%	0.0%	0.0%	34.5%	0.0%	0.0%	0.0%	41.4%	20.7%
90	0.0%	3.1%	2.0%	62.2%	8.2%	3.1%	0.0%	3.1%	18.4%
91	0.0%	0.7%	3.4%	59.7%	8.1%	6.1%	0.4%	13.1%	8.8%
(89-91)	0.0%	1.3%	1.8%	52.2%	5.4%	3.0%	0.1%	19.2%	15.9%
(89-91)	0.0%	1.3%	1.8%	52.2%	5.4%	3.0%	0.1%	19.2%	15.9%

Stock: Skookum Spring Fingerling

Reported Catch Only

Catch Year	------Fisheries with ceilings------- All Alaska	All Nth/Cent	WCVI Troll	Total Geo St	Other Canada Net	Other Canada Sport	Other U.S. Troll	Other U.S. Net	Other U.S. Sport
85	0.0%	5.6%	21.4%	44.4%	19.0%	0.0%	0.0%	1.6%	7.9%
86	0.0%	11.1%	0.0%	80.6%	0.0%	0.0%	0.0%	0.0%	8.3%
87	0.0%	5.8%	0.0%	65.4%	3.8%	0.0%	0.0%	19.2%	3.8%
88	0.0%	5.0%	1.4%	83.6%	2.9%	0.0%	3.6%	1.4%	2.9%
89	0.0%	0.0%	8.9%	6.7%	13.3%	11.1%	8.9%	17.8%	33.3%
90	0.0%	0.0%	0.0%	21.7%	0.0%	0.0%	65.2%	0.0%	13.0%
91	0.0%	0.0%	0.0%	0.0%	0.0%	50.0%	12.5%	37.5%	0.0%
(85-91)	0.0%	3.9%	4.5%	43.2%	5.6%	8.7%	12.9%	11.1%	9.9%
(85-91)	0.0%	3.9%	4.5%	43.2%	5.6%	8.7%	12.9%	11.1%	9.9%

Total Mortalities

Catch Year	------Fisheries with ceilings------- All Alaska	All Nth/Cent	WCVI Troll	Total Geo St	Other Canada Net	Other Canada Sport	Other U.S. Troll	Other U.S. Net	Other U.S. Sport
85	0.0%	5.2%	20.9%	44.0%	17.9%	0.0%	0.0%	1.5%	8.2%
86	0.0%	9.5%	0.0%	83.3%	0.0%	0.0%	0.0%	0.0%	7.1%
87	0.0%	4.1%	0.0%	71.6%	4.1%	0.0%	0.0%	14.9%	6.8%
88	0.0%	6.3%	1.3%	82.3%	2.5%	0.0%	3.8%	1.3%	2.5%
89	0.0%	0.0%	8.5%	8.5%	12.8%	10.6%	8.5%	19.1%	31.9%
90	0.0%	0.0%	0.0%	20.8%	0.0%	0.0%	66.7%	0.0%	12.5%
91	0.0%	0.0%	0.0%	0.0%	0.0%	50.0%	12.5%	37.5%	0.0%
(85-91)	0.0%	3.6%	4.4%	44.4%	5.3%	8.7%	13.1%	10.6%	9.9%
(85-91)	0.0%	3.6%	4.4%	44.4%	5.3%	8.7%	13.1%	10.6%	9.9%

Stock: Quilcene Spring Yearling

Reported Catch Only

Catch Year	------Fisheries with ceilings------ All Alaska	All Nth/Cent	WCVI Troll	Total Geo St	Other Canada Net	Other Canada Sport	Other U.S. Troll	Other U.S. Net	Other U.S. Sport
85	0.0%	0.0%	28.7%	0.0%	5.5%	3.2%	0.0%	20.0%	42.6%
86	0.0%	1.7%	0.0%	2.7%	0.0%	0.0%	0.0%	2.7%	92.5%
87	0.0%	9.9%	4.3%	8.5%	33.3%	0.0%	8.5%	0.0%	36.2%
88	0.0%	6.7%	51.7%	0.0%	2.5%	0.0%	0.0%	20.8%	18.3%
89	0.0%	3.0%	0.0%	8.0%	14.0%	0.0%	25.0%	12.0%	36.0%
90	0.0%	4.7%	28.5%	9.3%	2.3%	0.0%	26.6%	0.9%	27.1%
91	1.6%	9.8%	14.6%	8.1%	3.3%	6.5%	17.1%	0.0%	38.2%
(85-91)	0.2%	5.1%	18.2%	5.2%	8.7%	1.4%	11.0%	8.1%	41.6%
(85-91)	0.2%	5.1%	18.2%	5.2%	8.7%	1.4%	11.0%	8.1%	41.6%

Total Mortalities

Catch Year	------Fisheries with ceilings------ All Alaska	All Nth/Cent	WCVI Troll	Total Geo St	Other Canada Net	Other Canada Sport	Other U.S. Troll	Other U.S. Net	Other U.S. Sport
85	0.0%	0.3%	25.5%	0.5%	4.9%	2.7%	0.2%	17.9%	47.9%
86	0.0%	1.7%	1.3%	2.6%	0.0%	0.0%	0.3%	2.6%	91.1%
87	0.0%	9.9%	4.6%	7.9%	31.1%	0.0%	7.9%	0.0%	39.1%
88	0.0%	5.6%	45.7%	2.5%	2.5%	0.0%	5.6%	16.0%	22.2%
89	0.0%	3.6%	5.8%	10.8%	10.8%	0.7%	23.7%	9.4%	36.0%
90	0.0%	5.0%	30.3%	10.1%	2.5%	0.0%	26.9%	0.8%	24.8%
91	2.2%	8.9%	14.1%	8.1%	3.0%	5.9%	16.3%	0.0%	40.0%
(85-91)	0.3%	5.0%	18.2%	6.1%	7.8%	1.3%	11.6%	6.7%	43.0%
(85-91)	0.3%	5.0%	18.2%	6.1%	7.8%	1.3%	11.6%	6.7%	43.0%

Stock: White River Spring Yearling

Reported Catch Only

Catch Year	------Fisheries with ceilings------- All Alaska	All Nth/Cent	WCVI Troll	Total Geo St	Other Canada Net	Other Canada Sport	Other U.S. Troll	Other U.S. Net	Other U.S. Sport
82	0.0%	0.0%	0.0%	3.2%	0.0%	0.0%	0.0%	67.7%	28.0%
83	0.0%	2.0%	5.4%	0.0%	0.0%	0.0%	0.0%	16.3%	75.5%
84	0.0%	11.1%	8.6%	9.9%	0.0%	0.0%	4.9%	17.3%	48.1%
85	0.0%	0.0%	0.0%	0.0%	3.0%	2.3%	0.0%	31.8%	62.6%
86	0.0%	0.4%	0.7%	2.9%	2.3%	0.0%	0.4%	21.7%	71.8%
87	0.0%	0.0%	0.0%	2.7%	0.8%	0.0%	5.8%	19.8%	70.8%
88	0.0%	0.0%	0.4%	4.1%	0.3%	0.5%	2.1%	20.9%	71.8%
89	0.0%	0.0%	1.9%	1.9%	1.6%	0.0%	8.9%	20.4%	65.1%
90	0.0%	0.0%	2.9%	1.3%	1.0%	0.0%	5.6%	21.2%	68.3%
91	0.0%	0.0%	1.2%	2.0%	0.0%	1.6%	5.1%	16.1%	74.1%
(82-91)	0.0%	1.4%	2.1%	2.8%	0.9%	0.4%	3.3%	25.3%	63.6%
(85-91)	0.0%	0.1%	1.0%	2.1%	1.3%	0.6%	4.0%	21.7%	69.2%

Total Mortalities

Catch Year	------Fisheries with ceilings------- All Alaska	All Nth/Cent	WCVI Troll	Total Geo St	Other Canada Net	Other Canada Sport	Other U.S. Troll	Other U.S. Net	Other U.S. Sport
82	0.0%	0.8%	1.6%	2.3%	0.0%	0.0%	0.0%	53.1%	41.4%
83	0.0%	2.6%	5.8%	0.0%	0.0%	0.0%	0.0%	16.1%	75.5%
84	0.0%	7.0%	5.7%	6.3%	0.0%	0.0%	2.5%	11.4%	67.7%
85	0.0%	0.0%	0.0%	0.0%	2.6%	1.9%	0.0%	26.8%	68.9%
86	0.0%	0.5%	0.7%	2.7%	2.2%	0.0%	0.5%	21.5%	72.1%
87	0.0%	0.0%	0.0%	2.1%	0.6%	0.0%	3.7%	11.5%	82.2%
88	0.0%	0.0%	0.5%	3.9%	0.3%	0.5%	2.4%	21.0%	71.4%
89	0.0%	0.0%	2.1%	2.3%	1.5%	0.0%	9.4%	18.4%	66.4%
90	0.0%	0.0%	3.2%	1.5%	0.9%	0.0%	6.4%	20.1%	68.3%
91	0.0%	0.0%	1.1%	2.6%	0.0%	1.4%	4.6%	12.6%	77.7%
(82-91)	0.0%	1.1%	2.1%	2.4%	0.8%	0.4%	3.0%	21.3%	69.2%
(85-91)	0.0%	0.1%	1.1%	2.1%	1.2%	0.6%	3.9%	18.8%	72.4%

Stock: Sooes Fall Fingerling

Reported Catch Only

Catch Year	------Fisheries with ceilings------- All Alaska	All Nth/Cent	WCVI Troll	Total Geo St	Other Canada Net	Other Canada Sport	Other U.S. Troll	Other U.S. Net	Other U.S. Sport
89	38.5%	20.5%	7.7%	0.0%	12.8%	23.1%	0.0%	0.0%	0.0%
90	27.4%	34.4%	21.7%	8.3%	2.5%	0.0%	1.3%	0.0%	3.8%
91	33.8%	34.3%	12.3%	0.0%	10.8%	0.0%	0.0%	0.0%	8.3%
(89-91)	33.2%	29.7%	13.9%	2.8%	8.7%	7.7%	0.4%	0.0%	4.1%
(89-91)	33.2%	29.7%	13.9%	2.8%	8.7%	7.7%	0.4%	0.0%	4.1%

Total Mortalities

Catch Year	------Fisheries with ceilings------- All Alaska	All Nth/Cent	WCVI Troll	Total Geo St	Other Canada Net	Other Canada Sport	Other U.S. Troll	Other U.S. Net	Other U.S. Sport
89	41.5%	23.2%	11.0%	2.4%	7.3%	11.0%	0.0%	0.0%	3.7%
90	33.7%	32.6%	20.2%	7.3%	2.1%	0.0%	1.0%	0.0%	3.1%
91	41.9%	30.1%	11.4%	0.0%	9.3%	0.0%	0.0%	0.0%	7.2%
(89-91)	39.0%	28.6%	14.2%	3.2%	6.2%	3.7%	0.3%	0.0%	4.7%
(89-91)	39.0%	28.6%	14.2%	3.2%	6.2%	3.7%	0.3%	0.0%	4.7%

Stock: Quinault Fall Fingerling

Reported Catch Only

Catch Year	------Fisheries with ceilings------- All Alaska	All Nth/Cent	WCVI Troll	Total Geo St	Other Canada Net	Other Canada Sport	Other U.S. Troll	Other U.S. Net	Other U.S. Sport
79	11.9%	17.7%	9.5%	0.7%	0.7%	0.0%	0.0%	55.0%	4.6%
80	12.9%	16.1%	5.3%	0.0%	1.5%	0.0%	1.4%	61.1%	1.8%
81	7.0%	22.9%	13.0%	0.0%	18.4%	0.0%	0.0%	38.7%	0.0%
82	8.6%	8.5%	9.3%	0.0%	0.0%	0.0%	0.0%	73.2%	0.5%
83	21.0%	22.2%	6.9%	0.2%	0.2%	0.1%	0.0%	49.4%	0.0%
84	15.8%	12.0%	14.7%	0.0%	0.0%	0.0%	0.5%	55.5%	1.5%
85	14.3%	28.6%	2.9%	0.0%	10.3%	0.0%	0.0%	44.0%	0.0%
86	6.0%	14.7%	14.8%	1.6%	1.3%	2.0%	0.9%	54.6%	4.0%
87	10.6%	12.2%	7.5%	0.0%	0.0%	0.4%	0.2%	68.2%	0.9%
88	12.0%	16.8%	13.8%	0.0%	0.4%	0.0%	0.5%	55.3%	1.2%
89	8.8%	10.9%	4.7%	0.0%	0.1%	0.4%	0.1%	74.2%	0.7%
90	17.7%	10.1%	7.1%	0.0%	0.2%	0.0%	0.0%	62.5%	2.4%
91	51.7%	34.1%	10.4%	0.0%	0.0%	0.0%	0.0%	3.7%	0.0%
(79-91)	15.3%	17.4%	9.2%	0.2%	2.5%	0.2%	0.3%	53.5%	1.4%
(85-91)	17.3%	18.2%	8.7%	0.2%	1.8%	0.4%	0.2%	51.8%	1.3%

Total Mortalities

Catch Year	------Fisheries with ceilings------- All Alaska	All Nth/Cent	WCVI Troll	Total Geo St	Other Canada Net	Other Canada Sport	Other U.S. Troll	Other U.S. Net	Other U.S. Sport
79	12.5%	18.4%	9.5%	0.7%	0.7%	0.0%	0.2%	53.7%	4.3%
80	13.6%	16.4%	5.6%	0.0%	1.5%	0.0%	1.4%	59.7%	1.6%
81	11.5%	27.4%	13.6%	0.0%	14.7%	0.0%	0.0%	32.5%	0.0%
82	12.1%	9.0%	8.8%	0.0%	0.0%	0.0%	0.0%	69.4%	0.8%
83	22.5%	21.7%	7.0%	0.2%	0.2%	0.1%	0.0%	48.3%	0.0%
84	17.6%	12.1%	14.4%	0.0%	0.0%	0.0%	0.5%	53.9%	1.5%
85	28.7%	26.0%	13.1%	0.7%	5.0%	1.0%	0.5%	20.3%	4.5%
86	13.6%	17.8%	16.1%	1.2%	1.0%	1.5%	0.8%	44.5%	3.3%
87	15.6%	13.6%	8.6%	0.0%	0.0%	0.4%	0.2%	60.8%	0.9%
88	14.8%	18.3%	15.1%	0.0%	0.3%	0.0%	0.5%	49.9%	1.1%
89	12.6%	11.1%	4.9%	0.0%	0.1%	0.4%	0.1%	70.1%	0.7%
90	23.9%	9.9%	6.9%	0.0%	0.2%	0.0%	0.0%	56.9%	2.2%
91	58.5%	29.9%	8.9%	0.0%	0.0%	0.0%	0.0%	2.8%	0.0%
(79-91)	19.8%	17.8%	10.2%	0.2%	1.8%	0.3%	0.3%	47.9%	1.6%
(85-91)	24.0%	18.1%	10.5%	0.3%	0.9%	0.5%	0.3%	43.6%	1.8%

Stock: Queets Fall Fingerling

Reported Catch Only

Catch Year	------Fisheries with ceilings------- All Alaska	All Nth/Cent	WCVI Troll	Total Geo St	Other Canada Net	Other Canada Sport	Other U.S. Troll	Other U.S. Net	Other U.S. Sport
81	13.8%	19.3%	16.6%	0.0%	0.3%	0.0%	6.1%	43.1%	1.1%
82	12.4%	40.4%	15.9%	0.0%	0.0%	0.0%	0.0%	31.4%	0.0%
83	49.8%	7.0%	5.2%	0.0%	4.0%	0.0%	1.2%	32.8%	0.0%
84	9.7%	39.3%	11.7%	0.0%	0.0%	0.0%	5.9%	33.3%	0.0%
85	21.6%	50.6%	4.5%	0.0%	1.0%	0.0%	0.0%	20.1%	2.1%
86	48.6%	24.6%	8.7%	0.0%	1.2%	0.0%	0.0%	16.6%	0.0%
87	40.2%	22.5%	1.1%	0.0%	0.0%	0.0%	0.8%	34.4%	0.8%
88	34.1%	17.6%	8.7%	0.0%	0.0%	0.8%	0.0%	32.5%	6.3%
89	25.3%	17.8%	10.0%	0.0%	0.0%	0.0%	0.0%	44.8%	2.1%
90	31.9%	17.8%	16.2%	0.0%	0.0%	0.0%	0.0%	34.3%	0.0%
91	57.1%	29.2%	12.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.9%
(81-91)	31.3%	26.0%	10.1%	0.0%	0.6%	0.1%	1.3%	29.4%	1.2%
(85-91)	37.0%	25.7%	8.8%	0.0%	0.3%	0.1%	0.1%	26.1%	1.7%

Total Mortalities

Catch Year	------Fisheries with ceilings------- All Alaska	All Nth/Cent	WCVI Troll	Total Geo St	Other Canada Net	Other Canada Sport	Other U.S. Troll	Other U.S. Net	Other U.S. Sport
81	25.4%	26.6%	13.4%	0.0%	0.7%	0.0%	5.4%	28.1%	0.7%
82	17.8%	38.0%	14.7%	0.0%	0.0%	0.0%	0.5%	28.9%	0.0%
83	55.4%	6.5%	4.8%	0.0%	3.6%	0.0%	1.2%	28.5%	0.0%
84	11.2%	39.1%	11.5%	0.0%	0.0%	0.0%	6.3%	31.9%	0.0%
85	24.9%	49.2%	4.4%	0.0%	1.0%	0.0%	0.0%	18.3%	2.2%
86	54.6%	22.0%	7.9%	0.0%	1.2%	0.0%	0.0%	14.3%	0.0%
87	45.9%	20.7%	1.9%	0.0%	0.0%	0.0%	0.7%	29.8%	0.9%
88	37.6%	18.4%	9.6%	0.0%	0.0%	0.7%	0.0%	28.1%	5.5%
89	32.9%	18.0%	10.4%	0.0%	0.0%	0.0%	0.0%	36.8%	1.9%
90	35.8%	18.0%	15.3%	0.0%	0.0%	0.0%	0.0%	31.0%	0.0%
91	64.2%	24.5%	10.4%	0.0%	0.0%	0.0%	0.0%	0.2%	0.7%
(81-91)	36.9%	25.5%	9.5%	0.0%	0.6%	0.1%	1.3%	25.1%	1.1%
(85-91)	42.3%	24.4%	8.6%	0.0%	0.3%	0.1%	0.1%	22.6%	1.6%

Stock: Humtulips Fall Fingerling

Reported Catch Only

Catch Year	------Fisheries with ceilings------- All Alaska	All Nth/Cent	WCVI Troll	Total Geo St	Other Canada Net	Other Canada Sport	Other U.S. Troll	Other U.S. Net	Other U.S. Sport
87	10.8%	3.9%	0.0%	0.0%	1.0%	0.0%	0.0%	79.8%	4.4%
88	12.1%	14.1%	2.7%	0.0%	0.0%	0.0%	0.0%	68.5%	2.7%
89	9.9%	15.3%	1.9%	0.9%	0.0%	0.0%	0.4%	68.7%	2.9%
90	15.4%	6.0%	10.0%	0.0%	0.5%	0.0%	0.0%	67.8%	0.3%
91	28.6%	18.2%	6.5%	0.0%	0.5%	0.5%	0.0%	43.4%	2.2%
(87-91)	15.3%	11.5%	4.2%	0.2%	0.4%	0.1%	0.1%	65.6%	2.5%
(87-91)	15.3%	11.5%	4.2%	0.2%	0.4%	0.1%	0.1%	65.6%	2.5%

Total Mortalities

Catch Year	------Fisheries with ceilings------- All Alaska	All Nth/Cent	WCVI Troll	Total Geo St	Other Canada Net	Other Canada Sport	Other U.S. Troll	Other U.S. Net	Other U.S. Sport
87	18.9%	9.3%	2.3%	0.0%	0.8%	0.0%	0.0%	64.5%	3.5%
88	21.5%	16.4%	5.6%	0.3%	0.0%	0.3%	0.0%	53.3%	2.3%
89	16.8%	15.8%	3.3%	0.9%	0.0%	0.0%	0.3%	60.3%	2.5%
90	21.3%	6.7%	11.2%	0.0%	0.5%	0.0%	0.0%	60.1%	0.3%
91	40.3%	19.9%	6.4%	0.0%	0.4%	0.5%	0.0%	30.0%	2.5%
(87-91)	23.8%	13.6%	5.7%	0.2%	0.3%	0.2%	0.1%	53.6%	2.2%
(87-91)	23.8%	13.6%	5.7%	0.2%	0.3%	0.2%	0.1%	53.6%	2.2%

Stock: Quillayute Summers

Reported Catch Only

Catch Year	Fisheries with ceilings: All Alaska	All Nth/Cent	WCVI Troll	Total Geo St	Other Canada Net	Other Canada Sport	Other U.S. Troll	Other U.S. Net	Other U.S. Sport
89	38.2%	35.3%	23.5%	0.0%	5.9%	0.0%	0.0%	0.0%	0.0%
90	33.3%	52.0%	0.0%	0.0%	0.0%	0.0%	9.3%	0.0%	4.0%
91	42.2%	27.5%	13.8%	0.0%	0.0%	0.0%	16.5%	0.0%	0.0%
(89-91)	37.9%	38.3%	12.4%	0.0%	2.0%	0.0%	8.6%	0.0%	1.3%
(89-91)	37.9%	38.3%	12.4%	0.0%	2.0%	0.0%	8.6%	0.0%	1.3%

Total Mortalities

Catch Year	Fisheries with ceilings: All Alaska	All Nth/Cent	WCVI Troll	Total Geo St	Other Canada Net	Other Canada Sport	Other U.S. Troll	Other U.S. Net	Other U.S. Sport
89	44.9%	28.6%	18.4%	0.0%	4.1%	0.0%	4.1%	0.0%	0.0%
90	44.4%	43.5%	1.9%	0.0%	0.0%	0.0%	8.3%	0.0%	2.8%
91	50.7%	22.8%	11.8%	0.0%	0.0%	0.0%	14.0%	0.0%	0.0%
(89-91)	46.7%	31.6%	10.7%	0.0%	1.4%	0.0%	8.8%	0.0%	0.9%
(89-91)	46.7%	31.6%	10.7%	0.0%	1.4%	0.0%	8.8%	0.0%	0.9%

Stock: Cowlitz Tule

Reported Catch Only

Catch Year	------Fisheries with ceilings------- All Alaska	All Nth/Cent	WCVI Troll	Total Geo St	Other Canada Net	Other Canada Sport	Other U.S. Troll	Other U.S. Net	Other U.S. Sport
81	3.3%	6.3%	24.9%	0.0%	7.2%	0.0%	12.6%	17.4%	28.3%
82	5.6%	5.7%	22.3%	0.0%	1.1%	1.6%	29.6%	15.0%	19.1%
83	6.5%	16.9%	28.1%	0.8%	0.9%	0.0%	11.1%	7.5%	28.2%
84	7.3%	15.8%	37.0%	0.0%	3.1%	0.0%	6.8%	23.6%	6.3%
85	7.9%	16.3%	21.6%	0.8%	2.4%	0.0%	8.8%	12.9%	29.4%
86	0.7%	2.1%	17.4%	0.5%	1.4%	0.0%	17.5%	42.5%	17.8%
87	5.9%	6.3%	13.0%	0.0%	0.9%	0.7%	14.0%	33.8%	25.5%
88	3.1%	3.0%	22.2%	0.0%	0.9%	0.0%	20.9%	33.3%	16.6%
89	7.8%	9.1%	11.9%	0.0%	2.4%	0.0%	32.7%	14.6%	21.4%
90	8.5%	14.8%	28.6%	0.0%	2.1%	0.0%	20.8%	0.0%	25.3%
91	18.9%	10.2%	13.1%	0.0%	0.0%	5.8%	21.9%	21.4%	8.7%
(81-91)	6.9%	9.7%	21.8%	0.2%	2.0%	0.7%	17.9%	20.2%	20.6%
(85-91)	7.5%	8.8%	18.2%	0.2%	1.5%	0.9%	19.5%	22.7%	20.7%

Total Mortalities

Catch Year	------Fisheries with ceilings------- All Alaska	All Nth/Cent	WCVI Troll	Total Geo St	Other Canada Net	Other Canada Sport	Other U.S. Troll	Other U.S. Net	Other U.S. Sport
81	5.6%	5.6%	25.9%	0.0%	6.0%	0.0%	17.0%	15.6%	24.3%
82	7.3%	5.5%	22.6%	0.0%	1.0%	1.6%	29.9%	14.6%	17.6%
83	8.2%	17.1%	28.2%	0.8%	0.8%	0.0%	11.7%	7.1%	26.2%
84	8.7%	15.9%	36.8%	0.0%	3.0%	0.0%	7.0%	22.7%	6.0%
85	10.9%	15.1%	21.5%	0.9%	2.2%	0.0%	9.1%	13.0%	27.3%
86	1.2%	2.1%	17.7%	0.5%	1.3%	0.0%	18.4%	40.3%	18.6%
87	8.2%	6.9%	14.0%	0.0%	0.8%	0.6%	14.1%	30.9%	24.5%
88	4.0%	3.2%	24.3%	0.0%	0.8%	0.0%	21.1%	31.2%	15.5%
89	10.2%	9.4%	12.4%	0.0%	2.2%	0.0%	32.7%	13.3%	19.8%
90	10.1%	14.9%	29.0%	0.0%	1.9%	0.0%	20.3%	0.0%	23.7%
91	26.1%	10.6%	13.2%	0.0%	0.0%	4.6%	20.7%	17.7%	7.1%
(81-91)	9.1%	9.7%	22.3%	0.2%	1.8%	0.6%	18.4%	18.8%	19.2%
(85-91)	10.1%	8.9%	18.9%	0.2%	1.3%	0.7%	19.5%	20.9%	19.5%

Stock: Spring Creek Tule

Reported Catch Only

Catch Year	Fisheries with ceilings: All Alaska	All Nth/Cent	WCVI Troll	Total Geo St	Other Canada Net	Other Canada Sport	Other U.S. Troll	Other U.S. Net	Other U.S. Sport
79	0.0%	0.6%	26.2%	3.0%	4.4%	0.1%	16.8%	29.8%	19.1%
80	0.1%	0.7%	29.4%	3.0%	1.3%	0.3%	28.2%	24.2%	12.9%
81	0.0%	0.4%	23.6%	1.9%	3.2%	0.7%	25.8%	24.5%	20.0%
82	0.0%	0.6%	23.6%	1.1%	0.1%	0.0%	25.1%	39.0%	10.4%
83	0.0%	0.7%	41.5%	2.2%	0.0%	0.3%	12.0%	29.1%	14.2%
84	0.0%	3.6%	40.4%	0.0%	1.2%	0.5%	8.8%	36.8%	8.8%
85	0.0%	0.3%	24.6%	0.0%	0.5%	0.9%	21.4%	45.8%	6.6%
86	0.0%	2.8%	26.6%	1.9%	1.7%	3.9%	4.2%	50.2%	8.7%
87	0.0%	0.0%	10.4%	0.0%	0.0%	0.0%	22.1%	43.6%	23.9%
88	0.0%	1.1%	28.5%	1.1%	1.2%	0.6%	19.5%	36.9%	11.2%
89	0.0%	0.2%	17.0%	0.4%	0.4%	1.0%	30.9%	41.8%	8.2%
90	0.0%	0.7%	21.4%	0.6%	1.1%	2.2%	21.0%	33.9%	19.1%
91	0.0%	0.3%	16.4%	0.1%	0.3%	1.1%	21.8%	44.2%	15.7%
(79-91)	0.0%	0.9%	25.4%	1.2%	1.2%	0.9%	19.8%	36.9%	13.8%
(85-91)	0.0%	0.8%	20.7%	0.6%	0.8%	1.4%	20.1%	42.3%	13.3%

Total Mortalities

Catch Year	Fisheries with ceilings: All Alaska	All Nth/Cent	WCVI Troll	Total Geo St	Other Canada Net	Other Canada Sport	Other U.S. Troll	Other U.S. Net	Other U.S. Sport
79	0.0%	0.6%	27.4%	2.3%	3.7%	0.1%	18.5%	26.2%	21.2%
80	0.1%	0.7%	29.3%	2.5%	1.1%	0.3%	28.9%	23.3%	13.9%
81	0.0%	0.3%	23.3%	1.5%	2.8%	0.7%	26.3%	24.8%	20.2%
82	0.0%	0.6%	24.1%	1.0%	0.1%	0.0%	27.9%	36.7%	9.6%
83	0.0%	0.7%	41.0%	2.5%	0.0%	0.3%	12.2%	27.4%	15.9%
84	0.0%	3.3%	37.2%	0.0%	1.1%	0.4%	8.2%	35.3%	14.4%
85	0.0%	0.3%	24.9%	0.0%	0.4%	0.8%	24.3%	43.1%	6.2%
86	0.0%	3.0%	27.7%	1.9%	1.6%	3.8%	4.6%	48.6%	8.8%
87	0.0%	0.0%	10.6%	0.0%	0.0%	0.0%	21.4%	43.8%	24.2%
88	0.0%	1.1%	29.9%	1.1%	1.0%	0.6%	18.5%	35.4%	12.4%
89	0.0%	0.3%	18.4%	0.8%	0.3%	0.9%	32.2%	38.5%	8.5%
90	0.0%	0.8%	23.4%	0.9%	0.9%	2.2%	22.0%	29.9%	19.9%
91	0.0%	0.3%	17.9%	0.2%	0.3%	1.1%	22.5%	41.5%	16.1%
(79-91)	0.0%	0.9%	25.8%	1.1%	1.0%	0.9%	20.6%	35.0%	14.7%
(85-91)	0.0%	0.8%	21.8%	0.7%	0.7%	1.3%	20.8%	40.1%	13.8%

Stock: Bonneville Tule

Reported Catch Only

Catch Year	------Fisheries with ceilings------- All Alaska	All Nth/Cent	WCVI Troll	Total Geo St	Other Canada Net	Other Canada Sport	Other U.S. Troll	Other U.S. Net	Other U.S. Sport
80	0.1%	5.7%	2.7%	4.5%	7.9%	6.7%	3.0%	15.6%	53.9%
81	0.0%	0.7%	37.1%	5.6%	5.1%	0.0%	33.7%	3.2%	14.6%
82	0.0%	1.9%	46.6%	0.0%	0.8%	0.6%	10.7%	31.7%	7.7%
83	0.0%	5.6%	55.8%	4.8%	0.3%	0.2%	15.6%	7.9%	9.9%
84	0.0%	8.7%	55.7%	0.0%	2.0%	0.0%	5.5%	24.1%	3.9%
85	0.0%	1.8%	56.1%	0.0%	8.4%	2.0%	18.6%	7.6%	5.6%
86	0.0%	0.0%	9.2%	3.6%	11.9%	4.3%	4.0%	38.5%	28.6%
87	0.0%	2.6%	35.1%	0.6%	0.3%	1.3%	21.2%	28.1%	10.8%
(80-87)	0.0%	3.4%	37.3%	2.4%	4.6%	1.9%	14.0%	19.6%	16.9%
(85-91)	0.0%	1.5%	33.5%	1.4%	6.8%	2.5%	14.6%	24.7%	15.0%

Total Mortalities

Catch Year	------Fisheries with ceilings------- All Alaska	All Nth/Cent	WCVI Troll	Total Geo St	Other Canada Net	Other Canada Sport	Other U.S. Troll	Other U.S. Net	Other U.S. Sport
80	0.1%	3.1%	26.2%	1.6%	4.2%	2.9%	18.9%	8.1%	35.0%
81	0.0%	0.7%	36.5%	4.8%	4.4%	0.0%	37.3%	3.0%	13.3%
82	0.0%	1.8%	46.8%	0.0%	0.8%	0.7%	11.8%	30.1%	8.0%
83	0.0%	5.6%	56.0%	4.5%	0.3%	0.2%	16.6%	7.4%	9.3%
84	0.0%	8.7%	54.9%	0.0%	2.0%	0.0%	5.6%	24.4%	4.4%
85	0.0%	1.5%	55.2%	0.0%	6.9%	1.8%	22.3%	7.1%	5.2%
86	0.0%	0.0%	4.1%	3.2%	5.5%	2.9%	1.9%	26.3%	56.0%
87	0.0%	2.8%	37.0%	0.6%	0.2%	1.1%	20.7%	26.3%	11.3%
(80-87)	0.0%	3.0%	39.6%	1.8%	3.0%	1.2%	16.9%	16.6%	17.8%
(85-91)	0.0%	1.4%	32.1%	1.2%	4.2%	1.9%	15.0%	19.9%	24.2%

Stock: Stayton Pond Tule

Reported Catch Only

Catch Year	------Fisheries with ceilings------- All Alaska	All Nth/Cent	WCVI Troll	Total Geo St	Other Canada Net	Other Canada Sport	Other U.S. Troll	Other U.S. Net	Other U.S. Sport
82	0.0%	2.9%	32.7%	1.5%	0.4%	0.4%	29.0%	19.2%	13.9%
83	0.0%	4.0%	50.1%	2.2%	0.9%	0.9%	18.4%	10.1%	13.6%
84	0.0%	2.8%	70.1%	2.9%	2.2%	0.4%	6.5%	10.4%	4.8%
85	0.0%	1.9%	45.3%	2.8%	1.8%	0.7%	30.6%	5.2%	11.7%
86	0.0%	2.0%	27.3%	4.3%	10.1%	5.3%	22.3%	12.6%	16.0%
87	0.0%	1.9%	35.6%	0.8%	0.3%	2.3%	21.1%	24.6%	13.4%
88	0.6%	0.5%	41.9%	0.0%	0.0%	1.8%	19.6%	30.6%	4.9%
89	0.0%	0.0%	26.7%	0.0%	4.0%	0.0%	49.2%	9.8%	10.3%
90	0.0%	0.3%	29.5%	0.0%	2.3%	0.0%	51.7%	0.6%	15.6%
91	0.0%	0.6%	27.8%	1.9%	6.2%	3.7%	13.9%	6.5%	39.5%
(82-91)	0.1%	1.7%	38.7%	1.6%	2.8%	1.5%	26.2%	13.0%	14.4%
(85-91)	0.1%	1.0%	33.4%	1.4%	3.5%	2.0%	29.8%	12.9%	15.9%

Total Mortalities

Catch Year	------Fisheries with ceilings------- All Alaska	All Nth/Cent	WCVI Troll	Total Geo St	Other Canada Net	Other Canada Sport	Other U.S. Troll	Other U.S. Net	Other U.S. Sport
82	0.0%	2.8%	33.1%	1.7%	0.4%	0.3%	29.4%	18.5%	13.7%
83	0.0%	3.9%	49.6%	2.3%	0.8%	0.9%	18.9%	9.5%	14.1%
84	0.0%	2.8%	70.2%	2.8%	2.0%	0.3%	6.8%	9.7%	5.4%
85	0.0%	1.8%	45.2%	2.6%	1.6%	0.6%	32.1%	5.1%	10.9%
86	0.0%	2.1%	21.8%	5.6%	7.7%	4.8%	18.2%	11.2%	28.6%
87	0.0%	2.2%	41.1%	0.6%	0.3%	1.8%	20.8%	20.3%	13.0%
88	0.7%	0.5%	45.2%	0.0%	0.0%	1.7%	19.3%	28.1%	4.5%
89	0.0%	0.0%	28.2%	0.0%	3.5%	0.0%	49.8%	8.6%	10.0%
90	0.0%	0.3%	30.9%	0.0%	2.1%	0.0%	51.4%	0.5%	14.9%
91	0.0%	0.5%	22.5%	14.9%	4.2%	3.3%	11.2%	5.5%	37.9%
(82-91)	0.1%	1.7%	38.8%	3.0%	2.2%	1.4%	25.8%	11.7%	15.3%
(85-91)	0.1%	1.1%	33.6%	3.4%	2.8%	1.7%	29.0%	11.3%	17.1%

Stock: Upriver Bright

Reported Catch Only

Catch Year	------Fisheries with ceilings------- All Alaska	All Nth/Cent	WCVI Troll	Total Geo St	Other Canada Net	Other Canada Sport	Other U.S. Troll	Other U.S. Net	Other U.S. Sport
79	26.1%	20.2%	17.2%	0.4%	0.8%	0.0%	2.1%	30.9%	2.3%
80	46.5%	20.4%	13.4%	1.8%	0.6%	0.0%	2.0%	12.6%	2.8%
81	43.8%	23.8%	11.2%	0.8%	2.7%	0.8%	1.9%	10.6%	4.4%
82	27.6%	28.0%	21.5%	0.0%	2.5%	0.0%	3.5%	13.2%	3.9%
83	36.8%	35.6%	7.9%	0.5%	0.1%	0.0%	0.9%	18.1%	0.0%
84	33.5%	22.1%	13.4%	0.3%	0.7%	0.5%	0.3%	26.8%	2.4%
85	24.7%	14.7%	10.5%	0.1%	2.2%	0.1%	1.0%	42.3%	4.5%
86	18.6%	13.7%	12.9%	0.3%	0.2%	0.2%	1.9%	48.0%	4.3%
87	18.6%	18.0%	9.7%	0.0%	0.0%	0.4%	1.9%	46.4%	5.0%
88	14.1%	10.3%	12.6%	0.0%	0.1%	0.0%	2.6%	57.0%	3.2%
89	11.9%	16.8%	9.4%	0.0%	1.2%	0.0%	1.8%	56.0%	2.8%
90	19.9%	14.7%	11.9%	0.0%	0.0%	0.0%	3.4%	47.1%	3.0%
91	15.5%	11.2%	21.0%	0.0%	0.0%	0.0%	1.8%	38.6%	11.9%
(79-91)	26.0%	19.2%	13.3%	0.3%	0.9%	0.2%	1.9%	34.4%	3.9%
(85-91)	17.6%	14.2%	12.6%	0.1%	0.5%	0.1%	2.1%	47.9%	4.9%

Total Mortalities

Catch Year	------Fisheries with ceilings------- All Alaska	All Nth/Cent	WCVI Troll	Total Geo St	Other Canada Net	Other Canada Sport	Other U.S. Troll	Other U.S. Net	Other U.S. Sport
79	26.7%	20.1%	17.3%	0.4%	0.8%	0.0%	2.1%	30.2%	2.3%
80	47.1%	20.3%	13.4%	1.7%	0.6%	0.0%	2.0%	12.1%	2.8%
81	47.9%	22.4%	10.8%	0.7%	2.2%	0.7%	2.0%	9.3%	4.2%
82	38.5%	24.0%	18.4%	0.0%	2.0%	0.0%	3.2%	11.0%	2.9%
83	44.7%	32.3%	7.1%	0.5%	0.1%	0.0%	0.9%	14.4%	0.0%
84	38.1%	20.7%	12.6%	0.3%	0.6%	0.5%	0.3%	24.5%	2.3%
85	28.3%	13.7%	10.0%	0.1%	2.0%	0.1%	1.0%	40.4%	4.5%
86	21.3%	13.0%	12.8%	0.3%	0.1%	0.2%	2.0%	45.9%	4.4%
87	25.1%	18.7%	10.6%	0.0%	0.0%	0.4%	1.9%	38.9%	4.4%
88	19.2%	11.2%	14.0%	0.0%	0.1%	0.0%	2.5%	50.2%	2.8%
89	18.3%	17.7%	9.7%	0.0%	1.0%	0.0%	1.7%	49.1%	2.5%
90	24.0%	15.3%	11.9%	0.0%	0.0%	0.0%	3.3%	42.7%	2.8%
91	21.2%	11.5%	20.3%	0.0%	0.0%	0.0%	1.8%	35.0%	10.3%
(79-91)	30.8%	18.5%	13.0%	0.3%	0.7%	0.1%	1.9%	31.1%	3.5%
(85-91)	22.5%	14.4%	12.8%	0.0%	0.5%	0.1%	2.0%	43.2%	4.5%

Stock: Hanford Wild

Reported Catch Only

Catch Year	------Fisheries with ceilings------- All Alaska	All Nth/Cent	WCVI Troll	Total Geo St	Other Canada Net	Other Canada Sport	Other U.S. Troll	Other U.S. Net	Other U.S. Sport
90	15.8%	9.6%	15.9%	0.0%	0.5%	2.8%	0.8%	47.0%	7.6%
91	17.5%	19.3%	6.9%	1.5%	0.0%	0.0%	1.6%	44.2%	8.9%
(90-91)	16.7%	14.4%	11.4%	0.8%	0.2%	1.4%	1.2%	45.6%	8.3%
(90-91)	16.7%	14.4%	11.4%	0.8%	0.2%	1.4%	1.2%	45.6%	8.3%

Total Mortalities

Catch Year	------Fisheries with ceilings------ All Alaska	All Nth/Cent	WCVI Troll	Total Geo St	Other Canada Net	Other Canada Sport	Other U.S. Troll	Other U.S. Net	Other U.S. Sport
90	19.1%	10.1%	15.3%	0.0%	0.5%	2.6%	0.9%	44.3%	7.3%
91	22.9%	19.0%	6.9%	1.5%	0.0%	0.0%	1.6%	40.0%	8.1%
(90-91)	21.0%	14.5%	11.1%	0.8%	0.2%	1.3%	1.2%	42.2%	7.7%
(90-91)	21.0%	14.5%	11.1%	0.8%	0.2%	1.3%	1.2%	42.2%	7.7%

Stock: Lewis River Wild

Reported Catch Only

Catch Year	------Fisheries with ceilings------- All Alaska	All Nth/Cent	WCVI Troll	Total Geo St	Other Canada Net	Other Canada Sport	Other U.S. Troll	Other U.S. Net	Other U.S. Sport
81	16.4%	16.6%	14.6%	0.0%	1.8%	0.0%	4.9%	7.9%	37.8%
82	13.4%	9.3%	18.8%	0.8%	1.3%	0.0%	8.1%	10.9%	37.4%
86	9.2%	8.0%	11.0%	0.0%	0.0%	4.8%	4.8%	42.5%	19.7%
87	6.7%	10.6%	14.6%	0.0%	0.0%	0.5%	4.7%	44.8%	18.1%
88	6.8%	5.6%	14.6%	0.0%	0.2%	0.0%	7.6%	38.0%	27.1%
89	5.4%	16.5%	14.5%	0.0%	2.3%	1.0%	12.9%	26.7%	20.7%
90	15.5%	10.5%	37.9%	0.0%	0.0%	2.0%	13.8%	10.1%	10.2%
91	14.5%	12.7%	12.6%	0.0%	1.6%	0.0%	5.2%	37.2%	16.3%
(81-91)	11.0%	11.2%	17.3%	0.1%	0.9%	1.0%	7.7%	27.3%	23.4%
(85-91)	9.7%	10.6%	17.5%	0.0%	0.7%	1.4%	8.2%	33.2%	18.7%

Total Mortalities

Catch Year	------Fisheries with ceilings------- All Alaska	All Nth/Cent	WCVI Troll	Total Geo St	Other Canada Net	Other Canada Sport	Other U.S. Troll	Other U.S. Net	Other U.S. Sport
81	17.9%	15.7%	15.3%	0.0%	1.6%	0.0%	5.4%	8.8%	35.4%
82	16.5%	9.3%	18.4%	0.7%	1.2%	0.0%	8.0%	10.1%	35.8%
86	10.9%	8.4%	12.5%	0.0%	0.0%	4.2%	5.2%	40.4%	18.4%
87	8.4%	10.5%	14.9%	0.0%	0.0%	0.5%	4.5%	44.1%	17.1%
88	7.5%	6.0%	16.1%	0.0%	0.2%	0.0%	7.6%	37.0%	25.5%
89	7.5%	17.2%	15.2%	0.0%	2.1%	0.9%	12.9%	24.8%	19.3%
90	18.2%	10.3%	37.8%	0.0%	0.0%	1.9%	13.4%	9.2%	9.3%
91	18.0%	12.5%	12.4%	0.0%	1.5%	0.0%	5.0%	34.7%	15.9%
(81-91)	13.1%	11.2%	17.8%	0.1%	0.8%	0.9%	7.7%	26.1%	22.1%
(85-91)	11.8%	10.8%	18.1%	0.0%	0.6%	1.2%	8.1%	31.7%	17.6%

Stock: Lyons Ferry

Reported Catch Only

Catch Year	------Fisheries with ceilings------- All Alaska	All Nth/Cent	WCVI Troll	Total Geo St	Other Canada Net	Other Canada Sport	Other U.S. Troll	Other U.S. Net	Other U.S. Sport
88	4.6%	6.0%	27.1%	0.0%	0.1%	0.0%	14.6%	42.4%	5.2%
89	5.5%	10.2%	18.4%	0.0%	1.3%	0.8%	13.6%	38.6%	11.6%
90	6.9%	4.9%	20.2%	0.0%	0.0%	0.0%	14.7%	44.1%	9.3%
91	22.3%	5.7%	9.3%	0.0%	0.9%	0.0%	10.1%	39.5%	12.3%
(88-91)	9.8%	6.7%	18.7%	0.0%	0.6%	0.2%	13.2%	41.2%	9.6%
(88-91)	9.8%	6.7%	18.7%	0.0%	0.6%	0.2%	13.2%	41.2%	9.6%

Total Mortalities

Catch Year	------Fisheries with ceilings------- All Alaska	All Nth/Cent	WCVI Troll	Total Geo St	Other Canada Net	Other Canada Sport	Other U.S. Troll	Other U.S. Net	Other U.S. Sport
88	5.2%	6.4%	28.6%	0.0%	0.2%	0.0%	14.8%	39.7%	5.1%
89	7.0%	10.8%	20.7%	0.0%	1.2%	0.7%	14.5%	34.8%	10.4%
90	9.7%	5.3%	21.7%	0.0%	0.0%	0.0%	15.1%	39.9%	8.4%
91	25.2%	6.2%	10.2%	0.0%	0.8%	0.0%	9.6%	36.8%	11.2%
(88-91)	11.8%	7.2%	20.3%	0.0%	0.5%	0.2%	13.5%	37.8%	8.7%
(88-91)	11.8%	7.2%	20.3%	0.0%	0.5%	0.2%	13.5%	37.8%	8.7%

Stock: Willamette Spring

Reported Catch Only

Catch	Fisheries with ceilings				Other	Other	Other	Other	Other
Year	All Alaska	All Nth/Cent	WCVI Troll	Total Geo St	Canada Net	Canada Sport	U.S. Troll	U.S. Net	U.S. Sport
80	19.3%	39.8%	10.9%	3.3%	0.0%	0.0%	2.1%	0.1%	24.5%
81	18.4%	38.9%	6.2%	0.1%	0.0%	0.0%	1.8%	6.9%	27.6%
82	14.2%	11.8%	9.4%	0.0%	0.0%	0.0%	1.9%	10.7%	52.0%
83	9.6%	3.5%	0.7%	0.3%	0.0%	0.0%	2.5%	28.3%	55.2%
84	6.2%	4.5%	3.2%	0.2%	0.2%	0.0%	1.6%	38.5%	45.7%
85	21.5%	3.8%	2.3%	0.5%	0.0%	0.0%	1.1%	25.6%	45.3%
86	3.8%	16.5%	6.5%	0.0%	0.0%	0.7%	0.5%	35.1%	36.9%
87	9.9%	56.3%	3.5%	0.0%	0.0%	0.0%	2.0%	3.8%	24.4%
88	16.6%	15.4%	6.0%	0.0%	0.0%	0.0%	4.1%	6.4%	51.5%
89	11.3%	7.4%	4.0%	0.3%	0.3%	0.3%	2.7%	21.8%	51.8%
90	13.8%	3.5%	3.9%	0.0%	0.1%	0.2%	2.2%	26.6%	49.8%
91	7.3%	3.0%	0.6%	0.3%	0.2%	0.1%	2.1%	16.5%	69.9%
(80-91)	12.6%	17.0%	4.8%	0.4%	0.1%	0.1%	2.0%	18.4%	44.6%
(85-91)	12.0%	15.1%	3.8%	0.1%	0.1%	0.2%	2.1%	19.4%	47.1%

Total Mortalities

Catch	Fisheries with ceilings				Other	Other	Other	Other	Other
Year	All Alaska	All Nth/Cent	WCVI Troll	Total Geo St	Canada Net	Canada Sport	U.S. Troll	U.S. Net	U.S. Sport
80	22.3%	38.5%	9.9%	2.3%	0.0%	0.0%	2.2%	0.6%	24.2%
81	19.9%	36.8%	6.0%	0.1%	0.0%	0.0%	1.8%	5.9%	29.5%
82	16.7%	11.7%	8.8%	0.0%	0.0%	0.0%	1.9%	9.1%	51.8%
83	11.4%	3.7%	0.8%	0.3%	0.0%	0.0%	2.5%	26.4%	55.0%
84	7.5%	5.2%	3.6%	0.2%	0.2%	0.0%	1.7%	35.6%	46.0%
85	28.4%	3.4%	2.1%	0.4%	0.0%	0.0%	1.0%	21.1%	43.6%
86	5.3%	18.9%	7.6%	0.0%	0.0%	0.8%	0.6%	32.5%	34.3%
87	46.4%	28.3%	5.8%	0.0%	0.0%	0.0%	4.8%	1.7%	13.1%
88	22.1%	15.4%	5.8%	0.0%	0.0%	0.0%	3.5%	6.4%	46.8%
89	15.8%	8.1%	4.3%	0.4%	0.3%	0.3%	2.7%	18.3%	49.8%
90	18.0%	4.0%	4.2%	0.0%	0.1%	0.2%	2.3%	23.2%	48.1%
91	11.1%	3.4%	0.6%	0.5%	0.2%	0.1%	2.2%	14.8%	67.1%
(80-91)	18.7%	14.8%	4.9%	0.3%	0.1%	0.1%	2.3%	16.3%	42.4%
(85-91)	21.0%	11.6%	4.3%	0.2%	0.1%	0.2%	2.5%	16.9%	43.2%

Stock: Salmon River

Reported Catch Only

Catch Year	------Fisheries with ceilings------- All Alaska	All Nth/Cent	WCVI Troll	Total Geo St	Other Canada Net	Other Canada Sport	Other U.S. Troll	Other U.S. Net	Other U.S. Sport
81	29.2%	58.0%	7.1%	0.0%	0.0%	1.7%	2.5%	0.0%	1.4%
82	32.0%	39.7%	22.5%	0.0%	0.0%	0.0%	3.4%	0.0%	2.4%
83	34.7%	47.8%	14.7%	0.0%	0.0%	0.0%	0.0%	0.0%	2.9%
84	25.8%	62.8%	6.2%	0.0%	3.1%	0.0%	0.3%	0.7%	1.1%
85	45.5%	50.2%	4.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
86	44.5%	45.2%	8.1%	0.0%	0.0%	0.0%	0.0%	0.0%	2.2%
87	30.7%	48.6%	9.2%	0.0%	0.0%	0.0%	7.8%	0.0%	3.7%
88	39.8%	34.3%	16.2%	0.0%	0.0%	0.0%	3.6%	0.0%	6.1%
89	38.9%	45.4%	10.4%	0.0%	0.9%	0.0%	4.0%	0.0%	0.5%
90	32.8%	40.1%	15.9%	0.0%	0.4%	0.0%	7.5%	0.0%	3.3%
91	44.1%	39.5%	13.1%	0.0%	0.0%	0.0%	0.4%	0.0%	2.9%
(81-91)	36.2%	46.5%	11.6%	0.0%	0.4%	0.2%	2.7%	0.1%	2.4%
(85-91)	39.5%	43.3%	11.0%	0.0%	0.2%	0.0%	3.3%	0.0%	2.7%

Total Mortalities

Catch Year	------Fisheries with ceilings------- All Alaska	All Nth/Cent	WCVI Troll	Total Geo St	Other Canada Net	Other Canada Sport	Other U.S. Troll	Other U.S. Net	Other U.S. Sport
81	31.1%	56.1%	7.5%	0.0%	0.2%	1.4%	2.3%	0.0%	1.4%
82	37.2%	36.8%	20.7%	0.0%	0.0%	0.0%	3.2%	0.0%	2.1%
83	38.9%	44.9%	13.7%	0.0%	0.0%	0.0%	0.1%	0.0%	2.5%
84	30.0%	59.3%	6.0%	0.0%	2.8%	0.0%	0.3%	0.6%	1.0%
85	54.9%	39.9%	4.4%	0.0%	0.0%	0.0%	0.4%	0.0%	0.4%
86	48.4%	39.5%	8.9%	0.0%	0.0%	0.0%	1.2%	0.0%	2.0%
87	40.1%	43.9%	7.6%	0.0%	0.0%	0.0%	6.0%	0.0%	2.5%
88	41.6%	34.0%	15.9%	0.0%	0.0%	0.0%	3.2%	0.0%	5.3%
89	43.8%	41.7%	9.6%	0.0%	0.7%	0.0%	3.8%	0.0%	0.5%
90	38.0%	37.8%	14.7%	0.0%	0.3%	0.0%	6.6%	0.0%	2.6%
91	51.4%	34.3%	11.6%	0.0%	0.0%	0.0%	0.3%	0.0%	2.3%
(81-91)	41.4%	42.6%	11.0%	0.0%	0.4%	0.1%	2.5%	0.1%	2.1%
(85-91)	45.5%	38.7%	10.4%	0.0%	0.2%	0.0%	3.1%	0.0%	2.2%

APPENDIX H

Chinook Model Estimates of Stock Composition of Total Fishing Mortality in Ceiling Fisheries, Percent of Total Stock Mortality Occurring in Fishery, and Status of Associated Escapement Indicator Stock

Stock composition and mortality distribution are average for the years 1985-1991. See Section 4.5 for additional description of tables.

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FISHERY: SE ALASKA ALL GEAR

Model Stock	Percent Fishery	Percent Stock	Escapement Indicator Stock Name	Status
Columbia Upriver Bright	30.97%	26.76%	Columbia Upriver Bright	Above Goal
WCVI Hatchery	18.81%	39.38%	NA	
North/Central BC	12.23%	48.02%	Yakoun Skeena Rivers Inlet Nass Area 8 Index Smith Inlet Area 6 Index	Above Goal Above Goal Probably Rebuilding Indeterminate Prob. Not Rebuilding Prob. Not Rebuilding Not Rebuilding
Oregon Coastal North Migrating	9.96%	25.34%	Oregon Coastal	Increasing
Fraser Early	7.93%	33.89%	Upper Fraser Middle Fraser Thompson	Above Goal Above Goal Indeterminate
WCVI Wild	7.28%	37.35%	WCVI	Prob. Not Rebuilding
Upper Georgia Strait	2.28%	27.86%	Upper Georgia Strait	Indeterminate
Washington Coastal Wild	2.20%	15.21%	Grays Harbor Fall Quillayute Fall Hoh Fall Queets Fall	Above Goal Increasing Increasing Increasing
Willamette River Hatchery	2.06%	8.96%	NA	
WA Coastal Hatchery	1.85%	15.50%	NA	
Columbia Upriver Summer	1.40%	28.12%	Columbia Upriver Summer	Prob. Not Rebuilding
Alaska South SE	0.75%	94.93%	Andrew Creek Keta King Salmon Chickamin Unuk Blossom	Above Goal Above Goal Prob. Not Rebuilding Prob. Not Rebuilding Prob. Not Rebuilding Prob. Not Rebuilding
Lewis River Wild	0.70%	11.09%	Lewis River	Above Goal
Spring Cowlitz Hatchery	0.37%	1.78%	NA	
Fall Cowlitz Hatchery	0.29%	6.10%	NA	
Fraser Late	0.24%	0.24%	Harrison	Prob. Not Rebuilding
Lower GS Hatchery	0.20%	1.86%	NA	
Lower Georgia Strait	0.13%	2.03%	Lower Georgia Strait	Prob. Not Rebuilding
Skagit Summer/Fall	0.08%	2.55%	Skagit Sum/Fall	Indeterminate
PS Hatchery Fingerling	0.07%	0.27%	NA	
Puget Sound Natural	0.06%	0.25%	Green	Above Goal
Nooksack Fall	0.05%	0.12%	NA	
Snohomish Summer/Fall	0.03%	1.68%	Snohomish	Not Rebuilding
PS Yearling	0.02%	0.24%	NA	
Snake River Fall	0.02%	4.29%	Not Represented	
Stillaguamish Summer/Fall	0.02%	5.56%	Stillaguamish	Indeterminate
Lower Bonneville Hatchery	0.00%	0.00%	NA	
Spring Creek Hatchery	0.00%	0.00%	NA	
Nooksack Spring	0.00%	0.00%	Not Represented	

FISHERY: NORTH/CENTRAL B.C ALL GEAR

Model Stock	Percent Fishery	Percent Stock	Escapement Indicator Stock Name	Escapement Indicator Stock Status
Columbia Upriver Bright	22.34%	18.42%	Columbia Upriver Bright	Above Goal
WCVI Hatchery	12.60%	26.32%	NA	
North/Central BC	12.42%	47.34%	Yakoun	Above Goal
			Skeena	Above Goal
			Rivers Inlet	Probably Rebuilding
			Nass	Indeterminate
			Area 8 Index	Prob. Not Rebuilding
			Smith Inlet	Prob. Not Rebuilding
			Area 6 Index	Not Rebuilding
Oregon Coastal North Migrating	12.26%	30.68%	Oregon Coastal	Increasing
Fraser Early	8.41%	35.57%	Upper Fraser	Above Goal
			Middle Fraser	Above Goal
			Thompson	Indeterminate
WCVI Wild	5.18%	26.21%	WCVI	Prob. Not Rebuilding
Upper Georgia Strait	4.29%	51.07%	Upper Georgia Strait	Indeterminate
Willamette River Hatchery	3.98%	17.17%	NA	
Fraser Late	3.48%	3.48%	Harrison	Prob. Not Rebuilding
Washington Coastal Wild	2.92%	19.55%	Grays Harbor Fall	Above Goal
			Quillayute Fall	Increasing
			Hoh Fall	Increasing
			Queets Fall	Increasing
WA Coastal Hatchery	2.48%	19.61%	NA	
Lower GS Hatchery	1.61%	14.59%	NA	
Columbia Upriver Summer	1.48%	28.23%	Columbia Upriver Summer	Prob. Not Rebuilding
Lower Bonneville Hatchery	1.22%	1.89%	NA	
Lower Georgia Strait	0.99%	14.70%	Lower Georgia Strait	Prob. Not Rebuilding
Nooksack Fall	0.85%	2.10%	NA	
Spring Cowlitz Hatchery	0.85%	3.90%	NA	
Skagit Summer/Fall	0.58%	18.26%	Skagit Sum/Fall	Indeterminate
Lewis River Wild	0.46%	7.26%	Lewis River	Above Goal
PS Hatchery Fingerling	0.36%	1.24%	NA	
PS Yearling	0.30%	3.24%	NA	
Puget Sound Natural	0.27%	1.14%	Green	Above Goal
Fall Cowlitz Hatchery	0.25%	5.16%	NA	
Snohomish Summer/Fall	0.25%	12.68%	Snohomish	Not Rebuilding
Stillaguamish Summer/Fall	0.06%	14.26%	Stillaguamish	Indeterminate
Snake River Fall	0.04%	9.56%	Not Represented	
Alaska South SE	0.04%	5.07%	Andrew Creek	Above Goal
			Keta	Above Goal
			King Salmon	Prob. Not Rebuilding
			Chickamin	Prob. Not Rebuilding
			Unuk	Prob. Not Rebuilding
			Blossom	Prob. Not Rebuilding
Spring Creek Hatchery	0.04%	0.44%	NA	
Nooksack Spring	0.01%	3.08%	Not Represented	

FISHERY: WCVI TROLL

Model Stock	Percent Fishery	Percent Stock	Escapement Indicator Stock Name	Status
Fraser Late	25.32%	24.68%	Harrison	Prob. Not Rebuilding
Lower Bonneville Hatchery	17.43%	37.18%	NA	
Columbia Upriver Bright	16.85%	15.24%	Columbia Upriver Bright	Above Goal
WCVI Hatchery	5.61%	11.46%	NA	
Nooksack Fall	5.43%	14.18%	NA	
PS Hatchery Fingerling	4.73%	17.07%	NA	
Oregon Coastal North Migrating	3.69%	9.99%	Oregon Coastal	Increasing
Puget Sound Natural	3.67%	16.30%	Green	Above Goal
WCVI Wild	2.26%	11.31%	WCVI	Prob. Not Rebuilding
Spring Creek Hatchery	2.19%	22.27%	NA	
Spring Cowlitz Hatchery	1.89%	9.47%	NA	
Willamette River Hatchery	1.58%	7.40%	NA	
Columbia Upriver Summer	1.40%	29.79%	Columbia Upriver Summer	Prob. Not Rebuilding
Fall Cowlitz Hatchery	1.32%	30.31%	NA	
Washington Coastal Wild	1.15%	8.27%	Grays Harbor Fall Quillayute Fall Hoh Fall Queets Fall	Above Goal Increasing Increasing Increasing
WA Coastal Hatchery	1.05%	8.54%	NA	
PS Yearling	0.95%	11.11%	NA	
Fraser Early	0.94%	4.23%	Upper Fraser Middle Fraser Thompson	Above Goal Above Goal Indeterminate
Lewis River Wild	0.70%	12.43%	Lewis River	Above Goal
Skagit Summer/Fall	0.67%	23.01%	Skagit	Indeterminate
Lower GS Hatchery	0.31%	2.75%	NA	
Snohomish Summer/Fall	0.28%	15.45%	Snohomish	Not Rebuilding
Lower Georgia Strait	0.19%	2.75%	Lower Georgia Strait	Prob. Not Rebuilding
North/Central BC	0.13%	0.52%	Yakoun Skeena Rivers Inlet Nass Area 8 Index Smith Inlet Area 6 Index	Above Goal Above Goal Probably Rebuilding Indeterminate Prob. Not Rebuilding Prob. Not Rebuilding Not Rebuilding
Snake River Fall	0.11%	28.04%	Not Represented	
Upper Georgia Strait	0.06%	0.71%	Upper Georgia Strait	Indeterminate
Stillaguamish Summer/Fall	0.06%	15.17%	Stillaguamish	Indeterminate
Nooksack Spring	0.03%	10.19%	Not Represented	
Alaska South SE	0.00%	0.00%	Andrew Creek Keta King Salmon Chickamin Unuk Blossom	Above Goal Above Goal Prob. Not Rebuilding Prob. Not Rebuilding Prob. Not Rebuilding Prob. Not Rebuilding

FISHERY: GS SPORT AND TROLL

Model Stock	Percent Fishery	Percent Stock	Escapement Indicator Stock Name	Escapement Indicator Stock Status
Fraser Late	53.36%	43.70%	Harrison	Prob. Not Rebuilding
Nooksack Fall	10.79%	21.93%	NA	
Lower GS Hatchery	9.69%	70.68%	NA	
Lower Georgia Strait	5.96%	70.30%	Lower Georgia Strait	Prob. Not Rebuilding
PS Hatchery Fingerling	3.34%	8.76%	NA	
Columbia Upriver Bright	2.75%	1.50%	Columbia Upriver Bright	Above Goal
PS Yearling	2.46%	20.51%	NA	
Puget Sound Natural	2.37%	7.61%	Green	Above Goal
Lower Bonneville Hatchery	2.28%	3.16%	NA	
Upper Georgia Strait	1.29%	12.23%	Upper Georgia Strait	Indeterminate
Fraser Early	1.05%	3.62%	Upper Fraser Middle Fraser Thompson	Above Goal Above Goal Indeterminate
Washington Coastal Wild	0.84%	4.17%	Grays Harbor Fall Quillayute Fall Hoh Fall Queets Fall	Above Goal Increasing Increasing Increasing
WA Coastal Hatchery	0.84%	4.62%	NA	
Skagit Summer/Fall	0.76%	17.56%	Skagit Sum/Fall	Indeterminate
WCVI Hatchery	0.72%	1.22%	NA	
Snohomish Summer/Fall	0.34%	13.38%	Snohomish	Not Rebuilding
WCVI Wild	0.27%	1.13%	WCVI	Prob. Not Rebuild
Columbia Upriver Summer	0.22%	3.00%	Columbia Upriver Summer	Prob. Not Rebuilding
Nooksack Spring	0.18%	52.31%	Not Represented	
Spring Creek Hatchery	0.16%	1.50%	NA	
North/Central BC	0.10%	0.32%	Yakoun Skeena Rivers Inlet Nass Area 8 Index Smith Inlet Area 6 Index	Above Goal Above Goal Probably Rebuilding Indeterminate Prob. Not Rebuilding Prob. Not Rebuilding Not Rebuilding
Stillaguamish Summer/Fall	0.08%	17.27%	Stillaguamish	Indeterminate
Spring Cowlitz Hatchery	0.06%	0.22%	NA	
Willamette River Hatchery	0.05%	0.17%	NA	
Lewis River Wild	0.02%	0.27%	Lewis River	Above Goal
Fall Cowlitz Hatchery	0.01%	0.09%	NA	
Snake River Fall	0.00%	0.00%	Not Represented	
Oregon Coastal North Migrating	0.00%	0.00%	Oregon Coastal	Increasing
Alaska South SE	0.00%	0.00%	Andrew Creek Keta King Salmon Chickamin Unuk Blossom	Above Goal Above Goal Prob. Not Rebuilding Prob. Not Rebuilding Prob. Not Rebuilding Prob. Not Rebuilding

APPENDIX I

Catch By Fishery, 1975-1991
See Table 1-1 footnotes for explanation of catch areas.

Southeast Alaska

Year	Southeast Alaska			
	Troll	Net	Sport	Total
1975	287342	13365	17000	317707
1976	231239	10523	17000	258762
1977	271735	13443	17000	302178
1978	375919	25492	17000	418411
1979	389151	28455	17000	434606
1980	303885	20114	20000	343999
1981	248791	18951	21000	288742
1982	242315	48999	26000	317314
1983	269790	19655	22321	311766
1984	235629	32398	22049	290076
1985	216086	35469	24858	276413
1986	237557	22302	22551	282410
1987	242025	15539	24323	281887
1988	231281	21450	26160	278891
1989	235731	24276	31071	291078
1990	287931	27696	51200	366827
1991	263756	32807	60400	356963

North/Central B.C.

Year	North/Central B.C.			
	Troll	Net	Sport	Total
1975	327883	66080	NA	NA
1976	315596	48782	NA	NA
1977	242325	76605	8795	327725
1978	233249	63632	11457	308338
1979	244706	91085	15302	351093
1980	249675	54610	19669	323954
1981	218699	60636	11425	290760
1982	237536	77316	17274	332126
1983	253688	29659	12353	295700
1984	254157	35935	10525	300617
1985	211979	52156	9867	274002
1986	201604	46998	12619	261221
1987	239693	29260	13827	282780
1988	181907	44382	19307	245596
1989	244947	40560	35333	300840
1990	179130	41911	30862	251903
1991	220625	50067	32496	303188

West Coast Vancouver Island

Year	West Coast Vancouver Island			
	Troll	Net	Sport	Total
1975	547402	19233	NA	NA
1976	656161	17492	NA	NA
1977	566571	13745	11023	591339
1978	555259	25143	8974	589376
1979	480373	35623	7964	523960
1980	488155	34732	8539	531426
1981	397518	36411	11230	445159
1982	543783	41172	17100	602055
1983	385367	37535	28000	450902
1984	460057	43792	44162	548011
1985	354068	11089	21587	386744
1986	342063	3276	9075	354414
1987	378931	478	31790	411199
1988	408724	15438	32810	456972
1989	203695	40321	48222	292238
1990	297974	29578	61268	388820
1991	202910	59733	80239	342882

Georgia Strait/Fraser

Year	Georgia Strait/Fraser			
	Troll	Net	Sport	Total
1975	177318	66119	398000	641437
1976	197839	73018	400000	670857
1977	248932	85222	372000	706154
1978	215531	50247	500000	765778
1979	257278	48375	350000	655653
1980	273122	31143	371000	675265
1981	238876	19985	253300	512161
1982	178498	22968	163793	365259
1983	105061	17520	198433	321014
1984	88158	19851	369445	477454
1985	55686	31001	234838	321525
1986	43899	32358	181896	258153
1987	38695	13016	121081	172792
1988	19611	8373	119117	147101
1989	28474	23833	132846	185153
1990	34394	15298	111914	161606
1991	32228	15071	115519	162818

Johnstone Strait

Year	Johnstone St.	
	Net	Total
1975	30295	30295
1976	31855	31855
1977	49511	49511
1978	55148	55148
1979	31391	31391
1980	30325	30325
1981	28620	28620
1982	29454	29454
1983	28364	28364
1984	18361	18361
1985	38073	38073
1986	17866	17866
1987	13863	13863
1988	6292	6292
1989	29486	29486
1990	18433	18433
1991	13333	13333

Canada - Strait of Juan de Fuca

Year	Juan de Fuca Strait		
	Troll	Net	Total
1975	920	9799	10719
1976	1613	13004	14617
1977	1283	25344	26627
1978	824	9725	10549
1979	395	8665	9060
1980	469	3438	3907
1981	617	9982	10599
1982	208	7072	7280
1983	204	328	532
1984	275	6237	6512
1985	48	17164	17212
1986	324	17727	18051
1987	29	6782	6811
1988	13	4473	4486
1989	23	21238	21261
1990	9	7405	7414
1991	0	7957	7957

Washington - Strait of Juan de Fuca

Year	Washington Strait of Juan de Fuca			
	Troll	Net	Sport	Total
1975	5752	8048	81681	95481
1976	10488	6072	75308	91868
1977	8915	14930	53238	77083
1978	10006	11224	62299	83529
1979	7804	10939	67094	85837
1980	10682	11320	56415	78417
1981	15638	18541	51352	85531
1982	19024	22547	29842	71413
1983	18489	16141	58060	92690
1984	15650	12120	48003	75773
1985	11808	12784	44267	68859
1986	30000	17000	69000	116000
1987	45000	11000	53000	109000
1988	49000	10000	39000	98000
1989	65000	10000	52000	127000
1990	46000	5000	NA	NA
1991	35000	3000	NA	NA

Washington - San Juans

Year	Washington San Juans			
	Troll	Net	Sport	Total
1975	3	90100	31988	122091
1976	0	66832	34505	101337
1977	62	84316	14049	98427
1978	3	87565	15083	102651
1979	5	53750	17367	71122
1980	0	64338	12231	76569
1981	4	50695	9727	60426
1982	0	38763	6953	45716
1983	2	28497	15166	43665
1984	83	33432	25759	59274
1985	872	33579	12610	47061
1986	0	21000	15000	36000
1987	0	29000	14000	43000
1988	0	32000	9000	41000
1989	1000	16000	9000	26000
1990	1000	9000	NA	NA
1991	0	14000	NA	NA

Washington - Other Puget Sound

Year	Washington Other Puget Sound			
	Troll	Net	Sport	Total
1975	0	131982	173086	305068
1976	0	141281	151246	292527
1977	0	145470	97761	243231
1978	0	150298	116979	267277
1979	0	128073	156402	284475
1980	0	171516	142799	314315
1981	0	145152	106048	251200
1982	0	149274	85703	234977
1983	0	134492	123752	258244
1984	0	180248	102740	282988
1985	0	184907	92603	277510
1986	0	153000	88000	241000
1987	0	127000	59000	186000
1988	0	133000	63000	196000
1989	0	156000	70000	226000
1990	0	179000	NA	NA
1991	0	130000	NA	NA

Washington - Inside Coastal

Year	Washington Inside Coastal			
	Troll	Net	Sport	Total
1975	0	34859	1716	36575
1976	0	51995	2219	54214
1977	0	72467	2043	74510
1978	0	32662	3399	36061
1979	0	36501	2199	38700
1980	0	47681	1476	49157
1981	0	36880	786	37666
1982	0	33271	1114	34385
1983	0	16210	1452	17662
1984	0	16239	1319	17558
1985	0	25162	1955	27117
1986	0	29000	3000	32000
1987	0	51000	3000	54000
1988	0	74000	7000	81000
1989	0	85000	6000	91000
1990	0	58000	NA	NA
1991	0	54000	NA	NA

Columbia River

Year	Columbia River		
	Net	Sport	Total
1975	323000	34870	357870
1976	288400	42527	330927
1977	255600	58838	314438
1978	189100	56582	245682
1979	171000	36505	207505
1980	150300	32774	183074
1981	95100	36269	131369
1982	155300	51560	206860
1983	57700	45609	103309
1984	127900	64364	192264
1985	151400	45515	196915
1986	283100	71865	354965
1987	483500	116545	600045
1988	489100	110398	599498
1989	275000	96878	371878
1990	147300	94820	242120
1991	106800	77986	184786

Washington/Oregon Ocean North of Cape Falcon

Year	Washington/Oregon North of Falcon			
	Troll	Net	Sport	Total
1975	268971	1212	265785	535968
1976	371239	203	215319	586761
1977	244491	4	197563	442058
1978	150673	4	104306	254983
1979	133035	3	84977	218015
1980	125709	1215	59099	186023
1981	109519	209	96151	205879
1982	154720	267	114952	269939
1983	63584	62	51789	115435
1984	15392	0	6980	22372
1985	55408	493	30189	86090
1986	52000	0	23000	75000
1987	81000	4000	44000	129000
1988	108000	3000	19000	130000
1989	75000	1000	21000	97000
1990	65000	0	33000	98000
1991	51000	0	14000	65000

Oregon - Troll is late season troll off Elk River mouth; sport is estuary and inland.

Year	Oregon		
	Troll	Sport	Total
1975	300	19000	19300
1976	1000	21000	22000
1977	3000	34000	37000
1978	1000	37000	38000
1979	800	31000	31800
1980	300	22000	22300
1981	300	28000	28300
1982	500	23000	23500
1983	700	19000	19700
1984	1088	27000	28088
1985	1700	25000	26700
1986	1900	33000	34900
1987	3600	46000	49600
1988	4800	49000	53800
1989	4500	45000	49500
1990	0	38000	38000
1991	0	44500	44500