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# TABLE OF CONTENTS

	Page
INTRODUCTION .....	ii
EXECUTIVE SUMMARY .....	iv
1988 CHINOOK SALMON CATCHES IN FISHERIES WITH CEILINGS .....	iv
CUMULATIVE DEVIATIONS FROM CATCH CEILINGS .....	iv
ESCAPEMENT ASSESSMENT .....	v
EXPLOITATION RATE ANALYSIS .....	vi
QUALIFICATIONS .....	viii
RECOMMENDATIONS .....	viii
CHAPTER 1. 1988 CATCH AND ESCAPEMENT .....	1-1
CHAPTER 2. ESCAPEMENT ASSESSMENT .....	2-1
CHAPTER 3. EXPLOITATION RATE ANALYSIS .....	3-1

## INTRODUCTION

Chapter 1 of this report summarizes the 1988 chinook catch and escapement data for fisheries and stocks of concern to the Pacific Salmon Commission (PSC). Future changes to these data are expected to be small, but some data continues to be noted as preliminary. Chapters 2 and 3 describe the Chinook Committee's assessment of rebuilding through 1988.

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, therefore, was to increase 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-ceilinged, pass-through fisheries.

The Treaty instructed the Chinook Technical Committee (CTC) to "develop procedures to evaluate progress in the rebuilding of naturally spawning chinook stocks". The February 1987 Chinook Technical report "Assessing Progress Toward Rebuilding Depressed Chinook Stocks" established an evaluation framework which documented an indicator stock program, identified information requirements, and recommended analytical procedures for the assessment of rebuilding. The CTC also identified a number of policy issues (e.g. appropriate stock aggregates; proportion of the stocks rebuilding, etc.) which must be resolved before final conclusions can be reached regarding the status of rebuilding on a regional or coastwide basis. Decisions on those issues have not been made.

In assessing the status of individual stocks under the rebuilding program, the CTC identified three main elements which 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 three phases corresponding with three, 5-year chinook life-cycles in the rebuilding period: 1984-88; 1989-93; and 1994-98. The Committee also felt that a three phase approach to assessment would address the problems of changing data availability and quality over time.

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

Adequate exploitation rate and escapement information is not available for all naturally spawning chinook stocks. Stocks for which escapement information is considered sufficient to allow assessment are referred to as "escapement indicator stocks". Assessment of the rebuilding status of these indicator stocks based upon spawning escapement data is presented in Chapter 2 of this report.

The assessment of rebuilding must also evaluate changes in exploitation by ocean fisheries. Analysis of exploitation rates requires a time-series of coded-wire tag data in stocks

harvested by these fisheries. Stocks with a useful time-series of tag data are referred to as "exploitation rate indicator stocks". These stocks are generally of hatchery origin and not necessarily the same as the escapement indicator stocks. The exploitation rate analysis of changes in ocean fishery impacts across stocks and within stocks across fisheries is presented in Chapter 3 of this report. Further, Chapter 3 also includes estimates of brood year exploitation rates by stock, catch distributions for each indicator stock, indices of brood year survival trends, and catch contributions of major stocks to the fisheries under PSC established catch ceilings.

The Committee notes that the rebuilding assessment to be prepared next year will be the first year of evaluation in Phase 2 of the Rebuilding Program. As such, the Committee will likely revise assessment procedures used in this report. The changes would be to begin accounting for increased chinook production expected from changes in spawning escapements and progressive reductions in exploitation rates.

## EXECUTIVE SUMMARY

### 1988 CHINOOK SALMON CATCHES IN FISHERIES WITH CEILINGS

Estimates of 1988 catch for each fishery managed under a harvest ceiling established by the Treaty are:

AREA AND FISHERY	CEILING (x1000)	CATCH c/ (x1000)	DIFFERENCE	
			#'s	%
SE Alaska (T,N,S) a/ b/	263	253.7	-9.3	-3.5%
North/Central B.C. (T,N,S)	263	245.9	-17.1	-6.5%
West Coast Vancouver I. (T)	360	407.2	47.2	13.1%
Georgia Strait (T,S)	275	138.7	136.3	-49.6%

a/ T=Troll; N=Net; S=Sport

b/ The actual total catch was 278,700 chinook, including 25,000 for hatchery add-on.

c/ compiled with information available as of 10/24/89

Catches in all fisheries of interest to the Pacific Salmon Commission are documented in Table 1-1. The catch in the west coast Vancouver Island troll fishery exceeded the 7.5% management range about the catch ceiling established by the Commission.

### CUMULATIVE DEVIATIONS FROM CATCH CEILINGS

Cumulative deviations from catch ceilings through 1988 are as follows :

AREA AND FISHERY	CEILING (x1000)	1987	1988	CUMULATIVE		ACTION REQUIRED IN THE FOLLOWING YEAR
		CATCH c/ (x1000)	CATCH c/ (x1000)	#'s	%	
SE Alaska (T,N,S) a/	263	266.1	253.7	-6.2	-2.4	NO
North/Central B.C. (T,N,S)	263	283.0	245.9	+ 3.1	+1.1	NO
West Coast Vancouver I. (T)	360	379.0	407.2	+66.2	+18.4	YES
Georgia Strait (T,S)	275	159.0	138.7	-252.3	-7.5 b/	No

a/ SE Alaska catches exclude hatchery add-ons of 16,000 and 25,000 for 1987 and 1988 respectively.

b/ Negative deviations below the 7.5% management range can not be accumulated.

c/ Compiled with information available as of 10/24/89

## ESCAPEMENT ASSESSMENT

Escapement assessment of progress towards rebuilding was based on the same 43 indicator stocks as used in last year's assessment (TCCHINOOK (88)-2). The 1988 escapement data have been incorporated and the methods for determining stock rebuilding status have been improved. The indicator stocks have not responded uniformly to the rebuilding program. However, since expected rebuilding schedules have not been defined for all indicator stocks, it is difficult to assess if progress is sufficient to ensure rebuilding of stocks by their target year. The Committee's assessment through 1988 can be summarized as follows:

<u>Categories</u>	<u>Number of Stocks</u>	<u>% of Indicators</u>
Rebuilding	9	21%
Probably Rebuilding a/	13	30%
Indeterminate	17	40%
Probably Not Rebuilding	4	9%
Not Rebuilding	0	0%
	<u>43</u>	<u>100%</u>

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a / Stikine stock has been included as Probably Rebuilding, see chapter 2.

- (1) **Rebuilding and Probably Rebuilding Categories:** In this 1988 assessment, 51% of the escapement indicator stocks were placed in these categories. There is basically no change in the percent of stocks in these categories from 1987, when using the present assessment method and the exclusion of the 1988 data point.
- (2) **Indeterminate:** Forty percent of the escapement indicator stocks do not show clear progress towards rebuilding or clear movement away from rebuilding. Lack of clear progress towards rebuilding for stocks in phase 1 of a 3-phase rebuilding program may not be a concern, as long as fishery exploitation rates meet expectations and these stocks show clear progress towards rebuilding during phase 2. SEAK and TBR stocks, which have been involved in a rebuilding program since 1981, are already in phase 2 of their rebuilding program. The rebuilding status of five of these stocks (Situk, Blossom, Alsek, Chilkat, and Taku) is Indeterminate, suggesting that these stocks are not currently responding to the rebuilding program as expected.
- (3) **Probably Not Rebuilding:** Nine percent of the escapement indicator stocks are placed in this category. These stocks are cause for concern and should receive special attention. The four stocks are the West Coast of Vancouver Island falls, the Lower Strait of Georgia falls, the Harrison River falls, and the Snohomish River summer/fall chinook.
- (4) **Not Rebuilding:** None of the escapement indicator stocks are placed in this category. The two stocks identified as Not Rebuilding in 1987 (WCVI and Lower Georgia Strait) both showed increased escapements in 1988.
- (5) The average treaty period escapements increased over pre-treaty periods for 29 (67%) indicator stocks, decreased for 9 (21%) stocks, and no change could be assessed for 5 (12%) stocks.
- (6) The percentage of stocks meeting their escapement goal decreased in 1988. The percentage reaching their goals increased each year between 1982 and 1987. From 1987 to 1988, however, the percentage decreased from 42% to 33%.

## EXPLOITATION RATE ANALYSIS

This analysis is based on 15 exploitation rate indicator stocks, 14 of which are hatchery stocks and 1 naturally spawning stock (Lewis River). The indicator stocks are composed of 2 spring run-type, 1 summer run-type, and 12 fall run-type. Four indicator stocks were added to the analysis for 1988 ( Puget Sound yearling and fingerling, Lewis River, and Columbia River Summer). The method to calculate fishery indices was changed to reduce the variability, attributed to low tag recovery numbers for some stock and age combinations, in the indices. The stock index method was changed to provide annual fishery impacts for a stock in fisheries under PSC ceiling management and Canadian and U.S. fisheries not under ceiling management. A new component was added to the analysis which provided catch distributions for each indicator stock by year.

- (1) **Fishery Indices:** With the exception of the North/Central B.C. troll fishery, total fishing mortalities for index stocks have not decreased to the extent anticipated when the chinook rebuilding program was established. This may indicate that, for stocks represented in the analysis, initial reductions in harvest rates obtained when ceilings were imposed in 1985 have partially been lost due to fishery restructuring, increased incidental mortalities, or abundance changes. The fishery indices are summarized as follows:

Southeast Alaska: The average 1985 - 88 fishery index is 15% below the base, but 7 percentage points higher than the 22% target reduction. However, the 1988 index was 31% below the base period.

North/Central B.C.: The average 1985 - 88 fishery index is 28% below the base and 12 percentage points below the 16% target reduction. The 1988 index was 48% below the base period.

West Coast Vancouver Island: The average 1985 - 88 fishery index is 4% below the base, but 20 percentage points higher than the 24% target reduction. The 1988 index is 14% above the base period.

Georgia Strait Sport and Troll Combined: The average 1985 - 88 fishery index is 26% below the base, but 21 percentage points higher than the 47% target reduction. The 1988 index is 28% below the base.

Washington/Oregon Ocean: The average 1985 - 88 fishery index is 24% below the base. The 1988 index has returned to the base period.

It appears that management actions for the Southeast Alaska and West Coast Vancouver Island troll fisheries have not reduced harvest rates on the indicator stocks to the degree intended. The average fishery index decreased for the combined Georgia Strait troll and sport fishery, but remained above target levels. The declining catches in the Strait of Georgia are primarily the result of declining stock abundance, not harvest rate reduction. The fishery index for the Washington and Oregon ocean fisheries initially decreased substantially from base period levels but have been gradually increasing for recent years.

- (2) **Stock Indices:** The indices showed that the combined impacts on the stocks for all fisheries under PSC catch ceiling management have generally declined since the base period (12 of 16 age-stock combinations). The combined exploitation rate for all Canadian fisheries not under PSC catch ceiling management (the majority are net fisheries) was reduced by 25% from the base period for all significantly impacted stocks. This result is consistent with the reduction in impacts for

Canadian net fisheries, which was assumed in the rebuilding program. The stocks significantly impacted by U.S. fisheries not under PSC catch ceiling management showed a mixed response (5 greater than base period, 5 less than base period).

- (3) **Brood Year Ocean Exploitation Rates** The 1982-84 average brood year exploitation rates have declined from pre-treaty levels for 11 of the indicator stocks (Quinsam, Big Qualicum, Puget Sound fingerling and yearling, Spring Creek, Cowlitz Fall, Bonneville Tule, Stayton Pond Tule, Columbia Upriver Brights, Columbia Summers, and Lewis River). The average decline was 9 percentage points from the base, but the values ranged from 3 to 19 percentage points. The average 1982-84 brood year rates have increased 6 percentage points from pre-treaty levels for two stocks (Alaska Springs and Robertson Creek). The 1982-84 brood year average rates have remained unchanged for Capilano and Willamette Springs. The brood year incidental mortalities have increased for fourteen of the fifteen indicator stocks. The proportion of total fishing mortality accounted for by incidental mortality has increased by more than 50% from the base period for 11 of the 15 indicator stocks.
- (4) **Survival Rate Indices** Nine of the fifteen stocks show long term (all available observations) decreasing trends in survival. For the short term, survival of 14 stocks has decreased substantially for the 1984 and 1985 broods.
- (5) **Stock Contribution Indices:** The contribution of Columbia Upriver Brights to the outside PSC fisheries has increased dramatically since the implementation of the PST. However, contribution of Robertson Creek and Spring Creek fish to the same fisheries and time periods has decreased substantially. These data indicate that increased contributions of Columbia Upriver Brights are probably compensating for decreased contributions of other stocks in these fisheries. Columbia Upriver Brights appear to be the largest single contributor to the PSC outside fisheries.
- (6) **Stock Catch Distribution:** Catch distributions for each exploitation indicator stock by year are presented. In general the average distributions are very similar to those presented in the 1987 report (calculated using the PSC model).
- (7) **Incidental mortalities of chinook salmon** continue to be a problem and are increasing. It is not possible to quantify impacts of incidental mortalities for each escapement indicator stock, but analyses of the exploitation rate indicators imply that incidental mortalities have slowed the rebuilding rate for stocks represented by these indicators.



## **QUALIFICATIONS**

- (1) With only four years of observations under full Pacific Salmon Commission management, plus the normal high variability in fishery and escapement data, conclusions regarding rebuilding status should be viewed cautiously. Further, the assessment based on spawning escapement alone can be misleading if stock-specific conservation measures or harvest impacts obscure the effects of PSC conservation measures in fisheries under catch ceilings.
- (2) Most agencies have not yet begun to collect age and sex information from natural spawning populations. Major changes in these parameters have been observed for some stocks. Observing only the number of spawners is inadequate to assess rebuilding under these circumstances.
- (3) The exploitation rate analysis is limited by insufficient numbers of spring and summer run-type indicator stocks.
- (4) Changing fishing patterns can confound interpretation of the total exploitation rate analysis; monitoring programs are essential to up-date information used to evaluate incidental mortalities and parameters used in the exploitation rate analysis.

## **RECOMMENDATIONS**

- (1) Four indicator stocks were assessed to be Probably Not Rebuilding based on spawning escapement (Harrison River falls, West Coast of Vancouver Island falls, Lower Georgia Strait falls, and Snohomish River summer/falls). Some changes in management are probably required to rebuild these stocks.
- (2) Five SEAK and TBR stocks were assessed as Indeterminate based on spawning escapements. Since these stocks are in phase 2 of their rebuilding program, the lack of progress is of concern. Potential causes for the lack of progress should be investigated.
- (3) Hatchery stocks that are major contributors to PSC fisheries have displayed declining trends in survival. Without compensating increases in abundance of natural stocks contributing to these fisheries, fishery harvest rates will increase unless management regimes are adjusted to reduce impacts at least proportional to reductions in abundance. The PSC should consider the decreasing trends in survival exhibited by the majority of the exploitation rate indicator stocks when establishing 1990 fishing regimes.
- (4) Management measures should be implemented to reduce or compensate for incidental chinook mortalities on a coastwide basis.
- (5) A complete assessment of cumulative pass-through impacts on rebuilding progress is needed to complete the Commission's rebuilding assessment. Policy questions and information needs for interpretation of the pass-through provision should be resolved.
- (6) Policy questions of what constitutes rebuilding must be resolved before the Committee can complete its assessment of rebuilding progress.

- (7) The Committee recommends attention to the following information concerns and needs.
- (a) An increased commitment should be made to conduct consistent escapement surveys and obtaining better escapement data, including sex ratio and age composition data needed to evaluate expected production and returns by brood years.
  - (b) The indicator stock programs should be reviewed to determine the adequacy of production region and stock type representation. The Committee is especially concerned about the representation of spring and spring/summer stocks in the exploitation rate analysis, and the development of standardized definitions for run-timing classifications of stocks.
  - (c) Changes in spatial and temporal fishery patterns have affected fishing effort and perhaps chinook encounter rates. Troll fisheries and catch non-retention periods should be re-sampled to assess these impacts, and to verify parameters used in the induced mortality assessments.
  - (d) Consistent and standardized recovery programs for coded-wire tagged fish at hatcheries and on spawning grounds are required. In addition, procedures used during tagging of juvenile fish should be standardized for enumeration of marks, total release numbers, and tag retention estimates.

# CHAPTER 1

## 1988 CATCH AND ESCAPEMENT

1.0 REVIEW OF FISHERIES WITH HARVEST CEILINGS .....	2
1.1 SOUTHEAST ALASKA FISHERIES .....	2
1.2 BRITISH COLUMBIAN FISHERIES .....	2
1.2.1 North/Central British Columbia .....	2
1.2.1.1 Troll .....	2
1.2.1.2 Commercial Net .....	3
1.2.1.3 Ocean Sport .....	3
1.2.2. West Coast Vancouver Island Troll .....	3
1.2.3. Georgia Strait Troll and Sport .....	3
1.2.3.1 Troll .....	3
1.2.3.2 Sport .....	3
2.0 REVIEW OF OTHER FISHERIES .....	4
2.1 BRITISH COLUMBIA .....	4
2.1.1. Transboundary Rivers .....	4
2.1.2. Southern B.C. Commercial Net .....	4
2.1.3. Area 12 Troll .....	4
2.1.4. Other Tidal Sport .....	4
2.1.5. Non-tidal Sport .....	4
2.1.6. Indian Food Fisheries .....	5
2.2 PUGET SOUND .....	5
2.3 WASHINGTON COAST .....	5
2.4 COLUMBIA RIVER .....	6
2.5 OCEAN FISHERIES NORTH OF CAPE FALCON .....	6
2.6 OCEAN FISHERIES FROM CAPE FALCON TO CAPE BLANCO .....	6
3.0 REVIEW OF 1988 CHINOOK ESCAPEMENTS .....	7
3.1 S.E. ALASKA .....	7
3.2 TRANSBOUNDARY RIVERS .....	7
3.3 BRITISH COLUMBIA .....	7
3.3.1 North/Central B.C. (Areas 1 to 10) .....	7
3.3.2 Southern B.C. (Areas 11 to 28) .....	8
3.3.3 Fraser River (Area 29) .....	8
3.4 PUGET SOUND .....	8
3.5 WASHINGTON COAST .....	9
3.6 COLUMBIA RIVER .....	9
3.7 OREGON COAST .....	9
TABLE 1-1. CHINOOK CATCHES IN FISHERIES RELEVANT TO THE U.S./CANADA SALMON TREATY, CATCHES FOR THE YEARS 1985 - 1988 .....	11
Table 1-2. SUMMARY OF THE ESCAPEMENT TO ESCAPEMENT INDICATOR STOCKS, 1985 to 1988 .....	12

## **1.0 REVIEW OF FISHERIES WITH HARVEST CEILINGS**

### **1.1 SOUTHEAST ALASKA FISHERIES**

The preliminary 1988 catch by all Southeast Alaska fisheries was 279,000 chinook salmon. This was 9,000 fish or roughly three percent below the total 1988 all-gear catch ceiling of 288,000 which consisted of a 263,000 fish base catch ceiling plus an Alaska hatchery add-on of 25,000 chinook salmon. The total chinook salmon harvest included 231,000 (82.9%) in troll fisheries, a net fishery harvest of 21,500 (7.7%), and 26,200 (9.4%) caught in recreational fisheries. Reported catches by purse seine include only chinook 28 inch. or greater in total length. The troll fishery harvest of chinook salmon occurred as follows: winter season - 60,400 (21.6%); June experimental and terminal hatchery - 8,800 (3.1%); and summer season - 162,100 (58.1%). At only 12 days, the general summer troll season was the shortest on record, opening on July 1 and closing on July 12. Chinook salmon non-retention during the remainder of the general summer troll season (July 13 to 25, August 5 to 14, August 25 to 31, and September 4 to 20) was monitored by ADF&G onboard observers. Incidental chinook salmon catches by net fisheries increased in 1988 compared to 1987 due to increased fishing time in the purse seine fishery. Chinook salmon non-retention in the purse seine fishery during July fishing periods, and non-retention resulting from the 28-inch size limit implemented in 1986, were monitored through the ADF&G port sampling program. Chinook salmon catches in recreational fisheries increased to 26,200 fish in 1988, approximately 10 percent above the 1985 to 1987 average of 23,900 fish. U.S. chinook catches in the transboundary rivers are included in the all-gear totals.

### **1.2 BRITISH COLUMBIAN FISHERIES**

The minimum size limit for troll fisheries in all areas except the Strait of Georgia remained at 67 cm. fork length. Catch statistics for commercial fisheries represent sales slip data accumulated through September 20, 1989. Only minor revisions would be expected beyond this time.

#### **1.2.1 North/Central British Columbia**

The 1988 chinook catch in fisheries under PSC ceilings totalled 245,900. This reduced catch was required to bring the accumulated catch deviations in northern B.C. within the 7.5% management range about the Treaty specified ceiling of 263,000.

##### **1.2.1.1 Troll:**

The troll fishery opened for all species on July 1. The southern portion of Area 2W on the Queen Charlotte Islands remained closed throughout the troll season to slow the chinook catch. The entire North/Central area closed to chinook trolling on August 5. On August 21, the North/Central Coast closed to commercial salmon trolling. These areas were reopened to chinook trolling from August 31 to September 7 to make up for a catch shortfall in the first opening. Chinook nonretention fisheries totalled 17 days but were not sampled for catch-release rates. Chinook catch was 181,000.

#### **1.2.1.2 Commercial Net:**

Net fisheries north of Vancouver Island harvested chinook incidentally during fisheries directed at sockeye, pink and chum. The total net catch of chinook in the North/Central Coast was 44,200. The Queen Charlotte Island chinook net catch was low in 1988 (5,700) reflecting the limited fishing time in 2W (the West Coast area), and the continued restrictions of fishing areas to reduce the chinook catch in Area 1 (Langara area). The Skeena-Nass (Areas 3,4,5) chinook net catch was high in 1988 (25,600), largely resulting from a high incidental catch during the early portion of the Skeena sockeye fishery. Central coast chinook catches were low (12,900) relative to recent years, apparently reflecting a low chinook abundance in these areas in 1988.

#### **1.2.1.3 Ocean Sport:**

Estimates of the North/Central sport catch in tidal water totalled 20,700. The Queen Charlotte sport catch in tidal water increased substantially in 1988 (7,000) reflecting increased fishing effort. The Skeena-Nass chinook sport catches were similar to 1987 (4,300), and Central coast catches increased to 9,400.

### **1.2.2. West Coast Vancouver Island Troll**

The 1988 catch ceiling for this fishery was 360,000. The fishery opened for chinook on July 1 and, as in 1987, was managed through area closures of Swiftsure Bank (off Juan de Fuca Strait) and Big Bank (off Barkley Sound) to reduce the catch rate. The fishery was closed for the retention of chinook on August 24 and for all species on September 7. Chinook non-retention fisheries (CNR) totalled 14 days. CNR periods were not sampled for catch-release rates. The reported catch was 407,200 chinook in 1988.

### **1.2.3. Georgia Strait Troll and Sport**

The 1988 combined catch ceiling for the Strait of Georgia (troll and sport) was 256,000. Chinook catch, based upon accumulated sales slips for troll fisheries and a creel survey for the sport fishery, was 138,700.

#### **1.2.3.1 Troll:**

The catch ceiling for the troll fishery was reduced from 50,000 to 31,000, as part of a management plan to rebuild the lower Strait of Georgia chinook stock. The troll fishery opened for chinook on July 1 and continued through September 30. Chinook non-retention fisheries did not occur in 1988. The reported catch was 19,600 chinook in 1988.

#### **1.2.3.2 Sport:**

The management plan to reduce the harvest impact of the recreational fishery in the Strait of Georgia was not fully implemented in 1988. Consequently, the annual chinook catch, as measured by the Strait of Georgia creel survey, was just slightly less than the 1987 catch. The estimated catch of chinook for 1988 is 119,100. Recreational effort in the Strait increased over recent years, but the proportion of the effort directed on chinook is uncertain. Increased catches of coho salmon probably accounted for the increased effort.

## 2.0 REVIEW OF OTHER FISHERIES

Available catch statistics for fisheries of interest to PSC, but not managed under PSC harvest ceilings are presented in Table 1-1. The narratives below describe the general 1988 fishery status for the major fisheries without ceilings of concern to PSC chinook management.

### 2.1 BRITISH COLUMBIA

#### 2.1.1. Transboundary Rivers

Commercial gill net catch of chinook in the Canadian portions of the Transboundary rivers are: Taku River - 555 chinook adults and 186 jacks; Stikine River - 1,180 chinook adults and 247 jacks.

#### 2.1.2. Southern B.C. Commercial Net:

Area (Stat. Area)	Catch (chinook > 5 lbs.)
-----	-----
Johnstone strait (11-13)	6,300
Georgia Strait (14-19)	1,500
Fraser River (28,29)	8,000
Juan de Fuca Strait (20)	4,379
Barkley Sound (23)	14,789
Other WCVI (21,22,24-27)	650

Catches in most southern B.C. net fisheries were at record lows, due to restricted fishing for sockeye. The exception to this is the catch of chinook in Barkley Sound. However, 84% of the total chinook catch (11,896 out of 14,354) occurred in two one night fisheries (August 22 and September 5) for Somass River chinook (largely Robertson Creek Hatchery chinook). Returns of chinook to the Somass River were stronger in 1988, and dominated by age 4 fish. The reported catch in the Fraser River nets includes 2,853 chinook taken during test fisheries conducted by the Department of Fisheries and Oceans and the Pacific Salmon Commission.

#### 2.1.3. Area 12 Troll

The catch in this fishery is estimated to be 1,570 chinook.

#### 2.1.4. Other Tidal Sport

A number of tidal sport fisheries occur on the west coast of Vancouver Island and in upper Johnstone Strait. However, only the fishery in Barkley Sound was assessed for catch. The 1988 chinook catch in Barkley Sound (for only August 15 through the end of September) is estimated by creel survey to be 32,800.

#### 2.1.5. Non-tidal Sport

Non-tidal recreational fisheries exist in most major B.C. rivers, including the Skeena, Nass, Kitimat, Bella Coola, Somass and Fraser rivers and various streams on the east coast of Vancouver Island. A small sport fishery occurs in the upper Alsek River. The reported catch in the Alsek fishery was 275 chinook in 1988. In northern B.C. rivers (areas 1-10), the 1988 chinook catch was estimated by field staff at 6,000 including jack chinooks. In the Fraser River, chinook fisheries occurred in nine areas (Bowron, Quesnel, Bridge, Clearwater, Shuswap, South Thompson, Thompson, Vedder-Chilliwack and Lower Fraser rivers). Chinook catch, estimated by creel surveys and interviews by fishery officers, was 3,000 chinook adults and

4,700 jacks. The largest catch (2,300 adults and 4,700 jacks) occurred in the lower Fraser River. Catch estimates are not yet available for the fishery in the Chilliwack-Vedder River.

#### **2.1.6. Indian Food Fisheries**

The 1988 chinook catch by native indians in the Stikine River was 1,178 adults and 197 jacks. Catch in the Taku River was 27 adults; and catch in the Alsek River was 315 chinook.

Fishing Area	Preliminary 1988 Catches
North/Central B.C.	23,200
Somass River	10,665
Fraser River	15,589

The vast majority of the North/Central catch occurs within the Nass and Skeena Rivers. In-river catches in 1988 were estimated to be 3,000 and 14,400 adults in the Nass and Skeena, respectively. Tidal catches in waters off the Nass and Skeena were 179 and 3,620 adults, respectively. The remainder of the catches occur in smaller fisheries throughout the North/Central area. The 1988 food fish catch of chinook in the North/Central B.C. was similar to the 1987 catch of 20,000.

The 1988 chinook catch in the Somass River was a decrease from the 1987 level of 12,211.

The 1988 chinook catch in the Fraser River was slightly higher than the 1987 level of 14,525.

Fisheries occur in several rivers draining into the Strait of Georgia. Reported catches from the Cowichan, Nanaimo, and Squamish rivers totalled 818 chinook in 1988. Reductions in catch have resulted from efforts to reduce fishing times and to supplement native food fisheries with other species.

## **2.2 PUGET SOUND**

Puget Sound commercial and recreational fisheries were regulated by time and area closures, with the intent to protect depressed spring chinook stocks. With several exceptions, Puget Sound summer/fall type chinook stocks returned at levels of abundance sufficient to support some terminal fisheries. Commercial net catch was 173,000 in 1988, similar to 1987 catch level. The recreational fisheries were managed in the same general manner as in 1987. The recreational fishery in the Strait of Juan de Fuca was closed on Fridays from July through September, with a two fish bag limit. The estimated recreational catch in 1988 is 131,000 chinook.

## **2.3 WASHINGTON COAST**

The northern Washington coastal stocks from the Quillayute (except summer runs), Hoh and Queets Rivers are managed on the basis of escapement floors and terminal exploitation rates. Returns to the rivers for all of these stocks are above the floor levels allowing both commercial and recreational fisheries. Commercial fisheries were conducted in Grays Harbor during the fall management period. A minimal spring chinook directed fishery was conducted on the Chehalis Reservation. Commercial net fisheries in coastal bays and rivers harvested 77,000 chinook in 1988, representing an increase of 23,000 over the 1987 catch level.

## **2.4 COLUMBIA RIVER**

The 1988 freshwater sport fishery, including the buoy 10 fishery, harvested approximately 94,000 chinook compared to 84,000 in 1987. The 1988 Columbia River net fisheries harvested 491,300 chinook compared to 483,000 in 1987. A lower river spring chinook gillnet fishery, targeting on surplus lower river spring stocks, harvested 18,300 chinook, 5,100 of which were of up-river origin. Treaty Indian 1988 commercial catches of upper Columbia River spring and summer chinook stocks, incidental to fisheries directed at other species, totalled 200 and 1,200 adult fish, respectively. There were ceremonial and subsistence fisheries on the upriver spring chinook run which harvested about 6,800 fish. Commercial chinook fisheries were directed primarily at lower river fall stocks and upriver bright fall stocks. Fall commercial seasons were structured to maximize harvest of surplus upriver brights and lower river tule (hatchery) stocks while providing protection for the depressed Spring Creek Hatchery stock.

## **2.5 OCEAN FISHERIES NORTH OF CAPE FALCON**

Ocean chinook fisheries off the Washington coast and the Oregon coast, north of Cape Falcon, were managed primarily for Columbia River chinook stocks. Far northerly migrating chinook stocks are taken incidentally to harvest directed at Columbia River Tule stocks in this area. In 1988, the coastwide impacts on chronically depressed upper Columbia River spring and summer run stocks were of particular concern to the Council in setting ocean troll and recreational quotas. There was also some continued concern for depressed Columbia River fall tule chinooks destined for Spring Creek Hatchery. Ocean quotas were established for all fisheries north of Cape Falcon for the 1988 season. The total ocean troll harvest was 107,000 chinook. Washington landings totalled 105,000 and include both treaty and non-treaty fishery catches. The total ocean recreational harvest north of Cape Falcon was 20,000 chinook. These fisheries were also limited by PFMC quotas.

## **2.6 OCEAN FISHERIES FROM CAPE FALCON TO CAPE BLANCO**

Ocean fisheries in Oregon's central coast area harvest a mixture of stocks originating primarily from California's central valley and north coast rivers and the Rogue river in southern Oregon. These stocks do not migrate north into PSC jurisdiction. Stocks that do migrate north into PSC fisheries include the north migrating coastal Oregon stock aggregate. These north migrators are harvested only incidentally (probably < 10%) in Oregon fisheries in this area. An early chinook fishery began on May 1 in state waters, while the general all species fishery opened on July 1 for most areas along the central coast. The all-species fishery was closed on August 19 for coho while chinook fishing continued generally until October 31. Chinook catch in this area was very good, with 460,000 fish landed, as productivity of the southern stocks continued to remain high. This troll catch was the second largest on record for chinook in Oregon ocean waters. The only fishery harvesting predominately north migrating chinook is the late season near-shore fishery off the mouth of Elk River (Lat. 43 N) and 4371 chinook were landed in this area in 1988. This is the largest number of chinook to be taken in this local fishery.



## **3.0 REVIEW OF 1988 CHINOOK ESCAPEMENTS**

We have prepared the following brief narratives to complement the escapement data presented in Table 1-2.

### **3.1 S.E. ALASKA**

Based on ADF&G estimates, 1988 total escapements of wild stock chinook salmon to Southeast Alaska and transboundary rivers increased by 16 percent to 60,500 compared to 52,000 in 1987. Compared to the 1975 to 1980 base period average escapement of 26,000, the 1988 escapement represented an increase of 132 percent or 34,500 chinook salmon. However, the increase in total escapement in 1988 was due primarily to increased chinook salmon escapements in the Stikine and Taku transboundary rivers. Escapements in 8 of the 11 index systems decreased by an average of 33 percent in 1988 compared to 1987. The weakness in 1988 chinook salmon escapements generally occurred throughout the region except as noted for the Taku and Stikine. The largest decreases in chinook escapements were observed in the Blossom (-72%), Situk (-53 %), and Chilkat Rivers (-39 %). Escapements to southern and central systems (Behm Canal systems and the Stikine River) have exhibited the greatest improvements in escapement levels in recent years relative to the base period, with northern systems (Taku, Alsek, and Chilkat Rivers) generally showing less improvement.

### **3.2 TRANSBOUNDARY RIVERS**

Chinook escapements increased in 1988, compared to 1987, in two of the six transboundary rivers and declined in four. The 1988 Stikine escapement of 31,800 chinook is the largest since observations began in 1975. Escapements to the Taku in 1988 increased relative to 1987 (+50% U.S. estimate, +54% Canadian estimate), but remained approximately half the goal. Percent changes for the systems with declining escapements were: -11% (94 fish) in the Chilkat River, -12% (360 fish) in the Unuk River, in the Chickamin River -20% (300 fish), and -24% (numerical value differs between U.S. and Canadian estimates) in the Alsek River.

### **3.3 BRITISH COLUMBIA**

#### **3.3.1 North/Central B.C. (Areas 1 to 10)**

Escapements to Area 6 (Kitimat/Butedale) and Area 8 (Bella Coola) indicator stocks were revised to exclude rivers where enhancement contributes substantially to current escapements. Recent escapements to these systems do not accurately reflect the level of natural stock rebuilding since escapement to the enhanced rivers cannot be separated into enhanced and natural components. Kitimat and adjacent tributaries in Area 6, and Bella Coola River in Area 8, were excluded from the indicator stocks used in this report. Indicator stocks in these areas are now referred to as the Area 6 and Area 8 index stocks, respectively, in other Committee reports.

The 1988 Queen Charlotte Island (Area 1) chinook escapement is estimated at 2,000, similar to the 1987 escapement and above the escapement goal. Nass Area escapements (Area 3) are estimated to total 10,000 in 1988, a decline from 1987. Skeena stocks remained strong in 1988; spawning escapements increased to 68,705 and exceeded the escapement goal.

Escapements to the Area 6 Index stocks improved in 1988 to 3,165 from 1,666 in 1987. Spawning escapements to the Area 8 Index stocks totalled 1,650 similar to the

1987 level but 39% below the 1985-87 average escapement period. Rivers Inlet (Area 9) spawning escapements in 1988 were estimated to total 4,429, up from the 1985-87 average escapement. Spawning escapement of Smith Inlet (Area 10) was the same as in 1987, 1,050, about 50% below the escapement goal.

### **3.3.2 Southern B.C. (Areas 11 to 28)**

The 1988 escapement to the upper Strait of Georgia stock group decreased from 1987 and did not meet the target escapement goal (as was achieved in 1987). Estimates of escapement to this area are however, quite variable, probably reflecting natural variation in fish returns and problems with visual survey methods in some mainland inlet rivers which are glacially fed. The reported aggregate escapement to the 5 indicator stocks was 3,300 chinook.

Brood stock has been removed from escapements previously reported for indicator stocks in the Lower Strait of Georgia. Escapements reported now only represent chinook which spawned naturally, but terminal runs to these areas will include terminal catches and brood stock removed. This was done so that the response of natural spawning populations could be compared to the escapement objectives established for chinook spawning naturally.

Escapements to indicator stocks (Squamish, Nanaimo and Cowichan Rivers) in the lower Strait of Georgia were variable. Returns to the Cowichan River increased approximately three-fold over 1987. A counting fence was operated on the Cowichan River in 1988 and successfully enumerated chinook between early September and early November (therefore the 1987 and 1988 enumerations are not directly comparable). Spawning escapements to the Squamish are down relative to 1987 while the Nanaimo River is higher than 1987. Escapement monitoring programs are also being established in these rivers. The aggregate escapement to these three indicator stocks in 1988 was 6,900 chinook, and the total terminal run (natural spawning, Native catch, and brood stock removal) was 9,300.

Escapements to naturally spawning stocks on the West Coast of Vancouver Island appear to have increased relative to 1987, returning to near base period levels, which is 50% of the goals. Aggregate escapement to these 7 indicator stocks was 5,525 chinook.

### **3.3.3 Fraser River (Area 29)**

The 1988 escapement of Fraser River indicator stocks totalled 141,200, a decline of 20% from the 1987 level. The decline was greatest in the Harrison River (35,700, a 55% decline). Relative to 1987, Middle Fraser stocks declined by 12% (24,160 escapement), Upper Fraser stocks by 1% (34,250 escapement), and the Thompson River stocks increased by 28 % (47,100 escapement).

## **3.4 PUGET SOUND**

Springs - Many spring chinook stocks are in perilous condition. For example, less than 50 fish returned to the White River, less than 500 fish to the Dungeness River, and less than 1,000 to the Nooksack River. For most of the spring stocks we have little past information from which to draw an historical perspective and gauge progress. Some rivers still do not have complete methodology for estimating spring chinook escapements.

Summers and Falls - Green River chinook escapement in 1988 declined from the 1987 level but exceeded the escapement goal. A large fraction of these fish are

considered to be hatchery strays from yearling plants. Escapements for the Skagit, Snohomish and Stillaguamish stocks were all below escapement goals in 1988, as in 1987.

### 3.5 WASHINGTON COAST

Spring/Summer stocks - Grays Harbor spring chinook escapement in 1988 was above the escapement objective of 1400 adults. Aside from this year and the 1986 escapement, this stock has been chronically underescaped for the past decade. Quillayute River stock escapement in 1988 was about double the level observed in 1986 and 1987 but below the escapement goal. Escapement for this stock has been below the goal each year since 1979. The remaining coastal spring/summer stocks all achieved their respective minimum escapement objectives.

Fall stocks - All of the coastal fall chinook stocks had escapements in 1988 at levels well above the average in 1979-82, except in the Hoh River.

### 3.6 COLUMBIA RIVER

Columbia River stocks continued to show a mixed response to rebuilding efforts. Escapement needs for lower river spring chinook stocks (Willamette and Cowlitz) were met. The Bonneville Dam escapement of 35,100 wild upriver spring chinook adults decreased 15 percent from the 41,400 escapement in 1987, ending the previous upward trend. The 84,000 wild adult escapement goal at Bonneville Dam is equivalent to the magnitude of wild fish in the run when the combined natural and hatchery goal of 120,000 was developed.

The 1988 Bonneville Dam escapement of 30,100 adult summer chinook was a 5 percent decrease from the 1987 escapement of 31,800. Whether escapement measured at Bonneville Dam is an accurate portrayal of the true status of summer chinook is in question. Overlapping run timings with increasing abundance of spring and fall stocks may be inflating the counts of summer chinook. The trend of increasing escapements ended in 1987, and this stock remains seriously depressed compared to its 85,000 escapement goal.

The count of adult upriver bright fall chinook at McNary Dam was 114,700 fish compared to the 1987 count of 154,100 and the escapement goal of 40,000 adults. Sport fisheries and a limited tribal commercial gillnet fishery in the area above McNary Dam harvested a small portion of this surplus with adult catches of 5,000 and 2,200, respectively. The upriver bright fall chinook stock has demonstrated dramatic abundance increases in the last few years compared to the record low return in 1981.

The 1988 return to Spring Creek Hatchery, including tule fall chinook trapped at Bonneville Dam as supplement broodstock, totalled 3,600 adults compared to only 2,050 in 1987 and the escapement goal of 8,200 adults. Approximately 3,000 surplus females from Bonneville Hatchery were transferred to Spring Creek Hatchery as supplemental broodstock in 1988.

Large surpluses of lower river hatchery tules were recorded at nearly all lower river Washington and Oregon hatchery facilities in 1988.

### 3.7 OREGON COAST

Spawning escapements into the 10 standard survey streams were the highest on record, as indicated by indices of the peak number of live and dead fish on the

spawning grounds. The spawner abundance index for the aggregated north migrating stocks on the Oregon Coast was 221 fish per mile as compared to 129 fish per mile in 1987. These stocks have been experiencing unusually high survival, particularly the 1984 brood. Subsequent broods appear to be experiencing lower survival.

TABLE 1-1. CHINOOK CATCHES IN FISHERIES RELEVANT TO THE U.S./CANADA SALMON TREATY, CATCHES FOR THE YEARS 1985 - 1988 (numbers of fish in 1,000's).  
05-Nov-89

AREA	TROLL				NET				SPORT				TOTAL			
	1988	1987	1986	1985	1988	1987	1986	1985	1988	1987	1986	1985	1988	1987	1986	1985
S.E. ALASKA	231	242	236	217 a	22	15	22	36 a	26	24	21	25	279	281	279	278
BRITISH COLUMBIA																
North/Cent. Coast	181	240	202	215	44	29	47	51	21	14	12	9	246	283	261	275
W. Vanc. Island	407	379	342	358	15	0.5	3.3	11	33	32	13	22 d	455	412	358	391
Georgia St/Fraser	20	38	44	52	10	13	32	31	119	121	182	235 e	149	172	258	318
Johnstone St	2	2	4	5	6	14	18	38	10	10	10	10	18	26	32	53
Juan de Fuca St	0	0	0	0.4	4	7	18	17				e	4	7	18	17
sub-total	610	659	592	630	79	64	118	148	183	177	217	276	872	900	927	1054
WASHINGTON INSIDE																
Strait (mar)	50	45	30	13 g	9	11	19	13	41	53	69	44 h	92	99	114	63
San Juans (mar)	0	0	0	0	32	29	21	33	12	14	17	13 h	44	43	38	46
Other PS (mar+fw)	0	0	0	0	132	124	151	180	78	59	88	93 h	210	183	239	273
Coastal (mar+fw)	0	0	0	0	77	54	28	25	3	3	3	2	80	57	31	27
sub-total	50	45	30	13	250	218	219	251	134	129	177	152	426	382	422	409
COLUMBIA RIVER	-	-	-	-	491	483	283	151 i	94	84	66	48 j	585	567	349	199
WA/OR N C FALCON	107	78	51	58	3	2	0	0	19	44	23	30	138	134	79	91
OREGON																
C Blanco-C Falcon	4	3	2	2 l	-	-	-	-	49	47	33	25 k	53	50	35	27
South of C Falcon	456	516	393	205 m	-	-	-	-	38	55	20	52 m	494	571	413	257
GRAND TOTAL	1458	1543	1304	1125	842	780	642	586	543	560	557	608	2843	2883	2503	2319

- a/ S.E. Alaska troll catches shown for Oct. 1- Sept. 30 counting year; purse seine catches only include chinook 28 in. or greater in total lt.
- b/ British Columbia net catch only includes fish over 5 lb. round weight. Native food fishery catches are not included.
- c/ Sport catches are for tidal waters only, catch updates will be provided as available.
- d/ Estimates of 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/ Coastal and Puget Sound sport catches include marine and freshwater catches, but only adults in freshwater.
- g/ Includes areas 5, 6c and area 4B troll catches outside of the PFMC management period (May - September) in the Juan de Fuca Strait total.
- h/ Adjusted for punch card bias by multiplying punch card estimate by 0.833. This bias adjustment methodology is currently under review and may result in future adjustment to these numbers; 1988 catches do not include freshwater catches.
- i/ Columbia River net catches include Oregon, Washington and treaty catches, but not treaty ceremonial.
- j/ Columbia River sport catches include adults only, for Washington, Oregon, Idaho and Buoy 10 anglers.
- k/ Estuary and inland sport catch data are still preliminary for 1986 to 1988.
- l/ Includes only special late season ocean troll catch off Elk River in the Cape Blanco area.
- m/ Catches in marine fisheries managed by the Pacific Marine Fisheries Council.

Table 1-2. SUMMARY OF THE ESCAPEMENT TO ESCAPEMENT INDICATOR STOCKS, 1985 to 1988.  
05-Nov-89

Production Unit	Stock Type	Ave Esc. Base a/	Esc. Goal	1985 Esc.	1986 Esc.	1987 Esc.	1988 Esc.	1988 % Base	1988 % Goal
<b>Southeast Alaska</b>									
Situk	Spring	1,557	2,100	1,521	2,067	1,884	885	57%	42%
King Salmon	Spring	95	250	171	245	193	206	217%	82%
Andrews Creek	Spring	371	750	510	1,131	1,042	752	203%	100%
Blossom	Spring	165	1,300	1,134	2,045	2,158	614	372%	47%
Keta	Spring	407	800	998	1,104	1,229	920	226%	115%
<b>Transboundary Rivers Not Addressed in Treaty Annexes</b>									
Chilkat (U.S.)	Spring	213	2,000	625	170	875	781	367%	39%
Unuk (U.S.)	Spring	1,283	2,900	1,894	3,402	3,157	2,794	218%	96%
Chickamin (U.S.)	Spring	344	1,400	1,530	2,683	1,560	1,258	366%	90%
<b>Transboundary Rivers Addressed in Treaty Annexes</b>									
Alsek (U.S.)	Spring	4,501	5,000	2,005	4,073	3,892	3,105	69%	62%
Alsek (Canada)	Spring	5,780	12,500	2,916	5,400	5,200	4,060	70%	32%
Taku (U.S.)	Spring	7,978	25,600	10,851	12,178	8,951	13,411	168%	52%
Taku (Canada)	Spring	9,967	30,000	14,416	15,040	11,500	17,250	173%	57%
Stikine (U.S.)	Spring	6,224	13,700	12,584	11,572	19,108	29,168	469%	213%
Stikine (Canada)	Spring	8,283	25,000	12,584	11,572	18,132	29,168	352%	117%
<b>B.C. North Coast</b>									
Yakoun River	Spr/Sum	788	1,576	1,500	500	2,000	2,000	254%	127%
Nass area	Spr/Sum	7,944	15,888	8,000	17,390	11,400	10,000	126%	63%
Skeena area	Spr/Sum	20,883	41,766	53,600	59,968	59,120	68,700	329%	164%
<b>B.C. Central Coast</b>									
Area 6 Index	Summer	2,760	5,521	1,510	2,615	1,566	3,165	115%	57%
Area 8 Index	Summer	2,725	5,450	4,550	3,362	1,456	1,650	61%	30%
Rivers Inlet	Summer	2,475	4,950	3,370	7,623	5,239	4,430	179%	89%
Smith Inlet	Summer	1,055	2,110	230	532	1,050	1,050	100%	50%
<b>West Coast Vancouver Island</b>									
Indicator Stocks	Fall	5,814	11,628	4,900	4,810	3,570	5,525	95%	48%
<b>Fraser River</b>									
Upper River	Spr/Sum	12,229	24,458	34,527	41,207	34,520	34,250	280%	140%
Middle River	Spr/Sum	9,216	21,133	17,595	27,349	27,330	24,160	262%	114%
Thompson River	Spr/Sum	22,059	55,714	39,997	45,130	36,730	47,100	214%	85%
Harrison River	Fall	116,791	233,582	147,620	162,393	78,693	35,700	31%	15%
<b>Georgia Strait</b>									
Upper	b/ Fall	2,662	5,325	4,600	1,630	5,700	3,300	124%	62%
Lower	Fall	11,139	22,278	4,796	2,830	2,530	6,914	62%	31%

Table 2. (Continued)

Production Unit	Stock Type	Ave Esc. Base a/	Esc. Goal	1985 Esc.	1986 Esc.	1987 Esc.	1988 Esc.	1988 % Base	1988 % Goal
<b>Puget Sound</b>									
Skagit	Spring	1,217	3,000	3,265	1,995	2,108	1,988	163%	66%
Skagit	Sum/Fall	13,265	14,900	16,298	18,127	9,647	11,954	90%	80%
Stillaguamish	Sum/Fall	817	2,000	1,409	1,277	1,321	717	88%	36%
Snohomish	Sum/Fall	5,028	5,250	4,873	4,534	4,689	4,513	90%	86%
Green	Fall	5,723	5,800	2,908	4,792	10,338	7,994	140%	138%
<b>Washington Coast</b>									
Hoh	Spr/Sum	1,325	NA c/	1,000	1,500	1,700	2,600	196%	NA
Hoh	Fall	2,875	NA c/	1,700	5,000	4,000	2,700	94%	NA
Queets	Spr/Sum	925	NA c/	700	900	600	1,800	195%	NA
Queets	Fall	3,875	NA c/	3,500	7,700	6,000	8,600	222%	NA
Grays Harbor	Spring	450	1,400	1,200	1,800	800	3,000	667%	214%
Grays Harbor	Fall	8,575	14,600	9,500	10,500	18,800	28,200	329%	193%
Quillayute	Summer	1,250	1,500	600	600	700	1,300	104%	NA
Quillayute	Fall	5,850	NA c/	6,200	10,000	12,400	7,900	135%	NA
<b>Columbia River</b>									
Upper River d/	Spring	28,955	84,000	27,200	38,500	41,400	35,100	121%	42%
Upper River	Summer	24,275	85,000	23,200	25,700	31,800	30,100	124%	35%
Lewis River d/	Fall	11,800	10,000	7,500	12,000	12,900	12,100	103%	121%
Upriver Bright	Fall	28,325	40,000	93,300	113,300	154,100	114,700	405%	287%
<b>Oregon Coast</b>									
Aggregate Index e/	Fall	91	N/A	133	121	129	221	243%	NA

a/ Base period for Alaskan and Transboundary stocks 1975-80; base for all other stocks 1979-82.

b/ 1986 escapement estimate for Upper Georgia Strait reflects unusual survey conditions.

c/ Stocks managed on the basis of floor minimum and fixed harvest rates.

d/ Only includes naturally spawning component.

e/ Oregon coastal north-migrating chinook stocks are assessed in terms of spawners per mile survey units.

## CHAPTER 2

### ASSESSMENT OF ESCAPEMENTS THROUGH 1988

A Report of the Rebuilding Assessment Workgroup\*  
of the PSC Chinook Technical Committee

- \* Members of the Rebuilding Assessment Workgroup include: John Clark, Sandy Moore, Pat Pattillo, Neil Schubert, Mel Seibel, Tom Shardlow, Barb Snyder, Tim Roth, and Ron Williams.

#### Table of Contents

1.0 INTRODUCTION .....	3
2.0 FRAMEWORK .....	3
2.1 ESCAPEMENT INDICATOR STOCKS .....	3
2.2 ESCAPEMENT DATA .....	3
2.2.1 Data Sources .....	3
2.2.2 Estimation Methods .....	3
2.2.3 Changes Relative to the 1987 Annual Report .....	4
2.3 ESCAPEMENT GOALS .....	5
2.3.1 Changes Relative to the 1987 Annual Report .....	5
2.4 EVALUATION TIME FRAME .....	5
2.4.1 SEAK and TBR Stocks .....	5
2.4.2 Other Stocks .....	6
2.5 EVALUATION METHOD .....	6
2.5.1 Comparison of Average Escapements .....	6
2.5.2 Comparison With Linear Rebuilding Schedules .....	6
2.5.3 Assessment of Escapement Trends .....	7
2.5.4 Changes Relative to the 1987 Annual Report .....	7
2.5.4.1 Comparison of Mean Escapements .....	7
2.5.4.2 Assessment of Escapement Trends .....	7
2.5.4.3 Assessment of Stocks Without Escapement Goals .....	7
2.5.4.4 Stock Specific Evaluation .....	7
2.5.5 Assessment of Rebuilding by Run-type .....	8
2.6 CAUTIONS .....	8
3.0 RESULTS .....	8
3.1 1988 ESCAPEMENTS vs. ESCAPEMENT GOALS .....	8
3.2 COMPARISON OF AVERAGE ESCAPEMENTS .....	8
3.3 COMPARISON WITH LINEAR REBUILDING SCHEDULES .....	9
3.4 ASSESSMENT OF ESCAPEMENT TRENDS .....	9
3.5 REBUILDING CATEGORIES .....	9
3.6 RUN-TIMING EVALUATION .....	9
4.0 DISCUSSION .....	9
4.1 Status Revision Based on Other Considerations .....	10
4.1.1 Keta .....	10
4.1.2 Nass Area .....	10
4.1.3 Harrison .....	10
4.1.4 Lewis River .....	10



5.0 CONCLUSIONS .....	10
5.1 Rebuilding and Probably Rebuilding Categories .....	10
5.2 Indeterminate .....	10
5.3 Probably Not Rebuilding .....	11
5.4 Not Rebuilding .....	11
5.5 Stock status relative to 1987 .....	11
5.6 Run-type evaluation .....	11
5.7 Stocks achieving goals .....	11
5.8 Conclusion .....	11
Table 2-1. Summary of escapement assessment results for natural chinook indicator stocks. ....	12
Table 2-2. Summary of escapement indicator stock scores and rebuilding status with and without the 1988 data. ....	13
Table 2-3. Rebuilding status of indicator stocks through 1988. ....	14
Table 2-4. Rebuilding status of chinook stocks categorized by run type. ....	15
Figure 2-1. Percent of indicator stocks meeting escapement goals, 1982 to 1988. ....	16
Figure 2-2. Distribution of indicator stocks by percent of escapement goal. ....	17
Figure 2-3. Distribution of assessed rebuilding status of chinook salmon indicator stocks through 1988. ....	18
Figure 2-4. Average index of escapement changes by run-type since the PSC Treaty base period. ....	19
SECTION 6.0 DATA TABLES AND FIGURES .....	20

## 1.0 INTRODUCTION

Spawning escapement assessment was undertaken as one measure of whether rebuilding progress has occurred since implementation of conservation actions. Evaluation of escapements for assessment of progress in the first phase of the PST rebuilding program (1984-1988) focuses on: (1) changes in average escapements from base years to conservation years; (2) comparison of observed recent escapements with a line drawn from the escapement base to the goal at the rebuilding target date; and (3) trends in spawning escapements during recent conservation years.

Escapement information has been compiled for a broad set of naturally spawning indicator stocks which we believe represent the majority of natural spawning chinook ranging in origin from central Oregon to Southeast Alaska.

It should be recognized that in the first phase of the rebuilding program it is expected that changes in spawning escapements of some stocks will be difficult to detect since expected responses to PSC management actions are small relative to annual variations in escapements.

## 2.0 FRAMEWORK

### 2.1 ESCAPEMENT INDICATOR STOCKS

Forty-three stock units, termed escapement indicator stocks, are included in the assessment. These stock units represent distinct natural spawning populations or management groups that originate from individual rivers or watersheds. Some stock units represent several populations aggregated by region and life history type. Distribution of the escapement indicator stocks by run timing and area of origin is:

<u>Area</u>	<u>Spring</u>	<u>Spring/ Summer</u>	<u>Summer</u>	<u>Summer/ Fall</u>	<u>Fall</u>	<u>Total</u>
S.E. Alaska	5					5
Transboundary	6					6
Northern B.C.	1	3	3			7
Southern B.C.	1	1	1	1	3	7
WA/OR	3	2	2	3	8	18
Totals	16	6	6	4	11	43

The escapement indicator stocks vary widely in their abundance and production. Escapement goals range from a few hundred (King Salmon R. in Southeast Alaska) to more than 200,000 (Harrison R., tributary to Fraser R.).

### 2.2 ESCAPEMENT DATA

**2.2.1 Data Sources** Escapement data used for the rebuilding assessment were provided by management agencies of the various jurisdictions. Indicator stock escapements represent measures of actual spawner abundance, where available, or a consistent estimate (or index) of abundance measured at a point of migration that is beyond the effect of major fisheries.

**2.2.2 Estimation Methods** Natural chinook stock escapements were estimated using weirs, counting fences, aerial or foot surveys, dam passage counts, electronic counting devices, and mark-recapture studies. Methods depend on river system characteristics and agency

resources. Escapement estimates normally represent the abundance of chinook spawning naturally, with four exceptions:

- (1) adjustments to eliminate the influence of variable fishing effects up-river of the enumeration site. For example, escapements of upper Columbia River spring and summer stocks are Bonneville Dam passage counts adjusted for harvest in fisheries occurring upriver.
- (2) adjustments to remove enhancement related bias, either by using CWT data to subtract hatchery-origin fish from the escapement estimator (e.g. some Puget Sound stocks) or precluding rivers with major enhancement influence (e.g. Bella-Coola, Kitimat/Butedale). The influence of hatchery stocks or enhancement efforts persists in the escapement information for some stocks.
- (3) for some Washington coastal and Puget Sound stocks, reported escapements represent observed redds multiplied by average adults per redd.
- (4) Oregon coastal north-migrating stocks are indexed in units of spawners-per-river-mile.

**2.2.3 Changes Relative to the 1987 Annual Report** Some changes have been made in the data and run-timing classifications used for the escapement analysis since the 1987 Annual Report.

**SEAK and U.S. TBR:** Spawning escapement data for S.E. Alaskan (SEAK) and U.S. estimates of Transboundary River (TBR) stocks have been adjusted to reflect the following changes: (1) age 1.1 and 1.2 chinook have been deleted from final weir counts because only 1.3 and 1.4 chinook are enumerated on a consistent basis; (2) corrections have been made to the methods used to expand index tributaries to total drainage escapements; (3) revisions have been made to weir or aerial survey counts to correct minor errors and finalize preliminary data.

**Canadian Areas 6 and 8:** Escapements reported in the 1987 assessment of rebuilding for Canadian Area 6 (Kitimat/Butedale) and Area 8 (Bella Coola) chinook indicator stocks have been revised to exclude rivers where enhancement contributes substantially to current escapement. Kitimat River and adjacent tributaries in Area 6, and Bella Coola River in Area 8, were excluded from the indicator stock analysis. This change was made because recent escapements to these systems do not fairly reflect the level of natural stock rebuilding. Escapement to the enhanced rivers cannot be separated into enhanced and natural components because there are no specific hatchery returns or sampling programs in the natural spawning areas. Future reference to these stocks will be to Area 6 and Area 8 Index stocks.

**Lower Georgia Strait:** Escapement reported for the Lower Georgia Strait stock has been revised to exclude brood stock removed from the natural spawning population. This revision was done so that escapement trends reported are directly comparable to the goal developed for naturally spawning chinook. Data presented for "escapement" in this report only include the estimated number of chinook spawning in the river. Brood stock returns are reported in the terminal run.

**Columbia River Springs and Summers:** Spawning escapement data for Columbia River upriver spring and summer chinook have been adjusted downward from those reported in 1987 to account for Treaty Indian ceremonial and subsistence catch estimates that have recently been published. In the 1987 report, escapements were estimated as Bonneville Dam counts minus subsequent Treaty Indian commercial harvest. The 1988 adjustments, with a reduction for additional non-commercial Treaty Indian harvest, result in a more accurate assessment of actual spawning escapements relative to the spawning escapement goals.

**Oregon Coastal:** Spawning escapement data for Oregon Coastal chinook have been changed from estimates of spawner abundance to an escapement index (fish/mile). This index has been used historically by ODF&W for assessing trends in escapement. Although, in the future, spawner abundance estimates will best serve PSC management needs, ODF&W has not yet completed the data and methodology review necessary to provide a reliable measure of spawner abundance.

**Run Timing Classifications:** Run timing classifications for three North and Central Coast B.C. stocks were changed. The Yakoun stock was changed from a spring/summer designation to summer, the Bella Coola (now referred to as the Area 8 Index) stock from spring/summer to spring, and the Rivers Inlet stock from summer to spring/summer. In the Fraser River, the run timing designations for the Upper Fraser and Thompson River stocks were changed from spring/summer to spring and summer, respectively.

## **2.3 ESCAPEMENT GOALS**

Escapement goals in this report were established by managers associated with the respective stock's region of origin. In some cases, these goals represent estimates of escapement levels that optimize stock production or harvest, based on knowledge of the stock's productivity or usable spawning habitat. In cases where stock productivity is poorly understood, interim management objectives have been developed from general considerations of stock size, harvest and escapement history, freshwater spawning and rearing environments. For example, Canadian chinook goals are interim targets based on a doubling of base period average escapements. Escapement goals for some stocks may change as new information is acquired during this rebuilding program.

There are several stocks for which no escapement goals have been set. Five Washington coastal stocks are managed on the basis of minimum acceptable spawning escapement levels (escapement floors). When terminal runs exceed the floor, terminal fisheries on these stocks are managed on a harvest rate basis. Similarly, spawning escapement objectives are not currently established for Oregon coastal north-migrating stocks.

**2.3.1 Changes Relative to the 1987 Annual Report** Escapement goals have been changed for three indicator stocks. In all three cases, the escapement goals are interim targets based on a doubling of pre-Treaty average escapements.

**Canadian Areas 6 and 8:** The escapement goals for these two areas have been reduced to reflect the exclusion of enhancement influenced rivers.

**Lower Georgia Strait:** The escapement goal for this stock has been reduced slightly to reflect the separation of natural escapement and brood stock collection. The revision is small because brood stock collected during the base period was limited (a few hundred fish per river).

**Lewis River:** For the purpose of this analysis, an escapement goal of 10,000 has been assumed since the stock is managed to maintain escapements about 10,000 chinook (as evident in the Lewis River figure in Section 6.0). In 1987, the Lewis was reported as having no escapement goal.

## **2.4 EVALUATION TIME FRAME**

**2.4.1 SEAK and TBR Stocks:** For SEAK and TBR stocks, a 15-year rebuilding program for the years 1981-1995 was initiated prior to implementation of the Pacific Salmon Treaty. For these stocks, the base (or pre-Treaty) period was defined as 1975-1980 and the Treaty (or conservation) period as 1981-1988. The target date for rebuilding is 1995. (This rebuilding program was actually initiated by the State of Alaska.)

**2.4.2 Other Stocks:** For all other stocks, a 15-year rebuilding program for the years 1984 - 1998 was established. The base period for these stocks was defined as 1979 - 1982 for consistency with data availability during the negotiations of the Treaty. The Treaty period for these stocks was defined as 1984 - 1988. The Harrison River stock is the one exception in this group. Comparable escapement data prior to 1984 are unavailable for the Harrison, consequently the base period is only 1984 and the Treaty period was defined as 1985 - 1988.

## **2.5 EVALUATION METHOD**

Three assessment criteria were developed: (1) a comparison of average base and Treaty period escapements, to examine the magnitude of changes in escapement; (2) a comparison of observed recent escapements with a line drawn from the base escapement to the goal at the target date, to examine whether escapements have been consistent with a linear approximation to the expected rebuilding schedule; and (3) an assessment of escapement trends in recent years to examine whether the escapements are tending towards rebuilding.

Each assessment criterion has strengths and weaknesses, and each addresses a question of interest concerning stock status. To assess the overall rebuilding status of individual stocks, a system based on all three criteria was developed:

- (1) Each stock was evaluated on each criterion, and assigned a value of +1 if it exhibited a positive response, -1 if it exhibited a negative response, and 0 if the response was uncertain.
- (2) Scores were then summed across all three criteria and stocks classified according to their total score. Note that stocks without goals can only be scored for two criteria and, therefore, can only be scored between 2 and -2.

<u>Status of Stock</u>	<u>Total Score of Criteria</u>
Rebuilding	+3
Probably Rebuilding	+2
Indeterminate	+1,0,-1
Probably Not Rebuilding	-2
Not Rebuilding	-3

### **2.5.1 Comparison of Average Escapements**

Average base and Treaty period escapements were calculated for each stock. A difference in averages of greater than 10% from the base period escapement was accepted as a change between periods. Those stocks with increases of greater than 10% were assigned a score of +1 and those with decreases of greater than 10% were assigned a score of -1. Stocks with changes of less than 10% were judged to show an uncertain response and given a score of 0.

### **2.5.2 Comparison With Linear Rebuilding Schedules**

Expected rebuilding schedules have not been developed for each indicator stock. Instead, for each stock with an escapement goal, a straight line was drawn from base period average escapement to the escapement goal in 1995 for SEAK and TBR stocks, and in 1998 for all other stocks. While this base-to-goal line is only an approximation to the expected rebuilding schedule, the actual rebuilding schedules will be stock specific and have not yet been defined. An expected schedule could be more or less than the linear approximation, depending on the status of the stock at the beginning of the rebuilding schedule and a variety of other stock specific characteristics.

For all stocks, the most recent three escapement values were compared with the linear approximation. Stocks with all three recent escapement values on or above the line were given a score of +1, and stocks with all three points below the line given a score of -1. Stocks that did not meet either condition were given a score of 0. The lack of an escapement goal prohibits the use of

this criterion; consequently, the range of scores possible for these stocks is more limited than for stocks with goals.

### **2.5.3 Assessment of Escapement Trends**

To identify recent escapement trends, slopes were calculated (using the least squared deviation method) for 1984-1988 escapement data. R-squared values which may vary from 0 to 1 (a higher value indicating a better fit) were used as a measure of goodness of fit (i.e. as a measure of how well the points fit a linear trend). Stocks that had positive slopes with r-squared values of greater than .25 were accepted as showing positive escapement trends and were given a score of +1. Stocks that had negative slopes with r-squared values of greater than .25 were accepted as showing a negative trend and scored a -1. All other stocks were given a score of 0.

The use of a minimum r-squared value is not intended to indicate statistical confidence in the slope values. It was simply chosen to identify those stocks with very little linear tendency in the escapement data.

### **2.5.4 Changes Relative to the 1987 Annual Report**

**2.5.4.1 Comparison of Mean Escapements:** In the 1987 report, stocks with any level of escapement change between periods were scored as having escapement changes. In this report, escapement changes of greater than 10% of the base period average were required to meet this criterion. Further, for all stocks, other than SEAK and TBR, the Treaty average escapements were estimated for 1984-1988; 1984 was not included last year.

**2.5.4.2 Assessment of Escapement Trends:** In the 1987 report, stocks were scored as showing either a positive or negative trend, regardless of the goodness-of-fit. In this report, only trends with r-squared values greater than .25 were considered to be positive or negative trends.

In the 1987 report, slopes were calculated between 1980-1987 for SEAK and TBR stocks and from 1984-1987 for all other stocks. In this report, because the intent of the assessment was to identify recent escapement trends, slopes for all stocks were calculated using data from 1984-1988.

**2.5.4.3 Assessment of Stocks Without Escapement Goals:** In the 1987 Report, stocks without escapement goals were not placed in rebuilding categories. In this Report, these stocks have been categorized based on criteria 1 and 3.

**2.5.4.4 Stock Specific Evaluation:** In the 1987 report, classification was based on a tally of Rebuilding and Not Rebuilding criteria. In this report, each individual assessment criterion was numerically scored +1, 0, or -1 depending on how the criterion was satisfied. Scores for each stock were summed across all three criteria and stocks were classified according to their total score. The only effect of this change is that in this report a stock with two positive scores and one negative (or visa versa) are classified as Indeterminate; in the 1987 report the stock would have been scored as Probably Rebuilding (or Probably Not Rebuilding).

For example:

1987 Criteria		Rebuilding Status	
# Rebuilding	# Not Rebuilding	1987 Status	1988 Status
2	1	Prob. Rebuild.	Indeterminate
1	2	Prob. Not Rebuild.	Indeterminate

The Committee recommends this change in scoring to account for conflicting information between criteria for assessing rebuilding status.

### **2.5.5 Assessment of Rebuilding by Run-type**

The change in average escapements between the base and Treaty periods was used to evaluate whether early run-timing stocks had shown greater increases in escapements than later run-timing stocks. Stocks were ranked by the percent change between periods, with the largest, positive increase receiving the largest score, 43 (i.e. the number of stocks compared). The stock with the second largest change was scored as 42, and so on. Run-types were compared by averaging the rank scores within run-types (spring, spring/summer, summer, summer/fall, and fall). Differences between run-types were tested using the Kruskal-Wallis test, a robust non-parametric statistic. This test statistic is only affected by the overall rank of the change between periods, not the absolute magnitude of the change.

## **2.6 CAUTIONS**

- (1) The use of actual spawning escapement, as opposed to alternative measures such as ocean escapement or river runsize, presents some problems in interpretation of the results. Stock-specific conservation measures (e.g. fishery closure) or variable terminal or non-ceiling fishery impacts may obscure the effects of PSC conservation measures. Where available, terminal area runsize estimates are presented in Section 6.0 of this chapter.
- (2) Indicator stock escapement variability can be caused by other factors that may obscure PSC management actions. For example, escapement can be related to brood year abundance, freshwater and marine survival rates, fishery harvest rates, counting or estimation errors, etc. Consequently, an assessment of rebuilding must incorporate additional information, such as the Exploitation Rate Analysis, to correctly interpret the results of this evaluation of escapement changes.

## **3.0 RESULTS**

Assessment data for the 43 stocks and 3 tests are presented in Table 2-1. The score for each criterion by stock and the categorization of each stock are listed in Table 2-2, and collated by Rebuilding status in Table 2-3. In addition, Section 6.0 contains summary tables and graphs of the data used in this escapement evaluation. For each escapement indicator stock there is a table and a graph showing historical escapement data and terminal run size (where available). For stocks with escapement goals, these graphs also show the goal, as well as the straight line rebuilding approximation drawn from the base period escapement average to the goal at the rebuilding target date.

### **3.1 1988 ESCAPEMENTS vs. ESCAPEMENT GOALS:**

The number of the indicator stocks meeting or exceeding their escapement goal decreased in 1988; 12 of the 36 stocks met their goal (6 stocks without goals and the Stikine stock were omitted) (Table 2-1). The number of stocks achieving their goal had increased each year between 1982 and 1987, but decreased from 42% in 1987 to 33% in 1988 (Figure 2-1).

### **3.2 COMPARISON OF AVERAGE ESCAPEMENTS:**

Twenty-nine of the 43 escapement indicator stocks showed positive changes of greater than 10% in average escapement; 9 stocks showed negative changes of greater than 10%; and 5 stocks showed less than a 10% change (Table 2-1). Since implementation of the Treaty, substantially more of the indicator stocks are meeting their escapement goals on average than were during the base period (Figure 2-2).

### 3.3 COMPARISON WITH LINEAR REBUILDING SCHEDULES:

Recent escapements of 15 stocks, and the US estimate of the Stikine, showed rebuilding progress greater than the linear approximation, while escapements of 10 stocks were consistently below the linear approximation. Escapements of 11 stocks, and the Canadian estimate of the Stikine varied above and below the linear approximation; and 6 stocks without goals were excluded from this assessment (Table 2-1).

### 3.4 ASSESSMENT OF ESCAPEMENT TRENDS:

Twenty-two of the 43 stocks have positive escapement trends from 1984 - 1988, while 3 stocks show negative trends. Slopes for 18 stocks have r-squared values below the minimum r-square and were judged to show no recent escapement trend (Table 2-1).

### 3.5 REBUILDING CATEGORIES:

Results of the stock-specific evaluation are summarized in Table 2-2 and categorized in Table 2-3. Note that categorizations in Tables 2-2 and 2-3 involve 4 stocks for which the Committee agreed to change the rebuilding status. These changes are discussed below and were based upon data qualifications, magnitude of the escapements, and terminal run sizes when returns to the river were substantially greater than the reported escapement. By category, the number of stocks were (Figure 2-3):

Category	Number of Stocks (all stocks included)		Number of Stocks (excluding stocks w/o goals)	
	#	%	#	%
Rebuilding	9	21%	9	24%
Prob. Rebuilding	13	30%	10	27%
Indeterminate	17	40%	14	38%
Prob. Not Rebuild.	4	9%	4	11%
Not Rebuilding	0	0%		0%
TOTAL	43		37	

### 3.6 RUN-TIMING EVALUATION:

The magnitude of change between base and Treaty period escapements varied significantly between run-types (Kruskal-Wallis test  $H = 10.0$  ( $p < 0.05$ )). Stocks migrating into freshwater in the spring and early summer have a greater degree of escapement increase than do the later migrating stocks (Figure 2-4). Rebuilding status of stocks grouped by their run-type is summarized in Table 2-4. Overall, the comparisons suggest that early run types (spring and spring/summer) may be benefiting more from the rebuilding program than later run types (summer, summer/fall, and fall). However, this interpretation should be viewed with caution for two reasons: (1) run type designations are made by each management agency and are not entirely consistent among agencies, and (2) effects of run timing are confounded by area effects (natural variation in survival, terminal fisheries, etc.).

## 4.0 DISCUSSION

This report summarizes the results of an assessment based on escapements of indicator stocks during the first phase of a three phase rebuilding program (for most stocks). Although PSC restrictions have been in effect for five years, we are only starting to see returns from escapements affected by these management regimes. As such, it is still too early to develop an accurate stock specific assessment of rebuilding progress for many of the escapement indicator stocks.



Since the 1987 Annual Report, 1988 data have become available and numerous changes have been made in both the historical escapement data and in the methods used to place stocks in rebuilding categories. As a result of these changes categorization of some stocks changed and more stocks are categorized as Indeterminate in this report.

Identification of changes in stock status between years is an important component of the rebuilding assessment. To investigate this we assessed each stock with and without the 1988 escapement point. Eleven stocks changed status due to the inclusion of the 1988 data point. Overall, 4 stocks (Blossom, Stillaguamish, Snohomish, Quillayute fall) move to lower categories and 8 stocks (Unuk, N/CBC Areas 6 and 10, WCVI, Lower Georgia Strait, Hoh spring/summer, Queets spring/summer, Grays Harbor spring) move to higher categories, when the 1988 escapement data are included.

#### **4.1 Status Revision Based on Other Considerations:**

Most stocks were placed in rebuilding categories based upon the assessment criteria described above. However, after consideration of stock specific circumstances, the Committee decided that four of the stocks should be re-assigned to different categories.

**4.1.1 Keta:** The status of this stock was revised from Probably Rebuilding to Rebuilding because escapements have been consistently above the escapement goal in recent years.

**4.1.2 Nass Area:** The status of this stock was revised from Indeterminate to Probably Rebuilding. The Indeterminate status resulted from a relatively low escapement value in 1988. This value is considered to be a conservative estimate, however, due to poor enumeration conditions in one of the major spawning populations. The 1988 escapement to the Nass was likely greater than recorded, and would result in a +1 score for the line criteria. The total score for the Nass stocks would then be +2.

**4.1.3 Harrison:** The status of this stock was revised from Indeterminate to Probably Not Rebuilding. The Indeterminate status was due to the -9% decrease between average base and Treaty period escapements (i.e. only 1% from the minimum criteria). The Committee felt that the recent sharp decline in escapement and the negative change in average escapement warrant a reduction in the stock status.

**4.1.4 Lewis River:** The status of this stock was revised from Indeterminate to Probably Rebuilding. This stock comprises the majority of the natural fall chinook production of the Lower Columbia River. Although an optimum spawning escapement goal for this stock has not been developed, an interim goal of 10,000 has been used for terminal fishery management. Average escapements during the Treaty period have exceeded the interim management goal and terminal run sizes have increased dramatically. For these reasons, the stock was moved to a higher category.

## **5.0 CONCLUSIONS**

**5.1 Rebuilding and Probably Rebuilding Categories:** In this 1988 assessment, 51% of the escapement indicator stocks were placed in these categories. There is basically no change in the percent of stocks in these categories from 1987, when using the present assessment method and the exclusion of the 1988 data point. While these stocks show clear progress towards rebuilding, the Committee has not yet been determined what constitutes sufficient progress to ensure rebuilding by the target date.

**5.2 Indeterminate:** Forty percent of the escapement indicator stocks do not show clear progress towards rebuilding or clear movement away from rebuilding. Lack of clear progress towards rebuilding for stocks in phase 1 of a 3-phase rebuilding program may not be a concern, as long as these stocks show clear progress to rebuilding during phase 2. SEAK and TBR stocks, which have been involved in a rebuilding program since 1981, are already in phase 2 of the rebuilding

program. The rebuilding status of five of these stocks (Situk, Blossom, Alsek, Chilkat, and Taku) is Indeterminate, suggesting that these stocks are not currently responding to the rebuilding program as expected.

The patterns of recent escapements are different between the 5 Indeterminate SEAK and TBR stocks. The Blossom River is characterized by an increasing escapement trend from 1981 to 1987, with 1986 and 1987 escapements above the escapement goal. However, the 1988 escapement decreased to less than half the goal. Escapements to the Chilkat are variable from 1980 to 1985, with recent (1985 to 1988) escapements being below the linear rebuilding trend. Escapements to the Taku river are generally increasing, but remain below the linear rebuilding trend since 1981. Escapements to the Alsek River also remain below the linear rebuilding trend. Escapements to the Situk River have varied about the linear rebuilding trend since 1984, with a substantial decrease in escapement in 1988. Four of the 5 SEAK and TBR Indeterminate stocks had decreased escapements in 1988, compared to 1987.

**5.3 Probably Not Rebuilding:** Nine percent of the escapement indicator stocks are placed in this category. These stocks are cause for concern and should receive special attention.

**5.4 Not Rebuilding:** None of the escapement indicator stocks are placed in this category. The two stocks identified as Not Rebuilding in 1987 (WCVI and Lower Georgia Strait) both showed increased escapements in 1988.

**5.5 Stock status relative to 1987:** The assessment was repeated excluding the 1988 escapement data to identify stocks that changed rebuilding status relative to 1987. Four stocks moved to lower categories and 8 stocks moved to higher categories with the inclusion of the 1988 data point. Of the 8 stocks that showed improvement, only 3 improved sufficiently to move into the Rebuilding or Probably Rebuilding categories.

**5.6 Run-type evaluation:** Stocks with early run timings may be benefiting from the rebuilding program more than stocks with later run timing. It is currently impossible to identify an effect due solely to run timing.

**5.7 Stocks achieving goals:** While variation around escapement goals is to be expected, the 1988 drop in the percentage of indicator stocks achieving their escapement goals, after several years of increase, may be cause for concern.

**5.8 Conclusion:** The indicator stocks have not responded uniformly to the rebuilding program. However, since expected rebuilding schedules have not yet been defined for all indicator stocks, it is difficult to assess if progress has been sufficient to ensure rebuilding by the target years.

Table 2-1. Summary of escapement assessment results for natural chinook indicator stocks.

Stock Name	Region	Run Type	Escapement		Mean Escapements		Change		Comparison		Treaty Period	
			1988	Goal	Base Period	Treaty Period	between periods	Percent	Base-to-Goal	Above Below	Trend b/ Slope	R2
Situk	SEAK	Spring	885	2100	1391	1226	-165	-12%	2	1	-132	0.21
King Salmon	SEAK	Spring	206	250	92	214	122	133%	3	0	-7	0.09
Andrew Creek	SEAK	Spring	752	750	379	663	284	75%	3	0	133	0.40
Blossom	SEAK	Spring	614	1280	163	1064	901	552%	2	1	63	0.02
Keta	SEAK	Spring	920	800	407	1034	627	154%	3	0	12	0.02
Alsek (US est)	TBR	Spring	3105	5000	4214	3146	-1068	-25%	0	3	319	0.32
Alsek (CAN est)	TBR	Spring	4060	12500	5255	4092	-1163	-22%	0	3	490	0.39
Chilkat (US est)	TBR	Spring	781	2000	213	968	755	355%	0	3	-228	0.27
Taku (US est)	TBR	Spring	13411	25600	7978	10127	2149	27%	0	3	1231	0.48
Taku (CAN est)	TBR	Spring	17252	30000	9700	12417	2717	28%	0	3	1594	0.48
Stikine (US est)	TBR	Spring	29168	13400	6224	15496	9272	149%	3	0	4830	0.85
Stikine (CAN est)	TBR	Spring	29168	25000	8004	16984	8980	112%	2	1	4318	0.78
Unuk (US est)	TBR	Spring	2794	2880	1469	2415	946	64%	3	0	97	0.07
Chickamin (US est)	TBR	Spring	1258	1440	338	1418	1080	319%	3	0	-98	0.08
Yakoun	BC/N	Summer	2000	1580	788	1260	473	60%	2	1	390	0.57
Nass Area	BC/N	Spr/Sum	10000	15900	7944	11882	3938	50%	2	1	-184	0.01
Skeena Area	BC/N	Spr/Sum	68705	41800	20883	55798	34915	167%	3	0	6774	0.86
Area 6 Index	BC/C	Summer	3165	5520	2761	2154	-607	-22%	0	3	256	0.32
Area 8 Index	BC/C	Spring	1650	5450	2725	3144	419	15%	1	2	-919	0.89
Rivers Inlet	BC/C	Spr/Sum	4429	4950	2475	4412	1937	78%	3	0	793	0.30
Smith Inlet	BC/C	Summer	1050	2100	1055	726	-329	-31%	0	3	138	0.38
W. C. Vanc. Is	WCVI	Fall	5525	11500	5745	4763	-981	-17%	0	3	-30	0.00
Upper Geo. Str	GS	Sum/Fall	3300	5100	2546	3966	1421	56%	1	2	-150	0.02
Lower Geo. Str	GS	Fall	6914	22300	11139	5618	-5521	-50%	0	3	-1048	0.22
Upper Fraser	FR	Spring	34248	24500	12229	33288	21059	172%	3	0	2461	0.31
Middle Fraser	FR	Spr/Sum	24164	21100	9216	22079	12863	140%	3	0	3015	0.62
Thompson	FR	Summer	47103	55700	22059	39786	17728	80%	3	0	3099	0.51
Harrison	FR	Fall	35694	233600	116791	106100	-10691	-9%	1	2	-23112	0.50
Green	PS	Fall	7994	5800	5723	5877	154	3%	2	1	1671	0.69
Skagit	PS	Sum/Fall	11954	14900	13265	13853	588	4%	1	2	-922	0.19
Skagit	PS	Spring	1988	3000	1217	2024	807	66%	3	0	129	0.05
Stillaguamish	PS	Sum/Fall	717	2000	817	1020	203	25%	2	1	60	0.04
Snohomish	PS	Sum/Fall	4513	5250	5028	4474	-554	-11%	0	3	132	0.24
Quillayute	WAC	Summer	1300	1500	1275	760	-515	-40%	0	3	150	0.60
Quillayute	WAC	Fall	7900	NA	5850	9120	3270	56%			380	0.07
Hoh	WAC	Spr/Sum	2600	NA	1325	1660	335	25%			290	0.61
Hoh	WAC	Fall	2700	NA	2875	3060	185	6%			390	0.19
Queets	WAC	Spr/Sum	1800	NA	925	1000	75	8%			150	0.25
Queets	WAC	Fall	8600	NA	3875	5940	2065	53%			1190	0.70
Grays Harbor	WAC	Spring	3000	1400	425	1560	1135	267%	3	0	360	0.41
Grays Harbor	WAC	Fall	28200	14600	8575	17600	9025	105%	3	0	2370	0.23
Col River Bright	CR	Fall	114700	40000	28325	107280	78955	279%	3	0	16820	0.61
Col River Summer	CR	Summer	30100	85000	23100	26580	3480	15%	0	3	2460	0.84
Col River Spring	CR	Spring	35100	84000	27425	32160	4735	17%	2	1	4720	0.65
Lewis River	CR	Fall	12052	10000	13021	10319	-2702	-21%	3	0	1528	0.76
Oregon Coastal c/	ORC	Fall	221	NA	91	141	50	55%			24	0.65

(a) Alaska and Transboundary base: 1975-80; Treaty Period: 1981-88; Harrison base:1984, Treaty Period:1985-88.

Other stocks's base period: 1979-82; Treaty Period: 1984-88.

(b) Slopes were calculated from 1984 - 1988 escapements.

(c) Oregon Coastal Stock escapements are in units of Number of chinook salmon/River Mile

Table 2-2. Summary of escapement indicator stock scores and rebuilding status with and without the 1988 data.

Stock Name	Region	Run Type	Assessment Scores				Rebuilding Status to 1988	Status Change from 1987
			Mean	Line	Trend	Total		
Situk	SEAK	Spring	-1	0	0	-1	Indeterminate	
King Salmon	SEAK	Spring	1	1	0	2	Probably Rebuilding	
Andrew Creek	SEAK	Spring	1	1	1	3	Rebuilding	
Blossom	SEAK	Spring	1	0	0	1	Indeterminate	Decline
Keta	SEAK	Spring	1	1	0	2	Rebuilding 1/	
Alsek (US est)	TBR	Spring	-1	-1	1	-1	Indeterminate	
Alsek (CAN est)	TBR	Spring	-1	-1	1	-1	Indeterminate	
Chilkat (US est)	TBR	Spring	1	-1	-1	-1	Indeterminate	
Taku (US est)	TBR	Spring	1	-1	1	1	Indeterminate	
Taku (CAN est)	TBR	Spring	1	-1	1	1	Indeterminate	
Stikine (US est)	TBR	Spring	1	1	1	3	Rebuilding	
Stikine (CAN est)	TBR	Spring	1	0	1	2	Probably Rebuilding	
Unuk (US est)	TBR	Spring	1	1	0	2	Probably Rebuilding	Improvement
Chickamin (US est)	TBR	Spring	1	1	0	2	Probably Rebuilding	
Yakoun	BC/N	Summer	1	0	1	2	Probably Rebuilding	
Nass Area	BC/N	Spr/Sum	1	0	0	1	Probably Rebuilding 1/	
Skeena Area	BC/N	Spr/Sum	1	1	1	3	Rebuilding	
Area 6 Index	BC/C	Summer	-1	-1	1	-1	Indeterminate	Improvement
Area 8 Index	BC/C	Spring	1	0	-1	0	Indeterminate	
Rivers Inlet	BC/C	Spr/Sum	1	1	1	3	Rebuilding	
Smith Inlet	BC/C	Summer	-1	-1	1	-1	Indeterminate	Improvement
W. C. Vanc. Is	WCVI	Fall	-1	-1	0	-2	Probably Not Rebuilding	Improvement
Upper Georgia Str	GS	Sum/Fall	1	0	0	1	Indeterminate	
Lower Georgia Str	GS	Fall	-1	-1	0	-2	Probably Not Rebuilding	Improvement
Upper Fraser	FR	Spring	1	1	1	3	Rebuilding	
Middle Fraser	FR	Spr/Sum	1	1	1	3	Rebuilding	
Thompson	FR	Summer	1	1	1	3	Rebuilding	
Harrison	FR	Fall	0	0	-1	-1	Probably Not Rebuilding 1/	
Green	PS	Fall	0	0	1	1	Indeterminate	
Skagit	PS	Sum/Fall	0	0	0	0	Indeterminate	
Skagit	PS	Spring	1	1	0	2	Probably Rebuilding	
Stillaguamish	PS	Sum/Fall	1	0	0	1	Indeterminate	Decline
Snohomish	PS	Sum/Fall	-1	-1	0	-2	Probably Not Rebuilding	Decline
Quillayute	WAC	Summer	-1	-1	1	-1	Indeterminate	
Quillayute	WAC	Fall	1		0	1	Indeterminate	Decline
Hoh	WAC	Spr/Sum	1		1	2	Probably Rebuilding	Improvement
Hoh	WAC	Fall	0		0	0	Indeterminate	
Queets	WAC	Spr/Sum	0		0	0	Indeterminate	Improvement
Queets	WAC	Fall	1		1	2	Probably Rebuilding	
Grays Harbor	WAC	Spring	1	1	1	3	Rebuilding	Improvement
Grays Harbor	WAC	Fall	1	1	0	2	Probably Rebuilding	
Col River Bright	CR	Fall	1	1	1	3	Rebuilding	
Col River Summer	CR	Summer	1	-1	1	1	Indeterminate	
Col River Spring	CR	Spring	1	0	1	2	Probably Rebuilding	
Lewis River	CR	Fall	-1	1	1	1	Probably Rebuilding 1/	
Oregon Coastal	ORC	Fall	1		1	2	Probably Rebuilding	

1/ The status of these stocks was altered from the rebuilding criteria results after consideration of unique stock-specific circumstances discussed in the text.

Table 2-3. Rebuilding status of indicator stocks through 1988.

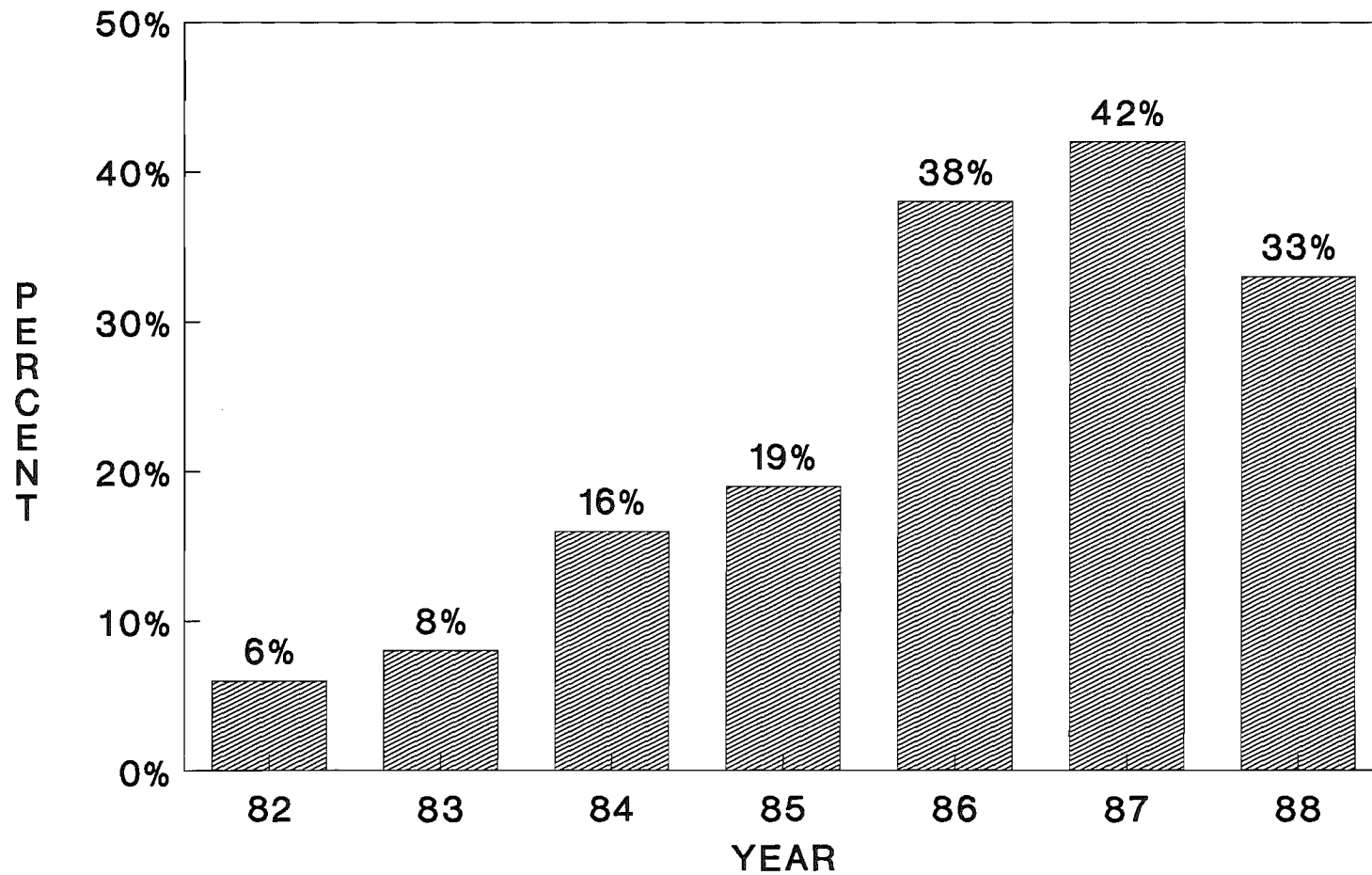
<u>REBUILDING</u>	<u>REGION</u>	<u>RUN TYPE</u>
Andrew Creek	SEAK	spring
Keta	SEAK	spring
Stikine (US est)	TBR	spring
Skeena	N/CBC	spring/summer
Rivers Inlet	N/CBC	spring/summer
Upper Fraser	FRASER	spring
Middle Fraser	FRASER	spring/summer
Thompson	FRASER	summer
Grays Harbor	WA CST	spring
Columbia Upriver bright	COL R	fall
<u>PROBABLY REBUILDING</u>		
King Salmon	SEAK	spring
Stikine (CAN est)	TBR	spring
Unuk	TBR	spring
Chickamin	TBR	spring
Yakoun	N/CBC	summer
Nass	N/CBC	spring/summer
Skagit	PGT SD	spring
Hoh	PGT SD	spring/summer
Queets	WA CST	fall
Grays Harbor	WA CST	fall
Columbia Upriver Spring	COL R	spring
Lewis	COL R	fall
Oregon Coastal	OR CST	fall
<u>INDETERMINATE</u>		
Situk	SEAK	spring
Blossom	SEAK	spring
Alsek	TBR	spring
Chilkat	TBR	spring
Taku	TBR	spring
Area 6 Index	N/CBC	summer
Area 8 Index	N/CBC	spring
Smith Inlet	N/CBC	summer
Upper Georgia Strait	GEOR ST	summer/fall
Green	PGT SD	fall
Skagit	PGT SD	summer/fall
Stillaguamish	PGT SD	summer/fall
Quillayute	WA CST	summer
Quillayute	WA CST	fall
Hoh	WA CST	fall
Queets	WA CST	spring/summer
Columbia River Summer	COL R	summer
<u>PROBABLY NOT REBUILDING</u>		
W. Coast Vancouver I.	WCVI	fall
Lower Georgia Strait	GEOR ST	fall
Harrison	FRASER	fall
Snohomish	PGT SD	summer/fall

Table 2-4. Rebuilding status of chinook stocks categorized by run type.

REBUILDING STATUS	RUN TYPE					TOTAL # OF STOCKS
	Spring	Spr/Sum	Summer	Sum/Fall	Fall	
Rebuilding	4	3	1	0	1	9
Probably Rebuilding a/	6	2	1	0	4	13
Indeterminate	6	1	4	3	3	17
Probably Not Rebuilding	0	0	0	1	3	4
Not Rebuilding	0	0	0	0	0	0
Totals	16	6	6	4	11	43

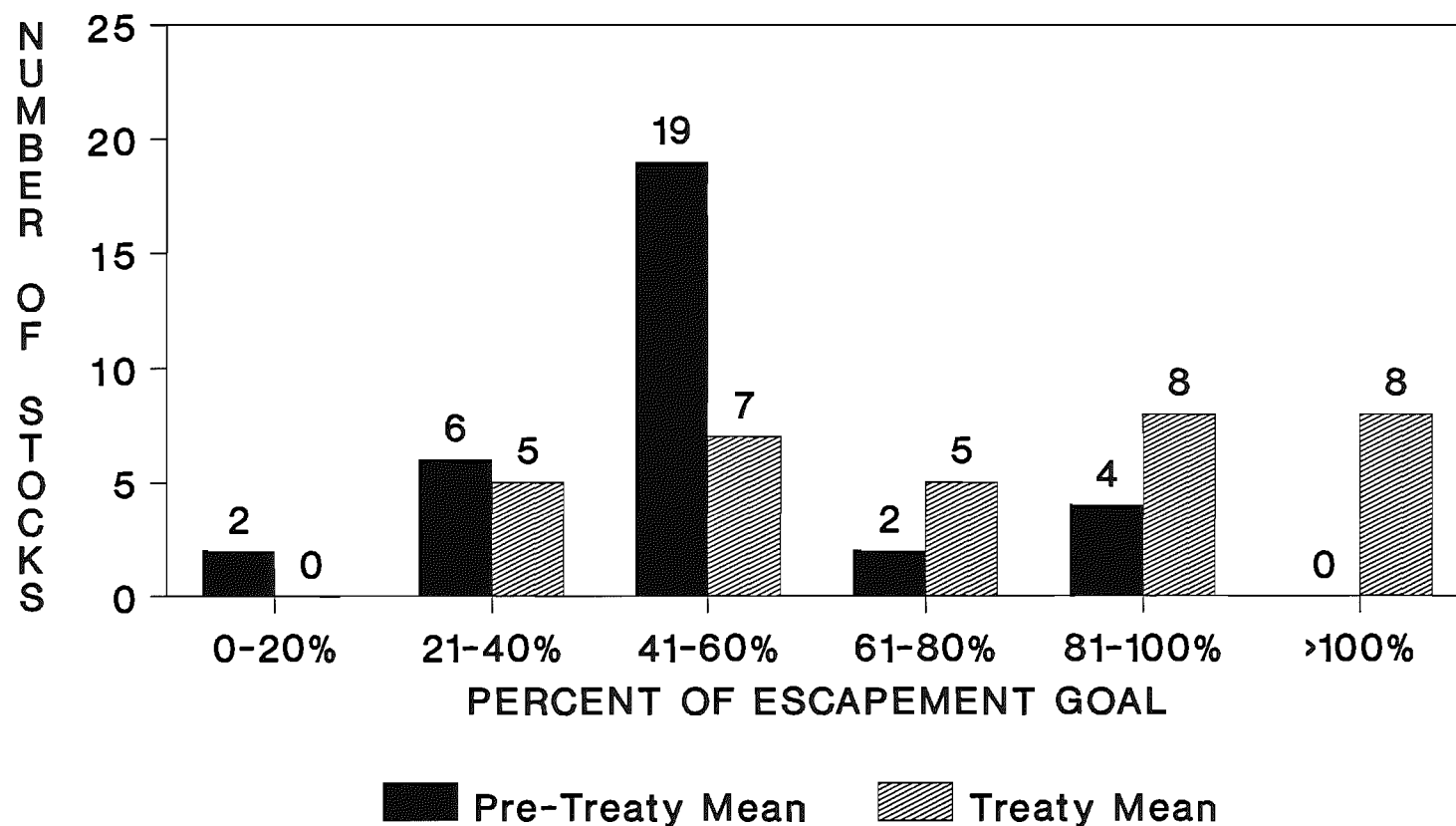
a/ The Stikine stock was included as Probably Rebuilding.

**FIGURE 2-1. PERCENT OF INDICATOR STOCKS  
MEETING ESCAPEMENT GOALS, 1982 TO 1988**



Stocks w/out goals & TBR stocks which  
differ are omitted.  
Total # indicator stocks differ by year.

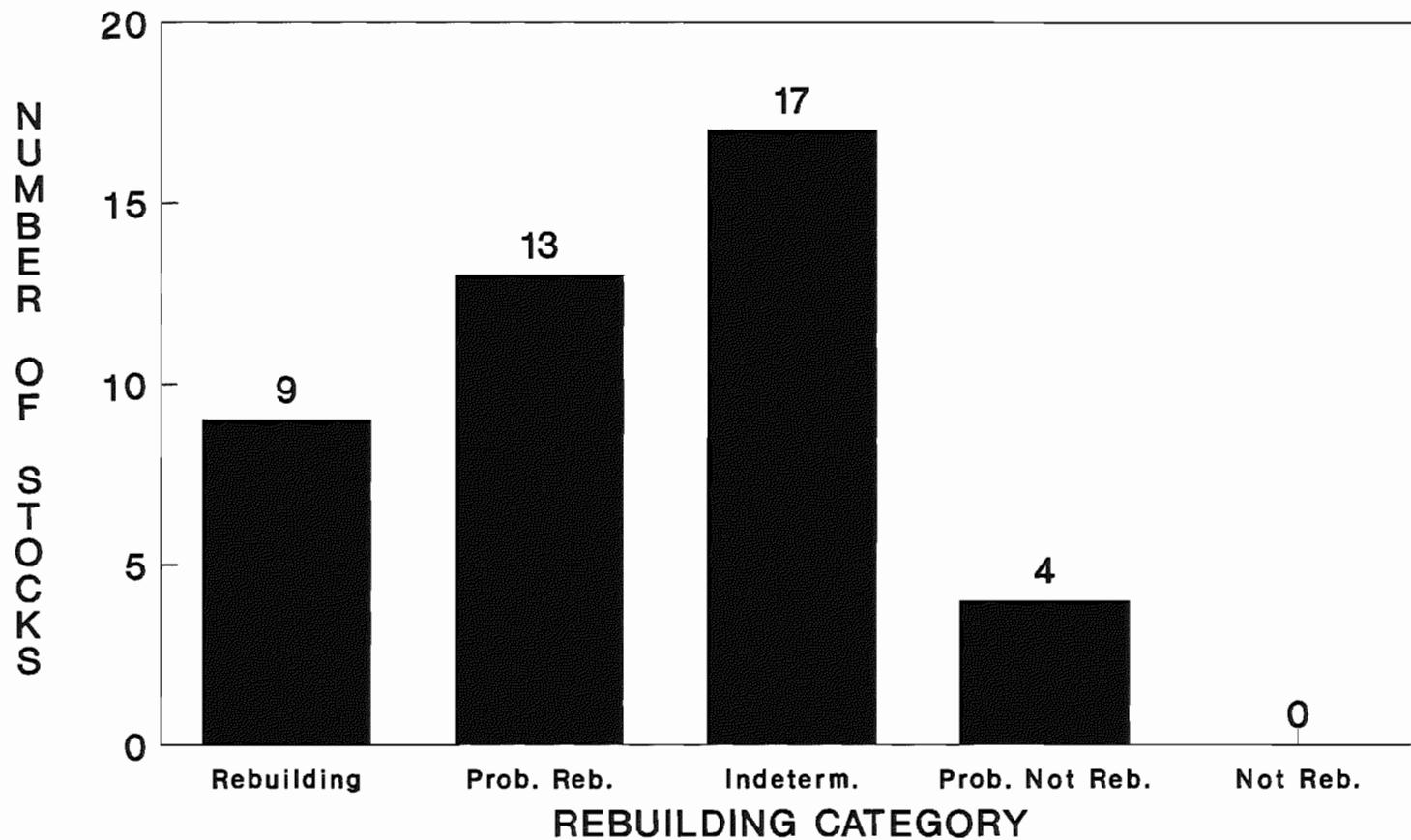
**FIGURE 2-2. DISTRIBUTION OF INDICATOR STOCKS BY PERCENT OF ESCAPEMENT GOAL (PRE-TREATY VS. TREATY)**



Stocks w/out goals & TBR stocks w/ conflicting U.S. & Can. goals omitted.  
 Total # of indicator stocks = 33

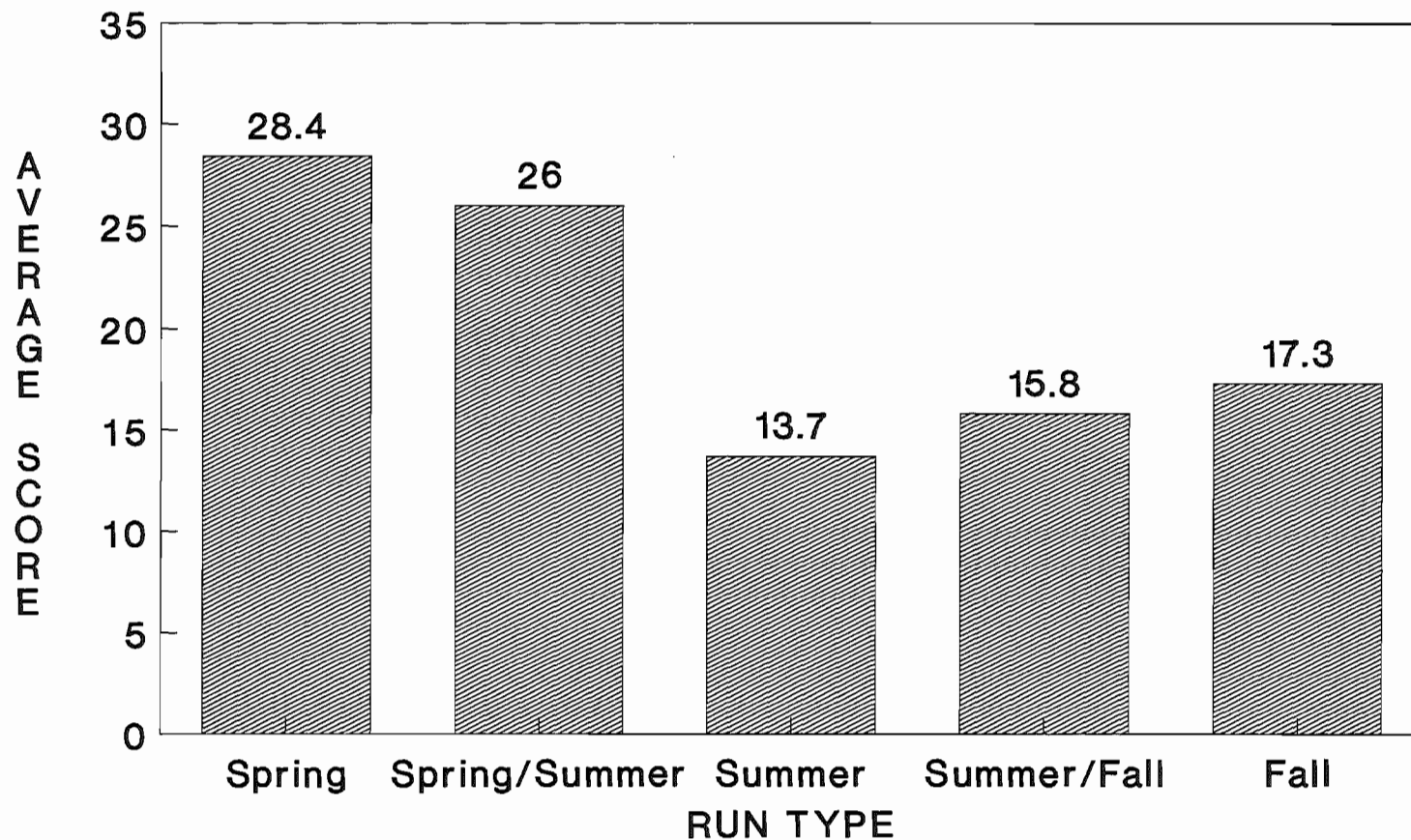


**FIGURE 2-3. DISTRIBUTION OF ASSESSED  
REBUILDING STATUS OF CHINOOK SALMON  
INDICATOR STOCKS THROUGH 1988**



Stikine River Included as Probably  
Rebuilding.  
Total # Indicator stocks = 43.

**FIGURE 2-4. AVERAGE INDEX OF ESCAPEMENT  
CHANGES BY RUN-TYPE  
SINCE THE PSC TREATY BASE PERIOD**



Higher score indicates greater % change from base period. TBR stocks averaged & counted once.

# SECTION 6.0 DATA TABLES AND FIGURES

## for the 1988 Escapement Assessment of the PSC Chinook Rebuilding Program

Escapements and terminal runs of PSC Chinook Technical  
Committee escapement indicator stocks, 1975-88.

Puget Sound									
Year	Skagit spring esc.	Skagit River summer/fall esc. t.run		Green River esc. t.run		Stilla- guamish esc t.run		Snohomish esc. t.run	
1975	804	11555	24625	3394	6217	1198	1635	4485	6123
1976	763	14479	23306	3140	7679	2140	4002	5315	9889
1977	716	9497	17693	3804	5339	1475	2549	5565	9618
1978	1079	13209	20030	3304	4337	1232	1959	7931	12591
1979	1032	13605	21243	9704	10725	1042	2366	5903	12706
1980	1842	20345	28938	7743	10537	821	2647	6460	16688
1981	1306	8670	19675	3606	4900	630	2783	3368	8968
1982	686	10439	21022	1840	3822	773	3058	4379	8470
1983	710	9080	14671	3679	13244	387	925	4549	10386
1984	765	13239	15005	3353	5339	374	883	3762	8480
1985	3265	16298	25075	2908	7417	1409	2456	4873	10899
1986	1995	18127	21585	4792	5770	1277	2416	4534	8267
1987	2108	9647	13037	10338	12825	1321	1906	4689	6670
1988	1988	11954	14564	7994	9447	717	1194	4513	7507
Goal	3000	14900		5800		2000		5250	

Washington Coast																
Quillayute spr/summer			Quillayute fall		Hoh spr/summer		Hoh fall		Queets spr/summer		Queets fall		Grays Harbor spring		Grays Harbor fall	
Year	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	9000
1977	3800	5300	3300	7600	1000	2000	2100	3800	700	1200	3600	5500	800	1700	5200	13500
1978	2300	2700	4700	6200	1400	2500	1900	2900	1100	1400	2200	3200	1000	1600	4600	11200
1979	2100	3900	3900	6600	1400	2300	1700	2200	900	1400	3900	4700	300	1100	9400	12400
1980	1000	1500	6700	7600	800	1000	2200	2800	1000	1200	3200	5800	200	600	11700	23700
1981	800	1700	5700	6900	1500	2100	3100	4000	1000	1200	4300	8000	600	900	7600	13200
1982	1200	2700	7100	9600	1600	2300	4500	5800	800	1200	4100	6200	600	600	5600	14600
1983	1400	1800	2900	5600	1800	1800	2500	3300	1000	1200	2600	3800	800	900	4500	9000
1984	600	1000	9100	10300	1500	2400	1900	2600	1000	1200	3900	5300	1000	1100	21000	23600
1985	600	700	6200	8100	1000	1400	1700	3500	700	900	3500	5300	1200	1300	9500	16900
1986	600	1000	10000	13600	1500	2500	5000	6000	900	1200	7700	8900	1800	1900	10500	20200
1987	700	2200	12400	14200	1700	2600	4000	5200	600	1800	6000	9000	800	1100	18800	31800
1988	1300	2600	7900	15400	2600	3900	2700	5600	1800	2300	8600	12000	3000	3000	28200	28200
Goal	1500		NA		NA		NA		NA		NA		1400		14600	

Escapements and terminal runs of PSC Chinook Technical  
Committee escapement indicator stocks, 1975-88.

Northern B.C.

Year	AREA 1 Yakoun	AREA 3 Nass		AREA 4 Skeena		AREA 6	AREA 8	AREA 9 Rivers Inlet	AREA 10 Smith Inlet
		esc.	t.run	esc.	t.run				
1975	1500	6025		20319		2225	4425	3280	960
1976	700	5590		13078		2765	3550	1640	1000
1977	800	9060	11518	29018	35716	1820	3600	2225	1050
1978	600	10190	12250	22661	32574	3912	4000	2800	2100
1979	400	8180	10153	18488	23741	3455	4600	2150	500
1980	600	9072	11423	23429	35714	1935	2529	2325	1200
1981	750	7950	9567	24523	36634	1502	3550	3175	1020
1982	1400	6575	8726	17092	31022	4150	220	2250	1500
1983	600	8055	14319	23562	38204	2845	650	3320	1050
1984	300	12620	15010	37598	50042	1914	4700	1400	770
1985	1500	8002	11938	53599	69054	1509	4550	3371	230
1986	500	17390	22608	59968	82911	2615	3362	7623	532
1987	2000	11400	16210	59120	73038	1566	1456	5239	1050
1988	2000	10000	14248	68705	89745	3165	1650	4429	1050
Goal	15800	15900		41800		5520	5450	4950	2100

Southern B.C.

Fraser River

Year	W. Coast Vancouver I. Island	Upper Georgia Strait	Lower Georgia Strait		Upper	Middle	Thompson	Harrison	
			esc.	t.run				esc.	t.run
1975	1675	11800	11022	11537	7028	15050	37035		
1976	1275	15150	9240	9640	7612	10975	14875		
1977	3875	3880	10655	14165	10135	13320	30321		
1978	6275	6150	8035	9475	14015	13450	28465		
1979	3058	3610	12281	13652	12495	8595	25145		
1980	6645	1367	10835	14652	15796	9625	19330		
1981	5360	1945	10970	12536	9021	8175	23375		
1982	7915	3260	10470	11905	11603	10470	20385		
1983	4575	3820	8950	9989	17185	15404	20381		
1984	5012	4600	11022	12167	21938	13957	29972	116791	127719
1985	4900	4600	4796	6342	34527	17595	39997	147620	152099
1986	4810	1630	2830	4817	41207	27349	45130	162393	176351
1987	3570	5700	2530	4569	34520	27330	36730	78693	81340
1988	5525	3300	6914	9343	34248	24164	47103	35694	40613
Goal	11600	5100	22300		24500	21100	55700	233600	

Escapements and terminal runs of PSC Chinook Technical  
Committee escapement indicator stocks, 1975-88.

Southeast Alaska

Year	Situk		King		Blossom	Keta
	esc.	t.run	Salmon	Andrews		
1975	1888	2073	53	416	234	325
1976	1543	1874	81	404	109	134
1977	1732	2251	168	456	179	368
1978	880	1216	71	388	229	627
1979	1400	2021	89	327	86	682
1980	905	1578	88	281	142	307
1981	702	1115	113	511	254	526
1982	434	579	286	635	552	1206
1983	592	749	245	366	942	1315
1984	1726	2041	250	355	813	976
1985	1521	1975	171	510	1134	998
1986	2067	2134	245	1131	2045	1104
1987	1884	2254	193	1042	2158	1229
1988	885	1155	206	752	614	920
Goal	2100		250	750	1280	800

Transboundary Rivers

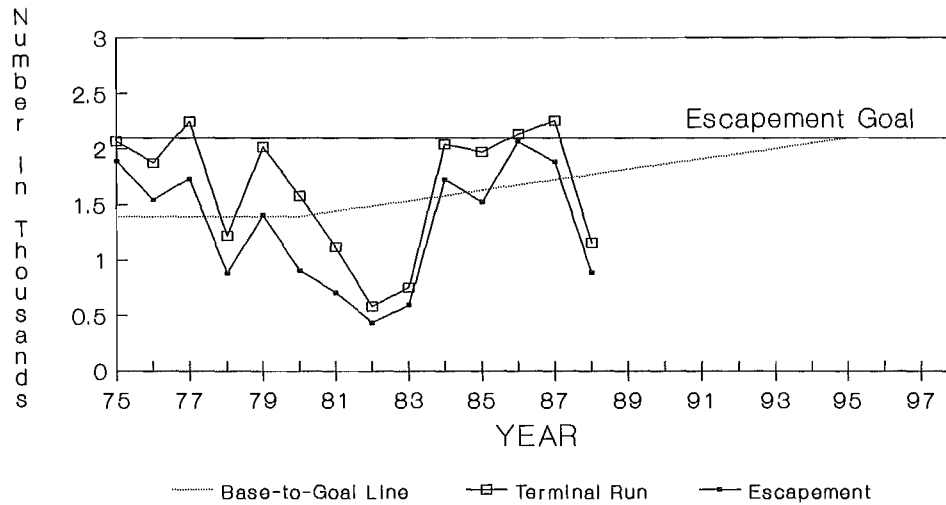
Year	US		Canadian		US		US		Canadian		US		Canadian		US		US	
	Alsek	esc. t.run	Alsek	esc. t.run	Chilkat	esc. t.run	Taku	esc. t.run	Taku	esc. t.run	Stikine	esc. t.run	Stikine	esc. t.run	Unuk	Chickamin	esc. t.run	esc. t.run
1975	4214	5593			188	4609	4609	5800	5800	4480	5081	6000	6601	1469	588			
1976	1802	2639	2231	3068	223	8278	8278	10300	10300	2560	3140	3400	3980	1469	147			
1977	4522	6474	5738	7690	223	10000	10000	12500	12500	5120	5201	6800	6881	1558	363			
1978	4181	7222	5352	8393	214	4987	4987	6200	6200	4045	4295	5400	5650	1770	290			
1979	6678	9983	8028	11333	214	6593	6690	8312	8409	7462	8599	9328	10465	922	224			
1980	3886	5564	4924	6602	214	13402	13627	15088	15313	13677	14793	17096	18212	1626	418			
1981	3067	4311	3761	4987	1670	17889	18048	19572	19731	21338	22117	26672	27451	1170	614			
1982	3077	4233	4114	5270	500	8407	8434	9626	9653	18112	19306	22640	23834	2162	1015			
1983	3495	4200	4462	5168	1080	3018	3096	4124	4202	3802	4865	4752	5815	1800	922			
1984	2456	3077	2769	3404	2045	6307	6454	7818	7965	8282	8633	10352	10703	2939	1763			
1985	2005	2643	2916	3554	625	10851	11014	14416	14579	12584	13664	12584	13664	1894	1530			
1986	4073	4818	5418	6163	170	12178	12316	15040	15178	11572	13508	11572	13508	3402	2683			
1987	3892	4729	5232	6067	875	8951	9015	11486	11550	19108	21309	18132	20333	3157	1560			
1988	3105	3615	4060	4570	781	13411	13702	17252	17543	29168	31520	29168	31520	2794	1258			
Goal	5000		12500		2000	25600		30000		13400		25000		2880	1440			

Escapements and terminal runs of PSC Chinook Technical  
Committee Technical Committee escapement indicator

Columbia River								Oregon
Year	Col. River bright		Col. River summer		Col. River spring		Lewis River	Oregon Coastal
	esc.	t.run	esc.	t.run	esc.	t.run	esc. t.run	esc.
1975	29600	112500	33000	33000			13859 36800	59
1976	28800	115100	26600	26700			3371 14900	48
1977	37600	95100	33300	34300	55300	79092	6930 29800	73
1978	27300	85300	37600	38700	87800	93300	5363 18500	77
1979	31200	89200	26700	27800	22100	23088	8023 32700	90
1980	29900	76800	25800	27000	26700	27612	16394 38800	95
1981	21100	66600	21100	22400	30700	32849	19297 25000	81
1982	31100	79000	18800	20100	30200	33197	8370 13000	99
1983	48700	86100	17700	18000	23600	25155	13540 16800	49
1984	61000	131400	22100	22400	18600	20382	7132 13300	100
1985	93300	195600	23200	24200	27200	28763	7491 13300	133
1986	113300	281500	25700	26200	38500	39765	11983 24500	121
1987	154100	419400	31800	33000	41400	46030	12935 37900	129
1988	114700	339900	30100	31300	35100	40740	12052 41700	221
Goal	40000		85000		84000		10000	NA

## Situk Chinook Escapements

### Adult Chinook Salmon

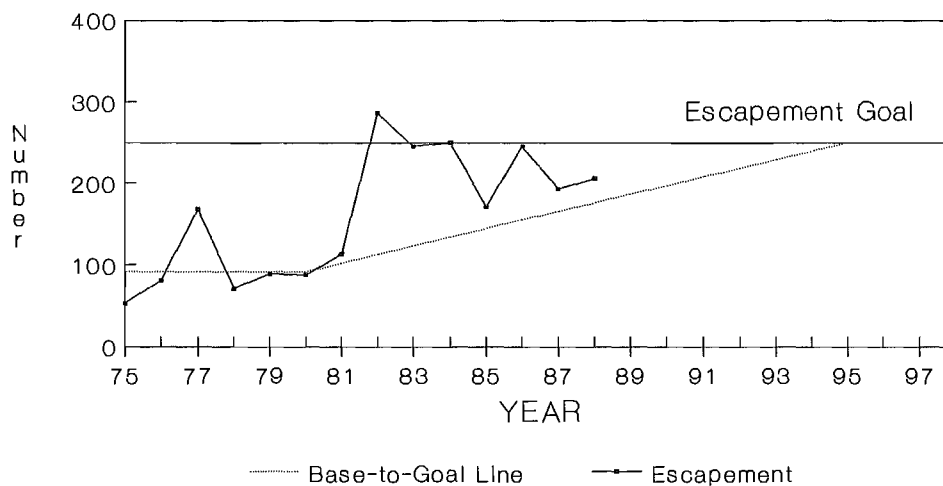


	Base	81	82	83	84	85	86	87	88	Goal
Situk River	1,391	702	434	592	1,726	1,521	2,067	1,884	885	2,100

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## King Salmon Chinook Escapements

### Adult Chinook Salmon

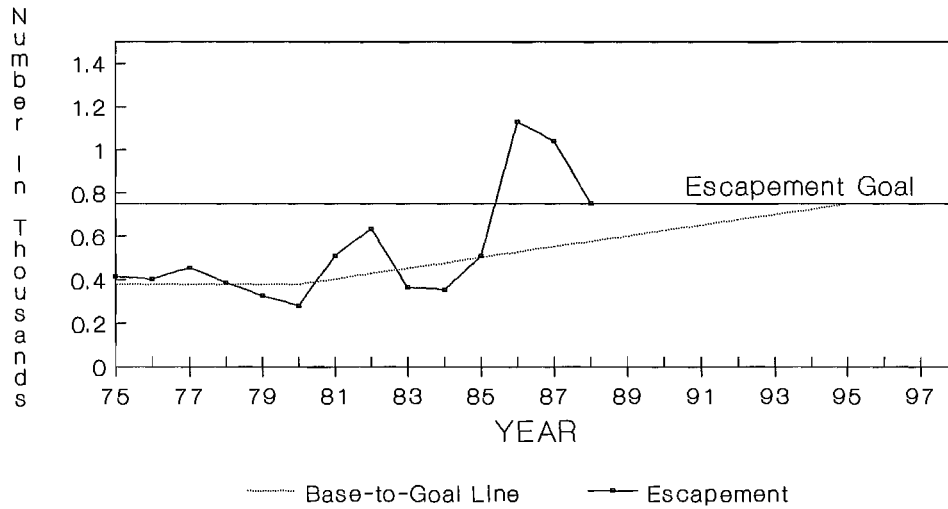


	Base	81	82	83	84	85	86	87	88	Goal
King Salmon River	92	113	286	245	250	171	245	193	206	250

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## Andrew Creek Chinook Escapements

### Adult Chinook Salmon

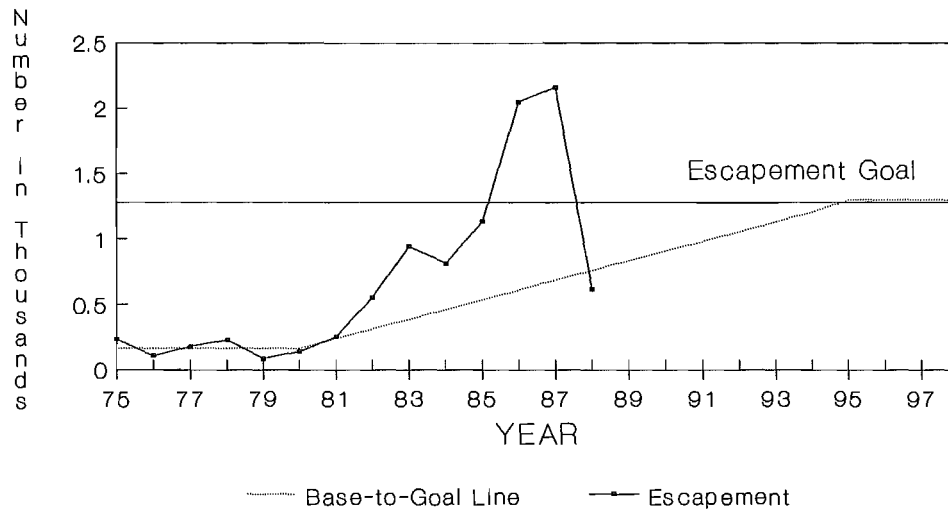


	Base	81	82	83	84	85	86	87	88	Goal
Andrew Creek	379	511	635	386	355	510	1,131	1,042	752	750

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## Blossom River Chinook Escapements

### Adult Chinook Salmon



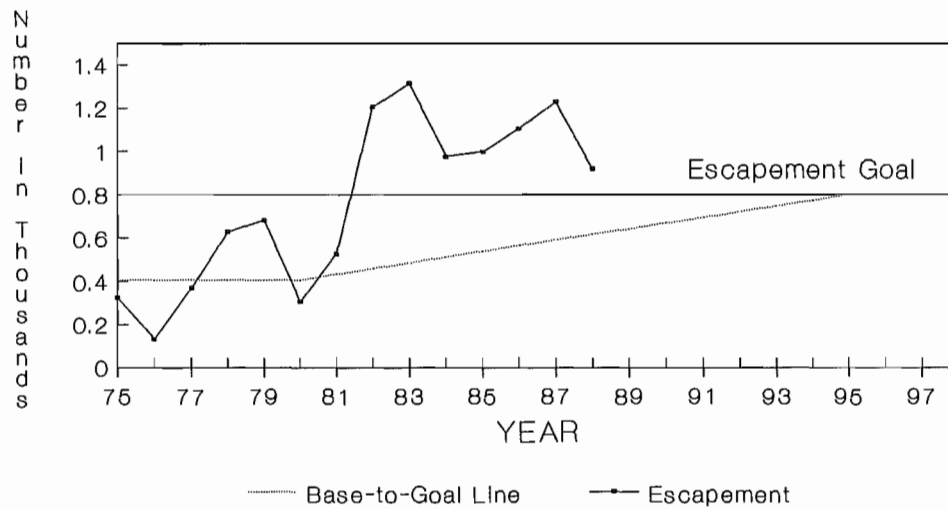
	Base	81	82	83	84	85	86	87	88	Goal
Blossom River	163	254	552	942	813	1,134	2,045	2,158	614	1,280

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## Keta River Chinook Escapements

### Adult Chinook Salmon

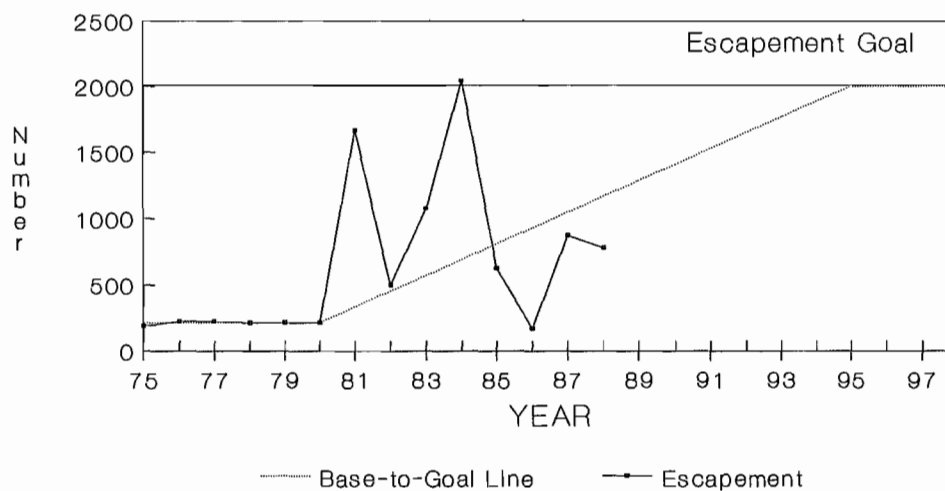


	Base	81	82	83	84	85	86	87	88	Goal
Keta River	407	528	1,208	1,315	978	998	1,104	1,229	920	800

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## Chilkat River Chinook Escapements

### U. S. Estimates and Goals Adult Chinook Salmon



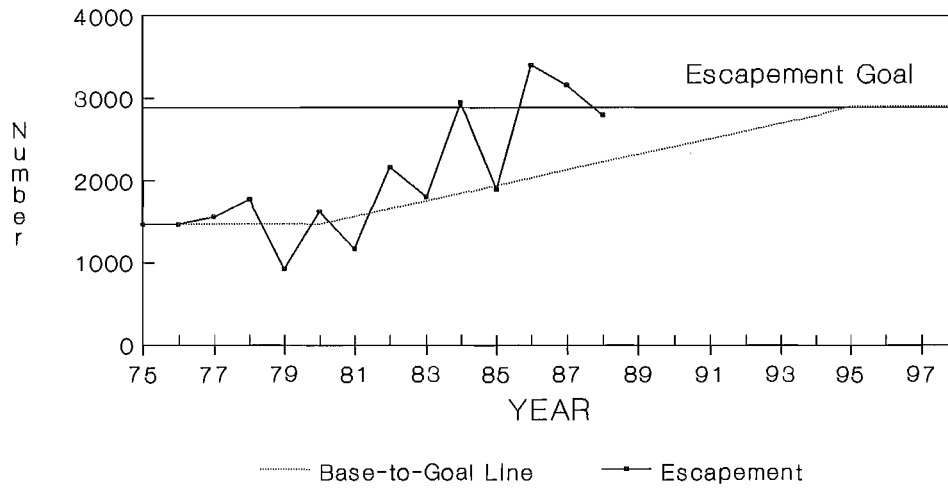
	Base	81	82	83	84	85	86	87	88	Goal
Chilkat R. (U.S.)	213	1,870	500	1,080	2,045	625	170	875	781	2,009

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# Unuk River Chinook Escapements

## U. S. Estimates and Goals

### Adult Chinook Salmon



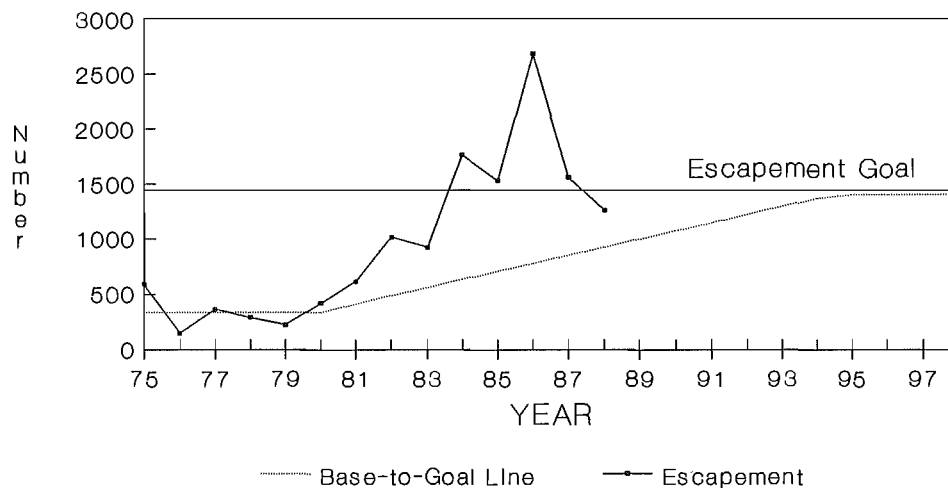
	Base	81	82	83	84	85	86	87	88	Goal
Unuk River (U.S.)	1,469	1,170	2,162	1,800	2,939	1,894	3,402	3,167	2,794	2,880

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# Chickamin R. Chinook Escapements

## U. S. Estimates and Goals

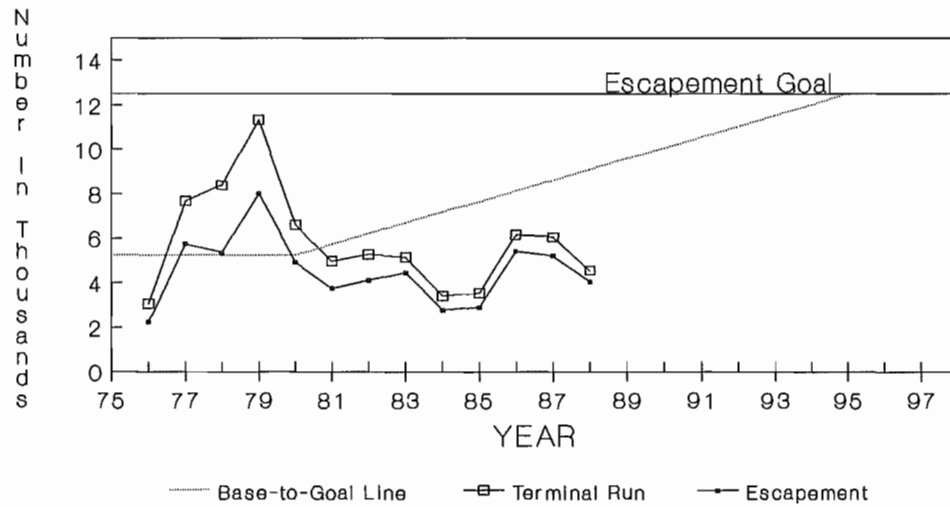
### Adult Chinook Salmon



	Base	81	82	83	84	85	86	87	88	Goal
Chickamin R. (U.S.)	338	614	1,016	922	1,763	1,530	2,683	1,560	1,258	1,440

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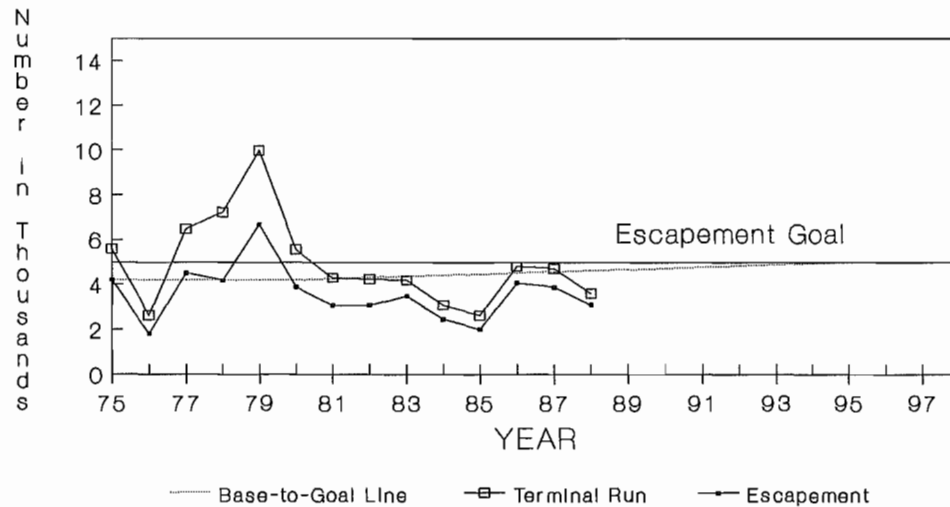
# **Alsek Chinook Escapements** **Canadian Estimates and Goals** **Adult Chinook Salmon**



	Base	81	82	83	84	85	86	87	88	Goal
Alsek River (Can.)	5,255	3,761	4,114	4,462	2,769	2,916	5,418	5,232	4,060	12,500

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



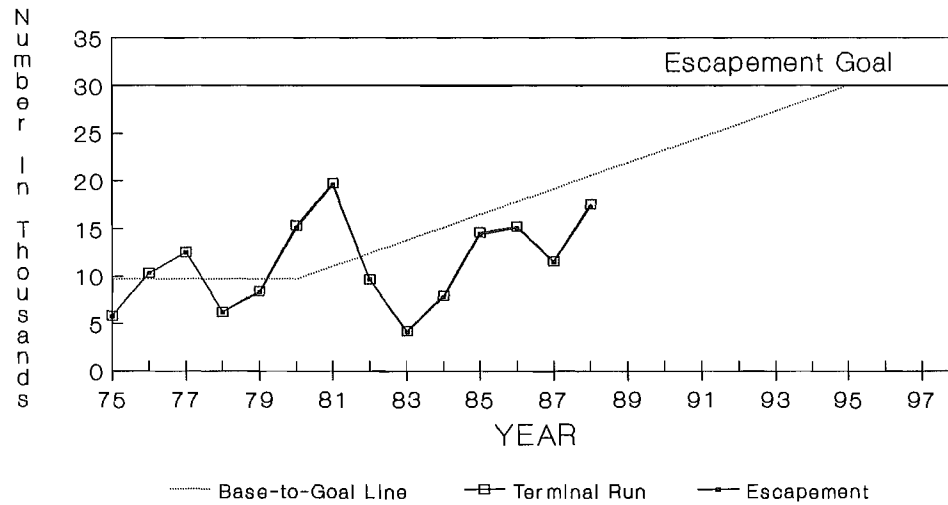
	Base	81	82	83	84	85	86	87	88	Goal
Alsek River (U.S.)	4,214	3,067	3,077	3,495	2,456	2,005	4,073	3,892	3,105	5,000

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# Taku Chinook Escapements

## Canadian Estimates and Goals

### Adult Chinook Salmon



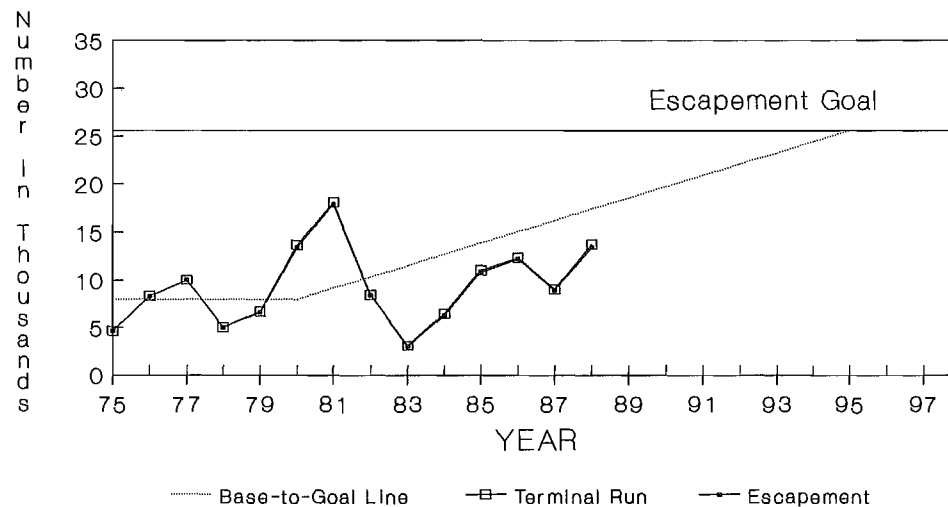
	Base	81	82	83	84	85	88	87	88	Goal
Taku River (Can.)	9,700	19,672	9,628	4,124	7,818	14,416	15,040	11,486	17,252	30,000

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# Taku Chinook Escapements

## U. S. Estimates and Goals

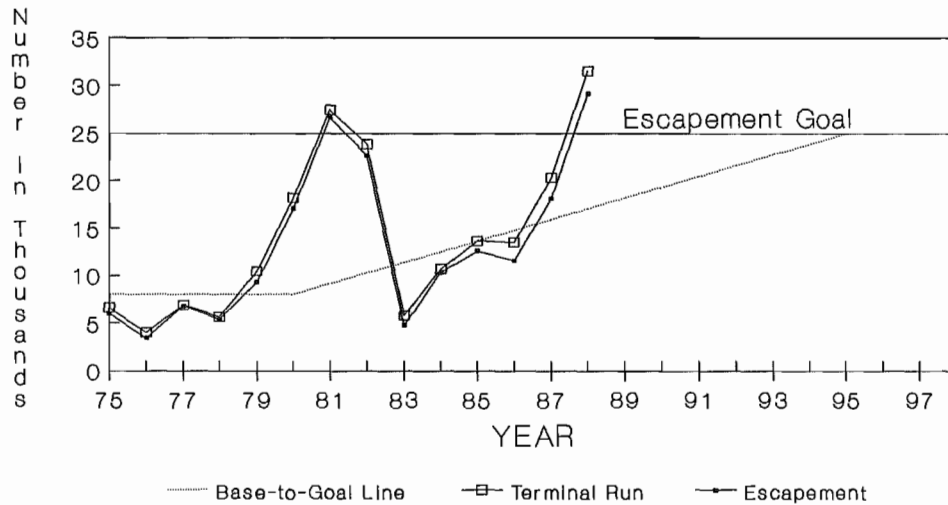
### Adult Chinook Salmon



	Base	81	82	83	84	85	88	87	88	Goal
Taku River (U.S.)	7,978	17,889	8,407	3,018	8,307	10,851	12,178	8,951	13,411	25,600

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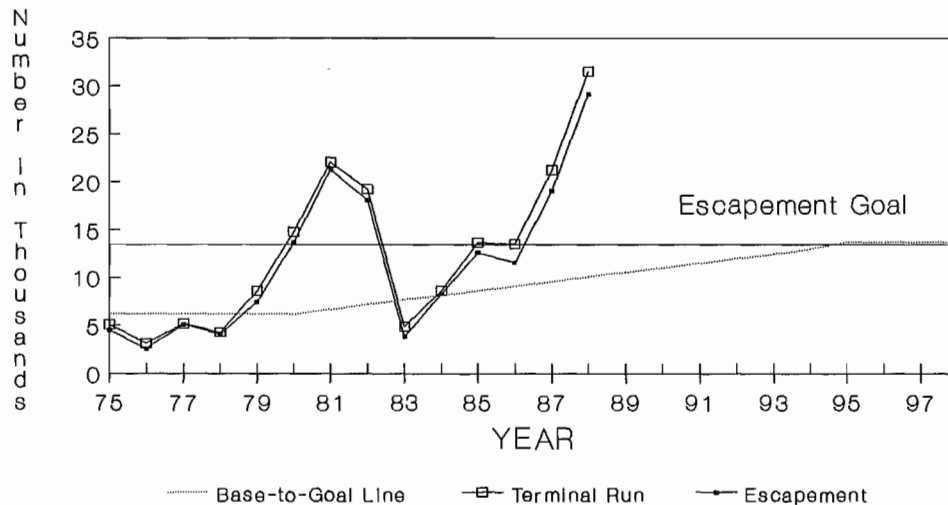
# Stikine Chinook Escapements Canadian Estimates and Goals Adult Chinook Salmon



	Base	81	82	83	84	85	86	87	88	Goal
Stikine R. (Can.)	8,004	28,878	28,840	4,782	10,388	12,884	11,572	16,138	20,188	25,000

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

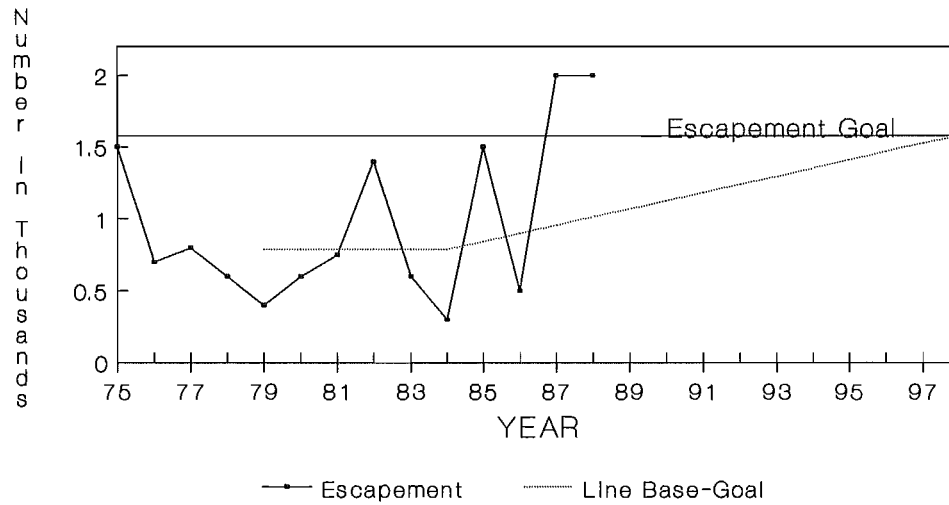


	Base	81	82	83	84	85	86	87	88	Goal
Stikine R. (U.S.)	6,224	21,338	18,112	3,802	8,282	12,584	11,572	19,108	29,168	13,440

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

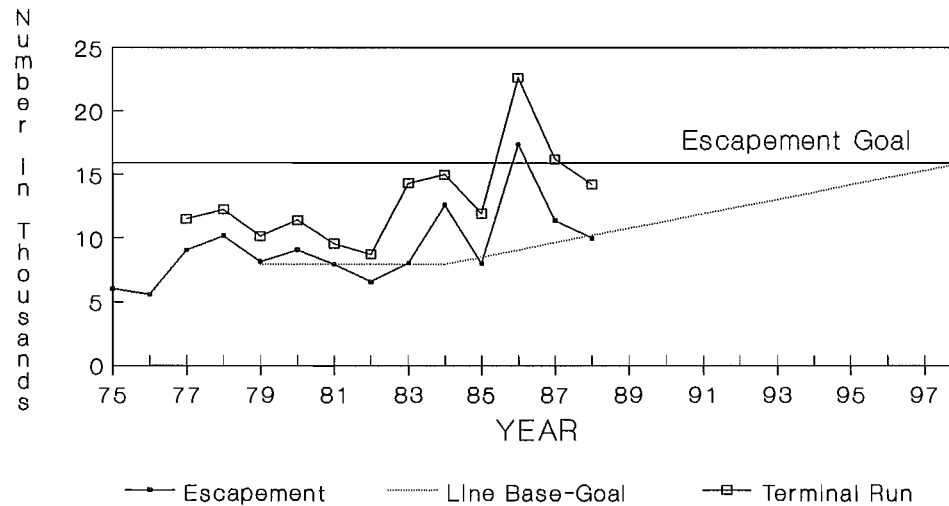
### Adult Chinook Salmon



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## Nass Area Chinook Escapements

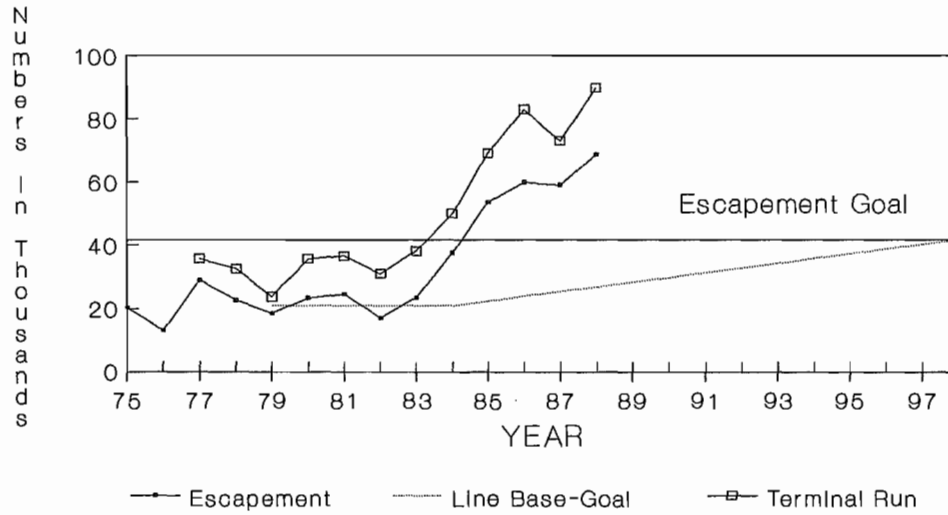
### Adult Chinook Salmon



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## Skeena Area Chinook Escapements

### Adult Chinook Salmon

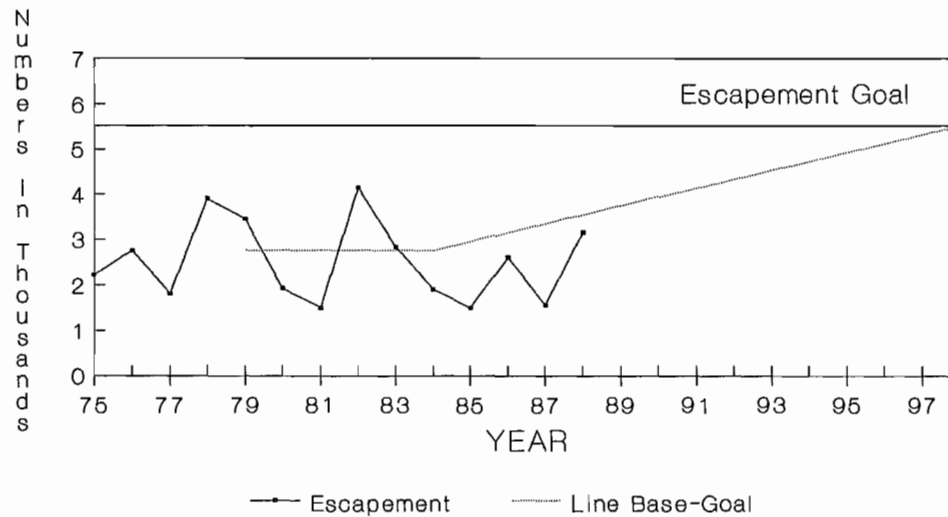


	Base	85	86	87	88	Goal
Skeena River	20,883	53,599	59,968	59,120	66,705	41,800

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## Area 6 Index Chinook Escapements

### Adult Chinook Salmon

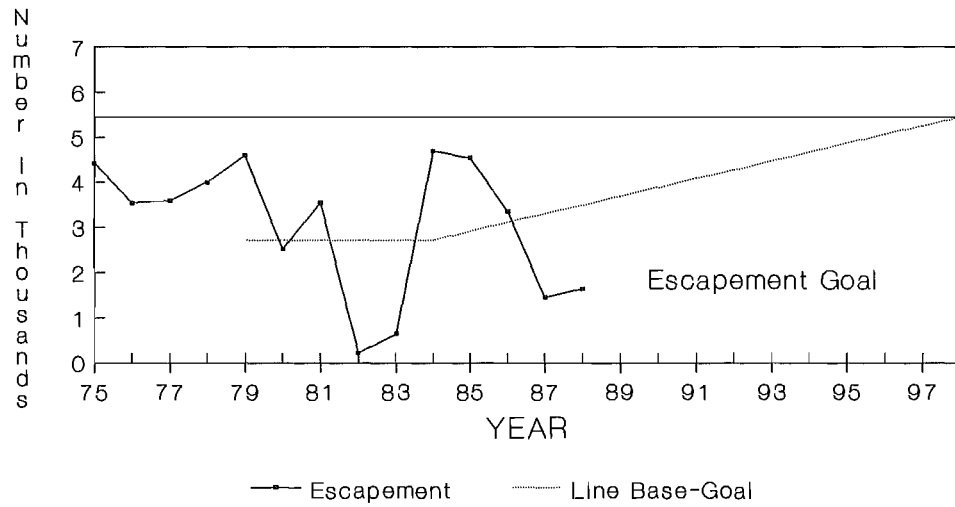


	Base	85	86	87	88	Goal
Area 6 Index Stock	2,761	1,509	2,815	1,568	3,165	5,521

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## Area 8 Index Chinook Escapements

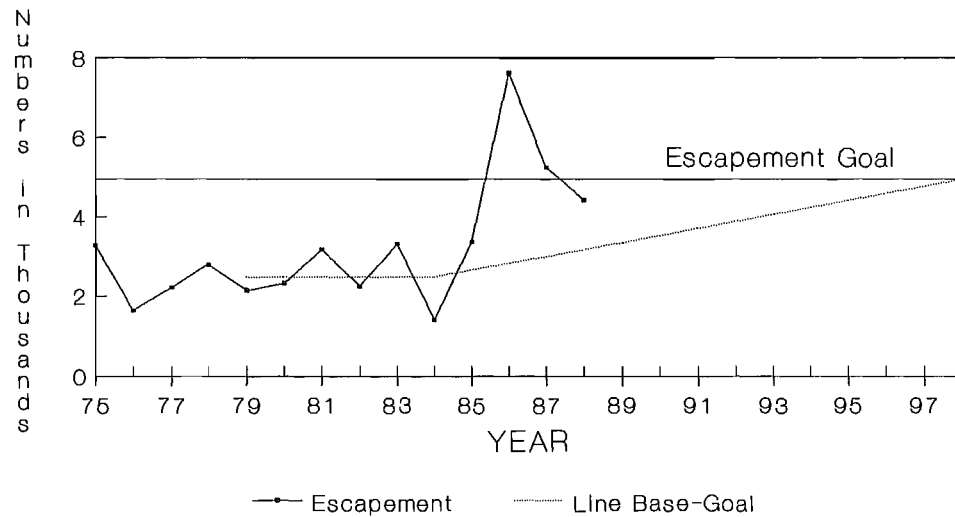
### Adult Chinook Salmon



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## Rivers Inlet Chinook Escapements

### Adult Chinook Salmon

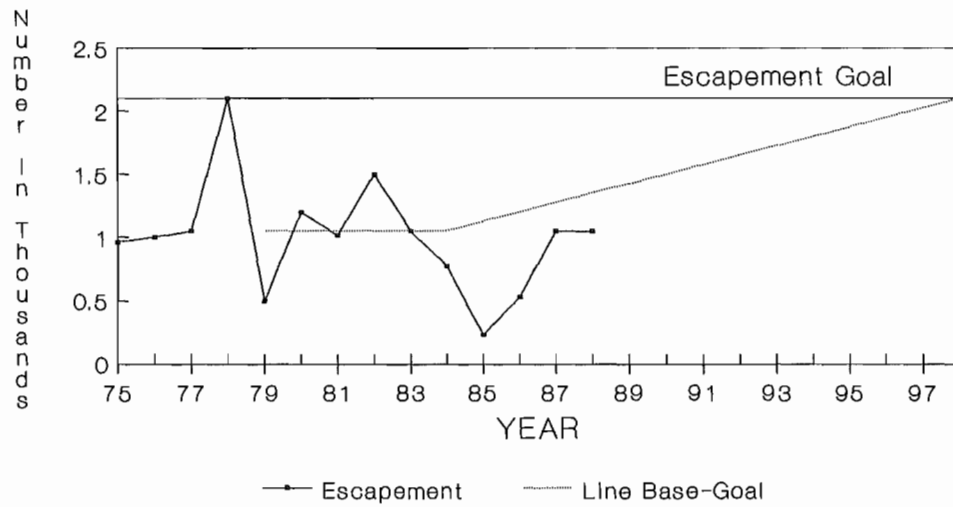


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## Smith Inlet Chinook Escapements

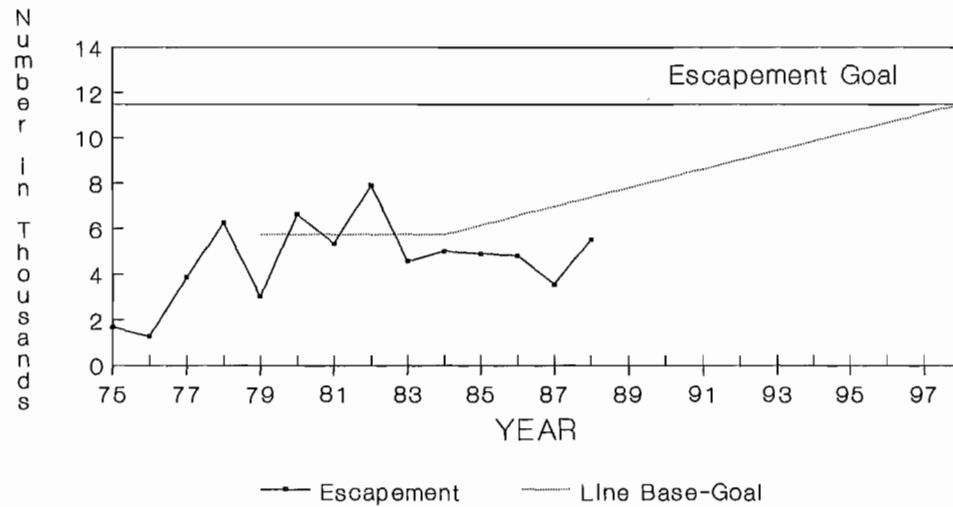
### Adult Chinook Salmon



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## WCVI Chinook Escapements

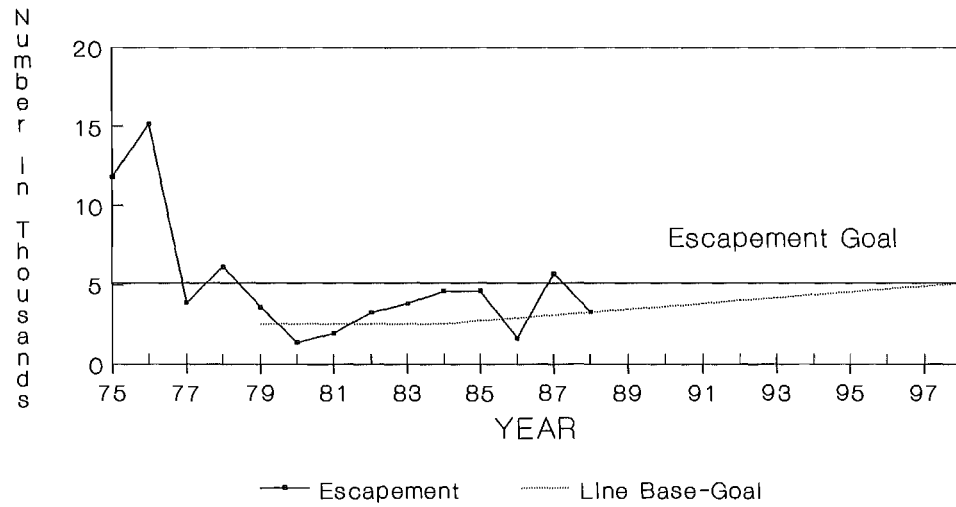
### Adult Chinook Salmon



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## Upper Georgia Str. Chinook Escapements

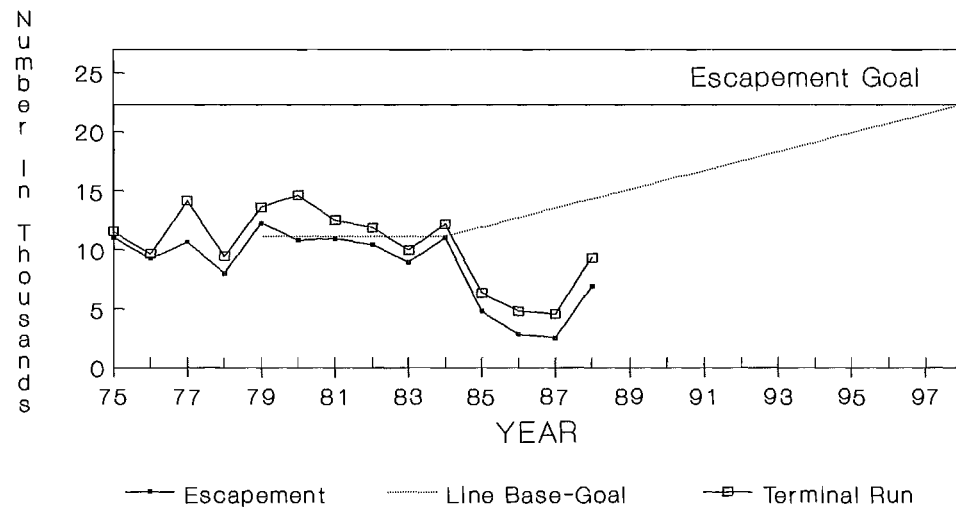
### Adult Chinook Salmon



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## Lower Georgia Str. Chinook Escapements

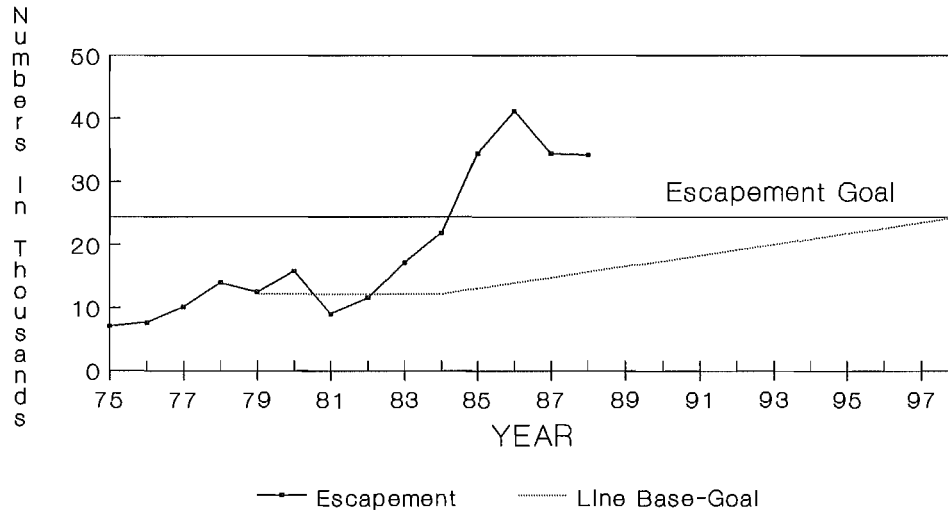
### Adult Chinook Salmon



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## Upper Fraser R. Chinook Escapements

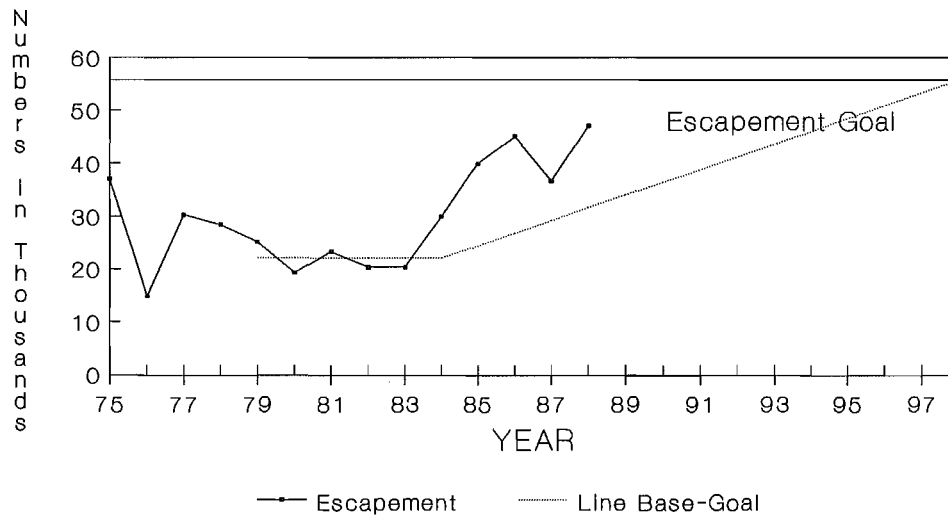
### Adult Chinook Salmon



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## Middle Fraser R. Chinook Escapements

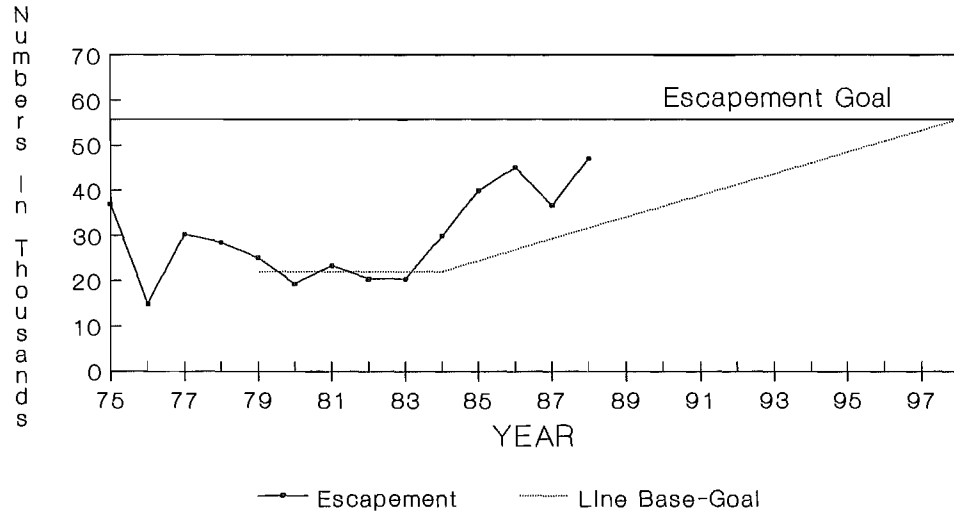
### Adult Chinook Salmon



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## Thompson R. Chinook Escapements

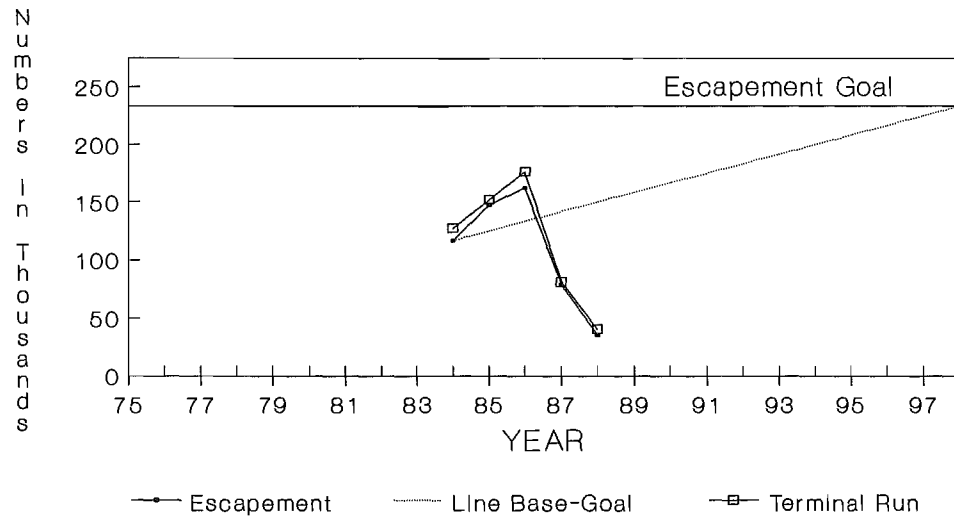
### Adult Chinook Salmon



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## Harrison Chinook Escapements

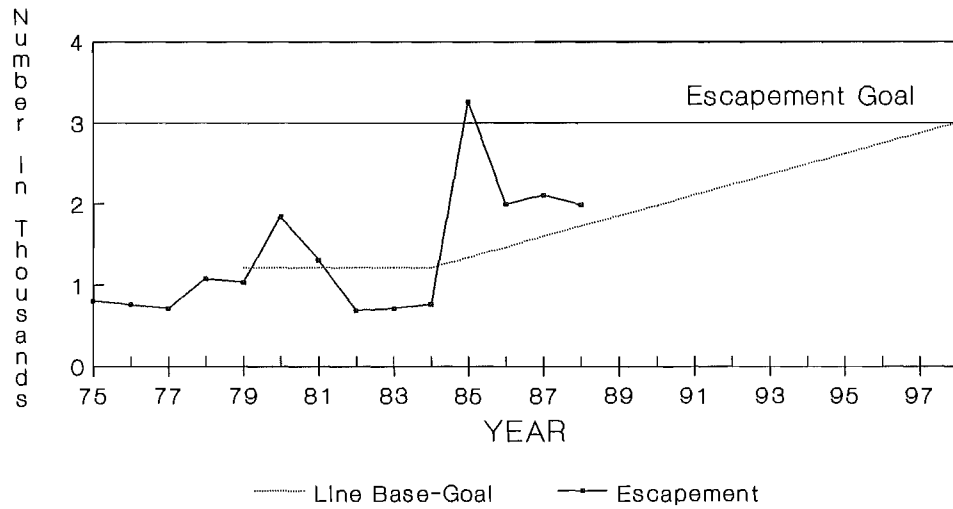
### Adult Chinook Salmon



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## Skagit Spring Chinook Escapements

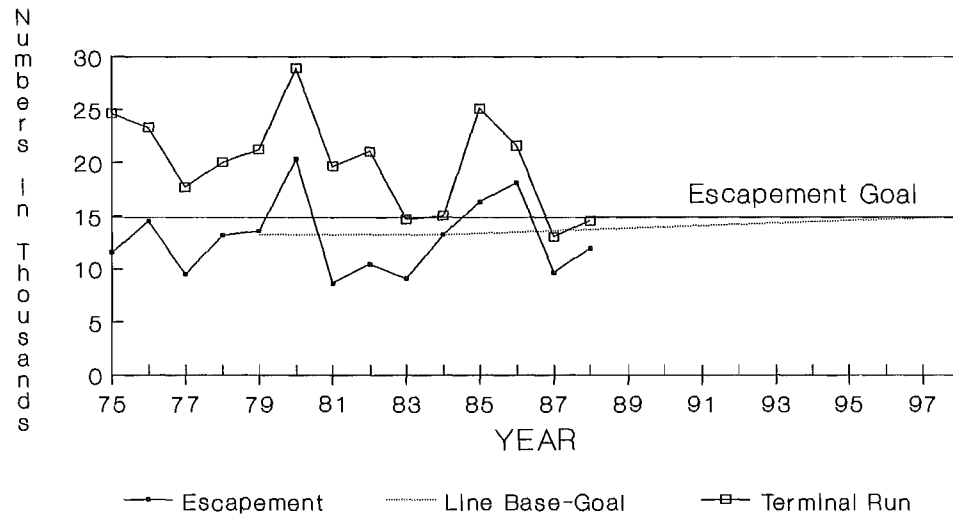
### Adult Chinook Salmon



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## Skagit Sum./Fall Chinook Escapements

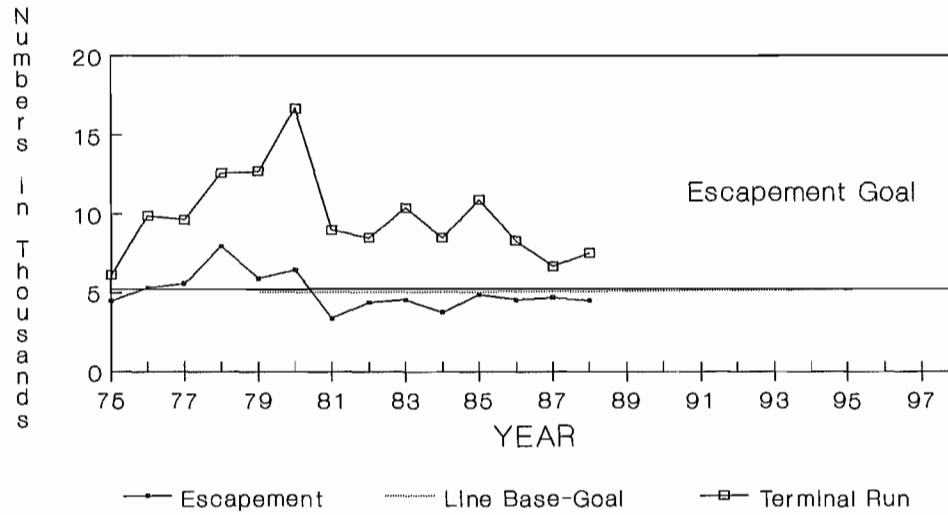
### Adult Chinook Salmon



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## Snohomish River Chinook Escapements

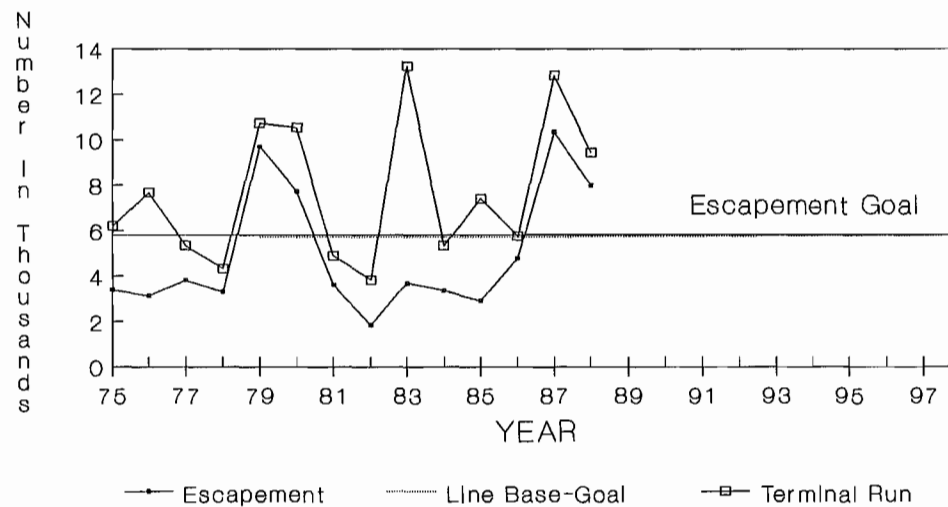
### Adult Chinook Salmon



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## Green River Chinook Escapements

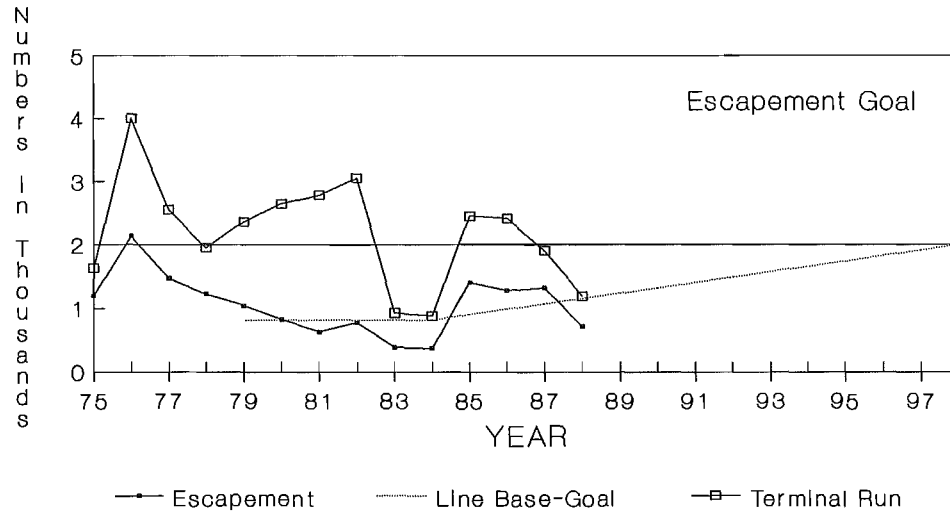
### Adult Chinook Salmon



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## Stillaguamish River Chinook Escapements

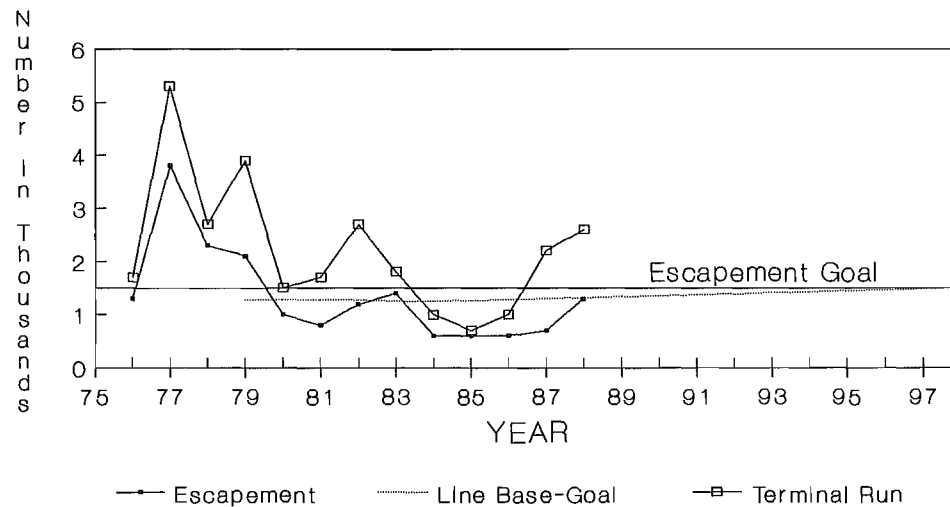
### Adult Chinook Salmon



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## Quillayute Summer Chinook Escapements

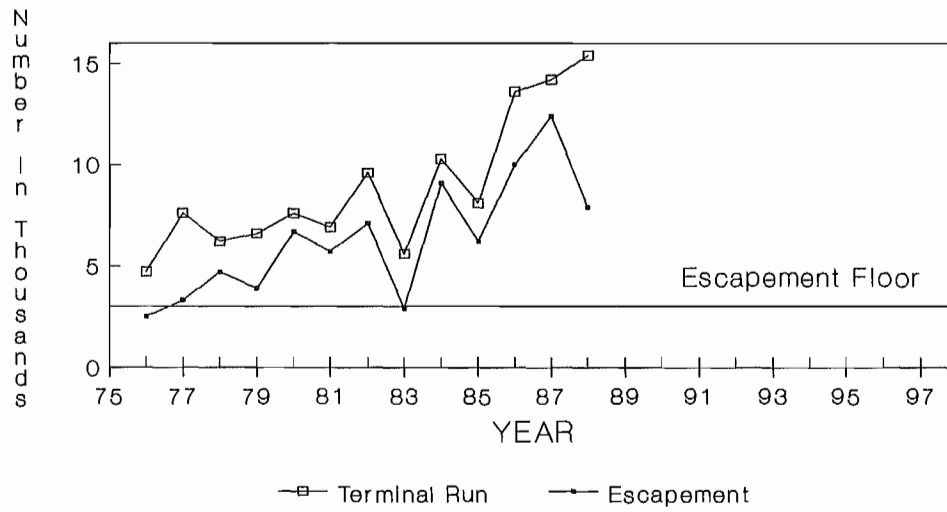
### Adult Chinook Salmon



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## Quillayute Fall Chinook Escapements

### Adult Chinook Salmon

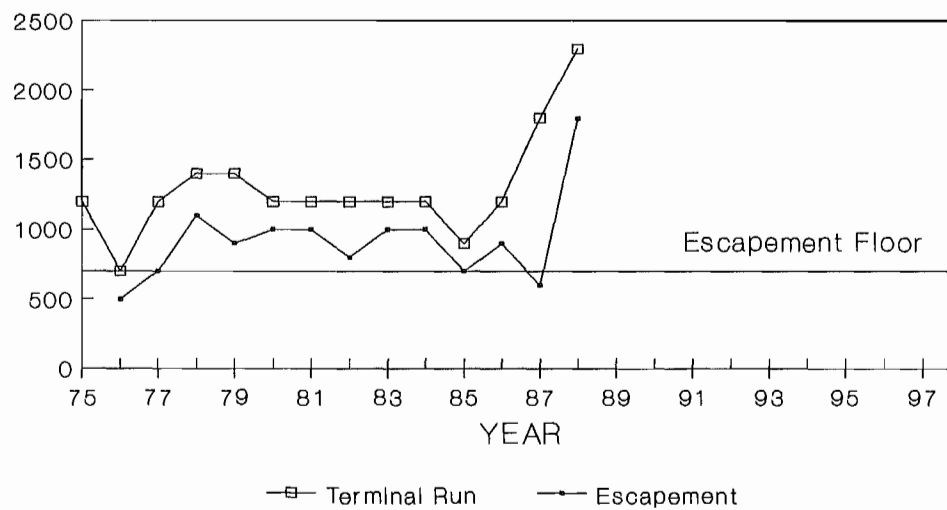


	Base	85	88	87	88	Floor
Quillayute R. Fall	6,850	8,200	10,000	12,400	7,900	3,000

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## Queets Spr/Sum Chinook Escapements

### Adult Chinook Salmon



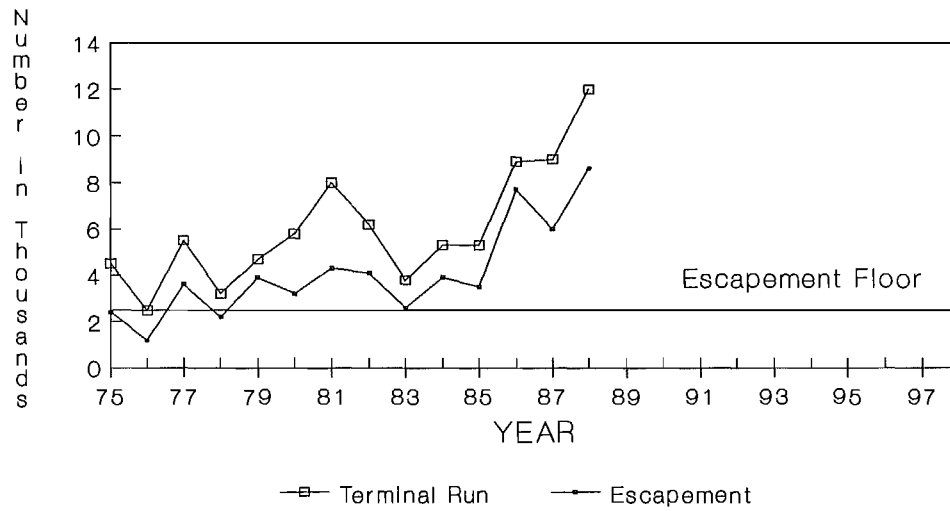
	Base	85	88	87	88	Floor
Queets Spr./Sum.	925	700	900	800	1,800	700

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## Queets Fall Chinook Escapements

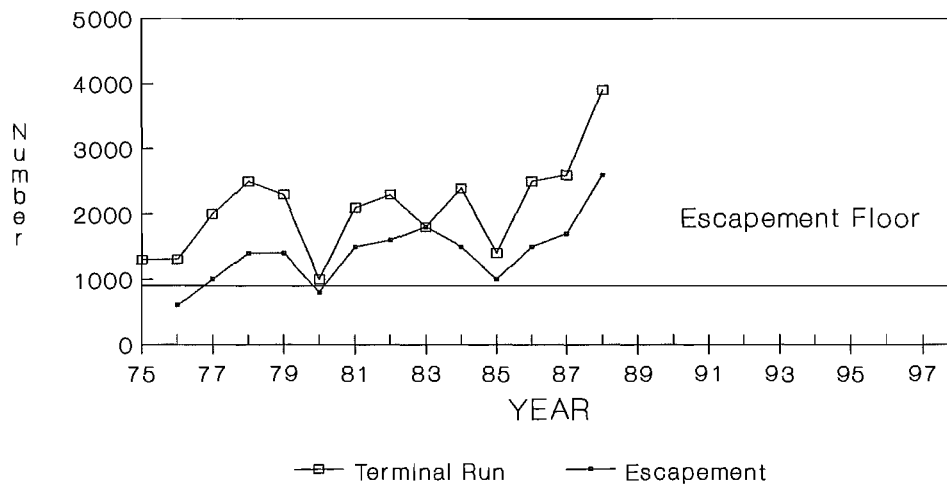
### Adult Chinook Salmon



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## Hoh Spr/Sum Chinook Escapements

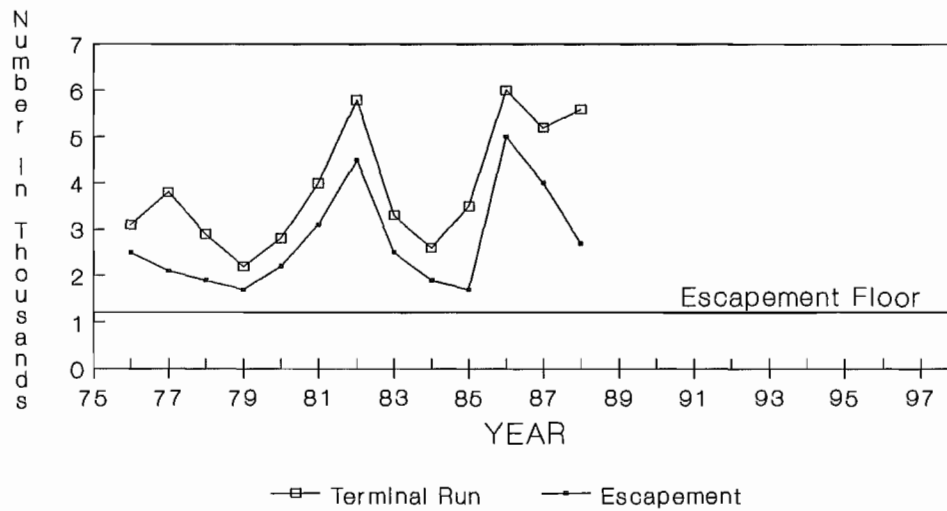
### Adult Chinook Salmon



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## Hoh Fall Chinook Escapements

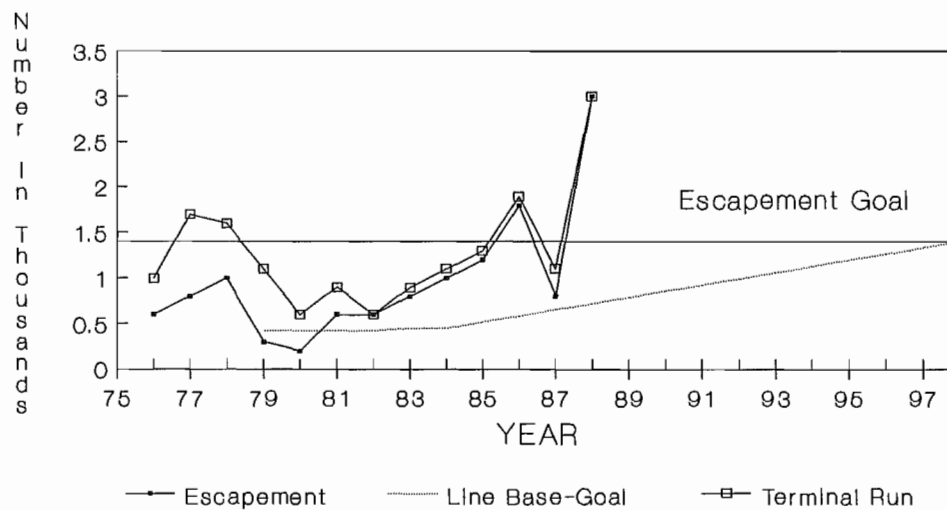
### Adult Chinook Salmon



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## Grays Harbor Spring Chinook Escapements

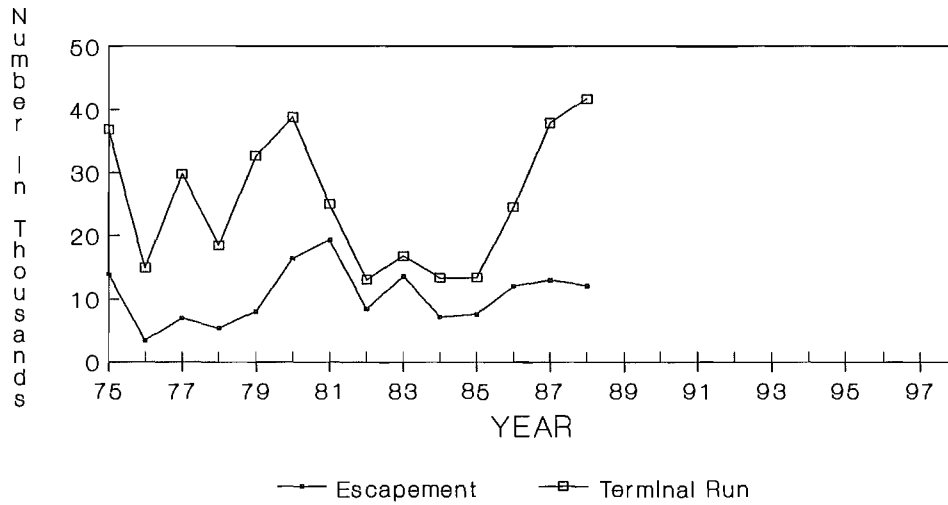
### Adult Chinook Salmon



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## Lewis R. Fall Chinook Escapements

### Adult Chinook Salmon

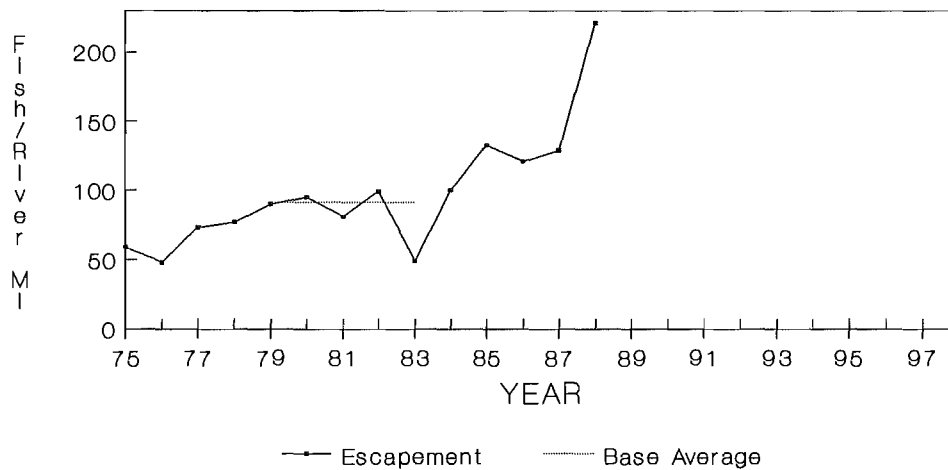


	Base	85	86	87	88	Goal
Lewis River Fall	13,021	7,491	11,983	12,935	12,052	10,000

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## Oregon Coastal Chinook Escapements

### Adult Chinook Salmon

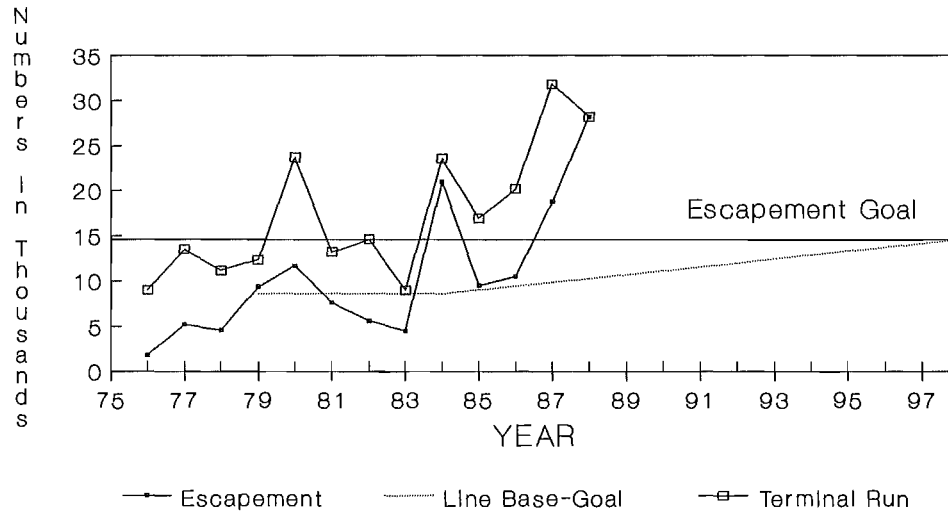


	Base	85	86	87	88
Oregon Coastal	91	133	121	129	221

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## Grays Harbor Fall Chinook Escapements

### Adult Chinook Salmon

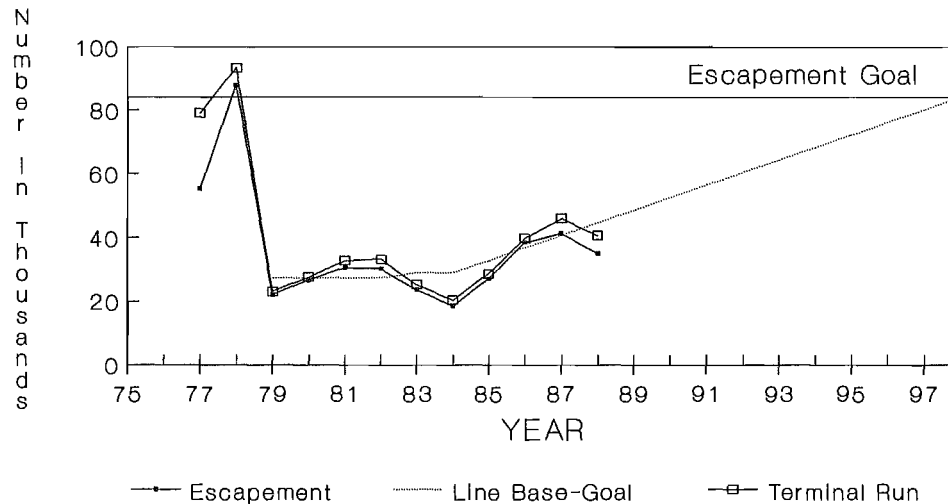


	Base	85	88	87	88	Goal
Grays Harbor Fall	8,575	9,500	10,500	18,800	28,200	14,800

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## Columbia R. Spring Chinook Escapements

### Adult Chinook Salmon

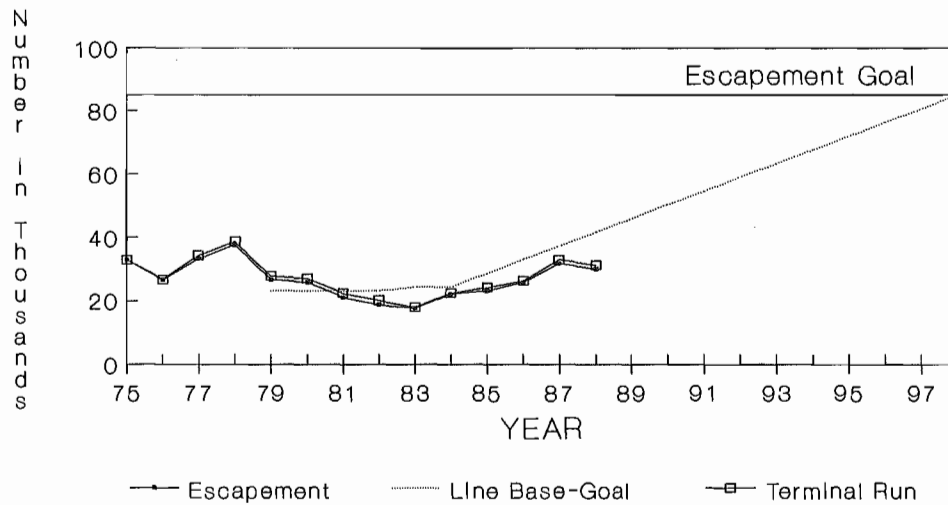


	Base	85	88	87	88	Goal
Columbia R. Spring	27,425	27,200	38,500	41,400	35,100	84,000

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## Columbia R. Summer Chinook Escapements

### Adult Chinook Salmon

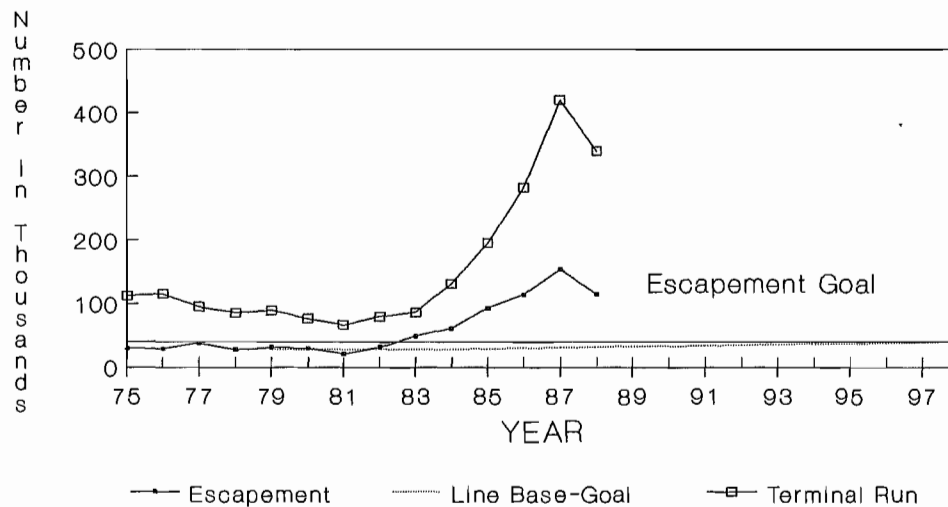


	Base	85	88	87	88	Goal
Columbia R. Summer	23,100	23,200	25,700	31,800	30,100	85,000

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## Columbia R. Bright Chinook Escapements

### Adult Chinook Salmon



	Base	85	86	87	88	Goal
Columbia R. Brights	28,325	93,300	113,300	154,100	114,700	40,000

D:\RAW\CHARTS\CRURBTGB.CH

## **CHAPTER 3 EXPLOITATION RATE ANALYSIS**

**A Report of the Analytical Work Group\*  
of the Chinook Technical Committee  
November 1989**

**\* Members of the Analytical Work Group completing the analysis:  
John E. Clark, Gary Morishima, Howard Schaller, Jim Scott, Paul Starr**

# EXPLOITATION RATE ANALYSIS

1.0 INTRODUCTION .....	1
1.1 OVERVIEW .....	1
1.2 CHANGES IN ANALYTICAL PROCEDURES FOR THE 1988 ANALYSIS .....	2
1.2.1 FISHERY INDICES .....	2
1.2.2 STOCK INDICES .....	3
1.2.3 STOCK CATCH DISTRIBUTION .....	3
1.3 CWT DATA USED .....	4
2.0 ESTIMATION OF EXPLOITATION RATES .....	5
2.1 THEORY AND PROCEDURES .....	5
2.2 ASSUMPTIONS AND INTERPRETATION OF THE ANALYSES .....	5
3.0 RESULTS .....	7
3.1 FISHERY INDICES .....	7
3.1.1 SOUTHEAST ALASKA .....	8
3.1.1.1 Ages 4 and 5 .....	8
3.1.1.2 SOUTHEAST ALASKA SPRING STOCK .....	9
3.1.2 NORTH/CENTRAL B.C. ....	9
3.1.3 WEST COAST VANCOUVER ISLAND TROLL .....	9
3.1.3.1 Age 3 .....	9
3.1.3.2 Age 4 .....	9
3.1.3.3 Ages 3 & 4 Combined .....	9
3.1.4 GEORGIA STRAIT .....	10
3.1.4.1 Sport and Troll Combined .....	10
3.1.4.2 Troll .....	10
3.1.4.3 Sport .....	10
3.1.5 WASHINGTON/OREGON OCEAN FISHERIES .....	11
3.1.5.1 Age 3 .....	11
3.1.5.2 Age 4 .....	11
3.1.5.3 Ages 3 & 4 Combined .....	11
3.2 COMPARISON OF TOTAL MORTALITY AND REPORTED CATCH INDICES .....	11
3.3 STOCK SPECIFIC RESULTS .....	12
3.3.1 STOCK INDICES .....	12
3.3.1.1 Southeast Alaska Spring .....	13
3.3.1.2 Robertson Creek .....	13
3.3.1.3 Quinsam .....	13
3.3.1.4 Big Qualicum .....	13
3.3.1.5 Capilano .....	13
3.3.1.6 Puget Sound Fingerling .....	13
3.3.1.7 Puget Sound Yearling .....	13
3.3.1.8 Cowlitz Fall Tule .....	14
3.3.1.9 Spring Creek Tule .....	14
3.3.1.10 Bonneville Tule .....	14
3.3.1.11 Stayton Pond Tule .....	14
3.3.1.12 Columbia River Upriver Bright .....	14
3.3.1.13 Lewis River Wild .....	14
3.3.1.14 Columbia River Summer .....	14
3.3.1.15 Willamette Spring .....	14
3.3.2 BROOD OCEAN EXPLOITATION RATES .....	15
3.3.2.1 Southeast Alaska Spring .....	16
3.3.2.2 Robertson Creek .....	17
3.3.2.3 Quinsam .....	17
3.3.2.4 Big Qualicum .....	17

3.3.2.5	Capilano	17
3.3.2.6	Puget Sound Fingerling	17
3.3.2.7	Puget Sound Yearling	17
3.3.2.8	Cowlitz Fall Tule	18
3.3.2.9	Spring Creek Tule	18
3.3.2.10	Bonneville Tule	18
3.3.2.11	Stayton Pond Tule	18
3.3.2.12	Columbia River Upriver Bright	18
3.3.2.13	Lewis River Wild	18
3.3.2.14	Columbia River Summer	19
3.3.2.15	Willamette Spring	19
3.3.3	SURVIVAL RATE INDICES	19
3.3.3.1	Southeast Alaska Spring	20
3.3.3.2	Robertson Creek	20
3.3.3.3	Quinsam	20
3.3.3.4	Big Qualicum	20
3.3.3.5	Capilano	20
3.3.3.6	Puget Sound Fingerling	20
3.3.3.7	Puget Sound Yearling	20
3.3.3.8	Cowlitz Fall Tule	20
3.3.3.9	Spring Creek Tule	20
3.3.3.10	Bonneville Tule	20
3.3.3.11	Stayton Pond Tule	20
3.3.3.12	Columbia River Upriver Bright	20
3.3.3.13	Lewis River Wild	21
3.3.3.14	Columbia River Summer	21
3.3.3.15	Willamette Spring	21
3.3.4	STOCK CATCH DISTRIBUTION	21
3.3.4.1	Southeast Alaska Spring	21
3.3.4.2	Robertson Creek	22
3.3.4.3	Quinsam	22
3.3.4.4	Big Qualicum	22
3.3.4.5	Capilano	22
3.3.4.6	Puget Sound Fingerling	22
3.3.4.7	Puget Sound Yearling	22
3.3.4.8	Cowlitz Fall Tule	23
3.3.4.9	Spring Creek Tule	23
3.3.4.10	Bonneville Tule	23
3.3.4.11	Stayton Pond Tule	23
3.3.4.12	Columbia River Upriver Bright	23
3.3.4.13	Lewis River Wild	23
3.3.4.14	Columbia River Summer	23
3.3.4.15	Willamette Spring	24
3.4	STOCK CONTRIBUTION INDICES	24
4.0	DISCUSSION AND SUMMARY	27
4.1	FISHERY INDICES	27
4.1.1	S.E. ALASKA TROLL FISHERY	27
4.1.2	NORTH/CENTRAL B.C. TROLL FISHERY	28
4.1.3	WEST COAST VANCOUVER ISLAND TROLL FISHERY	28
4.1.4	GEORGIA STRAIT SPORT AND TROLL FISHERIES	28
4.1.5	WASHINGTON/OREGON TROLL AND SPORT FISHERIES	29
4.2	STOCK INDICES	29
4.3	BROOD YEAR EXPLOITATION RATES	29
4.4	SURVIVAL RATE INDICES	30
4.5	STOCK CATCH DISTRIBUTION	30
4.6	STOCK CONTRIBUTION INDICES	30



# **EXPLOITATION RATE ANALYSIS**

## **Based on CWT Recovery Data Through 1988**

### **1.0 INTRODUCTION**

#### **1.1 OVERVIEW**

Exploitation rate trends in this report are based on coded-wire tag recoveries for 15 indicator stocks which are referred to as the "Exploitation Rate" indicator stocks. These stocks have a usable time series of recovery data. The indicator stocks employed in this analysis consist of:

4 fall chinook stocks from southern B.C.

Big Qualicum  
Capilano  
Quinsam  
Robertson Creek

6 fall chinook stocks from the Columbia River

Cowlitz Tule  
Spring Creek Tule  
Bonneville Tule  
Stayton Pond Tule  
Upriver Bright  
Lewis River

Columbia River summer

Willamette spring (lower Columbia River)

S.E. Alaskan spring

2 fall Puget Sound stock groups

fingerling (represented by South Puget Sound and Hood Canal stocks)  
yearling (represented by accelerated releases from the University of Washington)

As in previous years, the exploitation rate indicators are dominated by fall-type stocks.

The Exploitation Rate Analysis presented in this report consists of six major parts:

- (1) **Fishery Indices:** stock and age specific exploitation rates in a fishery are combined across the indicator stocks to develop indices of change in fishery impacts under PST chinook management regimes relative to a 1979-82 base period. Indices based upon reported catch and total mortalities are presented. The total mortality index provides a consistent means of representing changes in total mortalities associated with regulatory measures employed to implement PST regimes.
- (2) **Stock Indices:** stock specific indices are presented to estimate annual changes in impacts relative to the base period. A single index is computed for the combined impact of all fisheries operating under PST management regimes. Indices are also computed for impacts of Canadian and U.S. fisheries for which PST ceilings have not been established.

- (3) **Brood Year Exploitation Rate:** within specific stocks, estimates of the cumulative impacts of all ocean fisheries on all ages (i.e., across the cohort) are presented. When the chinook rebuilding program was first established, exploitation rates for depressed stocks were expected to be reduced by 15 percentage points by 1998. The 1982 and 1983 brood years (fall chinook) are the first brood years to have legal size chinook fished entirely under PST management regimes. Monitoring these rates will be important in evaluating rebuilding and chinook productivities.
- (4) **Survival Rate Indices:** stock survival data assist in the interpretation of exploitation rates and rebuilding progress. When coupled with estimates of stock abundance, survival rate data provides information on changes in relative contributions of various stocks.
- (5) **Stock Catch Distribution:** a new analysis prepared for this year is the distribution of reported catch and of total mortalities for each indicator stock. The distributions are presented both as percentages of the total reported catch and as percentages of the total fishing mortalities by catch year for each fishery with a ceiling. All other fisheries are similarly presented, summarized by country and gear type.
- (6) **Stock Contribution Indices:** estimates of contributions of five major stock groups (Columbia River Upriver Bright, Robertson Creek, Spring Creek, Oregon Lower Columbia Hatchery Tules, and Washington Lower Columbia Hatchery Tules) to the Southeast Alaska, North/Central B.C., and west coast Vancouver Island troll fisheries are used to illustrate relative changes in stock contributions. These contribution indices provide insight into the interpretation of changes in exploitation rates; for example, these data illustrate how substantial increases in abundance of some stocks do not automatically result in reduced exploitation rates because of decreased abundance of other stocks.

## 1.2 CHANGES IN ANALYTICAL PROCEDURES FOR THE 1988 ANALYSIS

### 1.2.1 FISHERY INDICES

Methods and analytical procedures employed in the analysis are identical to those described in Appendix II of the 1987 Annual Report of the Joint Chinook Technical Committee TCCHINOOK (88)-2, with two exceptions:

- (1) The method used to calculate shakers and chinook non-retention (CNR) mortalities was changed so as to provide equal weighting of recoveries between brood years. When the data are initially read into the analysis, the maximum value of coded-wire-tag (CWT) releases by brood year (by) in the time series is noted:

$$\text{MaxRel} = \text{MAX}(\text{CWT Release}_{\text{by}}) \text{ for all by}$$

then, all recoveries are adjusted as follows:

$$\text{Recovery}_{\text{by}} = \text{Recovery}_{\text{by}} * \frac{\text{MaxRel}}{\text{CWT Release}_{\text{by}}}$$

This has the effect of eliminating any effects of differential marking between brood years (which is important when brood years are being combined to estimate non-catch mortalities). However, this procedure does not adjust for survival differentials between brood years.

- (2) In previous years, selection of stocks and ages within a fishery which were used to estimate the fishery index was based upon examination of stock contribution profiles and the perceived importance of each age class. Inclusion of many stock/age classes increases the chance that the fishery index will be more representative of general impacts. However, the need to include many stocks is counterbalanced by the need to exclude stock/age classes for which recoveries are so low that little confidence can be placed in the data; including stock/age class data with too few recoveries may potentially increase the variance of the index while adding little usable information.

For the 1988 analysis, a more rigorous two step selection process was employed:

- (a) a stock-age class was included in a fishery index if the average estimated adult equivalent mortality (reported or total, depending on the analysis) was at least 35. This criterion approximately corresponds to a minimum of a 30% coefficient of variation about the estimated recoveries of multiple tag codes released from a single location (derived from de Libero, page 103, assuming a 20% sampling rate);
- (b) for individual years, a second criterion was included to select only those cohorts which would be expected to produce at least 17.5 (half the minimum average used in criterion a) recoveries under average exploitation rates. The average exploitation rates include exploitation rates for all available years.

## 1.2.2 STOCK INDICES

The stock index calculations were changed from the 1987 method in order to provide more detailed information about annual fishery impacts on a stock. The age specific exploitation rates (total fishing mortality divided by cohort size, expressed in adult equivalents) for fisheries of interest are combined for a stock. The categories of fishery combinations are as follows: all fisheries under PSC ceiling management; all Canadian fisheries not under ceiling management; and all U.S. fisheries not under PSC ceiling management. Impacts of these fishery categories on age 5 and older fish were included only for stocks which have an older age structure (i.e. impacts on age 5 fish from early-maturing stocks like tules were excluded). For other age classes, impacts of these fishery categories were included only if the exploitation rate averaged at least 3% during the base period. Indices of change for a stock relative to a 1979 - 1982 base period average are developed for the fishery combinations of interest. Indices are derived from total mortalities. The index is calculated using the ratio of the means method described in TCCHINOOK (88)-2 Appendix II.

## 1.2.3 STOCK CATCH DISTRIBUTION

This report presents a new type of analysis designed to provide information on the annual distribution of reported catch and total mortalities for each indicator stock. Distributions were calculated in the following manner for each indicator stock:

1. Variations in tag release numbers between brood years were treated as described in Section 1.2.1. Catches and total mortalities were expanded to reflect the production associated with each tag group and were also multiplied by the appropriate "adult equivalent" factor for that age (see Section 3.1 for a discussion of this factor).
2. The catches are then added across brood years within each calendar year. All percentages are calculated in terms of either the total reported catch or the total mortalities (no escapements are included).
3. There are many gaps in the availability of data for some indicator stocks and many catch years only have one or two ages represented for the stock. It was

decided to only report years that have at least 3 age classes present because of the bias introduced when using only the youngest or oldest age classes. The only exception to this rule was for the Columbia River Summer stock which has very few brood years of data; strict adherence to the 3 age class rule would have resulted in only one year being reported (instead, we report those years with 2 age classes present).

### 1.3 CWT DATA USED

CWT recovery data employed in the Exploitation Rate Analysis came from three major sources:

1. recoveries by Canadian fisheries were obtained from the Mark-Recovery Database maintained by the Canadian Department of Fisheries and Oceans at the Pacific Biological Station;
2. recoveries by Alaskan fisheries were obtained from the Alaska Department of Fish & Game database;
3. recoveries by Washington and Oregon fisheries were obtained from the database maintained by the Pacific Marine Fisheries Commission; and
4. the most recent CWT recovery data for escapements were obtained directly from fishery agencies.

In some instances data employed for the 1988 analysis differ from those used in previous analyses. These differences are summarized below:

#### **All areas:**

Escapement estimates were updated to reflect the most current data available.

#### **Recoveries in Alaskan Fisheries**

Alaskan hatchery fish harvested during experimental troll fisheries were considered to be terminal catch if they were caught in the same district in which the hatchery is located. Harvest of Alaskan fish during other periods or other locations was considered to be ocean (mixed-stock) catch.

#### **Recoveries in Canadian fisheries:**

Estimated recoveries for all CWT groups were adjusted for "no pin" and "lost pin" categories. Treatment of these categories in the 1987 analysis was inconsistent.

#### **Georgia Strait:**

Four Capilano tag codes were eliminated from the analysis due to the experimental nature of the release (chemical treatment to alter sex) and one tag code from the Big Qualicum 1972 brood year was added:

#### **Dropped (Capilano):**

02/17/35 (80 brood year)  
02/25/31 (82 brood year)  
02/26/02 (82 brood year)  
08/22/53 (83 brood year)

Added (Big Qualicum):  
BL/OR/LG (72 brood year)

#### Canadian Recoveries in US Fisheries:

On occasion, catches from US fisheries are landed and sampled in Canada. This can be a data management problem, and, in the past, recoveries in this class have not been included in the analysis. For the 1988 analysis, however, these recoveries have been included in the appropriate fisheries.

To evaluate the changes in exploitation rate estimates resulting from updated data sets and the modification of shaker/CNR mortality loss (Section 1.2.1, paragraph 1), fishery indices for 1979 through 1987 were compared using the same stocks and ages as in TCCHINOOK (88 - 2) (Table 3-1). Except for some of the 1987 estimates, the difference between the two estimates exceeded 10% in only one instance (1986 Georgia Strait Troll). Differences in the 1987 estimates are primarily due to the use of average maturity rates to estimate the size of the incomplete cohort. In some instances, when the actual maturity rates were computed using 1988 recovery data, the calculated values differed substantially from the average.

Table 3-1. Relative Comparison of Fishery Indices Using 1987 and 1988 Data Sets, Based on Methods and Stock-Age Combinations Employed in the 1987 Analysis. Stocks and Methods Are Those Employed in the 1987 Analysis. (1988 Index Expressed as a Percent of 1987 Index).

Fishery Year	ALASKA Troll Age 4/5	N/C Age 4/5	WEST COAST VANCOUVER ISLAND TROLL			GEORGIA STRAIT			WA/OR Trl/Spt Age 3/4
			Age 3	Age 4	Age 3/4	Trl/Spt Age 3/4	Troll Age 3/4	Sport Age 3/4	
1979	99%	100%	104%	110%	105%	101%	101%	101%	101%
1980	100%	91%	99%	101%	101%	100%	100%	100%	100%
1981	101%	106%	98%	96%	98%	101%	101%	100%	99%
1982	99%	105%	99%	98%	99%	97%	98%	97%	100%
1983	101%	103%	99%	98%	99%	98%	100%	96%	100%
1984	101%	104%	98%	98%	98%	101%	99%	101%	98%
1985	103%	102%	99%	98%	99%	105%	100%	106%	101%
1986	99%	102%	104%	101%	96%	97%	118%	94%	103%
1987	104%	107%	102%	112%	109%	78%	69%	80%	108%

## 2.0 ESTIMATION OF EXPLOITATION RATES

### 2.1 THEORY AND PROCEDURES

For fisheries operating under PSC ceiling management, the rebuilding program relies upon a substantial initial reduction in exploitation rate combined with progressive reductions in exploitation rates over time. The Exploitation Rate Analysis computes a time series of age and fishery specific exploitation rates through cohort analysis for stocks with suitable CWT data.

### 2.2 ASSUMPTIONS AND INTERPRETATION OF THE ANALYSES

These analyses rely upon several fundamental assumptions:

- 1) The temporal and spatial distributions of stocks in and between the fisheries are relatively stable from year to year.

- 2) The coded wire tagged fish behave in the same manner as the untagged stocks which they are intended to represent.
- 3) Fishery and escapement CWT recovery data are obtained in a consistent manner from year to year. This implies that biases and relative precision of CWT recovery data are of the same magnitude from year to year and do not significantly prejudice the estimates of relative change in exploitation rates.

Given these assumptions, changes in fishery indices reflect differences in fishery harvest rates.

- 4) There are a number of assumptions about parameter values involved in the cohort analysis. The exploitation rate analysis used a 30% shaker mortality rate in the troll and sport fisheries. This rate is in the 20%- 30% range previously stated by the Committee and is the most conservative value (within this range) for estimating mortality impacts. The Analytical Work Group evaluated impacts of a 20% shaker mortality rate in the troll and sport fisheries for comparison (Table 3-2). The Work Group concluded that rates within this shaker mortality range would not affect any general conclusions of an Exploitation Rate analysis based on the 30% shaker mortality rate. Details concerning other parameter values were presented in Supplement B of TCCHINOOK (88 - 2).

Table 3-2. Comparison of fishery indices with 20 percent and 30 percent shaker mortality rates.

Fishery Year	Alaska Troll			N/C Troll			WCVI Troll			GS Spt/Troll			WA/OR Spt/Troll		
	20%	30%	Change	20%	30%	Change	20%	30%	Change	20%	30%	Change	20%	30%	Change
1979	0.99	0.98	0.01	0.99	0.99	0.00	0.99	1.00	-0.00	0.89	0.89	-0.00	0.81	0.81	0.00
1980	1.01	1.01	0.00	1.07	1.08	-0.00	1.05	1.04	0.00	0.97	0.97	-0.01	1.04	1.03	0.00
1981	1.11	1.10	0.01	1.18	1.18	-0.00	0.85	0.85	0.00	1.45	1.46	-0.01	0.93	0.94	-0.00
1982	0.89	0.91	-0.02	0.74	0.74	0.00	1.11	1.11	-0.00	0.69	0.68	0.02	1.14	1.14	-0.00
1983	1.30	1.31	-0.01	1.00	0.99	0.00	1.23	1.23	-0.00	0.74	0.72	0.02	0.62	0.62	0.00
1984	0.97	0.99	-0.02	0.85	0.85	-0.00	1.48	1.47	0.01	1.02	1.02	-0.01	0.29	0.28	0.00
1985	1.06	1.10	-0.03	0.79	0.79	0.01	0.92	0.92	0.00	0.68	0.68	-0.00	0.61	0.62	-0.01
1986	0.74	0.74	-0.01	0.85	0.85	0.00	1.02	1.02	0.00	0.87	0.88	-0.01	0.57	0.57	0.01
1987	0.84	0.88	-0.04	0.74	0.71	0.03	0.75	0.77	-0.02	0.69	0.69	0.00	0.84	0.83	0.01
1988	0.67	0.69	-0.02	0.50	0.52	-0.01	1.22	1.14	0.08	0.72	0.72	0.00	1.01	1.01	0.01

## 2.3 REPORTED CATCH VS TOTAL MORTALITIES

Exploitation Rate Indices are presented for both reported catch and total mortality. Management strategies have changed considerably for fisheries constrained by PST catch ceilings. Regulatory changes include size limit changes and periods of CNR. These changes are not reflected in CWT recovery data, yet are crucially important for assessment of total fishery impacts. Procedures to theoretically estimate these incidental mortality losses and incorporate them into the exploitation rate analysis were described in Supplement B of TCCHINOOK (88 - 2).

The following assumptions are inherent in the procedures used to estimate incidental mortalities:

- 1) the geographic and temporal distribution of legal and sub-legal sized fish is similar for each stock;
- 2) all stocks have similar size distributions (a single size distribution at age is used for each fishery);

- 3) the procedure for estimating the mortality of legal-sized CWT during a non-retention period assumes that the stock distribution is the same as during the period of legal catch retention. Estimates of non-retention mortalities for Alaskan fisheries utilize reported incidence of legal and sublegal sized fish where available;
- 4) the procedure for estimating sub-legal mortalities during a non-retention period assumes that the relative abundance of legal and sub-legal sized fish is the same as during the legal retention period.

## 3.0 RESULTS

### 3.1 FISHERY INDICES

The Fishery Index is a measure of the overall effect of changes in fishery impacts on index stocks. The index is expressed in terms of total mortality and "adult equivalents" to provide a consistent basis for monitoring the total impact of a fishery over time and allows comparison between years with substantially changed regulatory regimes. Adult equivalents, which are weighting factors representing the potential of a given age fish to contribute to the spawning population in the absence of fishing, adjust for changes in fishery regulations which alter the average age of mortality (such as a size limit change).

The average fishery index during the base period is defined as 1 (one) and the index for any given year is scaled in relation to 1 through division by the base period average. Therefore, a fishery index less than one represents a decrease from the base period while a fishery index greater than one indicates an increase. The magnitude of the change will be the difference of the measured fishery index from one.

Summary results of the exploitation rate analysis based on total mortalities are presented in Table 3-3:

Table 3-3. Total Mortality Fishery Exploitation Rate Indices (adjusted by adult equivalents )

Fishery Year	S.E. ALASKA Troll	NORTH/CENTRAL TROLL			WCVI TROLL			GEORGIA STRAIT			WA/OR OCEAN TROLL & SPORT		
		N/C	Nth	Ctl	Age 3	Age 4	Age 3/4	Troll/ Sport	Troll	Sport	Age 3	Age 4	Age 3/4
1979	0.98	0.99	0.77	1.25	1.01	0.98	1.00	0.89	1.22	0.84	0.71	1.05	0.81
1980	1.01	1.08	0.94	1.00	1.13	0.98	1.04	0.97	1.03	0.87	1.10	0.80	1.03
1981	1.10	1.18	1.34	1.09	0.83	0.86	0.85	1.46	0.85	1.76	0.92	0.98	0.94
1982	0.91	0.74	0.80	0.66	1.07	1.14	1.11	0.68	0.90	0.53	1.18	1.06	1.14
1983	1.31	0.99	0.85	0.98	1.25	1.22	1.23	0.72	1.00	0.81	0.61	0.65	0.62
1984	0.99	0.85	1.11	0.61	1.40	1.52	1.47	1.02	0.66	1.45	0.29	0.27	0.28
1985	1.10	0.79	1.31	0.22	0.89	0.95	0.92	0.68	0.20	1.03	0.74	0.23	0.62
1986	0.74	0.85	1.04	0.60	1.03	1.02	1.02	0.88	0.44	1.21	0.71	0.33	0.57
1987	0.88	0.71	0.89	0.52	0.84	0.70	0.77	0.69	0.32	1.01	0.88	0.66	0.83
1988	0.69	0.52	0.78	0.16	1.13	1.15	1.14	0.72	0.09	1.36	0.92	1.21	1.01

Figures presented in Section 5.1 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 range of fishery indices observed among individual stocks. For reference, tabular results of the analysis for individual stocks and the fishery as a whole are presented below each figure. Large variability is often evident when the indices of several stocks are compared. This variation may be due to sampling, departures from assumptions,

and differential harvest rates. Actual estimates of exploitation rates by stock and age are presented in Section 9.0.

A comparison of estimated and target reductions in fishery indices resulting from the PSC regimes is summarized in Table 3-4. The "target reductions" indicated in the last column of Table 3-4 represent minimums expected in the first year of the rebuilding program. Further reductions in indices for PSC ceilinged fisheries are expected as the rebuilding program progresses due to decreases in fishing mortality and contributions from increases in spawning escapements. A brief discussion of individual fishery indices follows.

Table 3-4. Changes in Harvest Rates From the 1979-82 Base Period, As Estimated From Changes in Fishery Indices Resulting From Exploitation Rate Analysis. All Calculations Are Done in Terms of Adult Equivalents.

ESTIMATED CHANGE IN FISHERY HARVEST RATE FROM BASE								
Fishery	Age(s)	-- Total Mortality --				1985-88	AVERAGE	TARGET <sup>a/</sup> REDUCTION
		1985	1986	1987	1988	Total Mort	Reported Catch	
S.E. Alaska Troll	3/4/5/6	10%	-26%	-12%	-31%	-15%	-26%	-22%
North/Central Troll	3/4/5	-21%	-15%	-29%	-48%	-28%	-31%	-16%
WCVI Troll	3/4	-8%	2%	-23%	14%	-4%	-8%	-24%
WCVI Troll	3	-11%	3%	-16%	13%	-3%	-11%	-24%
WCVI Troll	4	-5%	2%	-30%	15%	-5%	-6%	-24%
Georgia Strait								
Troll & Sport	3/4/5	-32%	-12%	-31%	-28%	-26%	-27%	-47%
Troll <sup>b/</sup>	3	-80%	-56%	-68%	-91%	-74%	-77%	-79%
Sport <sup>b/</sup>	3/4	3%	21%	1%	36%	15%	15%	-20%
WA/OR Ocean Spt/Trl	3/4	-38%	-43%	-17%	1%	-24%	-24%	c/
WA/OR Ocean Spt/Trl	3	-26%	-29%	-12%	-8%	-19%	-18%	c/
WA/OR Ocean Spt/Trl	4	-77%	-67%	-34%	21%	-39%	-39%	c/
-----								
<sup>a/</sup> Initial target reductions from 1979-82 base period under PST regimes.								
<sup>b/</sup> Using Canadian domestic catch allocation decisions								
<sup>c/</sup> No target reductions were established for Washington and Oregon ocean fisheries.								
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### 3.1.1 SOUTHEAST ALASKA

#### 3.1.1.1 Ages 4 and 5

Total fishery mortality of index stocks has decreased from base period levels for the Alaska troll fishery for three of four years under PST regimes. The 1988 index indicates that total mortalities for the S.E. Alaska troll fishery have decreased by 31% from base period levels. Results of the 1988 and 1987 Committee analyses differ due to three principal factors: (a) the incorporation of three additional stock groups into the analysis; (b) the use of different selection filters which include or exclude stocks and age classes into the index; and (c) to a lesser extent, the use of observed maturation rates for computation of the 1987 fishery index (the 1987 index necessarily relied upon average maturity rates since the broods had not yet completed their life cycle).

The 1985-88 average fishery index is .85, approximately 7 percentage points higher than the 22% target reduction under the initial PST regimes.



### **3.1.1.2 SOUTHEAST ALASKA SPRING STOCK**

Exploitation rate analysis was conducted for the years 1982- 88 on the Southeast Alaska spring index stock, which has migratory characteristics different from the other index stocks. Due to lack of data from the base period (1979 - 1982), results are not directly comparable to those of the other indicator stocks. Compared to the 1982-84 base used for this stock, the index for this stock indicates a decrease in exploitation rates since implementation of the treaty. The 1988 index value for this stock is .89; the 1985-88 period average index for this stock of .72 indicates a 28% reduction from the 1982-84 average. The S.E. Alaska stock has been included into the fishery index because of the desire to broaden representation of spring stock types in the exploitation rate analysis even though tag data are available for only 1 age class of 1 brood year during the 1979-82 base period.

### **3.1.2 NORTH/CENTRAL B.C.**

Total mortality of index stocks in the North/Central British Columbia troll fisheries has decreased from base period levels since implementation of the PST. The 1988 exploitation rate is estimated to be 48% below base period levels. The 1985-88 average fishery index is .72, approximately 12 percentage points lower than the 16% reduction expected under the initial PST regimes.

Reductions in exploitation rates have been much more pronounced for the Central B.C. troll fishery than for the north B.C. troll fishery. This may be due to abundance decreases in the areas normally fished during the base period or to significant shifts in the fishing patterns of the trollers (e.g., there is now better fishing off the west coast of the Queen Charlotte Islands). Analysis of historical coded wire tag recoveries indicated that east coast Vancouver Island stocks were more abundant in the central troll fishery than in the northern troll. Accordingly, directed management actions were taken in 1988 to reduce the impact of the central troll fishery, particularly in the waters of Queen Charlotte Strait immediately north of Vancouver Island.

### **3.1.3 WEST COAST VANCOUVER ISLAND TROLL**

#### **3.1.3.1 Age 3**

Fishery indices for age 3 index stocks in the West Coast Vancouver Island troll fishery have varied about base period levels since implementation of the PST. The 1988 index is 1.13, indicating exploitation rate is estimated to be 13% above base period levels. The 1985-88 average fishery index is .97, approximately 21 percentage points higher than the 24% target reduction under the initial PST regimes.

#### **3.1.3.2 Age 4**

Fishery indices for age 4 index stocks in the West Coast Vancouver Island troll fishery have varied about base period levels since implementation of the PST. The 1988 index is estimated at 1.15, indicating an increase of 15% from the base period level. The 1985-88 average fishery index is .95, approximately 19 percentage points higher than the 24% target reduction under the initial PST regimes.

#### **3.1.3.3 Ages 3 & 4 Combined**

Combined fishery indices for age 3 and 4 fish in the West Coast Vancouver Island troll fishery increased over base period levels for two of the four years since implementation of the PST and only approached target reduction levels in 1987. The 1988 fishery index is estimated to be 1.14, indicating that exploitation rates increased above base period levels by 14%. The 1985-88 average fishery index is .96,

approximately 20 percentage points higher than the 24% target reduction under the initial PST regimes.

### **3.1.4 GEORGIA STRAIT**

#### **3.1.4.1 Sport and Troll Combined**

Fishery indices for age 3 and 4 year old fish in the combined Strait of Georgia sport and troll fisheries have declined from base period levels, but not nearly to the level expected under PST regimes. The index for these combined fisheries has not decreased since 1985. The 1988 index is estimated at .72; the 1985-88 average index of .74 indicates a reduction of approximately one-half the expected 47% decrease under initial PST regimes. To evaluate the Georgia Strait sport and troll fisheries separately, we have divided the PST catch ceilings according to Canadian domestic allocation policy.

Due to questions which have been raised as to the accuracy of the recoveries of Capilano tags in recent escapements, the analysis was repeated with the elimination of Capilano in 1988. The value of this re-computed index was the same (.72) as the index calculated with Capilano included. The reason for this is that the age 3 index shows a drop while the age 4 index shows an increase; these two age classes apparently have identical, but opposite effects. However, it should be noted that there were adequate recoveries of tags in 1988 at the Capilano hatchery and that the final computed exploitation rate for the 1984 brood year was comparable to exploitation rates computed in earlier years (see Section 3.3.2). Therefore, the Capilano stock will be retained in the 1988 analysis. However, given potential problems due to low flow conditions in 1989, the inclusion of this stock will be reviewed before next year's analysis.

#### **3.1.4.2 Troll**

The fishery index for the Strait of Georgia troll fishery has declined substantially from base period levels since implementation of the treaty. The 1988 index value is .09, indicating a reduction of 91% from base period levels. (Note, however, that the 1988 index consists only of age 3 fish of only one stock.) The 1985-88 average fishery index of .26 is, however, slightly higher (3 percentage points) than the target level under initial PST regimes.

As the Capilano stock did not have any recoveries in the troll fishery in 1988, concerns about the Capilano data do not affect the calculation of this fishery index.

#### **3.1.4.3 Sport**

Fishery indices of age 3 and 4 index stocks combined in the Georgia Strait sport fishery have exceeded base period levels since implementation of the PST. The 1988 index of 1.36 is the highest observed since implementation of the treaty. The 1985-88 average exploitation rate is 1.15, approximately 35 percentage points higher than the 20% target reduction under the initial PST regimes.

Age 3 Capilano recoveries in 1988 were excluded from the analysis using the rules described in 1.2.1. However, the age 4 recoveries, which showed a large increase in sport exploitation, were included. The computed index (1.36) is reduced to 1.03 if the age 4 Capilano recoveries are excluded; the index would also be reduced to 1.13 if the age 3 Capilano (which show a reduction) were included. The sport index for 1988 is sensitive to the use of the Capilano stock and a lower index (still greater than 1) would be computed if this stock were removed.

### **3.1.5 WASHINGTON/OREGON OCEAN FISHERIES**

#### **3.1.5.1 Age 3**

Fishery indices of age 3 index stocks in the combined Washington/Oregon ocean troll and sport fisheries have remained below base period levels since implementation of the PST. The fishery index ranged from .71 to .92, but the average reduction in exploitation rate was 19% from the base period level.

#### **3.1.5.2 Age 4**

Fishery indices of age 4 index stocks in the combined Washington/Oregon ocean troll and sport fisheries remained substantially below base period levels from 1985 through 1987. The 1988 index is 1.21, indicating exploitation rates of Age 4 fish above the base period level. The average 1985-88 level is .61, indicating a 39% reduction from the base period level.

#### **3.1.5.3 Ages 3 & 4 Combined**

Fishery indices of age 3 and 4 index stocks in the combined Washington/Oregon ocean troll and sport fisheries remained below the average base period through 1987. The 1988 index is 1.01, indicating that exploitation rates of combined age 3 and age 4 fish returned to base period levels. The 1985-1988 average index is .76, indicating a reduction of 24% from the base period.

## **3.2 COMPARISON OF TOTAL MORTALITY AND REPORTED CATCH INDICES**

The Fishery Index can be computed separately for either reported catch or total mortality. Graphs comparing indices based on reported catch and total fishing mortality are presented in Section 5.2. The total mortality index includes the mortality component contributed by non-retention fisheries and the discarding of fish due to a changed 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 all instances where there have not been significant changes in incidental mortality over the time period, the indices based on the two methods are extremely close (Table 3-5). The effects of size limit changes and non-retention regulations on total mortalities are readily apparent for the west coast Vancouver Island troll fishery and in the S.E. Alaska troll fishery. In the west coast Vancouver Island fishery, the increase in size limit in 1987 had a differential effect on age 3 and age 4 fish. The effect of the non-retention periods in S.E. Alaska on increasing the estimate of total mortalities is also evident.

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

	Alaska Troll Age 4-5		N/C Troll Age 4-5		WCVI Troll Age 3-5		GS Sport/Troll Age 3-4		WA/OR Spt/Troll Age 3-4	
	Rept Catch	Total Mort	Rept Catch	Total Mort	Rept Catch	Total Mort	Rept Catch	Total Mort	Rept Catch	Total Mort
1979	1.01	0.98	0.98	0.99	1.00	1.00	0.89	0.89	0.82	0.81
1980	1.03	1.01	1.07	1.08	1.05	1.04	0.97	0.97	1.04	1.03
1981	1.12	1.10	1.19	1.18	0.85	0.85	1.46	1.46	0.93	0.94
1982	0.84	0.91	0.74	0.74	1.11	1.11	0.68	0.68	1.13	1.14
1983	1.25	1.31	1.00	0.99	1.23	1.23	0.72	0.72	0.63	0.62
1984	0.91	0.99	0.86	0.85	1.49	1.47	1.02	1.02	0.29	0.28
1985	0.95	1.10	0.79	0.79	0.91	0.92	0.67	0.68	0.59	0.62
1986	0.70	0.74	0.85	0.85	1.04	1.02	0.85	0.88	0.58	0.57
1987	0.70	0.88	0.66	0.71	0.67	0.77	0.68	0.69	0.83	0.83
1988	0.61	0.69	0.47	0.52	1.06	1.14	0.72	0.72	1.02	1.01

### 3.3 STOCK SPECIFIC RESULTS

#### 3.3.1 STOCK INDICES

Stock indices are used to present information on the annual impact of fisheries for a specific stock relative to a selected base period. Three indices are provided. One index combines the impacts of all fisheries operating under PSC ceilings. A second index represents impacts of non-ceilinged Canadian fisheries. The third index represents impacts of all U.S. fisheries not operating under PSC catch ceilings. An index of one represents no change from the base period and an index greater than one represents an increased impact from the base period.

Stock indices are graphically presented in Section 6.0 and are summarized in Table 3-6. Detailed data for stock indices are presented in tabular form in Section 10. Comments on indices for individual stocks follow.

Table 3-6. Summary of stock exploitation rate indices for fisheries with ceilings, British Columbia fisheries without ceilings, and US fisheries without ceilings.

Stock	Ceiling Fisheries		---- Other BC ----		---- Other US ----	
	Avg 85-88	1988	Avg 85-88	1988	Avg 85-88	1988
Alaska Spring Age 4 <sup>a/</sup>	1.28	1.51	d/		d/	
Alaska Spring Age 5 <sup>b/</sup>	0.80	0.79	d/		d/	
Robertson Creek	1.11	1.12	0.52	0.62	d/	
Quinsam River	0.73	0.43	0.66	0.47	d/	
Big Qualicum River	0.84	0.77	0.68	0.45	d/	
Capilano River	0.85	0.67	0.69	0.02	d/	
Puget Sd. Fingerling	0.79	0.88	d/		0.97	1.02
Puget Sd. Yearling	0.96	0.97	d/		1.49	2.50
Cowlitz Fall	0.85	0.65	d/		0.99	1.28
Spring Creek Tule	0.80	1.20	d/		0.95	0.92
Bonneville Tule	1.39	1.27	d/		0.87	1.25
Stayton Pond	1.26	1.62	d/		0.99	1.69
Col. Upriver Bright	0.93	0.91	d/		3.34	3.80
Lewis River Fall	0.90	1.05	d/		1.36	1.78
Columbia R. Summer <sup>c/</sup>	0.38	0.39	d/		2.78	3.61
Willamette Spring	0.98	1.09	d/		1.19	1.56
Average	0.93	0.96	0.64	0.39	1.49	1.94

a/ Base period is 1982-84.

b/ Base period is 1983-84.

c/ Average is for 1986-87.

d/ Excluded because average base period exploitation rate was less than 3%

#### **3.3.1.1 Southeast Alaska Spring**

Tag data from the 1979-82 period used for all other stocks are not available for the S.E. Alaska stock. Because Age 4 and Age 5 required the use of different base periods for calculation of the index, it was not possible to combine results into a single index. For Age 4, the stock index for ceilinged fisheries was at or above the base period for 1985 through 1988. For Age 5, the index for ceilinged fisheries was at or below base period levels for 1985 through 1988.

#### **3.3.1.2 Robertson Creek**

The index for age 3-5 total mortality in fisheries with ceilings has been consistently greater than 1 since 1985. The average for 1985 through 1988 was 1.11 and the 1988 value was near the average at 1.12. The index for fisheries in British Columbia with no ceilings has been significantly less than 1 since 1985. The average for 1985 through 1988 was .52. Much of this reduction is due to restrictions in the terminal net fishery implemented when survival of the Robertson Creek Hatchery stock was poor.

#### **3.3.1.3 Quinsam**

The total mortality index for age 3-5 exhibits similar trends for both fisheries with ceilings and British Columbia fisheries without ceilings. Both indices have been less than 1 since 1984 and continue to decline. The 1985 through 1988 average for fisheries with ceilings was .73, with a 1988 index value of .43.

#### **3.3.1.4 Big Qualicum**

The index for total age 3-4 mortality in fisheries with ceilings has been less than 1 in three out of the last four years. The average index for 1985 through 1988 was .84; 1988 was near the average with an index of .77. The total mortality index for British Columbia fisheries without ceilings has been less than 1 since 1984. The average index for 1985 through 1988 for British Columbia fisheries without ceilings was .66, with a 1988 index value of .47.

#### **3.3.1.5 Capilano**

The indices for the Capilano stock (age 3-4) show similar trends to the Big Qualicum stock. The index has been less than 1 for three out of the last four years in fisheries with ceilings. The average for the period 1985 through 1988 was .85, and the index for 1988 was .67. The index for total mortality in British Columbia fisheries without ceilings has been greater than 1 in two out of the last four years. The index for 1988 was near 0, however.

#### **3.3.1.6 Puget Sound Fingerling**

The index for age 3-4 total mortality in fisheries with ceilings has been less than 1 since 1985, averaging .79 for the years 1985 through 1988 and equaling .88 for 1988. The index for U.S. fisheries without ceilings has been variable, with 1 year (1985) significantly greater than 1, 2 years less than 1 (1985 and 1986), and one year near 1 (1988).

#### **3.3.1.7 Puget Sound Yearling**

The total mortality index for age 3-4 fish in fisheries with ceilings has been variable since 1985 with an average value near 1. The index was greater than 1 in two years (1985, 1986) and less than 1 the last two years. The total mortality index for U.S. fisheries without ceilings has been greater than the base period level for the last two

years. This increase results from net fisheries in South Puget Sound directed at harvesting surplus hatchery production.

#### **3.3.1.8 Cowlitz Fall Tule**

The index for ceilinged fisheries has displayed a decreasing trend since 1985 and has been below base period impact levels, averaging .85 for the years 1985-1988. The combined effects of U.S. fisheries, not under ceiling management, has steadily increased since 1985 and has been above base period levels for the last three years.

#### **3.3.1.9 Spring Creek Tule**

The index for ceilinged fisheries has been near base period levels, with the exception of 1987 (the 1985-88 average is .80). The index for U.S. fisheries without ceilings has increased since 1985 and remained near base period levels.

#### **3.3.1.10 Bonneville Tule**

The index for ceilinged fisheries has been variable since 1985, averaging 1.39 for the years 1985-1988, but remained consistently above base period levels. There is no consistent trend in the index for U.S. fisheries without ceilings.

#### **3.3.1.11 Stayton Pond Tule**

The index for ceilinged fisheries has been highly variable since 1985, averaging 1.26 for the years 1985-1988, but has been way above base period levels for 1986 and 1987. The index for U.S. fisheries without ceilings has steadily increased since 1985 and was way above base period levels in 1988.

#### **3.3.1.12 Columbia River Upriver Bright**

The index for ceilinged fisheries has remained at base period levels since 1985, averaging .93 for the years 1985-1988. The index for U.S. fisheries without ceilings has increased and remained way above base period levels since 1985.

#### **3.3.1.13 Lewis River Wild**

The index for ceilinged fisheries has been variable, averaging .90 for the years 1985-1988, but increased and returned to base period levels in 1988. The index for U.S. fisheries without ceilings has increased and remained above base period levels.

#### **3.3.1.14 Columbia River Summer**

Tagging for this stock has been intermittent. The index for ceilinged fisheries was below base period levels for 1986-1988, averaging .38 for the years 1986-1988. The index for U.S. fisheries without ceilings was way above base period levels in 1987 and 1988. However, the exploitation rate calculated for in-river fisheries from the CWT analysis is inconsistent with those calculated from actual catch and river return. The rates calculated from in-river data was 4% for 1987 and 1988 which are similar to base period levels. It appears that in-river CWT recovery data are not representative for 1987 and 1988.

#### **3.3.1.15 Willamette Spring**

The index for ceilinged fisheries has been variable since 1985, averaging .98 for the years 1985-1988. The index for U.S. fisheries without ceilings has also been variable, but has remained above base period levels for 1987 and 1988.

### 3.3.2 BROOD OCEAN EXPLOITATION RATES

The cumulative impacts of all ocean fisheries on all ages (i.e., across the cohort) can be measured in terms of a brood exploitation rate. This analysis sums all mortalities over all ages (adjusted for adult equivalents) and divides by the same mortalities (again adjusted for adult equivalents) plus escapement summed over all ages. These brood year exploitation rates are the best indication of the cumulative effect of all fishing on a stock. When the chinook rebuilding program was established, exploitation rates of depressed stocks were expected to be reduced by 15 percentage points by 1998. Since fisheries have operated under PSC regimes for four years, data are now available to initiate a brood year exploitation rate analysis. To assess the overall effects of PST management, both the brood exploitation rate and fishery indices are needed. The former provides cumulative information over all fisheries for a stock while the later provides information for a specific fishery over several stocks.

Brood exploitation rates for the indicator stocks are graphically presented in Section 7.0 and are summarized in Table 3-7. Note that the values depicted in the brood year exploitation rate figures are not indices, but rather represent actual values. Three types of information are presented: (1) the brood year exploitation rate based only on reported catch; (2) the brood year exploitation rate based on estimates of total fishing mortality; and (3) the percentage of total fishing mortality comprised of incidental fishing mortality loss. Recent year averages are compared to base period levels for convenience. Changes in Reported Catch and Total Fishing Mortality Brood Year Exploitation Rates from base period levels are expressed in terms of percentage point reductions since the chinook rebuilding program was designed to reduce exploitation rates by 15 percentage points by 1998.

Table 3-7. Base period, 1982, 1983, and 1984 (where appropriate) Brood Year Ocean Exploitation Rates for the 15 indicator stocks. Exploitation rates are reported in terms of reported catch and total mortalities. The base period is defined as the 1976 to 1979 brood years for fall stocks and 1975 to 1978 for spring or yearling stocks (for Quinsam the base period is 1976 to 1980 due to the presence of an extra age class).

<----- 1982-84 <sup>a/</sup> ----->						
Stock	Base Period	1982	1983	1984	Average	Change From Base Period
=====						
Alaska Spring						
Reported	47%	46%	36% <sup>b/</sup>	NA	41%	-6 Percentage Points
Total	54%	60%	55%	NA	58%	+4 Percentage Points
Incidental/Total	13%	23%	35%	NA	29%	+123%
Robertson Creek						
Reported	60%	65%	65%	41% <sup>b/</sup>	57%	-3 Percentage Points
Total	66%	74%	91%	61%	75%	+9 Percentage Points
Incidental/Total	9%	12%	29%	33%	24%	+167%
Quinsam						
Reported	69%	54%	57% <sup>b/</sup>	NA	56%	-13 Percentage Points
Total	77%	63%	72%	NA	68%	-9 Percentage Points
Incidental/Total	10%	14%	21%	NA	18%	+80%
Big Qualicum						
Reported	75%	65%	74%	56% <sup>b/</sup>	65%	-10 Percentage Points
Total	80%	72%	79%	68%	73%	-7 Percentage Points
Incidental/Total	6%	7%	6%	18%	11%	+83%
Capilano						
Reported	87%	83%	89%	NA	86%	-1 Percentage Point
Total	89%	87%	93%	NA	90%	+1 Percentage Point
Incidental/Total	2%	5%	4%	NA	5%	+125%
Puget Sound Fingerling						
Reported	70%	63%	52%	62% <sup>b/</sup>	59%	-11 Percentage Points
Total	75%	70%	61%	69%	67%	-8 Percentage Points
Incidental/Total	7%	10%	15%	10%	12%	+71%

Table 3-7. Continued.

Stock	<---- 1982-84 <sup>a/</sup> ---->					Change From Base Period	
	Base Period	----Brood Year----- 1982 1983 1984	Average				
=====							
Puget Sound Yearling							
Reported	68%	67%	59%	65% <sup>b/</sup>	64%	-4	Percentage Points
Total	76%	74%	67%	73%	71%	-5	Percentage Points
Incidental/Total	11%	9%	12%	11%	10%	-9%	
Cowlitz Fall							
Reported	59%	42%	38%	41% <sup>b/</sup>	40%	-19	Percentage Points
Total	63%	45%	42%	46%	44%	-19	Percentage Points
Incidental/Total	6%	7%	10%	11%	9%	+50%	
Spring Creek							
Reported	63%	38%	40%	51% <sup>b/</sup>	43%	-20	Percentage Points
Total	67%	44%	45%	55%	48%	-19	Percentage Points
Incidental/Total	6%	14%	11%	7%	10%	+67%	
Bonneville							
Reported	65%	53%	59%	51% <sup>b/</sup>	54%	-9	Percentage Points
Total	69%	59%	63%	61%	61%	-8	Percentage Points
Incidental/Total	6%	10%	6%	16%	11%	+83%	
Stayton Pond							
Reported	61%	48%	47%	68% <sup>b/</sup>	54%	-7	Percentage Points
Total	66%	54%	52%	74%	60%	-6	Percentage Points
Incidental/Total	8%	11%	10%	8%	10%	+25%	
Upriver Bright							
Reported	36%	31%	36%	30% <sup>b/</sup>	32%	-4	Percentage Points
Total	42%	37%	42%	39%	39%	-3	Percentage Points
Incidental/Total	14%	16%	14%	23%	18%	+29%	
Lewis River							
Reported	31%	23%	30%	NA	27%	-4	Percentage Points
Total	35%	26%	33%	NA	30%	-5	Percentage Points
Incidental/Total	11%	12%	9%	NA	11%	+5%	
Columbia Summer							
Reported	58%	NA	51%	30% <sup>b/</sup>	41%	-17	Percentage Points
Total	62%	NA	56%	36%	46%	-16	Percentage Points
Incidental/Total	6%	NA	9%	17%	11%	+83%	
Willamette Spring							
Reported	30%	16%	31% <sup>b/</sup>	NA	24%	-6	Percentage Points
Total	33%	25%	38%	NA	32%	-1	No Change
Incidental/Total	9%	36%	18%	NA	27%	+200%	
-----							
<sup>a/</sup>	Available broods since 1982.						
<sup>b/</sup>	Incomplete Brood						

### 3.3.2.1 Southeast Alaska Spring

The brood year exploitation rate decreased steadily for the 1978-1981 broods, but increased for the 1982 and 1983 broods. The brood year exploitation rate based upon reported catch only, declined by 6 percentage points from the base period level. The total brood year exploitation rate on this stock, including incidental fishing mortality loss, is estimated to be 4 percentage points above the base period level. Incidental mortalities are estimated to comprise an average of 29% of the total mortality for this stock for the 1982-83 broods and have increased by 123% over base period levels.



#### **3.3.2.2 Robertson Creek**

The 1982-84 average brood year exploitation rate due to reported catch decreased by 3 percentage points from the base period level; however, substantial incidental mortalities for this stock bring total mortalities to 9 percentage points above the base period level. Incidental fishing mortalities accounted for an average of 24% of the total fishing mortality for the 1982-84 broods. The proportion of total fishing mortalities accounted for by incidental mortality loss increased by 167% over the base period level.

#### **3.3.2.3 Quinsam**

The brood year exploitation rate for the Quinsam stock has decreased from levels observed prior to initiation of treaty fishing regimes for both reported catch and total fishing mortality. The incidental fishing mortality loss accounted for an average of 18% of the total fishing mortality for the 1982-83 broods. The proportion of total fishing mortality accounted for by incidental mortality loss increased by 80% over the base period level.

#### **3.3.2.4 Big Qualicum**

The brood year exploitation rate for the Big Qualicum stock has decreased from levels observed prior to initiation of treaty fishing regimes for both reported catch and total fishing mortality. The incidental fishing mortality loss accounted for an average of 11% of the total fishing mortality for the 1982-84 broods. The proportion of total fishing mortality accounted for by incidental mortality loss increased by 83% over the base period level.

#### **3.3.2.5 Capilano**

Exploitation rates for the Capilano stock continue to be extremely high, probably due to inadequate recovery of terminal run tags. Treaty fishing regimes have not resulted in a reduction of exploitation rates for this stock; a slight increasing trend is apparent along with substantial increases in the proportion of total fishing mortality accounted for by incidental mortality loss. Recent increases in exploitation rates could, however, be confounded by increasing problems with CWT recoveries in terminal fishing areas.

#### **3.3.2.6 Puget Sound Fingerling**

The brood year exploitation rate for the Puget Sound fingerling complex has decreased from levels observed prior to initiation of treaty fishing regimes for both reported catch and total fishing mortality. The incidental fishing mortality loss accounted for an average of 12% of the total fishing mortality for the 1982-84 broods. The proportion of total fishing mortality accounted for by incidental mortality loss increased by 71% over the base period level.

#### **3.3.2.7 Puget Sound Yearling**

The brood year exploitation rate for the Puget Sound yearling complex has decreased by approximately 5% from levels observed prior to initiation of treaty fishing regimes for both reported catch and total fishing mortality. The incidental fishing mortality loss accounted for an average of 10% of the total fishing mortality for the 1982-84 broods. The proportion of total fishing mortality accounted for by incidental mortality loss is slightly lower than the base period level.

#### **3.3.2.8 Cowlitz Fall Tule**

The brood year exploitation rate for the Cowlitz Tule stock has decreased by approximately 19% from levels observed prior to initiation of treaty fishing regimes for both reported catch and total fishing mortality. The incidental fishing mortality loss accounted for an average of 9% of the total fishing mortality for the 1982-84 broods. The proportion of total fishing mortality accounted for by incidental mortality loss increased by 50% over the base period level.

#### **3.3.2.9 Spring Creek Tule**

The brood year exploitation rate for the Spring Creek Tule stock has decreased by approximately 19% from levels observed prior to initiation of treaty fishing regimes for both reported catch and total fishing mortality. The incidental fishing mortality loss accounted for an average of 10% of the total fishing mortality for the 1982-84 broods. The proportion of total fishing mortality accounted for by incidental mortality loss increased by 67% over the base period level.

#### **3.3.2.10 Bonneville Tule**

The brood year exploitation rate for the Bonneville Tule stock has decreased by approximately 9% from levels observed prior to initiation of treaty fishing regimes for both reported catch and total fishing mortality. The incidental fishing mortality loss accounted for an average of 11% of the total fishing mortality for the 1982-84 broods. The proportion of total fishing mortality accounted for by incidental mortality loss increased by 83% over the base period level.

#### **3.3.2.11 Stayton Pond Tule**

The brood year exploitation rate for the Stayton Pond Tule stock has decreased by approximately 7% from levels observed prior to initiation of treaty fishing regimes for both reported catch and total fishing mortality. The incidental fishing mortality loss accounted for an average of 10% of the total fishing mortality for the 1982-84 broods. The proportion of total fishing mortality accounted for by incidental mortality loss increased by 25% over the base period level.

#### **3.3.2.12 Columbia River Upriver Bright**

The brood year exploitation rate for the Columbia River Upriver Bright stock has decreased slightly (approximately 4%) from levels observed prior to initiation of treaty fishing regimes for both reported catch and total fishing mortality. The incidental fishing mortality loss accounted for an average of 18% of the total fishing mortality for the 1982-84 broods. The proportion of total fishing mortality accounted for by incidental mortality loss increased by 29% over the base period level. The exploitation rate for this stock was highly variable prior to the 1980 brood. Exploitation rates for the 1981 through 1984 broods have remained relatively stable at approximately 40%.

#### **3.3.2.13 Lewis River Wild**

The brood year exploitation rate for the Lewis River stock shows a slight declining trend (average 4% decrease for the 1982-83 broods). The incidental fishing mortality loss accounted for an average of 11% of the total fishing mortality for the 1982-83 broods. The proportion of total fishing mortality accounted for by incidental mortality loss increased slightly (5%) over the base period level.

### 3.3.2.14 Columbia River Summer

Exploitation rates for the 1983 and 1984 broods appear to be substantially below (17%) levels observed for the 1976 and 1977 broods. Intermittent tagging of this stock precludes a trend assessment for this stock. The incidental fishing mortality loss accounted for an average of 11% of the total fishing mortality for the 1982-84 broods. The proportion of total fishing mortality accounted for by incidental mortality loss increased by 83% over the base period level.

### 3.3.2.15 Willamette Spring

The exploitation rate for this stock exhibits substantial variability. A slight increase in exploitation rates is apparent for the 1981 through 1983 broods compared to the 1978 through 1980 broods. Incidental mortality for this stock for the 1981 through 1984 broods is considerably above previous levels. The proportion of total fishing mortality accounted for by incidental mortality loss increased by 200% over the base period level.

## 3.3.3 SURVIVAL RATE INDICES

These indices provide a relative measure of year to year variation in stock survival. A time series of indices is calculated by summing the total fishing mortalities and escapement for an indicator stock at age 3 (for each year), divided by the total hatchery release for that brood year. An index based on 2-year olds is also computed to provide earlier indications of stock survival rates. The index based on 3-year olds is a more reliable indicator of survival.

In order to summarize the analysis, two types of survival trends were developed. First, long-term trends (defined by the slope of a trend line fitted through available observations); and short-term (defined by the relationship between survival of the last two broods compared to the previous five brood-year average). Results of this assessment are presented in Table 3-8 and Section 7.0.

For the long-term, 10 indicator stocks show decreasing trends in survival, only one stock shows an increasing trend, and the remaining four stocks show no definite trend at all. For the short term, 13 stocks show a decreasing trend in survival, and 1 stock shows an increasing trend (the trend cannot be determined for one stock).

Table 3-8. Long-Term Trend and Short-Term Outlook For Survival of Age 3 Hatchery Indicator Stocks (+ = Increasing; - = Decreasing; ? = Indeterminate).

Stock	LONG-TERM TREND	SHORT-TERM OUTLOOK
Alaska Spring	?	-
Robertson Creek	-	-
Quinsam	-	-
Big Qualicum	-	-
Capilano	-	+
Puget Snd Fingerling	-	-
Puget Snd Yearling	-	-
Cowlitz Fall	+	-
Spring Creek	-	-
Bonneville	? a/	? a/
Stayton Pond	-	-
Upriver Bright	?	-
Lewis River	? b/	- b/
Columbia Summer	- b/	- b/
Willamette Spring	-	-

a/ No tags available since the 1984 brood year. Tagging for the Bonneville stock has been discontinued. The stock is to be represented by Stayton Pond in future years.

b/ Data are not comparable to time series available for other stocks due to intermittent tagging

#### **3.3.3.1 Southeast Alaska Spring**

The survival rate for the S.E. Alaska stock exhibited a rapid increase to a peak for the 1982 brood. Since the 1982 brood, survival has decreased precipitously.

#### **3.3.3.2 Robertson Creek**

The survival rate for this stock has decreased consistently since the 1974 brood. A slight improvement in survival is indicated for the 1984 brood.

#### **3.3.3.3 Quinsam**

Three year old survival has remained relatively stable, but a sharp decrease in the survival rate of the 1985 and 1986 broods is indicated.

#### **3.3.3.4 Big Qualicum**

The survival rate for this stock has been declining substantially since the mid 1970's. Very low survival is indicated for this stock since the 1977 brood.

#### **3.3.3.5 Capilano**

Survival of the Capilano stock has declined substantially since the mid 1970's. Survival has continued to be at a very low level since the 1982 brood. A slight increase in survival for the 1986 brood is indicated.

#### **3.3.3.6 Puget Sound Fingerling**

Survival of this stock is highly variable. A decreasing trend has been apparent since 1978.

#### **3.3.3.7 Puget Sound Yearling**

A long-term decreasing trend has been apparent since the 1976 brood. Survival has increased slightly beginning with the 1980 brood.

#### **3.3.3.8 Cowlitz Fall Tule**

Survival is highly variable. Exceptionally high survival is indicated for the 1983 and 1984 broods. However, survival of the 1985 and 1986 broods appears to be at or below levels prior to the 1983 and 1984 broods.

#### **3.3.3.9 Spring Creek Tule**

Survival is highly variable. A long-term decreasing trend has been apparent beginning with the 1972 brood.

#### **3.3.3.10 Bonneville Tule**

Survival of this stock has been relatively constant, except for very high survival of the 1984 brood.

#### **3.3.3.11 Stayton Pond Tule**

Survival of the Stayton Pond stock has exhibited a slight decreasing trend since the 1978 brood. Exceptionally high survival of the 1984 brood is indicated.

#### **3.3.3.12 Columbia River Upriver Bright**

Survival of the bright stock is variable and appears to be more cyclic than other stocks. Survival decreased for the 1975 through 1980 broods, increased for the 1981 through 1984 broods, and decreased substantially for the 1985 and 1986 broods.

#### **3.3.3.13 Lewis River Wild**

Survival of this stock is highly variable with no apparent trend.

#### **3.3.3.14 Columbia River Summer**

Data are insufficient to determine trends in survival. Exceptionally high survival of the 1984 brood is indicated.

#### **3.3.3.15 Willamette Spring**

Survival for the 1979 through 1984 broods is below levels observed for the 1976 through 1978 broods. Except for very poor survival of the 1982 brood, survival has remained relatively stable for this stock since the 1979 brood.

### **3.3.4 STOCK CATCH DISTRIBUTION**

The distributions of reported catch and of total mortalities for each indicator stock (all ages combined) are reported in Section 11.0. Impacts are reported by 9 fishery categories: 1 for each set of PSC ceilinged fisheries, and one for each gear type for Canadian and U.S. fisheries which do not operate under PSC ceilings.

Distribution data reflect the migratory and harvest patterns of each stock. Changes can either be due to changes in the stock distribution pattern, the fishery harvest rates, or procedures employed to collect and report recovery data. Since distributions are reported in percentages, large changes in the tables may not correspond to large changes in terms of numbers of fish.

These distribution tables should be interpreted with caution. For example, an abnormally high percentage may occasionally appear in a fishery (e.g. Big Qualicum in Alaska for 1987). There are many possible explanations for this type of shift, including:

- a) an unusual shift in stock distribution;
- b) several weak cohorts and an unusually high recovery rate in that fishery;
- c) a large cohort could bias the recovery data for a particular age class.

These alternatives illustrate the difficulty and extensive analysis that could be required to explain each anomaly. Causes for specific results of the distributional analysis can be investigated upon request.

Shifts in distribution may occasionally occur when comparing reported and total mortalities. Such shifts are due to the methods employed to estimate incidental fishing mortality and generally reflect the presence of a large cohort. A large cohort will be assigned a high incidental mortality loss relative to other cohorts impacted by the fishery.

#### **3.3.4.1 Southeast Alaska Spring**

This stock is almost exclusively harvested in S.E. Alaska. The only other harvest comes from the northern B.C. fisheries under ceiling management. Catch data recorded in 1988 under "Other US Sport" come from fresh-water sport catch recoveries.

#### **3.3.4.2 Robertson Creek**

More than 2/3 of the catch and total mortalities for this stock occur in S.E. Alaska and in North B.C. The increase in chinook non-retention periods in S.E. Alaska can be seen when comparing the reported catch percentages with the total mortality percentages in more recent years for this fishery. Changes in "Other Canada Net and Sport", especially from 1985 to 1987, reflect reductions in the terminal net and sport fisheries for conservation during periods of low terminal returns.

#### **3.3.4.3 Quinsam**

Over 80% of this stock is taken in either North B.C. and in S.E. Alaska. Catches in Georgia Strait are from sport fisheries near the river mouth. Johnstone Strait is the net fishery responsible for most of the catch in "Other Canada Net". This stock, as with the Big Qualicum and the Capilano, shows large incidental mortalities in North/Central B.C. in 1988. This is due to catches of age 2 fish in the northern net fisheries. This results in the assignment of substantial numbers of incidental mortalities to the 1986 brood year.

#### **3.3.4.4 Big Qualicum**

The majority of the catch (nearly 60%) or of the total mortalities (about 50%) are from the Georgia Strait sport and troll fisheries. North/Central B.C. accounts for another 1/4 of the catch. Johnstone Strait accounts for 10% and a small, but consistent, harvest comes from S.E. Alaska. This stock, as with Quinsam and Capilano, shows large numbers of incidental mortalities in North/Central B.C. in 1988. This is due to catches of age 2 fish in the northern net fisheries. This results in the assignment of substantial numbers of incidental mortalities to the 1986 brood year.

#### **3.3.4.5 Capilano**

The catch distribution for this stock is similar to that of the Big Qualicum stock. This is not surprising since the Capilano stock is derived from Big Qualicum brood stock. However, the percentage catch derived from Georgia Strait is slightly higher than that for the Big Qualicum. This may be due to location of the hatchery (near Vancouver, B.C.) which may increase the residence proportions in Georgia Strait or may increase the vulnerability of this stock to exploitation in this fishery. This stock, as with Quinsam and Big Qualicum, shows large numbers of incidental mortalities in North/Central B.C. in 1988. This is due to catches of age 2 fish in the northern net fisheries and to relatively strong brood strength for the 1986 brood year. This results in the assignment of substantial numbers of incidental mortalities to the 1986 brood year.

#### **3.3.4.6 Puget Sound Fingerling**

The majority (about 60%) of this stock is taken in the Puget Sound net and sport fisheries. At times, up to 1/3 of the catch from this stock can come from the west coast Vancouver Island troll fishery; the long-term average is about 25%. Georgia Strait (primarily the sport fishery) accounts for about 10% of the catch or total mortalities.

#### **3.3.4.7 Puget Sound Yearling**

Nearly 70% of the catch (or total mortalities) for this stock is taken from the Puget Sound sport and net fisheries. The west coast of Vancouver Island troll fishery (less than 20%) and Georgia Strait (about 5%) account for a smaller portion of the impact than for the Puget Sound fingerling stock.

#### **3.3.4.8 Cowlitz Fall Tule**

The Columbia River sport and net fisheries are the major harvesters of this stock (about 40% of the catch). Another 15% to 20% is taken in the troll fishery off the Washington and Oregon coasts. On average 25% of the catch is taken off the west coast of Vancouver Island and the remaining 15% are taken in the north, either in B.C. or in S.E. Alaska.

#### **3.3.4.9 Spring Creek Tule**

As for the Cowlitz stock, the major harvest components for Spring Creek are the Columbia River net and sport fisheries (about 50%), the Washington/Oregon troll fishery (about 15%) and the west coast of Vancouver Island troll fishery (about 30%). The distributions for 1987 are quite anomalous when compared with other years. This is because of a general failure of the 1984 brood year (3-year olds in 1987). This brood year would normally have been the major age class in the catch; without it, the distribution is more like that of the 2-year olds alone.

#### **3.3.4.10 Bonneville Tule**

The distribution for this stock shows a greater proportion on the west coast of Vancouver Island than for the two previous Tule stocks (about 40% compared to 30% for Spring Creek and 20% for Cowlitz). Columbia River catches are also lower (less than 40%) while the Washington/Oregon troll is about the same (15%).

#### **3.3.4.11 Stayton Pond Tule**

Stayton Pond Tule stock closely resembles the distribution for Bonneville Tules. This is understandable because they are the same stock, the only difference being the rearing and release site on the Willamette River for this stock while the Bonneville stock is released just below the Bonneville Dam on the Columbia. The proportion taken in the Columbia, however, is lower than for Bonneville, perhaps reflecting a difference in vulnerability between the two stocks due to river location.

#### **3.3.4.12 Columbia River Upriver Bright**

This stock is mainly taken in the Columbia River net (30%), North B.C. (20%) and S.E. Alaska (30%). It is also important on the west coast of Vancouver Island (10% to 15%). Recent (since 1985) increases in the terminal exploitation rate by the Columbia River net fishery are apparent from the major shifts in catch distribution. Also, it is apparent that this stock has a relatively lower vulnerability to the Columbia River sport than some of the other Columbia River stocks.

#### **3.3.4.13 Lewis River Wild**

Like the other Columbia River stocks, this stock has a large in-river component (more than 50%), equally divided between sport and net. Otherwise, it seems to be intermediate between the Upriver Bright stock and the lower river Tule stocks, with about 15% on the west coast of Vancouver Island and about 10% each in northern B.C. and S.E. Alaska. The west coast of Washington/Oregon is a relatively minor component (less than 10%) for this stock.

#### **3.3.4.14 Columbia River Summer**

The Columbia Summer catch distribution is very similar to the Upriver Bright distribution. Most of the in-river catch occurs in the net fishery (about 30%). About

15% of the impact is accounted for by the west coast of Vancouver Island troll fishery, about 25% by north B.C. fisheries and about 15% by S.E. Alaska fisheries. The northerly distribution of catch appears to be slightly less extreme than that of the Brights. As for the Brights, the recent increases in terminal net exploitation rates are reflected in increased proportion of catch in the Columbia River net. However, the exploitation rate calculated for in-river fisheries from the CWT recovery data is inconsistent with those calculated from actual catch and river return, probably due to intermittent tagging and low tagging levels in recent years.

#### **3.3.4.15 Willamette Spring**

This stock appears to be more vulnerable to the Columbia River sport fishery (35% to 40% of the catch) than to the Columbia net fishery (about 20%). Very little catch occurs on the west coasts of Washington, Oregon and Vancouver Island (less than 10% in aggregate). Northern catches are divided almost equally between North B.C. and S.E. Alaska (about 20% for each).

### **3.4 STOCK CONTRIBUTION INDICES**

The contributions of major index stocks to the Southeast Alaska, North/Central, west coast of Vancouver Island troll, and Washington/Oregon ocean troll and sport fisheries were calculated by expanding the estimated fishery CWT recoveries at age by the ratio of terminal (escapement plus terminal catch) CWT recoveries to stock specific terminal returns at the same age. The major index stocks are Robertson Creek, Columbia River Brights, Spring Creek hatchery, Oregon Lower Columbia hatchery tules, and Washington Lower Columbia hatchery tules. Only the Robertson Creek and Columbia River Brights have indices calculated for the Alaska and North/Central B.C. troll fisheries. The estimated contributions of each individual stock was compared to its average contribution during the 1979-82 base period.

The results of the stock contribution index analysis are presented in Table 3-9. These data should most appropriately be viewed on an individual stock basis since estimation procedures for terminal run size and the associated accuracy of the estimate may not be directly comparable between stocks. Trends for individual stocks are believed to be reliable indicators of relative contributions for that stock.

The contribution of Columbia Upriver Brights to the outside PSC fisheries with ceilings has increased dramatically since the implementation of the PST. However, the relative contribution of Robertson Creek fish to the same fisheries and time periods has decreased substantially. There is evidence that west coast of Vancouver Island troll catches have recently declined in the contribution of Robertson Creek and Spring Creek stocks concomitant with increases in the contribution of Upriver Bright and Washington and Oregon Lower Columbia hatchery tule stocks.



Table 3-9. Stock contribution indices for reported catches of Columbia River Upriver Brights, Robertson Creek, Spring Creek Hatchery, Oregon Lower Columbia Tule Hatchery and Washington Lower Columbia Tule Hatchery stocks to the S.E. Alaska, North/Central B.C., West Coast Vancouver Island troll fisheries, and Washington/Oregon ocean troll and sport fisheries (1979 - 1988). The index provided is calculated for each stock based on the average index for 1979 - 1982. (Catch in thousand fish.)

Fishery: Southeast Alaska Troll

Year	Columbia River		Somass River		Robertson Creek	
	Upriver Bright	Index	Catch	Index	Hatchery	Index
1979	35.7	1.29	53.0	0.74	13.0	0.44
1980	28.6	1.04	72.0	1.00	34.0	1.18
1981	36.0	1.30	69.0	0.97	31.0	1.08
1982	10.1	0.37	92.0	1.28	37.0	1.30
1983	26.6	0.96	102.0	1.43	44.0	1.53
1984	60.7	2.20	76.0	1.06	34.0	1.18
1985	51.6	1.87	29.0	0.40	11.0	0.40
1986	48.7	1.76	11.0	0.15	6.0	0.21
1987	101.0	3.66	9.0	0.13	6.0	0.20
1988	67.3	2.44	20.0	0.28	10.0	0.36
-----						
Average						
1979-82	27.6		71.5		28.8	
-----						

Fishery: North/Central Troll

Year	Columbia River		Somass River		Robertson Creek	
	Upriver Bright	Index	Catch	Index	Hatchery	Index
1979	23.4	1.51	76.0	1.23	23.0	0.92
1980	17.3	1.12	39.0	0.63	22.0	0.88
1981	14.2	0.92	51.0	0.83	22.0	0.88
1982	6.9	0.45	81.0	1.32	33.0	1.32
1983	23.6	1.53	57.0	0.92	27.0	1.09
1984	38.7	2.51	50.0	0.81	21.0	0.84
1985	31.5	2.04	36.0	0.59	16.0	0.64
1986	38.0	2.46	7.0	0.11	4.0	0.17
1987	94.5	6.12	12.0	0.20	7.0	0.27
1988	47.5	3.08	17.0	0.27	9.0	0.36
-----						
Average						
1979-82	15.5		61.8		25.0	
-----						

a/ Somass River estimate is based on the expansion of fishery tag recoveries using mark rates calculated from the terminal gillnet fishery, the terminal sport fishery, and the rack escapement. It is an estimate of the production of the total Somass River system, including the Robertson Creek hatchery.

b/ The Robertson Creek estimate is based on the expansion of fishery tag recoveries using mark rates at hatchery release. It is a minimum estimate of the production of the hatchery only.

Table 3-9. Continued

## Fishery: West Coast Vancouver Island Troll

Year	Columbia River Upriver Bright		Somass River Catch	Index	a/ Rbtsn Creek b/ Hatchery		Spring Creek Hatchery		Oregon Lower River Hatchery		Wash. Lower River Hatchery	
	Catch	Index			Catch	Index	Catch	Index	Catch	Index	Catch	Index
1979	32.5	2.25	30.0	1.31	9.0	0.93	91.6	1.27	75.0	1.18	NA	NA
1980	10.5	0.73	26.0	1.14	14.0	1.46	78.6	1.09	50.0	0.78	5.8	0.54
1981	6.5	0.45	13.0	0.55	6.0	0.62	59.5	0.83	61.0	0.96	13.4	1.24
1982	8.3	0.57	23.0	1.01	9.0	0.99	58.2	0.81	69.0	1.08	13.2	1.22
1983	6.6	0.45	15.0	0.68	7.0	0.72	25.1	0.35	43.0	0.67	23.9	2.21
1984	24.5	1.69	19.0	0.85	10.0	1.03	32.8	0.46	65.0	1.02	24.7	2.29
1985	30.1	2.08	5.0	0.22	2.0	0.19	10.1	0.14	38.0	0.60	14.2	1.31
1986	55.4	3.83	5.0	0.21	2.0	0.23	6.2	0.09	22.0	0.35	24.7	2.29
1987	46.5	3.21	3.0	0.15	2.0	0.18	1.9	0.03	148.0	2.32	31.9	2.96
1988	58.7	4.06	9.0	0.38	5.0	0.50	10.6	0.15	88.0	1.38	62.4	5.77
Average												
1979-82	14.5		23.0		9.5		72.0		63.8		10.8	

## Fishery: Washington/Oregon Ocean Sport and Troll

Year	Columbia River Upriver Bright		Spring Creek Hatchery		Oregon Lower River Hatchery		Wash. Lower River Hatchery	
	Catch	Index	Catch	Index	Catch	Index	Catch	Index
1979	6.0	1.45	88.0	1.00	42.0	0.52	NA	NA
1980	5.0	1.18	80.0	0.91	106.0	1.31	6.4	0.33
1981	2.0	0.56	99.0	1.14	89.0	1.10	18.3	0.95
1982	3.0	0.81	83.0	0.95	87.0	1.07	33.2	1.72
1983	1.0	0.19	10.0	0.12	18.0	0.22	26.9	1.39
1984	1.0	0.30	8.0	0.09	9.0	0.11	5.6	0.29
1985	11.0	2.73	9.0	0.10	29.0	0.36	16.8	0.87
1986	10.0	2.46	3.0	0.04	25.0	0.31	34.9	1.81
1987	14.0	3.67	7.0	0.08	120.0	1.48	82.3	4.27
1988	16.0	4.03	7.0	0.08	46.0	0.57	77.0	3.99
Average								
1979-82	4.0		87.5		81.0		19.3	

a/  
Somass River estimate is based on the expansion of fishery tag recoveries using mark rates calculated from the terminal gillnet fishery, the terminal sport fishery, and the rack escapement. It is an estimate of the production of the total Somass River system, including the Robertson Creek hatchery.

b/  
The Robertson Creek estimate is based on the expansion of fishery tag recoveries using mark rates at hatchery release. It is a minimum estimate of the production of the hatchery only.

## 4.0 DISCUSSION AND SUMMARY

This report is based on coded-wire tag recoveries for 15 indicator stocks with a usable time series of recovery data. These stocks are referred to as the "Exploitation Rate" indicator stocks. Analyses in this report are specific to these stocks; the extrapolation of results to similar stocks and/or generalized statements about fishery impacts will be dependent upon how representative these indicator stocks are of other stocks of interest or upon the stock composition in a fishery. At present, these indicator stocks consist of 4 fall chinook stocks from southern B.C., 6 fall chinook stocks from the Columbia River, the Columbia River summer stock, the Willamette spring chinook stock (lower Columbia River), a Southeast Alaska spring stock, and Puget Sound summer/fall fingerling and yearling stocks.

### 4.1 FISHERY INDICES

The fishery index measures the relative change in the total mortality of the indicator stocks within a fishery. With the exception of the North/Central B.C. troll fishery, these analyses indicate that total fishing mortalities on index stocks have not decreased to the extent anticipated when the chinook rebuilding program was established. The index for Washington and Oregon ocean fisheries indicates that exploitation rates decreased substantially from base period levels and have been gradually increasing again (1988 was near base period levels).

Target exploitation rate reductions for some fisheries with fixed ceilings have not been met, partially due to unanticipated mortalities from size limit changes and to increasing mortalities from non-retention fisheries. In addition, the west coast Vancouver Island troll fishery historically harvested primarily 3 year old fish; the size limit change has caused an increase in the exploitation of older age fish above that anticipated under PST fixed ceiling management.

#### 4.1.1 S.E. ALASKA TROLL FISHERY

The average 1985-88 total mortality fishery index is estimated at .85, indicating a 15% reduction from the 1979-82 base period. The yearly index from 1985-88 was below the base period level for 3 of the 4 years since implementation of treaty fishing regimes. The average 1985-88 fishery index, based on reported catch only, was 26% below the base period and 2 percentage points below the initial target reduction.

The index results for this fishery compare well with the results from last year's analysis, with the major exception of the 1987 catch year. The 1987 catch year index calculated in the 1987 analysis was 1.19 compared to .88 for the 1988 analysis. Updating in the CWT recovery data and using calculated maturity rates account for approximately 4% of the change. The remainder of the change is attributed to the addition of new exploitation rate indicator stocks and the two step selection criteria for inclusion of stocks in the computation of the fishery index. Additional stocks used for the 1988 analysis include the Alaska spring stock, Lewis River, Robertson Creek (age 3), Columbia River Summers, and Upriver Brights (age 3). Each of these stock/age categories had indices substantially less than one in 1987. The selection criterion based on a minimum number of average recoveries excluded the Big Qualicum stock. The second criterion excluded the Robertson Creek age 5 for catch year 1987 from the 1988 analysis based on an extremely low cohort size for this stock. These methods were employed so that the variability associated with low tag recoveries due to low tagging levels or poor survival can be reduced.

#### **4.1.2 NORTH/CENTRAL B.C. TROLL FISHERY**

The exploitation rate of this fishery appears to have been reduced substantially more than the amount expected under PST ceilings. The 1985-88 average index of .72 is 12 percentage points below the target level of .84. The estimated reduction using reported catch only is slightly lower at .69.

#### **4.1.3 WEST COAST VANCOUVER ISLAND TROLL FISHERY**

The combined age 3 and 4 fishery index increased over base period levels for two of the four years since implementation of the treaty catch ceiling. The 1985-1988 average index for this fishery of .96 is approximately 20 percentage points higher than the 24% reduction expected under PST fishing regimes. Management actions for this fishery have not reduced exploitation rates to the degree intended. The following combination of reasons may be responsible for the failure of this fishery to meet target reductions in exploitation rate: 1) time and area restructuring of the fishery may have concentrated exploitation on fall stocks; 2) a failure of Spring Creek hatchery stock and fluctuations in abundance of other key fall hatchery stocks; 3) the effect of concentrating harvest on 4 year olds due to the change in size limit has caused an increase in the exploitation rate on 4 year olds (historically, this fishery concentrated on 3 year old fish).

Reductions in fishery harvest rate estimated from reported catch alone are slightly greater than that for total mortality. Reported catch indices are: .89 for age 3, .94 for age 4 and .92 for both ages combined.

The index results for this fishery compare well with the results from last year's analysis, with the major exception of the 1987 catch year. The 1987 catch year index calculated in the 1987 analysis was 1.32 compared to .77 for the 1988 analysis. Updating the CWT recovery data and using calculated maturity rates account for approximately 9% of the change. However, the remainder of the change can be attributed to the addition of new exploitation rate indicator stocks and the two step selection criteria for inclusion of stocks in the computation of the fishery index. Additional stocks used for the 1988 analysis include Columbia Summers, Puget Sound Fingerlings and Yearlings, Lewis River, and Upriver Brights (age 3). Most of these stocks had low exploitation indices in 1987. The addition of these stocks is believed to improve the representation of the index. The second selection criterion excluded Bonneville Tule age 4 and Stayton Pond Tule age 4 in 1987 based on relatively small cohort sizes. In addition, Bonneville Tule age 4 had only 4 estimated recoveries and Stayton Pond Tule age 4 had only 12 estimated recoveries for 1987 catch year. The selection criteria methods were employed to reduce the variability associated with low tag recoveries due to low tagging levels and poor survival.

#### **4.1.4 GEORGIA STRAIT SPORT AND TROLL FISHERIES**

The average 1985-88 fishery index for the combined troll and sport fisheries has decreased by 26% since the base period, but remains 21 percentage points higher than target reduction under the initial PST regimes. The exploitation rate for the troll fishery has been substantially reduced. However, the exploitation rate for the sport fishery has increased above base period levels. Catches have declined in this same period because of declining abundance of available stocks rather than reduction of exploitation rates to desired levels. Management actions have not effectively compensated for reduced abundance.

Reductions in fishery harvest rate estimated from reported catch alone are nearly identical to those using incidental mortalities. Reported catch indices are: .73 for troll and sport combined, .23 for only troll and 1.15 for only sport.

#### **4.1.5 WASHINGTON/OREGON TROLL AND SPORT FISHERIES**

The average fishery index for Washington and Oregon troll and sport fisheries has decreased substantially from the base period, followed by an increasing trend in recent years. The 1985-88 fishery index averaged 76% of the base period levels for age 3 and 4 fish.

### **4.2 STOCK INDICES**

Stock indices are designed to assess the impact of fisheries with and without catch ceilings for a specific stock relative to the 1979-82 base period. The results of this analysis indicate that the combined impacts of all fisheries under catch ceiling management on the stocks have generally declined since the base period for 12 of 16 age-stock combinations. Results are variable among stocks and between age groups of individual stocks. The lack of consistency in stock indices suggest that the ocean fisheries have different impacts on each stock.

The average 1988 index value across all indicator stocks for fisheries under ceiling management is .96, indicating a 4% decline in the average exploitation rate from the base period. However, average exploitation rates were above base period levels for 7 of the 16 age stock combinations (indices ranged from 1.62 for Stayton Pond Tules to 0.39 for Columbia River Summers).

Stock indices for the four stocks that are significantly impacted by Canadian fisheries not under ceiling management (the vast majority of which are net fisheries) show a reduction of more than 25% from the base period. A 25% reduction in impacts by southern B.C. net fisheries was an integral part of the chinook rebuilding program. The average 1988 stock index value for Canadian fisheries not managed by ceilings is .39, indicating a 61% decline from the base period.

For the stocks that are significantly impacted by U.S. fisheries not under ceiling management, a mixed response was observed (5 greater than the base period, 5 less than the base period). This was primarily a result of terminal area fisheries management measures. The average 1988 stock index value for U.S. fisheries not managed by PSC ceilings is 1.84, indicating an 84% increase in the exploitation rate from the base period, primarily resulting from the harvest of fish in excess of spawning escapement goals and hatchery brood stock requirements.

### **4.3 BROOD YEAR EXPLOITATION RATES**

Brood year exploitation rates are designed to monitor the cumulative impacts of ocean fisheries over the life of offspring of a single spawning year (i.e., a cohort). The 1982-84 brood year ocean exploitation rates have declined from pre-treaty levels for eleven of the fifteen indicator stocks (Quinsam, Big Qualicum, Puget Sound fingerling and yearling, Spring Creek, Cowlitz Fall, Bonneville Tule, Stayton Pond Tule, Columbia River Upriver Brights, Columbia Summers, and Lewis River wild). The average decline was 9 percentage points from the base, but the values ranged from 3 to 19 percentage points. The average 1982-84 brood year exploitation rates increased from pre-treaty levels for two stocks (Alaska spring and Robertson Creek). The 1982-84 brood year average exploitation rates have remained unchanged for Capilano and Willamette Springs. Incidental mortalities have increased for fourteen of the fifteen indicator stocks. The proportion of total fishing mortality accounted for by incidental mortality increased by more than 50% from the base period for 11 of the 15 indicator stocks.

## 4.4 SURVIVAL RATE INDICES

Survival rate indices (defined as three-year old catch plus escapement divided by the total release size and two-year old catch plus escapement divided by total release size) indicate that substantial changes have occurred during recent years. Nine of the 15 stocks show long-term (all available observations) decreasing trends in survival. For the short-term, survival of 14 stocks has decreased substantially for the 1984 and 1985 broods. Although the analysis is mostly limited to hatchery production, these decreasing survival indices are of concern; decreasing contribution of hatchery stocks without compensating adjustments in management regimes will result in increased exploitation of natural stocks.

Implications for wild stock survival are uncertain. Trends in survival of hatchery fish may be confounded by propagation and rearing practices and environmental influences; survival of wild fish may be confounded by both environmental factors and spawning escapement levels.

## 4.5 STOCK CATCH DISTRIBUTION

Average distributions of reported catch and total fishing mortality for each exploitation indicator stock are very similar to those presented in TCCHINOOK (88)-2, Supplement A, Table A1. Some shifts and annual variation in catch distribution are apparent. Some shifts represent increasing or decreasing trends in response to management actions or stock abundance. For example, the gradual increase in the terminal harvest of Columbia River Upriver Brights and decreases in the terminal harvest of Robertson Creek. The large year-to-year variations which occasionally appear in the Tables in Section 11.0 could be caused by a large number of factors.

Differences in distributions between reported catch and total fishing mortality are due to the procedures used to estimate incidental mortalities; when there is a strong cohort relative to the other cohorts present or when there is a large catch in a fishery which has associated incidental mortalities, a large number of incidental mortalities are assigned.

## 4.6 STOCK CONTRIBUTION INDICES

Stock contribution indices provide insight into the interpretation of changes in exploitation rates. These data illustrate that substantial increases in abundance of some stocks do not necessarily translate into decreases in exploitation rates because of changes in the relative abundance of stocks.

Ocean exploitation rates on Columbia River Brights decreased for age 3 fish, but remained near base period levels for the age 3 and 4 age classes which principally contribute to ocean fisheries. In light of large increases in the abundance of this stock, this result suggests that stock composition has changed substantially in the fisheries harvesting Columbia River Brights.

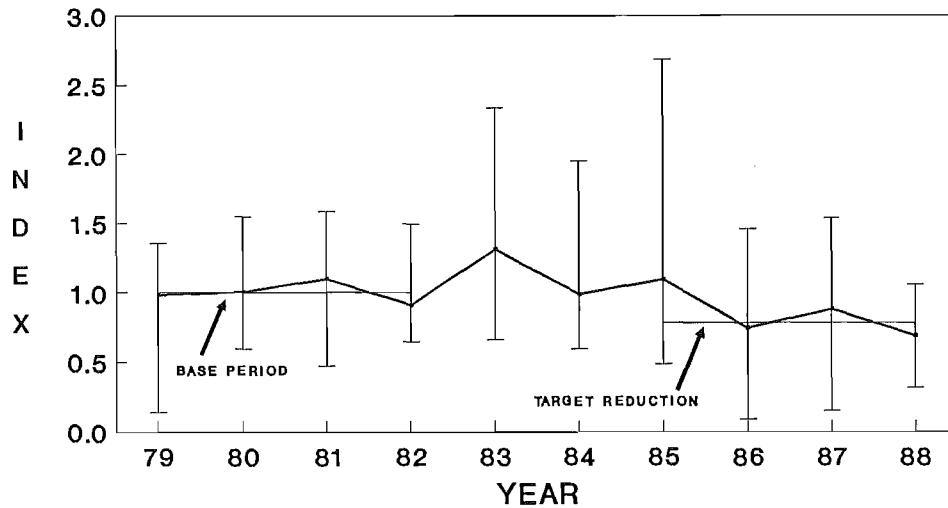
A time series of contributions of certain major indicator stocks to some ocean fisheries was estimated to investigate changes in relative stock compositions. The contribution of Columbia Upriver Brights to the outside PSC fisheries with ceilings has increased dramatically since the implementation of the PST. However, the contribution of Robertson Creek and Spring Creek hatchery fish to the same fisheries and time periods has decreased substantially. These data indicate that increased contributions of Upriver Brights are probably compensating for decreased contributions of other stocks in these fisheries. It appears that the Upriver Bright stock is presently the largest single contributor to the outside PSC fisheries.

## SECTION 5.1 FISHERY INDEX FIGURES

S.E. Alaska Troll (All Ages)  
S.E. Alaska Troll -- S.E. Alaska Stock only  
S.E. Alaska Troll (Age 3)  
S.E. Alaska Troll (Age 4)  
S.E. Alaska Troll (Age 5)  
North Central Troll (All Ages)  
North Central Troll (Age 3)  
North Central Troll (Age 4)  
North Central Troll (Age 5)  
Northern Troll (All Ages)  
Central Troll (All Ages)  
WCVI Troll (Age 3)  
WCVI Troll (Age 4)  
WCVI Troll (All Ages)  
Georgia Strait Troll and Sport (All Ages)  
Georgia Strait Troll and Sport (Age 3)  
Georgia Strait Troll and Sport (Age 4)  
Georgia Strait Troll (All Ages)  
Georgia Strait Sport (All Ages)  
Washington/Oregon Ocean Troll & Sport (All Ages)  
Washington/Oregon Ocean Troll & Sport (Age 3)  
Washington/Oregon Ocean Troll & Sport (Age 4)

# FISHERY INDEX

## ALASKA TROLL (ALL AGES)



I RANGE OF INDICES      — INDEX

TOTAL MORTALITY EXPLOITATION RATE INDEX BY STOCK										
Year	AKS Age 4	AKS Age 5	AKS Age 6	LRW Age 4	QUI Age 4	QUI Age 5	RBT Age 3	RBT Age 4	RBT Age 5	SUM Age 4
79	NA	NA	NA	NA	0.1409	0.8957	0.7388	0.8925	1.3561	NA
80	NA	NA	NA	NA	1.1477	0.5974	1.0897	0.9616	0.8968	1.5278
81	NA	NA	NA	0.9945	1.2187	1.0499	1.1819	1.2120	0.9341	0.4722
82	1.0000	NA	NA	1.0055	1.4928	1.4570	0.9896	0.9339	0.8130	NA
83	1.4535	NA	NA	0.9603	2.3338	2.1554	1.0669	1.0918	1.1545	NA
84	0.7582	NA	NA	NA	1.2098	1.9526	1.6602	1.0744	0.5975	NA
85	0.7901	NA	NA	NA	1.8049	2.2356	1.7768	0.4865	0.8907	NA
86	1.2758	NA	NA	0.6707	1.1497	1.4555	NA	1.1745	0.0889	NA
87	0.7226	NA	NA	0.3203	1.4451	1.5130	0.6263	NA	NA	0.1508
88	1.0581	NA	NA	0.3147	1.0218	0.8891	0.3714	0.6370	NA	0.5522

TOTAL MORTALITY EXPLOITATION RATE INDEX BY STOCK					
Year	URB Age 3	URB Age 4	URB Age 5	WSH Age 4	Fishery
79	0.5945	0.9171	NA	NA	0.9823
80	1.5483	1.1002	0.7698	1.5308	1.0069
81	NA	1.1589	1.5846	0.7807	1.0972
82	0.8571	0.8238	0.6456	0.6885	0.9084
83	0.6613	1.2969	NA	1.1117	1.3090
84	0.8427	1.2857	0.9197	0.6580	0.9882
85	0.5828	1.0367	0.9144	2.6814	1.0950
86	0.4726	0.7224	0.6593	NA	0.7447
87	1.0358	0.8817	0.8830	1.5358	0.8763
88	0.5067	0.4572	0.7264	0.8317	0.6873

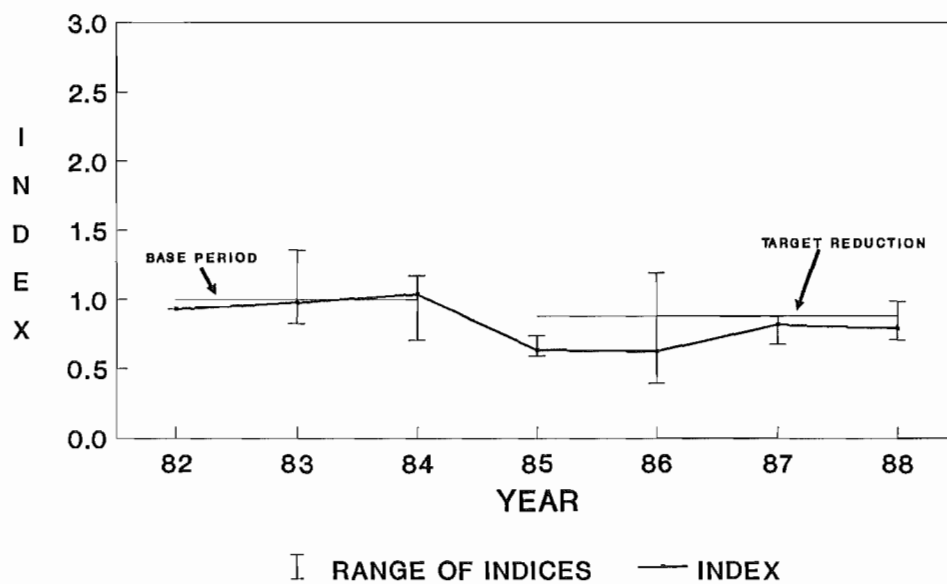
### Stock Identifiers

AKS = ALASKA SPRING  
 LRW = LEWIS RIVER WILD  
 QUI = QUINSAM  
 RBT = ROBERTSON CREEK  
 SUM = COLUMBIA RIVER SUMMER  
 URB = COLUMBIA RIVER UPRIVER BRIGHT  
 WSH = WILLAMETTE SPRING



# FISHERY INDEX: ALASKA STOCK

## ALASKA TROLL (ALL AGES)



### =====

#### TOTAL MORTALITY EXPLOITATION RATE INDEX BY STOCK

Year	AKS		Fishery
	Age 4	Age 5	
82	0.9341	NA	0.9341
83	1.3577	0.8257	0.9792
84	0.7082	1.1743	1.0398
85	0.7380	0.5932	0.6349
86	1.1917	0.3944	0.6244
87	0.6749	0.8787	0.8199
88	0.9883	0.7086	0.7893

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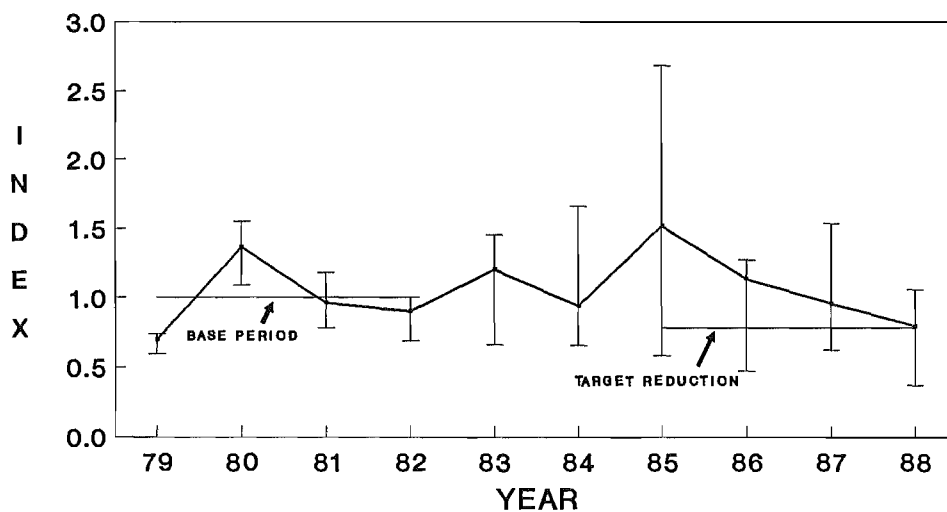
#### Stock Identifiers

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AKS = ALASKA SPRING

# FISHERY INDEX

## ALASKA TROLL (AGE 3)



I RANGE OF INDICES      — INDEX

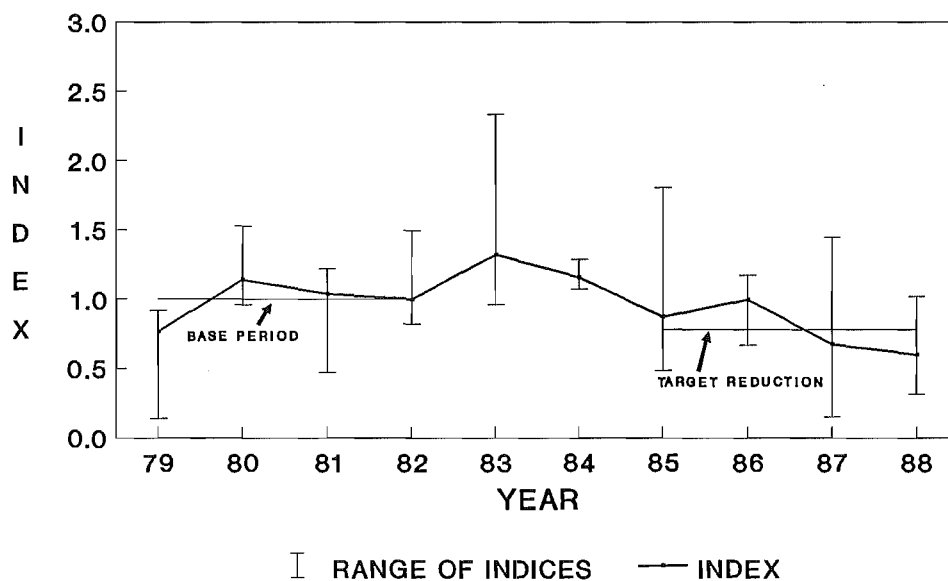
TOTAL MORTALITY EXPLOITATION RATE INDEX BY STOCK					
Year	AKS Age 4	RBT Age 3	URB Age 3	WSH Age 4	Fishery
79	NA	0.7388	0.5945	NA	0.6985
80	NA	1.0897	1.5483	1.5308	1.3655
81	NA	1.1819	NA	0.7807	0.9597
82	1.0000	0.9896	0.8571	0.6885	0.8988
83	1.4535	1.0669	0.6613	1.1117	1.2034
84	0.7582	1.6602	0.8427	0.6580	0.9396
85	0.7901	1.7768	0.5828	2.6814	1.5183
86	1.2758	NA	0.4726	NA	1.1362
87	0.7226	0.6263	1.0358	1.5358	0.9540
88	1.0581	0.3714	0.5067	0.8317	0.7937

### Stock Identifiers

AKS = ALASKA SPRING  
 RBT = ROBERTSON CREEK  
 URB = COLUMBIA RIVER UPRIVER BRIGHT  
 WSH = WILLAMETTE SPRING

# FISHERY INDEX

## ALASKA TROLL (AGE 4)



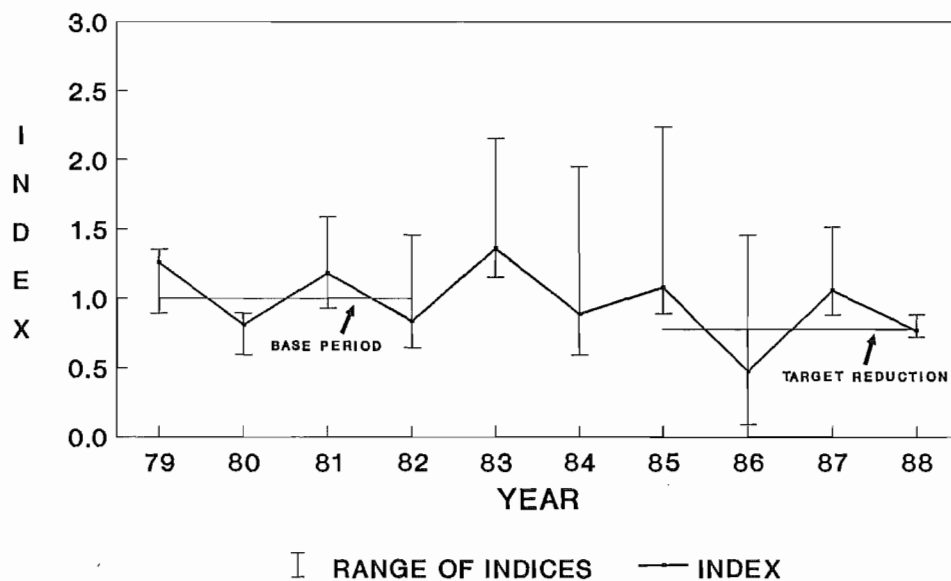
TOTAL MORTALITY EXPLOITATION RATE INDEX BY STOCK							
Year	AKS Age 5	LRW Age 4	QUI Age 4	RBT Age 4	SUM Age 4	URB Age 4	Fishery
79	NA	NA	0.1409	0.8925	NA	0.9171	0.7664
80	NA	NA	1.1477	0.9616	1.5278	1.1002	1.1394
81	NA	0.9945	1.2187	1.2120	0.4722	1.1589	1.0376
82	NA	1.0055	1.4928	0.9339	NA	0.8238	1.0025
83	NA	0.9603	2.3338	1.0918	NA	1.2969	1.3175
84	NA	NA	1.2098	1.0744	NA	1.2857	1.1572
85	NA	NA	1.8049	0.4865	NA	1.0367	0.8730
86	NA	0.6707	1.1497	1.1745	NA	0.7224	0.9975
87	NA	0.3203	1.4451	NA	0.1508	0.8817	0.6746
88	NA	0.3147	1.0218	0.6370	0.5522	0.4572	0.6008

### Stock Identifiers

AKS = ALASKA SPRING  
 LRW = LEWIS RIVER WILD  
 QUI = QUINSAM  
 RBT = ROBERTSON CREEK  
 SUM = COLUMBIA RIVER SUMMER  
 URB = COLUMBIA RIVER UPRIVER BRIGHT

# FISHERY INDEX

## ALASKA TROLL (AGE 5)



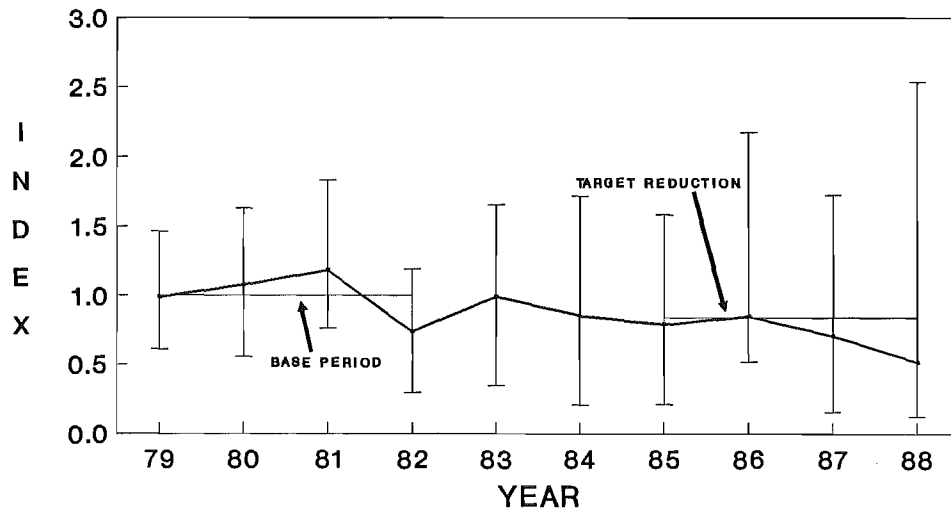
TOTAL MORTALITY EXPLOITATION RATE INDEX BY STOCK					
	AKS	QUI	RBT	URB	
Year	Age 6	Age 5	Age 5	Age 5	Fishery
79	NA	0.8957	1.3561	NA	1.2603
80	NA	0.5974	0.8968	0.7698	0.8115
81	NA	1.0499	0.9341	1.5846	1.1808
82	NA	1.4570	0.8130	0.6456	0.8399
83	NA	2.1554	1.1545	NA	1.3627
84	NA	1.9526	0.5975	0.9197	0.8937
85	NA	2.2356	0.8907	0.9144	1.0794
86	NA	1.4555	0.0889	0.6593	0.4748
87	NA	1.5130	NA	0.8830	1.0556
88	NA	0.8891	NA	0.7264	0.7710

### Stock Identifiers

AKS = ALASKA SPRING  
 QUI = QUINSAM  
 RBT = ROBERTSON CREEK  
 URB = COLUMBIA RIVER UPRIVER BRIGHT

# FISHERY INDEX

## NORTH/CENTRAL B.C. TROLL (ALL AGES)



I RANGE OF INDICES      — INDEX

### TOTAL MORTALITY EXPLOITATION RATE INDEX BY STOCK

Year	AKS Age 4	AKS Age 5	BQR Age 3	BQR Age 4	CAP Age 3	LRW Age 4	QUI Age 3	QUI Age 4	QUI Age 5	RBT Age 3	RBT Age 4	RBT Age 5
79	NA	NA	1.0229	1.0911	1.4638	NA	0.8915	1.1403	0.6712	1.2074	1.0842	0.6303
80	NA	NA	1.0706	0.9118	0.8078	NA	0.9625	1.1156	1.4239	1.1221	0.8871	1.1122
81	NA	NA	1.0631	0.8754	0.7622	1.3552	1.4992	1.1973	1.1880	0.7849	0.9547	1.8317
82	1.0000	NA	0.8434	1.1218	0.9662	0.6448	0.6468	0.5468	0.7168	0.8857	1.0741	0.4258
83	1.6551	NA	NA	1.1453	1.2907	1.3905	1.1565	1.0162	1.4019	1.0258	0.7999	0.5396
84	1.2282	NA	0.7166	NA	1.4001	NA	0.2056	0.4226	0.4550	0.5197	0.9947	1.7144
85	0.9387	NA	0.3934	NA	NA	NA	0.3233	0.2997	0.2118	1.1218	1.5811	1.4530
86	1.7109	NA	0.7821	2.1734	0.5806	0.7886	0.9304	0.6058	0.5176	NA	0.9115	NA
87	0.4858	NA	0.1588	0.7907	0.1560	1.3555	0.4272	0.5128	0.8156	0.7054	NA	NA
88	2.5373	NA	NA	NA	NA	NA	0.1229	0.2665	0.1375	0.8251	0.6735	NA

### TOTAL MORTALITY EXPLOITATION RATE INDEX BY STOCK

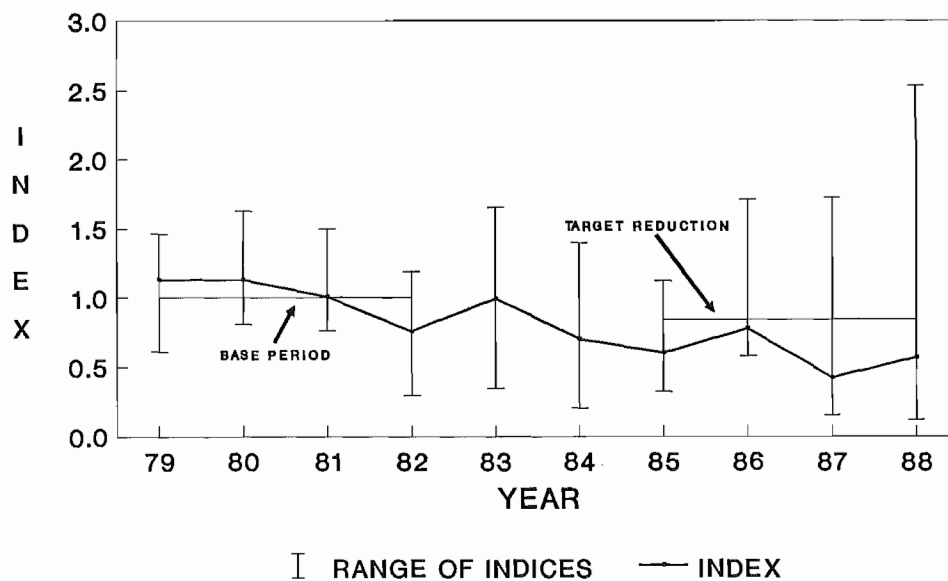
Year	URB Age 3	URB Age 4	URB Age 5	WSH Age 4	Fishery
79	0.6089	1.1725	NA	NA	0.9873
80	1.2024	1.1878	0.5551	1.6263	1.0751
81	NA	1.0655	1.4449	1.0769	1.1818
82	1.1887	0.5741	NA	0.2968	0.7380
83	1.5891	0.9667	NA	0.3474	0.9949
84	1.1688	1.4917	NA	0.3532	0.8549
85	0.9445	1.1900	0.6419	0.3793	0.7884
86	0.8774	0.9169	0.6879	NA	0.8511
87	1.7265	1.4861	1.0646	0.3113	0.7072
88	0.9552	0.7668	0.9475	0.4104	0.5170

### Stock Identifiers

AKS = ALASKA SPRING  
 BQR = BIG QUALICUM  
 CAP = CAPILANO  
 LRW = LEWIS RIVER WILD  
 QUI = QUINSAM  
 RBT = ROBERTSON CREEK  
 URB = COLUMBIA RIVER UPRIVER BRIGHT  
 WSH = WILLAMETTE SPRING

# FISHERY INDEX

## NORTH/CENTRAL B.C. TROLL (AGE 3)



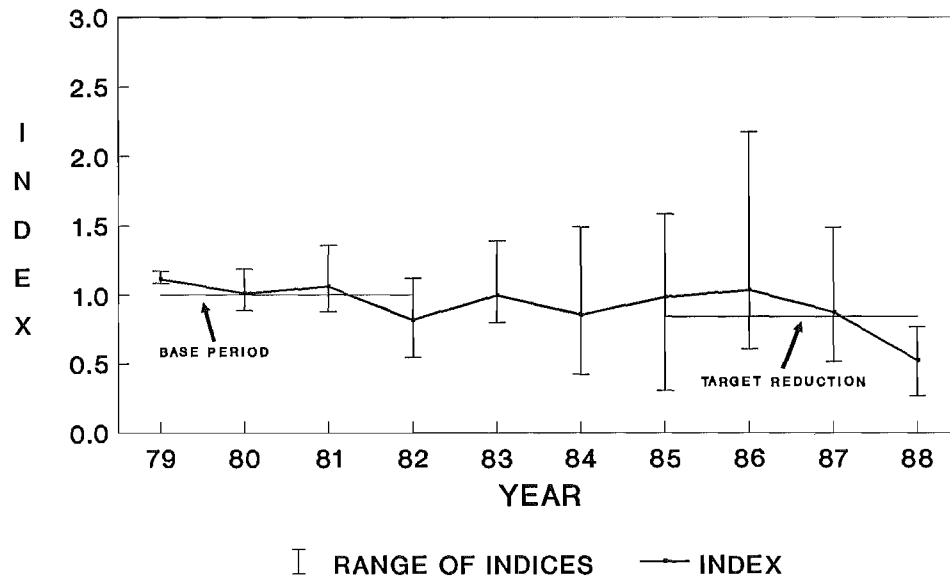
TOTAL MORTALITY EXPLOITATION RATE INDEX BY STOCK								
Year	AKS Age 4	BQR Age 3	CAP Age 3	QUI Age 3	RBT Age 3	URB Age 3	WSH Age 4	Fishery
79	NA	1.0229	1.4638	0.8915	1.2074	0.6089	NA	1.1304
80	NA	1.0706	0.8078	0.9625	1.1221	1.2024	1.6263	1.1321
81	NA	1.0631	0.7622	1.4992	0.7849	NA	1.0769	1.0068
82	1.0000	0.8434	0.9662	0.6468	0.8857	1.1887	0.2968	0.7603
83	1.6551	NA	1.2907	1.1565	1.0258	1.5891	0.3474	0.9914
84	1.2282	0.7166	1.4001	0.2056	0.5197	1.1688	0.3532	0.7034
85	0.9387	0.3934	NA	0.3233	1.1218	0.9445	0.3793	0.6005
86	1.7109	0.7821	0.5806	0.9304	NA	0.8774	NA	0.7747
87	0.4858	0.1588	0.1560	0.4272	0.7054	1.7265	0.3113	0.4195
88	2.5373	NA	NA	0.1229	0.8251	0.9552	0.4104	0.5703

### Stock Identifiers

AKS = ALASKA SPRING  
 BQR = BIG QUALICUM  
 CAP = CAPILANO  
 QUI = QUINSAM  
 RBT = ROBERTSON CREEK  
 URB = COLUMBIA RIVER UPRIVER BRIGHT  
 WSH = WILLAMETTE SPRING

# FISHERY INDEX

## NORTH/CENTRAL B.C. TROLL (AGE 4)



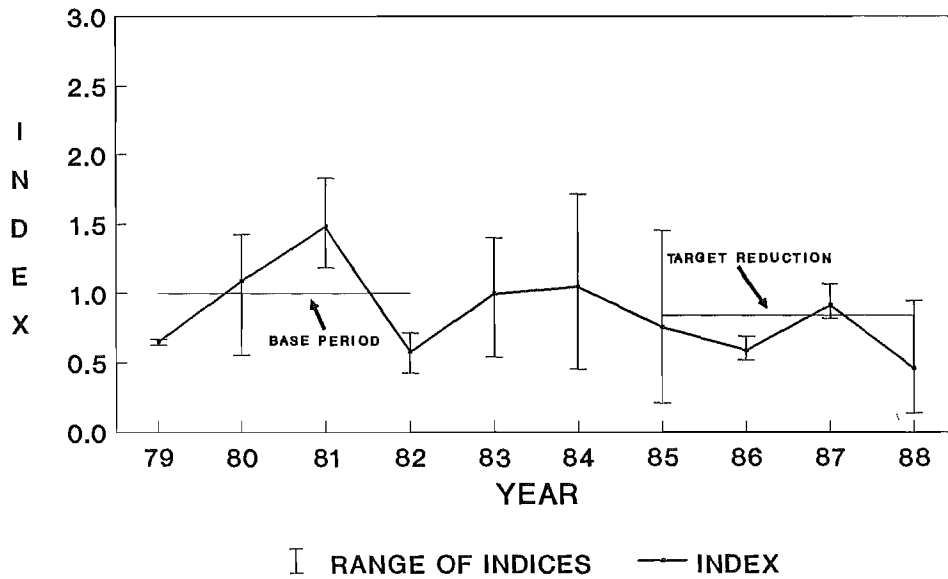
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TOTAL MORTALITY	EXPLOITATION RATE	INDEX BY STOCK					
	AKS	BQR	LRW	QUI	RBT	URB	
Year	Age 5	Age 4	Age 4	Age 4	Age 4	Age 4	Fishery
=====							
79	NA	1.0911	NA	1.1403	1.0842	1.1725	1.1173
80	NA	0.9118	NA	1.1156	0.8871	1.1878	1.0125
81	NA	0.8754	1.3552	1.1973	0.9547	1.0655	1.0613
82	NA	1.1218	0.6448	0.5468	1.0741	0.5741	0.8192
83	NA	1.1453	1.3905	1.0162	0.7999	0.9667	0.9968
84	NA	NA	NA	0.4226	0.9947	1.4917	0.8545
85	NA	NA	NA	0.2997	1.5811	1.1900	0.9856
86	NA	2.1734	0.7886	0.6058	0.9115	0.9169	1.0338
87	NA	0.7907	1.3555	0.5128	NA	1.4861	0.8727
88	NA	NA	NA	0.2665	0.6735	0.7668	0.5251
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### Stock Identifiers

AKS = ALASKA SPRING  
 BQR = BIG QUALICUM  
 LRW = LEWIS RIVER WILD  
 QUI = QUINSAM  
 RBT = ROBERTSON CREEK  
 URB = COLUMBIA RIVER UPRIVER BRIGHT

# FISHERY INDEX

## NORTH/CENTRAL B.C. TROLL (AGE 5)



TOTAL MORTALITY EXPLOITATION RATE INDEX BY STOCK				
Year	QUI Age 5	RBT Age 5	URB Age 5	Fishery
79	0.6712	0.6303	NA	0.6519
80	1.4239	1.1122	0.5551	1.0901
81	1.1880	1.8317	1.4449	1.4794
82	0.7168	0.4258	NA	0.5796
83	1.4019	0.5396	NA	0.9954
84	0.4550	1.7144	NA	1.0488
85	0.2118	1.4530	0.6419	0.7568
86	0.5176	NA	0.6879	0.5853
87	0.8156	NA	1.0646	0.9147
88	0.1375	NA	0.9475	0.4598

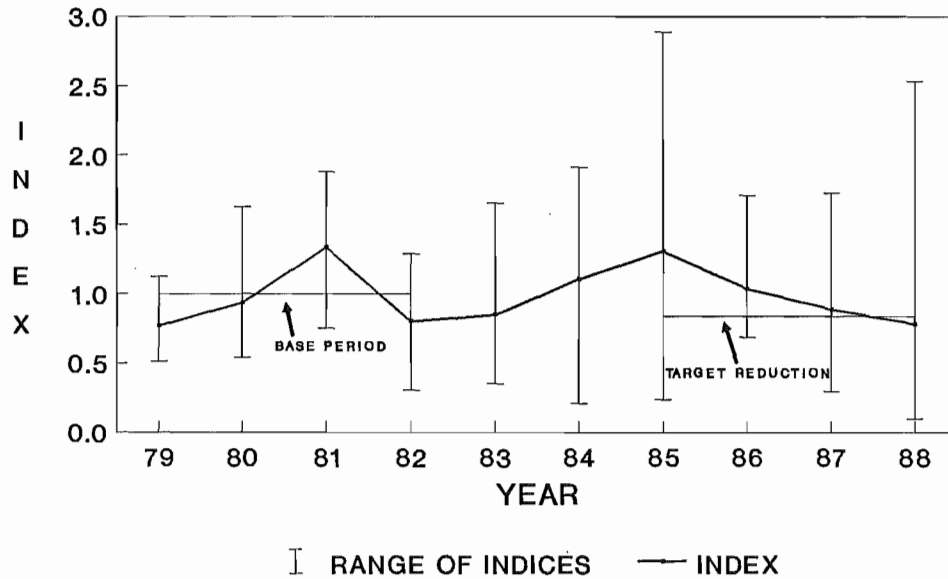
### Stock Identifiers

QUI = QUINSAM  
 RBT = ROBERTSON CREEK  
 URB = COLUMBIA RIVER UPRIVER BRIGHT



# FISHERY INDEX

## NORTH B.C.TROLL (ALL AGES)



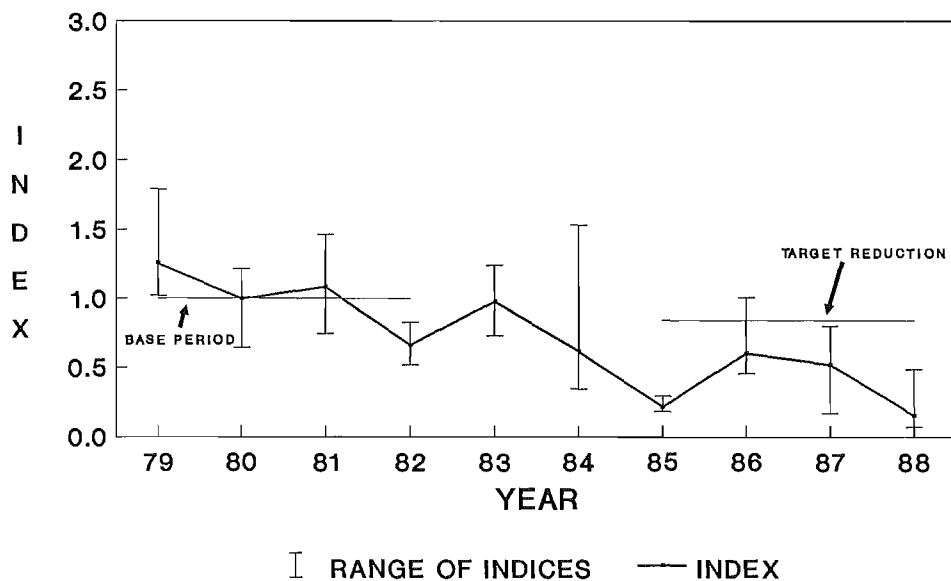
TOTAL MORTALITY EXPLOITATION RATE INDEX BY STOCK											
Year	AKS Age 4	QUI Age 3	QUI Age 4	RBT Age 3	RBT Age 4	RBT Age 5	URB Age 3	URB Age 4	URB Age 5	WSH Age 4	Fishery
79	NA	0.5510	NA	1.1272	0.9701	0.5133	0.6219	0.9470	NA	NA	0.7716
80	NA	0.7905	1.0168	1.1097	0.6525	0.8013	1.1040	1.1657	0.5426	1.6278	0.9364
81	NA	1.8810	1.4492	0.7514	1.0832	1.6854	NA	1.1446	1.4574	1.0678	1.3399
82	1.0000	0.7774	0.5340	1.0117	1.2942	NA	1.2741	0.7427	NA	0.3044	0.8033
83	1.6551	1.0712	1.5081	1.0931	0.7604	0.5118	1.5903	1.0516	NA	0.3516	0.8498
84	1.2282	0.2120	0.4466	0.6953	1.4813	1.9121	0.9287	1.6646	NA	0.3338	1.1072
85	0.9387	0.2375	0.4959	1.7982	2.8902	1.8520	1.0600	1.4885	0.7519	0.3490	1.3124
86	1.7109	0.8105	0.7649	NA	1.6662	NA	0.9100	1.1265	0.6907	NA	1.0386
87	0.4858	0.3477	0.6048	0.8950	NA	NA	1.5942	1.7292	1.2025	0.2956	0.8934
88	2.5373	0.1005	0.5206	1.0963	1.0913	NA	NA	0.9017	1.0671	0.3027	0.7846

### Stock Identifiers

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

# FISHERY INDEX

## CENTRAL B.C. TROLL (ALL AGES)



TOTAL MORTALITY EXPLOITATION RATE INDEX BY STOCK							
	BQR	CAP	QUI	QUI	RBT	RBT	
Year	Age 3	Age 3	Age 4	Age 5	Age 3	Age 4	Fishery
79	1.2622	1.7881	1.1389	1.0198	1.3072	1.2218	1.2540
80	0.7714	0.6407	1.2149	NA	1.1376	1.1705	0.9992
81	1.3250	0.7422	1.0736	1.4602	0.8265	0.7994	1.0866
82	0.6414	0.8290	0.5726	0.5200	0.7287	0.8082	0.6600
83	NA	1.0649	0.7323	1.2419	0.9420	0.8476	0.9792
84	0.6186	1.5309	0.4207	0.3434	NA	0.4071	0.6137
85	0.2917	NA	0.1831	0.2038	NA	NA	0.2162
86	1.0048	0.4520	0.5228	0.5371	NA	NA	0.5996
87	NA	0.1665	0.4701	0.7975	0.4695	NA	0.5185
88	NA	NA	0.1116	0.0735	0.4874	0.1690	0.1555

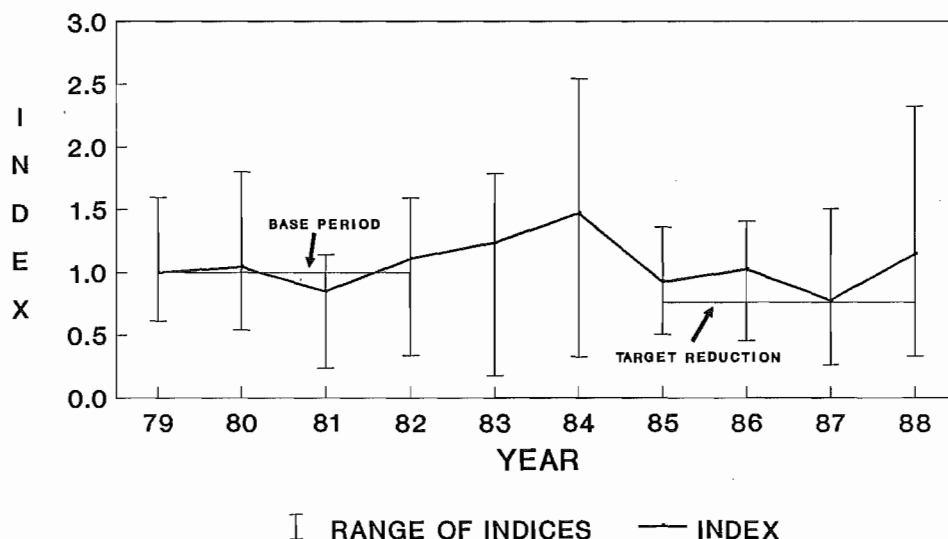
### Stock Identifiers

BQR = BIG QUALICUM  
 CAP = CAPILANO  
 QUI = QUINSAM  
 RBT = ROBERTSON CREEK

# FISHERY INDEX

## WEST COAST VANCOUVER ISLAND TROLL

### (ALL AGES)



TOTAL MORTALITY EXPLOITATION RATE INDEX BY STOCK													
Year	BON Age 3	BON Age 4	CWF Age 3	CWF Age 4	LRW Age 4	PSF Age 3	PSF Age 4	PSY Age 3	PSY Age 4	RBT Age 3	RBT Age 4	SPR Age 3	SPR Age 4
79	1.1569	NA	NA	NA	NA	NA	1.0015	0.6139	0.9669	1.1691	1.2318	0.9760	0.7548
80	0.5421	0.7079	1.7859	NA	NA	NA	NA	1.3565	0.7609	1.4020	1.7404	1.1937	1.2897
81	0.8894	0.7017	0.8783	0.8263	0.8305	0.6190	NA	0.7846	1.0083	0.6524	0.4492	0.8923	0.8162
82	1.4117	1.5904	0.3358	1.1737	1.1695	1.3810	0.9985	1.2450	1.2640	0.7765	0.5786	0.9381	1.1393
83	1.7354	1.4944	0.6514	1.3511	0.9476	1.5774	0.8268	0.7466	1.2113	0.3947	0.5894	1.4777	1.3031
84	1.3934	2.5434	0.3263	1.3133	NA	1.4532	0.8979	1.7524	0.9353	1.5754	0.8939	1.3452	1.6404
85	1.3572	NA	0.5043	0.8727	NA	0.7897	0.6507	0.8871	1.2346	1.0025	NA	0.6575	1.2572
86	NA	NA	0.8635	1.2429	0.4520	0.9530	1.0669	0.8893	1.4036	NA	NA	1.2003	0.8581
87	1.0740	NA	0.2639	0.8827	1.5034	0.9417	0.5935	0.4853	0.5795	0.4952	NA	0.4821	NA
88	NA	1.2358	0.3975	0.9666	2.3237	0.7693	0.7320	NA	0.9515	1.2132	0.8225	1.4024	NA

TOTAL MORTALITY EXPLOITATION RATE INDEX BY STOCK							
Year	STP Age 3	STP Age 4	SUM Age 4	URB Age 3	URB Age 4	WSH Age 4	Fishery
79	NA	NA	NA	1.5992	1.5323	NA	0.9954
80	NA	NA	0.8588	1.2295	1.1284	1.8005	1.0436
81	1.0158	NA	1.1412	0.2338	0.8830	0.2975	0.8467
82	0.9842	1.0000	NA	0.9376	0.4563	0.9020	1.1096
83	1.3719	1.7870	NA	0.3085	0.3631	0.1739	1.2347
84	1.7717	2.0311	NA	0.7156	1.1148	0.7776	1.4698
85	0.8913	0.8123	NA	0.6913	0.9003	0.5934	0.9209
86	0.9931	0.7831	NA	1.2103	1.0877	NA	1.0231
87	1.3621	NA	0.3905	1.0118	0.9020	0.6191	0.7728
88	1.3731	2.1592	0.3315	0.4935	1.7794	0.6326	1.1431

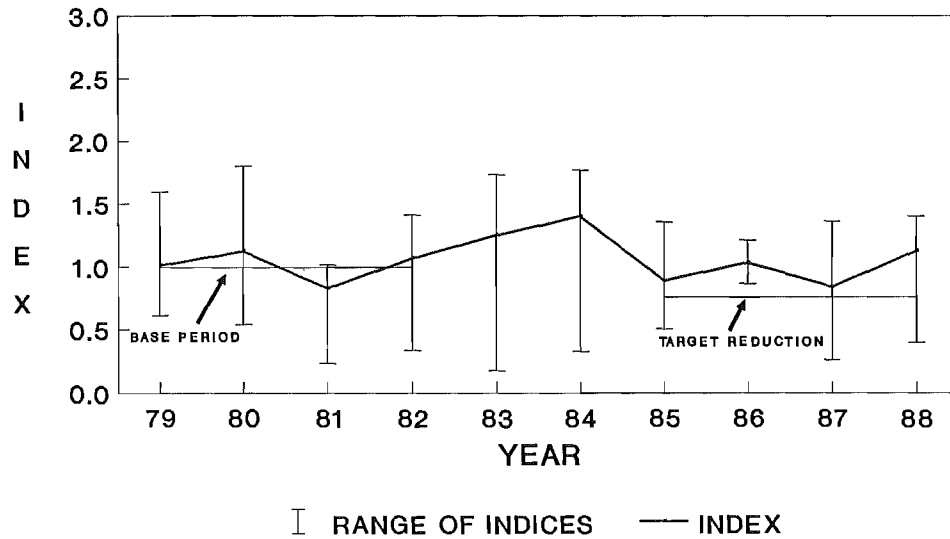
#### Stock Identifiers

BON = BONNEVILLE TULE  
 CWF = COWLITZ FALL TULE  
 LRW = LEWIS RIVER WILD  
 PSF = PUGET SOUND FINGERLING  
 PSY = PUGET SOUND YEARLING  
 RBT = ROBERTSON CREEK  
 SPR = SPRING CREEK TULE  
 STP = STAYTON POND TULE  
 SUM = COLUMBIA RIVER SUMMER  
 URB = COLUMBIA RIVER UPRIVER BRIGHT  
 WSH = WILLAMETTE SPRING

# FISHERY INDEX

## WEST COAST VANCOUVER ISLAND TROLL

### (AGE 3)



TOTAL MORTALITY EXPLOITATION RATE INDEX BY STOCK										
Year	BON Age 3	CWF Age 3	PSF Age 3	PSY Age 3	RBT Age 3	SPR Age 3	STP Age 3	URB Age 3	WSH Age 4	Fishery
79	1.1569	NA	NA	0.6139	1.1691	0.9760	NA	1.5992	NA	1.0137
80	0.5421	1.7859	NA	1.3565	1.4020	1.1937	NA	1.2295	1.8005	1.1262
81	0.8894	0.8783	0.6190	0.7846	0.6524	0.8923	1.0158	0.2338	0.2975	0.8326
82	1.4117	0.3358	1.3810	1.2450	0.7765	0.9381	0.9842	0.9376	0.9020	1.0698
83	1.7354	0.6514	1.5774	0.7466	0.3947	1.4777	1.3719	0.3085	0.1739	1.2534
84	1.3934	0.3263	1.4532	1.7524	1.5754	1.3452	1.7717	0.7156	0.7776	1.4017
85	1.3572	0.5043	0.7897	0.8871	1.0025	0.6575	0.8913	0.6913	0.5934	0.8910
86	NA	0.8635	0.9530	0.8893	NA	1.2003	0.9931	1.2103	NA	1.0312
87	1.0740	0.2639	0.9417	0.4853	0.4952	0.4821	1.3621	1.0118	0.6191	0.8400
88	NA	0.3975	0.7693	NA	1.2132	1.4024	1.3731	0.4935	0.6326	1.1264

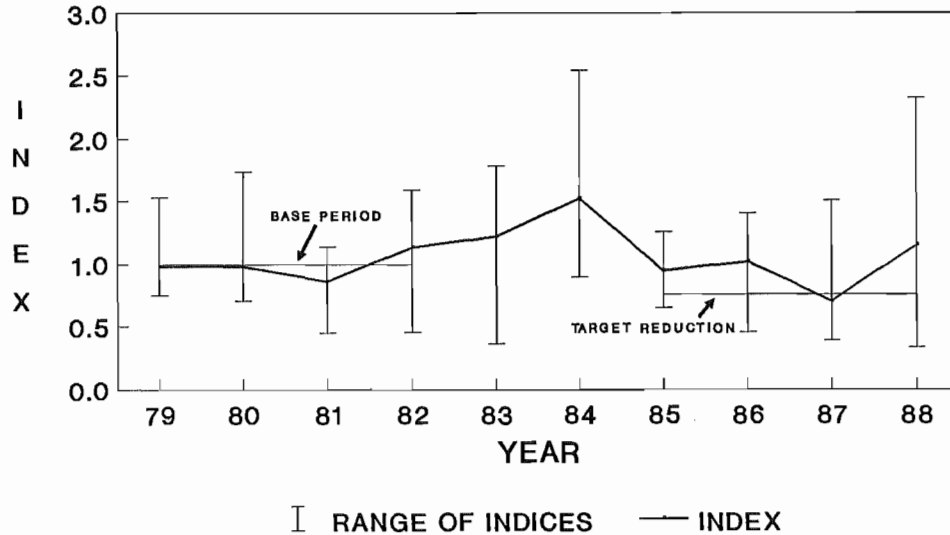
#### Stock Identifiers

BON = BONNEVILLE TULE  
 CWF = COWLITZ FALL TULE  
 PSF = PUGET SOUND FINGERLING  
 PSY = PUGET SOUND YEARLING  
 RBT = ROBERTSON CREEK  
 SPR = SPRING CREEK TULE  
 STP = STAYTON POND TULE  
 URB = COLUMBIA RIVER UPRIVER BRIGHT  
 WSH = WILLAMETTE SPRING

# FISHERY INDEX

## WEST COAST VANCOUVER ISLAND TROLL

### (AGE 4)



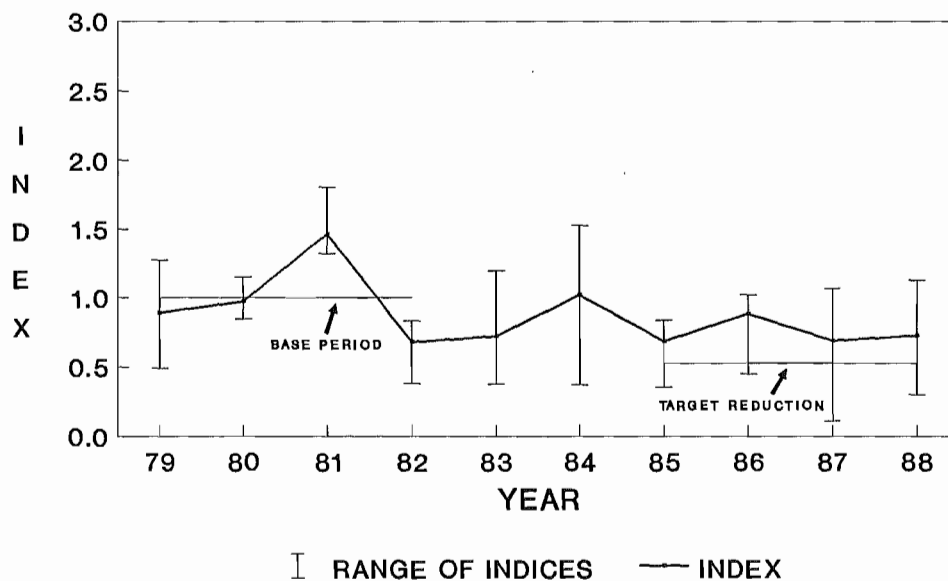
TOTAL MORTALITY EXPLOITATION RATE INDEX BY STOCK											
Year	BON Age 4	CWF Age 4	LRW Age 4	PSF Age 4	PSY Age 4	RBT Age 4	SPR Age 4	STP Age 4	SUM Age 4	URB Age 4	Fishery
79	NA	NA	NA	1.0015	0.9669	1.2318	0.7548	NA	NA	1.5323	0.9813
80	0.7079	NA	NA	NA	0.7609	1.7404	1.2897	NA	0.8588	1.1284	0.9814
81	0.7017	0.8263	0.8305	NA	1.0083	0.4492	0.8162	NA	1.1412	0.8830	0.8585
82	1.5904	1.1737	1.1695	0.9985	1.2640	0.5786	1.1393	1.0000	NA	0.4563	1.1365
83	1.4944	1.3511	0.9476	0.8268	1.2113	0.5894	1.3031	1.7870	NA	0.3631	1.2220
84	2.5434	1.3133	NA	0.8979	0.9353	0.8939	1.6404	2.0311	NA	1.1148	1.5186
85	NA	0.8727	NA	0.6507	1.2346	NA	1.2572	0.8123	NA	0.9003	0.9480
86	NA	1.2429	0.4520	1.0669	1.4036	NA	0.8581	0.7831	NA	1.0877	1.0182
87	NA	0.8827	1.5034	0.5935	0.5795	NA	NA	NA	0.3905	0.9020	0.7011
88	1.2358	0.9666	2.3237	0.7320	0.9515	0.8225	NA	2.1592	0.3315	1.7794	1.1510

#### Stock Identifiers

BON = BONNEVILLE TULE  
 CWF = COWLITZ FALL TULE  
 LRW = LEWIS RIVER WILD  
 PSF = PUGET SOUND FINGERLING  
 PSY = PUGET SOUND YEARLING  
 RBT = ROBERTSON CREEK  
 SPR = SPRING CREEK TULE  
 STP = STAYTON POND TULE  
 SUM = COLUMBIA RIVER SUMMER  
 URB = COLUMBIA RIVER UPRIVER BRIGHT

# FISHERY INDEX

## GEORGIA STRAIT TROLL & SPORT (ALL AGES)



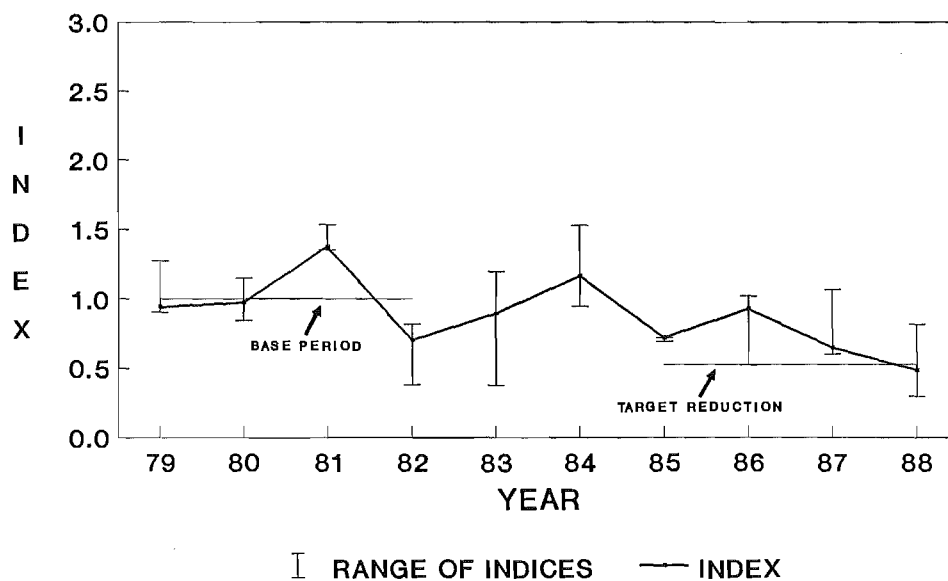
TOTAL MORTALITY EXPLOITATION RATE INDEX BY STOCK									
	BQR	BQR	CAP	CAP	PSF	PSF	PSY	QUI	
Year	Age 3	Age 4	Age 3	Age 4	Age 3	Age 4	Age 3	Age 5	Fishery
79	0.9049	0.6396	0.9413	1.0333	NA	1.1702	1.2723	0.4913	0.8900
80	1.1496	1.0494	0.8787	0.9321	NA	NA	0.8463	NA	0.9746
81	1.3526	1.8036	1.3631	1.3211	1.5329	NA	1.4994	1.7729	1.4627
82	0.5929	0.5074	0.8168	0.7135	0.4671	0.8298	0.3820	0.7358	0.6793
83	1.1961	0.7603	0.7829	0.5027	0.3735	0.5730	0.8587	0.4457	0.7235
84	1.5281	NA	0.9443	0.9907	0.9963	0.6915	1.5160	0.3722	1.0222
85	0.7213	0.4650	0.7196	0.8366	NA	0.7289	0.6937	0.3535	0.6824
86	1.0190	0.7742	0.9021	0.9879	NA	NA	0.5236	0.4488	0.8814
87	0.6024	0.9772	0.6000	0.7339	1.0675	NA	1.0410	0.1107	0.6890
88	0.8167	0.8203	0.2994	1.1281	0.4279	NA	NA	0.4142	0.7245

### Stock Identifiers

BQR = BIG QUALICUM  
 CAP = CAPILANO  
 PSF = PUGET SOUND FINGERLING  
 PSY = PUGET SOUND YEARLING  
 QUI = QUINSAM

# FISHERY INDEX

## GEORGIA STRAIT TROLL & SPORT (AGE 3)



### TOTAL MORTALITY EXPLOITATION RATE INDEX BY STOCK

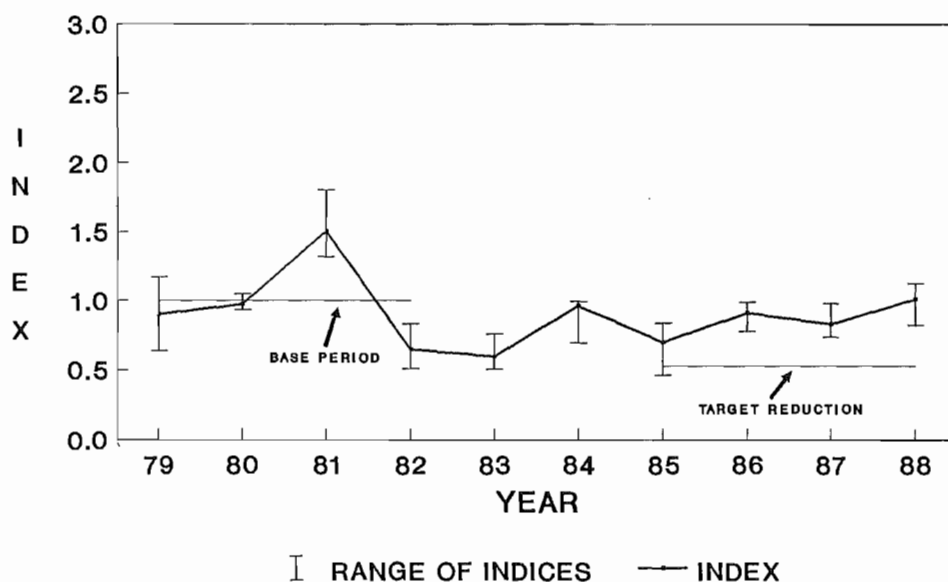
Year	BQR Age 3	CAP Age 3	PSF Age 3	PSY Age 3	Fishery
79	0.9049	0.9413	NA	1.2723	0.9428
80	1.1496	0.8787	NA	0.8463	0.9730
81	1.3526	1.3631	1.5329	1.4994	1.3762
82	0.5929	0.8168	0.4671	0.3820	0.7025
83	1.1961	0.7829	0.3735	0.8587	0.8961
84	1.5281	0.9443	0.9963	1.5160	1.1639
85	0.7213	0.7196	NA	0.6937	0.7191
86	1.0190	0.9021	NA	0.5236	0.9270
87	0.6024	0.6000	1.0675	1.0410	0.6490
88	0.8167	0.2994	0.4279	NA	0.4863

### Stock Identifiers

BQR = BIG QUALICUM  
 CAP = CAPILANO  
 PSF = PUGET SOUND FINGERLING  
 PSY = PUGET SOUND YEARLING

# FISHERY INDEX

## GEORGIA STRAIT TROLL & SPORT (AGE 4)



### TOTAL MORTALITY EXPLOITATION RATE INDEX BY STOCK

Year	BQR Age 4	CAP Age 4	PSF Age 4	Fishery
79	0.6396	1.0333	1.1702	0.9030
80	1.0494	0.9321	NA	0.9761
81	1.8036	1.3211	NA	1.5019
82	0.5074	0.7135	0.8298	0.6480
83	0.7603	0.5027	0.5730	0.5976
84	NA	0.9907	0.6915	0.9628
85	0.4650	0.8366	0.7289	0.6993
86	0.7742	0.9879	NA	0.9078
87	0.9772	0.7339	NA	0.8251
88	0.8203	1.1281	NA	1.0128

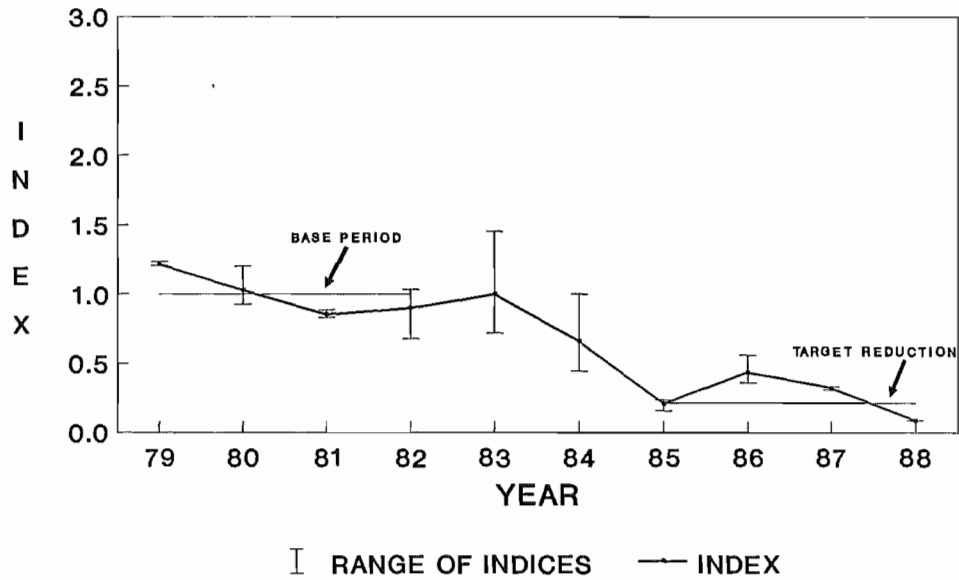
### Stock Identifiers

BQR = BIG QUALICUM  
 CAP = CAPILANO  
 PSF = PUGET SOUND FINGERLING



# FISHERY INDEX

## GEORGIA STRAIT TROLL (ALL AGES)



### TOTAL MORTALITY EXPLOITATION RATE INDEX BY STOCK

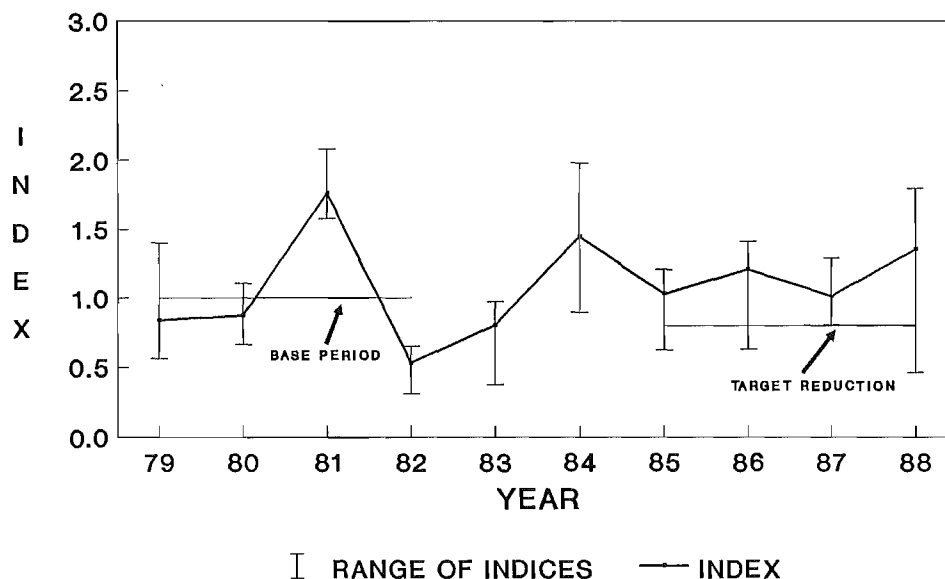
Year	BQR	CAP	Fishery
	Age 3	Age 3	
79	1.2327	1.2053	1.2158
80	1.1982	0.9273	1.0316
81	0.8874	0.8323	0.8535
82	0.6817	1.0351	0.8990
83	1.4529	0.7189	1.0016
84	1.0026	0.4439	0.6591
85	0.1541	0.2344	0.2035
86	0.5619	0.3562	0.4354
87	0.3055	0.3305	0.3209
88	0.0870	NA	0.0870

### Stock Identifiers

BQR = BIG QUALICUM  
CAP = CAPILANO

# FISHERY INDEX

## GEORGIA STRAIT SPORT (ALL AGES)



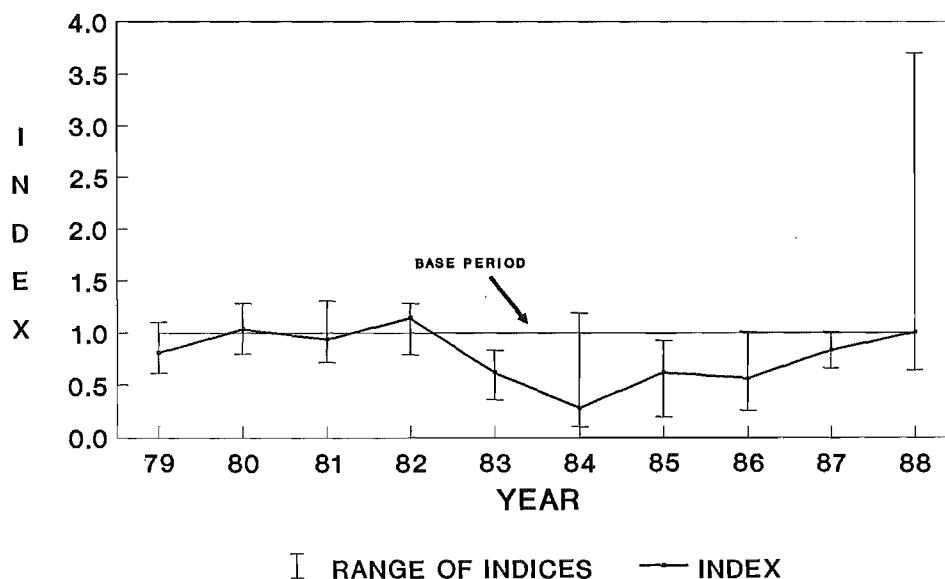
TOTAL MORTALITY EXPLOITATION RATE INDEX BY STOCK								
Year	BQR Age 3	BQR Age 4	CAP Age 3	CAP Age 4	PSF Age 3	PSF Age 4	PSY Age 3	Fishery
79	0.6240	0.5644	0.7409	1.1430	NA	1.4024	0.9869	0.8402
80	1.1079	1.0437	0.8418	0.6671	NA	NA	0.9096	0.8739
81	1.7513	2.0794	1.7663	1.5777	1.5833	NA	1.6646	1.7630
82	0.5168	0.3124	0.6510	0.6122	0.4167	0.5976	0.4389	0.5317
83	0.9759	0.8066	0.8315	0.7984	0.3779	0.6732	0.6712	0.8060
84	1.9784	NA	1.3244	1.4361	0.8981	0.9648	1.6119	1.4499
85	1.2075	0.6225	1.0881	1.2091	NA	0.9246	0.8359	1.0276
86	1.4107	1.0215	1.3167	1.2030	NA	NA	0.6310	1.2074
87	0.8568	1.2905	0.8047	1.0442	1.1702	NA	0.8855	1.0105
88	1.4421	0.8855	NA	1.7918	0.4626	NA	NA	1.3571

### Stock Identifiers

BQR = BIG QUALICUM  
 CAP = CAPILANO  
 PSF = PUGET SOUND FINGERLING  
 PSY = PUGET SOUND YEARLING

# FISHERY INDEX

## WA/OR TROLL & WA SPORT (ALL AGES)



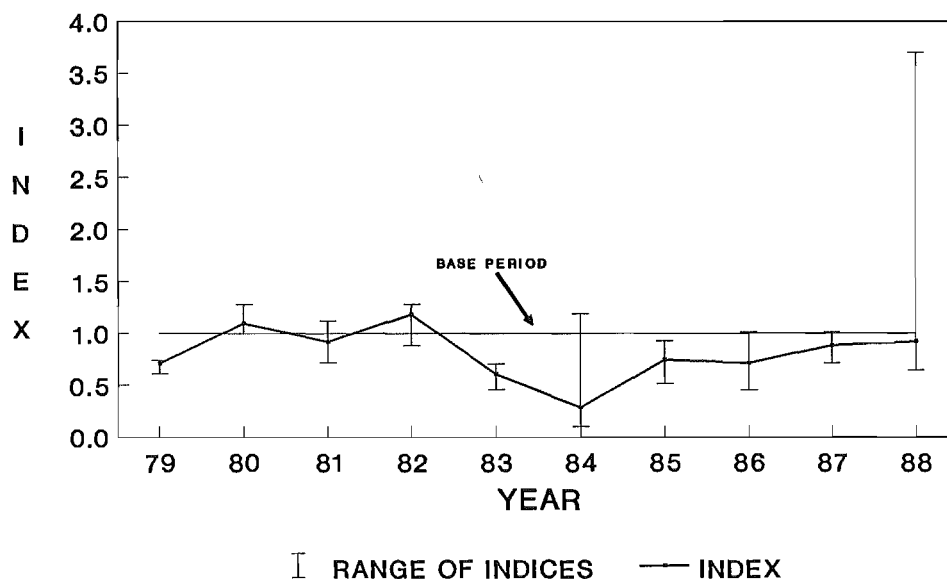
TOTAL MORTALITY EXPLOITATION RATE INDEX BY STOCK											
Year	BON Age 3	CWF Age 3	CWF Age 4	PSF Age 3	PSF Age 4	PSY Age 3	SPR Age 3	SPR Age 4	STP Age 3	STP Age 4	Fishery
79	0.7404	NA	NA	NA	0.8117	0.6109	0.6927	1.1035	NA	NA	0.8061
80	1.1513	0.9984	NA	NA	NA	1.2806	1.0863	0.7977	NA	NA	1.0337
81	1.1227	0.7610	0.7520	1.1168	NA	0.9980	1.0068	1.3074	0.7188	NA	0.9370
82	0.9857	1.2406	1.2480	0.8832	1.1883	1.1105	1.2142	0.7914	1.2812	1.0000	1.1376
83	0.6997	0.5919	0.8330	0.6728	0.7530	0.6648	0.4551	0.3578	0.7037	NA	0.6190
84	0.4422	0.1046	0.1985	1.1860	0.6977	0.2903	0.2994	NA	0.2096	NA	0.2812
85	0.9220	0.6127	0.1913	NA	0.4750	0.5161	0.6401	NA	0.7952	NA	0.6181
86	NA	1.0100	0.2558	NA	NA	NA	0.4540	0.4254	0.8397	NA	0.5654
87	0.9180	0.7112	0.6598	NA	NA	0.7708	1.0098	NA	0.8079	NA	0.8343
88	NA	0.7742	0.8043	3.7008	NA	NA	0.6430	NA	1.2044	2.7995	1.0072

### Stock Identifiers

BON = BONNEVILLE TULE  
 CWF = COWLITZ FALL TULE  
 PSF = PUGET SOUND FINGERLING  
 PSY = PUGET SOUND YEARLING  
 SPR = SPRING CREEK TULE  
 STP = STAYTON POND TULE

# FISHERY INDEX

## WA/OR TROLL & WA SPORT (AGE 3)



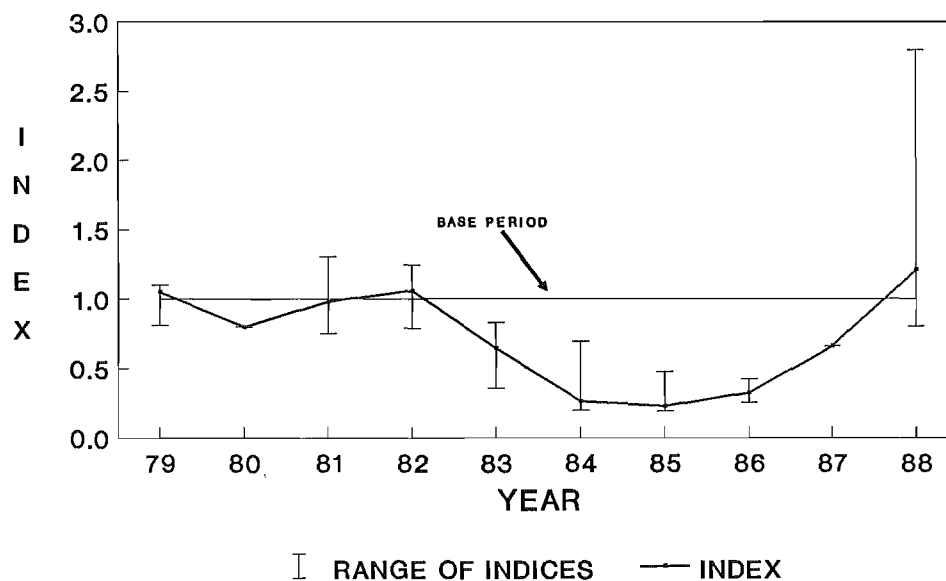
TOTAL MORTALITY EXPLOITATION RATE INDEX BY STOCK							
	BON	CWF	PSF	PSY	SPR	STP	
Year	Age 3	Age 3	Age 3	Age 3	Age 3	Age 3	Fishery
79	0.7404	NA	NA	0.6109	0.6927	NA	0.7070
80	1.1513	0.9984	NA	1.2806	1.0863	NA	1.0954
81	1.1227	0.7610	1.1168	0.9980	1.0068	0.7188	0.9165
82	0.9857	1.2406	0.8832	1.1105	1.2142	1.2812	1.1803
83	0.6997	0.5919	0.6728	0.6648	0.4551	0.7037	0.6059
84	0.4422	0.1046	1.1860	0.2903	0.2994	0.2096	0.2857
85	0.9220	0.6127	NA	0.5161	0.6401	0.7952	0.7375
86	NA	1.0100	NA	NA	0.4540	0.8397	0.7103
87	0.9180	0.7112	NA	0.7708	1.0098	0.8079	0.8808
88	NA	0.7742	3.7008	NA	0.6430	1.2044	0.9186

### Stock Identifiers

BON = BONNEVILLE TULE  
 CWF = COWLITZ FALL TULE  
 PSF = PUGET SOUND FINGERLING  
 PSY = PUGET SOUND YEARLING  
 SPR = SPRING CREEK TULE  
 STP = STAYTON POND TULE

# FISHERY INDEX

## WA/OR TROLL & WA SPORT (AGE 4)



TOTAL MORTALITY EXPLOITATION RATE INDEX BY STOCK					
	CWF	PSF	SPR	STP	
Year	Age 4	Age 4	Age 4	Age 4	Fishery
79	NA	0.8117	1.1035	NA	1.0507
80	NA	NA	0.7977	NA	0.7977
81	0.7520	NA	1.3074	NA	0.9826
82	1.2480	1.1883	0.7914	1.0000	1.0610
83	0.8330	0.7530	0.3578	NA	0.6456
84	0.1985	0.6977	NA	NA	0.2662
85	0.1913	0.4750	NA	NA	0.2298
86	0.2558	NA	0.4254	NA	0.3262
87	0.6598	NA	NA	NA	0.6598
88	0.8043	NA	NA	2.7995	1.2094

### Stock Identifiers

CWF = COWLITZ FALL TULE  
 PSF = PUGET SOUND FINGERLING  
 SPR = SPRING CREEK TULE  
 STP = STAYTON POND TULE

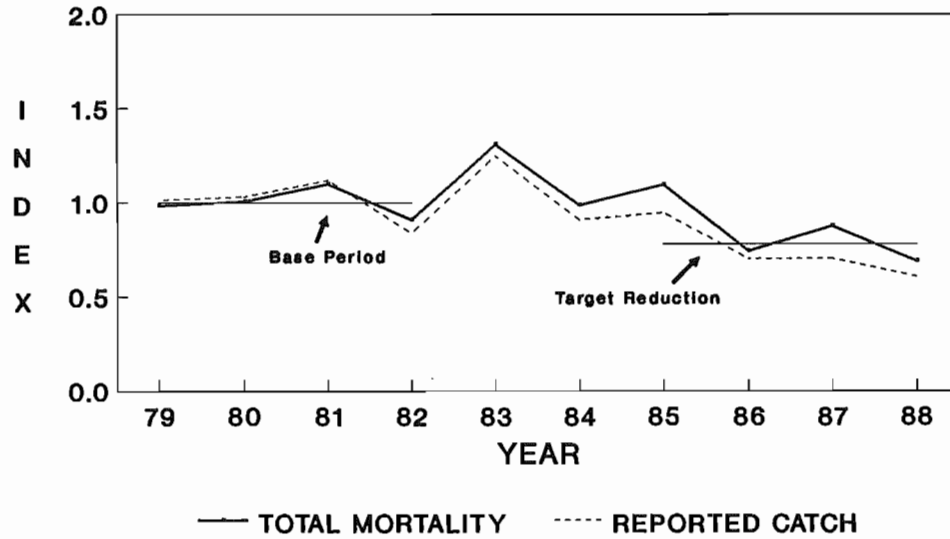
## **SECTION 5.2   FISHERY INDEX FIGURES - COMPARISON OF TOTAL MORTALITY AND REPORTED CATCH INDICES**

Total Mortality and Reported Catch. S.E. Alaska Troll  
Total Mortality and Reported Catch. WCVI Troll (All Ages)  
Total Mortality and Reported Catch. WCVI Troll (Age 3)  
Total Mortality and Reported Catch. WCVI Troll (Age 4)

# FISHERY INDEX

## TOTAL MORTALITY & REPORTED CATCH

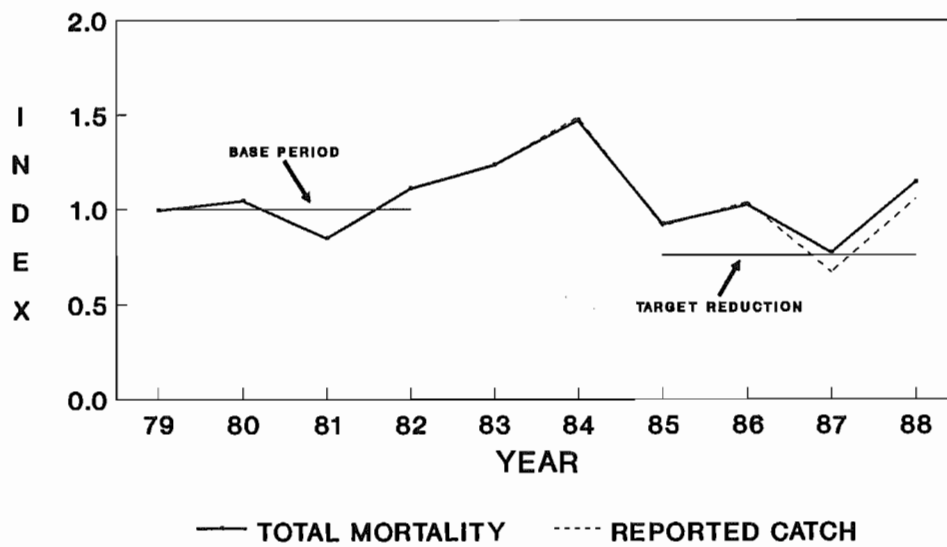
### ALASKA TROLL (ALL AGES)



# FISHERY INDEX

## TOTAL MORTALITY & REPORTED CATCH

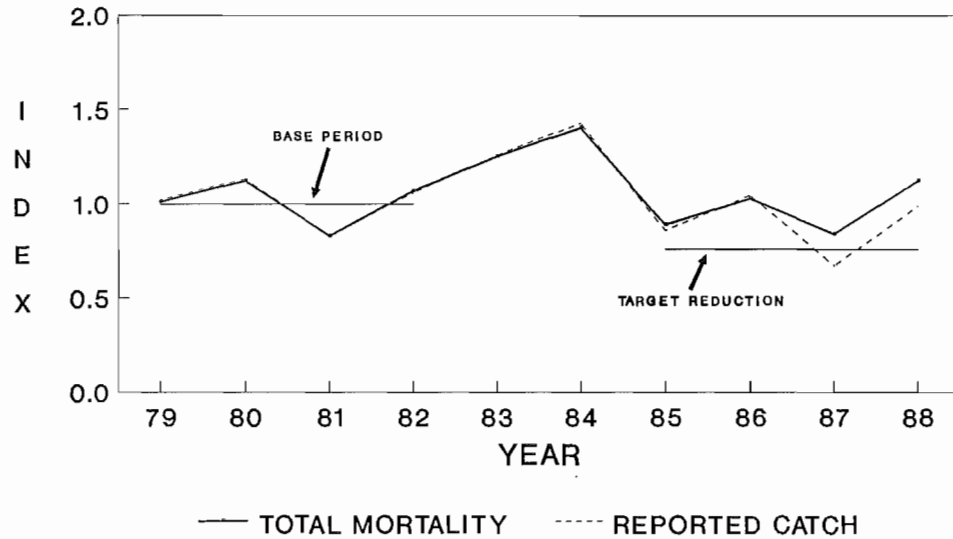
### WCVI TROLL (ALL AGES)



# FISHERY INDEX

## TOTAL MORTALITY & REPORTED CATCH

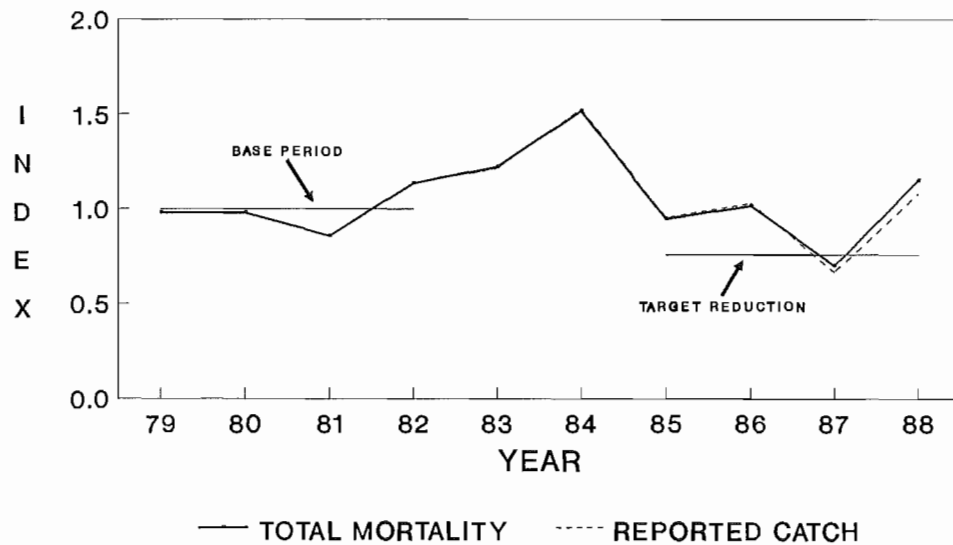
### WCVI TROLL (AGE 3)



# FISHERY INDEX

## TOTAL MORTALITY & REPORTED CATCH

### WCVI TROLL (AGE 4)





## SECTION 6. STOCK INDEX FIGURES

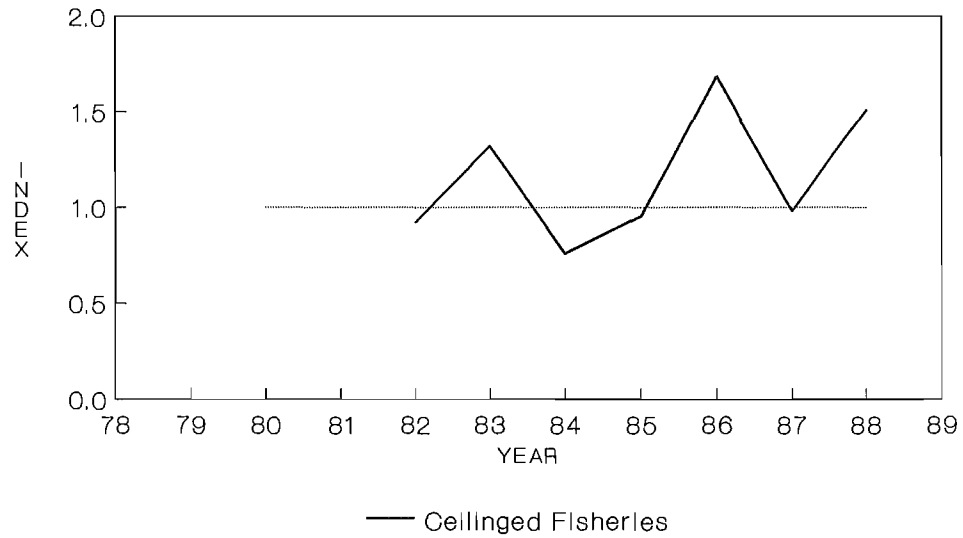
### Stock Index

Alaska Spring (Age 4)  
Alaska Spring (Age 5)  
Robertson Creek  
Quinsam  
Big Qualicum  
Capilano  
Puget Sound Fingerling  
Puget Sound Yearling  
Cowlitz Fall  
Spring Creek Tule  
Bonneville Tule  
Stayton Pond Tule  
Columbia River Upriver Bright  
Lewis River Fall  
Columbia River Summer  
Willamette Spring

### Age-Specific Stock Indices

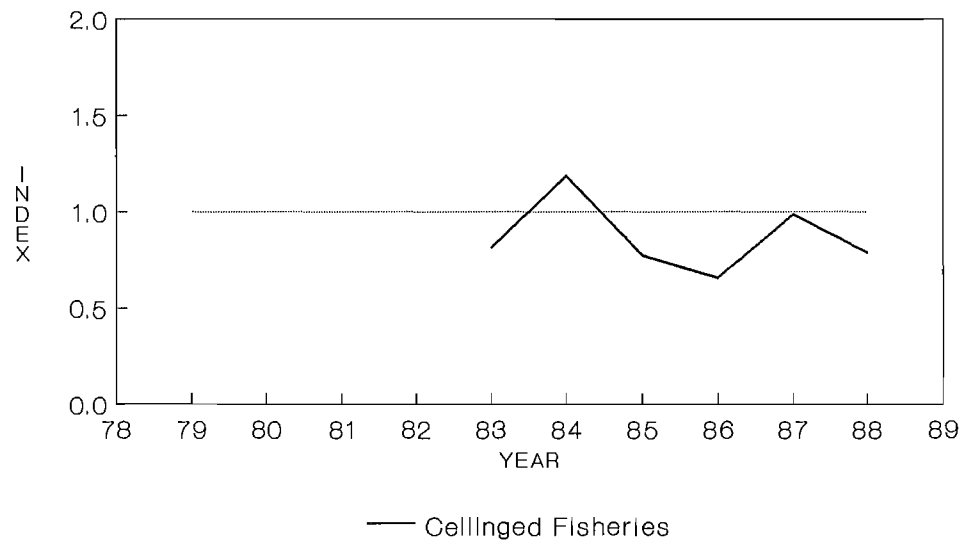
Robertson Creek (Age 3)  
Robertson Creek (Age 4)  
Robertson Creek (Age 5)  
Quinsam (Age 3)  
Quinsam (Age 4)  
Quinsam (Age 5)  
Big Qualicum (Age 3)  
Big Qualicum (Age 4)  
Capilano (Age 3)  
Capilano (Age 4)  
Puget Sound Fingerling (Age 3)  
Puget Sound Fingerling (Age 4)  
Puget Sound Yearling (Age 3)  
Puget Sound Yearling (Age 4)  
Cowlitz Fall (Age 3)  
Cowlitz Fall (Age 4)  
Spring Creek Tule (Age 3)  
Spring Creek Tule (Age 4)  
Bonneville Tule (Age 3)  
Bonneville Tule (Age 4)  
Stayton Pond (Age 3)  
Stayton Pond (Age 4)  
Columbia River Upriver Bright (Age 3)  
Columbia River Upriver Bright (Age 4)  
Columbia River Upriver Bright (Age 5)  
Lewis River (Age 3)  
Lewis River (Age 4)  
Lewis River (Age 5)  
Columbia River Summer (Age 3)  
Columbia River Summer (Age 4)  
Columbia River Summer (Age 5)  
Willamette Spring (Age 4)  
Willamette Spring (Age 5)

**STOCK INDEX**  
**ALASKA SPRING AGE 4**



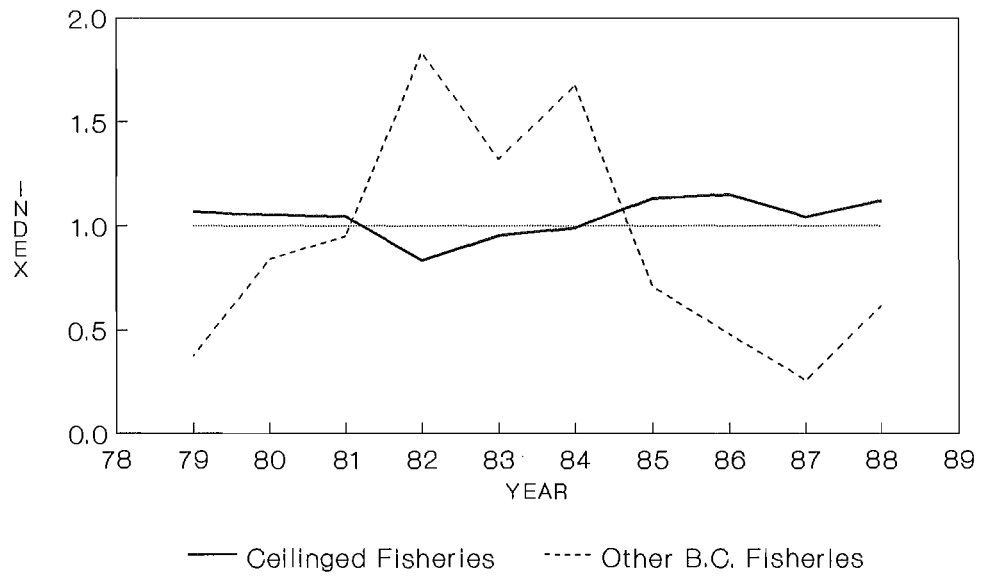
TOTAL MORTALITY  
\* NOTE BASE PERIOD USED IS 82-84

**STOCK INDEX**  
**ALASKA SPRING AGE 5**



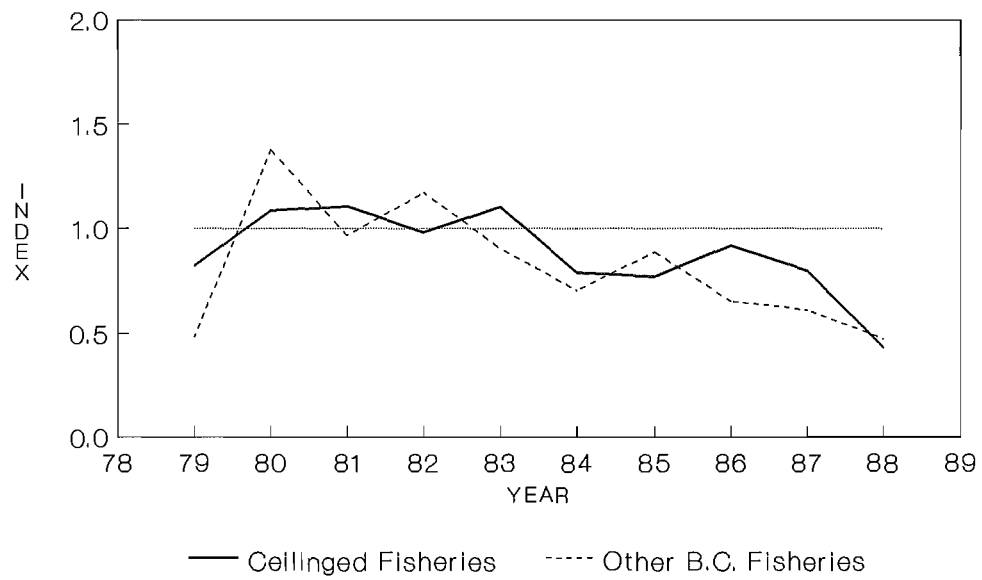
TOTAL MORTALITY  
\* NOTE BASE PERIOD USED IS 83-84

**STOCK INDEX**  
**ROBERTSON CREEK AGES 3-5**



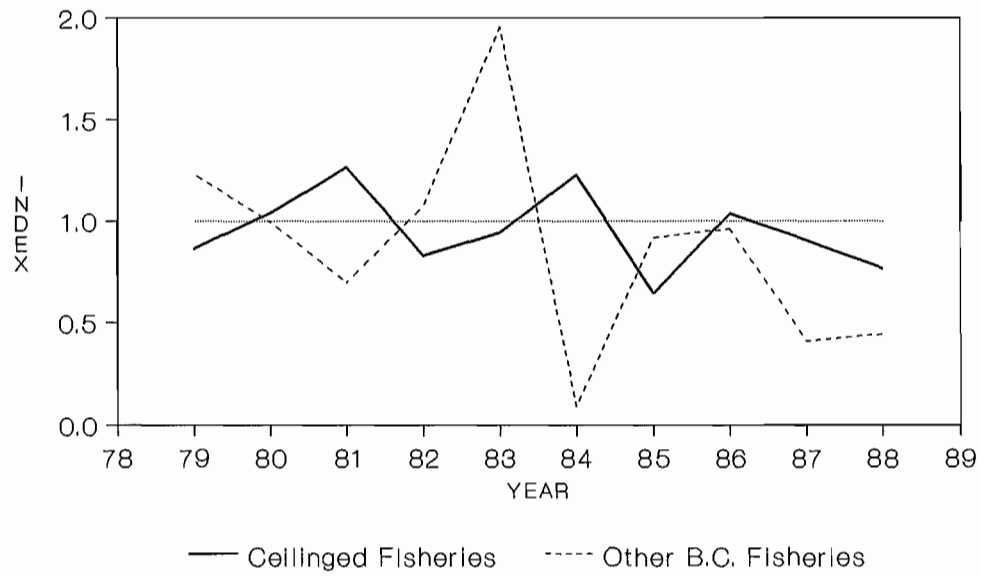
TOTAL MORTALITY

**STOCK INDEX**  
**QUINSAM AGES 3-5**



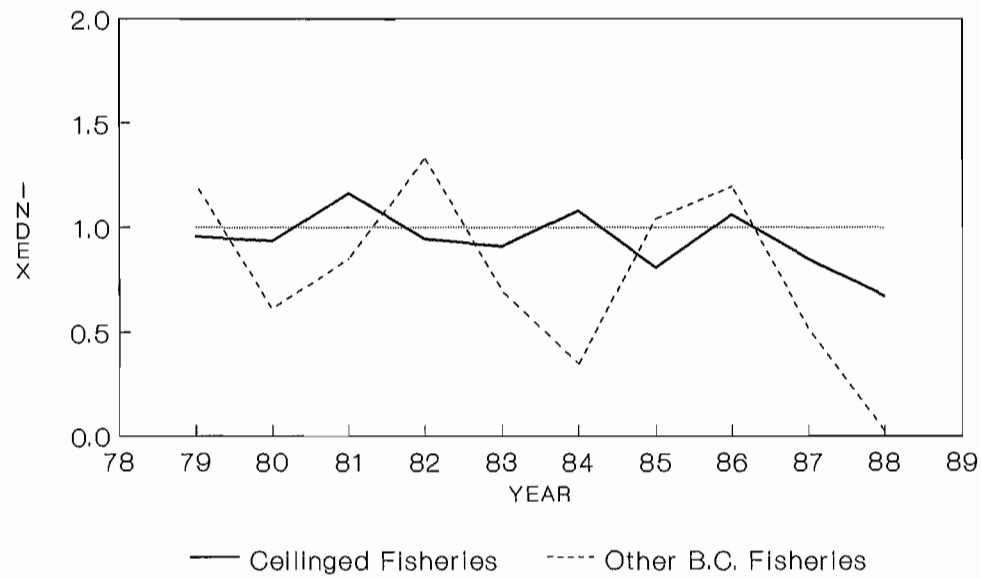
TOTAL MORTALITY

**STOCK INDEX**  
**BIG QUALICUM AGE 3-4**

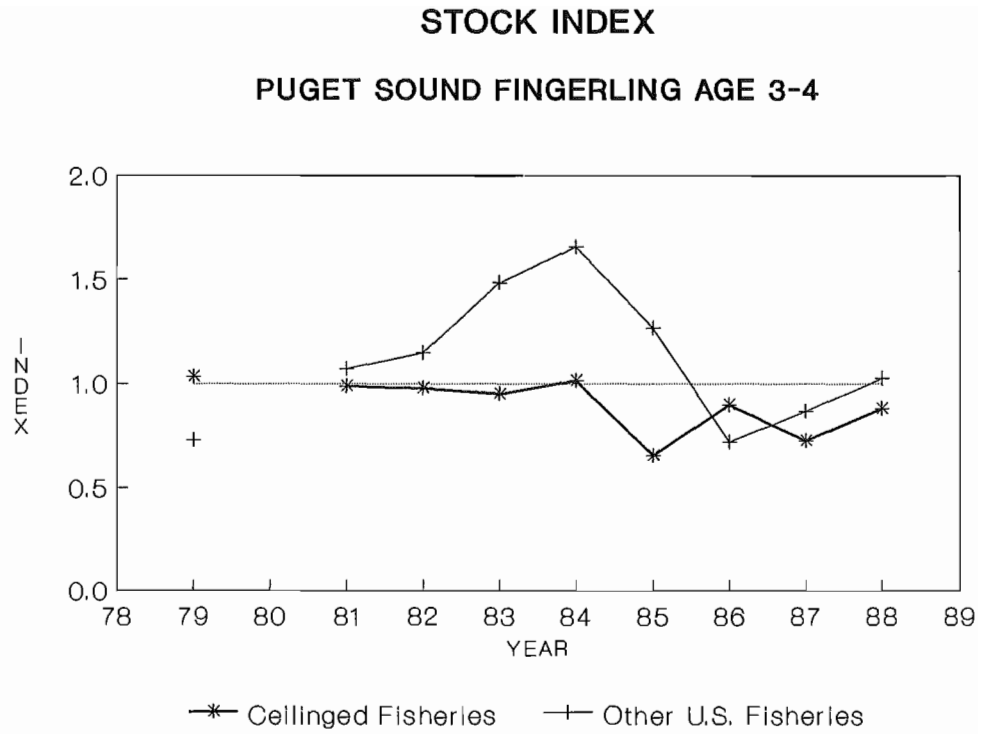


TOTAL MORTALITY

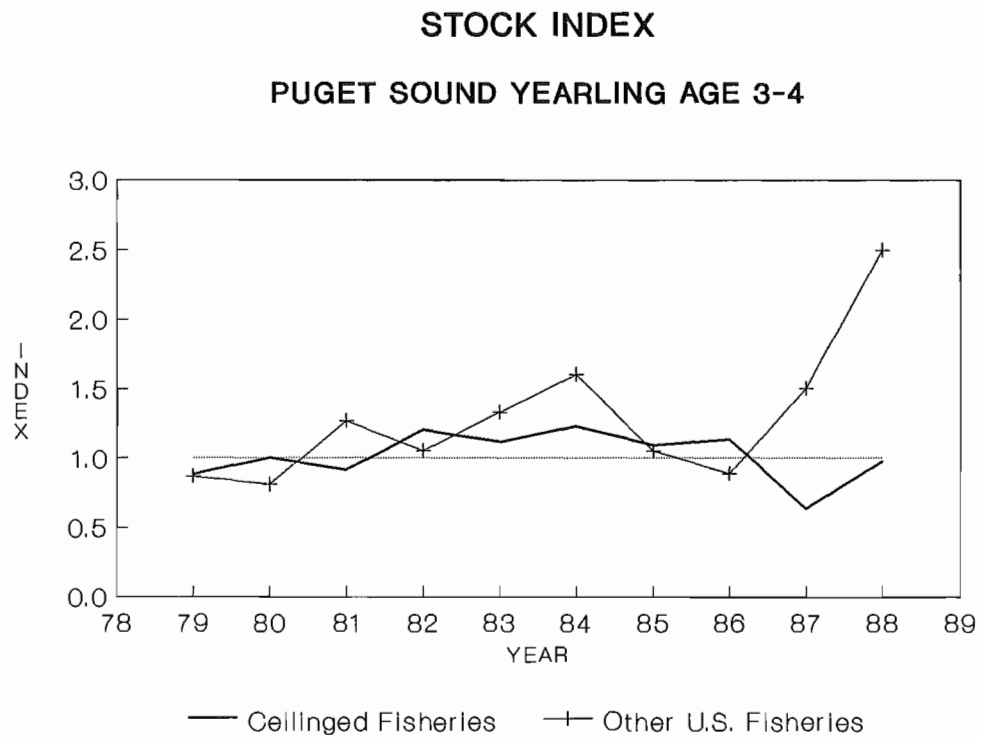
**STOCK INDEX**  
**CAPILANO AGE 3-4**



TOTAL MORTALITY



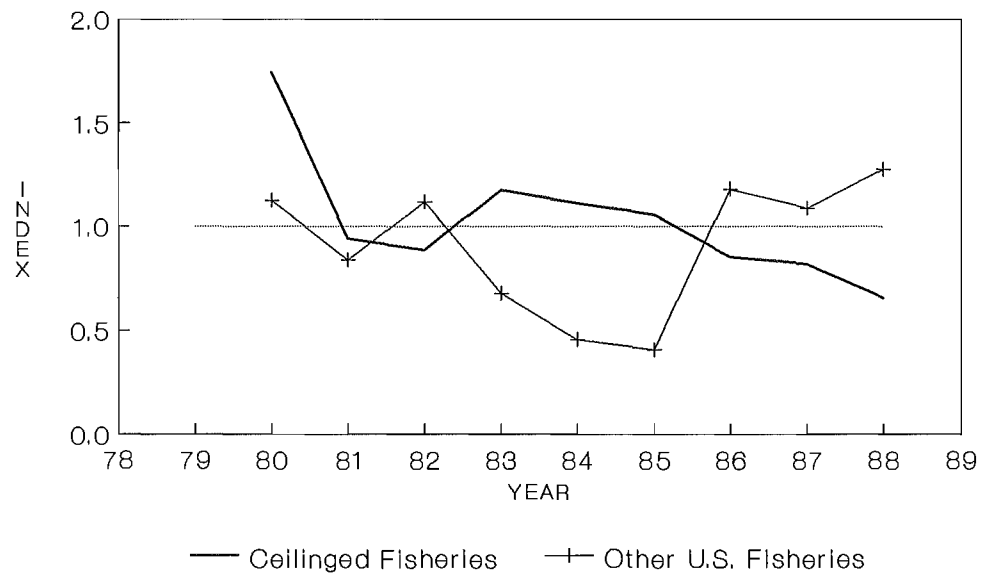
TOTAL MORTALITY



TOTAL MORTALITY

# STOCK INDEX

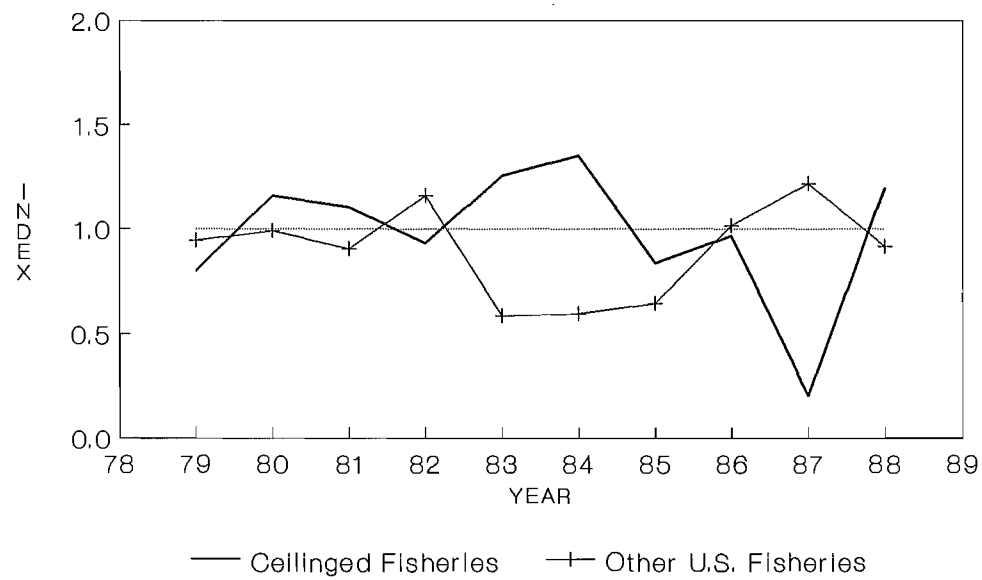
## COWLITZ FALL AGE 3-4



TOTAL MORTALITY

# STOCK INDEX

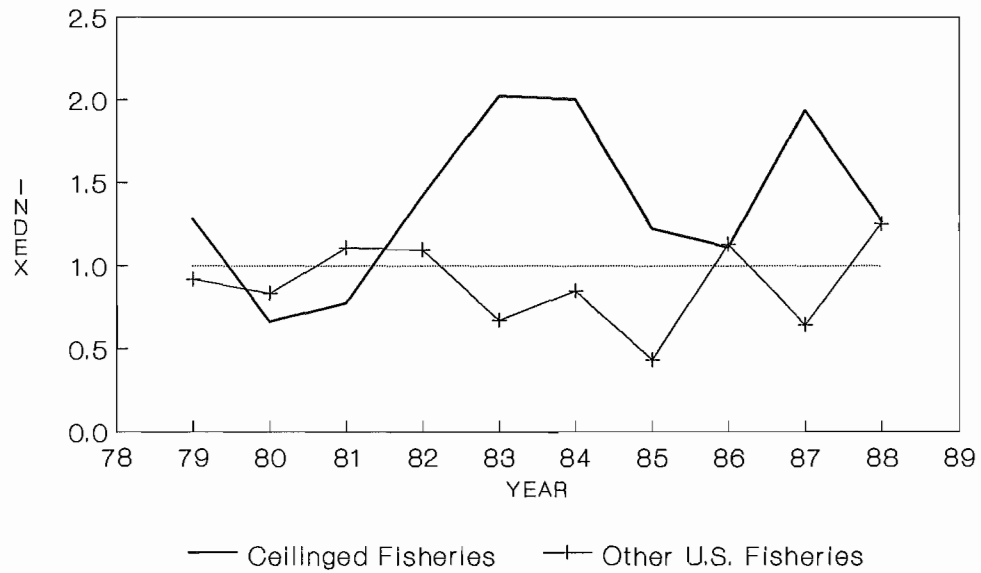
## SPRING CREEK TULE AGE 3-4



TOTAL MORTALITY

# STOCK INDEX

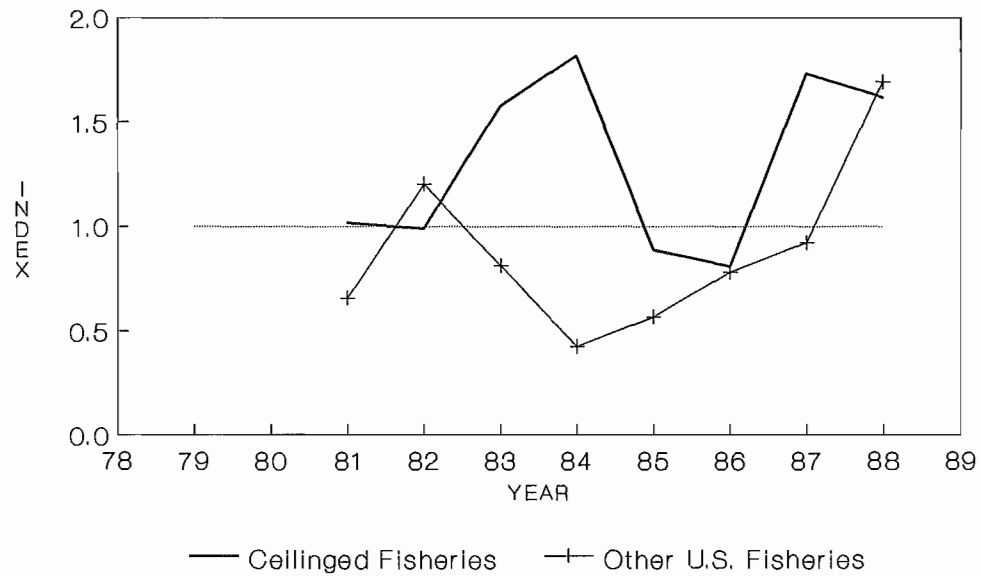
## BONNEVILLE TULE AGE 3-4



TOTAL MORTALITY

# STOCK INDEX

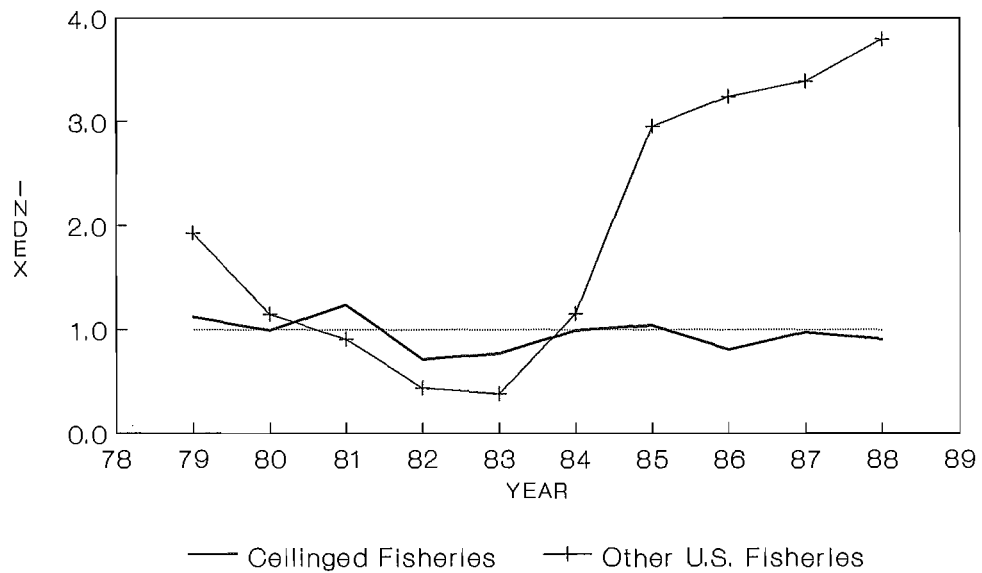
## STAYTON POND AGE 3-4



TOTAL MORTALITY

# STOCK INDEX

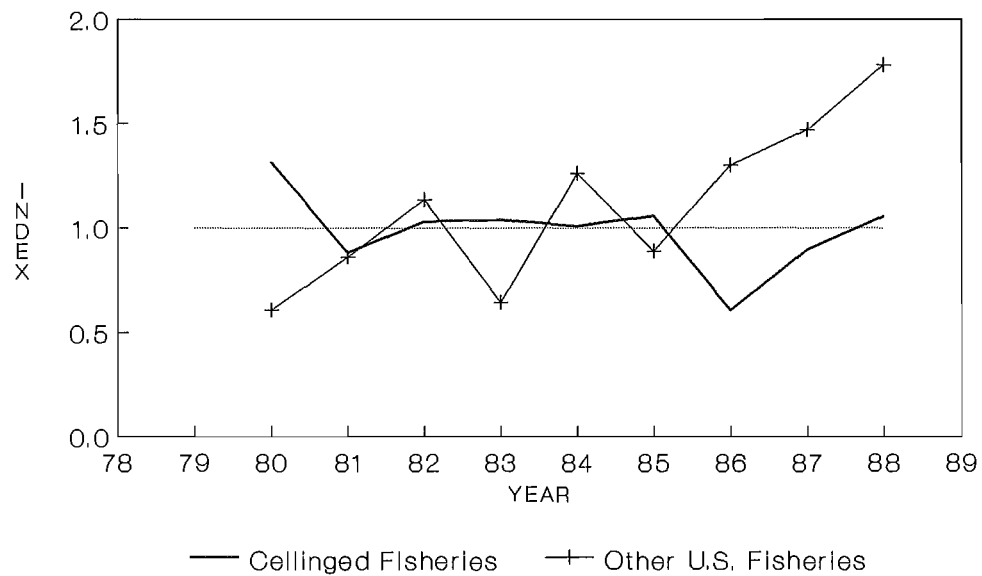
## COLUMBIA UPRIVER BRIGHT AGES 3-5



TOTAL MORTALITY

# STOCK INDEX

## LEWIS RIVER FALL AGES 3-5

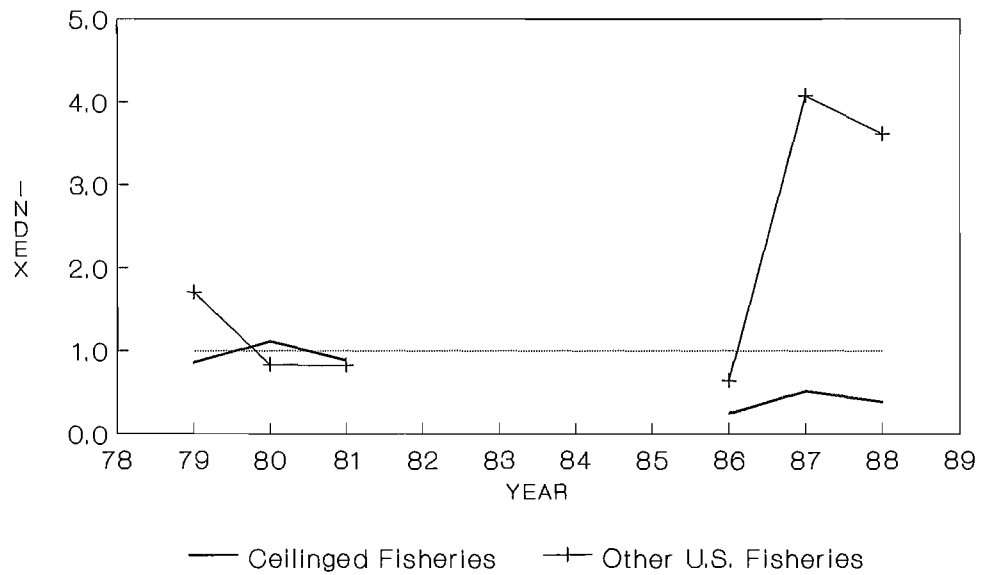


TOTAL MORTALITY



# STOCK INDEX

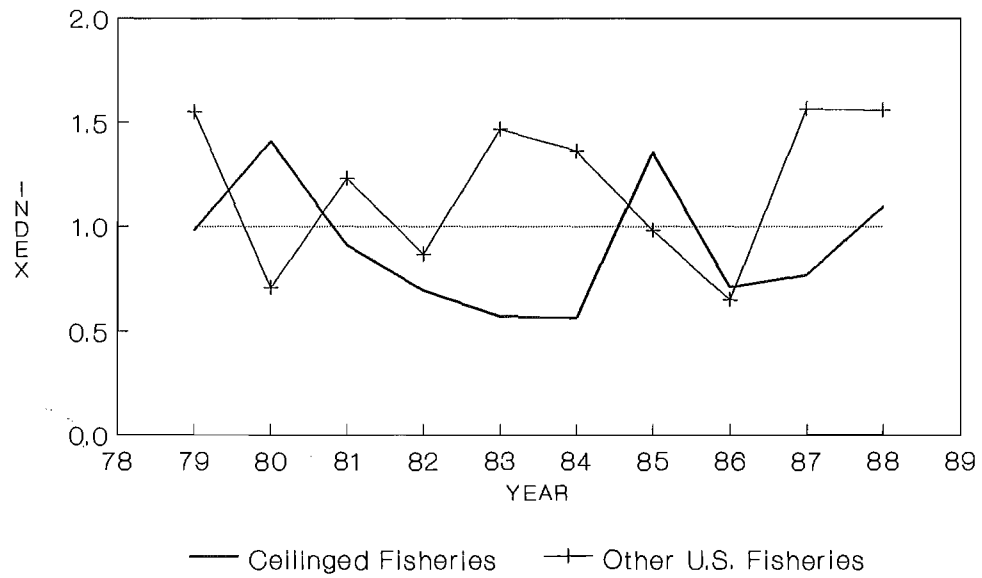
## COLUMBIA RIVER SUMMER AGE 3-4



TOTAL MORTALITY

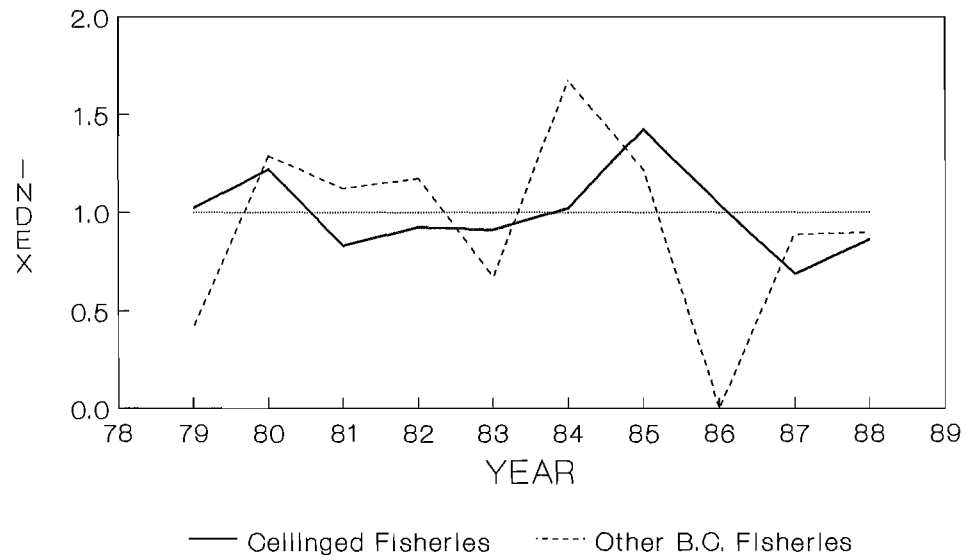
# STOCK INDEX

## WILLAMETTE SPRING AGE 4-5



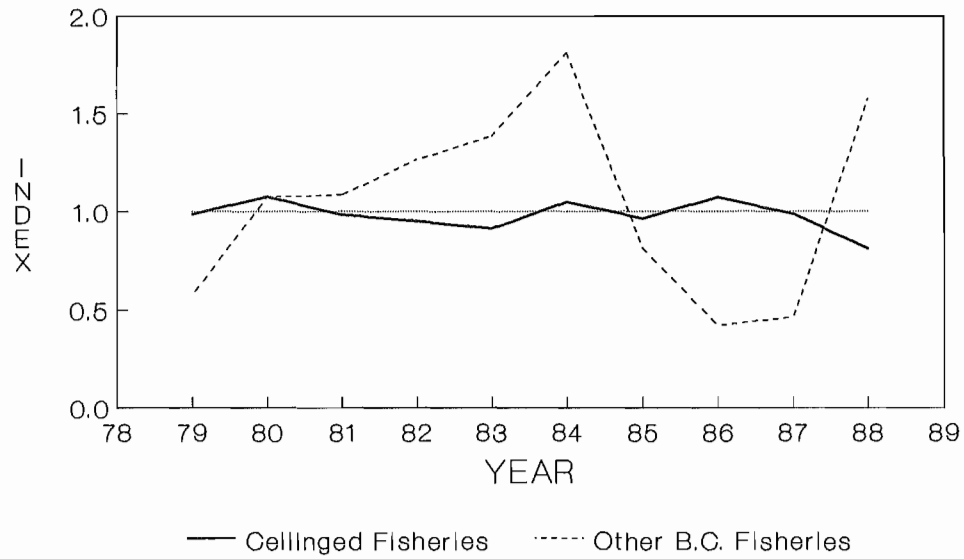
TOTAL MORTALITY

**STOCK INDEX**  
**ROBERTSON CREEK AGE 3**



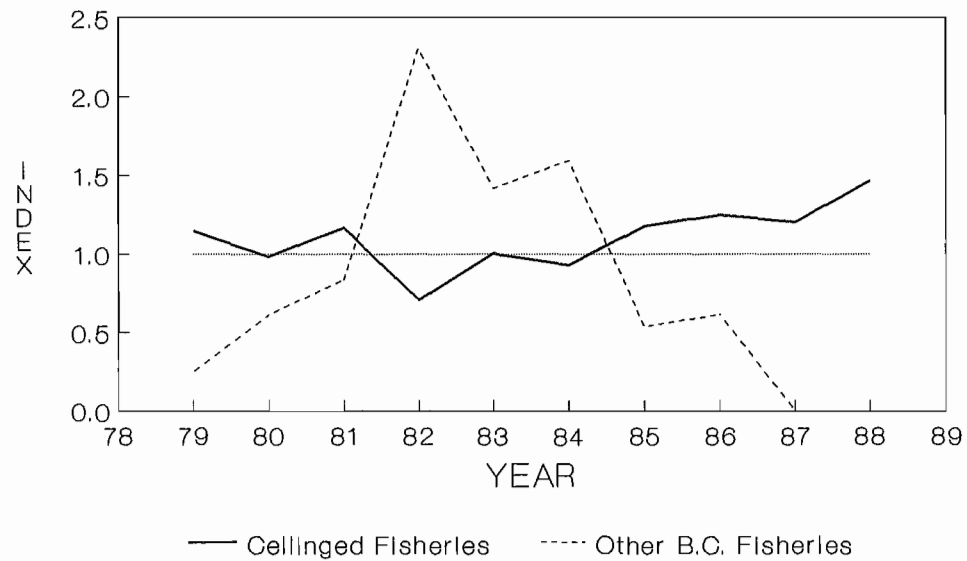
TOTAL MORTALITY

**STOCK INDEX**  
**ROBERTSON CREEK AGE 4**



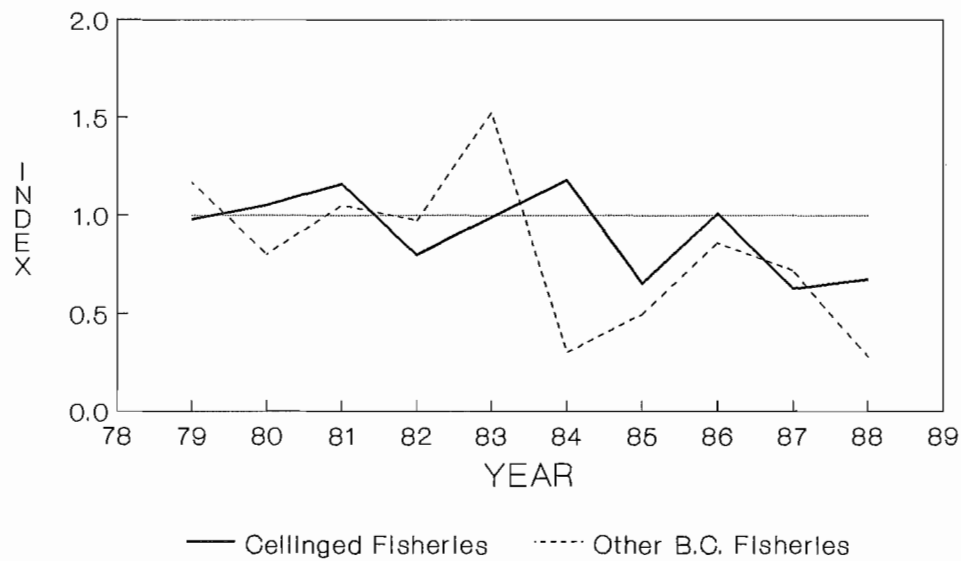
TOTAL MORTALITY

**STOCK INDEX**  
**ROBERTSON CREEK AGE 5**



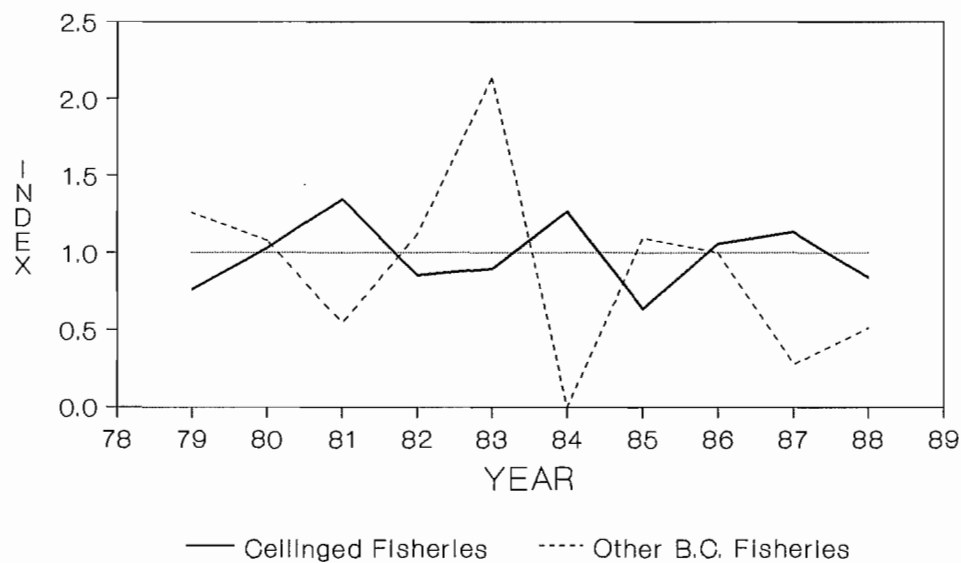
TOTAL MORTALITY

# **STOCK INDEX** **BIG QUALICUM AGE 3**



TOTAL MORTALITY

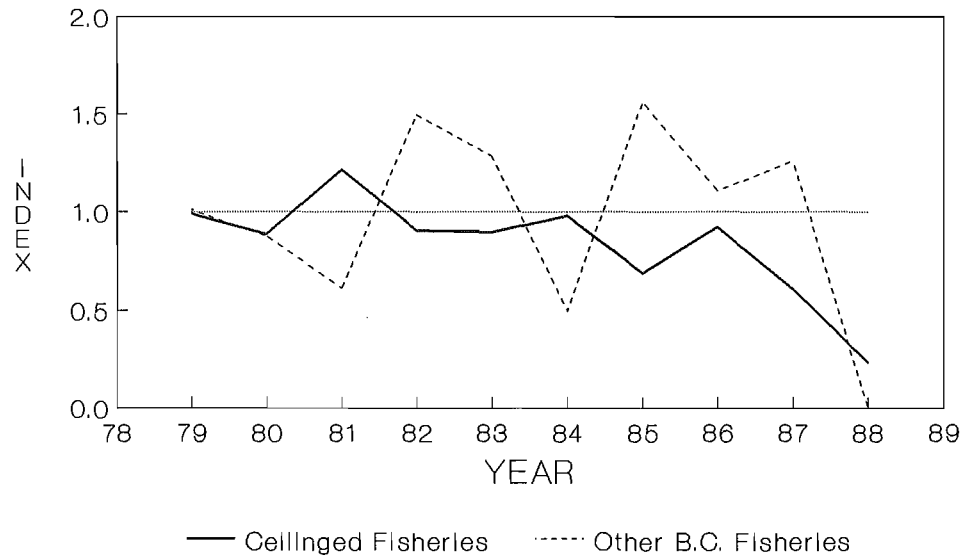
# **STOCK INDEX** **BIG QUALICUM AGE 4**



TOTAL MORTALITY

# STOCK INDEX

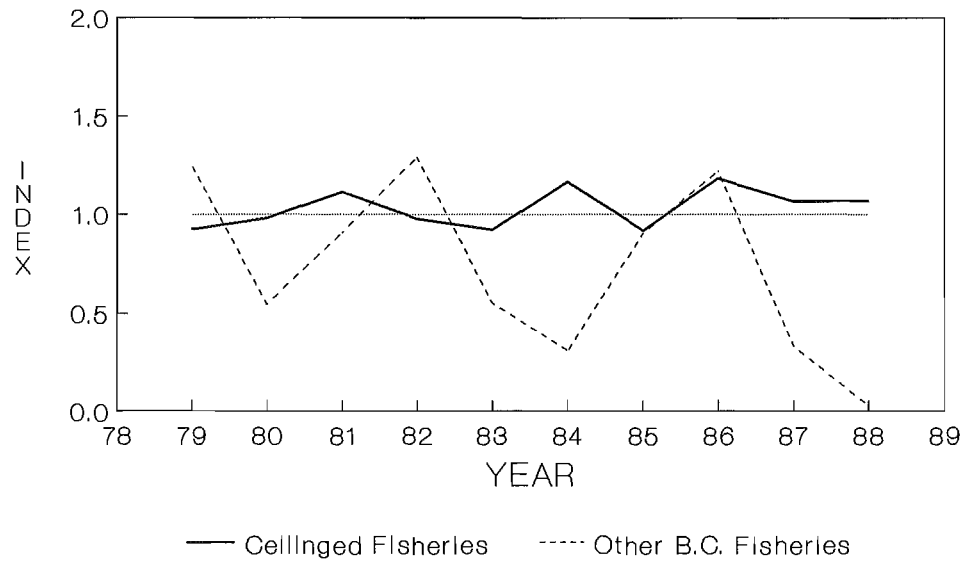
## CAPILANO AGE 3



TOTAL MORTALITY

# STOCK INDEX

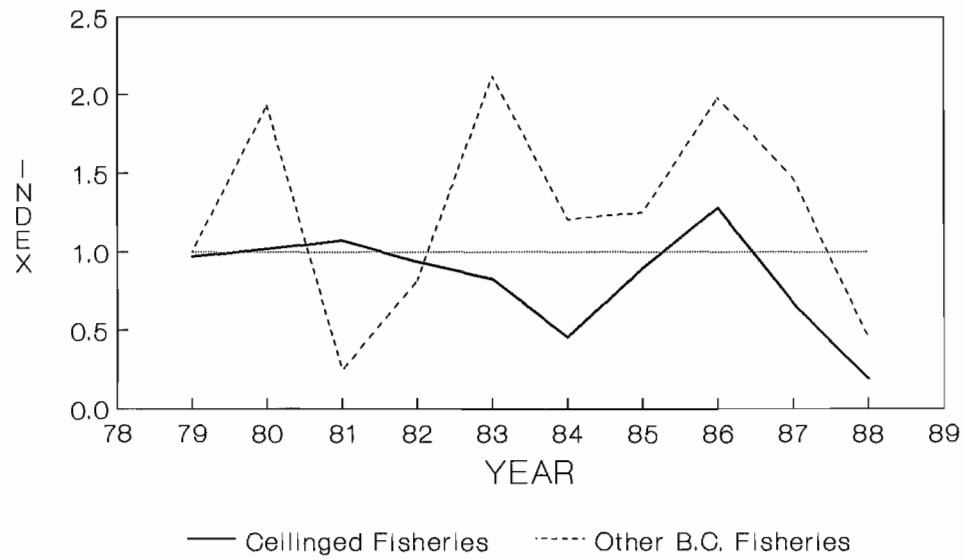
## CAPILANO AGE 4



TOTAL MORTALITY

## STOCK INDEX

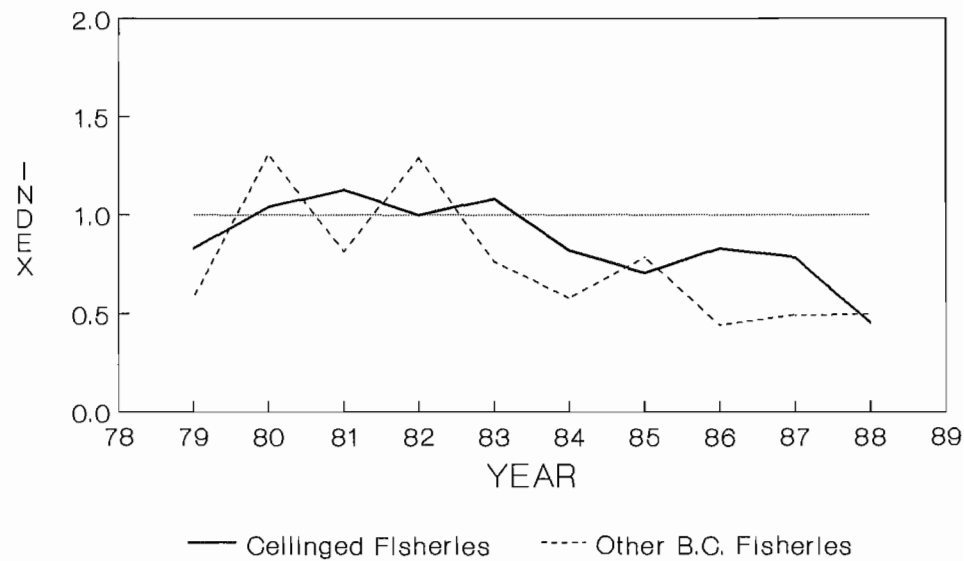
### QUINSAM AGE 3



TOTAL MORTALITY

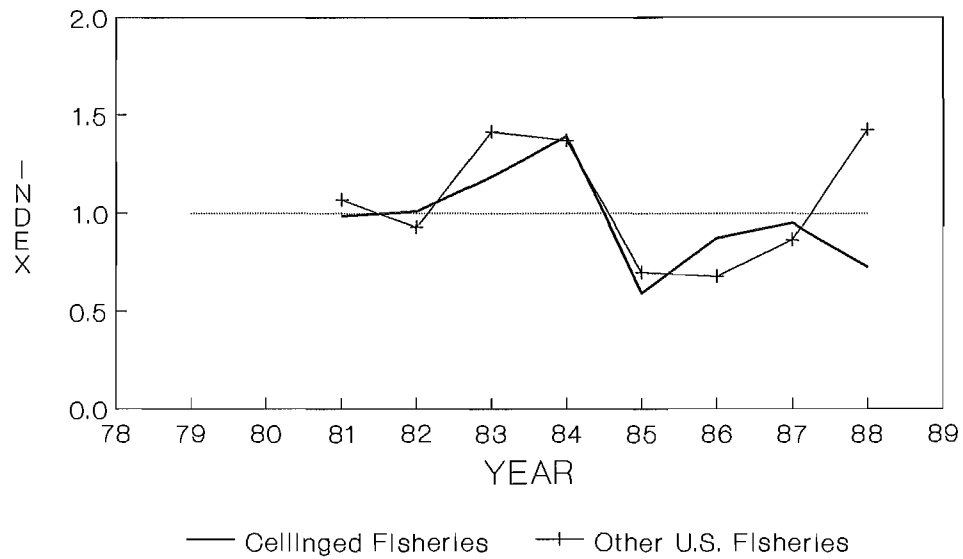
## STOCK INDEX

### QUINSAM AGE 4



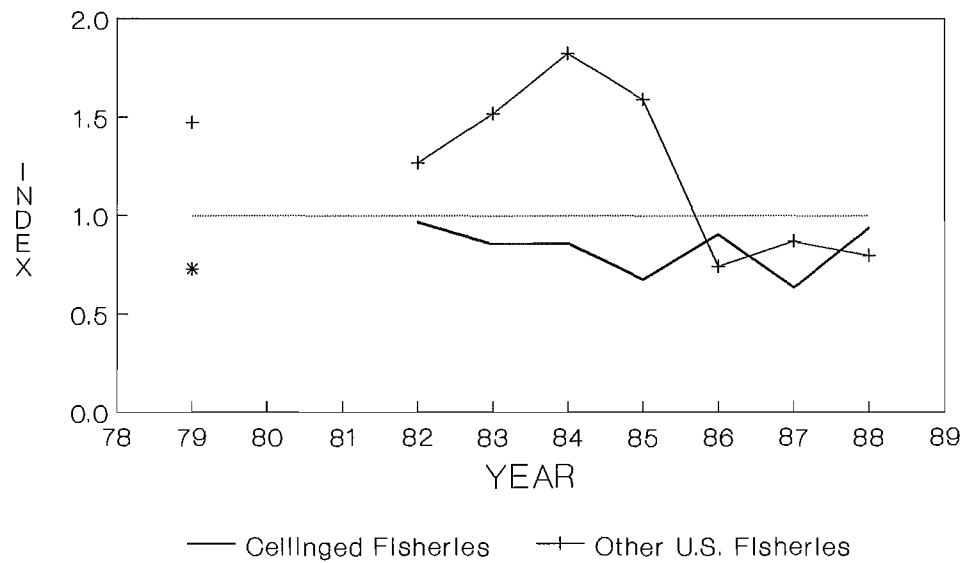
TOTAL MORTALITY

**STOCK INDEX**  
**PUGET SOUND FINGERLING AGE 3**



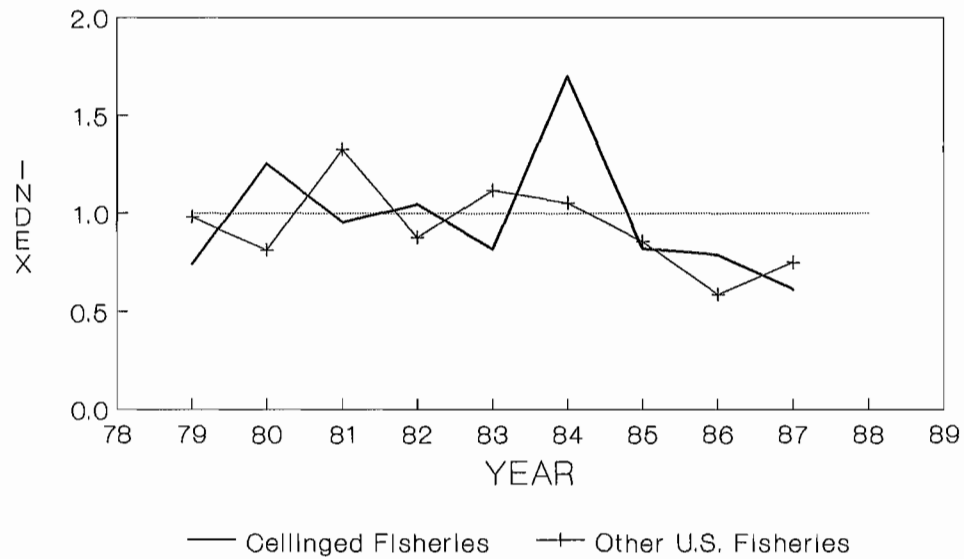
TOTAL MORTALITY

**STOCK INDEX**  
**PUGET SOUND FINGERLING AGE 4**



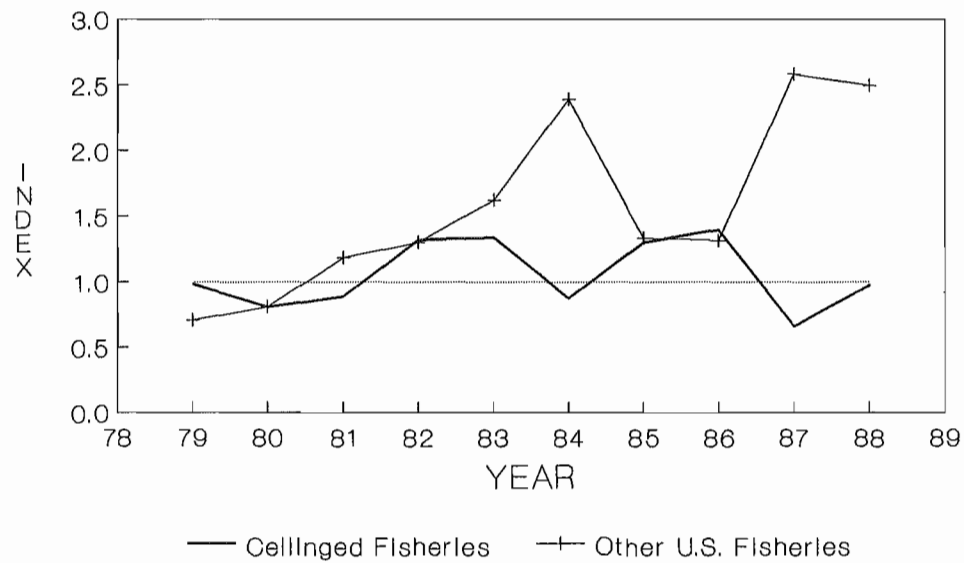
TOTAL MORTALITY

**STOCK INDEX**  
**PUGET SOUND YEARLING AGE 3**



TOTAL MORTALITY

**STOCK INDEX**  
**PUGET SOUND YEARLING AGE 4**

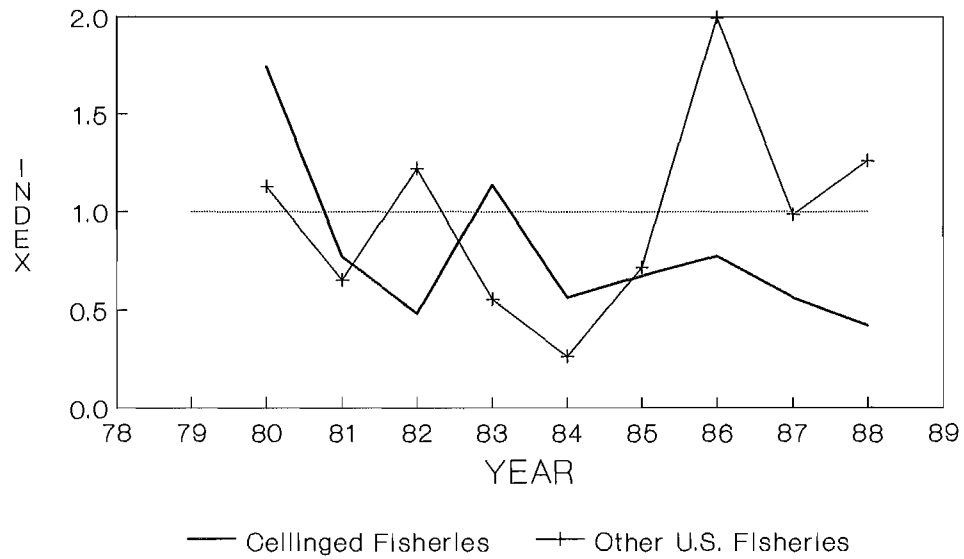


TOTAL MORTALITY



# STOCK INDEX

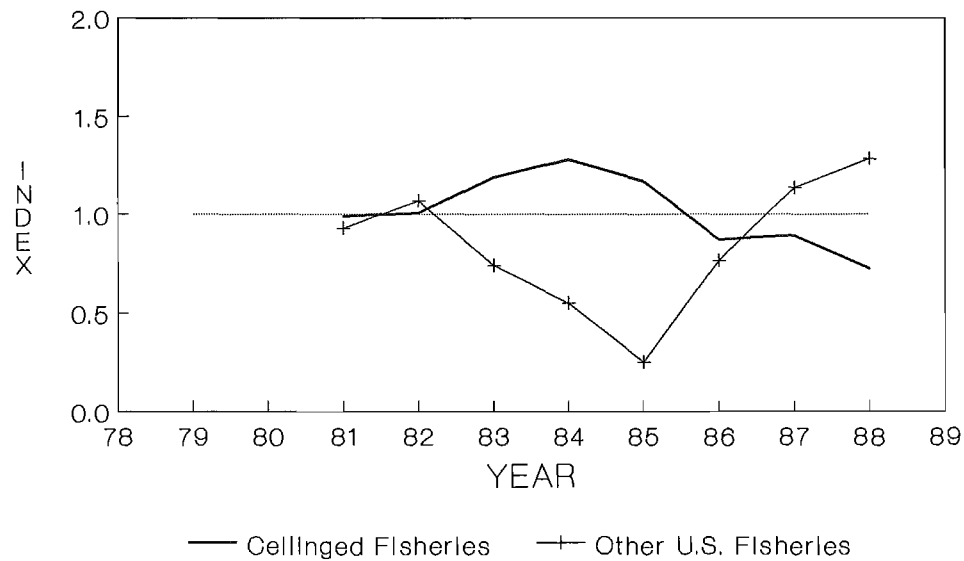
## COWLITZ FALL AGE 3



TOTAL MORTALITY

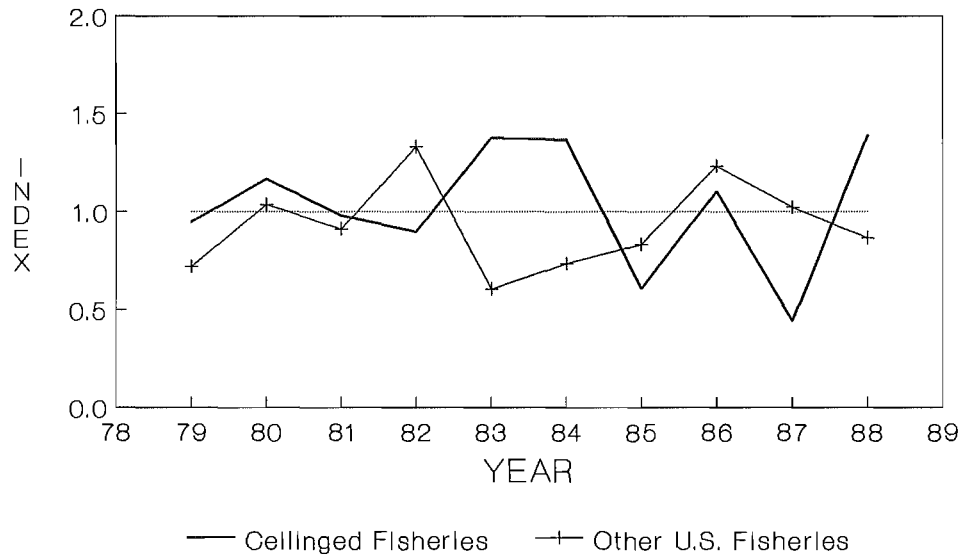
# STOCK INDEX

## COWLITZ FALL AGE 4



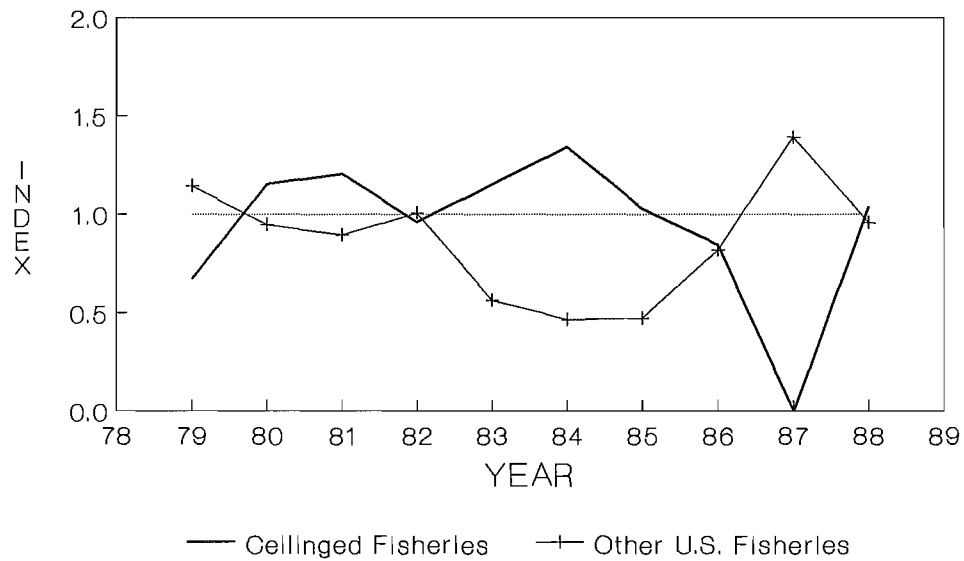
TOTAL MORTALITY

# **STOCK INDEX** **SPRING CREEK TULE AGE 3**



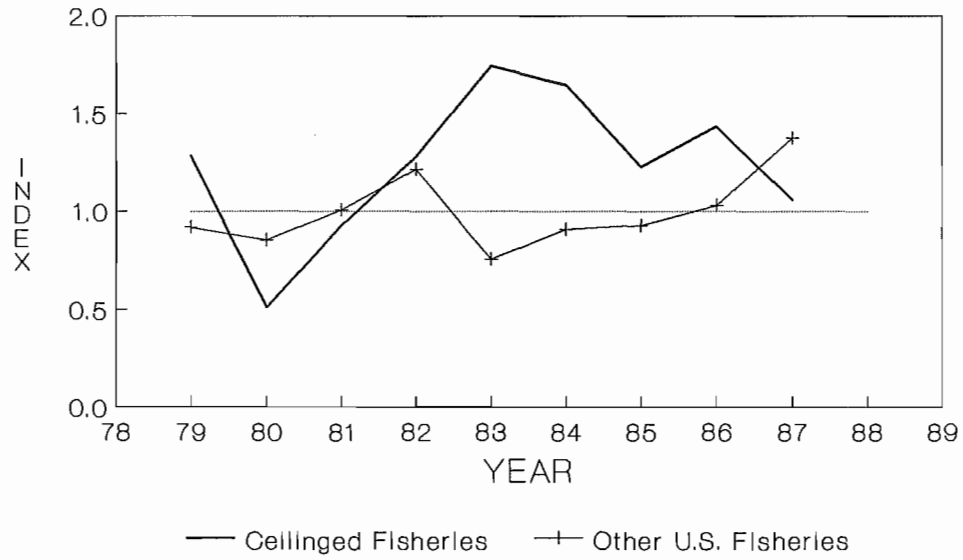
TOTAL MORTALITY

# **STOCK INDEX** **SPRING CREEK TULE AGE 4**



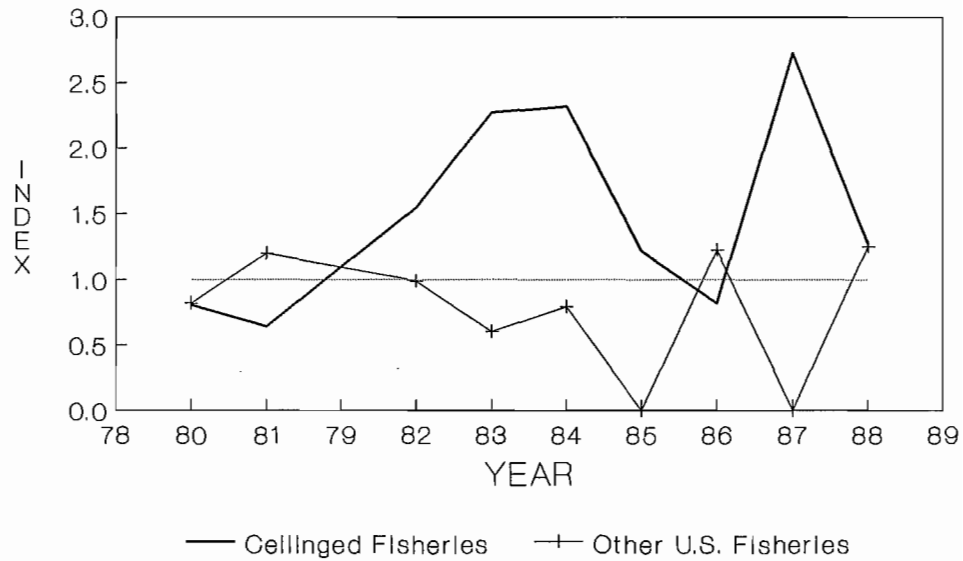
TOTAL MORTALITY

**STOCK INDEX**  
**BONNEVILLE TULE AGE 3**



TOTAL MORTALITY

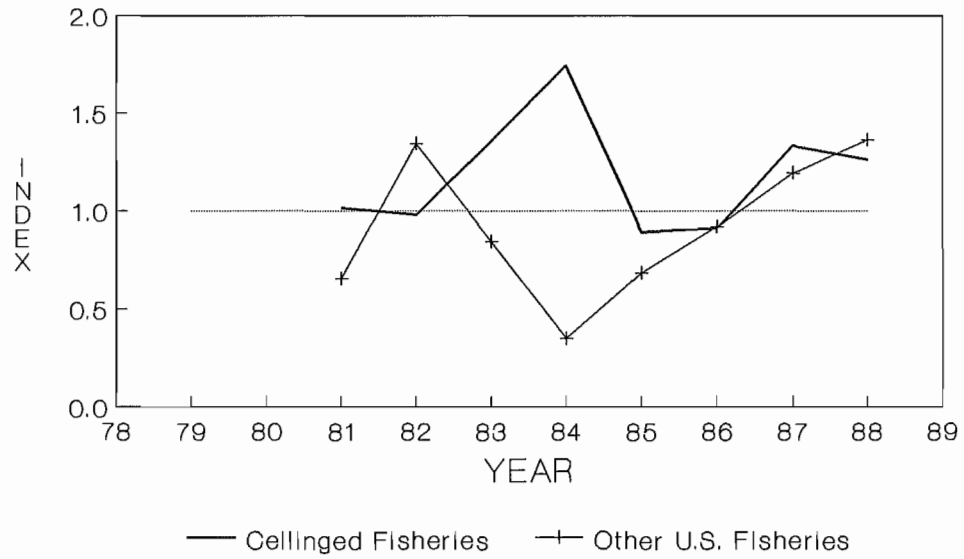
**STOCK INDEX**  
**BONNEVILLE TULE AGE 4**



TOTAL MORTALITY

# STOCK INDEX

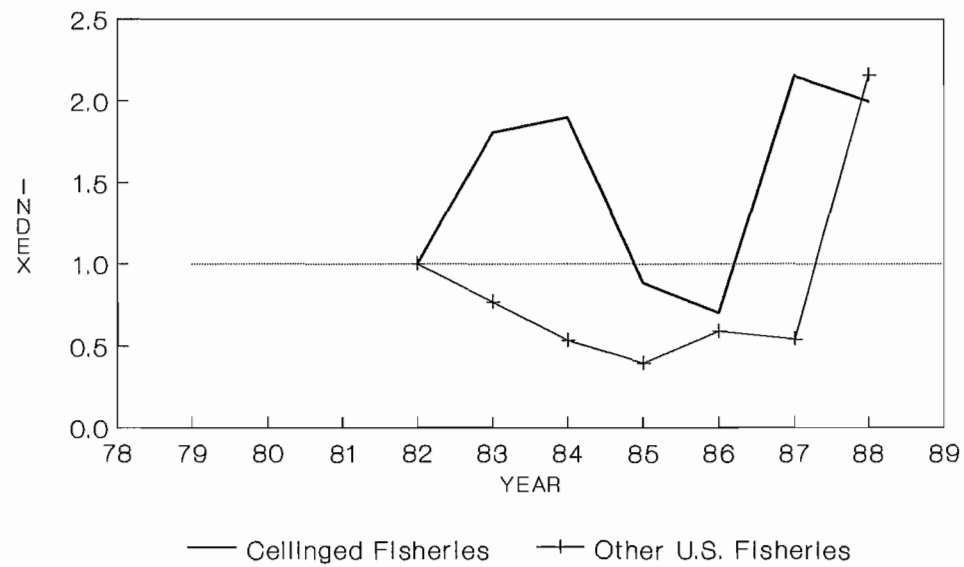
## STAYTON POND AGE 3



TOTAL MORTALITY

# STOCK INDEX

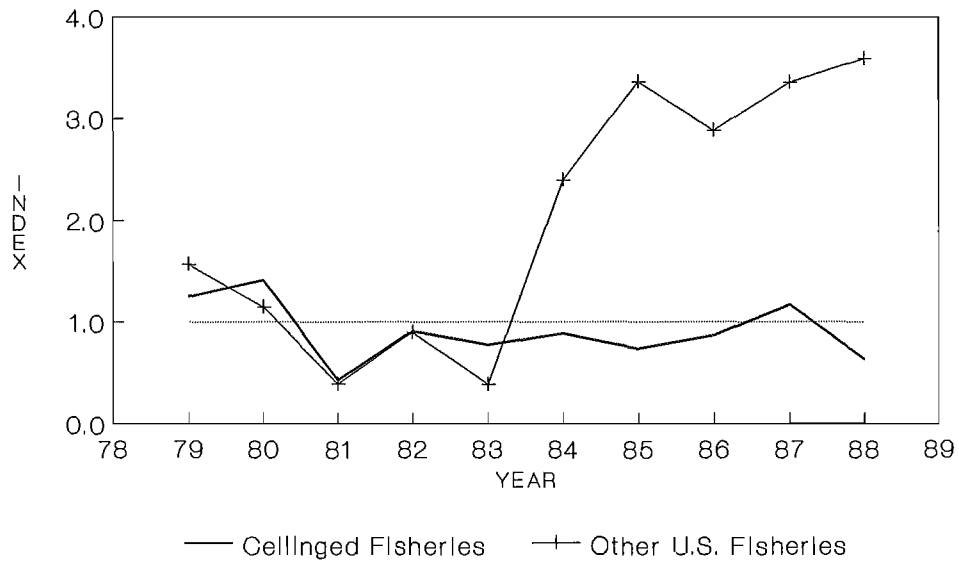
## STAYTON POND AGE 4



TOTAL MORTALITY

# STOCK INDEX

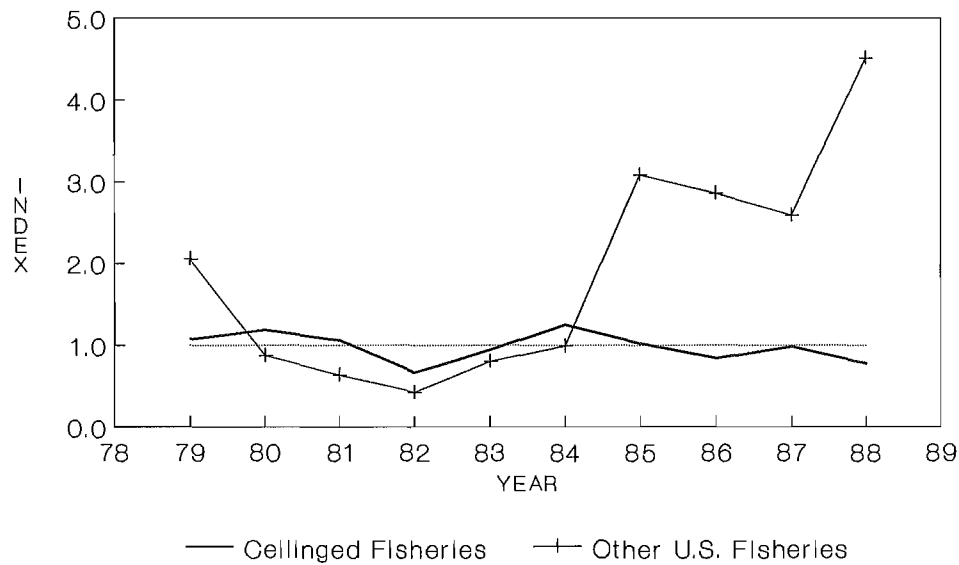
## COLUMBIA UPRIVER BRIGHT AGE 3



TOTAL MORTALITY

# STOCK INDEX

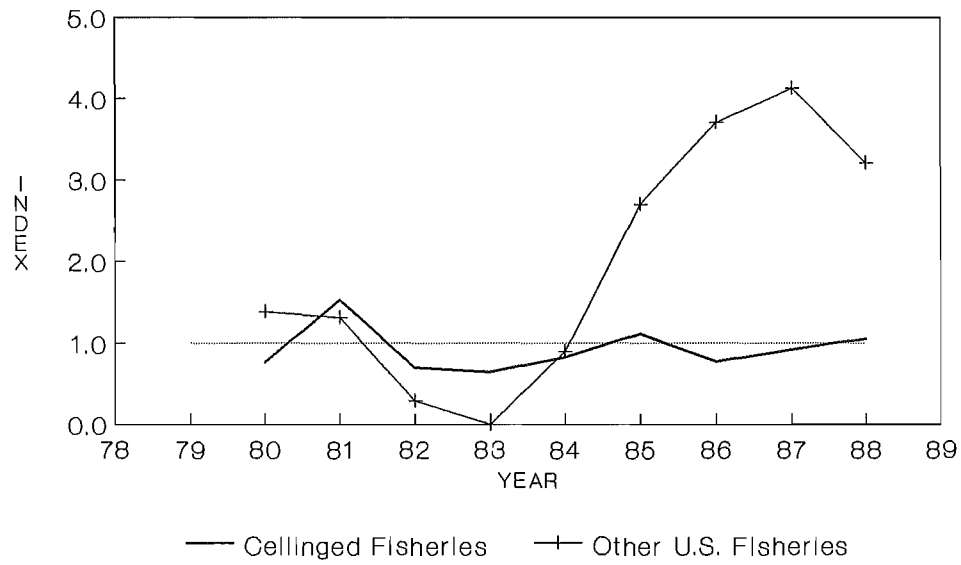
## COLUMBIA UPRIVER BRIGHT AGE 4



TOTAL MORTALITY

# STOCK INDEX

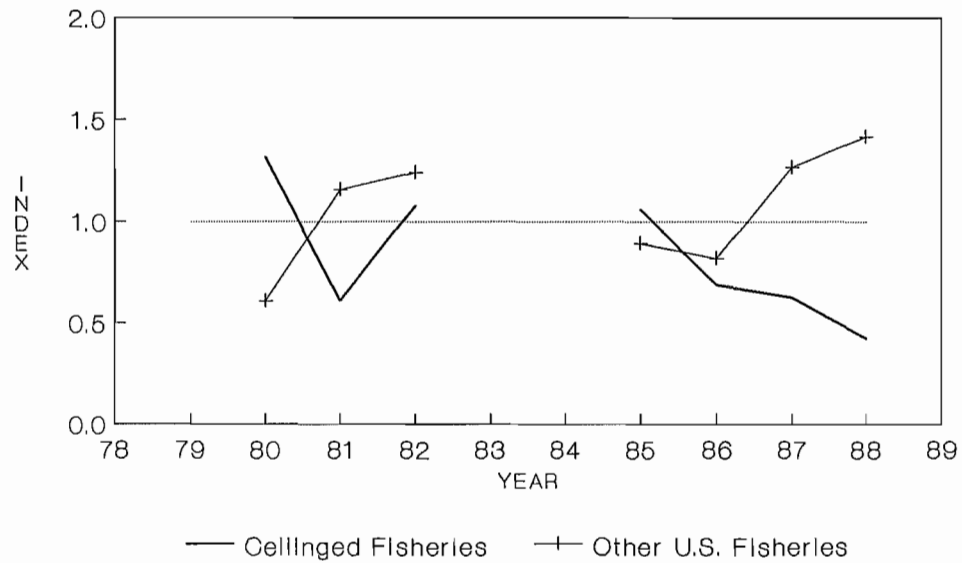
## COLUMBIA UPRIVER BRIGHT AGE 5



TOTAL MORTALITY

# STOCK INDEX

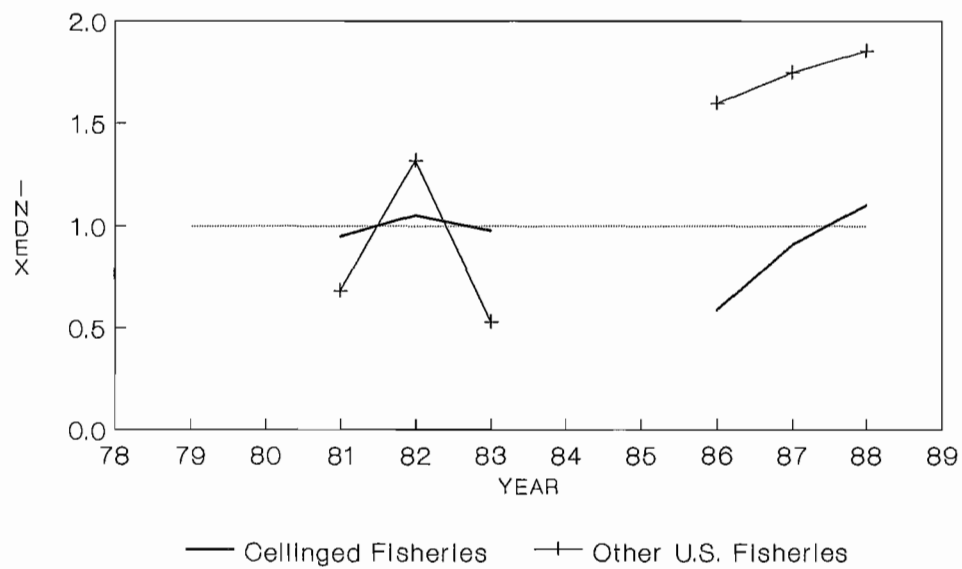
## LEWIS RIVER FALL AGE 3



TOTAL MORTALITY

# STOCK INDEX

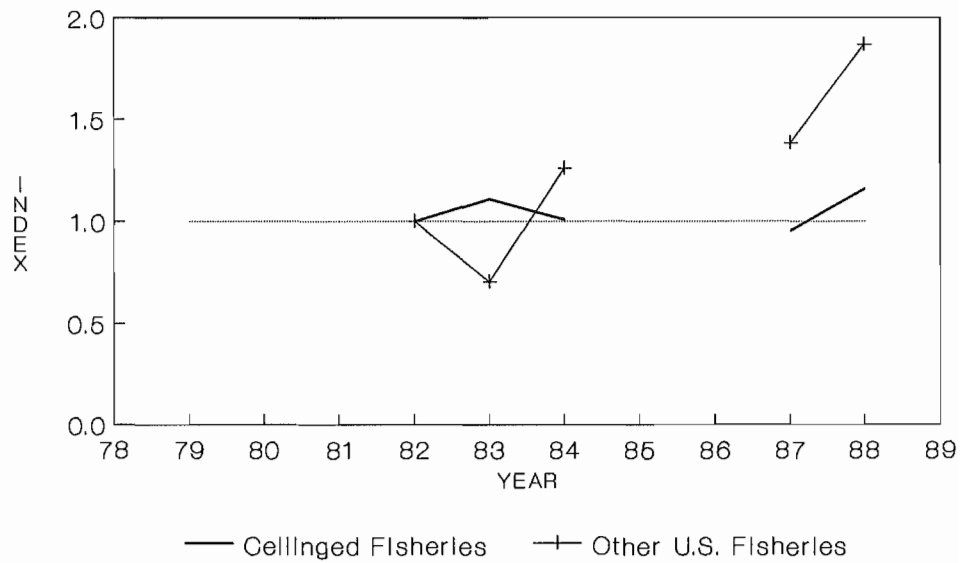
## LEWIS RIVER FALL AGE 4



TOTAL MORTALITY

### STOCK INDEX

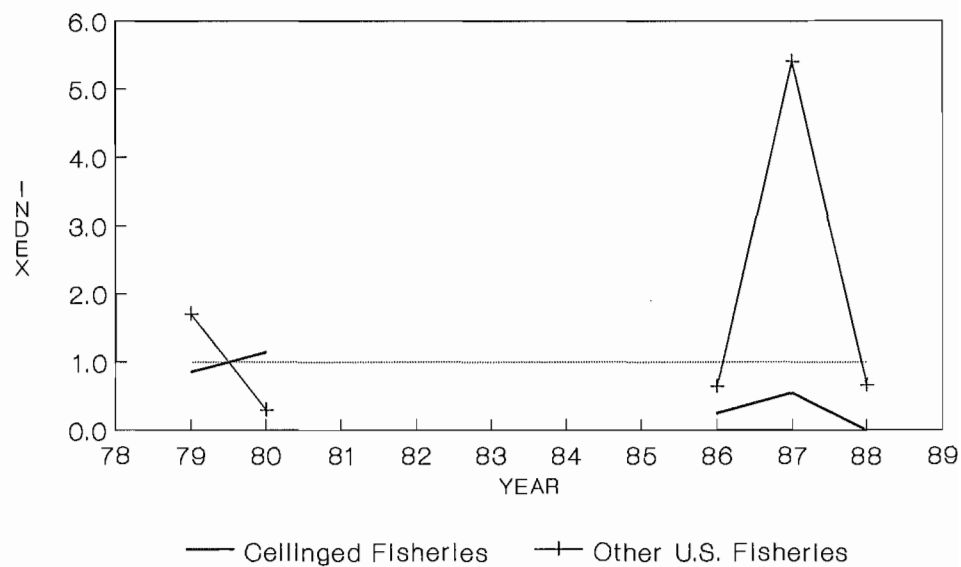
#### LEWIS RIVER FALL AGE 5



TOTAL MORTALITY

### STOCK INDEX

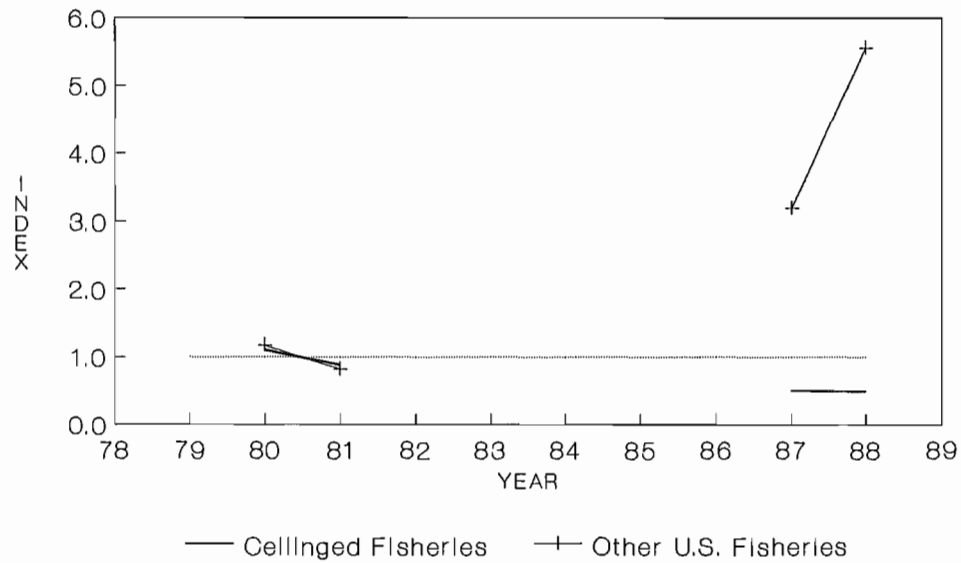
#### COLUMBIA RIVER SUMMER AGE 3



TOTAL MORTALITY

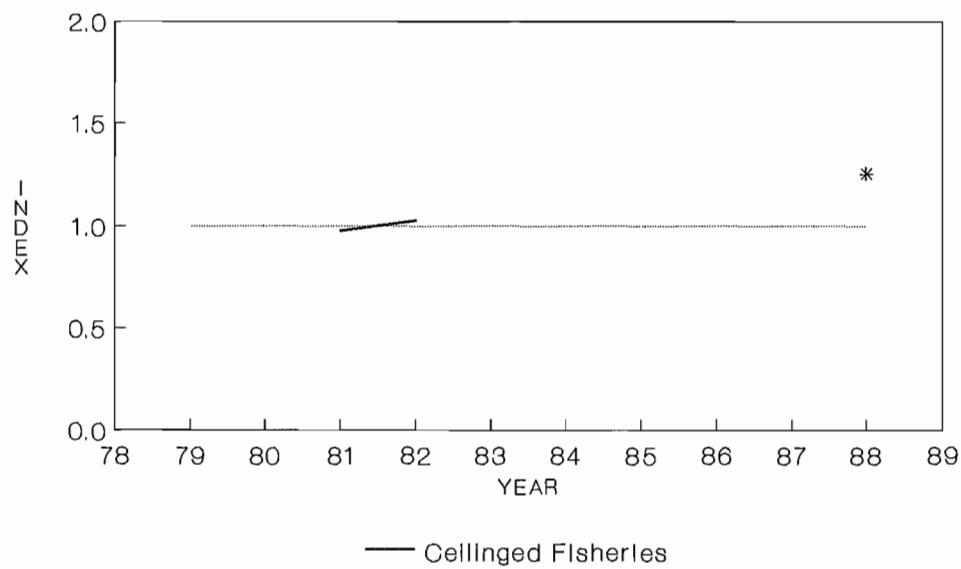


**STOCK INDEX**  
**COLUMBIA RIVER SUMMER AGE 4**



TOTAL MORTALITY

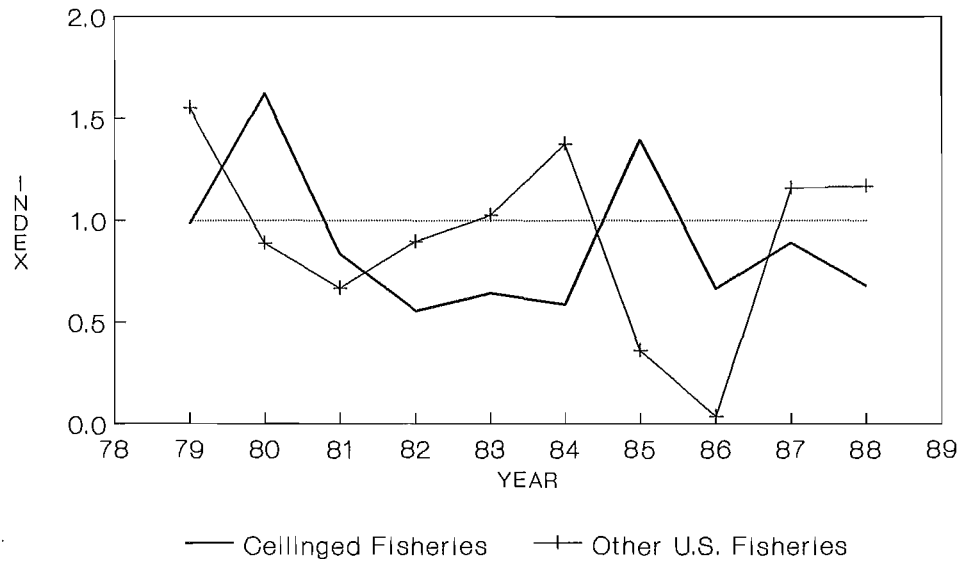
**STOCK INDEX**  
**COLUMBIA RIVER SUMMER AGE 5**



TOTAL MORTALITY

# STOCK INDEX

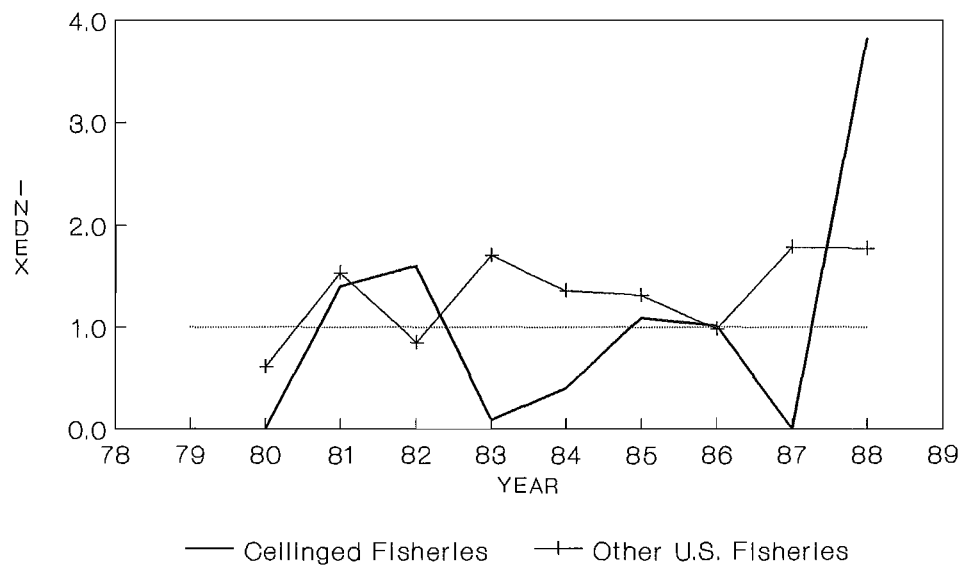
## WILLAMETTE SPRING AGE 4



TOTAL MORTALITY

# STOCK INDEX

## WILLAMETTE SPRING AGE 5

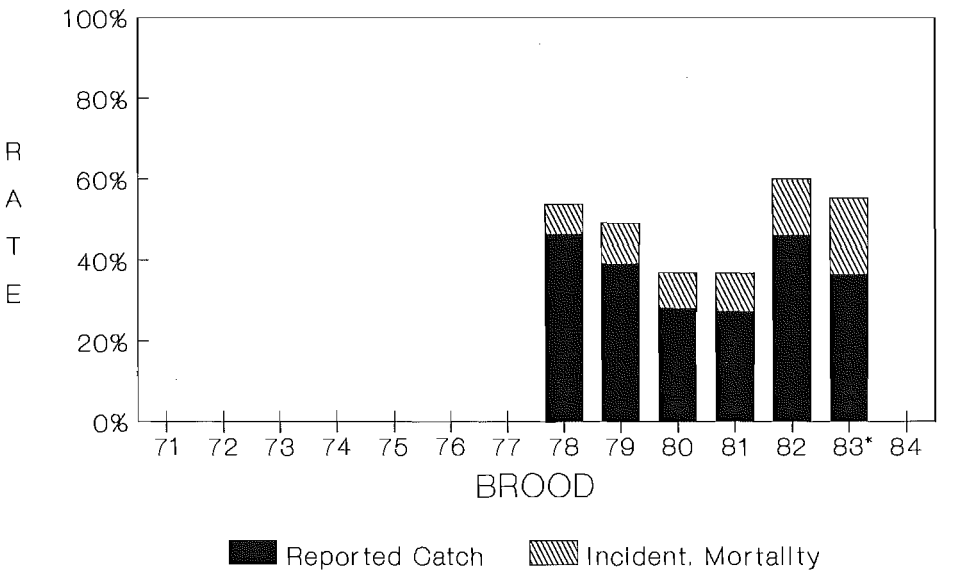


TOTAL MORTALITY

## SECTION 7. BROOD YEAR EXPLOITATION RATE FIGURES

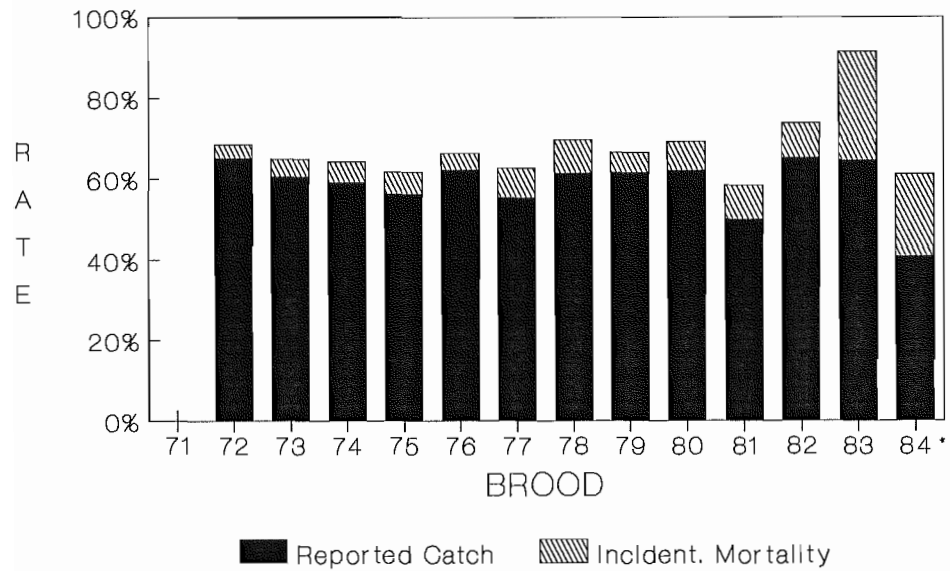
S.E. Alaska Stock  
Robertson Creek  
Quinsam  
Big Qualicum  
Capilano  
Puget Sound Fingerling  
Puget Sound Yearling  
Cowlitz Tule  
Spring Creek Tule  
Bonneville Tule  
Stayton Pond Tule  
Columbia River Upriver Bright  
Lewis River Wild  
Columbia River Summer  
Willamette Spring

BROOD YEAR EXPLOITATION RATE  
S.E. ALASKA STOCK



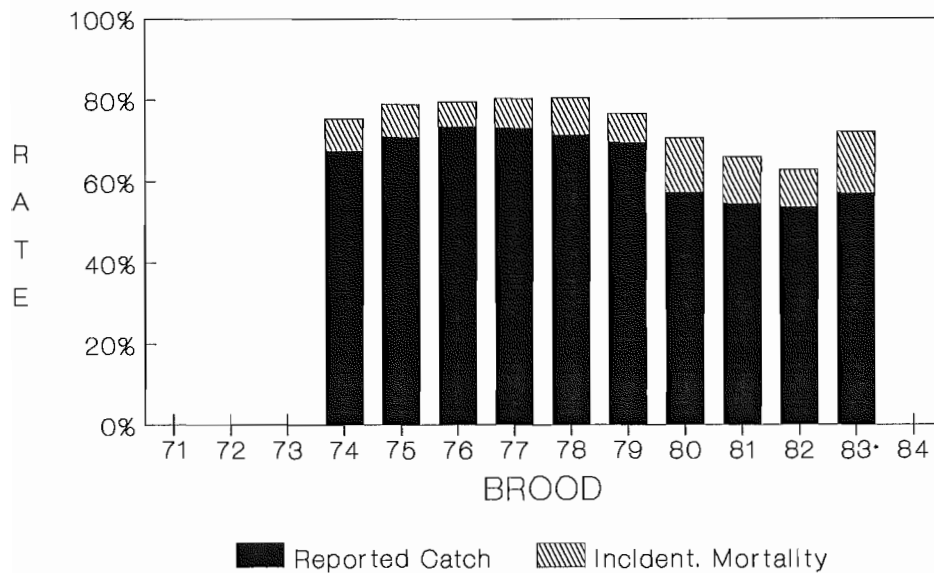
\* 1983 Brood Year is incomplete

## BROOD YEAR EXPLOITATION RATE ROBERTSON CREEK



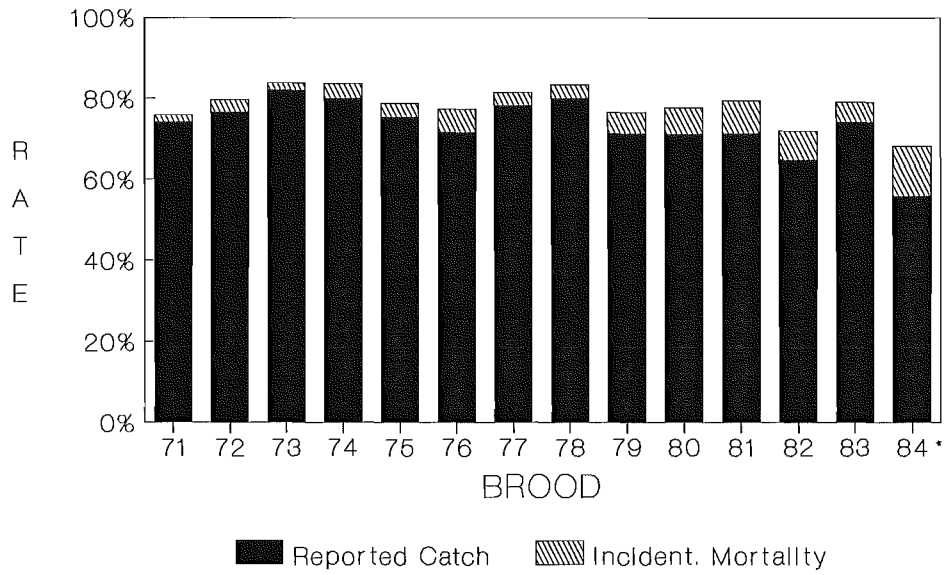
\* 1984 Brood year Is Incomplete

## BROOD YEAR EXPLOITATION RATE QUINSAM



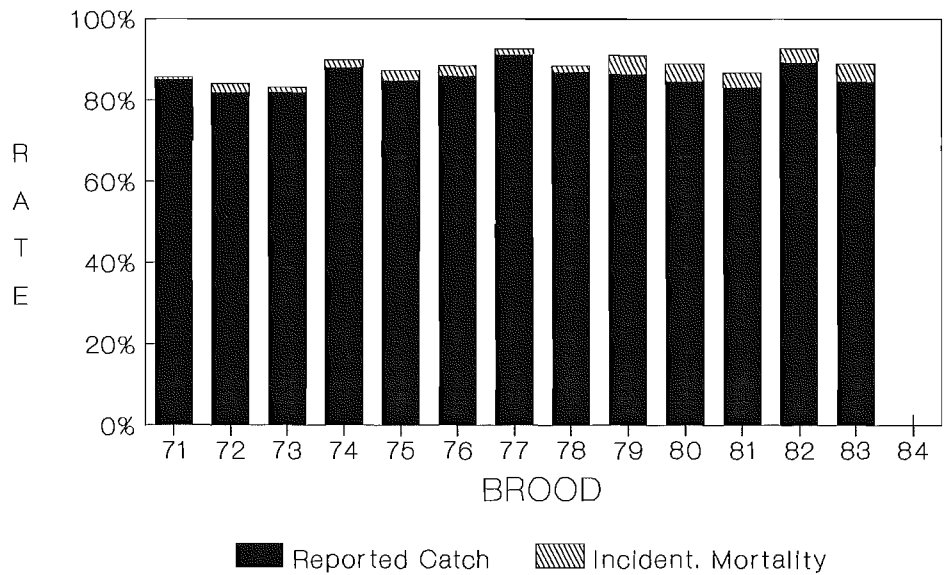
\* 1983 Brood Year Is Incomplete

## BROOD YEAR EXPLOITATION RATE BIG QUALICUM

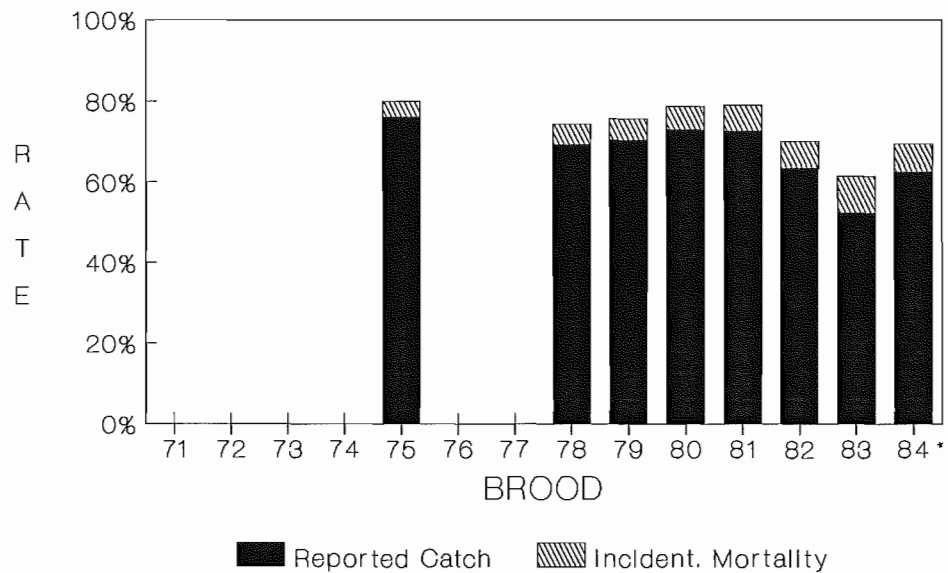


\* 1984 Brood year is incomplete

## BROOD YEAR EXPLOITATION RATE CAPILANO

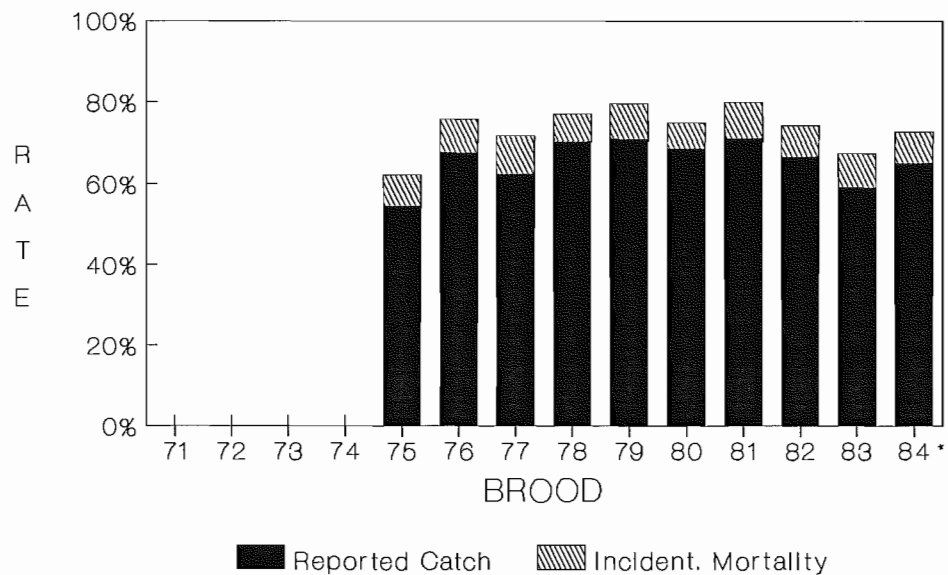


## BROOD YEAR EXPLOITATION RATE PUGET SOUND FINGERLING



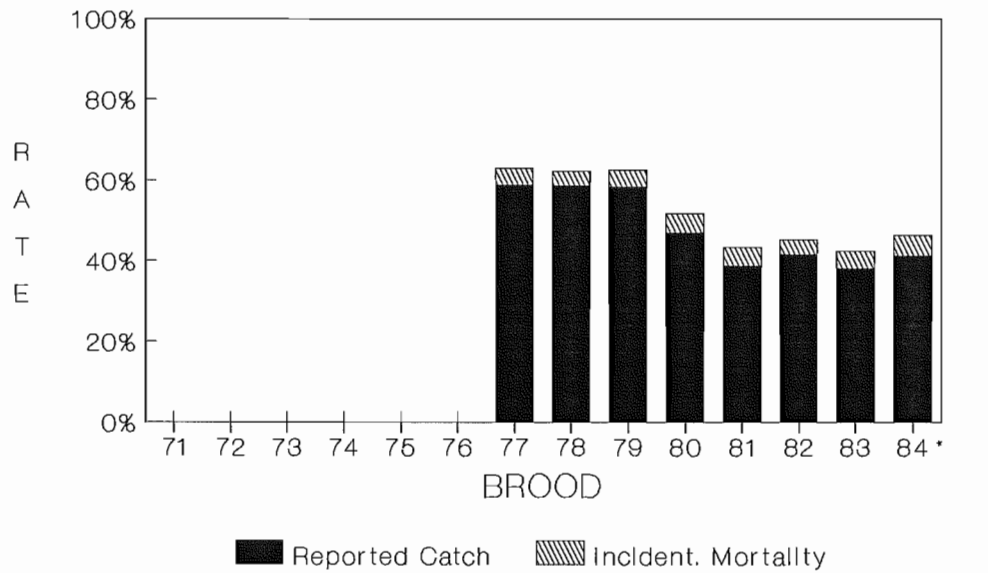
\* 1984 Brood year is Incomplete

## BROOD YEAR EXPLOITATION RATE PUGET SOUND YEARLING



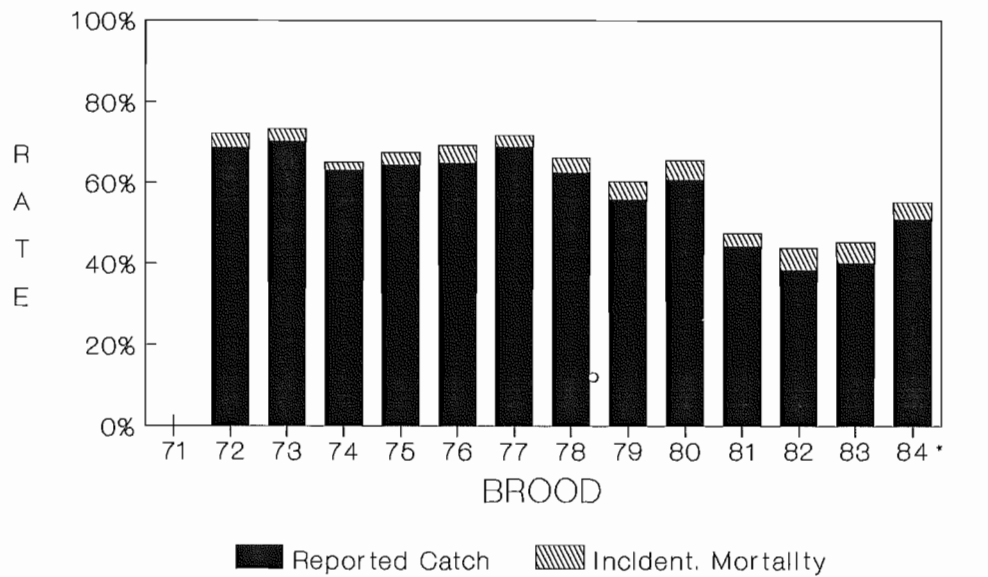
\* 1984 Brood year is Incomplete

## BROOD YEAR EXPLOITATION RATE COWLITZ TULE



\* 1984 Brood year Is Incomplete

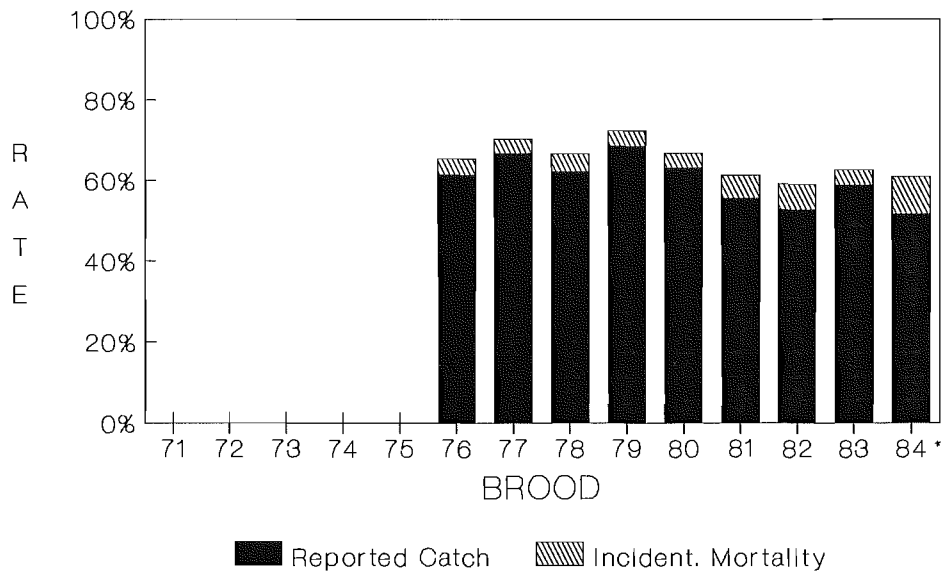
## BROOD YEAR EXPLOITATION RATE SPRING CREEK TULE



\* 1984 Brood year Is Incomplete

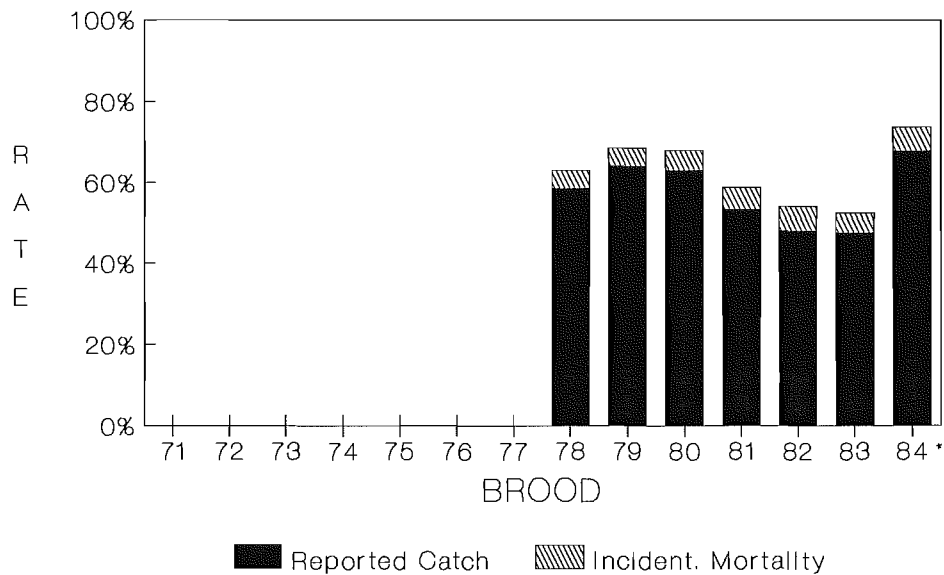


## BROOD YEAR EXPLOITATION RATE BONNEVILLE HATCHERY TULE



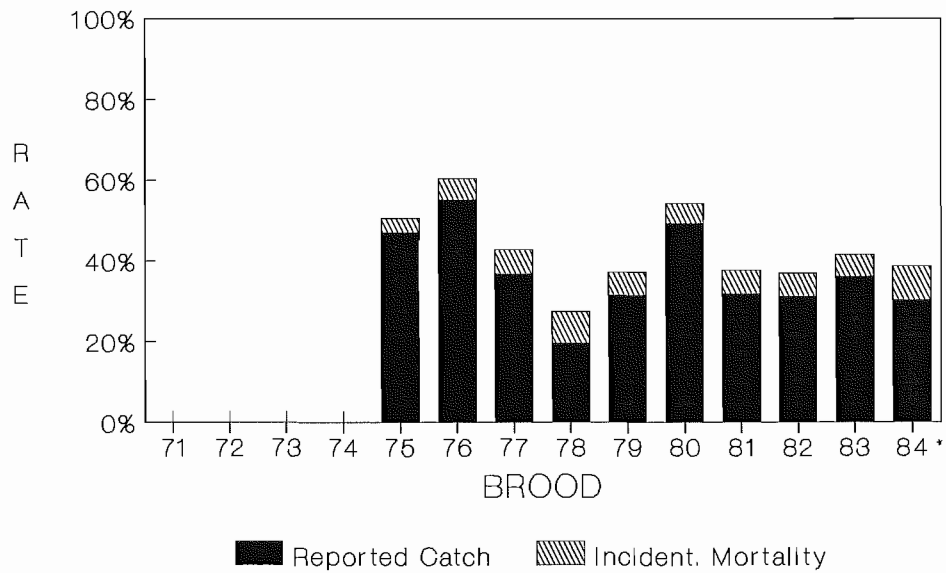
\* 1984 Brood year Is Incomplete

## BROOD YEAR EXPLOITATION RATE STAYTON POND TULE



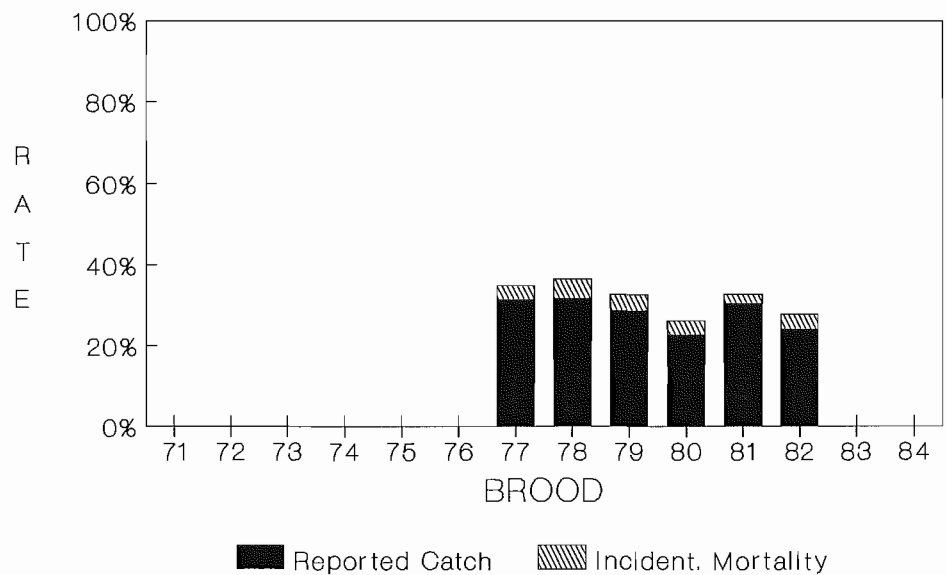
\* 1984 Brood year Is Incomplete

## BROOD YEAR EXPLOITATION RATE COLUMBIA UPRIVER BRIGHT

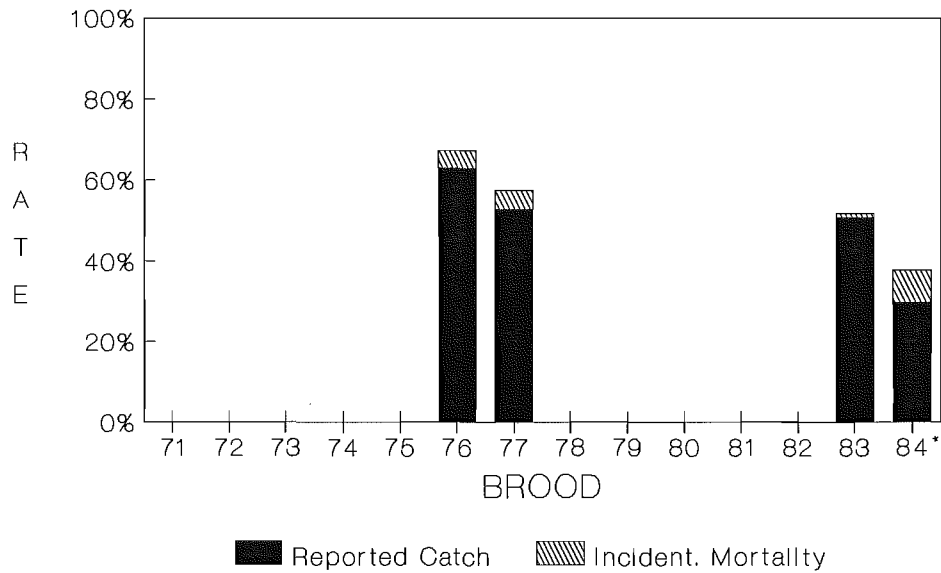


\* 1984 Brood year is Incomplete

## BROOD YEAR EXPLOITATION RATE LEWIS RIVER

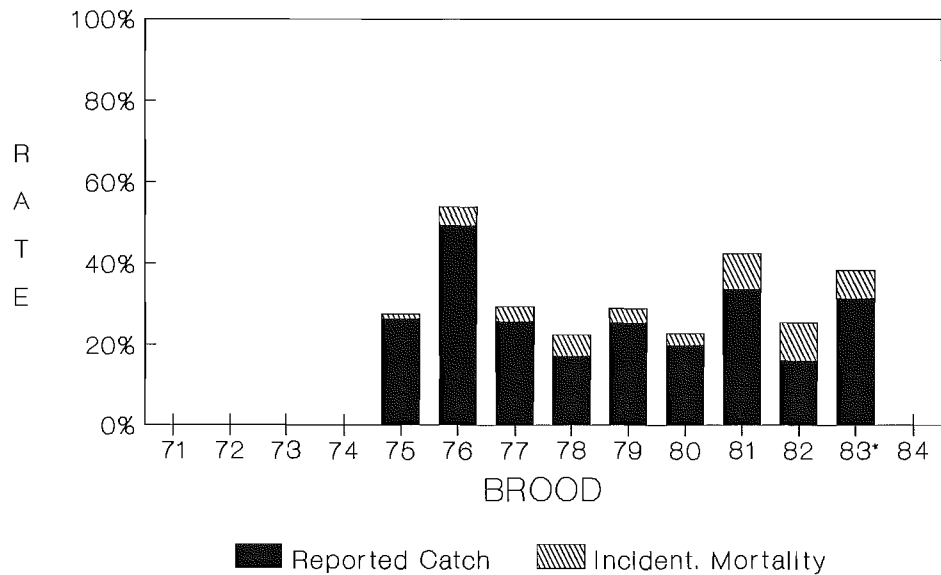


## BROOD YEAR EXPLOITATION RATE COLUMBIA SUMMER



\* 1984 Brood year is Incomplete

## BROOD YEAR EXPLOITATION RATE WILLAMETTE SPRING



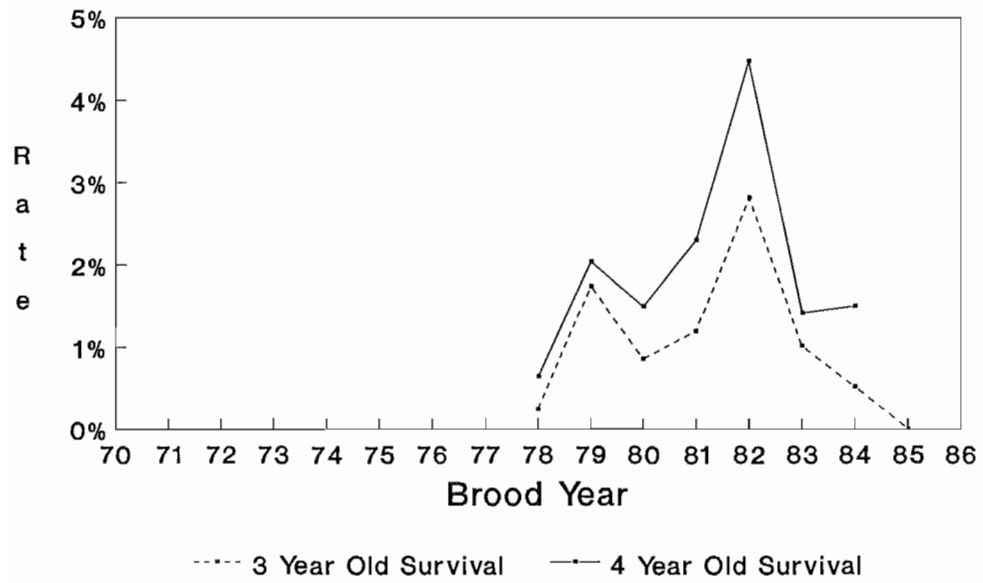
\* 1983 Brood year is Incomplete

## **SECTION 8. SURVIVAL RATE FIGURES**

**Caution, survival rate scales vary greatly.**

S.E. Alaska Stock  
Robertson Creek  
Quinsam  
Big Qualicum  
Capilano  
Puget Sound Fingerling  
Puget Sound Yearling  
Cowlitz Tule  
Spring Creek Tule  
Bonneville Tule  
Stayton Pond Tule  
Columbia River Upriver Bright  
Lewis River Wild  
Columbia River Summer  
Willamette Spring

# SURVIVAL RATE INDEX SOUTHEAST ALASKA

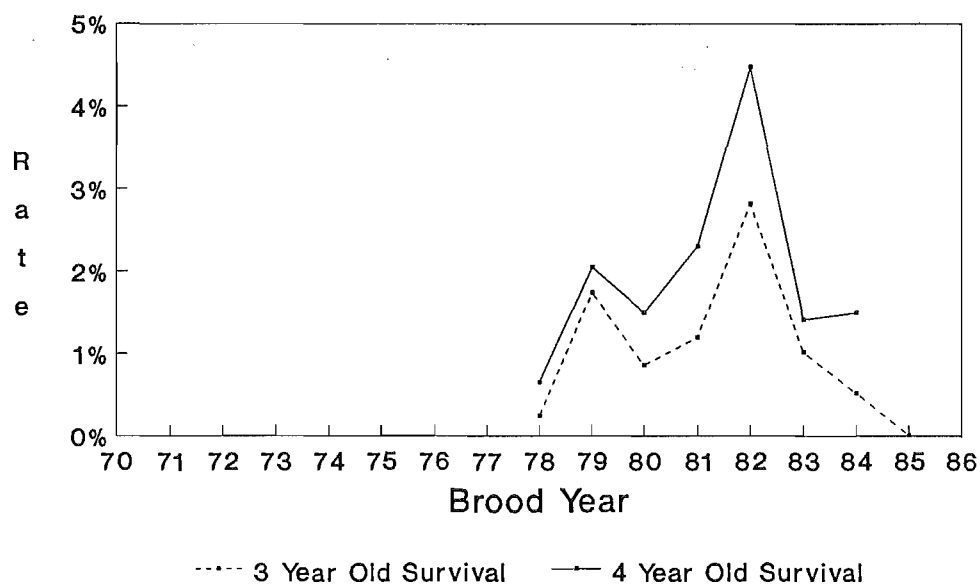


## **SECTION 8. SURVIVAL RATE FIGURES**

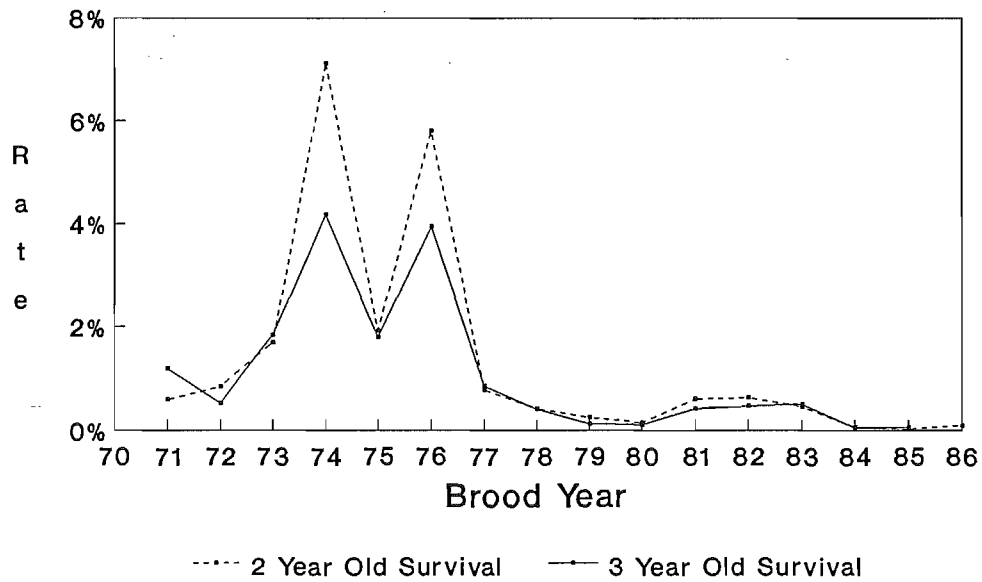
**Caution, survival rate scales vary greatly.**

S.E. Alaska Stock  
Robertson Creek  
Quinsam  
Big Qualicum  
Capilano  
Puget Sound Fingerling  
Puget Sound Yearling  
Cowlitz Tule  
Spring Creek Tule  
Bonneville Tule  
Stayton Pond Tule  
Columbia River Upriver Bright  
Lewis River Wild  
Columbia River Summer  
Willamette Spring

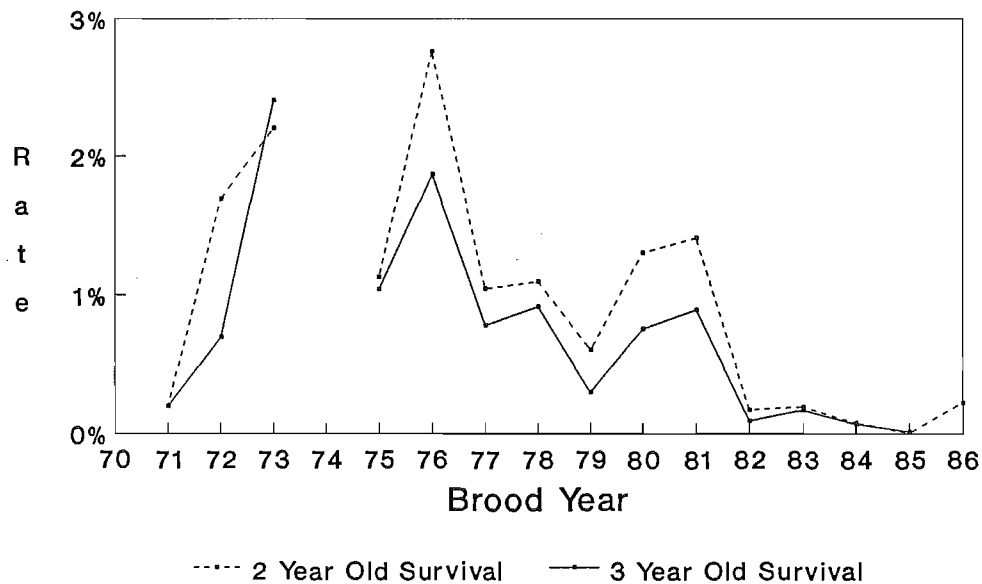
# SURVIVAL RATE INDEX SOUTHEAST ALASKA



# **SURVIVAL RATE INDEX** **BIQ QUALICUM RIVER**

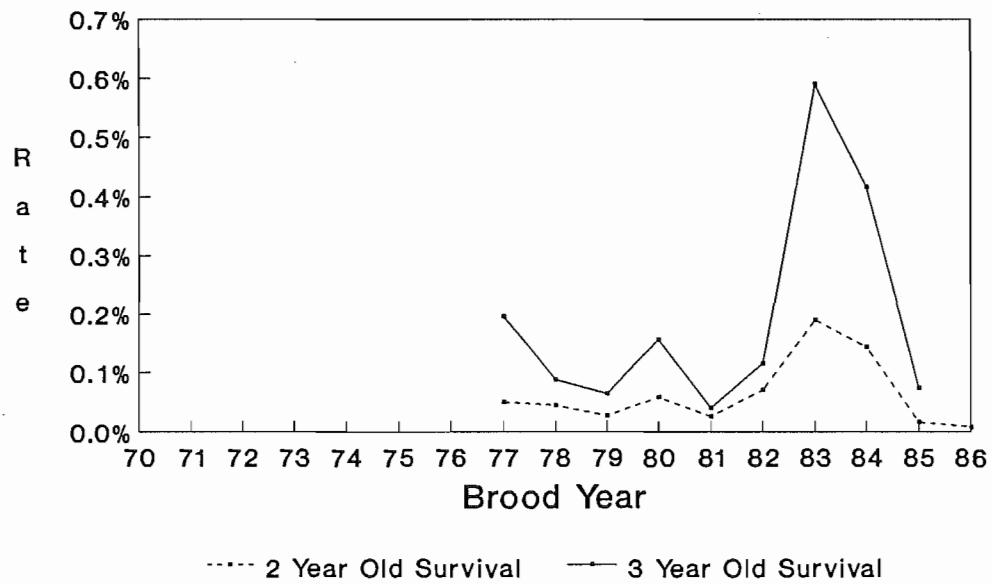


# **SURVIVAL RATE INDEX** **CAPILANO RIVER**

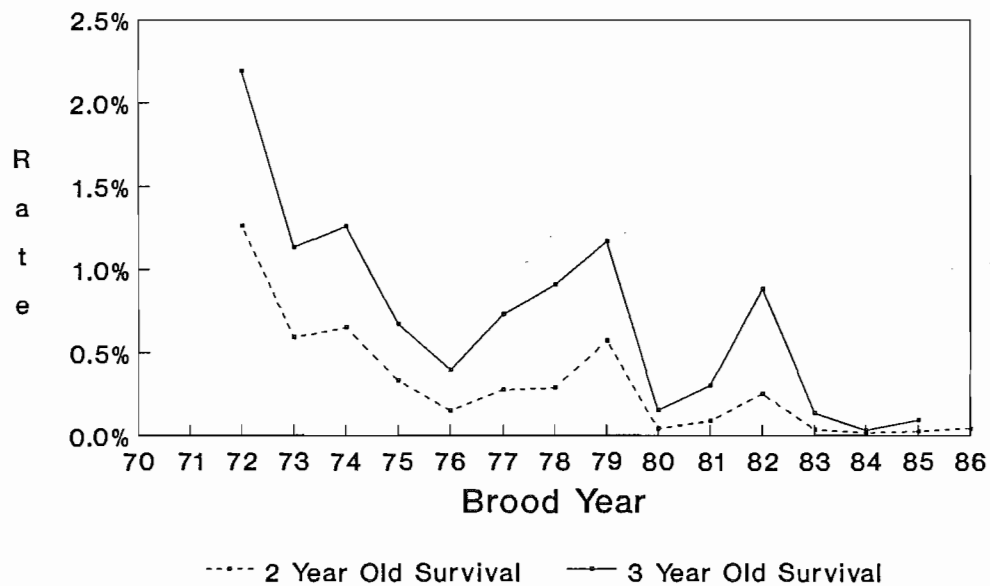




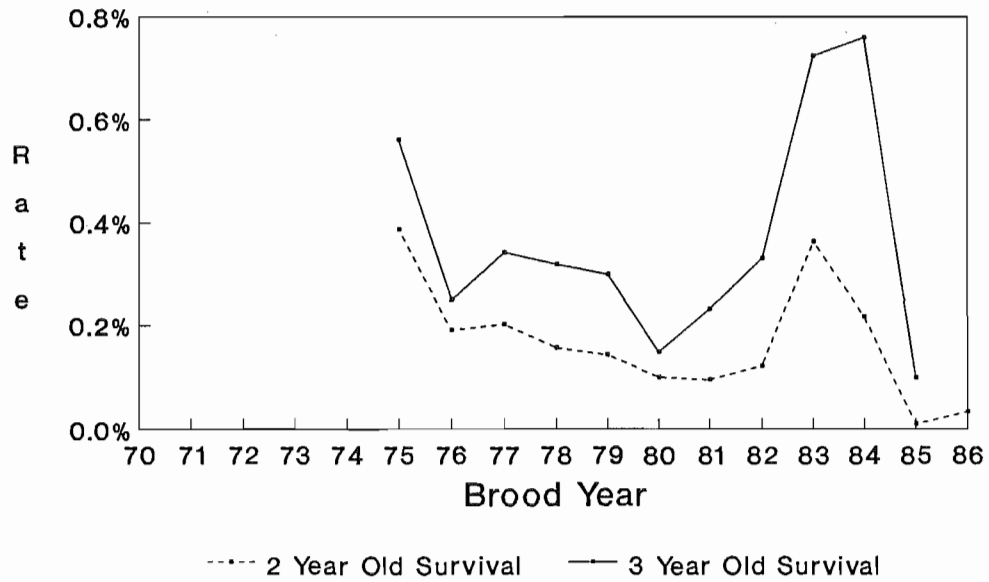
## SURVIVAL RATE INDEX COWLITZ TULE



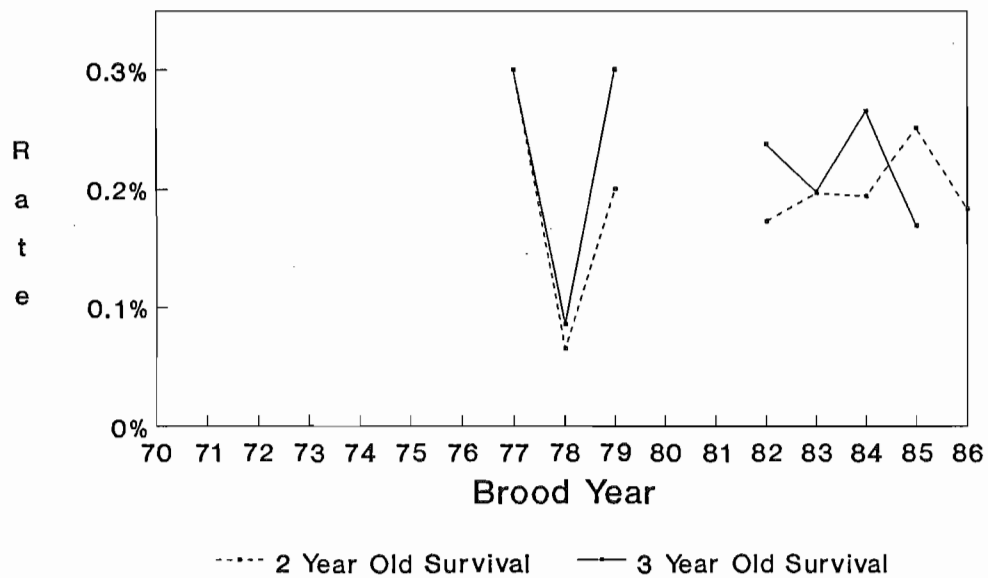
## SURVIVAL RATE INDEX SPRING CREEK



## SURVIVAL RATE INDEX UPRIVER BRIGHTS



## SURVIVAL RATE INDEX LEWIS RIVER WILD



## SECTION 9. DETAILED EXPLOITATION RATE AND FISHERY INDEX DATA

### S.E. Alaska Troll

- Total Mortality
- Reported Catch
- Total Mortality (S.E. Alaska Stock Only)
- Reported Catch (S.E. Alaska Stock Only)

### North/Central Troll

- Total Mortality
- Reported Catch

### West Coast Vancouver Island Troll

- Total Mortality
- Reported Catch

### Georgia Strait

- Sport and Troll Combined Total Mortality
- Sport and Troll Combined Reported Catch
- Sport Total Mortality
- Sport Reported Catch
- Troll Total Mortality
- Troll Reported Catch

### Washington/Oregon Ocean Sport and Troll Combined

- Total Mortality
- Reported Catch

## SE ALASKA TROLL

TOTAL MORTALITY EXPLOITATION RATES BY STOCK										
Year	AKS Age 4	AKS Age 5	AKS Age 6	LRW Age 4	QUI Age 4	QUI Age 5	RBT Age 3	RBT Age 4	RBT Age 5	SUM Age 4
79	NA	NA	NA	NA	0.0137	0.0980	0.0525	0.2663	0.5650	NA
80	NA	NA	NA	NA	0.1112	0.0654	0.0774	0.2869	0.3736	0.2289
81	NA	NA	NA	0.0779	0.1181	0.1149	0.0840	0.3616	0.3892	0.0708
82	0.1307	NA	NA	0.0788	0.1447	0.1594	0.0703	0.2786	0.3387	NA
83	0.1900	NA	NA	0.0752	0.2262	0.2358	0.0758	0.3257	0.4810	NA
84	0.0991	NA	NA	NA	0.1173	0.2136	0.1180	0.3206	0.2489	NA
85	0.1033	NA	NA	NA	0.1749	0.2446	0.1262	0.1452	0.3711	NA
86	0.1668	NA	NA	0.0526	0.1114	0.1593	NA	0.3504	0.0370	NA
87	0.0944	NA	NA	0.0251	0.1401	0.1655	0.0445	NA	NA	0.0226
88	0.1383	NA	NA	0.0247	0.0990	0.0973	0.0264	0.1901	NA	0.0827
Base	0.1307	-1.0000	-1.0000	0.0784	0.0969	0.1094	0.0711	0.2984	0.4166	0.1498

TOTAL MORTALITY EXPLOITATION RATES BY STOCK				
Year	URB Age 3	URB Age 4	URB Age 5	WSH Age 4
79	0.0164	0.1399	NA	NA
80	0.0426	0.1678	0.2232	0.1350
81	NA	0.1768	0.4595	0.0688
82	0.0236	0.1256	0.1872	0.0607
83	0.0182	0.1978	NA	0.0980
84	0.0232	0.1961	0.2667	0.0580
85	0.0160	0.1581	0.2651	0.2364
86	0.0130	0.1102	0.1912	NA
87	0.0285	0.1345	0.2560	0.1354
88	0.0139	0.0697	0.2106	0.0733
Base	0.0275	0.1525	0.2900	0.0882

TOTAL MORTALITY EXPLOITATION RATE INDEX BY STOCK										
Year	AKS Age 4	AKS Age 5	AKS Age 6	LRW Age 4	QUI Age 4	QUI Age 5	RBT Age 3	RBT Age 4	RBT Age 5	SUM Age 4
79	NA	NA	NA	NA	0.1409	0.8957	0.7388	0.8925	1.3561	NA
80	NA	NA	NA	NA	1.1477	0.5974	1.0897	0.9616	0.8968	1.5278
81	NA	NA	NA	0.9945	1.2187	1.0499	1.1819	1.2120	0.9341	0.4722
82	1.0000	NA	NA	1.0055	1.4928	1.4570	0.9896	0.9339	0.8130	NA
83	1.4535	NA	NA	0.9603	2.3338	2.1554	1.0669	1.0918	1.1545	NA
84	0.7582	NA	NA	NA	1.2098	1.9526	1.6602	1.0744	0.5975	NA
85	0.7901	NA	NA	NA	1.8049	2.2356	1.7768	0.4865	0.8907	NA
86	1.2758	NA	NA	0.6707	1.1497	1.4555	NA	1.1745	0.0889	NA
87	0.7226	NA	NA	0.3203	1.4451	1.5130	0.6263	NA	NA	0.1508
88	1.0581	NA	NA	0.3147	1.0218	0.8891	0.3714	0.6370	NA	0.5522

TOTAL MORTALITY EXPLOITATION RATE INDEX BY STOCK					
Year	URB Age 3	URB Age 4	URB Age 5	WSH Age 4	Fishery
79	0.5945	0.9171	NA	NA	0.9823
80	1.5483	1.1002	0.7698	1.5308	1.0069
81	NA	1.1589	1.5846	0.7807	1.0972
82	0.8571	0.8238	0.6456	0.6885	0.9084
83	0.6613	1.2969	NA	1.1117	1.3090
84	0.8427	1.2857	0.9197	0.6580	0.9882
85	0.5828	1.0367	0.9144	2.6814	1.0950
86	0.4726	0.7224	0.6593	NA	0.7447
87	1.0358	0.8817	0.8830	1.5358	0.8763
88	0.5067	0.4572	0.7264	0.8317	0.6873

## Stock Identifiers

AKS = ALASKA SPRING  
 LRW = LEWIS RIVER WILD  
 QUI = QUINSAM  
 RBT = ROBERTSON CREEK  
 SUM = COLUMBIA RIVER SUMMER  
 URB = COLUMBIA RIVER UPRIVER BRIGHT  
 WSH = WILLAMETTE SPRING

SE ALASKA TROLL (SE ALASKA STOCK ONLY)

=====

TOTAL MORTALITY EXPLOITATION RATES BY STOCK

	AKS	AKS
Year	Age 4	Age 5
82	0.1307	NA
83	0.1900	0.2849
84	0.0991	0.4052
85	0.1033	0.2047
86	0.1668	0.1361
87	0.0944	0.3032
88	0.1383	0.2445
Base	0.1399	0.3450

=====

TOTAL MORTALITY EXPLOITATION RATE INDEX BY STOCK

	AKS	AKS	
Year	Age 4	Age 5	Fishery
82	0.9341	NA	0.9341
83	1.3577	0.8257	0.9792
84	0.7082	1.1743	1.0398
85	0.7380	0.5932	0.6349
86	1.1917	0.3944	0.6244
87	0.6749	0.8787	0.8199
88	0.9883	0.7086	0.7893

Stock Identifiers

AKS = ALASKA SPRING

# NORTH/CENTRAL TROLL

TOTAL MORTALITY EXPLOITATION RATES BY STOCK												
Year	AKS Age 4	AKS Age 5	BQR Age 3	BQR Age 4	CAP Age 3	LRW Age 4	QUI Age 3	QUI Age 4	QUI Age 5	RBT Age 3	RBT Age 4	RBT Age 5
79	NA	NA	0.0848	0.0995	0.1208	NA	0.0498	0.1775	0.1140	0.0965	0.1677	0.0955
80	NA	NA	0.0887	0.0831	0.0666	NA	0.0538	0.1736	0.2418	0.0897	0.1373	0.1685
81	NA	NA	0.0881	0.0798	0.0629	0.0552	0.0838	0.1864	0.2018	0.0628	0.1477	0.2775
82	0.0048	NA	0.0699	0.1023	0.0797	0.0263	0.0362	0.0851	0.1217	0.0708	0.1662	0.0645
83	0.0079	NA	NA	0.1044	0.1065	0.0566	0.0647	0.1582	0.2381	0.0820	0.1238	0.0817
84	0.0058	NA	0.0594	NA	0.1155	NA	0.0115	0.0658	0.0773	0.0416	0.1539	0.2597
85	0.0045	NA	0.0326	NA	NA	NA	0.0181	0.0466	0.0360	0.0897	0.2446	0.2201
86	0.0081	NA	0.0648	0.1981	0.0479	0.0321	0.0520	0.0943	0.0879	NA	0.1410	NA
87	0.0023	NA	0.0132	0.0721	0.0129	0.0552	0.0239	0.0798	0.1385	0.0564	NA	NA
88	0.0121	NA	NA	NA	NA	NA	0.0069	0.0415	0.0233	0.0660	0.1042	NA
Base	0.0048	-1.0000	0.0829	0.0912	0.0825	0.0407	0.0559	0.1556	0.1698	0.0800	0.1547	0.1515

TOTAL MORTALITY EXPLOITATION RATES BY STOCK				
Year	URB Age 3	URB Age 4	URB Age 5	WSH Age 4
79	0.0133	0.0838	NA	NA
80	0.0263	0.0849	0.0623	0.1336
81	NA	0.0761	0.1622	0.0884
82	0.0260	0.0410	NA	0.0244
83	0.0348	0.0691	NA	0.0285
84	0.0256	0.1066	NA	0.0290
85	0.0207	0.0850	0.0720	0.0312
86	0.0192	0.0655	0.0772	NA
87	0.0378	0.1062	0.1195	0.0256
88	0.0209	0.0548	0.1063	0.0337
Base	0.0219	0.0715	0.1122	0.0821

TOTAL MORTALITY EXPLOITATION RATE INDEX BY STOCK												
Year	AKS Age 4	AKS Age 5	BQR Age 3	BQR Age 4	CAP Age 3	LRW Age 4	QUI Age 3	QUI Age 4	QUI Age 5	RBT Age 3	RBT Age 4	RBT Age 5
79	NA	NA	1.0229	1.0911	1.4638	NA	0.8915	1.1403	0.6712	1.2074	1.0842	0.6303
80	NA	NA	1.0706	0.9118	0.8078	NA	0.9625	1.1156	1.4239	1.1221	0.8871	1.1122
81	NA	NA	1.0631	0.8754	0.7622	1.3552	1.4992	1.1973	1.1880	0.7849	0.9547	1.8317
82	1.0000	NA	0.8434	1.1218	0.9662	0.6448	0.6468	0.5468	0.7168	0.8857	1.0741	0.4258
83	1.6551	NA	NA	1.1453	1.2907	1.3905	1.1565	1.0162	1.4019	1.0258	0.7999	0.5396
84	1.2282	NA	0.7166	NA	1.4001	NA	0.2056	0.4226	0.4550	0.5197	0.9947	1.7144
85	0.9387	NA	0.3934	NA	NA	NA	0.3233	0.2997	0.2118	1.1218	1.5811	1.4530
86	1.7109	NA	0.7821	2.1734	0.5806	0.7886	0.9304	0.6058	0.5176	NA	0.9115	NA
87	0.4858	NA	0.1588	0.7907	0.1560	1.3555	0.4272	0.5128	0.8156	0.7054	NA	NA
88	2.5373	NA	NA	NA	NA	NA	0.1229	0.2665	0.1375	0.8251	0.6735	NA

TOTAL MORTALITY EXPLOITATION RATE INDEX BY STOCK					
Year	URB Age 3	URB Age 4	URB Age 5	WSH Age 4	Fishery
79	0.6089	1.1725	NA	NA	0.9873
80	1.2024	1.1878	0.5551	1.6263	1.0751
81	NA	1.0655	1.4449	1.0769	1.1818
82	1.1887	0.5741	NA	0.2968	0.7380
83	1.5891	0.9667	NA	0.3474	0.9949
84	1.1688	1.4917	NA	0.3532	0.8549
85	0.9445	1.1900	0.6419	0.3793	0.7884
86	0.8774	0.9169	0.6879	NA	0.8511
87	1.7265	1.4861	1.0646	0.3113	0.7072
88	0.9552	0.7668	0.9475	0.4104	0.5170

## Stock Identifiers

AKS = ALASKA SPRING  
 BQR = BIG QUALICUM  
 CAP = CAPILANO  
 LRW = LEWIS RIVER WILD  
 QUI = QUINSAM  
 RBT = ROBERTSON CREEK  
 URB = COLUMBIA RIVER UPRIVER BRIGHT  
 WSH = WILLAMETTE SPRING

WEST COAST VANCOUVER ISLAND TROLL

TOTAL MORTALITY EXPLOITATION RATES BY STOCK													
Year	BON Age 3	BON Age 4	CWF Age 3	CWF Age 4	LRW Age 4	PSF Age 3	PSF Age 4	PSY Age 3	PSY Age 4	RBT Age 3	RBT Age 4	SPR Age 3	SPR Age 4
79	0.2311	NA	NA	NA	NA	NA	0.2516	0.0693	0.1673	0.0368	0.0745	0.1988	0.1624
80	0.1083	0.1579	0.1142	NA	NA	NA	0.1531	0.1317	0.0441	0.1052	0.2432	0.2775	
81	0.1776	0.1565	0.0562	0.1413	0.0617	0.0451	NA	0.0885	0.1745	0.0205	0.0272	0.1818	0.1756
82	0.2820	0.3547	0.0215	0.2008	0.0869	0.1007	0.2509	0.1405	0.2188	0.0244	0.0350	0.1911	0.2451
83	0.3466	0.3333	0.0417	0.2311	0.0704	0.1150	0.2077	0.0842	0.2096	0.0124	0.0356	0.3010	0.2804
84	0.2783	0.5673	0.0209	0.2247	NA	0.1060	0.2256	0.1977	0.1619	0.0496	0.0541	0.2740	0.3529
85	0.2711	NA	0.0323	0.1493	NA	0.0576	0.1635	0.1001	0.2137	0.0316	NA	0.1340	0.2705
86	NA	NA	0.0552	0.2126	0.0336	0.0695	0.2680	0.1004	0.2429	NA	NA	0.2445	0.1846
87	0.2145	NA	0.0169	0.1510	0.1117	0.0687	0.1491	0.0548	0.1003	0.0156	NA	0.0982	NA
88	NA	0.2756	0.0254	0.1653	0.1726	0.0561	0.1839	NA	0.1647	0.0382	0.0497	0.2857	NA
Base	0.1997	0.2230	0.0640	0.1711	0.0743	0.0729	0.2512	0.1128	0.1731	0.0315	0.0605	0.2037	0.2152

TOTAL MORTALITY EXPLOITATION RATES BY STOCK						
Year	STP Age 3	STP Age 4	SUM Age 4	URB Age 3	URB Age 4	WSH Age 4
79	NA	NA	NA	0.0527	0.0861	NA
80	NA	NA	0.1491	0.0405	0.0634	0.0606
81	0.2107	NA	0.1981	0.0077	0.0496	0.0100
82	0.2041	0.1906	NA	0.0309	0.0256	0.0304
83	0.2846	0.3406	NA	0.0102	0.0204	0.0059
84	0.3675	0.3871	NA	0.0236	0.0627	0.0262
85	0.1849	0.1548	NA	0.0228	0.0506	0.0200
86	0.2060	0.1493	NA	0.0399	0.0611	NA
87	0.2825	NA	0.0678	0.0333	0.0507	0.0208
88	0.2848	0.4115	0.0576	0.0163	0.1000	0.0213
Base	0.2074	0.1906	0.1736	0.0330	0.0562	0.0337

TOTAL MORTALITY EXPLOITATION RATE INDEX BY STOCK													
Year	BON Age 3	BON Age 4	CWF Age 3	CWF Age 4	LRW Age 4	PSF Age 3	PSF Age 4	PSY Age 3	PSY Age 4	RBT Age 3	RBT Age 4	SPR Age 3	SPR Age 4
79	1.1569	NA	NA	NA	NA	NA	1.0015	0.6139	0.9669	1.1691	1.2318	0.9760	0.7548
80	0.5421	0.7079	1.7859	NA	NA	NA	1.3565	0.7609	1.4020	1.7404	1.1937	1.2897	
81	0.8894	0.7017	0.8783	0.8263	0.8305	0.6190	NA	0.7846	1.0083	0.6524	0.4492	0.8923	0.8162
82	1.4117	1.5904	0.3358	1.1737	1.1695	1.3810	0.9985	1.2450	1.2640	0.7765	0.5786	0.9381	1.1393
83	1.7354	1.4944	0.6514	1.3511	0.9476	1.5774	0.8268	0.7466	1.2113	0.3947	0.5894	1.4777	1.3031
84	1.3934	2.5434	0.3263	1.3133	NA	1.4532	0.8979	1.7524	0.9353	1.5754	0.8939	1.3452	1.6404
85	1.3572	NA	0.5043	0.8727	NA	0.7897	0.6507	0.8871	1.2346	1.0025	NA	0.6575	1.2572
86	NA	NA	0.8635	1.2429	0.4520	0.9530	1.0669	0.8893	1.4036	NA	NA	1.2003	0.8581
87	1.0740	NA	0.2639	0.8827	1.5034	0.9417	0.5935	0.4853	0.5795	0.4952	NA	0.4821	NA
88	NA	1.2358	0.3975	0.9666	2.3237	0.7693	0.7320	NA	0.9515	1.2132	0.8225	1.4024	NA

TOTAL MORTALITY EXPLOITATION RATE INDEX BY STOCK							
Year	STP Age 3	STP Age 4	SUM Age 4	URB Age 3	URB Age 4	WSH Age 4	Fishery
79	NA	NA	NA	1.5992	1.5323	NA	0.9954
80	NA	NA	0.8588	1.2295	1.1284	1.8005	1.0436
81	1.0158	NA	1.1412	0.2338	0.8830	0.2975	0.8467
82	0.9842	1.0000	NA	0.9376	0.4563	0.9020	1.1096
83	1.3719	1.7870	NA	0.3085	0.3631	0.1739	1.2347
84	1.7717	2.0311	NA	0.7156	1.1148	0.7776	1.4698
85	0.8913	0.8123	NA	0.6913	0.9003	0.5934	0.9209
86	0.9931	0.7831	NA	1.2103	1.0877	NA	1.0231
87	1.3621	NA	0.3905	1.0118	0.9020	0.6191	0.7728
88	1.3731	2.1592	0.3315	0.4935	1.7794	0.6326	1.1431

Stock Identifiers

BON = BONNEVILLE TULE  
 CWF = COWLITZ FALL TULE  
 LRW = LEWIS RIVER WILD  
 PSF = PUGET SOUND FINGERLING  
 PSY = PUGET SOUND YEARLING  
 RBT = ROBERTSON CREEK  
 SPR = SPRING CREEK TULE  
 STP = STAYTON POND TULE  
 SUM = COLUMBIA RIVER SUMMER  
 URB = COLUMBIA RIVER UPRIVER BRIGHT  
 WSH = WILLAMETTE SPRING

GEORGIA STRAIT SPORT AND TROLL COMBINED

TOTAL MORTALITY EXPLOITATION RATES BY STOCK								
Year	BQR Age 3	BQR Age 4	CAP Age 3	CAP Age 4	PSF Age 3	PSF Age 4	PSY Age 3	QUI Age 5
79	0.2322	0.1790	0.4124	0.4828	NA	0.0562	0.0402	0.0600
80	0.2951	0.2938	0.3850	0.4355	NA	NA	0.0267	NA
81	0.3472	0.5049	0.5972	0.6172	0.0770	NA	0.0473	0.2165
82	0.1522	0.1420	0.3578	0.3333	0.0235	0.0399	0.0121	0.0899
83	0.3070	0.2129	0.3430	0.2348	0.0188	0.0275	0.0271	0.0544
84	0.3922	NA	0.4137	0.4628	0.0500	0.0332	0.0479	0.0455
85	0.1851	0.1302	0.3153	0.3908	NA	0.0350	0.0219	0.0432
86	0.2615	0.2167	0.3952	0.4615	NA	NA	0.0165	0.0548
87	0.1546	0.2736	0.2629	0.3429	0.0536	NA	0.0329	0.0135
88	0.2096	0.2296	0.1311	0.5270	0.0215	NA	NA	0.0506
Base	0.2567	0.2799	0.4381	0.4672	0.0502	0.0481	0.0316	0.1221

TOTAL MORTALITY EXPLOITATION RATE INDEX BY STOCK									
Year	BQR Age 3	BQR Age 4	CAP Age 3	CAP Age 4	PSF Age 3	PSF Age 4	PSY Age 3	QUI Age 5	Fishery
79	0.9049	0.6396	0.9413	1.0333	NA	1.1702	1.2723	0.4913	0.8900
80	1.1496	1.0494	0.8787	0.9321	NA	NA	0.8463	NA	0.9746
81	1.3526	1.8036	1.3631	1.3211	1.5329	NA	1.4994	1.7729	1.4627
82	0.5929	0.5074	0.8168	0.7135	0.4671	0.8298	0.3820	0.7358	0.6793
83	1.1961	0.7603	0.7829	0.5027	0.3735	0.5730	0.8587	0.4457	0.7235
84	1.5281	NA	0.9443	0.9907	0.9963	0.6915	1.5160	0.3722	1.0222
85	0.7213	0.4650	0.7196	0.8366	NA	0.7289	0.6937	0.3535	0.6824
86	1.0190	0.7742	0.9021	0.9879	NA	NA	0.5236	0.4488	0.8814
87	0.6024	0.9772	0.6000	0.7339	1.0675	NA	1.0410	0.1107	0.6890
88	0.8167	0.8203	0.2994	1.1281	0.4279	NA	NA	0.4142	0.7245

Stock Identifiers

BQR = BIG QUALICUM  
 CAP = CAPILANO  
 PSF = PUGET SOUND FINGERLING  
 PSY = PUGET SOUND YEARLING  
 QUI = QUINSAM



# GEORGIA STRAIT SPORT

## TOTAL MORTALITY EXPLOITATION RATES BY STOCK

	BQR	BQR	CAP	CAP	PSF	PSF	PSY
Year	Age 3	Age 4	Age 3	Age 4	Age 3	Age 4	Age 3
79	0.0862	0.1180	0.1845	0.3362	NA	0.0483	0.0259
80	0.1531	0.2183	0.2096	0.1962	NA	NA	0.0238
81	0.2420	0.4349	0.4398	0.4641	0.0725	NA	0.0436
82	0.0714	0.0653	0.1621	0.1801	0.0191	0.0206	0.0115
83	0.1349	0.1687	0.2070	0.2348	0.0173	0.0232	0.0176
84	0.2734	NA	0.3298	0.4224	0.0411	0.0332	0.0422
85	0.1669	0.1302	0.2709	0.3556	NA	0.0318	0.0219
86	0.1950	0.2136	0.3278	0.3538	NA	NA	0.0165
87	0.1184	0.2699	0.2004	0.3071	0.0536	NA	0.0232
88	0.1993	0.1852	NA	0.5270	0.0212	NA	NA
Base	0.1382	0.2091	0.2490	0.2941	0.0458	0.0344	0.0262

## TOTAL MORTALITY EXPLOITATION RATE INDEX BY STOCK

	BQR	BQR	CAP	CAP	PSF	PSF	PSY	
Year	Age 3	Age 4	Age 3	Age 4	Age 3	Age 4	Age 3	Fishery
79	0.6240	0.5644	0.7409	1.1430	NA	1.4024	0.9869	0.8402
80	1.1079	1.0437	0.8418	0.6671	NA	NA	0.9096	0.8739
81	1.7513	2.0794	1.7663	1.5777	1.5833	NA	1.6646	1.7630
82	0.5168	0.3124	0.6510	0.6122	0.4167	0.5976	0.4389	0.5317
83	0.9759	0.8066	0.8315	0.7984	0.3779	0.6732	0.6712	0.8060
84	1.9784	NA	1.3244	1.4361	0.8981	0.9648	1.6119	1.4499
85	1.2075	0.6225	1.0881	1.2091	NA	0.9246	0.8359	1.0276
86	1.4107	1.0215	1.3167	1.2030	NA	NA	0.6310	1.2074
87	0.8568	1.2905	0.8047	1.0442	1.1702	NA	0.8855	1.0105
88	1.4421	0.8855	NA	1.7918	0.4626	NA	NA	1.3571

## Stock Identifiers

BQR = BIG QUALICUM  
 CAP = CAPILANO  
 PSF = PUGET SOUND FINGERLING  
 PSY = PUGET SOUND YEARLING

# GEORGIA STRAIT TROLL

## ===== TOTAL MORTALITY EXPLOITATION RATES BY STOCK

	BQR	CAP
Year	Age 3	Age 3
79	0.1460	0.2279
80	0.1419	0.1754
81	0.1051	0.1574
82	0.0807	0.1957
83	0.1721	0.1359
84	0.1187	0.0839
85	0.0183	0.0443
86	0.0665	0.0674
87	0.0362	0.0625
88	0.0103	NA
Base	0.1184	0.1891

## ===== TOTAL MORTALITY EXPLOITATION RATE INDEX BY STOCK

	BQR	CAP	
Year	Age 3	Age 3	Fishery
79	1.2327	1.2053	1.2158
80	1.1982	0.9273	1.0316
81	0.8874	0.8323	0.8535
82	0.6817	1.0351	0.8990
83	1.4529	0.7189	1.0016
84	1.0026	0.4439	0.6591
85	0.1541	0.2344	0.2035
86	0.5619	0.3562	0.4354
87	0.3055	0.3305	0.3209
88	0.0870	NA	0.0870

## Stock Identifiers

BQR = BIG QUALICUM  
CAP = CAPILANO

WASHINGTON/OREGON SPORT AND TROLL COMBINED

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TOTAL MORTALITY EXPLOITATION RATES BY STOCK

Year	BON Age 3	CWF Age 3	CWF Age 4	PSF Age 3	PSF Age 4	PSY Age 3	SPR Age 3	SPR Age 4	STP Age 3	STP Age 4
79	0.1355	NA	NA	NA	0.0281	0.0148	0.1838	0.1729	NA	NA
80	0.2106	0.1268	NA	NA	NA	0.0310	0.2882	0.1250	NA	NA
81	0.2054	0.0966	0.1661	0.0102	NA	0.0242	0.2671	0.2049	0.1661	NA
82	0.1803	0.1575	0.2756	0.0080	0.0412	0.0269	0.3221	0.1240	0.2961	0.0563
83	0.1280	0.0751	0.1840	0.0061	0.0261	0.0161	0.1207	0.0561	0.1626	NA
84	0.0809	0.0133	0.0438	0.0108	0.0242	0.0070	0.0794	NA	0.0484	NA
85	0.1687	0.0778	0.0423	NA	0.0165	0.0125	0.1698	NA	0.1837	NA
86	NA	0.1282	0.0565	NA	NA	NA	0.1204	0.0667	0.1940	NA
87	0.1679	0.0903	0.1457	NA	NA	0.0187	0.2679	NA	0.1867	NA
88	NA	0.0983	0.1776	0.0337	NA	NA	0.1706	NA	0.2783	0.1575
Base	0.1830	0.1270	0.2208	0.0091	0.0346	0.0242	0.2653	0.1567	0.2311	0.0563

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TOTAL MORTALITY EXPLOITATION RATE INDEX BY STOCK

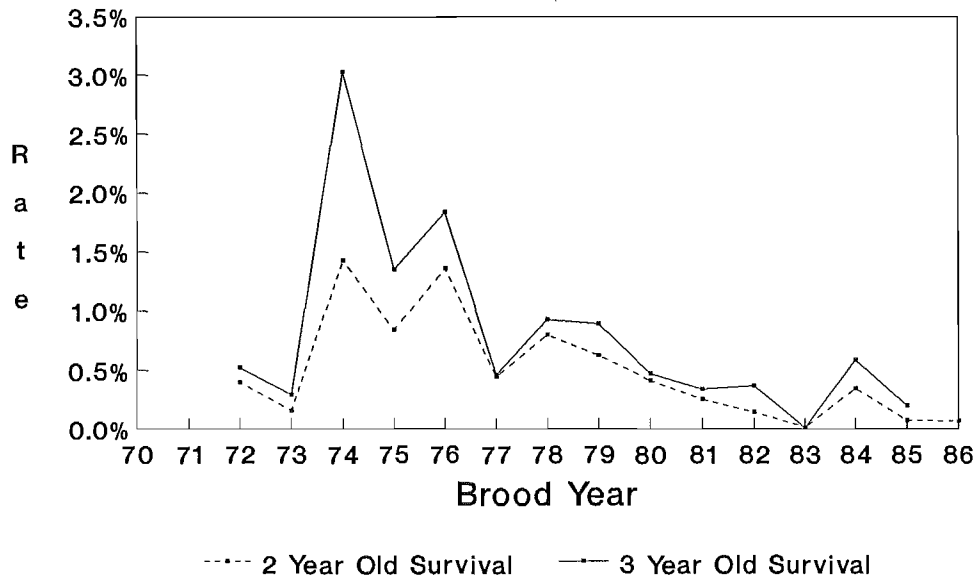
Year	BON Age 3	CWF Age 3	CWF Age 4	PSF Age 3	PSF Age 4	PSY Age 3	SPR Age 3	SPR Age 4	STP Age 3	STP Age 4	Fishery
79	0.7404	NA	NA	NA	0.8117	0.6109	0.6927	1.1035	NA	NA	0.8061
80	1.1513	0.9984	NA	NA	NA	1.2806	1.0863	0.7977	NA	NA	1.0337
81	1.1227	0.7610	0.7520	1.1168	NA	0.9980	1.0068	1.3074	0.7188	NA	0.9370
82	0.9857	1.2406	1.2480	0.8832	1.1883	1.1105	1.2142	0.7914	1.2812	1.0000	1.1376
83	0.6997	0.5919	0.8330	0.6728	0.7530	0.6648	0.4551	0.3578	0.7037	NA	0.6190
84	0.4422	0.1046	0.1985	1.1860	0.6977	0.2903	0.2994	NA	0.2096	NA	0.2812
85	0.9220	0.6127	0.1913	NA	0.4750	0.5161	0.6401	NA	0.7952	NA	0.6181
86	NA	1.0100	0.2558	NA	NA	NA	0.4540	0.4254	0.8397	NA	0.5654
87	0.9180	0.7112	0.6598	NA	NA	0.7708	1.0098	NA	0.8079	NA	0.8343
88	NA	0.7742	0.8043	3.7008	NA	NA	0.6430	NA	1.2044	2.7995	1.0072

Stock Identifiers

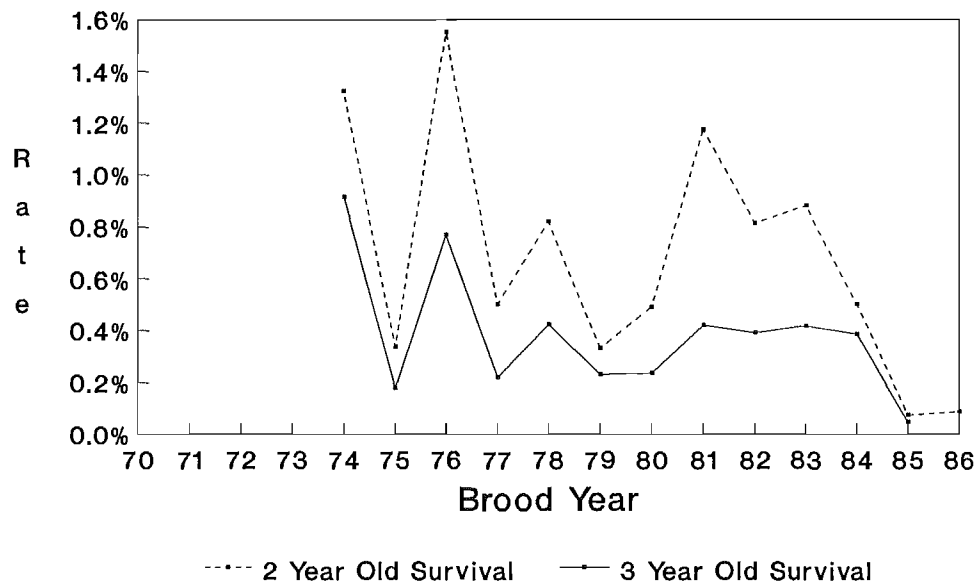
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BON = BONNEVILLE TULE  
 CWF = COWLITZ FALL TULE  
 PSF = PUGET SOUND FINGERLING  
 PSY = PUGET SOUND YEARLING  
 SPR = SPRING CREEK TULE  
 STP = STAYTON POND TULE

## SURVIVAL RATE INDEX ROBERTSON CREEK

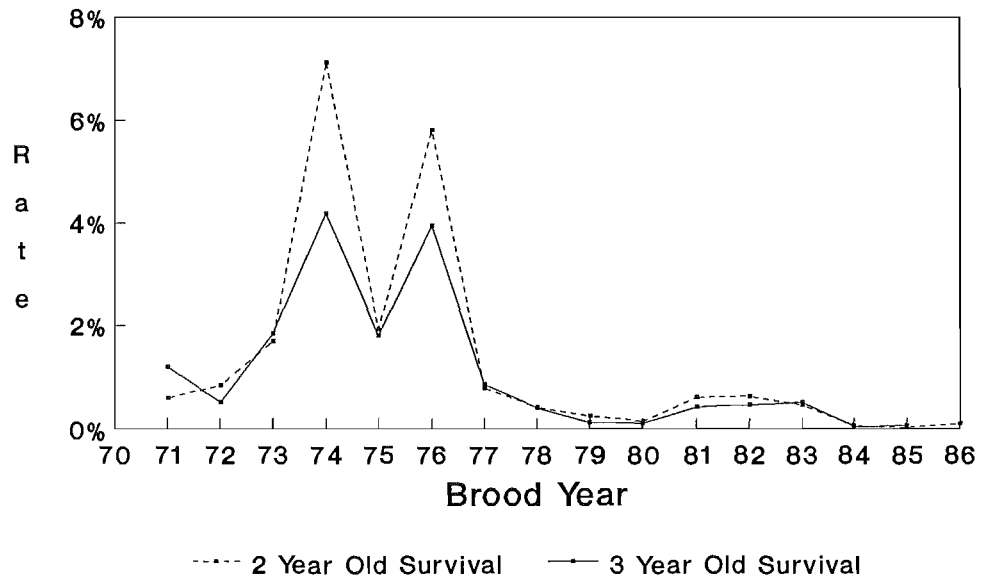


## SURVIVAL RATE INDEX QUINSAM RIVER



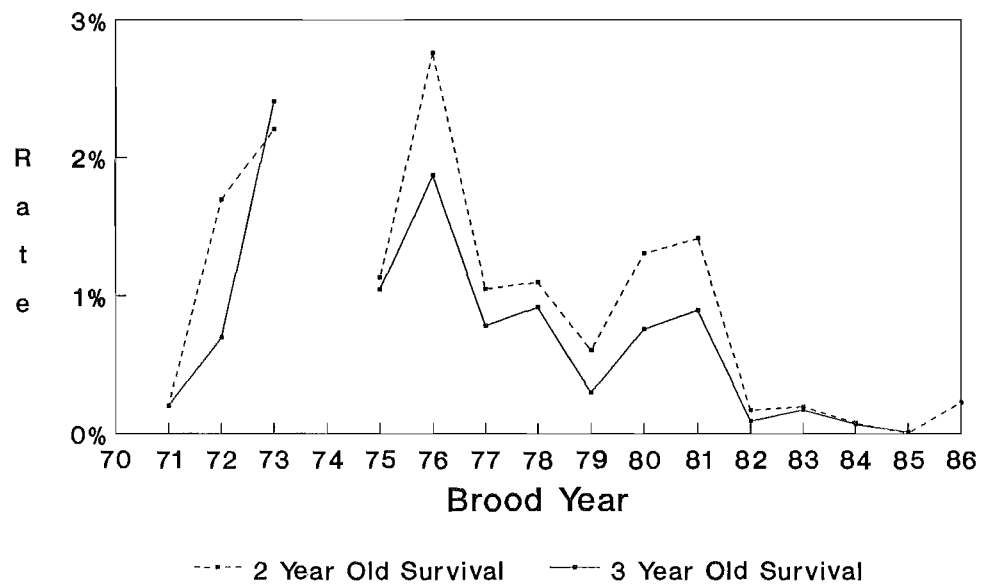
## SURVIVAL RATE INDEX

### BIQ QUALICUM RIVER

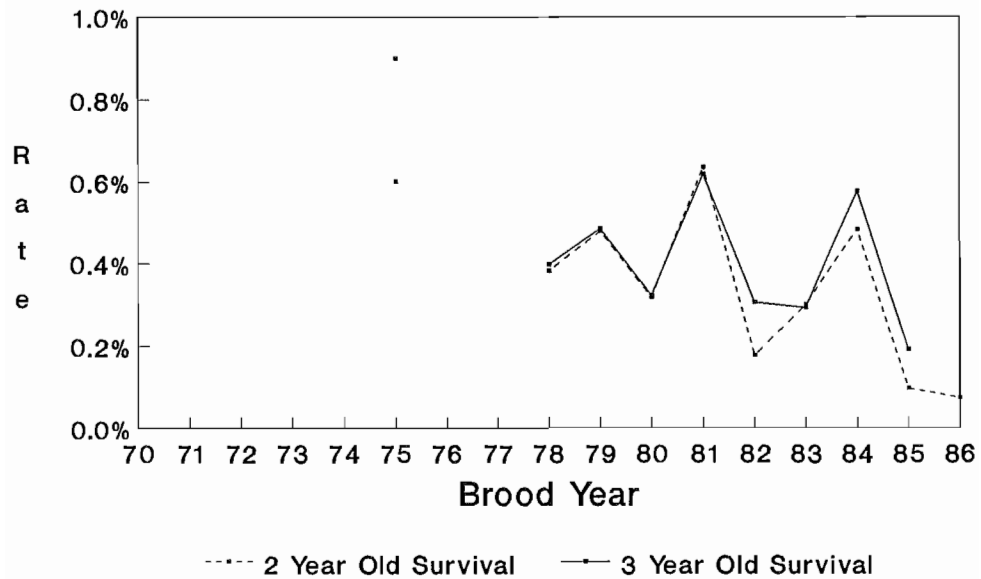


## SURVIVAL RATE INDEX

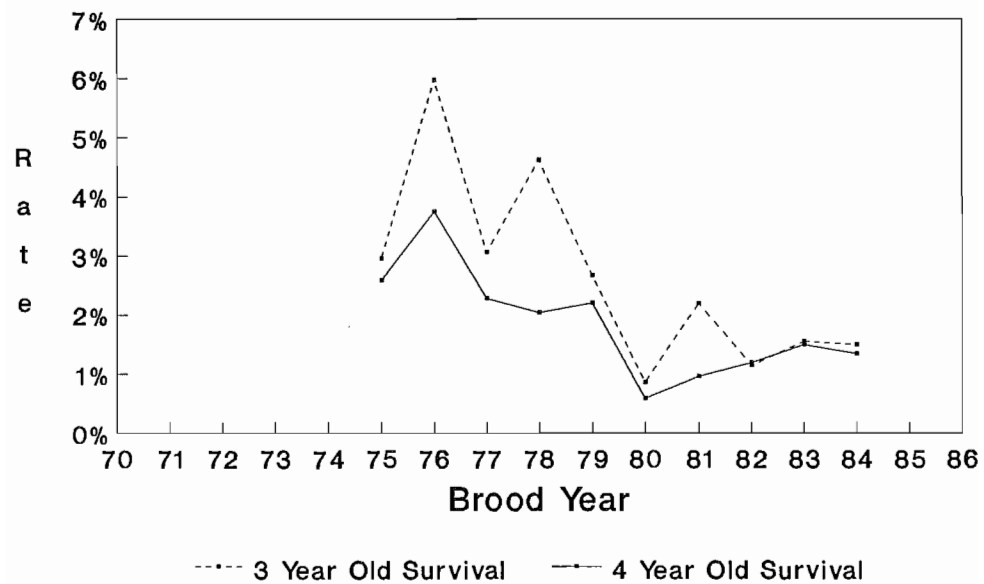
### CAPILANO RIVER



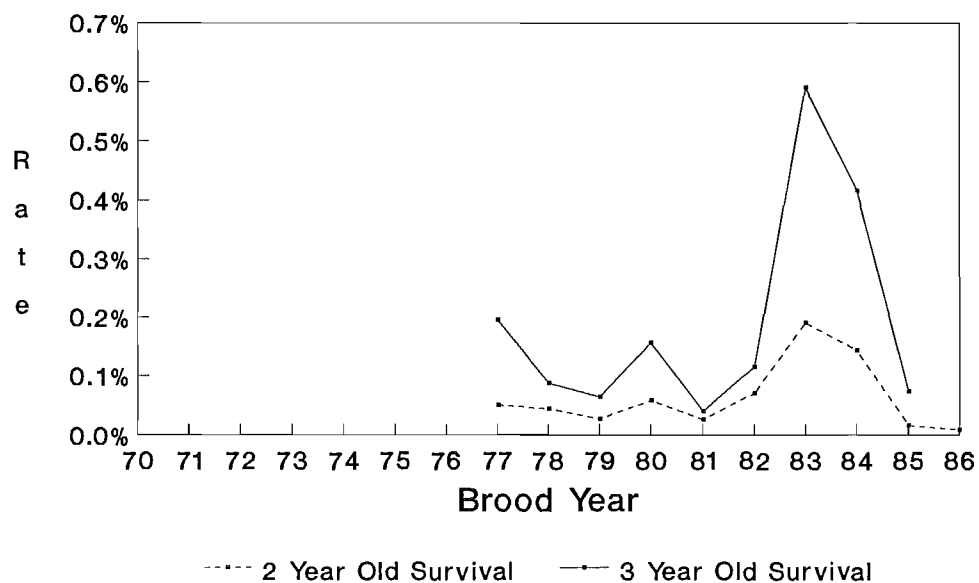
## SURVIVAL RATE INDEX PUGET SOUND FINGERLING



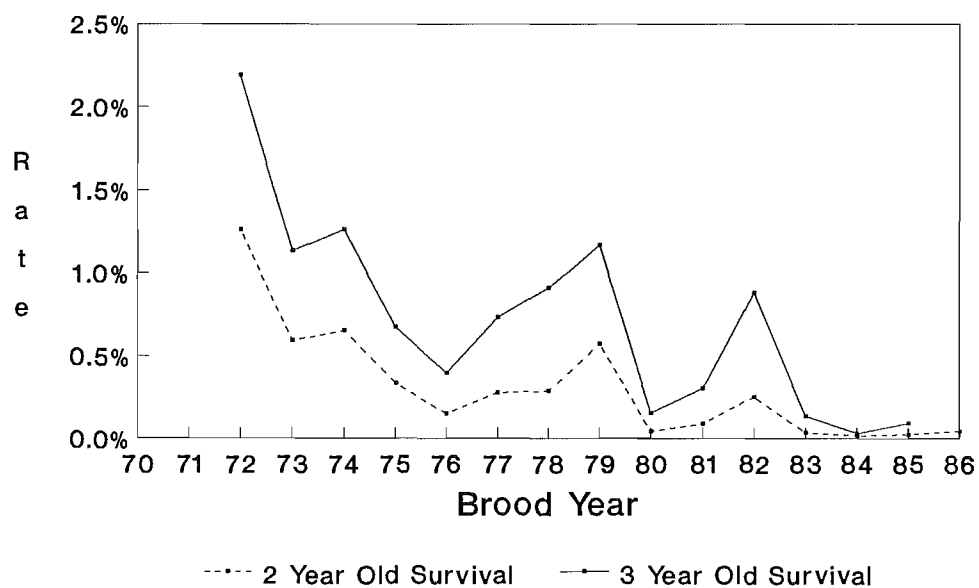
## SURVIVAL RATE INDEX PUGET SOUND YEARLING



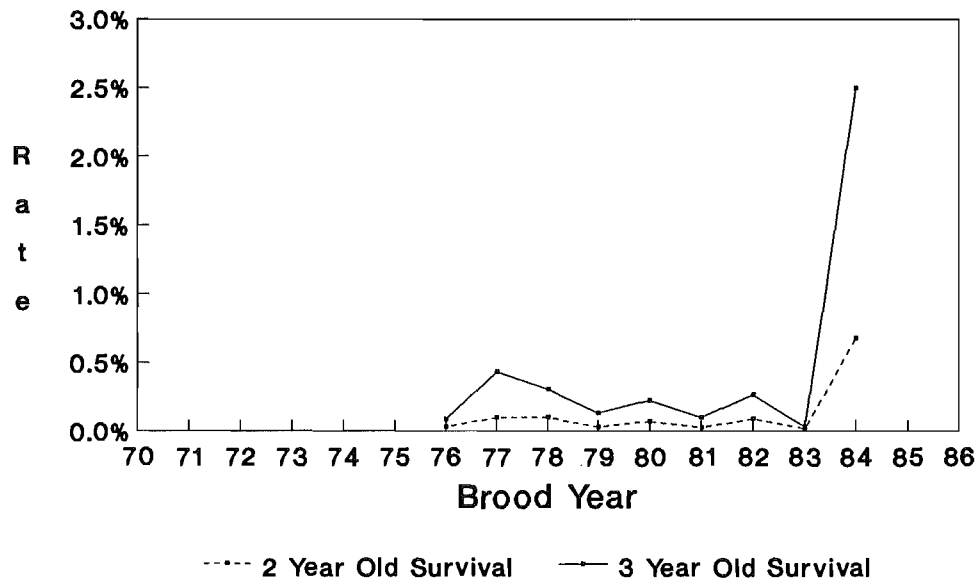
## SURVIVAL RATE INDEX COWLITZ TULE



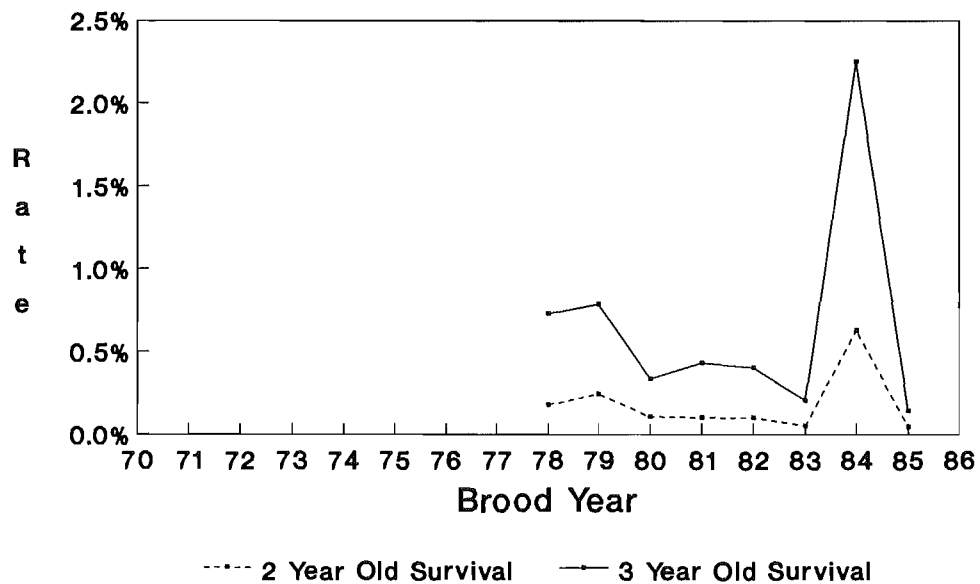
## SURVIVAL RATE INDEX SPRING CREEK



## SURVIVAL RATE INDEX BONNEVILLE TULE

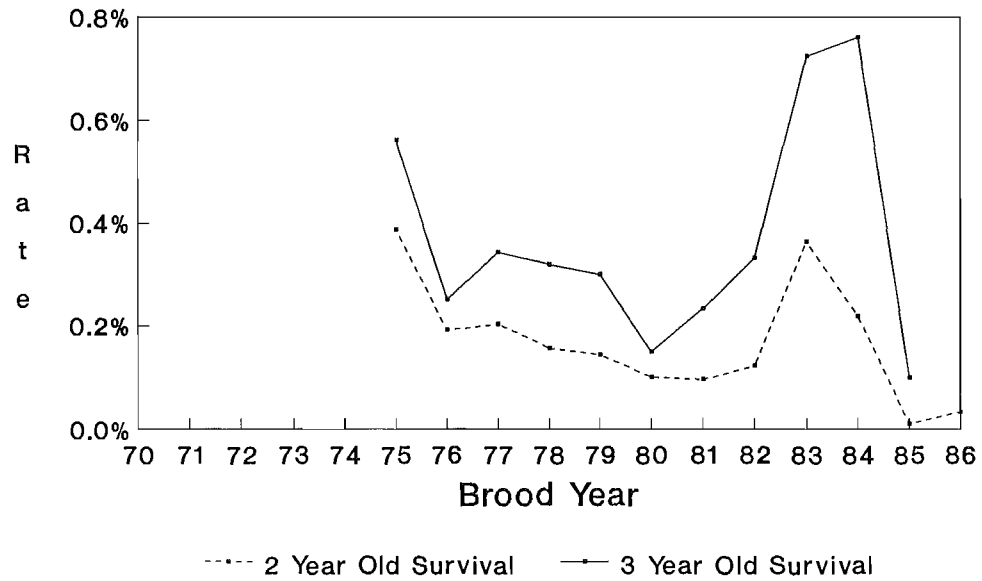


## SURVIVAL RATE INDEX STAYTON POND TULE

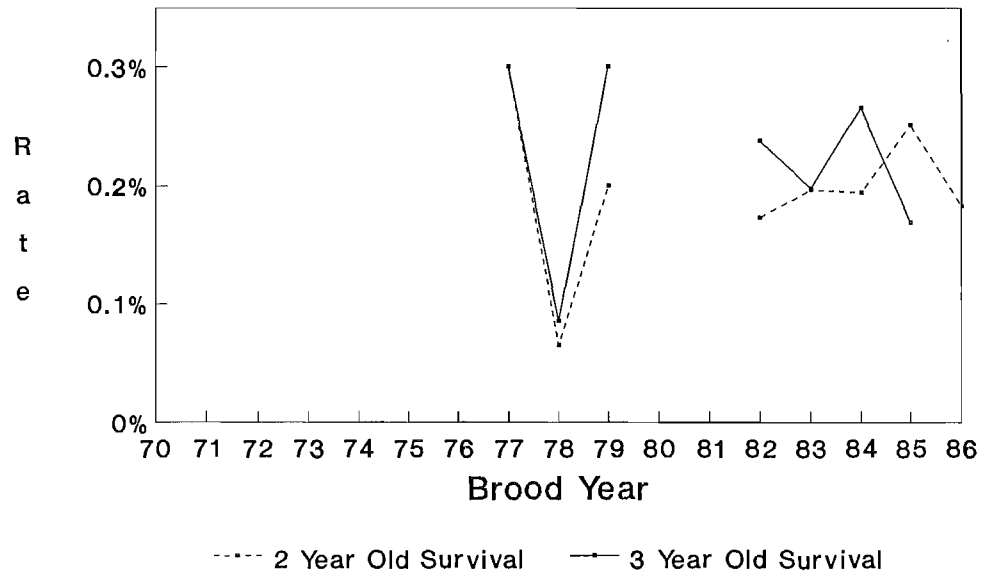




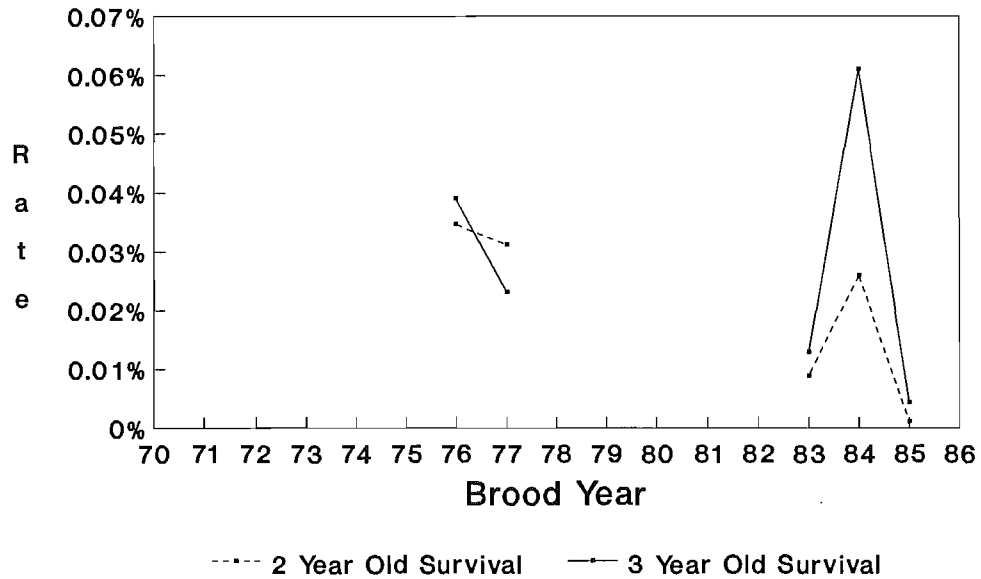
## SURVIVAL RATE INDEX UPRIVER BRIGHTS



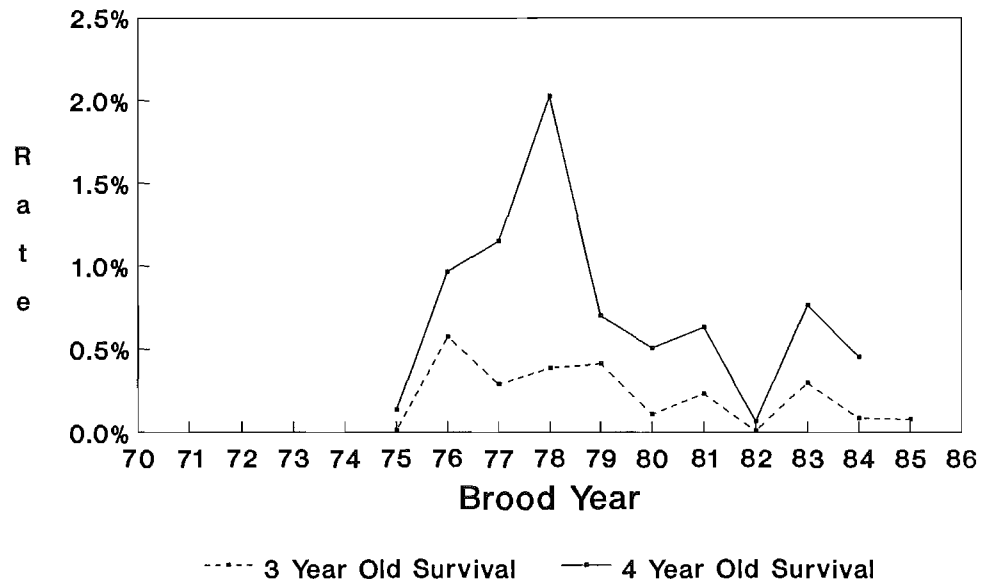
## SURVIVAL RATE INDEX LEWIS RIVER WILD



## SURVIVAL RATE INDEX COLUMBIA RIVER SUMMERS



## SURVIVAL RATE INDEX WILLAMETTE SPRINGS



## SECTION 9. DETAILED EXPLOITATION RATE AND FISHERY INDEX DATA

### S.E. Alaska Troll

- Total Mortality
- Reported Catch
- Total Mortality (S.E. Alaska Stock Only)
- Reported Catch (S.E. Alaska Stock Only)

### North/Central Troll

- Total Mortality
- Reported Catch

### West Coast Vancouver Island Troll

- Total Mortality
- Reported Catch

### Georgia Strait

- Sport and Troll Combined Total Mortality
- Sport and Troll Combined Reported Catch
- Sport Total Mortality
- Sport Reported Catch
- Troll Total Mortality
- Troll Reported Catch

### Washington/Oregon Ocean Sport and Troll Combined

- Total Mortality
- Reported Catch

SE ALASKA TROLL

TOTAL MORTALITY EXPLOITATION RATES BY STOCK										
Year	AKS Age 4	AKS Age 5	AKS Age 6	LRW Age 4	QUI Age 4	QUI Age 5	RBT Age 3	RBT Age 4	RBT Age 5	SUM Age 4
79	NA	NA	NA	NA	0.0137	0.0980	0.0525	0.2663	0.5650	NA
80	NA	NA	NA	NA	0.1112	0.0654	0.0774	0.2869	0.3736	0.2289
81	NA	NA	NA	0.0779	0.1181	0.1149	0.0840	0.3616	0.3892	0.0708
82	0.1307	NA	NA	0.0788	0.1447	0.1594	0.0703	0.2786	0.3387	NA
83	0.1900	NA	NA	0.0752	0.2262	0.2358	0.0758	0.3257	0.4810	NA
84	0.0991	NA	NA	NA	0.1173	0.2136	0.1180	0.3206	0.2489	NA
85	0.1033	NA	NA	NA	0.1749	0.2446	0.1262	0.1452	0.3711	NA
86	0.1668	NA	NA	0.0526	0.1114	0.1593	NA	0.3504	0.0370	NA
87	0.0944	NA	NA	0.0251	0.1401	0.1655	0.0445	NA	NA	0.0226
88	0.1383	NA	NA	0.0247	0.0990	0.0973	0.0264	0.1901	NA	0.0827
Base	0.1307	-1.0000	-1.0000	0.0784	0.0969	0.1094	0.0711	0.2984	0.4166	0.1498

TOTAL MORTALITY EXPLOITATION RATES BY STOCK				
Year	URB Age 3	URB Age 4	URB Age 5	WSH Age 4
79	0.0164	0.1399	NA	NA
80	0.0426	0.1678	0.2232	0.1350
81	NA	0.1768	0.4595	0.0688
82	0.0236	0.1256	0.1872	0.0607
83	0.0182	0.1978	NA	0.0980
84	0.0232	0.1961	0.2667	0.0580
85	0.0160	0.1581	0.2651	0.2364
86	0.0130	0.1102	0.1912	NA
87	0.0285	0.1345	0.2560	0.1354
88	0.0139	0.0697	0.2106	0.0733
Base	0.0275	0.1525	0.2900	0.0882

TOTAL MORTALITY EXPLOITATION RATE INDEX BY STOCK										
Year	AKS Age 4	AKS Age 5	AKS Age 6	LRW Age 4	QUI Age 4	QUI Age 5	RBT Age 3	RBT Age 4	RBT Age 5	SUM Age 4
79	NA	NA	NA	NA	0.1409	0.8957	0.7388	0.8925	1.3561	NA
80	NA	NA	NA	NA	1.1477	0.5974	1.0897	0.9616	0.8968	1.5278
81	NA	NA	NA	0.9945	1.2187	1.0499	1.1819	1.2120	0.9341	0.4722
82	1.0000	NA	NA	1.0055	1.4928	1.4570	0.9896	0.9339	0.8130	NA
83	1.4535	NA	NA	0.9603	2.3338	2.1554	1.0669	1.0918	1.1545	NA
84	0.7582	NA	NA	NA	1.2098	1.9526	1.6602	1.0744	0.5975	NA
85	0.7901	NA	NA	NA	1.8049	2.2356	1.7768	0.4865	0.8907	NA
86	1.2758	NA	NA	0.6707	1.1497	1.4555	NA	1.1745	0.0889	NA
87	0.7226	NA	NA	0.3203	1.4451	1.5130	0.6263	NA	NA	0.1508
88	1.0581	NA	NA	0.3147	1.0218	0.8891	0.3714	0.6370	NA	0.5522

TOTAL MORTALITY EXPLOITATION RATE INDEX BY STOCK					
Year	URB Age 3	URB Age 4	URB Age 5	WSH Age 4	Fishery
79	0.5945	0.9171	NA	NA	0.9823
80	1.5483	1.1002	0.7698	1.5308	1.0069
81	NA	1.1589	1.5846	0.7807	1.0972
82	0.8571	0.8238	0.6456	0.6885	0.9084
83	0.6613	1.2969	NA	1.1117	1.3090
84	0.8427	1.2857	0.9197	0.6580	0.9882
85	0.5828	1.0367	0.9144	2.6814	1.0950
86	0.4726	0.7224	0.6593	NA	0.7447
87	1.0358	0.8817	0.8830	1.5358	0.8763
88	0.5067	0.4572	0.7264	0.8317	0.6873

Stock Identifiers

AKS = ALASKA SPRING  
 LRW = LEWIS RIVER WILD  
 QUI = QUINSAM  
 RBT = ROBERTSON CREEK  
 SUM = COLUMBIA RIVER SUMMER  
 URB = COLUMBIA RIVER UPRIVER BRIGHT  
 WSH = WILLAMETTE SPRING

## SE ALASKA TROLL

REPORTED CATCH EXPLOITATION RATES BY STOCK								
Year	AKS Age 4	LRW Age 4	QUI Age 4	QUI Age 5	RBT Age 3	RBT Age 4	RBT Age 5	SUM Age 4
79	NA	NA	0.0137	0.0960	0.0221	0.2645	0.5650	NA
80	NA	NA	0.1107	0.0654	0.0485	0.2853	0.3700	0.2274
81	NA	0.0758	0.1155	0.1119	0.0571	0.3531	0.3810	0.0708
82	0.0876	0.0687	0.1298	0.1449	0.0318	0.2491	0.2984	NA
83	0.1313	0.0631	0.2075	0.2177	0.0244	0.2985	0.4430	NA
84	0.0593	NA	0.1058	0.1909	0.0563	0.2853	0.2229	NA
85	0.0671	NA	0.1487	0.2110	0.0615	0.1237	0.3208	NA
86	0.1154	0.0467	0.1014	0.1448	NA	0.3205	0.0370	NA
87	0.0371	0.0201	0.1114	0.1318	0.0227	NA	NA	0.0169
88	0.0723	0.0219	0.0883	0.0895	0.0069	0.1687	NA	0.0647
Base	0.0876	0.0722	0.0924	0.1046	0.0399	0.2880	0.4036	0.1491

REPORTED CATCH EXPLOITATION RATES BY STOCK				
Year	URB Age 3	URB Age 4	URB Age 5	WSH Age 4
79	0.0000	0.1392	NA	NA
80	0.0229	0.1668	0.2228	0.1150
81	NA	0.1720	0.4505	0.0576
82	0.0057	0.1128	0.1675	0.0418
83	0.0011	0.1821	NA	0.0757
84	0.0040	0.1758	0.2389	0.0444
85	0.0044	0.1356	0.2277	0.1438
86	0.0047	0.0999	0.1728	NA
87	0.0042	0.1078	0.2063	0.0824
88	0.0000	0.0617	0.1881	0.0538
Base	0.0095	0.1477	0.2802	0.0715

REPORTED CATCH EXPLOITATION RATE INDEX BY STOCK								
Year	AKS Age 4	LRW Age 4	QUI Age 4	QUI Age 5	RBT Age 3	RBT Age 4	RBT Age 5	SUM Age 4
79	NA	NA	0.1477	0.9182	0.5551	0.9184	1.4000	NA
80	NA	NA	1.1979	0.6251	1.2165	0.9906	0.9167	1.5254
81	NA	1.0490	1.2498	1.0705	1.4316	1.2261	0.9440	0.4746
82	1.0000	0.9510	1.4046	1.3861	0.7968	0.8648	0.7394	NA
83	1.4995	0.8738	2.2454	2.0821	0.6133	1.0365	1.0976	NA
84	0.6769	NA	1.1451	1.8259	1.4127	0.9905	0.5524	NA
85	0.7659	NA	1.6091	2.0184	1.5422	0.4293	0.7948	NA
86	1.3173	0.6468	1.0977	1.3847	NA	1.1129	0.0918	NA
87	0.4235	0.2780	1.2061	1.2602	0.5690	NA	NA	0.1137
88	0.8250	0.3035	0.9559	0.8560	0.1743	0.5859	NA	0.4343

REPORTED CATCH EXPLOITATION RATE INDEX BY STOCK					
Year	URB Age 3	URB Age 4	URB Age 5	WSH Age 4	Fishery
79	0.0000	0.9421	NA	NA	1.0137
80	2.4019	1.1295	0.7949	1.6090	1.0304
81	NA	1.1645	1.6074	0.8057	1.1189
82	0.5981	0.7639	0.5977	0.5853	0.8378
83	0.1125	1.2329	NA	1.0595	1.2487
84	0.4201	1.1899	0.8525	0.6209	0.9073
85	0.4655	0.9183	0.8124	2.0119	0.9471
86	0.4968	0.6766	0.6166	NA	0.7022
87	0.4460	0.7298	0.7360	1.1529	0.7023
88	0.0000	0.4176	0.6714	0.7531	0.6078

## Stock Identifiers

AKS = ALASKA SPRING  
 LRW = LEWIS RIVER WILD  
 QUI = QUINSAM  
 RBT = ROBERTSON CREEK  
 SUM = COLUMBIA RIVER SUMMER  
 URB = COLUMBIA RIVER UPRIVER BRIGHT  
 WSH = WILLAMETTE SPRING

SE ALASKA TROLL (SE ALASKA STOCK ONLY)

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TOTAL MORTALITY EXPLOITATION RATES BY STOCK

	AKS	AKS
Year	Age 4	Age 5
=====		
82	0.1307	NA
83	0.1900	0.2849
84	0.0991	0.4052
85	0.1033	0.2047
86	0.1668	0.1361
87	0.0944	0.3032
88	0.1383	0.2445
-----		
Base	0.1399	0.3450
-----		

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TOTAL MORTALITY EXPLOITATION RATE INDEX BY STOCK

	AKS	AKS	
Year	Age 4	Age 5	Fishery
=====			
82	0.9341	NA	0.9341
83	1.3577	0.8257	0.9792
84	0.7082	1.1743	1.0398
85	0.7380	0.5932	0.6349
86	1.1917	0.3944	0.6244
87	0.6749	0.8787	0.8199
88	0.9883	0.7086	0.7893
-----			

Stock Identifiers

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AKS = ALASKA SPRING

SE ALASKA TROLL (SE ALASKA STOCK ONLY)

=====

REPORTED CATCH EXPLOITATION RATES BY STOCK

	AKS	AKS
Year	Age 4	Age 5
=====		
82	0.0876	NA
83	0.1313	0.2610
84	0.0593	0.3632
85	0.0671	0.1748
86	0.1154	0.1216
87	0.0371	0.2428
88	0.0723	0.2157
-----		
Base	0.0927	0.3121
-----		

=====

REPORTED CATCH EXPLOITATION RATE INDEX BY STOCK

	AKS	AKS	
Year	Age 4	Age 5	Fishery
=====			
82	0.9445	NA	0.9445
83	1.4162	0.8362	0.9691
84	0.6393	1.1638	1.0437
85	0.7234	0.5600	0.5974
86	1.2441	0.3898	0.5855
87	0.3999	0.7781	0.6914
88	0.7792	0.6912	0.7114
-----			

Stock Identifiers

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AKS = ALASKA SPRING

## NORTH/CENTRAL TROLL

TOTAL MORTALITY EXPLOITATION RATES BY STOCK												
Year	AKS Age 4	AKS Age 5	BQR Age 3	BQR Age 4	CAP Age 3	LRW Age 4	QUI Age 3	QUI Age 4	QUI Age 5	RBT Age 3	RBT Age 4	RBT Age 5
79	NA	NA	0.0848	0.0995	0.1208	NA	0.0498	0.1775	0.1140	0.0965	0.1677	0.0955
80	NA	NA	0.0887	0.0831	0.0666	NA	0.0538	0.1736	0.2418	0.0897	0.1373	0.1685
81	NA	NA	0.0881	0.0798	0.0629	0.0552	0.0838	0.1864	0.2018	0.0628	0.1477	0.2775
82	0.0048	NA	0.0699	0.1023	0.0797	0.0263	0.0362	0.0851	0.1217	0.0708	0.1662	0.0645
83	0.0079	NA	NA	0.1044	0.1065	0.0566	0.0647	0.1582	0.2381	0.0820	0.1238	0.0817
84	0.0058	NA	0.0594	NA	0.1155	NA	0.0115	0.0658	0.0773	0.0416	0.1539	0.2597
85	0.0045	NA	0.0326	NA	NA	NA	0.0181	0.0466	0.0360	0.0897	0.2446	0.2201
86	0.0081	NA	0.0648	0.1981	0.0479	0.0321	0.0520	0.0943	0.0879	NA	0.1410	NA
87	0.0023	NA	0.0132	0.0721	0.0129	0.0552	0.0239	0.0798	0.1385	0.0564	NA	NA
88	0.0121	NA	NA	NA	NA	NA	0.0069	0.0415	0.0233	0.0660	0.1042	NA
Base	0.0048	-1.0000	0.0829	0.0912	0.0825	0.0407	0.0559	0.1556	0.1698	0.0800	0.1547	0.1515

TOTAL MORTALITY EXPLOITATION RATES BY STOCK				
Year	URB Age 3	URB Age 4	URB Age 5	WSH Age 4
79	0.0133	0.0838	NA	NA
80	0.0263	0.0849	0.0623	0.1336
81	NA	0.0761	0.1622	0.0884
82	0.0260	0.0410	NA	0.0244
83	0.0348	0.0691	NA	0.0285
84	0.0256	0.1066	NA	0.0290
85	0.0207	0.0850	0.0720	0.0312
86	0.0192	0.0655	0.0772	NA
87	0.0378	0.1062	0.1195	0.0256
88	0.0209	0.0548	0.1063	0.0337
Base	0.0219	0.0715	0.1122	0.0821

TOTAL MORTALITY EXPLOITATION RATE INDEX BY STOCK												
Year	AKS Age 4	AKS Age 5	BQR Age 3	BQR Age 4	CAP Age 3	LRW Age 4	QUI Age 3	QUI Age 4	QUI Age 5	RBT Age 3	RBT Age 4	RBT Age 5
79	NA	NA	1.0229	1.0911	1.4638	NA	0.8915	1.1403	0.6712	1.2074	1.0842	0.6303
80	NA	NA	1.0706	0.9118	0.8078	NA	0.9625	1.1156	1.4239	1.1221	0.8871	1.1122
81	NA	NA	1.0631	0.8754	0.7622	1.3552	1.4992	1.1973	1.1880	0.7849	0.9547	1.8317
82	1.0000	NA	0.8434	1.1218	0.9662	0.6448	0.6468	0.5468	0.7168	0.8857	1.0741	0.4258
83	1.6551	NA	NA	1.1453	1.2907	1.3905	1.1565	1.0162	1.4019	1.0258	0.7999	0.5396
84	1.2282	NA	0.7166	NA	1.4001	NA	0.2056	0.4226	0.4550	0.5197	0.9947	1.7144
85	0.9387	NA	0.3934	NA	NA	NA	0.3233	0.2997	0.2118	1.1218	1.5811	1.4530
86	1.7109	NA	0.7821	2.1734	0.5806	0.7886	0.9304	0.6058	0.5176	NA	0.9115	NA
87	0.4858	NA	0.1588	0.7907	0.1560	1.3555	0.4272	0.5128	0.8156	0.7054	NA	NA
88	2.5373	NA	NA	NA	NA	NA	0.1229	0.2665	0.1375	0.8251	0.6735	NA

TOTAL MORTALITY EXPLOITATION RATE INDEX BY STOCK					
Year	URB Age 3	URB Age 4	URB Age 5	WSH Age 4	Fishery
79	0.6089	1.1725	NA	NA	0.9873
80	1.2024	1.1878	0.5551	1.6263	1.0751
81	NA	1.0655	1.4449	1.0769	1.1818
82	1.1887	0.5741	NA	0.2968	0.7380
83	1.5891	0.9667	NA	0.3474	0.9949
84	1.1688	1.4917	NA	0.3532	0.8549
85	0.9445	1.1900	0.6419	0.3793	0.7884
86	0.8774	0.9169	0.6879	NA	0.8511
87	1.7265	1.4861	1.0646	0.3113	0.7072
88	0.9552	0.7668	0.9475	0.4104	0.5170

## Stock Identifiers

AKS = ALASKA SPRING  
 BQR = BIG QUALICUM  
 CAP = CAPILANO  
 LRW = LEWIS RIVER WILD  
 QUI = QUINSAM  
 RBT = ROBERTSON CREEK  
 URB = COLUMBIA RIVER UPRIVER BRIGHT  
 WSH = WILLAMETTE SPRING



## NORTH/CENTRAL TROLL

REPORTED CATCH EXPLOITATION RATES BY STOCK												
Year	AKS Age 4	BQR Age 3	BQR Age 4	CAP Age 3	LRW Age 4	QUI Age 3	QUI Age 4	QUI Age 5	RBT Age 3	RBT Age 4	RBT Age 5	
79	NA	0.0748	0.0995	0.1129	NA	0.0416	0.1775	0.1120	0.0833	0.1666	0.0928	
80	NA	0.0803	0.0831	0.0622	NA	0.0438	0.1720	0.2418	0.0818	0.1363	0.1685	
81	NA	0.0792	0.0798	0.0564	0.0552	0.0718	0.1850	0.2018	0.0552	0.1477	0.2759	
82	0.0041	0.0637	0.1023	0.0762	0.0242	0.0320	0.0840	0.1217	0.0610	0.1653	0.0645	
83	0.0072	NA	0.1044	0.1000	0.0566	0.0581	0.1582	0.2381	0.0725	0.1223	0.0817	
84	0.0054	0.0578	NA	0.1001	NA	0.0091	0.0658	0.0773	0.0295	0.1532	0.2597	
85	0.0040	0.0313	NA	NA	NA	0.0146	0.0462	0.0360	0.0731	0.2419	0.2201	
86	0.0075	0.0525	0.1950	0.0434	0.0307	0.0473	0.0943	0.0869	NA	0.1410	NA	
87	0.0019	0.0033	0.0684	0.0055	0.0527	0.0139	0.0768	0.1385	0.0417	NA	NA	
88	0.0090	NA	NA	NA	NA	0.0057	0.0398	0.0233	0.0472	0.0965	NA	
Base	0.0041	0.0745	0.0912	0.0769	0.0397	0.0473	0.1546	0.1693	0.0703	0.1540	0.1504	

REPORTED CATCH EXPLOITATION RATES BY STOCK				
Year	URB Age 3	URB Age 4	URB Age 5	WSH Age 4
79	0.0091	0.0832	NA	NA
80	0.0215	0.0839	0.0623	0.1178
81	NA	0.0755	0.1622	0.0784
82	0.0236	0.0410	NA	0.0174
83	0.0305	0.0691	NA	0.0245
84	0.0212	0.1066	NA	0.0245
85	0.0179	0.0850	0.0720	0.0280
86	0.0165	0.0652	0.0772	NA
87	0.0216	0.1014	0.1181	0.0152
88	0.0105	0.0510	0.1022	0.0248
Base	0.0180	0.0709	0.1122	0.0712

REPORTED CATCH EXPLOITATION RATE INDEX BY STOCK												
Year	AKS Age 4	BQR Age 3	BQR Age 4	CAP Age 3	LRW Age 4	QUI Age 3	QUI Age 4	QUI Age 5	RBT Age 3	RBT Age 4	RBT Age 5	
79	NA	1.0044	1.0911	1.4683	NA	0.8798	1.1477	0.6614	1.1842	1.0818	0.6172	
80	NA	1.0779	0.9118	0.8083	NA	0.9257	1.1123	1.4281	1.1629	0.8849	1.1201	
81	NA	1.0631	0.8754	0.7332	1.3896	1.5178	1.1966	1.1915	0.7854	0.9593	1.8338	
82	1.0000	0.8546	1.1218	0.9902	0.6104	0.6767	0.5435	0.7189	0.8674	1.0739	0.4289	
83	1.7554	NA	1.1453	1.3000	1.4259	1.2282	1.0228	1.4061	1.0310	0.7942	0.5434	
84	1.3293	0.7760	NA	1.3009	NA	0.1929	0.4254	0.4563	0.4194	0.9947	1.7267	
85	0.9896	0.4200	NA	NA	NA	0.3091	0.2985	0.2124	1.0395	1.5713	1.4633	
86	1.8342	0.7053	2.1394	0.5644	0.7719	0.9990	0.6097	0.5130	NA	0.9159	NA	
87	0.4753	0.0442	0.7502	0.0717	1.3268	0.2928	0.4967	0.8180	0.5926	NA	NA	
88	2.2202	NA	NA	NA	NA	0.1209	0.2575	0.1379	0.6716	0.6268	NA	

REPORTED CATCH EXPLOITATION RATE INDEX BY STOCK					
Year	URB Age 3	URB Age 4	URB Age 5	WSH Age 4	Fishery
79	0.5035	1.1735	NA	NA	0.9775
80	1.1898	1.1834	0.5551	1.6537	1.0747
81	NA	1.0643	1.4449	1.1013	1.1882
82	1.3067	0.5787	NA	0.2450	0.7389
83	1.6902	0.9743	NA	0.3441	1.0046
84	1.1740	1.5035	NA	0.3434	0.8572
85	0.9936	1.1994	0.6419	0.3925	0.7933
86	0.9169	0.9190	0.6879	NA	0.8466
87	1.1982	1.4301	1.0520	0.2127	0.6586
88	0.5793	0.7188	0.9110	0.3487	0.4703

## Stock Identifiers

AKS = ALASKA SPRING  
 BQR = BIG QUALICUM  
 CAP = CAPILANO  
 LRW = LEWIS RIVER WILD  
 QUI = QUINSAM  
 RBT = ROBERTSON CREEK  
 URB = COLUMBIA RIVER UPRIVER BRIGHT  
 WSH = WILLAMETTE SPRING

WEST COAST VANCOUVER ISLAND TROLL

TOTAL MORTALITY EXPLOITATION RATES BY STOCK														
Year	BON Age 3	BON Age 4	CWF Age 3	CWF Age 4	LRW Age 4	PSF Age 3	PSF Age 4	PSY Age 3	PSY Age 4	RBT Age 3	RBT Age 4	SPR Age 3	SPR Age 4	
79	0.2311	NA	NA	NA	NA	NA	0.2516	0.0693	0.1673	0.0368	0.0745	0.1988	0.1624	
80	0.1083	0.1579	0.1142	NA	NA	NA	NA	0.1531	0.1317	0.0441	0.1052	0.2432	0.2775	
81	0.1776	0.1565	0.0562	0.1413	0.0617	0.0451	NA	0.0885	0.1745	0.0205	0.0272	0.1818	0.1756	
82	0.2820	0.3547	0.0215	0.2008	0.0869	0.1007	0.2509	0.1405	0.2188	0.0244	0.0350	0.1911	0.2451	
83	0.3466	0.3333	0.0417	0.2311	0.0704	0.1150	0.2077	0.0842	0.2096	0.0124	0.0356	0.3010	0.2804	
84	0.2783	0.5673	0.0209	0.2247	NA	0.1060	0.2256	0.1977	0.1619	0.0496	0.0541	0.2740	0.3529	
85	0.2711	NA	0.0323	0.1493	NA	0.0576	0.1635	0.1001	0.2137	0.0316	NA	0.1340	0.2705	
86	NA	NA	0.0552	0.2126	0.0336	0.0695	0.2680	0.1004	0.2429	NA	NA	0.2445	0.1846	
87	0.2145	NA	0.0169	0.1510	0.1117	0.0687	0.1491	0.0548	0.1003	0.0156	NA	0.0982	NA	
88	NA	0.2756	0.0254	0.1653	0.1726	0.0561	0.1839	NA	0.1647	0.0382	0.0497	0.2857	NA	
Base	0.1997	0.2230	0.0640	0.1711	0.0743	0.0729	0.2512	0.1128	0.1731	0.0315	0.0605	0.2037	0.2152	

TOTAL MORTALITY EXPLOITATION RATES BY STOCK						
Year	STP Age 3	STP Age 4	SUM Age 4	URB Age 3	URB Age 4	WSH Age 4
79	NA	NA	NA	0.0527	0.0861	NA
80	NA	NA	0.1491	0.0405	0.0634	0.0606
81	0.2107	NA	0.1981	0.0077	0.0496	0.0100
82	0.2041	0.1906	NA	0.0309	0.0256	0.0304
83	0.2846	0.3406	NA	0.0102	0.0204	0.0059
84	0.3675	0.3871	NA	0.0236	0.0627	0.0262
85	0.1849	0.1548	NA	0.0228	0.0506	0.0200
86	0.2060	0.1493	NA	0.0399	0.0611	NA
87	0.2825	NA	0.0678	0.0333	0.0507	0.0208
88	0.2848	0.4115	0.0576	0.0163	0.1000	0.0213
Base	0.2074	0.1906	0.1736	0.0330	0.0562	0.0337

TOTAL MORTALITY EXPLOITATION RATE INDEX BY STOCK														
Year	BON Age 3	BON Age 4	CWF Age 3	CWF Age 4	LRW Age 4	PSF Age 3	PSF Age 4	PSY Age 3	PSY Age 4	RBT Age 3	RBT Age 4	SPR Age 3	SPR Age 4	
79	1.1569	NA	NA	NA	NA	NA	1.0015	0.6139	0.9669	1.1691	1.2318	0.9760	0.7548	
80	0.5421	0.7079	1.7859	NA	NA	NA	NA	1.3565	0.7609	1.4020	1.7404	1.1937	1.2897	
81	0.8894	0.7017	0.8783	0.8263	0.8305	0.6190	NA	0.7846	1.0083	0.6524	0.4492	0.8923	0.8162	
82	1.4117	1.5904	0.3358	1.1737	1.1695	1.3810	0.9985	1.2450	1.2640	0.7765	0.5786	0.9381	1.1393	
83	1.7354	1.4944	0.6514	1.3511	0.9476	1.5774	0.8268	0.7466	1.2113	0.3947	0.5894	1.4777	1.3031	
84	1.3934	2.5434	0.3263	1.3133	NA	1.4532	0.8979	1.7524	0.9353	1.5754	0.8939	1.3452	1.6404	
85	1.3572	NA	0.5043	0.8727	NA	0.7897	0.6507	0.8871	1.2346	1.0025	NA	0.6575	1.2572	
86	NA	NA	0.8635	1.2429	0.4520	0.9530	1.0669	0.8893	1.4036	NA	NA	1.2003	0.8581	
87	1.0740	NA	0.2639	0.8827	1.5034	0.9417	0.5935	0.4853	0.5795	0.4952	NA	0.4821	NA	
88	NA	1.2358	0.3975	0.9666	2.3237	0.7693	0.7320	NA	0.9515	1.2132	0.8225	1.4024	NA	

TOTAL MORTALITY EXPLOITATION RATE INDEX BY STOCK							
Year	STP Age 3	STP Age 4	SUM Age 4	URB Age 3	URB Age 4	WSH Age 4	Fishery
79	NA	NA	NA	1.5992	1.5323	NA	0.9954
80	NA	NA	0.8588	1.2295	1.1284	1.8005	1.0436
81	1.0158	NA	1.1412	0.2338	0.8830	0.2975	0.8467
82	0.9842	1.0000	NA	0.9376	0.4563	0.9020	1.1096
83	1.3719	1.7870	NA	0.3085	0.3631	0.1739	1.2347
84	1.7717	2.0311	NA	0.7156	1.1148	0.7776	1.4698
85	0.8913	0.8123	NA	0.6913	0.9003	0.5934	0.9209
86	0.9931	0.7831	NA	1.2103	1.0877	NA	1.0231
87	1.3621	NA	0.3905	1.0118	0.9020	0.6191	0.7728
88	1.3731	2.1592	0.3315	0.4935	1.7794	0.6326	1.1431

Stock Identifiers

BON = BONNEVILLE TULE  
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 LRW = LEWIS RIVER WILD  
 PSF = PUGET SOUND FINGERLING  
 PSY = PUGET SOUND YEARLING  
 RBT = ROBERTSON CREEK  
 SPR = SPRING CREEK TULE  
 STP = STAYTON POND TULE  
 SUM = COLUMBIA RIVER SUMMER  
 URB = COLUMBIA RIVER UPRIVER BRIGHT  
 WSH = WILLAMETTE SPRING

WEST COAST VANCOUVER ISLAND TROLL

REPORTED CATCH EXPLOITATION RATES BY STOCK													
Year	BON Age 3	BON Age 4	CWF Age 3	CWF Age 4	LRW Age 4	PSF Age 3	PSF Age 4	PSY Age 3	PSY Age 4	RBT Age 3	RBT Age 4	SPR Age 3	SPR Age 4
79	0.2151	NA	NA	NA	NA	NA	0.2487	0.0645	0.1656	0.0317	0.0733	0.1851	0.1579
80	0.0984	0.1579	0.1049	NA	NA	NA	NA	0.1430	0.1291	0.0391	0.1040	0.2264	0.2734
81	0.1602	0.1522	0.0472	0.1378	0.0617	0.0372	NA	0.0830	0.1745	0.0187	0.0272	0.1694	0.1732
82	0.2623	0.3514	0.0167	0.1969	0.0848	0.0904	0.2487	0.1248	0.2146	0.0217	0.0342	0.1665	0.2393
83	0.3116	0.3175	0.0350	0.2264	0.0696	0.1053	0.2048	0.0762	0.2083	0.0099	0.0347	0.2832	0.2757
84	0.2621	0.5673	0.0114	0.2219	NA	0.0952	0.2226	0.1872	0.1583	0.0442	0.0526	0.2629	0.3529
85	0.2319	NA	0.0285	0.1493	NA	0.0497	0.1608	0.0938	0.2137	0.0299	NA	0.1152	0.2705
86	NA	NA	0.0490	0.2126	0.0336	0.0618	0.2680	0.0921	0.2429	NA	NA	0.2190	0.1795
87	0.1748	NA	0.0055	0.1444	0.1066	0.0452	0.1404	0.0406	0.0944	0.0119	NA	0.0804	NA
88	NA	0.2526	0.0000	0.1509	0.1616	0.0376	0.1724	NA	0.1557	0.0299	0.0456	0.2601	NA
Base	0.1840	0.2205	0.0562	0.1673	0.0733	0.0638	0.2487	0.1038	0.1709	0.0278	0.0597	0.1869	0.2109

REPORTED CATCH EXPLOITATION RATES BY STOCK						
Year	STP Age 3	STP Age 4	SUM Age 4	URB Age 3	URB Age 4	WSH Age 4
79	NA	NA	NA	0.0478	0.0849	NA
80	NA	NA	0.1476	0.0370	0.0624	0.0530
81	0.1942	NA	0.1934	0.0062	0.0496	0.0083
82	0.1874	0.1860	NA	0.0285	0.0256	0.0268
83	0.2632	0.3370	NA	0.0096	0.0188	0.0051
84	0.3391	0.3790	NA	0.0208	0.0627	0.0228
85	0.1637	0.1506	NA	0.0205	0.0499	0.0184
86	0.2030	0.1493	NA	0.0360	0.0600	NA
87	0.1887	NA	0.0621	0.0236	0.0459	0.0161
88	0.2298	0.3802	0.0540	0.0035	0.0920	0.0183
Base	0.1908	0.1860	0.1705	0.0299	0.0557	0.0294

REPORTED CATCH EXPLOITATION RATE INDEX BY STOCK													
Year	BON Age 3	BON Age 4	CWF Age 3	CWF Age 4	LRW Age 4	PSF Age 3	PSF Age 4	PSY Age 3	PSY Age 4	RBT Age 3	RBT Age 4	SPR Age 3	SPR Age 4
79	1.1692	NA	NA	NA	NA	NA	1.0000	0.6214	0.9688	1.1401	1.2287	0.9906	0.7486
80	0.5349	0.7162	1.8640	NA	NA	NA	NA	1.3772	0.7551	1.4063	1.7437	1.2117	1.2960
81	0.8705	0.6902	0.8390	0.8236	0.8419	0.5831	NA	0.7992	1.0208	0.6735	0.4553	0.9064	0.8210
82	1.4254	1.5936	0.2970	1.1764	1.1581	1.4169	1.0000	1.2022	1.2553	0.7801	0.5724	0.8912	1.1344
83	1.6933	1.4399	0.6217	1.3531	0.9496	1.6511	0.8235	0.7340	1.2188	0.3578	0.5808	1.5153	1.3071
84	1.4246	2.5731	0.2024	1.3262	NA	1.4923	0.8948	1.8033	0.9259	1.5921	0.8807	1.4067	1.6734
85	1.2604	NA	0.5060	0.8922	NA	0.7799	0.6466	0.9041	1.2500	1.0762	NA	0.6164	1.2824
86	NA	NA	0.8710	1.2707	0.4583	0.9686	1.0777	0.8872	1.4211	NA	NA	1.1718	0.8510
87	0.9499	NA	0.0977	0.8628	1.4556	0.7091	0.5643	0.3911	0.5522	0.4285	NA	0.4300	NA
88	NA	1.1456	0.0000	0.9018	2.2062	0.5896	0.6932	NA	0.9108	1.0747	0.7640	1.3920	NA

REPORTED CATCH EXPLOITATION RATE INDEX BY STOCK							
Year	STP Age 3	STP Age 4	SUM Age 4	URB Age 3	URB Age 4	WSH Age 4	Fishery
79	NA	NA	NA	1.6014	1.5261	NA	0.9973
80	NA	NA	0.8657	1.2400	1.1217	1.8044	1.0465
81	1.0180	NA	1.1343	0.2063	0.8915	0.2841	0.8464
82	0.9820	1.0000	NA	0.9523	0.4606	0.9115	1.1063
83	1.3794	1.8117	NA	0.3223	0.3384	0.1744	1.2323
84	1.7772	2.0379	NA	0.6956	1.1256	0.7748	1.4883
85	0.8579	0.8099	NA	0.6847	0.8964	0.6255	0.9133
86	1.0638	0.8025	NA	1.2062	1.0784	NA	1.0359
87	0.9888	NA	0.3645	0.7912	0.8244	0.5482	0.6712
88	1.2042	2.0441	0.3165	0.1166	1.6520	0.6242	1.0551

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 URB = COLUMBIA RIVER UPRIVER BRIGHT  
 WSH = WILLAMETTE SPRING

GEORGIA STRAIT SPORT AND TROLL COMBINED

TOTAL MORTALITY EXPLOITATION RATES BY STOCK								
	BQR	BQR	CAP	CAP	PSF	PSF	PSY	QUI
Year	Age 3	Age 4	Age 3	Age 4	Age 3	Age 4	Age 3	Age 5
79	0.2322	0.1790	0.4124	0.4828	NA	0.0562	0.0402	0.0600
80	0.2951	0.2938	0.3850	0.4355	NA	NA	0.0267	NA
81	0.3472	0.5049	0.5972	0.6172	0.0770	NA	0.0473	0.2165
82	0.1522	0.1420	0.3578	0.3333	0.0235	0.0399	0.0121	0.0899
83	0.3070	0.2129	0.3430	0.2348	0.0188	0.0275	0.0271	0.0544
84	0.3922	NA	0.4137	0.4628	0.0500	0.0332	0.0479	0.0455
85	0.1851	0.1302	0.3153	0.3908	NA	0.0350	0.0219	0.0432
86	0.2615	0.2167	0.3952	0.4615	NA	NA	0.0165	0.0548
87	0.1546	0.2736	0.2629	0.3429	0.0536	NA	0.0329	0.0135
88	0.2096	0.2296	0.1311	0.5270	0.0215	NA	NA	0.0506
Base	0.2567	0.2799	0.4381	0.4672	0.0502	0.0481	0.0316	0.1221

TOTAL MORTALITY EXPLOITATION RATE INDEX BY STOCK									
	BQR	BQR	CAP	CAP	PSF	PSF	PSY	QUI	
Year	Age 3	Age 4	Age 3	Age 4	Age 3	Age 4	Age 3	Age 5	Fishery
79	0.9049	0.6396	0.9413	1.0333	NA	1.1702	1.2723	0.4913	0.8900
80	1.1496	1.0494	0.8787	0.9321	NA	NA	0.8463	NA	0.9746
81	1.3526	1.8036	1.3631	1.3211	1.5329	NA	1.4994	1.7729	1.4627
82	0.5929	0.5074	0.8168	0.7135	0.4671	0.8298	0.3820	0.7358	0.6793
83	1.1961	0.7603	0.7829	0.5027	0.3735	0.5730	0.8587	0.4457	0.7235
84	1.5281	NA	0.9443	0.9907	0.9963	0.6915	1.5160	0.3722	1.0222
85	0.7213	0.4650	0.7196	0.8366	NA	0.7289	0.6937	0.3535	0.6824
86	1.0190	0.7742	0.9021	0.9879	NA	NA	0.5236	0.4488	0.8814
87	0.6024	0.9772	0.6000	0.7339	1.0675	NA	1.0410	0.1107	0.6890
88	0.8167	0.8203	0.2994	1.1281	0.4279	NA	NA	0.4142	0.7245

Stock Identifiers

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 BQR = BIG QUALICUM  
 CAP = CAPILANO  
 PSF = PUGET SOUND FINGERLING  
 PSY = PUGET SOUND YEARLING  
 QUI = QUINSAM

GEORGIA STRAIT SPORT AND TROLL COMBINED

REPORTED CATCH EXPLOITATION RATES BY STOCK

Year	BQR Age 3	BQR Age 4	CAP Age 3	CAP Age 4	PSF Age 3	PSF Age 4	PSY Age 3	QUI Age 5
79	0.2314	0.1790	0.4115	0.4828	NA	0.0562	0.0402	0.0600
80	0.2946	0.2938	0.3842	0.4355	NA	NA	0.0267	NA
81	0.3464	0.5049	0.5964	0.6172	0.0770	NA	0.0473	0.2165
82	0.1522	0.1420	0.3578	0.3333	0.0235	0.0399	0.0121	0.0899
83	0.3070	0.2129	0.3419	0.2348	0.0188	0.0275	0.0271	0.0544
84	0.3891	NA	0.4090	0.4628	0.0499	0.0332	0.0471	0.0455
85	0.1812	0.1302	0.3054	0.3873	NA	0.0345	0.0219	0.0432
86	0.2458	0.2136	0.3802	0.4462	NA	NA	0.0165	0.0548
87	0.1546	0.2736	0.2518	0.3429	0.0519	NA	0.0316	0.0135
88	0.2096	0.2296	0.1311	0.5270	0.0212	NA	NA	0.0506
Base	0.2561	0.2799	0.4375	0.4672	0.0502	0.0481	0.0316	0.1221

REPORTED CATCH EXPLOITATION RATE INDEX BY STOCK

Year	BQR Age 3	BQR Age 4	CAP Age 3	CAP Age 4	PSF Age 3	PSF Age 4	PSY Age 3	QUI Age 5	Fishery
79	0.9035	0.6396	0.9406	1.0333	NA	1.1702	1.2723	0.4913	0.8896
80	1.1501	1.0494	0.8782	0.9321	NA	NA	0.8463	NA	0.9745
81	1.3524	1.8036	1.3632	1.3211	1.5329	NA	1.4994	1.7729	1.4627
82	0.5941	0.5074	0.8179	0.7135	0.4671	0.8298	0.3820	0.7358	0.6798
83	1.1984	0.7603	0.7815	0.5027	0.3735	0.5730	0.8587	0.4457	0.7233
84	1.5189	NA	0.9349	0.9907	0.9929	0.6915	1.4937	0.3722	1.0169
85	0.7075	0.4650	0.6981	0.8291	NA	0.7179	0.6937	0.3535	0.6720
86	0.9595	0.7631	0.8691	0.9550	NA	NA	0.5236	0.4488	0.8512
87	0.6036	0.9772	0.5756	0.7339	1.0342	NA	1.0002	0.1107	0.6809
88	0.8184	0.8203	0.2998	1.1281	0.4220	NA	NA	0.4142	0.7248

Stock Identifiers

-----  
 BQR = BIG QUALICUM  
 CAP = CAPILANO  
 PSF = PUGET SOUND FINGERLING  
 PSY = PUGET SOUND YEARLING  
 QUI = QUINSAM

# GEORGIA STRAIT SPORT

TOTAL MORTALITY EXPLOITATION RATES BY STOCK							
Year	BQR Age 3	BQR Age 4	CAP Age 3	CAP Age 4	PSF Age 3	PSF Age 4	PSY Age 3
79	0.0862	0.1180	0.1845	0.3362	NA	0.0483	0.0259
80	0.1531	0.2183	0.2096	0.1962	NA	NA	0.0238
81	0.2420	0.4349	0.4398	0.4641	0.0725	NA	0.0436
82	0.0714	0.0653	0.1621	0.1801	0.0191	0.0206	0.0115
83	0.1349	0.1687	0.2070	0.2348	0.0173	0.0232	0.0176
84	0.2734	NA	0.3298	0.4224	0.0411	0.0332	0.0422
85	0.1669	0.1302	0.2709	0.3556	NA	0.0318	0.0219
86	0.1950	0.2136	0.3278	0.3538	NA	NA	0.0165
87	0.1184	0.2699	0.2004	0.3071	0.0536	NA	0.0232
88	0.1993	0.1852	NA	0.5270	0.0212	NA	NA
Base	0.1382	0.2091	0.2490	0.2941	0.0458	0.0344	0.0262

TOTAL MORTALITY EXPLOITATION RATE INDEX BY STOCK								
Year	BQR Age 3	BQR Age 4	CAP Age 3	CAP Age 4	PSF Age 3	PSF Age 4	PSY Age 3	Fishery
79	0.6240	0.5644	0.7409	1.1430	NA	1.4024	0.9869	0.8402
80	1.1079	1.0437	0.8418	0.6671	NA	NA	0.9096	0.8739
81	1.7513	2.0794	1.7663	1.5777	1.5833	NA	1.6646	1.7630
82	0.5168	0.3124	0.6510	0.6122	0.4167	0.5976	0.4389	0.5317
83	0.9759	0.8066	0.8315	0.7984	0.3779	0.6732	0.6712	0.8060
84	1.9784	NA	1.3244	1.4361	0.8981	0.9648	1.6119	1.4499
85	1.2075	0.6225	1.0881	1.2091	NA	0.9246	0.8359	1.0276
86	1.4107	1.0215	1.3167	1.2030	NA	NA	0.6310	1.2074
87	0.8568	1.2905	0.8047	1.0442	1.1702	NA	0.8855	1.0105
88	1.4421	0.8855	NA	1.7918	0.4626	NA	NA	1.3571

## Stock Identifiers

BQR = BIG QUALICUM  
 CAP = CAPILANO  
 PSF = PUGET SOUND FINGERLING  
 PSY = PUGET SOUND YEARLING

# GEORGIA STRAIT SPORT

REPORTED CATCH EXPLOITATION RATES BY STOCK							
Year	BQR Age 3	BQR Age 4	CAP Age 3	CAP Age 4	PSF Age 3	PSF Age 4	PSY Age 3
79	0.0862	0.1180	0.1845	0.3362	NA	0.0483	0.0259
80	0.1531	0.2183	0.2096	0.1962	NA	NA	0.0238
81	0.2420	0.4349	0.4398	0.4641	0.0725	NA	0.0436
82	0.0714	0.0653	0.1621	0.1801	0.0191	0.0206	0.0115
83	0.1349	0.1687	0.2062	0.2348	0.0173	0.0232	0.0176
84	0.2719	NA	0.3291	0.4224	0.0411	0.0332	0.0422
85	0.1656	0.1302	0.2660	0.3556	NA	0.0318	0.0219
86	0.1944	0.2136	0.3278	0.3538	NA	NA	0.0165
87	0.1184	0.2699	0.2004	0.3071	0.0519	NA	0.0232
88	0.1993	0.1852	NA	0.5270	0.0209	NA	NA
Base	0.1382	0.2091	0.2490	0.2941	0.0458	0.0344	0.0262

REPORTED CATCH EXPLOITATION RATE INDEX BY STOCK								
Year	BQR Age 3	BQR Age 4	CAP Age 3	CAP Age 4	PSF Age 3	PSF Age 4	PSY Age 3	Fishery
79	0.6240	0.5644	0.7409	1.1430	NA	1.4024	0.9869	0.8402
80	1.1079	1.0437	0.8418	0.6671	NA	NA	0.9096	0.8739
81	1.7513	2.0794	1.7663	1.5777	1.5833	NA	1.6646	1.7630
82	0.5168	0.3124	0.6510	0.6122	0.4167	0.5976	0.4389	0.5317
83	0.9759	0.8066	0.8282	0.7984	0.3779	0.6732	0.6712	0.8052
84	1.9671	NA	1.3217	1.4361	0.8981	0.9648	1.6119	1.4471
85	1.1980	0.6225	1.0684	1.2091	NA	0.9246	0.8359	1.0211
86	1.4065	1.0215	1.3167	1.2030	NA	NA	0.6310	1.2068
87	0.8568	1.2905	0.8047	1.0442	1.1336	NA	0.8855	1.0088
88	1.4421	0.8855	NA	1.7918	0.4560	NA	NA	1.3567

## Stock Identifiers

BQR = BIG QUALICUM  
 CAP = CAPILANO  
 PSF = PUGET SOUND FINGERLING  
 PSY = PUGET SOUND YEARLING

# GEORGIA STRAIT TROLL

## ===== TOTAL MORTALITY EXPLOITATION RATES BY STOCK

	BQR	CAP
Year	Age 3	Age 3
79	0.1460	0.2279
80	0.1419	0.1754
81	0.1051	0.1574
82	0.0807	0.1957
83	0.1721	0.1359
84	0.1187	0.0839
85	0.0183	0.0443
86	0.0665	0.0674
87	0.0362	0.0625
88	0.0103	NA
Base	0.1184	0.1891

## ===== TOTAL MORTALITY EXPLOITATION RATE INDEX BY STOCK

	BQR	CAP	
Year	Age 3	Age 3	Fishery
79	1.2327	1.2053	1.2158
80	1.1982	0.9273	1.0316
81	0.8874	0.8323	0.8535
82	0.6817	1.0351	0.8990
83	1.4529	0.7189	1.0016
84	1.0026	0.4439	0.6591
85	0.1541	0.2344	0.2035
86	0.5619	0.3562	0.4354
87	0.3055	0.3305	0.3209
88	0.0870	NA	0.0870

## Stock Identifiers

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BQR = BIG QUALICUM  
CAP = CAPILANO



GEORGIA STRAIT TROLL

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REPORTED CATCH EXPLOITATION RATES BY STOCK

	BQR	CAP
Year	Age 3	Age 3
79	0.1452	0.2270
80	0.1415	0.1746
81	0.1044	0.1566
82	0.0807	0.1957
83	0.1721	0.1357
84	0.1172	0.0799
85	0.0156	0.0394
86	0.0514	0.0524
87	0.0362	0.0515
88	0.0103	NA
Base	0.1179	0.1885

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REPORTED CATCH EXPLOITATION RATE INDEX BY STOCK

	BQR	CAP	
Year	Age 3	Age 3	Fishery
79	1.2310	1.2044	1.2146
80	1.1994	0.9263	1.0314
81	0.8849	0.8309	0.8517
82	0.6847	1.0384	0.9023
83	1.4592	0.7197	1.0043
84	0.9937	0.4240	0.6432
85	0.1327	0.2091	0.1797
86	0.4356	0.2779	0.3386
87	0.3068	0.2730	0.2860
88	0.0874	NA	0.0874

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Stock Identifiers

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BQR = BIG QUALICUM  
CAP = CAPILANO

WASHINGTON/OREGON SPORT AND TROLL COMBINED

TOTAL MORTALITY EXPLOITATION RATES BY STOCK										
Year	BON Age 3	CWF Age 3	CWF Age 4	PSF Age 3	PSF Age 4	PSY Age 3	SPR Age 3	SPR Age 4	STP Age 3	STP Age 4
79	0.1355	NA	NA	NA	0.0281	0.0148	0.1838	0.1729	NA	NA
80	0.2106	0.1268	NA	NA	NA	0.0310	0.2882	0.1250	NA	NA
81	0.2054	0.0966	0.1661	0.0102	NA	0.0242	0.2671	0.2049	0.1661	NA
82	0.1803	0.1575	0.2756	0.0080	0.0412	0.0269	0.3221	0.1240	0.2961	0.0563
83	0.1280	0.0751	0.1840	0.0061	0.0261	0.0161	0.1207	0.0561	0.1626	NA
84	0.0809	0.0133	0.0438	0.0108	0.0242	0.0070	0.0794	NA	0.0484	NA
85	0.1687	0.0778	0.0423	NA	0.0165	0.0125	0.1698	NA	0.1837	NA
86	NA	0.1282	0.0565	NA	NA	NA	0.1204	0.0667	0.1940	NA
87	0.1679	0.0903	0.1457	NA	NA	0.0187	0.2679	NA	0.1867	NA
88	NA	0.0983	0.1776	0.0337	NA	NA	0.1706	NA	0.2783	0.1575
Base	0.1830	0.1270	0.2208	0.0091	0.0346	0.0242	0.2653	0.1567	0.2311	0.0563

TOTAL MORTALITY EXPLOITATION RATE INDEX BY STOCK											
Year	BON Age 3	CWF Age 3	CWF Age 4	PSF Age 3	PSF Age 4	PSY Age 3	SPR Age 3	SPR Age 4	STP Age 3	STP Age 4	Fishery
79	0.7404	NA	NA	NA	0.8117	0.6109	0.6927	1.1035	NA	NA	0.8061
80	1.1513	0.9984	NA	NA	NA	1.2806	1.0863	0.7977	NA	NA	1.0337
81	1.1227	0.7610	0.7520	1.1168	NA	0.9980	1.0068	1.3074	0.7188	NA	0.9370
82	0.9857	1.2406	1.2480	0.8832	1.1883	1.1105	1.2142	0.7914	1.2812	1.0000	1.1376
83	0.6997	0.5919	0.8330	0.6728	0.7530	0.6648	0.4551	0.3578	0.7037	NA	0.6190
84	0.4422	0.1046	0.1985	1.1860	0.6977	0.2903	0.2994	NA	0.2096	NA	0.2812
85	0.9220	0.6127	0.1913	NA	0.4750	0.5161	0.6401	NA	0.7952	NA	0.6181
86	NA	1.0100	0.2558	NA	NA	NA	0.4540	0.4254	0.8397	NA	0.5654
87	0.9180	0.7112	0.6598	NA	NA	0.7708	1.0098	NA	0.8079	NA	0.8343
88	NA	0.7742	0.8043	3.7008	NA	NA	0.6430	NA	1.2044	2.7995	1.0072

Stock Identifiers

BON = BONNEVILLE TULE  
 CWF = COWLITZ FALL TULE  
 PSF = PUGET SOUND FINGERLING  
 PSY = PUGET SOUND YEARLING  
 SPR = SPRING CREEK TULE  
 STP = STAYTON POND TULE

WASHINGTON/OREGON SPORT AND TROLL COMBINED

REPORTED CATCH EXPLOITATION RATES BY STOCK										
Year	BON Age 3	CWF Age 3	CWF Age 4	PSF Age 3	PSF Age 4	PSY Age 3	SPR Age 3	SPR Age 4	STP Age 3	STP Age 4
79	0.1195	NA	NA	NA	0.0281	0.0136	0.1694	0.1669	NA	NA
80	0.1890	0.1142	NA	NA	NA	0.0282	0.2648	0.1168	NA	NA
81	0.1705	0.0854	0.1590	0.0083	NA	0.0223	0.2448	0.1951	0.1512	NA
82	0.1705	0.1432	0.2717	0.0067	0.0403	0.0230	0.2753	0.1113	0.2707	0.0517
83	0.1111	0.0692	0.1840	0.0047	0.0261	0.0147	0.1118	0.0561	0.1494	NA
84	0.0777	0.0114	0.0438	0.0092	0.0232	0.0056	0.0761	NA	0.0450	NA
85	0.1386	0.0759	0.0423	NA	0.0159	0.0115	0.1404	NA	0.1604	NA
86	NA	0.1191	0.0532	NA	NA	NA	0.1095	0.0641	0.1940	NA
87	0.1530	0.0801	0.1417	NA	NA	0.0142	0.2589	NA	0.1555	NA
88	NA	0.0831	0.1726	0.0278	NA	NA	0.1620	NA	0.2557	0.1524
Base	0.1624	0.1143	0.2153	0.0075	0.0342	0.0218	0.2385	0.1475	0.2110	0.0517

REPORTED CATCH EXPLOITATION RATE INDEX BY STOCK											
Year	BON Age 3	CWF Age 3	CWF Age 4	PSF Age 3	PSF Age 4	PSY Age 3	SPR Age 3	SPR Age 4	STP Age 3	STP Age 4	Fishery
79	0.7361	NA	NA	NA	0.8218	0.6229	0.7099	1.1314	NA	NA	0.8230
80	1.1638	0.9997	NA	NA	NA	1.2940	1.1100	0.7914	NA	NA	1.0416
81	1.0501	0.7472	0.7384	1.1105	NA	1.0264	1.0260	1.3226	0.7167	NA	0.9270
82	1.0500	1.2531	1.2616	0.8895	1.1782	1.0567	1.1540	0.7546	1.2833	1.0000	1.1330
83	0.6843	0.6055	0.8543	0.6253	0.7625	0.6733	0.4686	0.3801	0.7081	NA	0.6307
84	0.4783	0.0996	0.2036	1.2323	0.6770	0.2587	0.3189	NA	0.2132	NA	0.2905
85	0.8533	0.6642	0.1962	NA	0.4654	0.5271	0.5884	NA	0.7601	NA	0.5863
86	NA	1.0423	0.2469	NA	NA	NA	0.4590	0.4345	0.9197	NA	0.5826
87	0.9424	0.7009	0.6582	NA	NA	0.6514	1.0854	NA	0.7368	NA	0.8340
88	NA	0.7267	0.8014	3.7019	NA	NA	0.6793	NA	1.2118	2.9500	1.0181

Stock Identifiers

-----  
 BON = BONNEVILLE TULE  
 CWF = COWLITZ FALL TULE  
 PSF = PUGET SOUND FINGERLING  
 PSY = PUGET SOUND YEARLING  
 SPR = SPRING CREEK TULE  
 STP = STAYTON POND TULE

## SECTION 10. DETAILED STOCK INDEX DATA

S.E. Alaska Stock Age 4  
S.E. Alaska Stock Age 5  
Robertson Creek  
Quinsam  
Big Qualicum  
Capilano  
Puget Sound Fingerling  
Puget Sound Yearling  
Cowlitz Tule  
Spring Creek Tule  
Bonneville Tule  
Stayton Pond Tule  
Columbia River Upriver Bright  
Lewis River Wild  
Columbia River Summer  
Willamette Spring

# STOCK: Alaska Spring Age 4 Base Period 1982-84

=====			
TOTAL MORTALITY EXPLOITATION RATE BY FISHERY			
	ALLCEI	US/NON	BC/NON
Year	Age 4	Age 4	Age 4
=====			
79	NA	NA	NA
80	NA	NA	NA
81	NA	NA	NA
82	0.1523	NA	NA
83	0.2176	NA	NA
84	0.1253	NA	NA
85	0.1573	NA	NA
86	0.2775	NA	NA
87	0.1621	NA	NA
88	0.2491	NA	NA
-----			
Base	0.1651	0.0000	0.0000
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=====			
TOTAL MORTALITY STOCK INDEX BY FISHERY			
	ALLCEI	US/NON	CAN/NO
Year	Age 4	Age 4	Age 4
=====			
79	NA	NA	NA
80	NA	NA	NA
81	NA	NA	NA
82	0.9224	0.9224	NA
83	1.3184	1.3184	NA
84	0.7592	0.7592	NA
85	0.9532	0.9532	NA
86	1.6812	1.6812	NA
87	0.9818	0.9818	NA
88	1.5088	1.5088	NA
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Fisheries represented in ALLCEI  
ATR NTR CTR WCTR GSTR AN NN CN AS NCS GSS

Fisheries represented in US/NON  
WOTR PSNN PSNN WAN CRN WAS PSNS PSOS CRS

Fisheries represented in BC/NON  
WCVN JDFN JSN FRN WCVS

# STOCK: Alaska Spring Age 5 Base Period 1983-84

## =====

### TOTAL MORTALITY EXPLOITATION RATE BY FISHERY

	ALLCEI	US/NON	BC/NON
Year	Age 5	Age 5	Age 5
79	NA	NA	NA
80	NA	NA	NA
81	NA	NA	NA
82	NA	NA	NA
83	0.3221	NA	NA
84	0.4686	NA	NA
85	0.3058	NA	NA
86	0.2594	NA	NA
87	0.3903	NA	NA
88	0.3110	NA	NA

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Base	0.3953	0.0000	0.0000
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## =====

### TOTAL MORTALITY STOCK INDEX BY FISHERY

	ALLCEI	ALLCEI	US/NON	US/NON	BC/NON	BC/NON
Year	Age 5	Total	Age 5	Total	Age 5	Total
79	NA	NA	NA	NA	NA	NA
80	NA	NA	NA	NA	NA	NA
81	NA	NA	NA	NA	NA	NA
82	NA	NA	NA	NA	NA	NA
83	0.8147	0.8147	NA	NA	NA	NA
84	1.1853	1.1853	NA	NA	NA	NA
85	0.7735	0.7735	NA	NA	NA	NA
86	0.6563	0.6563	NA	NA	NA	NA
87	0.9874	0.9874	NA	NA	NA	NA
88	0.7866	0.7866	NA	NA	NA	NA

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Fisheries represented in ALLCEI  
ATR NTR CTR WCTR GSTR AN NN CN AS NCS GSS

Fisheries represented in US/NON  
WOTR PSNN PSNN WAN CRN WAS PSNS PSOS CRS

Fisheries represented in BC/NON  
WCVN JDFN JSN FRN WCVS

## STOCK: Quinsam

TOTAL MORTALITY EXPLOITATION RATE BY FISHERY									
Year	ALLCEI Age 3	ALLCEI Age 4	ALLCEI Age 5	US/NON Age 3	US/NON Age 4	US/NON Age 5	BC/NON Age 3	BC/NON Age 4	BC/NON Age 5
79	0.1695	0.2662	0.5000	NA	NA	NA	0.0075	0.0000	0.0640
80	0.1783	0.4303	0.6275	NA	NA	NA	0.0146	0.0456	0.1438
81	0.1871	0.3924	0.6789	NA	NA	NA	0.0019	0.0512	0.0898
82	0.1643	0.3489	0.6029	NA	NA	NA	0.0062	0.0255	0.1420
83	0.1447	0.4575	0.6531	NA	NA	NA	0.0160	0.0340	0.0839
84	0.0801	0.3251	0.4955	NA	NA	NA	0.0091	0.0315	0.0636
85	0.1566	0.2949	0.4269	NA	NA	NA	0.0095	0.0360	0.0863
86	0.2238	0.3200	0.5005	NA	NA	NA	0.0150	0.0329	0.0486
87	0.1177	0.3193	0.4730	NA	NA	NA	0.0111	0.0256	0.0541
88	0.0332	0.1877	0.2724	NA	NA	NA	0.0034	0.0124	0.0545
Base	0.1748	0.3595	0.6023	0.0000	0.0000	0.0000	0.0076	0.0306	0.1099

TOTAL MORTALITY STOCK INDEX BY FISHERY												
Year	ALLCEI Age 3	ALLCEI Age 4	ALLCEI Age 5	ALLCEI Total	US/NON Age 3	US/NON Age 4	US/NON Age 5	US/NON Total	BC/NON Age 3	BC/NON Age 4	BC/NON Age 5	BC/NON Total
79	0.9697	0.7406	0.8301	0.8233	NA	NA	NA	NA	0.9977	0.0000	0.5823	0.4832
80	1.0201	1.1970	1.0417	1.0875	NA	NA	NA	NA	1.9322	1.4908	1.3082	1.3778
81	1.0706	1.0916	1.1272	1.1072	NA	NA	NA	NA	0.2501	1.6741	0.8173	0.9653
82	0.9396	0.9707	1.0010	0.9820	NA	NA	NA	NA	0.8201	0.8351	1.2922	1.1737
83	0.8279	1.2727	1.0842	1.1044	NA	NA	NA	NA	2.1187	1.1125	0.7633	0.9046
84	0.4583	0.9043	0.8226	0.7924	NA	NA	NA	NA	1.2076	1.0290	0.5790	0.7040
85	0.8960	0.8205	0.7087	0.7729	NA	NA	NA	NA	1.2524	1.1761	0.7854	0.8900
86	1.2802	0.8902	0.8310	0.9188	NA	NA	NA	NA	1.9809	1.0747	0.4422	0.6514
87	0.6733	0.8882	0.7852	0.8006	NA	NA	NA	NA	1.4669	0.8374	0.4918	0.6129
88	0.1899	0.5221	0.4522	0.4340	NA	NA	NA	NA	0.4544	0.4049	0.4956	0.4748

Fisheries represented in ALLCEI  
 ATR NTR CTR WCTR GSTR AN NN CN AS NCS GSS

Fisheries represented in US/NON  
 WOTR PSNN PSON WAN CRN WAS PSNS PSOS CRS

Fisheries represented in BC/NON  
 WCVN JDFN JSN FRN WCVS

# STOCK: Robertson Creek

TOTAL MORTALITY EXPLOITATION RATE BY FISHERY									
Year	ALLCEI Age 3	ALLCEI Age 4	ALLCEI Age 5	US/NON Age 3	US/NON Age 4	US/NON Age 5	BC/NON Age 3	BC/NON Age 4	BC/NON Age 5
79	0.2252	0.5672	0.7825	0.0001	0.0023	NA	0.0186	0.0704	0.0531
80	0.2685	0.6158	0.6703	0.0000	0.0046	NA	0.0579	0.1309	0.1282
81	0.1830	0.5637	0.7964	0.0016	0.0034	NA	0.0504	0.1324	0.1757
82	0.2039	0.5452	0.4839	0.0053	0.0025	NA	0.0527	0.1545	0.4839
83	0.2009	0.5233	0.6863	0.0004	0.0040	NA	0.0302	0.1693	0.2985
84	0.2252	0.6021	0.6364	0.0000	0.0060	NA	0.0751	0.2215	0.3355
85	0.3140	0.5538	0.8050	0.0100	0.0565	NA	0.0548	0.0995	0.1132
86	0.2300	0.6154	0.8519	0.0200	0.0000	NA	0.0000	0.0513	0.1296
87	0.1516	0.5660	0.8205	0.0020	0.0000	NA	0.0400	0.0566	0.0000
88	0.1896	0.4660	1.0000	0.0069	0.0124	NA	0.0403	0.1924	0.0000
Base	0.2201	0.5730	0.6833	0.0017	0.0032	0.0000	0.0449	0.1220	0.2102

TOTAL MORTALITY STOCK INDEX BY FISHERY												
Year	ALLCEI Age 3	ALLCEI Age 4	ALLCEI Age 5	ALLCEI Total	US/NON Age 3	US/NON Age 4	US/NON Age 5	US/NON Total	BC/NON Age 3	BC/NON Age 4	BC/NON Age 5	BC/NON Total
79	1.0229	0.9899	1.1452	1.0667	0.0575	0.7307	NA	0.4934	0.4144	0.5767	0.2524	0.3766
80	1.2195	1.0748	0.9811	1.0530	0.0000	1.4333	NA	0.9281	1.2893	1.0722	0.6099	0.8404
81	0.8314	0.9838	1.1656	1.0452	0.9141	1.0576	NA	1.0070	1.1233	1.0851	0.8358	0.9507
82	0.9262	0.9515	0.7082	0.8351	3.0284	0.7783	NA	1.5714	1.1731	1.2661	2.3019	1.8323
83	0.9127	0.9133	1.0045	0.9554	0.2370	1.2335	NA	0.8823	0.6735	1.3872	1.4199	1.3205
84	1.0230	1.0509	0.9313	0.9914	0.0000	1.8707	NA	1.2113	1.6719	1.8147	1.5960	1.6758
85	1.4262	0.9665	1.1782	1.1330	5.7032	17.5828	NA	13.3957	1.2209	0.8150	0.5386	0.7092
86	1.0448	1.0740	1.2467	1.1496	11.4444	0.0000	NA	4.0337	0.0000	0.4202	0.6167	0.4797
87	0.6889	0.9879	1.2009	1.0419	1.1354	0.0000	NA	0.4002	0.8901	0.4638	0.0000	0.2561
88	0.8612	0.8132	1.4635	1.1214	3.9737	3.8726	NA	3.9082	0.8971	1.5766	0.0000	0.6170

Fisheries represented in ALLCEI  
 ATR NTR CTR WCTR GSTR AN NN CN AS NCS GSS

Fisheries represented in US/NON  
 WOTR PSNN PSON WAN CRN WAS PSNS PSOS CRS

Fisheries represented in BC/NON  
 WCVN JDFN JSN FRN WCVS



## STOCK: Big Qualicum

TOTAL MORTALITY EXPLOITATION RATE BY FISHERY						
Year	ALLCEI Age 3	ALLCEI Age 4	US/NON Age 3	US/NON Age 4	BC/NON Age 3	BC/NON Age 4
79	0.4004	0.3767	0.0018	0.0093	0.0427	0.1088
80	0.4295	0.5063	0.0014	0.0095	0.0294	0.0933
81	0.4737	0.6629	0.0067	0.0033	0.0385	0.0472
82	0.3261	0.4205	0.0000	0.0341	0.0357	0.0966
83	0.4047	0.4418	0.0000	0.0000	0.0558	0.1847
84	0.4812	0.6230	0.0000	0.0000	0.0109	0.0000
85	0.2673	0.3136	0.0000	0.0828	0.0183	0.0947
86	0.4121	0.5201	0.0058	0.0000	0.0315	0.0867
87	0.2566	0.5582	0.0000	0.0203	0.0263	0.0240
88	0.2749	0.4148	0.0000	0.0593	0.0103	0.0444
Base	0.4074	0.4916	0.0025	0.0140	0.0366	0.0865

TOTAL MORTALITY STOCK INDEX BY FISHERY									
Year	ALLCEI Age 3	ALLCEI Age 4	ALLCEI Total	US/NON Age 3	US/NON Age 4	US/NON Total	BC/NON Age 3	BC/NON Age 4	BC/NON Total
79	0.9828	0.7662	0.8644	0.7370	0.6614	0.6727	1.1675	1.2578	1.2310
80	1.0542	1.0300	1.0410	0.5668	0.6780	0.6614	0.8040	1.0788	0.9971
81	1.1627	1.3484	1.2643	2.6962	0.2320	0.6009	1.0522	0.5463	0.6967
82	0.8003	0.8553	0.8304	0.0000	2.4286	2.0651	0.9763	1.1171	1.0753
83	0.9932	0.8987	0.9415	0.0000	0.0000	0.0000	1.5258	2.1366	1.9550
84	1.1812	1.2672	1.2282	0.0000	0.0000	0.0000	0.2990	0.0000	0.0889
85	0.6560	0.6380	0.6461	0.0000	5.9014	5.0181	0.4990	1.0950	0.9178
86	1.0116	1.0581	1.0370	2.3627	0.0000	0.3536	0.8617	1.0026	0.9607
87	0.6297	1.1356	0.9063	0.0000	1.4485	1.2317	0.7194	0.2779	0.4092
88	0.6747	0.8438	0.7672	0.0000	4.2215	3.5897	0.2818	0.5140	0.4450

Fisheries represented in ALLCEI  
 ATR NTR CTR WCTR GSTR AN NN CN AS NCS GSS

Fisheries represented in US/NON  
 WOTR PSNN PSNN WAN CRN WAS PSNS PSOS CRS

Fisheries represented in BC/NON  
 WCVN JDFN JSN FRN WCVS