PACIFIC SALMON COMMISSION JOINT CHINOOK TECHNICAL COMMITHEE 1989 ANNJAL REPORT

REPORT TCCHINOOK (90)-3

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Mr. Paul Ryall, CDFO b/
Mr. Neil Schubert, CDFO b/
Ms. Barb Snyder, CDFO ${ }^{\text {b/ }}$
Mr. Paul Starr, CDFO ${ }^{a /}$

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Dr. Norma Jean Sands, ADF\&G b/
Mr. James B. Scott, NWIFC a/
Mr. Ronald H. Williams, ODFW b/

Also participating:
Mr. Jim Berkson, CRITFC ${ }^{\mathrm{a} / \mathrm{b} /}$
Dr. John E. Clark, ADF\&G a/

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## ACRONYM DEFINITIONS

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

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## INTRODUCTION

## THE PACIFIC SALMON TREATY CHINOOK REBUILDING PROGRAM

The Pacific Salmon Treaty established a system of fishery-specific catch and harvest rate restrictions intended to:
"halt the decline in spawning escapements of depressed stocks; and attain by 1998, escapement goals established in order to restore production of naturally spawning chinook stocks, as represented by indicator stocks identified by the Parties, based on a rebuilding program begun in 1984".

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

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

This report provides an evaluation through the first phase and first years of the second phase of the rebuilding program using data through 1989. This report includes recent catch in fisheries of concern to the Pacific Salmon Commission (Chapter 1), assessment of spawning escapements for 43 escapement indicator stocks (Chapter 2), fishery harvest and stock-specific exploitation rates based on 32 exploitation rate indicator stocks (Chapter 3), and an integration of Chapters 2 and 3 and results from the chinook model (Chapter 4).

Adequate escapement information is not available for a number of naturally spawning chinook stocks. Stocks for which escapement information is considered reliable enough to allow assessment are referred to as "escapement indicator stocks".

Information is not available to permit direct measurement of exploitation rates for most naturally spawning stocks. However, exploitation rates measured for hatchery stocks are used to generate estimates for naturally spawning chinook stocks. Analysis of exploitation rates requires a time-series of coded-wire-tag data for a stock. Stocks with a useful timeseries of coded-wire-tag data are referred to as "exploitation rate indicator stocks". These stocks are not generally the same as the escapement indicator stocks. The Exploitation Rate Analysis in this report also estimates catch distributions for each indicator stock, indices of brood year survival trends, and catch contributions of major stocks to fisheries.

## EXECUTIVE SUMMARY

## 1989 CHINOOK SALMON CATCHES IN FISHERIES WITH CEILINGS

Estimates of 1989 catch for each fishery managed under a harvest ceiling established by the Pacific Salmon Commission are presented below. Catches are compiled from information available as of October 1990 (numbers in thousands).


Chinook catches in all fisheries of interest to the PSC are documented in Table 1.1. The positive deviation for the catch in the North/Central B.C. fishery exceeds the 7.5\% management range about the catch ceiling established by the Pacific Salmon Commission.

## CUMULATIVE DEVIATIONS FROM CATCH CEILINGS

Catches and cumulative deviations from the catch ceilings, since 1987, are as follows (numbers in thousands):

a/ Compiled with information available as of 10/28/90 for U.S. data and 10/01/90 for Canada,
b/ Southeast Alaska catches exclude hatchery addons of $16,000,25,000$, and 26,700 for 1987, 1988, and 1989, respectively.
c/ Exceeds $7.5 \%$ management range; management action required.
d/ Negative deviations below the $7.5 \%$ management range can not be accumulated.
e/ Alternative catch values as per Canada's terminal area exclusion paper Feb. 13/89; see footnote c, above

## ESCAPEMENT ASSESSMENT

Results from the Escapement Assessment indicate that the status of many stocks has deteriorated since 1988. The overall outlook for stock rebuilding in the 1989 escapement assessment is worse than in 1988. In 1989, 11 stocks were classified as either Probably Not Rebuilding or Not Rebuilding, compared to 4 in 1988. Furthermore, 16 stocks decreased their rebuilding status from 1988, while only 5 improved their status.

Although the outlook is worse, 6 stocks attained their escapement goals for at least 4 out of the last 5 years: Andrew Creek, Keta, Chickamin, Skeena, Upper Fraser, and Columbia Upriver bright. Of these stocks, Andrew Creek, Keta, and Skeena are classified as Rebuilding. The other 3 stocks are classified as Probably Rebuilding because of declines in recent escapements. Altogether, 12 stocks met their escapement goals in 1989 (more than 1988 but fewer than in 1986 and 1987) and more stocks continued to reach a higher percentage of their goal than during the base period.

The 11 stocks categorized as Probably Not Rebuilding or Not Rebuilding are the least likely to reach their escapement goals by the rebuilding target date. Six stocks moved into these categories in 1989. One stock, the Fraser River Late (Harrison) was classified as Not Rebuilding. Given declining trends in survival of most stocks, the Committee concluded that the stocks in these lower categories are unlikely to rebuild under the current management regimes.

## EXPLOITATION RATE ASSESSMENT

## Fishery Indices

The fishery index measures exploitation rate changes over time for indicator stocks harvested by a fishery. The index was developed to estimate changes in fishery harvest rates. The utility of the index is dependent on how representative the indicator stocks are of the actual populations harvested in the fishery.

For 1989, the initial 1985 target reductions for fisheries with Pacific Salmon Commission catch ceilings were achieved in the Southeast Alaska troll fishery, the North/Central B.C. troll fishery, and the west coast Vancouver Island troll fishery. When 1985-1989 averages are considered, only the North/Central B.C. troll fishery has met the 1985 target reduction. The 1985 target reduction for Southeast Alaska was achieved for the reported catch index, but not for the total mortality index (catch plus incidental mortalities). The average 19851989 total mortality index for the Southeast Alaska troll fishery remains 4 percentage points above the 1985 target reduction. The 1985-1989 average fishery index for the west coast Vancouver Island troll fishery remains 6 percentage points above the 1985 target reduction.

In 1989, the combined harvest rate by the Strait of Georgia sport and troll fisheries continued to exceed the initial 1985 target reduction by a substantial margin. The average 1985-1989 reduction in the fishery index is slightly over half the 1985 target reduction. A reason for this is that the average reduction for the sport fishery index is estimated to be only $4 \%$ less than the base period and, in 1989, is estimated to have increased to $28 \%$ above the base period. The troll fishery has, on average, achieved its target reduction.

The Washington/Oregon ocean troll and sport fisheries have maintained, on average, exploitation rates below base period levels. Note that indices reported for 1987 and 1988 differ substantially from the indices reported in TCCHINOOK (89)-1 because CWT recoveries from the Washington Buoy 10 sport fishery were incorrectly identified as ocean sport fishery recoveries in the historical database.

## Stock Specific Trends

The stock-specific analyses in the Exploitation Rate Analysis monitor the response of stocks to fishery management actions, brood year survival and exploitation patterns, and stock contributions to fisheries.

For 17 stocks, recent exploitation rates could be compared to base period levels. Considering only changes greater than $\pm 2 \%$, total mortalities by ocean fisheries have been reduced for 14 of the 17 stocks. The portion of total mortality accounted for by incidental fishing mortality has increased for 10 of the 17 stocks evaluated.

The Committee emphasizes that to maintain reductions or further reduce brood year ocean exploitation rates under a fixed catch ceiling policy, the abundance of chinook in the fishing areas must equal or exceed recent abundances. However, both the survival rate assessment and the stock contribution estimates indicate reduced survival of recent brood years for most of the major contributing indicator stocks. Without reductions in harvest pressures, in ocean and/or terminal fisheries, it is unlikely that spawning escapements needed to maintain progress in the rebuilding program will be attained.

## INTEGRATED ANALYSIS

If the rebuilding program were proceeding as planned, we would expect fishery indices to be below 1985 target levels, brood year exploitation rates to decline to near MSY levels, and most of the escapement indicator stocks to be in the upper status categories.

Harvest rates in the ceiling fisheries have been reduced, but generally not to the 1985 target levels. Target reductions have been achieved or nearly achieved in the Southeast Alaska and North/Central B.C. ceiling fisheries and have not been met in the west coast Vancouver Island and Strait of Georgia ceiling fisheries. However, at this stage of the rebuilding program, it would be expected that harvest rate reductions in fisheries with Pacific Salmon Commission catch ceilings would be greater than the initial 1985 target reductions. Harvest rates in non-ceiling fisheries have generally declined.

Progress toward rebuilding for many of the stocks has been limited by poor survival and a failure to meet expected reductions in exploitation rates for ceiling fisheries. Reductions in stock exploitation indices were within $10 \%$ of their 1985 target levels for only 4 of the 7 stock groupings for which comparisons could be made.

With some exceptions, stock groups that have a majority of their fishing-related mortality in northern ceiling fisheries appear to be doing fairly well. Stock groups that have a majority of their fishing mortality in Strait of Georgia fisheries are typically classified as Probably Not Rebuilding or Not Rebuilding. The 2 stock groups that have a majority of their fishing mortality in U.S. non-ceiling fisheries have shown a mixed response.

Chinook abundance in the Southeast Alaska and North/Central B.C. troll fisheries is projected by the chinook model to be near the rebuilding period (1985-1989) average but above the long term (1979-1989) average. Abundance in the west coast Vancouver Island and Strait of Georgia fisheries is projected to be below the rebuilding period average and substantially below the long term average. However, these projections of fishery abundance are optimistic because the current model does not incorporate the declines in short-term survival projected in the Exploitation Rate Analysis.

Poor survival is projected for broods returning in 1990 and 1991; only 1 stock group is projected to have a short-term survival index greater than the long-term average. If the rebuilding progress is to continue despite these reduced survivals, brood year exploitation rate reductions will be required. In particular, in order to meet the rebuilding goals for stocks significantly impacted by the Strait of Georgia and west coast Vancouver Island fisheries, additional management actions will be required to reduce harvest rates for these fisheries.

## QUALIFICATIONS

1. The distribution of stocks, by geographic location and stock-type, is still incomplete, particularly for Canadian spring and summer stocks, even though the number of stocks included in this report has more than doubled compared to the 1988 report. The number of stocks was increased principally to improve the reliability of the exploitation rate evaluation and to examine the consistency of responses between stocks.
2. Changing fishing patterns can confound interpretation of total exploitation rate analysis.
3. The Committee is concerned that current management strategies may have resulted in changes to the age and sex composition of chinook spawning escapements in a way that may impede progress towards rebuilding. In particular, size limit changes may increase escapements of males while decreasing escapements of females (males typically mature at an earlier age and smaller size than females). It should be noted that the optimum spawning escapements established by agencies are based on an age and sex composition that would have resulted from previous ocean management. If spawning escapement increases contain a disproportionate number of males, the productivity resulting from increased escapements will not achieve expected levels based on historical data.

## CHINOOK TECHNICAL COMMITTEE RECOMMENDATIONS

1. Further management action should be taken to reduce stock exploitation rates (including compensation for increased incidental mortalities per reported catch) in order to increase the probability of reaching escapement goals by 1998. With the current management regime, it is expected that many indicator stocks will not achieve their escapement goals by 1998, since the assessed status of the escapement indicator stocks is poorer for 1989 than for 1988, survival projections indicate reduced chinook abundance in 1990 and 1991, and our assessments indicate that the current ceilings have not reduced harvest rates to the initial 1985 target levels for 3 out of 4 fisheries.

The exploitation rate reduction required to rebuild stocks will depend upon stock productivities, the change in brood survival rates, stock exploitation patterns, and abundance in ceiling fisheries in which the stock is primarily harvested. In general, the management actions required to reduce harvest rates will be proportional to the decreases in chinook abundance.
2. Policy issues and information needs for interpretation of the pass-through provision should be resolved. A complete assessment of cumulative pass-through impacts on rebuilding progress is needed to complete the rebuilding assessment.
3. Policy issues of what constitutes rebuilding must be resolved so the Committee can complete its assessment of rebuilding progress (e.g. appropriate stock groupings; proportion of the stocks rebuilding, etc.).
4. The Committee recommends attention to the following information concerns and needs:
a. The effect of regulatory changes on the potential productivity of naturally spawning stocks should be assessed. An increased commitment to conduct consistent escapement surveys, including sex ratio and age composition data, is needed to evaluate expected production and returns by brood year.
b. Indicator stock programs should be reviewed to determine if representation of production regions and stock types is adequate and if tagging levels for the indicator stocks are sufficient. The Committee is especially concerned about the representation of spring and spring/summer stocks, and the development of standardized definitions for run-timing classifications of stocks.
c. Troll fisheries and chinook non-retention periods should be annually sampled to assess the impacts of changes in fishing patterns and to verify parameters used in estimating incidental mortalities. Changes in spatial and temporal fishery patterns have affected fishing effort and perhaps chinook encounter rates.
d. Consistent and standardized recovery programs for CWT fish at hatcheries and on spawning grounds should be established. In addition, tagging of juvenile fish should be standardized for enumeration of marks, total release numbers, and tag retention estimation procedures.

## CHAPTER 11989 CHINOOK CATCH

### 1.11989 CHINOOK SALMON CATCHES IN FISHERIES WITH CEILINGS

Estimates of 1989 catch for each fishery managed under a harvest ceiling established by the Treaty are presented below. These data (numbers $\times 1,000$ ) are preliminary, compiled with information available as of 28/10/90 for U.S. data and 10/01/90 for Canada.


Catches in fisheries of interest to the PSC are documented in Table 1-1.

### 1.2 CUMULATIVE DEVIATIONS FROM CATCH CEILINGS

A $7.5 \%$ cumulative management range was established by the Commission in 1987. Catches and deviations from catch ceilings since 1987 (in thousands of fish) are as follows:

a/ Compiled with information available as of 10/28/90 for U.S. data and 10/01/90 for Canada
b/ Southeast Alaska catches exclude hatchery addons of 16,000, 25,000, and 23,600 for 1987, 1988, and 1989, respectively.
c/ Exceeds 7.5\% management range; management action required.
d/ Negative deviations below the $7.5 \%$ management range can not be accumulated.
e/ Alternative catch values as per Canada's terminal area exclusion paper Feb. 13/89; footnote c, above.

### 1.3 REVIEW OF FISHERIES WITH CATCH CEILINGS

### 1.3.1 Southeast Alaska (SEAK) Fisheries

In 1989, SEAK fisheries were managed under the following provisions established by the Pacific Salmon Commission:

1. An all-gear base catch ceiling of 263,000 chinook salmon;
2. An Alaska hatchery addon to be calculated in-season on the basis of coded-wire tag sampling;
3. A $7.5 \%$ management range, calculated in numbers of fish, for cumulative deviations from the base catch ceiling beginning in 1987. This is equivalent to $+/-19,700$ chinook for a 263,000 base catch ceiling.

Preliminary data for 1989 indicate the following:

1. The total all-gear catch (commercial and recreational) was 291,000 chinook salmon, including an all-gear base catch of 264,300 plus a hatchery addon of 26,700 ;
2. The 1989 Alaska hatchery addon, calculated on the basis of coded-wire tag recoveries, was 26,700 chinook. This yielded a total 1989 catch ceiling of 289,700 chinook. The addon was calculated as the estimated total Alaska hatchery harvest of 34,000 chinook reduced by 5,000 for pre-Treaty hatchery harvest and 2,300 for estimation error risk adjustment;
3. The deviation of the 1989 SEAK chinook catch from the base ceiling was 4,500 or $+1.7 \%$. Combined with a positive deviation of $+3,100$ or $1.2 \%$ in 1987, and a negative deviation of $-9,300$ in 1988, the cumulative deviation since 1987 is $-1,700$ chinook or $-0.7 \%$.

The 1989 SEAK all-gear harvest of 291,000 chinook salmon consisted of a commercial harvest of $259,900(89.3 \%)$ and a recreational harvest of $31,100(10.7 \%)$. Alaska hatcheries contributed an estimated 34,000 chinook salmon or $11.7 \%$ of the total harvest.

Troll Fisheries: The troll fishery harvest of 235,700 chinook included 34,300 harvested in the winter fishery (October 1, 1988 to April 14, 1989), 3,400 in experimental and terminal hatchery fisheries (June 6 -June 29), 30,400 in June special hatchery access fisheries (June 5-7 and June 21-23), and 167,600 during the general summer season (July 1-July 13). The 1989 winter troll catch was similar to the 1985 to 1988 average of 33,600 , but $44 \%$ less than the 1988 winter troll harvest of 60,400 . The decreased catch resulted from reduced effort and lower chinook abundance as well as less favorable weather conditions. The 1989 general summer troll season opened July 1 and remained open for 13 days through July 13. Approximately 167,600 chinook were harvested during this period for an average catch rate of 12,900 chinook per fleet day. This was slightly lower than the record 1988 summer season rate of 13,500 chinook per fleet day. About $3 \%$ of the chinook harvested during the summer troll season was produced by Alaska hatcheries, compared to $14 \%$ and $25 \%$ during the winter troll season and June hatchery access and experimental openings.

Chinook non-retention (CNR) regulations were implemented during the remainder of the summer troll season from July 14-August 13, and August 24 -September 20. The troll fishery was closed to all fishing from August 14-23 and September 21-30. As in past years, several outer coastal areas of high chinook abundance were closed to all trolling to reduce chinook salmon hook and release mortality. Troll harvest of other species during the summer season included 1.4 million coho, 1.8 million pink, 69,000 chum, and 20,200 sockeye salmon.

Net Fisheries: The 1989 commercial catch included 23,500 chinook harvested incidentally in net fisheries where chinook represent less than $0.1 \%$ of the total net harvest of 62 million salmon. Net fisheries are managed for a guideline harvest level of 20,000 chinook (excluding Alaska hatchery harvest) established by the Alaska Board of Fisheries. The 1989 incidental net harvest was $13 \%$ above the 1988 catch of 21,500 and $52 \%$ above the 1987 catch of 15,900 . Net harvest of chinook is limited by a 28 -inch minimum size limit and non-retention regulations for the purse seine fishery, and by spring closures in the gillnet fisheries.

Recreational Fisheries: Recreational fisheries are managed under a two fish per day bag limit and a 28 -inch minimum size limit. No recreational harvest guideline has been established by the Alaska Board of Fisheries. The 1989 harvest of 31,100 chinook is about 8,100 fish above the 1985 to 1988 average.

### 1.3.2 Canadian 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 are based on sales slip data accumulated through September, 1990. In 1989, an industry strike disrupted fishing from July 21 to August 7. Fishing effort was substantially reduced in this period.

### 1.3.2.1 North/Central British Columbia (NCBC)

Troll Fisheries: The troll chinook catch is estimated to be 224,800 . The 1989 troll fishery opened for all species on July 1. Small portions of Areas 10 and 11 remained closed throughout the troll season to slow the chinook catch. Additional closures to trolling were made during the season for Skeena coho conservation and because Fraser sockeye allocations were reached. For example, on August 14, chinook target fisheries on the west coast of the Queen Charlotte Islands closed to trolling for all salmon species. The NCBC coast closed to chinook trolling September 5. Following this, CNR fisheries occurred for the final 9 days of the 1989 season until the season closed September 14.

Net Fisheries: The total net catch of chinook in the NCBC areas was 46,000 , including catch in extreme terminal areas (see below). The Queen Charlotte Island chinook net catch was higher $(12,800)$ in 1989 than 1988. This is a result of heavy targeting on abundant Fraser sockeye and an exceptional abundance of chinook salmon in this area. The Skeena-Nass (Areas 3,4,5) chinook net catch was relatively high in $1989(26,500)$. Central coast (CBC) chinook catches were relatively low $(6,700)$ reflecting an apparent low chinook abundance in these areas in 1989, and low fishing effort directed at pink and sockeye.

Recreational Fisheries: Estimates of the NCBC sport catch in tidal water totalled 35,600 , including catch in extreme terminal areas (see below). The Queen Charlotte

Island sport chinook catch increased substantially in 1989 to 20,600 fish from 7,000 in 1988. Skeena/Nass tidal sport catches remained at 4,200 chinook, and CBC sport catches increased to 10,800 .

Catches in extreme terminal areas: Catches in areas (Skeena terminal gillnet (River/Gap/Slough), Kitimat sport - Sub-area 6-1, and the Bella Coola gillnet area) identified in Canada's paper on Terminal Exclusions (Feb. 13, 1989) were:

|  | Ave. catch in (1979-1982) | $\begin{array}{r} 1989 \\ \text { Catch } \end{array}$ | (difference) |
| :---: | :---: | :---: | :---: |
| Skeena gillnet | 2,400 | 6,875 | 4,475 |
| Kitimat sport | 3,400 | 4,800 | 1,400 |
| Bella Coola gillnet | 2,800 | 3,117 | 317 |
| Totals | 8,600 | 14,792 | $\overline{6,192}$ |

### 1.3.2.2 West Coast Vancouver Island Troll (WCVI)

The 1989 catch ceiling for this fishery was reduced through domestic actions from 360,000 to 309,000 to compensate for the catch overage in 1987 and 1988. The fishery opened for chinook on July 1 with area closures in place similar to those used in 1988. The fishery was closed completely July 14 to 19 and August 6 to 11. In addition, area closures were introduced to avoid reaching the coho ceiling early in the season. Chinook fishing closed for the balance of the season in areas under the PSC ceiling on September 3. There was no CNR period in 1989. The reported catch of chinook catch was 203,500 .

### 1.3.2.3 Strait of Georgia (GS)

Troll: As in 1988, the catch ceiling for the troll fishery was 31,000 chinook. The reduced ceiling was maintained to reduce exploitation on the lower Strait of Georgia chinook stock. The troll fishery opened for chinook on July 1 and continued through September 30. CNR fisheries did not occur in 1989. The reported catch by trollers was 28,500 .

Recreational: In 1989, a management plan to reduce the harvest impact of this recreational fishery was implemented. An annual bag limit of 15 and a size limit of 62 cm was implemented for the area north of Cadboro Point (north of Victoria in Statistical area 19B), including Johnstone Strait. These measures represent an increase in the bag limit (from 8 to 15) for the GS recreational fishery compared to 1988. In the Victoria area, the bag limit was increased from 8 to 20 , and the size limit was decreased from 62 to 45 cm . For Johnstone Strait, the daily bag limit was reduced from 4 to 2 , the season limit was reduced from 30 to 15 , and the size limit was increased from 45 cm to 62 cm . The estimated 1989 catch in the creel survey area (including the Victoria area but excluding Johnstone Strait) was 132,800. Recreational effort in the Strait was similar to recent years but reduced from 1988, although the proportion of the effort directed on chinook is uncertain.

### 1.4 REVIEW OF OTHER FISHERIES

### 1.4.1 Canadian Fisheries

### 1.4.1.1 Transboundary Rivers:

Commercial gill net catch of chinook in the Canadian portions of the Transboundary rivers are: Taku River - 895 chinook adults and 140 jacks; Stikine River $-1,590$ chinook adults and 174 jacks.
1.4.1.2 Southern B.C. Commercial Net:

| Area (Stat. Area) | Catch (ch |
| :---: | :---: |
| Johnstone Strait (11-13) | 29,400 |
| Georgia Strait (14-19) | 1,900 |
| Fraser River ( 28,29 ) | 21,800 |
| Juan de Fuca Strait (20) | 21,800 |
| Barkley Sound (23) | 38,200 |
| Other WCVI (21,22,24-27) | 1,700 |

1.4.1.3 Area 12 Troll: Preliminary catch is reported as 1,800 chinook.

### 1.4.1.4 Tidal Recreational:

Recreational catches in Barkley Sound were estimated by a creel survey between July 15 and September 30. The estimated catch within Barkley Sound and Alberni Inlet were 30,000 and 18,000 chinook, respectively.

### 1.4.1.5 Non-tidal Recreational:

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 this fishery was 272 chinook in 1989. In northern B.C. (NBC) rivers (Areas 1-10), the 1989 chinook catch was estimated by field staff at 9,800 including jack chinooks. In the Fraser River, chinook fisheries occurred in 9 areas (Bowron, Quesnel, Clearwater, Shuswap, South Thompson, Thompson, Vedder-Chilliwack and Lower Fraser rivers). Chinook catch, estimated by creel surveys and interviews by fishery officer, was 723. This figure excludes the Vedder-Chilliwack and lower Fraser rivers which were not assessed in 1989.

### 1.4.1.6 Indian Food Fisheries:

The 1989 chinook catch by native Indians in the Stikine River was 1,078 adults and 115 jacks; catch in the Taku River was 6 adults; and catch in the Alsek River was 167 chinook. Food fish catches in NCBC, the Somass River, and the Fraser River were 23,400, 12,000, and 6,000 chinook respectively. Catches in NBC and the Somass River were similar to the 1988 catches. However, the 1989 chinook catch in the Fraser River was well below the 1988 level of 15,589 . Catches in the Cowichan and Squamish rivers were estimated to total 1,078 chinook, up from the 818 reported for 1988.

### 1.4.2 Puget Sound

Recreational and commercial net fisheries in Puget Sound were regulated by time and area closures to protect depressed spring chinook stocks. With several exceptions, Puget Sound summer/fall type stocks returned at levels of abundance sufficient to support some terminal fisheries. Preliminary estimates of commercial net catch total 183,000 in 1989, compared to 175,000 in 1988 and 167,000 in 1987. The Puget Sound recreational fisheries were managed in the same general manner as in the last several years. Recreational catch data for 1989 are not available at this time.

### 1.4.3 Washington Coast

Ocean escapements of northern Washington coastal stocks were sufficient to allow both commercial and recreational fisheries. The 1989 net catch in Washington coastal marine and freshwater areas is estimated as 85,000 compared to 74,000 in 1988.

### 1.4.4 Columbia River

The 1989 Columbia River recreational and commercial gillnet fisheries experienced a substantial reduction in harvest compared to 1988. The commercial gillnet fisheries catch is estimated at 267,300 chinook compared to 491,300 in 1988. The freshwater recreational fisheries, including the Buoy 10 fishery, harvested 83,000 chinook compared to 94,000 in 1988. Treaty Indian ceremonial and subsistence fisheries harvested an additional 6,700 and 100 upriver spring and summer chinook, respectively. Commercial gillnet fisheries were directed primarily at surplus lower river fall and upriver bright chinook stocks. No incidental commercial impacts on the summer chinook run occurred in 1989 because of the lack of a summer sockeye fishery. This is in contrast to 1988 when 1,200 adult summer chinook were incidentally harvested during the target sockeye fisheries.

### 1.4.5 Ocean Fisheries North of Cape Falcon

In 1989, ocean commercial and recreational fisheries operating in the Pacific Fisheries Management Council (PFMC) region north of Cape Falcon were constrained by quotas for both chinook and coho salmon. Separate quotas were established for the treaty Indian troll and non-treaty fisheries.

Overall, chinook catch success was very poor, consistent with 1989 pre-season expectations that indicated low abundance of key stocks. Mixed or all-species fisheries were terminated when coho quotas were achieved; chinook quotas were not fully harvested. Estimates of ocean troll harvest total 74,000 chinook, compared to 108,000 in 1988. Estimates of ocean recreational harvest total 20,000 chinook, compared to 19,000 in 1988.

### 1.4.6 Ocean Fisheries From Cape Falcon To Cape Blanco

Ocean fisheries in Oregon's central coast area harvest a mixture of chinook primarily from southern stocks not involved in the PSC rebuilding program. These stocks do no migrate to any great extent north into PSC jurisdiction. Some stocks that spawn in Oregon coastal streams do migrate into PSC fisheries and include the North Oregon Coastal (NOC) stock aggregate. These north migrators are harvested incidentally (probably $<10 \%$ ) in Oregon fisheries in this area. An early chinook only 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. Several block closures were set to: decrease coho incidental mortality during chinook only
fishing; to reduce harvest impacts on the Klamath chinook stock; to equitably distribute the catch between ports; and to extend the sport fishing season over the Labor Day weekend. The troll fishery for coho was closed on August 17 while chinook fishing continued until mid-November. Troll chinook catch in this area was above average with 350,750 chinook landed in 1989. This is considerably less than the past two years when 524,000 and 463,000 chinook were landed. The sport catch of chinook in this area was 30,600 in 1989. This compares to the sport catch of 54,600 and 38,100 in 1987 and 1988. The only troll fishery harvesting predominantly NOC stock is the late season near-shore fishery off the mouth the Elk River, which harvested 4,522 chinook in 1989, a slight decrease from the final 1988 catch of 4,837 chinook for this fishery.

Table 1-1 Prel iminary 1989 chinook catches in fisheries relevant to the PST. Catches in thousands, as of 28/10/90 for U.S. data and 01/10/90 for Canada.

|  | TROLL |  |  |  | NET |  |  |  | SPORT |  |  |  | TOTAL |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| AREA | 1989 | 1988 | 1987 | 1986 | 1989 | 1988 | 1987 | 1986 | 1989 | 1988 | 1987 | 1986 | 1989 | 1988 | 1987 | 1986 |
| S.E. ALASKA | 236 | 231 | 242 | 236 a | 24 | 22 | 15 | 22 a | 31 | 26 | 24 | 21 | 291 | 279 | 281 | 279 |
| BRITISH COLUMBIA b, c |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| North/Cent. Coast | 225 | 182 | 240 | 202 | 46 | 44 | 29 | 47 | 36 | 21 | 14 | 12 | 307 | 247 | 283 | 261 |
| W. Vanc. Island | 203 | 409 | 379 | 342 | 40 | 15 | 0.5 | 3.3 | 48 | 33 | 32 | 13 d | 291 | 457 | 412 | 358 |
| Georgia St/Fraser | 29 | 20 | 38 | 44 | 29 | 8 | 13 | 32 | 133 | 119 | 121 | 182 e | 191 | 147 | 172 | 258 |
| Johnstone St | 2 | 2 | 2 | 4 | 29 | 6 | 14 | 18 | 10 | 10 | 10 | 10 | 41 | 18 | 26 | 32 |
| Juan de Fuca St | 0 | 0 | 0 | 0 | 22 | 4 | 7 | 18 |  |  |  | e | 22 | 4 | 7 | 18 |
| sub-total | 459 | 613 | 659 | 592 | 166 | 77 | 64 | 118 | 227 | 183 | 177 | 217 | 852 | 873 | 900 | 927 |
| WASHINGTON INSIDE f |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Strait (mar) | 63 | 50 | 45 | 30 g | 10 | 10 | 11 | 17 | NA | 40 | 53 | 69 i | NA | 113 | 109 | 116 |
| San Juans (mar) | 0 | 0 | 0 | 0 | 16 | 32 | 29 | 21 h | NA | 14 | 14 | 15 i | NA | 46 | 43 | 36 |
| Other PS (mar+fw) | 1 | 0.4 | 0 | 0 | 157 | 133 | 127 | 153 | NA | 82 | 59 | 88 i | NA | 215 | 186 | 241 |
| Coastal (mar+fw) | 0 | 0 | 0 | 0 | 85 | 74 | 51 | 29 | NA | 7 | 3 | 3 i | NA | 81 | 54 | 32 |
| sub-total | 64 | 50.4 | 45 | 30 | 269 | 248 | 218 | 220 | NA | 143 | 129 | 175 | NA | 441 | 392 | 425 |
| COLUMBIA RIVER | - | - | - | - | 267 | 491 | 483 | 283 j | 83 | 94 | 84 | 66 k | 350 | 585 | 567 | 349 |
| WA/OR N C FALCON | 74 | 108 | 81 | 52 | 1 | 3 | 4 | 0 | 20 | 19 | 44 | 23 | 95 | 130 | 129 | 75 |
| OREGON |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Inside Waters | 5 | 5 | 4 | 21 | - | - | - | - | - | - | - | - | 5 | 5 | 4 | 2 |
| Coastal (est+fw) |  |  |  |  |  |  |  |  | NA | 49 | 46 | 33 m | NA | 49 | 46 | 33 |
| GRAND TOTAL | 838 | 1007 | 1031 | 912 | 727 | 841 | 784 | 643 | NA | 514 | 504 | 535 | NA | 2362 | 2319 | 2090 |

a/ Southeast Alaska troll chinook catches shown for oct. 1 - Sept. 30 catch counting year.
b/ British Columbia net catches includes only fish over 5 lb round weight. Native food fishery catches are not included. 1989 includes catch from terminal sport and gillnet fisheries ( 6,600 ) proposed for exclusion from the catch ceiling.
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 vary between years.
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/ Strait troll catch includes all catch in areas $5 \& 6 C$, and catch in area 4B from Jan. 1 through April 30 , and Oct. 1 through Dec. 31 (outside the PFMC quota period)
h/ San Juan net catch includes catch in areas 6, 6A, 7, and 7A.
i/ Adjusted for punch card bias by multiplying punch card estimate by 0.833 . This bias adjustment methodology is under review and may result in future adjustment to these numbers.
j/ Columbia River net catches include Oregon, Washington and treaty catches, but not treaty ceremonial.
k/ Columbia River sport catches include adults only, for Washington, Oregon, Idaho and Buoy 10 anglers.
l/ Troll = late season troll off Elk River mouth (Cape Blanco).
$\mathrm{m} / \quad$ Sport $=$ estuary and inland coastal sport fisheries.

## CHAPTER 2 ESCAPEMENT ASSESSMENT OF REBUILDING THROUGH 1989

## 2．1 INTRODUCTION

Escapement information has been compiled for a set of indicator stocks representing the majority of naturally spawning chinook stocks from central Oregon to Southeast Alaska． Spawning escapements of these stocks were assessed as 1 measure of rebuilding progress since implementation of conservation actions under the Pacific Salmon Treaty（PST）． Assessment focused on：（1）changes in average escapements since the base period years；（2） comparison of recent escapements with a linear trend from the escapement base period to the goal at the rebuilding target date；and（3）trends in escapements since PST implementation．

For SEAK and transboundary（TBR）stocks，conservation actions began in 1981 as part of a 15 －year rebuilding program．For all other stocks，a 15 －year rebuilding program was implemented in 1984．These rebuilding programs were divided into three 5 －year Phases （TCCHINOOK（87）－2）with slightly more stringent assessment criteria used in each successive Phase．In 1989，all stocks were in Phase II，with SEAK and TBR stocks in the ninth year and the remainder in the sixth year of rebuilding．

In this chapter，we present the results of a rebuilding assessment based upon escapement information．Our objective here was to assess the rebuilding status of the escapement indicator stocks．Escapement variability，however，can be influenced by a variety of factors such as：brood year abundance，freshwater and marine survival rates，fishery harvest rates，counting or estimation errors，etc．Consequently，to determine if PST management actions have been effective in initiating rebuilding，the results of this escapement assessment should be considered together with the Exploitation Rate Assessment in Chapter 3．The combined assessment is presented in Chapter 4.

## 2．2 FRAMEWORK

## 2．2．1 Escapement Indicator Stocks

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

|  | RUN TIMING |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Area | Spring | Spring／Summer | Summer | Summer／Fall | Fall | Total |
|  |  |  |  |  |  |  |
| Southeast Alaska | 5 |  |  |  |  | 5 |
| Transboundary | 6 |  |  |  |  | 6 |
| Northern British Columbia | 1 | 3 | 3 |  |  | 7 |
| Southern British Columbia | 1 | 1 | 1 | 1 | 3 | 7 |
| Washington／Oregon | 3 | 2 | 2 | 3 | 8 | 18 |
| ＝＝＝＝＝＝＝＝＝＝＝＝＝＝＝＝＝ | ＝ | ＝＝＝＝＝＝＝ニニー | ＝＝＝ | $=$ | $===$ | ＝＝ |
| Totals | 16 | 6 | 6 | 4 | 11 | 43 |

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

### 2.2.2 Escapement Data

Data Sources: The escapement and terminal run data used in this report were provided by management agencies in each jurisdiction. These data are presented in Appendix A and graphed in Appendix B of this report.

Estimation Methods: The escapement estimates used were measures of actual spawner abundance, where available, or estimates (or indices) of abundance measured at a point of migration beyond the effect of major fisheries. Escapements were estimated using weirs, counting fences, aerial or foot surveys, dam passage counts, electronic counting devices, and mark-recapture studies. Methods depended on river characteristics and agency resources.

Caution is urged against directly comparing escapement levels or goals between stocks since escapements are measured in different units. Escapement estimates are relative measures; differences in escapements may not represent differences between stocks in population abundance or fishery contribution levels.

Some estimation techniques and concerns include:

1. For upper Columbia River spring and summer stocks, Bonneville Dam counts were used but were adjusted to eliminate the influence of variable fishing effects upriver of the enumeration site.
2. For some stocks, adjustments were made to remove enhancement related bias. Methods used include: using coded-wire tag (CWT) data to subtract hatchery-origin fish from the escapement estimate (e.g. some Puget Sound stocks), excluding spawners removed for hatchery brood stock (e.g. Upper Strait of Georgia, Lower Strait of Georgia), or by excluding rivers with major enhancement influence (e.g. Kitimat River and adjacent tributaries in Area 6 and Bella Coola River in Area 8). Minor enhancement biases may persist in the escapement information if enhanced stocks are returning at higher rates than natural stocks.
3. For the Quillayute summer stock, escapements represent a composite of naturally spawning fish from the summer stock and strays from spring stock enhancement. Data are not sufficient to allow complete separation of naturally spawning fish (see Section 2.6.3).
4. Escapements of Oregon coastal north-migrating stocks are not expanded; instead they are reported as an index of spawners per river mile.

Changes Relative to the 1988 Annual Report: Changes in escapement data relative to the 1988 Annual Report (TCCHINOOK (89)-1) are summarized below and detailed in Appendix A. Minor updates to catch and escapement data, including updates to preliminary estimates for the most recent years, are not described.

Situk River: Terminal run estimates for the Situk River were re-calculated due to inconsistent reporting of jacks in the historical catch and escapement data.
Escapement and terminal runs were taken from "Escapements of Chinook Salmon in Southeast Alaska and Transboundary Rivers" by D. Mecum 1990 (ADF\&G FDS 9052). The 1975 estimates were from foot surveys, expanded to be consistent with weir counts used since 1986.


#### Abstract

Alsek River: Raw escapement and catch counts for the Alsek River were from the Transboundary Technical Committee 1989 Annual Catch and Escapement Report (TCTR (90)-4). Escapements and terminal runs were recalculated for all years. Total spawning escapement was estimated by subtracting the Canadian in-river catch (sport and food catch) from the product of the Klukshu weir count and the expansion factor. The Canadian and U.S. expansion factors were 2.0 and 1.6 , respectively. Terminal runs were then estimated as the sum of spawning escapement and Canadian and U.S. in-river catches.


Taku River: In-river catches (joint estimate) and escapements (U.S. and Canadian estimates) were updated using estimates from TCTR (90)-4. This resulted in minor changes to escapement estimates for a few years and to terminal run estimates for most years.

Stikine River: A joint Canada/U.S. procedure was established that estimated total drainage spawning escapement as an expansion of the Little Tahltan escapement (TCTR (90)-4): in 1985-1989, Little Tahltan escapements were estimated from weir counts; before 1985, estimates were the product of aerial counts and the mean 19851989 ratio of weir to aerial counts. Although there are now joint estimates for both spawning escapement and terminal run size, Canadian and U.S. escapement goals still differ.

Chilkat River: The 1981-1989 Big Boulder Creek escapement index was expanded to include the Stonehouse Creek index.

Harrison River: Harrison River escapement estimates for all years were revised based on a final analysis of the 1984-1989 mark-recapture study data ${ }^{2}$.

Grays Harbor Fall: Corrections were made to remove a hatchery component from historical terminal run size estimates.

Columbia River Springs: Minor changes in terminal run and escapement estimates have been made for some years to correct for inappropriate wild percentages applied to incidental inriver harvest of this stock.

### 2.2.3 Escapement Goals

Origin of Goals: The escapement goals provided by each management agency define longterm stock rebuilding objectives. These goals were established by managers associated with the respective stock's region of origin. Where possible, these goals were based on estimates of stock productivity, usable spawning habitat, or other factors, and represent estimates of escapement levels that produce maximum average production or sustained harvest (e.g. Columbia Upriver spring, summer and bright). For most stocks, interim escapement goals were developed recognizing the uncertainty in data used for establishing goals. For example, Canadian goals are interim targets based on a doubling of base period average escapements. Stock escapement goals may change as new information is acquired.

[^1]Seven of the indicator stocks have no escapement goals: Lewis River, Oregon Coastal, Quillayute fall, Hoh spring/summer, Hoh fall, Queets spring/summer and Queets fall. These 7 stocks, referred to as "stocks without goals", are discussed separately from stocks with goals throughout this report. The 5 Washington coastal stocks are managed on the basis of escapement floors and inriver harvest rates; when terminal runs exceed the floor, terminal fisheries are managed on the basis of harvest rates.

Changes Relative to the 1988 Annual Report: Escapement goals were changed for 3 indicator stocks:

Harrison River: The escapement goal for Harrison chinook, defined as twice the base period ( 1984 for Harrison), was updated to reflect revised escapement estimates. The goal increased from 233,600 to 241,700 .

Quillayute Summer: The escapement goal previously reported for this stock included jacks (age 2 fish). As escapement data presented in this report include only adult fish, the goal has been revised from 1,500 to 1,200 fish.

Lewis River: Based on discussions with Columbia River managers, it was concluded that the Lewis River stock has no escapement goal. In the 1988 report a management objective of 10,000 chinook was used, for assessment purposes, to represent the Lewis River escapement goal.

### 2.2.4 Assessment Time Frame

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

SEAK and TBR Stocks: For SEAK and TBR stocks, a 15 -year rebuilding program was initiated in 1981, prior to implementation of the PST. The target date for completion of rebuilding is 1995. For these stocks, the base period included the years 1975-1980 and the rebuilding assessment period included the years 1981-1989.

Other Stocks: For all other stocks except the Harrison stock, a 15 -year rebuilding program was established for the years 1984-1998. For these stocks, the base period included the years 1979-1982 and the rebuilding assessment period included the years 1984-1989. For the Harrison River stock, pre-1984 escapement data are unavailable; consequently the Harrison base period was defined as 1984 and the rebuilding assessment period included the years 1985-1989.

### 2.3 ASSESSMENT METHOD

### 2.3.1 Stock Assessment and Scoring

Stocks With Escapement Goals: Three assessment criteria were used to evaluate the rebuilding progress of stocks with escapement goals:

1. The mean criterion assessed the magnitude of escapement changes by comparing average base period and rebuilding assessment period escapements for each stock. A difference between the 2 time periods of greater than $10 \%$ was accepted as a change between periods. Stocks were scored as follows: (a) stocks with increases of greater than $10 \%$ were scored +1 ; (b) stocks with decreases of greater than $10 \%$ were scored 1 ; and (c) stocks with changes of less than $10 \%$ were judged to show an uncertain response and scored 0.
2. The line criterion assessed escapements for consistency with a linear approximation of the expected rebuilding schedule. For each stock, a base period average escapement was established. A straight line was drawn from this base period average across the 15 -year rebuilding program to the escapement goal in 1995 for SEAK and TBR stocks and 1998 for all other stocks.

For each stock, the most recent 3 escapements (1987-1989) were compared with the linear approximation. Stocks were scored as follows: (a) stocks with all 3 escapement values on or above the line were scored +1 ; (b) stocks with all 3 points below the line were scored -1 ; and (c) stocks that did not meet either condition were scored 0 .

Regardless of escapement levels at the initiation of the rebuilding program, the linear approximation assumes for each stock that: (a) the escapement goal will be achieved at the target date (not before or after); and (b) escapement will increase by a constant number in each year until that time. Neither assumption is consistent with theoretical stock-recruit models or observed escapement trends. Development of more realistic rebuilding schedules would require numerous assumptions about stock productivity and future marine survivals, as well policy decisions concerning rebuilding. The straight line was selected as an acceptable alternative.
3. The trend criterion identified escapement trends since PST implementation. Slopes were calculated for 1984-1989 escapement data. R-squared values were used as a measure of the strength of a linear trend in the data. R-squared values vary from 0 to 1 , with a higher value indicating a stronger linear trend. Stocks were scored as follows: (a) stocks that had positive slopes with $r$-squared values of greater than 0.25 were scored +1 ; (b) stocks that had negative slopes with $r$-squared values of greater than 0.25 were scored -1 ; and (c) all other stocks were scored 0 .

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

Stocks Without Escapement Goals: Stocks without escapement goals were assessed using the mean and the trend criteria. Evaluation of these 2 criteria was the same as for stocks with
escapement goals. These stocks could not be assessed for the line criterion since base-to-goal lines could not be drawn.

### 2.3.2 Stock Classification

Stocks With Escapement Goals: Because each criterion addresses a different aspect of stock status, a classification system based on all 3 criteria was developed:

1. For each stock, scores were summed across all 3 criteria.
2. Stocks were classified according to the following system (all stocks are currently in Phase II):

| Status of Stock Total Score of Criteria |  |  |  |
| :---: | :---: | :---: | :---: |
|  |  | $====$ | ======== |
|  | Phase I | Phase II | Phase III |
| Rebuilding | +3 | +3 | +3 |
| Probably Rebuilding | +2 | +2 | +2 |
| Indeterminate | +1, 0,-1 | +1,0 | +1 |
| Probably Not Rebuilding | -2 | $-1,-2$ | 0,-1 |
| Not Rebuilding | -3 | -3 | -2,-3 |

This system uses more stringent criteria in Phases II and III, reflecting our recognition that as the rebuilding target date approaches, our expectations for improvement increase and the time remaining for rebuilding diminishes.
3. After completing steps (1) and (2), the resulting classifications were evaluated by the CTC; stocks classified as Indeterminate were considered for possible status changes.

Stocks Without Escapement Goals: For the 7 stocks without escapement goals, classifications such as Rebuilding or Not Rebuilding are inappropriate. Stocks were evaluated as follows:

1. For each stock, scores were summed across the mean and trend criteria.
2. Stocks were classified according to the following system:

| Phase II Status | Total Score of Criteria |
| :---: | :---: |
| Increas ing | +1, +2 |
| Indeterminate | 0 |
| Decreasing | -1,-2 |

### 2.3.3 Assessment by Run Type

Rebuilding progress was compared between early run stocks (spring and spring/summer) and later run stocks (summer, summer/fall, and fall) to test if the percent change in average escapement between the base period and rebuilding assessment period was equivalent for the 2 groups.

The stocks were ranked (from 1 to 43) by average percent change in escapement between base and rebuilding assessment periods; the stock with the largest positive change received
the highest score. The 2 run type groupings were then compared by averaging the rank scores within groups. The Mann-Whitney $U$ Test was used to test for a difference between the 2 groups. This test statistic is only affected by the rank of the change between periods, not the magnitude of the change.

### 2.3.4 Changes in Assessment Procedures Relative to 1988 Report

Stocks With Escapement Goals: Rebuilding of stocks with escapement goals was assessed in the same manner as in the 1988 report except that a new classification system was implemented, with more stringent scoring criteria in Phases II and III. In this report, the Phase II classification was used for all stocks. In the 1988 report, the Phase I classification was used for all stocks.

Without Escapement Goals: Stocks without escapement goals were assessed as in 1988 except that their total score was used to classify them as Increasing, Indeterminate, or Decreasing. In the 1988 report, they were classified in the same manner as stocks with escapement goals.

Assessment by Run Type: Stocks were combined into an early run type group and a late run type group and evaluated for a difference between the 2 groups. In the 1988 report, early and late run types were not grouped together and the assessment tested for a difference among the 5 run types.

### 2.4 RESULTS

### 2.4.1 Rebuilding Categories

Stocks With Escapement Goals: Individual stock results for the 3 rebuilding criteria are shown in Table 2-1a. Based upon these results, stocks were distributed among the 5 rebuilding categories as follows:

Rebuilding and Probably Rebuilding Forty-two percent of the stocks were assessed in these 2 categories (Tables 2-2a, 2-3a, Figure 2-1), compared to $50 \%$ in 1988. These included 5 of 11 stocks ( $45 \%$ ) in the ninth year of rebuilding and 10 of 25 stocks ( $40 \%$ ) in the sixth year of rebuilding. The Nass stock was included in this group; this stock was moved by the CTC from Indeterminate to Probably Rebuilding (see Section 2.5.1).

Indeterminate Twenty-eight percent of the stocks were classified as Indeterminate (Tables 2-2a, 2-3a, Figure 2-1). These included 4 of 11 stocks (36\%) in the ninth year of rebuilding and 6 of 25 stocks ( $24 \%$ ) in the sixth year of rebuilding. This was a decrease from 1988, when $39 \%$ of the stocks were in this category.

Probably Not Rebuilding Twenty-eight percent of the stocks were classified as Probably Not Rebuilding (Tables 2-2a, 2-3a, Figure 2-1), a substantial increase from $11 \%$ in 1988. These included 2 of 11 stocks ( $18 \%$ ) in the ninth year of rebuilding and 8 of 25 stocks ( $32 \%$ ) in the sixth year of rebuilding. The Columbia Upriver Spring and Upriver Summer stocks were included in this group; both of these stocks were moved by the CTC from Indeterminate to Probably Not Rebuilding (see Section 2.5.4).

Not Rebuilding The Harrison River stock was the only stock classified as Not Rebuilding (Tables 2-2a, 2-3a, Figure 2-1). In 1988, no stocks received this classification.

| Category | 1989 |  | 1988 |  |
| :---: | :---: | :---: | :---: | :---: |
|  | \# | \% | \# | \% |
| Rebuilding | 8 | 22\% | 9 | 25\% |
| Prob. Rebuilding | 7 | 19\% | 9 | 25\% |
| Indeterminate | 10 | 28\% | 14 | 39\% |
| Probably Not Rebuilding | 10 | 28\% | 4 | 11\% |
| Not Rebuilding | 1 | 3\% | 0 | 0\% |
| total | 36 | 100\% | 36 | 100\% |



TABLE 2.1b. Assessment results through 1989 for natural chinook indicator stocks without escapement goals.

| Stock Name | Region | Run type | $\begin{aligned} & 1989 \\ & \text { Esc. } \end{aligned}$ | MEAN CRITERION |  |  |  | TREND CRITERION |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  | ```Mean E Base Period``` | scapement <br> Rebuild. <br> Period | Between Number | ange <br> Periods <br> Percent | $\begin{aligned} & 1984- \\ & \text { Slope } \end{aligned}$ | $\begin{array}{r} \text { Trend } \\ \text { r2 } \\ \hline \end{array}$ |
| Quillayute fall | WAC | fall | 10000 | 5850 | 10483 | 4633 | 79\% | 969 | 0.69 |
| Hoh spr/summer | WAC | spr/sum | 4800 | 1325 | 2183 | 858 | 65\% | 614 | 0.69 |
| Hoh fall | WAC | fall | 5100 | 2875 | 3400 | 525 | 18\% | 514 | 0.41 |
| Queets spr/summer | WAC | spr/sum | 2500 | 925 | 1250 | 325 | 35\% | 300 | 0.57 |
| Queets fall | WAC | fall | 8900 | 3875 | 6300 | 2425 | 63\% | 1034 | 0.76 |
| Lewis | CR | fall | 21199 | 13021 | 12133 | -888 | -7\% | 2428 | 0.80 |
| Oregon Coastal 1/ | NOC | fall | 151 | 91 | 142 | 51 | 56\% | 15 | 0.46 |

1/ Oregon Coastal assessment is based upon index escapement.

TABLE 2.2a. Assessment scores and status through 1989 of chinook indicator stocks with escapement goals.

| Stock Name | Region | Run type | Assessment Scores |  |  |  | Rebuilding Status Through 1989 | Status Change from 1988 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  | Mean | Line | Trend | Total |  |  |
| Situk | SEAK | spring | -1 | 0 | -1 | -2 | Prob. Not Rebuilding | Decline |
| 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 |  |
| Keta | SEAK | spring | 1 | 1 | 1 | 3 | Rebuilding |  |
| Chilkat | TBR | spring | 1 | 0 | 0 | 1 | Indeterminate |  |
| Alsek (US \& Can est) | TBR | spring | -1 | -1 | 1 | -1 | Prob. Not Rebuilding | Decline |
| Taku (US \& Can est) | TBR | spring | 1 | -1 | 1 | 1 | Indeterminate |  |
| Stikine (US goal) | TBR | spring | 1 | 1 | 1 | 3 | Rebuilding |  |
| Stikine (Can goal) | TBR | spring | 1 | 1 | 1 | 3 | Rebuilding | Improvement |
| Unuk | TBR | spring | 1 | 0 | 0 | 1 | Indeterminate | Decline |
| Chickamin | TBR | spring | 1 | 1 | 0 | 2 | Probably Rebuilding |  |
| Yakoun | NBC | summer | 1 | 1 | 1 | 3 | Rebuilding | Improvement |
| Nass | NBC | spr/sum | 1 | 0 | 0 | 1 | Probably Rebuilding 1/ |  |
| Skeena | NBC | spr/sum | 1 | 1 | 1 | 3 | Rebuilding |  |
| Area 6 Index | NBC | summer | -1 | -1 | 0 | -2 | Prob. Not Rebuilding | Decline |
| Area 8 Index | CBC | spring | 1 | -1 | -1 | -1 | Prob. Not Rebuilding | Decline |
| Rivers Inlet | CBC | spr/sum | 1 | 0 | 0 | 1 | Indeterminate | Decline |
| Smith Inlet | CBC | summer | -1 | -1 | 0 | -2 | Prob. Not Rebuilding | Decline |
| W. Coast Van. Is. | WCVI | fall | 0 | 0 | 1 | 1 | Indeterminate | Improvement |
| Upper Geor. St. | GS | sum/fall | 1 | 0 | 0 | 1 | Indeterminate |  |
| Lower Geor. St. | GS | fall | -1 | -1 | 0 | -2 | Prob. Not Rebuilding |  |
| Upper Fraser | FR | spring | 1 | 1 | 0 | 2 | Probably Rebuilding | Decline |
| Middle Fraser | FR | spr/sum | 1 | 1 | 0 | 2 | Probably Rebuilding | Decline |
| Thompson | FR | summer | 1 | 1 | 0 | 2 | Probably Rebuilding | Decline |
| Harrison | FR | fall | -1 | -1 | -1 | -3 | Not Rebuilding | Decline |
| Skagit spring | PS | spring | 1 | 0 | 0 | 1 | Indeterminate | Decline |
| Skagit sum/fall | PS | sum/fall | 0 | -1 | -1 | -2 | Prob. Not Rebuilding | Decline |
| Stillaguamish | PS | sum/fall | 1 | 0 | 0 | 1 | Indeterminate |  |
| Snohomish | PS | sum/fall | -1 | -1 | 0 | -2 | Prob. Not Rebuilding |  |
| Green | PS | fall | 1 | 1 | 1 | 3 | Rebuilding | I mprovement |
| Quillayute summer | WAC | summer | -1 | 0 | 1 | 0 | Indeterminate |  |
| Grays Harbor spring | WAC | spring | 1 | 1 | 1 | 3 | Rebuilding |  |
| Grays Harbor fall | WAC | fall | 1 | 1 | 1 | 3 | Rebuilding | Improvement |
| Col. UpR. spring | CR | spring | 1 | -1 | 0 | 0 | Prob. Not Rebuilding 1/ | Decline |
| Col. UpR. summer | CR | summer | 1 | -1 | 1 | 1 | Prob. Not Rebuilding 1/ | Decline |
| Col. UpR. bright | CR | fall | 1 | 1 | 0 | 2 | Probably Rebuilding | Decline |

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

| Stock Name | Region | Run type | Assessment Scores |  |  | Status |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  | Mean | Trend | Total | Through 1989 | Change from 1988 1/ |
| Quillayute fall | WAC | fall | 1 | 1 | 2 | Increasing | Improvement |
| Hoh spr/summer | WAC | spr/sum | 1 | 1 | 2 | Increasing |  |
| Hoh fall | WAC | fall | 1 | 1 | 2 | Increasing | Improvement |
| Queets spr/summer | WAC | spr/sum | 1 | 1 | 2 | Increasing | Improvement |
| Queets fall | WAC | fall | 1 | 1 | 2 | Increasing |  |
| Lewis | CR | fall | 0 | 1 | 1 | Indeterminate |  |
| Oregon Coastal | NOC | fall | 1 | 1 | 2 | Increasing |  |

Stocks Without Escapement Goals: Individual stock results for the 2 assessment criteria are shown in Table 2-1b. Based upon these results, stocks were distributed among the 3 status categories as follows:

Increasing. Six of the 7 stocks ( $86 \%$ ) were classified as Increasing (Tables 2-2b, 2-3b). These stocks showed increasing trends since implementation of the PST rebuilding program.

Indeterminate. Lewis River was the only stock assessed as Indeterminate (Tables 22b, 2-3b).

|  | 1989 |  | 1988* |  |
| :---: | :---: | :---: | :---: | :---: |
| Category | \# | \% | \# | \% |
| Increasing | 6 | 86\% | 3 | 43\% |
| Indeterminate | 1 | 14\% | 4 | 57\% |
| Decreasing | 0 | 0\% | 0 | 0\% |
| TOTAL | 7 | 100\% | 7 | 100\% |

### 2.4.2 Status Changes Relative to 1988

Stocks With Escapement Goals: Twenty-one of the 36 stocks with escapement goals (58\%) changed status relative to 1988 (Table 2-2a). Five stocks (14\%) moved to higher categories and 16 stocks ( $44 \%$ ) moved to lower categories.

Stocks Without Escapement Goals: Stocks without goals were classified in a different manner in the 1988 report; however, had the current classification been used in both years, 3 stocks would have shown status increases from Indeterminate to Increasing in 1989 (Table 2-2b).

### 2.4.3 Stocks with Escapements Above Goal

Of the 33 indicator stocks with escapement goals (omitting TBR stocks with conflicting U.S. and Canadian goals), 12 stocks (36\%) had escapements above their goals in 1989 (Figure 2-2). This compares with 11 stocks (33\%) in 1988, 14 (42\%) in 1987, and 14 (42\%) in 1986.

### 2.4.4 Assessment by Run Type

The results indicate that the 2 groups have not had equivalent percent changes in average escapement between the base period and the rebuilding assessment period; early run stocks have shown a more positive response in escapements than late run stocks. The early run type group had significantly greater average ranks than the later group (Mann-Whitney $U=118 ; \mathrm{p}<0.01$ ). The average rank of early run stocks was 27.1 and that of the later run stocks was 16.6.

## FIGURE 2.1 NUMBER Of INDICATOR STOCKS by REBUILDING CATEGORY, 1989.



Stocks w/o Goals Omltted. Total No. Indicator Stocks $=36$

FIGURE 2.2 PERCENT Of INDICATOR STOCKS MEETING ESCAPEMENT GOALS YERRLY, 1982-89.


33 Stocks w/o conflicting
Goals Considered

## STOCKS IN 9TH YEAR OF REBUILDING

| REBUILDING | REGION | RUN TYPE |
| :---: | :---: | :---: |
| Andrew Creek 1/ | SEAK | spring |
| Keta 1/ | SEAK | spring |
| Stikine (Can and US est) | TBR | spring |
| PROBABLY REBUILDING |  |  |
| King Salmon | SEAK | spring |
| Chickamin 1/ | TBR | spring |
| I NDETERMINATE |  |  |
| Blossom | SEAK | spring |
| Chilkat | TBR | spring |
| Taku (Can and US est) | TBR | spring |
| Unuk | TBR | spring |
| PROBABLY NOT REBUILDING |  |  |
| Situk | SEAK | spring |
| Alsek (Can and US est) | TBR | spring |
|  | YEAR OF |  |
| REBUILDING |  |  |
| Yakoun | NBC | summer |
| Skeena 1/ | NBC | spring/summer |
| Green | PS | fall |
| Grays Harbor spring | WAC | spring |
| Grays Harbor fall | WAC | fall |
| PROBABLY REBUILDING |  |  |
| Nass 2/ | NBC | spring/summer |
| Upper Fraser 1/ | FR | spring |
| Middle Fraser | FR | spring/summer |
| Thompson | FR | summer |
| Col. Upriver bright 1/ | CR | fall |
| INDETERMINATE |  |  |
| Rivers Inlet | CBC | spring/summer |
| W. Coast Van. I. | WCVI | fall |
| Upper Georgia Strait | GS | summer/fall |
| Skagit spring | PS | spring |
| Stillaguamish | PS | summer/fall |
| Quillayute summer | WAC | summer |
| PROBABLY NOT REBUILDING |  |  |
| Area 6 Index | CBC | summer |
| Area 8 Index | CBC | spring |
| Smith Inlet | CBC | summer |
| Lower Georgia Strait | GS | fall |
| Skagit summer/fall | PS | summer/fall |
| Snohomish | PS | summer/fall |
| Col. Upriver spring 2/ | CR | spring |
| Col. Upriver summer 2/ | CR | summer |
| NOT REBUILDING |  |  |
| Harrison | FR | fall |

1/ Escapement of these stocks has been above the escapement goal for at least 4 of the last 5 years.
2/ Status of these stocks was altered from Indeterminate (see text for details).

Table 2-3b Rebuilding status through 1989 of indicator stocks without escapement goals.

| STOCK STATUS | REGION | RUN TYPE |
| :---: | :---: | :---: |
| INCREASING |  |  |
| Quillayute fall | WAC | fall |
| Hoh spring/summer | WAC | spring/summer |
| Hoh fall | WAC | fall |
| Queets spring/summer | WAC | spring/summer |
| Queets fall | WAC | fall |
| Oregon Coastal | NOC | fall |
| INDETERMINATE |  |  |
| Lewis | CR | fall |

### 2.5 STOCKS CONSIDERED FOR STATUS CHANGES

According to the assessment criteria, all of the following stocks were classified as Indeterminate. The CTC considered each stock individually, and decided whether or not to change the status to Probably Rebuilding or Probably Not Rebuilding.

### 2.5.1 Nass Area

The initial stock classification of Indeterminate resulted from a relatively low 1988 escapement value. This 1988 value, however, reflected poor enumeration conditions in 1 of the major tributaries. Given the uncertainty of the 1988 value and the long term increasing trend in escapement, the CTC revised the Nass status to Probably Rebuilding.

### 2.5.2 Rivers Inlet

This stock declined 2 status levels from the 1988 assessment. This change reflected a third year of declining escapements from a peak in 1986. The CTC considered but decided against revising the status of this stock to Probably Rebuilding, because the 1988 and 1989 escapements were below goal and the 1989 value was below the linear rebuilding schedule.

### 2.5.3 Upper Georgia Strait

The CTC considered revising the status of this stock to Probably Rebuilding based on the long term positive trend in recorded escapement. However, visual escapement surveys in mainland rivers are highly dependent on water clarity and frequency of visits. Variation in counting conditions in recent years reduced our confidence in the apparent trend and resulted in the CTC's decision not to revise the Indeterminate status of this stock.

### 2.5.4 Columbia Upriver Springs and Summers

The initial stock classification of Indeterminate was thought to be overly optimistic. Escapement levels for each stock have been well below the rebuilding goal and have declined in recent years. Escapement for the spring stock in 1989 was below the base period level and just $31 \%$ of the goal. Any optimism over summer stock escapement is diminished by problems in accounting accuracy (TCCHINOOK (87)-2). For these reasons, the CTC
revised the rebuilding status of both the spring and summer stocks from Indeterminate to Probably Not Rebuilding.

### 2.6 OTHER STOCK SPECIFIC NOTES

### 2.6.1 Smith Inlet

In 1989, the status of this stock declined from Indeterminate to Probably Not Rebuilding. This status decline resulted from a large decline in the recorded escapement in 1989. The 1989 value may reflect inconsistent enumeration methods and is presently under review.

### 2.6.2 Columbia Upriver Brights

In 1989, the status of this stock declined from Rebuilding to Probably Rebuilding. This decline occurred because the recent trend failed the r-squared criterion by a small margin. Further, 1988 and 1989 escapements showed large declines. Escapements, however, have been increasing over the long term and have been above goal for the last 5 years.

### 2.6.3 Quillayute Summers

The designation "summer" is used to distinguish this native stock from an earlier run nonnative spring stock introduced by enhancement activities. While the spring run is managed for hatchery production and the summer run is managed for natural production, run timing overlaps to some extent. Because data are not available to separate naturally spawning fish from the enhanced component, future inclusion of this stock as an escapement indicator stock is currently under review.

### 2.7 CONCLUSIONS

The overall results of the 1989 assessment of stock rebuilding are worse than in 1988 (Figure 2-3), although rebuilding progress can be seen for some stocks.

In 1989, 11 stocks were classified as either Probably Not Rebuilding or Not Rebuilding, compared to 4 in 1988. Furthermore, 16 stocks decreased their rebuilding status from 1988, while only 5 improved their status. Of these 16 decreases in 1989, 2 (Alsek and Area 8 Index) resulted from changing to Phase II methodology; the remaining 14 stocks declined due to the 1989 escapements.

Although the overall results of the rebuilding assessment are worse than in 1988, 6 stocks have had escapements above their goals for at least 4 out of the last 5 years: Andrew Creek, Keta, Chickamin, Skeena, Upper Fraser, and Columbia Upriver Brights. Of these stocks, Andrew Creek, Keta, and Skeena are classified as Rebuilding. The other 3 stocks are classified as Probably Rebuilding because of declines in recent escapements. Altogether, 12 stocks met their escapement goals in 1989 (more than 1988, but fewer than in 1986 and 1987) and more stocks continue to reach a higher percentage of their goal than during the base period (Figure 2-4).

Those eleven stocks categorized as Probably Not Rebuilding or Not Rebuilding are the least likely to reach their escapement goals by their rebuilding target dates. Six additional stocks moved into these categories in 1989. Given declining trends in survival of most stocks (see Chapter 3), the CTC is concerned about the ability of these stocks to rebuild under the current management regimes.

FIGURE 2.3 NUMBER of ESCAPEMENT INDICATOR STOCKS by REBUILDING CATEGORY, 1987-89


Note: 36 stocks with goals considered

FIGURE 2.4 NUMBER of INDICATOR STOCKS by PERCENT of GOAL, BASE PERIOD us 1987-89


33 stocks w/o conflicting goals considered

## CHAPTER 3 EXPLOITATION RATE ANALYSIS <br> Based on CWT Recovery Data Through Calendar Year 1989

### 3.1 INTRODUCTION

In Chapter 2, trends in escapements of indicator stocks were examined. In this Chapter, Exploitation Rate Analysis based on CWT studies, is used as another measure to assess rebuilding progress since implementation of ceiling management through the PSC. Several types of analyses are used to examine trends in exploitation rates for fisheries and stocks. In order to assess rebuilding progress, however, the results of the Exploitation Rate Analysis should be considered together with the escapement assessment in Chapter 2 and information from the PSC chinook model. The combined assessment is presented in Chapter 4.

### 3.1.1 Overview

A total of 32 "exploitation rate indicator stocks" with usable time series of recovery data were used in the analysis for 1989. For the 1988 analysis, 15 exploitation rate indicator stocks were used. The indicator stocks employed in this analysis are summarized in Table 31 ; stocks added for the 1989 analysis are indicated by an asterisk. As in previous years, these indicators are dominated by fall-type stocks.

The 17 stocks that were added to the analysis in 1989 provide greater representation of geographic regions and run timing. Fifteen of the stocks added were from Puget Sound or the Washington Coast. These stocks were tagged as part of a harvest rate indicator program initiated in 1985 and discussed in an earlier report (TCCHINOOK (87)-2, Appendix 3, Summary of Chinook Escapement and Harvest Rate Indicator Stocks For Puget Sound and Washington Coast). The remaining 2 stocks added to the analysis are fall run stocks (Harrison) originating from the Chehalis and Chilliwack hatcheries on the Fraser River. Although escapement data for these 2 stocks are unavailable, the CWT recoveries in the catch provide useful information regarding stock distribution. Additional stocks from all areas are likely to be added as data needs are identified and recoveries become available.

Table 3-1 List of exploitation rate indicator stocks.

| Exploitation Rate Indicator Stock | Location | Description |
| :---: | :---: | :---: |
| $==================================$ |  | ======= |
| Southeast Alaska | Southeast Alaska | Spring Run |
| Robertson Creek | WCVI | Fall Run |
| Quinsam | Georgia Strait | Fall Run |
| Big Qual icum | Georgia Strait | Fall Run |
| Capilano | Georgia Strait | Fall Run |
| Chehal is * | Lower Fraser River | Fall Run (Harrison Stock) Fingerling |
| Chilliwack * | Lower Fraser River | Fall Run (Harrison Stock) Fingerling |
| South Puget Sound Yearling | South Puget Sound | Summer/Fall Run |
| University of Washington Accelerated* | Central Puget Sound | Summer/Fall Run |
| Samish Fingerling* | North Puget Sound | Summer/Fall Run |
| Lummi Ponds Fingerling * | North Puget Sound | Summer/Fall Run |
| Stillaguamish Fingerling * | Central Puget Sound | Summer/Fall Run |
| George Adams Fingerling * | Hood Canal | Summer/Fall Run |
| South Puget Sound Fingerling | South Puget Sound | Summer/Fall Run |
| Kalama Creek Fingerling * | South Puget Sound | Summer/Fall Run |
| Elwha Fingerling* | Strait of Juan de Fuca | Summer/Fall Run |
| Skagit * | Central Puget Sound | Spring Yearling |
| Nooksack * | North Puget Sound | Spring Yearling |
| Skookum * | North Puget Sound | Spring Yearling |
| Quilcene * | Hood Canal | Spring Yearling |
| White River * | South Puget Sound | Spring Yearling |
| Quinault * | North Washington Coast | Fall Fingerling |
| Queets * | North Washington Coast | Fall Fingerling |
| Humptulips * | Grays Harbor | Fall Fingerling |
| Cowlitz | Columbia River (WA) | Fall Tule |
| Spring Creek | Columbia River (WA) | Fall Tule |
| Bonneville | Columbia River (OR) | Fall Tule |
| Stayton Pond | Columbia River (OR) | Fall Tule |
| Upriver Bright | Upper Columbia River | Fall Run |
| Lewis River | Lower Columbia River | Fall Run |
| Wells Hatchery | Upper Columbia River | Summer/Fall Run |
| Willamette | Lower Columbia River | Spring Run |



* Indicates stocks added for the 1989 analysis.

Available data for individual stocks are not adequate for use in all of the exploitation rate analyses. Table 3-2 identifies the stocks used for the different types of analyses reported and Table 3-3 indicates the brood years with available CWT data for each exploitation rate indicator stock.

Table 3-2 Data availability for indicator stocks for various aspects of the Exploitation Rate Analysis.


Table 3-3 Brood years included by stock for Exploitation Rate Analysis. ( $x=$ valid)

| Stock Name | Youngest Age | Oldest |  | --- |  | --- | ---- |  |  |  |  | 081 |  | 182 |  | 848 |  | 687 |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  | 71 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Southeast Alaska | 3 | 6 | - | - | - | - | - | - | - | $x$ | $x$ | x | $x$ | $x$ | $x$ | X | x | x | - |
| Robertson Creek | 2 | 5 | - | $x$ | $x$ | $x$ | $x$ | x | $x$ | $x$ | $x$ | x | $x$ | $x$ | $x$ | $x$ | x | $x$ | $x$ |
| Quinsam | 2 | 6 | - | - | - | $x$ | x | $x$ | $x$ | $x$ | $x$ | $x$ | x | $x$ | $x$ | $x$ | x | x | $x$ |
| Big Qualicum | 2 | 5 | X | $x$ | x | x | $\times$ | x | x | $x$ | x | X | $x$ | $x$ | $x$ | $x$ | $x$ | $x$ | $x$ |
| Capilano | 2 | 5 | X | $x$ | x | - | x | x | x | x | $x$ | x | x | $x$ | $x$ | X | $x$ | x | $x$ |
| Chehalis | 2 | 5 | - | - | - | - | - | - | - | - | - | - | X | X | X | X | X | X | $x$ |
| Chilliwack | 2 | 5 | - | - | - | - | - | - | - | - | - | - | $x$ | $x$ | x | $x$ | x | X | $x$ |
| South Puget Sound Yearling | 2 | 5 | - | - | - | - | - | - | - | X | X | X | X | - | - | - | - | X | - |
| Univ of Washington Accelerated | 2 | 5 | - | - | - | - | x | $x$ | x | x | $x$ | $x$ | x | $x$ | x | x | - | - | - |
| Samish Fingerling | 2 | 5 | - | - | - | - | X | - | - | - | $x$ | - | - | - | - | - | $x$ | $x$ | - |
| Lummi Ponds Fingerling | 2 | 5 | - | - | - | - | X | $x$ | $x$ | $x$ | $x$ | x | $x$ | - | - | - | x | $x$ | $x$ |
| Stillaguamish Fingerling | 2 | 5 | - | - | - | - | - | - | - | - | - | X | X | X | X | - | - | X | X |
| George Adams Fingerling | 2 | 5 | - | - | - | - | X | - | - | X | $x$ | $x$ | X | - | - | - | X | $x$ | X |
| South Puget Sound Fingerling | 2 | 5 | - | - | - | - | x | - | - | X | x | X | x | $x$ | $x$ | $x$ | X | $x$ | $x$ |
| Kalama Fingerling | 2 | 5 | - | - | - | - | - | - | - | - | $x$ | x | x | $x$ | $x$ | $x$ | $x$ | $x$ | $x$ |
| Elwha Fingerling | 2 | 5 | - | - | - | - | - | - | - | - | - | - | - | x | x | x | x | x | - |
| Skagit | 2 | 5 | - | - | - | - | - | - | - | - | - | - | $x$ | x | x | X | x | X | - |
| Nooksack | 2 | 5 | - | - | - | - | - | - | - | - | - | - | - | - | - | $x$ | - | $x$ | - |
| Skookum | 2 | 5 | - | - | - | - | - | - | - | - | - | x | - | $x$ | $x$ | x | $x$ | $x$ | - |
| Quilcene | 2 | 5 | - | - | - | - | - | - | - | - | - | - | $x$ | $x$ | $x$ | - | $x$ | $x$ | - |
| White River | 2 | 5 | - | - | - | - | - | - | - | - | x | x | X | X | x | x | x | $x$ | - |
| Quinault | 2 | 5 | - | - | - | - | X | $x$ | $x$ | $x$ | $x$ | x | - | $x$ | X | x | X | $x$ | - |
| Queets | 2 | 5 | - | - | - | - | - | - | X | x | x | x | x | x | x | - | $x$ | x | $x$ |
| Humptulips | 2 | 5 | - | - | - | - | - | - | - | - | - | - | - | $x$ | - | x | x | $x$ | x |
| Cowlitz | 2 | 5 | - | - | - | - | - | - | $x$ | X | x | x | x | x | $x$ | X | X | x | X |
| Spring Creek | 2 | 5 | - | $x$ | $x$ | $x$ | x | $x$ | X | $x$ | X | X | x | x | $x$ | X | X | X | x |
| Bonneville | 2 | 5 | - | - | - | - | - | x | x | X | $x$ | X | X | $x$ | X | x | - | - | - |
| Stayton Pond | 2 | 5 | - | - | - | - | - | - |  | x | X | X | x | X | x | $x$ | x | $x$ | $x$ |
| Upriver Bright | 2 | 5 | - | - | - | - | x | $x$ | x | x | x | x | x | x | $x$ | $x$ | x | x | x |
| Lewis River | 2 | 5 | - | - | - | - | - | - | X | x | x | - | - | X | x | X | X | X | $x$ |
| Wells Hatchery | 2 | 5 | - |  |  | - | - | $x$ |  | - |  | - | - | - | X | X | x | $x$ | - |
| Willamette | 3 | 6 | - | - | - | - |  |  |  |  |  |  |  |  | x | X | x | x | - |

The Exploitation Rate Analysis presented in this report consists of 6 major parts:

1. Fishery Indices: stock and age specific exploitation rates in a fishery are combined across the indicator stocks to develop indices of fishery impact changes under PST chinook management regimes relative to a 1979-1982 base period. The index for any given year is computed by dividing the fishery exploitation rate for that year by the base period average. Therefore, a fishery index less than 1.0 represents a decrease in exploitation from the base period while a fishery index greater than 1.0 indicates an increase. The relative magnitude of the change is the difference of the index from 1.0 .

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

Fishery indices were calculated separately for the Strait of Georgia sport and troll fisheries. The PSC catch ceiling for the combined troll and sport fisheries was apportioned according to Canadian domestic allocation.
2. 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. An index of 1.0 indicates no change from the base period (1979-1982); an index greater than 1.0 indicates that impacts have increased compared to the base period; an index less than 1.0 indicates that impacts have decreased relative to the base period.

Three stock indices are provided. One index estimates the impacts of all fisheries operating under PSC ceilings. The second index presents impacts of Canadian fisheries not operating under PSC ceilings. The third index estimates the impacts of all U.S. fisheries not operating under PSC catch ceilings.

Under the rebuilding program, the stock indices for fisheries operating under PSC ceilings are expected to decrease over time as abundance increases and fishery exploitation rates decline. As impacts of fisheries operating under PSC ceilings decline, more fish would be subjected to and harvested by other fisheries. Stock indices for these fisheries not operating under PSC ceilings would then be expected to increase, assuming that harvest rates were not reduced.
3. Brood Year Exploitation Rates: Within specific stocks and brood years, estimates of the cumulative impacts on all ages (within a cohort) by all fisheries and by only ocean fisheries are presented. Brood year exploitation rates are expressed in adult equivalents and presented for reported catch and total (catch plus incidental mortalities) fishing mortality. Rates are expressed as a proportion of the total fishing mortality plus escapements. The values presented in the figures and tables are actual proportions, not indices. Brood year exploitation rates need to decrease for rebuilding to take place; the required reduction depends upon stock productivity parameters and harvest patterns. These rates are the best indications of the cumulative effects of fisheries on a stock. Monitoring these rates will be important in evaluating chinook rebuilding and productivities. Fall chinook from the 19821985 brood years have been fished entirely under PSC management regimes.
4. Survival Rate Estimates: Stock survival estimates are computed for exploitation rate indicator hatchery stocks using CWT release and recovery data. A time series of survival estimates is calculated as the total fishing mortality plus escapement of fish of a given age divided by the number of tagged fish released for the brood. Separate estimates are computed for ocean age 2 and 3 fish. These estimates are used instead of a single estimate based on total survival in order to include recent (1986 and 1987) brood years in the analysis and provide indications of short-term abundance expectations. On average, the age 3 estimate provides a better index for total survival; however, the age 2 estimate projects survival for an additional brood year.

Survival rate data were examined for long and short-term trends. Long-term trends were determined by the sign of a line fitted through all available observations for stocks with at least 7 years of survival estimates. Short-term trends were determined by comparing the survival of the last 2 broods with the average of the previous 5 broods; these trends were determined only for stocks with at least 3 available survival estimates for the 1981-1985 broods. If the sign of the slope of age 2 and age 3 trends differed for a stock, the long-term trend was considered to be
indeterminate. The percent change in survival estimated for the 1986 and 1987 broods from corresponding 1983-1985 averages was also calculated for each stock.
5. Stock Catch Distribution: The distributions of reported catch and of total mortalities for each indicator stock are presented for 9 fishery categories: 1 for each set of fisheries operating under a PSC ceiling and 1 for each gear type of Canadian and U.S. fisheries that do not operate under PSC ceilings. Distributions are presented as percentages of both the reported catch and the total fishing mortality (expressed in terms of adult equivalents). Distributions are computed only for calendar years with CWT recovery data for at least 3 brood years.
6. Stock Contribution Indices: Estimates of contributions for major stock groups to the SEAK troll, the NCBC troll, the WCVI troll, the GS troll and sport, and the Washington/Oregon ocean troll and sport fisheries are used to illustrate relative changes in stock contributions. Contribution indices were computed for the Upriver Bright, Robertson Creek, Somass River, Spring Creek, Oregon Lower Columbia Tules, Washington Lower Columbia Tules, Willamette, Quinsam, and Big Qualicum stocks. Contributions were calculated by expanding the estimated fishery CWT recoveries at age by 1 of the 3 following methods: (1) the ratio of terminal (escapement plus terminal catch) CWT recoveries to stock-specific terminal returns at the same age; (2) the ratio of escapement CWT recoveries to stock-specific escapement returns at the same age; and (3) marked to unmarked release ratio for the hatchery. The estimated contributions of each individual stock were compared to its average contribution during the 1979-1982 base period. Stock 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.

### 3.1.2 Changes In Procedures For The 1989 Analysis

Methods and analytical procedures employed in the Exploitation Rate Analysis were described in Appendix II of the 1987 CTC Annual Report (TCCHINOOK (88)-2) and Section 1.2 of the 1988 CTC Annual Report (TCCHINOOK (89)-1), with the following exceptions:

Stock Indices: A change was made in the criteria used to determine which fisheries should be reported for each stock-age combination in the stock index calculations. In the 1988 analysis (TCCHINOOK (89)-1), impacts of a fishery aggregate were included only if the average exploitation rate was at least $3 \%$ of the available cohort during the base period. For the 1989 analysis, a fishery aggregate was included if at least 1 of the following criteria was satisfied: (1) the exploitation rate averaged at least $3 \%$ during the base period; (2) the exploitation rate averaged at least $3 \%$ from 1979-1989; or (3) the exploitation rate in any single year was at least $10 \%$.

For each fishery aggregate, the median of stock indices (i.e. the middle value of the ranked list) was calculated to summarize changes since the base period. The median was considered a more appropriate summary statistic since the distribution across stocks was not symmetric.

Brood Exploitation Rates: The formula described in TCCHINOOK (89)-1 for computation of brood ocean exploitation rates based on reported catch has been corrected. The formula used in TCCHINOOK (89)-1 did not accurately estimate
ocean exploitation rates since incidental fishing mortality was not included in the denominator. The 2 major effects of this formula were: over estimation of ocean exploitation rates for reported catch and under estimation of the impact of incidental fishing mortality. The second effect resulted from the subtraction of reported catch mortality from the estimate of total fishing mortality. Total (catch plus incidental) ocean fishery exploitation rates were correctly computed in TCCHINOOK (89)-1.

The formula used to estimate the brood year ocean exploitation rate for reported catch in TCCHINOOK (89)-1 was:

$$
\text { Reported Catch BYER }=\frac{\text { Reported Catch }}{\text { Reported Catch }+ \text { Escapement }}
$$

where BYER = Brood Year Exploitation Rate

The corrected formula is:

$$
\text { Reported Catch BYER }-\frac{\text { Reported Catch }}{\text { Total Fishing Mortality }+ \text { Escapement }}
$$

Clarification Of Data Used To Represent Columbia River Summer Chinook: The stock name Wells Hatchery has replaced Columbia River Summer throughout the Exploitation Rate Analysis. Exploitation rate data presented in previous reports have been based solely on CWT data for fish released from the Wells Hatchery. Over the years, the number of fall-type tags (particularly Priest Rapids hatchery) recovered from fish used as broodstock at Wells Hatchery has gradually increased. By expanding CWT from known fall chinook releases for the mark rate at release, a minimum estimate of the percentage of fall chinook in the brood stock collected for the Wells Hatchery can be made: 1977, 1\%; 1983, 7\%; 1984, 4\%; 1985, 7\%; and, 1986, $28 \%$ (other years are currently unavailable). A change in policy was instituted in the collection of brood stock in 1988; in that year, brood stock collection was suspended on September 30. September 15 was used as the cutoff date in 1989 and 1990. Under these circumstances, recent CWT releases from Wells Hatchery may not be appropriate indicators for Columbia River Summer chinook. However, during the base period, CWT groups released from Wells Hatchery were appropriate indicators for Columbia River summer chinook since the number of fall-type fish used for the 1977 brood and probably the 1976 brood was minimal.

### 3.1.3 CWT Data Used

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

1. Recoveries by Canadian fisheries were obtained from the Mark-Recovery Database maintained by the CDFO at the Pacific Biological Station.

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2. Recoveries by Alaskan fisheries were obtained from the ADF\&G database.
3. Recoveries by Washington and Oregon fisheries were obtained from the database maintained by the Pacific States Marine Fisheries Commission.
4. Preliminary recoveries by the Quinault Indian Nation for the Washington coastal net fisheries for 1987-1989 were provided by the Quinault Indian Nation.
5. The most recent CWT recovery data for escapements were obtained directly from fishery agencies.

In some instances, data employed for the 1989 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. Preliminary recovery estimates for some years have been finalized.

## 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.

CW'T recovery data for SEAK sport fishery during the 1979-1982 base period are of poor quality due to very limited sampling. The sport fishery sampling program expanded substantially from 1983 to 1986, resulting in more reliable estimates in recent years. To estimate CWT recoveries for this fishery, the Analytical Work Group (AWG) instituted the procedure documented in TCCHINOOK (90)-2.

## Recoveries in Canadian Fisheries:

Commercial Fisheries: Recoveries in commercial fisheries were taken directly from the Salmon Stock Assessment Database at the Pacific Biological Station. Expansions to correct for sampling rates were performed in accordance with Kuhn et al (1988) ${ }^{3}$. Changes in recoveries from those used to generate the analyses presented in TCCHINOOK (89)-1 are attributable to updates in catch information or corrections in the recovery data.

Sport Data: Canadian sport data were handled differently in 1989 than previous years. Starting in 1980, recoveries made in Strait of Georgia during the summer months (May-September) were expanded as documented in Kuhn et al (1988). Recoveries made in other months used the May-September average expansion factor in the same recovery year. Recoveries in areas outside the Strait of Georgia used the corresponding expansion factor for the Strait of Georgia, unless an expansion factor
based on creel survey data was available. Recoveries made prior to 1980 continued to be expanded by the default value of 4 .

The change in the method of expanding Strait of Georgia sport recoveries was made because of potential tag expansion biases associated with inadequate sampling and infrequent overflights of the sport fishery during winter months. The application of Strait of Georgia expansion factors to sport recoveries in other areas was necessary because data are normally unavailable for these areas. It is believed that the new method produces more reliable estimates than the old method.

Capilano Data: During recent years, low flows in the Capilano River have impeded chinook migration and resulted in straying and increased vulnerability to terminal fisheries (which are not sampled for CWT's). Consequently, escapements to the hatchery have been very poor and the consistency of escapement data between years is highly questionable. The Capilano hatchery data, therefore, have been removed from analyses that are sensitive to inconsistencies in escapement recoveries (fisheries index, survival index, and brood year exploitation rate analyses).

The effect of changing sport fishery expansion factors and of removing the Capilano data are demonstrated in Table 3-4. In general, both changes reduced the fishery index for the Strait of Georgia sport fishery. The trend in the index was not affected by either change.

> Table 3-4 Effect of changing the method of calculating the CWT sport expansion factors on the fishery index for the GS sport fishery index. The GS sport fishery index is calculated twice: by including and excluding the Capilano Hatchery stock. This was done to illustrate the effect of removing Capilano from the analysis.


Escapement Data: Escapement data for Canadian stocks were retrieved from the Salmon Stock Assessment Database at the Pacific Biological Station. Only hatchery rack recoveries were included for Robertson Creek, Big Qualicum, and Capilano stocks due to the inconsistency of recovery effort in the associated rivers. Hatchery strays in the Quinsam/Campbell River system have always been included due to the consistent recovery effort. For the 1989 assessment, in-river CWT recoveries from 1985 to 1988 were expanded using Petersen escapement estimates published by Andrew et al (1988) ${ }^{4}$

4
Andrew, J.H., M. Lightly, and T.M. Webb. 1988. Abundance, age, size, sex and coded-wire tag recoveries for chinook salmon escapements of Campbell and Quinsam Rivers, 1985. Can. MS Rep. Fish. Aquat. Sci. 2007:46p.
and Bocking et al (1990) ${ }^{5}$. Petersen estimates for 1984 and 1989 were obtained directly from Quinsam Hatchery (R. Reinhard, personal communication with Paul Starr). River recoveries in other years were expanded using the 1984-1989 average expansion factors calculated for each river.

## Recoveries in Washington/Oregon Fisheries:

In the 1988 exploitation rate analyses, Washington Buoy 10 sport fishery recoveries were inadvertently classified as recoveries in the Washington/Oregon ocean sport fisheries. For the 1989 analyses, the error was corrected for 1986-1989 by placing these Buoy 10 recoveries in the terminal sport fishery. The 1979-1985 Buoy 10 recoveries for all except Puget Sound and Washington Coastal stocks are still in the Washington/Oregon ocean sport fishery; these data will be corrected for future analyses. The Buoy 10 sport fishery effort was minimal during the 1979-1982 base period and should have only a minor effect on the fishery index for the Washington/Oregon ocean fisheries.

### 3.2 ESTIMATION OF EXPLOITATION RATES

### 3.2.1 Theory And Procedures

For fisheries operating under PSC ceiling management, successful completion of the rebuilding program depends upon a substantial initial reduction in 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. Theory and procedures employed in the Exploitation Rate Analysis were presented in TCCHINOOK (88)-2.

### 3.2.2 Assumptions And Interpretation Of The Analyses

Assumptions for the cohort analysis and other procedures utilized in the Exploitation Rate Analysis are summarized below. Detailed discussions of assumptions and parameter values may be found in TCCHINOOK (88)-2. Assumptions are discussed in relation to different types of analyses.

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

1. Fishery and escapement CWT recovery data are obtained in a consistent manner from year to year. Many of the analyses rely upon indices which are computed as the ratio of a statistic in a particular year to the value associated with a base period. Consistent biases will not affect this type of analysis.
2. For age 2 and older fish, natural mortality is constant for each age class in each year.
3. All stocks within a fishery have the same size distribution for each age and the size distribution at age is constant between years.
4. The distribution of sub-legal fish can be inferred from the catch of legal-sized fish.
5. Incidental mortality rates per encounter are constant within each fishery.
6. In the absence of an independent estimate of incidental mortality loss during non-retention periods, the procedure for estimating the mortality of CWT fish of legal size assumes that the stock distribution remains unchanged from the period of legal catch retention.

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

Survival Rate Indices: Fishery exploitation rates, incidental mortality rates, and stock maturation rates are constant from year to year.

Stock Contribution Indices: CWT fish are assumed to have the same temporal and spatial distributions as the untagged fish they are intended to represent.

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

1. For a given stock, the geographic and temporal distributions are similar for legal and sub-legal sized fish.
2. Assumptions (3) to (6) listed for the Cohort Analysis.
3. Estimates of non-retention mortalities for Alaskan fisheries utilize reported incidence of legal and sublegal sized fish where available.
4. When the number of CNR days are used to estimate incidental mortalities, the relative encounter rate of legal-sized fish is assumed to be $34 \%$ of the rate during the period when legal-sized fish are retained. This assumption is based upon reported incidence of legal sized fish in the SEAK troll fishery.

### 3.2.3 Reported Catch Versus Total Mortalities

Fishery Indices are presented for both reported catch and total mortality. Management strategies have changed considerably for fisheries constrained by PSC catch ceilings since implementation of the PST. 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 estimate these incidental mortality losses and incorporate them into the Exploitation Rate Analysis were described in Supplement B of TCCHINOOK (88)-2.

### 3.3 FISHERY INDICES

### 3.3.1 Overview

Results of fishery indices based on reported catch and total mortalities are presented in Appendix C. Summary results based on total mortalities are presented in Table 3-5:

| Table 3-5 Total mortality fishery exploitation rate indices (adjusted by adult equivalents) |  |  |  |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | S.E. | NORTH/CENTRAL |  |  | WCVI | TROLL |  | GEORGIA STRAIT |  |  | WA/OR OCEAN |  |  |
| Fishery | ALASKA |  | TROLL |  | Age | Age | Age | Troll/ |  |  | Age | Age | Age |
| Year | Troll | N/C | Nth | Ctl | 3 | 4 | 3/4 | Sport | Troll | Sport | 3 | 4 | 3/4 |
| ====== |  |  |  |  |  |  |  |  |  |  |  |  | $===$ |
| 1979 | 0.94 | 0.97 | 0.80 | 1.24 | 0.98 | 0.99 | 0.99 | 0.79 | 1.14 | 0.62 | 0.69 | 1.01 | 0.78 |
| 1980 | 0.96 | 1.10 | 0.97 | 1.09 | 1.04 | 1.00 | 1.02 | 1.19 | 1.18 | 1.24 | 1.09 | 0.79 | 1.03 |
| 1981 | 1.15 | 1.23 | 1.38 | 1.05 | 0.85 | 0.81 | 0.83 | 1.54 | 0.94 | 1.73 | 0.92 | 0.97 | 0.94 |
| 1982 | 0.93 | 0.71 | 0.74 | 0.69 | 1.12 | 1.12 | 1.12 | 0.61 | 0.72 | 0.50 | 1.18 | 1.10 | 1.16 |
| 1983 | 1.33 | 0.95 | 0.84 | 0.82 | 1.19 | 1.13 | 1.15 | 0.80 | 1.03 | 0.78 | 0.61 | 0.74 | 0.65 |
| 1984 | 0.98 | 0.81 | 1.10 | 0.48 | 1.35 | 1.52 | 1.45 | 1.06 | 1.04 | 1.14 | 0.29 | 0.27 | 0.28 |
| 1985 | 1.07 | 0.80 | 1.34 | 0.23 | 0.84 | 0.92 | 0.88 | 0.57 | 0.15 | 0.74 | 0.74 | 0.26 | 0.63 |
| 1986 | 0.77 | 0.92 | 1.13 | 0.74 | 0.94 | 1.02 | 0.99 | 0.79 | 0.56 | 0.98 | 0.70 | 0.33 | 0.57 |
| 1987 | 0.99 | 0.77 | 0.97 | 0.50 | 0.80 | 0.75 | 0.78 | 0.69 | 0.28 | 0.88 | 0.75 | 0.56 | 0.71 |
| 1988 | 0.64 | 0.50 | 0.79 | 0.18 | 0.84 | 1.19 | 1.04 | 0.72 | 0.09 | 0.91 | 0.63 | 0.69 | 0.65 |
| 1989 | 0.63 | 0.58 | 0.94 | 0.09 | 0.30 | 0.45 | 0.41 | 0.88 | 0.13 | 1.28 | 0.63 | 1.19 | 0.91 |

A comparison of estimated and target reductions in fishery indices resulting from the PSC regimes is summarized in Table 3-6. The "1985 target reductions" indicated in the last column were computed by dividing the catch ceiling by the average catch from 1979-1982. The 1985 target reduction represents the expected change in the fishery index which would result from imposition of the ceiling if stock abundance were equal to the 1979-1982 average. Further reductions in indices for PSC ceilinged fisheries were expected as the rebuilding program progressed due to decreases in fishing mortality and increases in production resulting from higher spawning escapements.

Table 3-6 Changes in fishery indices from the 1979-82 base period (adult equivalents).

| Fishery | Age(s) | CHANGE IN FISHERY HARVEST RATE FROM BASE ----------- Total Mortality |  |  |  |  | 1985-89 Average <br> Total Reported |  | 1985 <br> Target Reduction |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | 1985 | 1986 | 1987 | 1988 | 1989 | Mort | Catch |  |
| SEAK Troll | 3,4,5 | 7\% | -23\% | -1\% | -36\% | -37\% | -18\% | -28\% | -22\% |
| NCBC Troll | 3,4,5 | -20\% | -8\% | -23\% | -50\% | -42\% | -28\% | -30\% | -16\% |
| WCVI Troll | 3,4 | -12\% | -1\% | -22\% | 4\% | -59\% | -18\% | -22\% | -24\% |
| WCVI Troll | 3 | -16\% | -6\% | -20\% | -16\% | -70\% | -26\% | -33\% | -24\% |
| WCVI Troll | 4 | -8\% | 2\% | -25\% | 19\% | -55\% | -13\% | - $16 \%$ | -24\% |
| Strait of Georgia |  |  |  |  |  |  |  |  |  |
| Troll \& Sport | 3,4,5 | -43\% | -21\% | -31\% | -28\% | -12\% | - 27\% | -29\% | -47\% |
| Trollat | 3,4 | -85\% | -44\% | -72\% | -91\% | -87\% | -76\% | -80\% | -79\% |
| Sport ${ }^{\text {/ }}$ | 3,4,5 | -26\% | -2\% | -12\% | -9\% | 28\% | -4\% | -7\% | -20\% |
| WA/OR Ocean S/T | 3,4 | -37\% | -43\% | -29\% | -35\% | -9\% | -31\% | -31\% | b/ |
| WA/OR Ocean S/T | 3 | -26\% | -30\% | -25\% | -37\% | -37\% | -37\% | -32\% | b/ |
| WA/OR Ocean S/T | 4 | -74\% | -67\% | -44\% | -31\% | 19\% | -39\% | -39\% | b) |


b/ Using Canadian domestic catch allocation decisions.
bo target reductions were established for Washington and Oregon ocean fisheries.

Figures and tables of fishery indices are presented for all ages combined, individual ages, fisheries and gear. Separate indices are presented for the NBC and CBC troll fisheries, in order to evaluate effects of effort shifts between the 2 regions. Separate fishery indices were computed for age 3 and age 4 fish to evaluate the impact of the size limit change in 1987.

Figures presented in Appendix D depict fishery indices based on total fishing mortality over time. The heavy black line indicates the estimated fishery index; the light vertical bars are used to display the central range ${ }^{6}$ 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.

### 3.3.2 Southeast Alaska

Total fishery mortality of index stocks has decreased from base period levels for the SEAK troll fishery for 4 of 5 years under PSC regimes. The 1989 index indicates that total mortalities for the SEAK troll fishery have decreased by $37 \%$ from base period levels.

The 1985-1989 average fishery index is $0.82,4$ percentage points higher than the 1985 target reduction under the PSC regimes.

### 3.3.3 North/Central B.C.

The 1989 total mortality of index stocks in the NCBC troll fisheries decreased by $42 \%$ from base period levels. The 1985-1989 average fishery index is $0.72,12$ percentage points lower than the 1985 target reduction.

Reductions in exploitation rates have been much more pronounced for the CBC troll fishery than for the NBC troll fishery. For example, the 1989 index for NBC was 0.94, while the index for CBC was 0.09 . Similarly, the average index for the 1985-1989 period was 1.04 for NBC and 0.35 for the CBC troll fishery.

### 3.3.4 West Coast Vancouver Island Troll

Ages 3 \& 4 Combined: Combined fishery indices for age 3 and 4 fish in the WCVI troll fishery have been above the 1985 target reduction for 4 of the 5 years since implementation of the PSC ceiling, but the 1989 fishery index was 0.41. The 1985-1989 average fishery index is $0.82,6$ percentage points higher than the 1985 target reduction.

Age 3: Since implementation of the PST, age 3 fishery indices for the WCVI troll fishery have been consistently below the base period level. The 1989 index of 0.30 was substantially lower than the levels observed from 1985-1988. The 1985-1989 average

6
The central range is defined as follows:

| Stock-Age |  |
| :--- | :--- |
| Combinations | Central Range |
| 10 | the range of indices |
| 10 | to 19 |

20 to range remaining after the lowest and highest values are excluded
the range remaining after the two lowest and two highest values are excluded
fishery index of 0.74 approximately equals the 1985 target reduction; however, 1989 was the only year in which the 1985 target was reached.

Age 4: Fishery indices for age 4 index stocks in the WCVI troll fishery varied about base period levels from 1985-1988, however, the 1989 index was 0.45. The 1985-1989 average fishery index is $0.87,11$ percentage points higher than the 1985 target reduction.

### 3.3.5 Strait of Georgia

Sport and Troll Combined: Fishery indices for ages 3, 4, and 5 year old fish in the combined GS sport and troll fisheries have declined from base period levels, but not nearly to the 1985 target level. The index for these combined fisheries has increased in each of the last 3 years. The 1989 index is estimated at 0.88 . The 1985-1989 average reduction of $27 \%$ is approximately one-half the expected 1985 target reduction.

Troll: The fishery index for ages 3 and 4 for the GS troll fishery has declined substantially from base period level. The 1989 index value is 0.13 , indicating a reduction of $87 \%$ from the base period. The 1985-1989 average fishery index of 0.24 is, however, slightly higher ( 3 percentage points) than the 1985 target reduction expected under Canadian domestic allocation policy.

Sport: Fishery indices of ages 3,4 , and 5 fish combined in the GS sport fishery have been above the 1985 target reduction in 4 of the last 5 years. The 1989 index of 1.28 is the highest observed since implementation of the PST. The 1985-1989 average exploitation rate index is 0.96 , approximately 16 percentage points higher than the $20 \%$ 1985 target reduction.

### 3.3.6 Washington/Oregon Ocean Fisheries

Ages 3 \& 4 Combined: The Washington/Oregon (WA/OR) ocean troll and sport fishery indices for ages 3 and 4 fish remained below the base period average through 1989. The 1989 index is 0.91 , indicating that the estimated fishery harvest rate on combined age 3 and age 4 fish decreased by 9 percentage points from the base period level. The 19851989 average index is 0.69 , indicating a reduction of $31 \%$ from the base period.

Age 3: The age 3 fishery indices for the combined WA/OR ocean troll and sport fisheries remained substantially below base period levels from 1985-1989. The 1989 index is 0.63 , indicating exploitation rates of age 3 fish were $37 \%$ below the base period level. The 1985-1989 average fishery index for age 3 fish is also 0.63.

Age 4: The age 4 fishery index stocks for the combined WA/OR ocean troll and sport fisheries in 1989 was greater than the base period level for the first time since implementation of the Treaty. The 1989 index indicated an increase of $19 \%$ above the base period level. The fishery index has ranged from 0.26 to 1.19 from 1985-1989; the average index indicates a decrease in the estimated fishery harvest rate of $39 \%$ from the base period level.

### 3.3.7 Comparison Of Total Mortality And Reported Catch Indices

The fishery index can be computed for either reported catch or total mortality. Figures comparing indices based on reported catch and total fishing mortality for fisheries with regulatory changes that were expected to alter incidental mortality are presented in Appendix E. Although the size limit for the GS sport fishery was increased in 1989, a graph was not presented since only a single point would be depicted; the size limit change increased total mortality in the GS troll and sport fisheries by 8 percentage points (Table 3-7).

The total mortality index includes the mortality component contributed by CNR fisheries and the discarding of fish that are smaller than the legal size limit. Given a stable age structure, the reported catch index and the total mortality index should give similar results in the absence of major regulatory changes. Results from the comparison of the 2 indices are consistent with this expectation. In all instances where the incidental mortalities have not changed, the indices based on the 2 methods are extremely close (Table 3-7). The effects of size limit changes and CNR regulations on total mortalities are readily apparent for the WCVI troll fishery and the SEAK troll fishery (Table 3-7). In the WCVI troll fishery, the increase in size limit in 1987 had a differential effect on age 3 and age 4 fish. In the SEAK fishery, the effect of CNR periods is apparent since 1982.


### 3.4 STOCK SPECIFIC RESULTS

### 3.4.1 Stock Indices

The median 1989 index value for fisheries under PSC ceiling management across all indicator stocks is 0.51 , indicating a $49 \%$ decline from the base period (Table 3-8). Stock indices for fisheries under PSC ceiling management were below base period levels in 1989 for 14 of 15 stock-age combinations listed in Table 3-8 (indices ranged from 1.45 for the age 4 SEAK stock to 0.38 for the Spring Creek stock). The combined impacts of all fisheries under PSC catch ceiling management on the indicator stocks have declined since the base period for 12 of 18 age-stock combinations (1985-1989 averages, Table 3-8). Results vary among stocks and among age groups for the Southeast Alaska stock.

Stock indices in Canadian fisheries not under ceiling management (the vast majority of which are net fisheries) show a $38 \%$ reduction (median value 0.62 , Table $3-8$ ) from the base period,
using averages for 1985-1989. The median 1989 stock index value indicates a $58 \%$ decline from the base period. A $25 \%$ reduction in impacts by southern B.C. net fisheries was an expected part of the chinook rebuilding program. Using the 1985-1989 averages, the $25 \%$ reduction has been achieved in 2 of 3 stocks that are significantly impacted by these net fisheries.

For the stocks that are significantly impacted by U.S. fisheries not under PSC ceiling management, a mixed response was observed. For 9 stocks (using the 1985-1989 average), exploitation was greater than the base period, primarily as a result of terminal area fishery management measures designed to harvest hatchery or natural production above established broodstock or escapement goals. For 2 stocks (using 1989 only), exploitation was below the base period, reflecting increasingly restrictive terminal area fishing regimes. The median 1989 stock index value for U.S. fisheries not managed under PSC ceilings is 1.23 , indicating a $23 \%$ increase in the exploitation rate form the base period. However, as noted in Section 3.1.1, stock indices are expected to increase even if harvest rates in these fisheries have not changed since the base period.


Stock indices are graphically presented in Appendix F and detailed data for stock indices are presented in tabular form in Appendix G. Comments on summary indices for individual stocks follow.

Southeast Alaska: Tag data from the 1979-1982 period used for all other stocks are not available for the SEAK stock. Because age 4 and age 5 fish 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 was above the base period in 3 of the last 5 years and slightly below in the other 2 years. For age 5 , the index for ceilinged fisheries was at or below base period levels during 1985-1989.

Robertson Creek: The index for ages 3-5 mortality in fisheries with PSC ceilings was consistently greater than 1.00 from 1985-1988, but showed a decrease to 0.62 for 1989. The index for B.C.fisheries without PSC ceilings was significantly below 1.00 from 1985-1988, but increased to 2.30 for 1989. The high 1989 estimate was due to a terminal gillnet fishery on surplus returns to the Robertson Creek hatchery.

Quinsam: The total mortality index for ages $3-5$ in fisheries with PSC ceilings has been less than the base period level since 1984. The 1985-1989 average was 0.70 , with a 1989 index value of 0.50 . The decline in the index for B.C. fisheries without PSC ceilings which was observed since 1985 did not continue in 1989. The stock index in 1989 was 1.18, compared to a 1985-1989 average of 0.75 .

Big Qualicum: The index for combined ages $3-4$ mortality in fisheries with PSC ceilings has been at or below the base since 1985. The 1985-1989 average index was 0.87; 1989 (index 0.97) was above this average and approached the base period level. The total mortality index for B.C. fisheries without PSC ceilings has been less than 1.00 since 1984. The 1985-1989 average index for B.C. fisheries without PSC ceilings was 0.62 , with a 1989 index value of 0.42 .

South Puget Sound Yearling: An index for U.S. fisheries without PSC ceilings could not be calculated for 1986-1988 because of a cessation of tagging in the early 1980's. The index in 1989 is for age 3 fish only, and showed a reduction of $26 \%$ from the base period. This stock is generally not harvested by fisheries without PSC ceilings in Canada.

University of Washington Accelerated: The discontinuation of tagging on the University of Washington Accelerated stock did not allow the calculation of stock indices after 1988. For ages 3-4, the 1985-1988 average index for fisheries with PSC ceilings was 0.94 ; the index was above the base period level for 2 years and below the base period level for 2 years. The 1985-1988 average for U.S. fisheries without PSC ceilings was 1.48 , with a 1988 value of 2.37 .

Samish Fingerling: A complete series of stock indices could not be produced for Samish Fingerling because of intermittent tagging and the use of new criteria for including fisheries (Section 3.1.2.1). The index for fisheries with PSC ceilings (ages 3-4) dropped from 0.86 in 1988 to 0.50 in 1989. The index for U.S. fisheries not operating under PSC ceilings declined from 1.41 in 1988 to 1.12 in 1989.

George Adams Fingerling: Intermittent tagging of the George Adams Fingerling stock has produced gaps in the time series of stock indices. The ages 3-4 index for fisheries with PSC ceilings was 0.62 for both 1988 and 1989, compared to 1.05 for 1985. The index for U.S. fisheries without PSC ceilings increased from 0.72 in 1988 to 1.34 in 1989.

South Puget Sound Fingerling: The stock index for South Puget Sound Fingerling (ages 3-4) for fisheries with PSC ceilings has been below the base period level for every year since 1982. The 1989 value of 0.40 was lower than the 1985-1989 average value of 0.66 . In 3 of the last 5 years, the index for U.S. fisheries without PSC ceilings was less than 1.00. The 1989 value was 1.10 , compared to the 1985-1989 average of 1.02 .

White River: Base period data were unavailable for age 4 fish of the White River Yearling stock; consequently, stock indices could only be calculated for age 3 fish. Recoveries did not satisfy the criteria for fisheries with PSC ceilings. The stock index
for U.S. fisheries without PSC ceilings has been at or below 1.00 for the available time series since 1982. The 1989 value was 0.93 compared to the $1985-1989$ average of 0.81 .

Cowlitz: The index for fisheries with PSC ceilings has decreased since 1983 and has been below base period impact levels, averaging 0.70 for 1985-1989. The 1989 index value was 0.41 . The combined effects of U.S. fisheries without PSC ceilings was slightly below the base period level from 1985-1988; the 1989 index for this fishery aggregate returned to the base period level.

Spring Creek: The index for fisheries with PSC ceilings has been near or below the base period since 1985 with the average 1985-1989 index for age 3-4 equal to 0.70 . The 1989 index was 0.38 . The index for U.S. fisheries without PSC ceilings has varied since 1985. The 1985-1989 average index for this fishery aggregate was 0.97 ; the 1989 index was 1.40 .

Bonneville: The discontinuation of tagging for Bonneville Tules has stopped the stock index time series at 1988. The index for fisheries with PSC ceilings has been variable since 1985, averaging 1.41 for the years 1985-1988, but remained consistently above base period levels. No consistent trend in the index for U.S. fisheries without PSC ceilings was apparent.

Stayton Pond: The index for fisheries with PSC ceilings has been highly variable since 1985, averaging 1.08 for the years 1985-1989. The index decreased below base period levels in 1989 to a value of 0.41 . The index for U.S. fisheries without PSC ceilings steadily increased from 0.42 in 1984 to 1.49 in 1988; the 1989 index value was 1.43. The 1985-1989 average index is 1.02 .

Upriver Bright: The index for fisheries with PSC ceilings has remained at or below base period levels since 1985, averaging 0.85 for the years 1985-1989 and declining to 0.62 in 1989. The index for U.S. fisheries without PSC ceilings has increased substantially since 1985 , with a 1989 value of 5.58 . The increase being due to additional terminal fisheries on surplus returns to river.

Lewis River: The index for fisheries with PSC ceilings has been variable, averaging 0.76 for 1985-1989. The index for U.S. fisheries without PSC ceilings averaged 1.24 between 1985-1989. The 1989 index returned to base period levels.

Wells Hatchery: Tagging for this stock has been intermittent. The index for fisheries with PSC ceilings (ages 3-5) has been highly variable for 1986-1989, averaging 1.18, with a value of 0.54 for 1989. The index for U.S. fisheries without PSC ceilings (ages 35) has been above the base period level for 1986-1989 averaging 10.57, with a 1989 value of 11.23. This index shows a large increase for the years 1986-1989. However, this increase is due to increases in fall chinook inadvertently collected for broodstock at the Wells hatchery and subsequently changing the inriver migration timing. Wells hatchery tags have been recovered in the terminal net fishery as late as mid-September in recent years. Returns this late in the year were not observed during the base period, although it should be noted that fishing was restricted for the fall fishery during the 1979-1982 base period.

Willamette: The index for fisheries with PSC ceilings has been below 1.00 for the last 4 years. The 1989 index was 0.47 , compared to a 1985-1989 average of 0.78 . The index for U.S. fisheries without PSC ceilings has been above the base period for 4 of the last 5
years. The 1989 index for this stock was 1.48 , compared to 1.34 for the 1985-1989 average.

### 3.4.2 Brood Year Ocean Exploitation Rates

Brood year exploitation rates for the indicator stocks are graphically presented in Appendix $H$ and are summarized in Tables 3-9 (ocean exploitation rates) and 3-10 (total exploitation rates). For convenience, recent year averages are compared to base period levels. The base period is defined as the 1976-1979 brood years for fall stocks (for Quinsam the base period is 1976-1980, due to the presence of an extra age class) and 1975-1978 for spring or yearling-type stocks. Changes from base period levels are expressed both in terms of percentage point reductions and percentage reductions (e.g., if the brood year ocean exploitation rates during the base period and 1985 were estimated at $50 \%$ and $45 \%$, respectively, the percentage point reduction would be 5 and the percentage reduction would be $10 \%$ ).

Table 3-9 Brood year ocean exploitation rates for the exploitation rate indicator stocks. Incomplete brood years are designated by an asterisk. See text for definition of brood years in the base period for individual stocks.


Table 3-9 Continued


The 1982-1985 average brood year oceau exploitation rates have declined from pre-PST levels for 15 indicator stocks. The median decline was 8 percentage points from the base; values ranged from 2 to 19 percentage points. The average 1982-1985 brood year ocean exploitation rates increased from pre-PST levels for the Robertson Creek and White River stocks. No comparisons with base period levels could be made for 3 stocks since required data were not available.

Chapter 3 Exploitation Rate Analysis


Table 3-10 Continued.

| Stock | Base Period | 1982 | Brood 1983 | Year 1984 | $\begin{array}{r} ----- \\ 1985 \end{array}$ | $\begin{array}{r} \text { Avg } \\ 82-85 \end{array}$ | Change Percen Points | Base \% |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $=====$ | $==$ | $=====$ | $=$ | -======= | == $=$ | ==== | = |
| Quilcene |  |  |  |  |  |  |  |  |
| Reported Catch | NA | 85\% | 59\% | NA | 64\% * | - 69\% | NA | NA |
| Incidental Mortalities | NA | 9\% | 16\% | NA | 17\% | 14\% | NA | NA |
| Total Mortalities | NA | 93\% | 75\% | NA | 81\% | 83\% | NA | NA |
| White River |  |  |  |  |  |  |  |  |
| Reported Catch | 80\% | 68\% | 66\% | 58\% | 64\% * | - 64\% | -16 | -20\% |
| Incidental Mortalities | 11\% | 10\% | 14\% | 16\% | 14\% | 13\% | 2 | 16\% |
| Total Mortalities | 91\% | 77\% | 80\% | 74\% | 78\% | 77\% | -14 | -15\% |
| Cowlitz |  |  |  |  |  |  |  |  |
| Reported Catch | 63\% | 62\% | 65\% | 60\% | 54\% * | 60\% | -3 | -5\% |
| Incidental Mortalities | 11\% | 9\% | 11\% | 12\% | 15\% | 12\% | 1 | 7\% |
| Total Mortalities | 75\% | 71\% | 77\% | 72\% | 69\% | 72\% | -2 | -3\% |
| Spring Creek |  |  |  |  |  |  |  |  |
| Reported Catch | 71\% | 57\% | 72\% | 65\% | 82\% * | 69\% | -2 | -3\% |
| Incidental Mortalities | 16\% | 15\% | 15\% | 15\% | 11\% | 14\% | -2 | -14\% |
| Total Mortalities | 88\% | 72\% | 87\% | 80\% | 93\% | 83\% | -5 | -5\% |
| Bonneville |  |  |  |  |  |  |  |  |
| Reported Catch | 66\% | 51\% | 58\% | 57\% | NA | 55\% | -11 | -17\% |
| Incidental Mortalities | 13\% | 17\% | 15\% | 25\% | NA | 19\% | 6 | 45\% |
| Total Mortalities | 79\% | 68\% | 73\% | 82\% | NA | 74\% | -5 | -6\% |
| Stayton Pond |  |  |  |  |  |  |  |  |
| Reported Catch | 60\% | 45\% | 48\% | 71\% | 49\% * | 53\% | -6 | -11\% |
| Incidental Mortalities | 13\% | 12\% | 11\% | 23\% | 29\% | 19\% | 6 | 46\% |
| Total Mortalities | 73\% | 57\% | 59\% | 94\% | 78\% | 72\% | -1 | -1\% |
| Upriver Bright |  |  |  |  |  |  |  |  |
| Reported Catch | 39\% | 61\% | 59\% | 71\% | 66\% * | - 64\% | 26 | 65\% |
| Incidental Mortalities | 11\% | 11\% | 13\% | 13\% | 20\% | 14\% | 4 | 35\% |
| Total Mortalities | 50\% | 73\% | 72\% | 84\% | 86\% | 79\% | 29 | 59\% |
| Lewis River |  |  |  |  |  |  |  |  |
| Reported Catch | 45\% | 52\% | 59\% | 42\% | 50\% * | 51\% | 6 | 12\% |
| Incidental Mortalities | 8\% | 8\% | 9\% | 7\% | 9\% | 8\% | 0 | 4\% |
| Total Mortalities | 53\% | 60\% | 69\% | 49\% | 58\% | 59\% | 6 | 11\% |
| Wells Hatchery |  |  |  |  |  |  |  |  |
| Reported Catch | 53\% | NA | 50\% | 24\% | 31\% * | 35\% | -18 | -34\% |
| Incidental Mortalities | 10\% | NA | 13\% | 7\% | 11\% | 11\% | 0 | 3\% |
| Total Mortalities | 63\% | NA | 63\% | 32\% | 42\% | 46\% | -17 | -28\% |
| Willamette |  |  |  |  |  |  |  |  |
| Reported Catch | 54\% | 54\% | 68\% | 63\% | * NA | 62\% | 8 | 14\% |
| Incidental Mortalities | 15\% | 12\% | 20\% | 16\% | NA | 16\% | 1 | 9\% |
| Total Mortalities | 69\% | 66\% | 88\% | 78\% | NA | 78\% | 9 | 13\% |

The 1982-1985 average brood year total exploitation rates have declined from base period levels for 10 stocks. The median decline was 8 percentage points; declines ranged from 1 percentage point for the Stayton Pond stock to 21 percentage points for the South Puget Sound Fingerling stock. The 1982-1985 average brood year total exploitation rates increased for 5 stocks (range from 6 percentage points for the Lewis River stock to 29 percentage points for the Upriver Bright stock), and remained unchanged for 3 stocks. No comparisons with base period levels could be made for 3 stocks since data were not available. Incidental fishing
mortalities increased for 14 indicator stocks and decreased for only 2 stocks. The change from base period levels in the proportion of total fishing mortality accounted for by incidental fishing mortality ranged from a low of $-21 \%$ for the University of Washington Accelerated stock to $107 \%$ for the Robertson Creek stock.

### 3.4.3 Survival Rate Indices

Results of short and long-term survival rate trend assessments are presented in Table 3-11 and graphically in Appendix I (note that the scale of the vertical axes differs between graphs). For the long-term, 17 indicator stocks show decreasing trends in survival, 5 stocks show increasing trends, 1 stock shows no definite trend, and data were insufficient to identify trends for 9 stocks. For the short-term, 14 stocks show decreasing trends in survival, 5 stocks show increasing trends, 6 stocks show no definite trends, and data were insufficient to identify trends for 7 stocks.


### 3.4.4 Stock Catch Distribution

The distributions of reported catch and of total mortalities for each indicator stock (all ages combined) are reported in Appendix $\mathbf{J}$.

Distribution data reflect the migratory and harvest patterns of each stock. Changes can be attributed to changes in stock distribution patterns, 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 numbers of fish.

These distribution tables should be interpreted with caution because these are annual estimates over a number of brood years. An abnormally high percentage may occasionally appear in a fishery (e.g. Big Qualicum in SEAK for 1987) which may possibly be due to:

1. marine conditions causing an unusual shift in stock distribution;
2. weak cohorts causing high random variation in recovery of tags and unusually high recovery rate in that fishery; or
3. a large cohort biasing the recovery data for a particular age class.

These alternatives illustrate the difficulty in explaining each anomaly and the extensive analysis that could be required to identify causes for each anomaly. 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.

Southeast Alaska: This stock was harvested almost exclusively in SEAK, including a hatchery-directed terminal troll fishery. The only other harvest (approximately $3 \%$ ) occurred in NBC fisheries under ceiling management.

Robertson Creek: About two-thirds of the catch and total mortalities for this stock occurred in SEAK and in NBC. Two attributes were noted: (1) since 1987, the proportion of total mortalities in SEAK declined due to increased CNR periods; and (2) "Other Canada Net" harvest reflected conservation actions in the 1985-1987 terminal net fisheries. Terminal fishery catch increased in 1988-1989, resulting in a commensurate reduction in distribution proportions in NCBC and SEAK.

Quinsam: Over $80 \%$ of the catch and total mortalities of this stock occurred in NBC and SEAK fisheries. The remainder occurred in sport and troll fisheries in the upper part of GS and in the Johnstone Strait net fishery. Three attributes were noted: (1) in 1985, 1987, and 1989, increases in the Johnstone Strait net fishery may reflect exploitation in odd year fisheries directed at pink salmon; (2) in 1988, incidental mortalities in the NCBC net fisheries increased due to the strong 1986 brood and a high age 2 catch in the NCBC net fishery; and (3) in 1989, the proportion of total mortalities increased for the GS and Other Canada Net fisheries and decreased in the NCBC troll fishery.

Big Qualicum: Almost $60 \%$ of the catch and $50 \%$ of the total mortalities occurred in the GS sport and troll fisheries. CBC fisheries, largely in the region immediately above Vancouver Island, accounted for one-fifth of reported catch mortalities and onequarter of total mortalities. The Johnstone Strait net fishery accounted for approximately $10 \%$ and $13 \%$ of reported catch and total mortalities, respectively. SEAK fisheries accounted for $6 \%$ of the reported catch and $8 \%$ of total mortalities. As noted for Quinsam, this stock also showed high incidental mortalities in NCBC net fisheries in 1988.

Capilano: Capilano is a transplant of Big Qualicum stock and had a similar catch distribution, except for a higher proportion being accounted for by GS fisheries. This may reflect the more southerly location of the hatchery which may increase inside residency and vulnerability to the GS fisheries. As noted for Quinsam and Big

Qualicum, this stock also showed high incidental mortalities in NCBC net fisheries in 1988.

Chehalis: As with Big Qualicum and Capilano, Chehalis had a southern catch distribution, with nearly $50 \%$ of the catch and total mortalities accounted for by GS fisheries. Two attributes were noted: (1) Harrison was the only Canadian stock with a high proportion of the catch ( $20 \%$ ) accounted for by the WCVI troll fishery; and (2) Harrison was the only Canadian stock for which southern U.S. sport and net fisheries, particularly in northern Puget Sound, accounted for a significant portion of total mortality (an average of $13 \%$ ).

Chilliwack: Chilliwack is a transplant of Harrison stock and had a similar catch distribution to Chehalis. Compared to Chehalis, the proportion of total mortalities accounted for by the WCVI fishery ( $31 \%$ ) was higher and the proportion accounted for by GS fisheries (35\%) lower.

South Puget Sound Yearling: Almost $70 \%$ of the catch and total mortalities of this stock occurred in the Puget Sound sport fishery; an additional $20 \%$ was accounted for by the Puget Sound net fisheries. Canadian fisheries accounted for less than $10 \%$ of the mortalities.

University of Washington Accelerated: About 70\% of the catch and total mortalities of this stock occurred in Puget Sound. The remainder occurred primarily in Canada, especially in the WCVI troll fishery, but also in the GS and Juan de Fuca fisheries. A notable attribute of this stock was a decline in the catch proportion in the Puget Sound sport fishery and a commensurate increase in the Puget Sound net fisheries.

Lummi Ponds Fingerling: This northern Puget Sound stock had a more northerly distribution than southern Puget Sound stocks. About $50 \%-60 \%$ of the catch occurred in Puget Sound, with the remainder taken in Canada. The WCVI troll and the GS fisheries accounted for about one-third of the catch and total mortalities. A notable attribute of this stock was a decline in the proportion of the catch attributed to the WCVI troll fishery, especially in 1989.

Stillaguamish Fingerling: This stock had a northerly distribution, with $15 \%-20 \%$ of the catch and total mortalities occurring in the NCBC and SEAK fisheries. Less than onethird of the catch occurred in Puget Sound. The WCVI and GS fisheries accounted for a further one-third of the catch and total mortalities.

George Adams Fingerling: About $60 \%$ of the catch and total mortalities of this stock occurred in Puget Sound. The remainder was accounted for by Canadian fisheries, with the WCVI troll fishery accounting for about $20 \%$.

South Puget Sound Fingerling: About $60 \%$ of the catch and total mortalities of this stock occurred in Puget Sound. The WCVI troll (about 20\%) and GS (about 8\%) fisheries were the other fisheries of importance for this stock. As with Lummi Pond, there has been a decline in the proportion of the catch attributed to the WCVI troll fishery over time.

Kalama Creek Fingerling: This stock had a distribution similar to the South Puget Sound Fingerling stock, with about $60 \%$ of the catch and total mortalities in Puget

Sound, $20 \%$ in the WCVI troll fishery, and $7 \%$ in Strait of Georgia. A declining trend was also noted in the WCVI troll fishery.

Elwha Fingerling: This stock had a northerly distribution similar to Stillaguamish, with $25 \%-39 \%$ of the catch and total mortalities in the NBC and SEAK fisheries. Onethird of the catch and total mortalities occurred in Puget Sound, with the CBC net and troll and WCVI net and sport fisheries accounting for about $20 \%$.

Skagit: About $25 \%$ of the catch and total mortalities of this northern Puget Sound stock occurred in GS, the highest proportion among the Puget Sound stocks. A further $40 \%$ occurred in Puget Sound; the CBC net and troll and WCVI net and sport fisheries accounted for about $20 \%$.

Skookum: Over $50 \%$ of the catch and total mortalities of this stock occurred in GS, with a further $20 \%$ in Puget Sound. Less than $15 \%$ occurred in the WCVI and Juan de Fuca Strait fisheries.

Quilcene: Highly variable distribution patterns reflect the limited CWT recoveries for this stock. Puget Sound fisheries accounted for about $60 \%$ of the catch and total mortality. The distribution in Canadian fisheries was variable, but the largest proportions occurred in the WCVI troll and the Juan de Fuca net fisheries.

White River: About $85 \%$ of the catch and total mortalities of this stock occurred in Puget Sound, with largest proportion (70\%) in the sport fishery.

Quinault: This stock has a strong northward distribution, with $23 \%-25 \%$ of the catch and total mortalities in NCBC and $18 \%-21 \%$ in SEAK. Because this stock was managed for hatchery production, about $50 \%$ of the catch occurred in terminal net fisheries.

Queets: This stock has a northerly distribution similar to the Quinault stock; however, 2 differences were noted: (1) because this stock is managed for natural production, terminal net catch was less; and (2) because distributions are reported as proportions, the impact of ocean fisheries on the stock is higher.

Humptulips: This stock has a distribution similar to Quinault and Queets.
Cowlitz: About $40 \%$ of the catch and total mortalities for this stock occurred in the Columbia River sport and net fisheries. WA/OR, WCVI troll, and SEAK-NBC fisheries accounted for $15 \%-20 \%, 20 \%$, and $15 \%$, respectively. The proportion accounted for by NBC fisheries has declined since 1985.

Spring Creek: This stock has a distribution similar to Cowlitz, except the proportions accounted for by NBC and SEAK fisheries were lower. About $50 \%$ of the catch and total mortalities occurred in the Columbia River, $15 \%$ in the WA/OR fisheries, and $30 \%$ in the WCVI troll fishery. The 1987 distribution was anomalous due to poor survival of the 1984 brood. This brood would normally have produced the major age class in the 1987 catch; instead, the 1987 catch distribution was primarily from age 2 recoveries.

Bonneville: The percent of the catch and total mortalities in the WCVI troll fishery was higher for this stock (about $40 \%$ ) than for Spring Creek ( $30 \%$ ) or Cowlitz ( $20 \%$ ). The
percent accounted for by Columbia River fisheries was lower (less than $40 \%$ ) while the WA/OR fisheries was about the same (15\%).

Stayton Pond: Stayton Pond and Bonneville tules are the same stock. The Stayton Pond stock is reared and released on the Willamette River while the Bonneville stock is reared and released at Bonneville hatchery on the Columbia River. Distributions were similar, except the proportion of Stayton Pond tule accounted for by Columbia River fisheries was lower, perhaps reflecting a difference in vulnerability due to river location.

Upriver Bright: This stock has a northerly distribution, with about $50 \%$ of the catch and total mortalities occurring in the NBC and SEAK fisheries. Columbia River net and WCVI fisheries accounted for a further $30 \%$ and $10 \%-15 \%$, respectively. Two attributes were noted: (1) since 1985, Columbia River net catches have increased, causing a commensurate reduction in the catch proportion in NBC and SEAK; and (2) relative to other Columbia River stocks, this stock had a lower apparent vulnerability to the Columbia River sport fishery.

Lewis River: More than $50 \%$ of the catch and total mortalities of this stock occurred in the Columbia River, equally divided between sport and net fisheries. Otherwise, distributions were intermediate between the Upriver bright and lower river tule stocks, with about $15 \%$ in the WCVI troll fishery and $10 \%$ each in the NBC and SEAK fisheries.

Wells Hatchery: Distributions were similar to the Upriver bright stock, although the northerly distribution was less pronounced. More than $50 \%$ of the catch and total mortalities occurred in the Columbia River (primarily net), $10 \%$ in the WCVI troll, and $35 \%$ in NBC and SEAK combined. Two attributes were noted: (1) stock distribution was estimated from limited CWT recoveries in only 3 years; and (2) terminal fishery recovery patterns and broodstock history indicate that the Wells hatchery stock is no longer an appropriate indicator for Columbia River summer stock.

Willamette: NBC and SEAK fisheries each accounted for about $20 \%$ of the catch and total mortalities of this stock. A further $40 \%-45 \%$ and $15 \%$ of total mortalities was accounted for by Columbia River sport and net fisheries, respectively. Less than 10\% occurred in Washington/Oregon ocean and WCVI troll fisheries.

### 3.5 STOCK CONTRIBUTION INDICES

The results of the stock contribution index analysis are presented in Tables 3-12 through 3-16. Within a fishery, the data should be compared within stocks, not between stocks. Procedures for estimating terminal run size differ among stocks and contribution indices are, therefore, not directly comparable. In these tables, the Somass River contribution estimates are based on the expansion of fishery tag recoveries using mark rates from the terminal gillnet fishery, the terminal sport fishery, and the rack escapement. Therefore, the Somass River index estimates the relative production from the total Somass River system, including the Robertson Creek hatchery. The Robertson Creek index is based on the expansion of fishery tag recoveries from CWT mark rates at release from the hatchery. This is a minimum estimate of the relative hatchery production.

### 3.5.1 Southeast Alaska Troll

The 1989 stock contribution indices have declined from 1988 levels for 4 of the 5 contribution indicator stocks. The 1989 indices for the Upriver bright and Willamette stocks showed large decreases to near base period levels. The 1989 Robertson Creek Hatchery stock index is greater than recent years, but is still at one-half the base period level.

### 3.5.2 North/Central B.C. Troll

The 1989 contribution index declined for 4 stocks and increased for 3 stocks, relative to 1988. Only Upriver bright and Washington lower Columbia River tule indices for 1989 were above base period levels; however, both decreased from 1988. The 1989 Robertson Creek hatchery contribution index almost doubled from 1988, but was still below the base period level.

### 3.5.3 West Coast Vancouver Island Troll Fishery

All of the 1989 contribution indices decreased from 1988 levels. The Columbia River stocks all showed large decreases from 1988 to 1989 , and, with the exception of Upriver bright, all 1989 indices were below base period levels.

### 3.5.4 Strait of Georgia Sport and Troll

The 1989 contribution index in the sport fishery (for both stocks), increased over 1988 and over base period levels. The 1989 troll fishery index showed an increase in Big Qualicum contributions relative to 1988; however, the contribution index for both Big Qualicum and Quinsam was far below base period levels.

### 3.5.5 Washington/Oregon Sport and Troll

Compared to 1988 , the 1989 contribution indices declined for 3 stocks and increased for 2 stocks. The 1989 Washington lower Columbia River tule and Upriver bright contribution indices showed large declines from the 1988 level. Contribution indices for 1989 were above base period levels only for the Upriver bright and Washington lower Columbia River tule stocks.

Table 3-12 Stock contribution catches and indices for reported catches in the SEAK troll fishery, 1979-1989. Catch in thousand fish. The index provided is relative to the 1979-1982 average.

| Year | Upriver <br> Catch | Bright Index | $\begin{array}{r} \mathrm{Wi} \\ \text { Catch } \end{array}$ | mette | Wash. River Catch | Lower Tule Index | Somass Catch | River a/ Index | Robertson Hatchery Catch | Creek b/ Index |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  | . 18 | NA | NA | 52.6 | 0.75 |  | 0.45 |
| 79 | 35.1 | 1.26 | 1.0 | 0.18 | NA | NA | 52.6 | 0.75 | 12.9 | 0.45 |
| 80 | 29.5 | 1.06 | 9.9 | 1.82 | NA | NA | 66.2 | 0.95 | 33.7 | 1.18 |
| 81 | 36.3 | 1.31 | 6.4 | 1.17 | 5.0 | 1.23 | 61.0 | 0.87 | 30.8 | 1.08 |
| 82 | 10.1 | 0.36 | 4.5 | 0.83 | 3.1 | 0.77 | 99.6 | 1.43 | 36.9 | 1.29 |
| 83 | 26.6 | 0.96 | 9.9 | 1.82 | 6.4 | 1.57 | 107.4 | 1.54 | 43.7 | 1.53 |
| 84 | 60.7 | 2.18 | 5.6 | 1.03 | 3.4 | 0.84 | 76.7 | 1.10 | 33.7 | 1.18 |
| 85 | 51.6 | 1.86 | 12.0 | 2.20 | 3.4 | 0.84 | 29.2 | 0.42 | 11.3 | 0.40 |
| 86 | 48.2 | 1.74 | 6.5 | 1.19 | 0.9 | 0.22 | 10.6 | 0.15 | 6.1 | 0.22 |
| 87 | 107.3 | 3.86 | 20.6 | 3.77 | 10.9 | 2.70 | 9.1 | 0.13 | 5.6 | 0.20 |
| 88 | 66.4 | 2.39 | 15.4 | 2.82 | 5.9 | 1.47 | 20.2 | 0.29 | 10.3 | 0.36 |
| 89 | 32.8 | 1.18 | 5.2 | 0.95 | 4.8 | 1.18 | 16.7 | 0.24 | 15.5 | 0.54 |
| Average | 45.9 |  | 8.8 |  | 4.9 |  | 49.9 |  | 21.9 |  |

Table 3-13
Stock contribution catches and indices for reported catches in the NCBC troll fishery, 1979-1989. Catch in thousand fish. The index provided is relative to the 1979-1982 average

a/ Soms River estimate based the expansion fish
a/ Somass River estimate was 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 was based on the expansion of fishery tag recoveries using mark rates at hatchery release. It is a minimum estimate of the hatchery production only.
c/ The Quinsam/Campbell River contribution index was calculated using the 1984-89 average contribution.

Table 3-14 Stock contribution catches and indices for reported catches in the WCVI troll fishery, 1979-1989. Catch in thousand fish. The index provided is relative to the 1979-1982 average.

| Year | Upriver Catch =ニ==ニ= | Bright Index ====== | Willamette Catch Index |  |  | River a/ <br> Index | Robertson Creek Hatchery b/ Catch Index |  | eek |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  | ===== |
|  | 79 | 32.4 | 2.24 | 4.8 |  | 1.03 | 29.9 | 1.33 | 8.9 | 0.93 |
|  | 80 | 10.6 | 0.74 | 4.9 |  | 1.05 | 24.1 | 1.07 | 14.0 | 1.46 |
|  | 81 | 6.6 | 0.45 | 4.7 | 1.00 | 11.0 | 0.49 | 5.9 | 0.62 |
|  | 82 | 8.3 | 0.57 | 4.3 | 0.92 | 25.1 | 1.11 | 9.4 | 0.99 |
|  | 83 | 6.6 | 0.45 | 3.6 | 0.77 | 16.3 | 0.72 | 6.9 | 0.72 |
|  | 84 | 24.5 | 1.69 | 5.4 | 1.16 | 19.6 | 0.87 | 9.8 | 1.03 |
|  | 85 | 30.1 | 2.08 | 1.4 | 0.31 | 5.1 | 0.23 | 1.9 | 0.19 |
|  | 86 | 55.1 | 3.80 | 11.7 | 2.53 | 4.9 | 0.22 | 2.2 | 0.23 |
|  | 87 | 48.7 | 3.37 | 4.4 | 0.94 | 3.4 | 0.15 | 1.8 | 0.18 |
|  | 88 | 59.0 | 4.07 | 3.8 | 0.82 | 9.0 | 0.40 | 4.9 | 0.51 |
|  | 89 | 18.5 | 1.28 | 1.7 | 0.37 | 3.1 | 0.14 | 3.3 | 0.35 |
|  | Average | 27.3 |  | 4.6 |  | 13.8 |  | 6.3 |  |


| Year | Spring Creek Hatchery |  | Oregon lower c/ River Tule |  | Wash. lower River Tule |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Catch | Index | Catch | Index | Catch | Index |
| 79 | 91.6 | 1.27 | 74.8 | 1.18 | NA | NA |
| 80 | 78.6 | 1.09 | 49.8 | 0.79 | NA | NA |
| 81 | 59.5 | 0.83 | 60.5 | 0.95 | 13.4 | 1.01 |
| 82 | 58.1 | 0.81 | 69.1 | 1.09 | 13.2 | 0.99 |
| 83 | 25.1 | 0.35 | 42.8 | 0.67 | 23.9 | 1.80 |
| 84 | 32.8 | 0.46 | 65.4 | 1.03 | 24.7 | 1.86 |
| 85 | 10.1 | 0.14 | 37.5 | 0.59 | 14.2 | 1.07 |
| 86 | 6.3 | 0.09 | 21.8 | 0.34 | 24.7 | 1.85 |
| 87 | 1.7 | 0.02 | 147.9 | 2.33 | 31.5 | 2.37 |
| 88 | 10.9 | 0.15 | 83.5 | 1.31 | 58.1 | 4.37 |
| 89 | 4.0 | 0.06 | 7.8 | 0.12 | 10.1 | 0.76 |
| Average | 34.4 |  | 60.1 |  | 23.7 |  |

a/ Somass River estimate was 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 was based on the expansion of fishery tag recoveries using mark rates at hatchery release. It is a minimum estimate of the hatchery production only.
c/ The age structure for the terminal recovery data in 1980 was of poor quality. The average return age structure from CWT recoveries was used to assign the total terminal return to ages 2-5 in order to estimate the Terminal Return/CWT age specific ratio.

Stock contribution catches and indices for reported catches in the Strait of Georgia sport and troll fisheries, 1979-1989. Catch in thousand fish. The index provided is relative to the 1979-1982 average.


Strait of Georgia Sport

| $===========================================$ |  |  |
| ---: | ---: | ---: |
|  | Big Qualicum | Quinsam/Campbell |
| River | River a/ |  |

Year Catch Index Catch Index

| 79 | 6.3 | 0.76 | NA | NA |
| :---: | :---: | :---: | :---: | :---: |
| 80 | 10.9 | 1.33 | NA | NA |
| 81 | 14.0 | 1.71 | NA | NA |
| 82 | 1.6 | 0.20 | NA | NA |
| 83 | 3.1 | 0.37 | NA | NA |
| 84 | 19.0 | 2.32 | 1.1 | 0.79 |
| 85 | 12.3 | 1.51 | 0.8 | 0.56 |
| 86 | 20.3 | 2.47 | 1.8 | 1.30 |
| 87 | 5.8 | 0.71 | 1.0 | 0.71 |
| 88 | 3.9 | 0.48 | 1.1 | 0.78 |
| 89 | 8.4 | 1.02 | 2.6 | 1.86 |

Strait of Georgia Troll

| Year | Big Qualicum River |  | Quinsam/Campbel River a/ |  |
| :---: | :---: | :---: | :---: | :---: |
|  | Catch | Index | Catch | Index |
|  |  |  | === | ====3 |
| 79 | 7.0 | 1.48 | NA | NA |
| 80 | 5.0 | 1.03 | NA | NA |
| 81 | 5.0 | 1.15 | NA | NA |
| 82 | 2.0 | 0.33 | NA | NA |
| 83 | 2.0 | 0.53 | NA | NA |
| 84 | 5.0 | 1.03 | 0.1 | 2.94 |
| 85 | 1.0 | 0.14 | 0.0 | 0.00 |
| 86 | 4.0 | 0.95 | 0.0 | 0.95 |
| 87 | 0.0 | 0.09 | 0.1 | 1.09 |
| 88 | 0.0 | 0.05 | 0.1 | 1.01 |
| 89 | 1.0 | 0.12 | 0.0 | 0.00 |


| ========== |
| :---: |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |

Average $2.9 \quad 0.1$
===========================================
$=====================================$
a/ The contribution index was calculated using the 1984-1989 average contribution since data were insufficient during the base period.

Table 3-16 Stock contribution catches and indices for reported catches in the Washington/Oregon ocean sport and troll fisheries, 1979-1989. Catch in thousand fish. The index provided is relative to the 1979-1982 average.

a/ The age structure for the terminal recovery data in 1980 was of poor quality. The average return age structure from CWT recoveries was used to assign the total terminal return to ages $2-5$ in order to estimate the Terminal Return/CWT age specific ratio.

### 3.6 DISCUSSION AND SUMMARY

The exploitation rate analyses included in this report are based on CWT recoveries for 32 indicator stocks having usable time series of data. These stocks are referred to as the "exploitation rate indicator stocks." Analyses in this Chapter are specific to these stocks; the extrapolation of results to similar stocks and/or generalizations about fishery impacts will only be appropriate if these indicator stocks are representative of other stocks of interest.

### 3.6.1 Fishery Indices

The fishery index measures exploitation rate changes over time for indicator stocks harvested by a fishery. The index was developed to estimate changes in fishery harvest rates; however, the quality of the estimate is dependent on how representative the indicator stocks are of the actual populations harvested in the fishery.

For 1989, the initial 1985 target reductions for PSC ceilinged fisheries were achieved in the SEAK troll fishery, the NCBC troll fishery, and the WCVI troll fishery (Section 3.3). When 1985-1989 averages are considered, only the NCBC troll fishery met the 1985 target reduction. The 1985 target reduction for SEAK was achieved for reported catch, but not for the SEAK fishery when total mortality increased because of CNR regulations.

The NCBC troll fishery is the only fishery operating under a PSC ceiling which had a total mortality index below the 1985 target reduction. Reductions in exploitation rates have been more pronounced for the CBC troll fishery than the NBC troll fishery. This is likely due to significant shifts in fishing patterns (e.g. increased effort off the north and west coasts of the Queen Charlotte Islands in response to chinook abundance) and conservation actions for lower Strait of Georgia chinook caught in Queen Charlotte Sound. Analysis of historical CWT recoveries indicated that this stock was more abundant in that area than in other portions of the NCBC troll fishery. Accordingly, management actions have been implemented since 1988 to limit troll catch in the CBC waters immediately north of Vancouver Island.

On average, the target reduction for the WCVI troll fishery has not been met, partially due to the increased size limit in 1987. Historically, the WCVI troll fishery harvested primarily 3 year-old fish, but the size limit change increased both the incidental mortality on age 3 fish and fishery mortality on older-aged fish. Additionally, harvest rates on indicator stocks may have been maintained due to restructuring of the fishery to concentrate on fall stocks, and reduced abundance of key stocks that once contributed to this fishery (e.g. Spring Creek). The fishery index reduction observed in the 1989 WCVI troll fishery resulted from management actions taken to reduce the chinook catch to compensate for overages in previous years, and to slow the rate of coho catch. Actions taken included 2 fishery closures from July 14-19 and August 6-11, and smaller area closures to slow the catch rates.

Harvest rates in the combined GS sport and troll fishery continued, in 1989, to fail to meet the initial 1985 target reduction by a substantial margin. The average 1985-1989 reduction in the fishery index is slightly over half the 1985 target reduction. A reason for this is that the average reduction for the sport fishery index is estimated to be only $4 \%$ less than the base period and in 1989 is estimated to have increased to $28 \%$ above the base period. The troll fishery has, on average, achieved its target reduction. In addition, the short-term and longterm trends in survival indices for hatchery stocks, which are also assumed to be indicative of abundance trends for wild stocks, have decreased. The fishery index for this sport fishery indicates that management actions have not yet compensated for reduced stock abundance in this area.

The WA/OR fisheries have maintained, on average, exploitation rates below base period levels. Indices reported for 1987 and 1988 differ substantially from the indices reported in TCCHINOOK (89)-1. The 1987 index was reduced from 0.83 to 0.71 and the 1988 index was reduced from 1.01 to 0.65 . The reason for this is that CWT recoveries from the Washington Buoy 10 sport fishery were incorrectly identified as ocean sport fishery recoveries in the historical database. For 1986-1989, these recoveries are now indicated as terminal area fishery recoveries. Data for other years have not yet been corrected, but are not expected to significantly affect results.

### 3.6.2 Stock Specific Trends

Catch limits in ocean mixed-stock fisheries were intended to reduce exploitation rates on depressed natural stocks in order to increase spawning escapement and production of chinook. For these ceilings to be effective, however, it was assumed that: (1) incidental fishing mortalities would be minimized; (2) chinook abundance would remain at or above the 19791982 average level; and (3) the bulk of fish from depressed natural stocks which escaped ocean fisheries would be passed through to the spawning grounds. The stock specific analyses in this report were developed to monitor the response of stocks to the fishery ceilings and to evaluate these assumptions.

For 17 stocks, recent exploitation rates could be compared to base period levels (Section 3.4.2, Tables 3-7 and 3-8). Considering only changes greater than $2 \%$, the total exploitation rate has been reduced for only 7 of these 17 stocks while reductions in total mortalities by ocean fisheries have been observed for 14 of the 17 stocks. The Robertson Creek stock would also have shown a reduction ( $-3 \%$ ) if the 1983 brood year were excluded. Poor survival of the 1983 Robertson Creek brood resulted in very few tag recoveries and possible over-estimation of the exploitation rate. The median changes in total and ocean exploitation rates were $-0.5 \%$ and $7.5 \%$, respectively. Two points are notable in the brood year exploitation rate analysis:

1. For some Washington/Oregon indicator stocks, ocean exploitation has been reduced while total exploitation has not; in most cases, this is attributed to terminal fisheries targeting on hatchery stocks.
2. The portion of total mortality accounted for by incidental fishing mortality has increased for 10 of the 17 stocks evaluated.

The Committee emphasizes that to maintain reductions or further reduce brood year ocean exploitation rates under a fixed catch ceiling policy, the abundance of chinook in the fishing areas must equal of exceed recent abundances. However, both the survival rate assessment (Section 3.4.3) and the stock contribution estimates (Section 3.5) indicate reduced survival of recent brood years for many of the major contributing indicator stocks. Without reductions in harvest pressures, in ocean and/or terminal fisheries, the spawning escapements needed to maintain progress in the rebuilding program will not likely be attained.

Analyses in this chapter indicate that the above assumptions regarding incidental mortalities and abundance are not being met. Consequently, unless stock exploitation rates are further decreased, the present PSC ceiling management is probably inadequate to meet rebuilding goals for many of the natural chinook stocks.

The number of stocks included in this report have more than doubled compared to the 1988 report. The number of stocks was increased principally to improve the reliability of the exploitation rate evaluation and to examine the consistency of responses between stocks.

Unfortunately, the distribution of stocks both as to geographic location and stock-type is still not complete, particularly for Canadian spring and summer stocks and indicator stocks for the GS fisheries. We have begun, however, to examine the consistency of response within stock groups in Chapter 4.

## CHAPTER 4 INTEGRATION OF CTC ANALYSES

### 4.1 INTRODUCTION

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

Information is presented on the projected abundance of fish available to ceiling fisheries in 1990-1991. The abundance is presented relative to a long-term average and relative to 19851989. The abundance projections may be used to infer expected exploitation rates in each fishery and ultimately, upon the rate of rebuilding.

Status of rebuilding and factors which may be affecting progress toward rebuilding are summarized for 13 stock groups delineated by geographic proximity and similar catch distributions. Grouping stocks is advantageous in that: (1) the consistency of the response of stocks within the group may be evaluated; (2) data gaps within a particular stock may be filled from other stocks within the group; and (3) results are easier to present and summarize.

Data are summarized for the stock groups listed below:

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

If the rebuilding program were proceeding as planned, there would be a variety of responses we would expect to see in the stock groups. We would expect fishery indices and stock indices to have declined to below the 1985 target levels, brood year exploitation rates to have declined to near MSY levels, chinook abundance in fisheries to have increased, and most of the escapement indicator stocks to be in the upper status categories. It should be noted, however, that the stocks are not all equally benefitted by the PSC ceilings. Rebuilding of some groups (e.g. SEAK spring) relies heavily on reductions in exploitation by ceiling fisheries, since the majority of the fishing mortality occurs in these fisheries. Rebuilding of other groups (e.g. North Puget Sound summer/fall) is less dependent on reductions in ceiling fisheries, since substantial mortality occurs in non-ceiling fisheries. Such stock groups would be expected to respond more slowly to the rebuilding program.

### 4.2 METHODS

### 4.2.1 Model Estimates of Abundance and Short-Term Projections of Survival

The most recent calibration of the PSC chinook model was used to project the abundance of chinook salmon available to fisheries in 1990-1991. Abundance was estimated using the methods described in Notes on Index Development, provided by the AWG to the Chinook Work Group in November, 1989. An index of abundance was computed by expressing each annual abundance relative to the long-term (1979-1989) average.

Short-term projections of survival were compiled in a stock group by fishery matrix. The projected survival for a stock group was included for each fishery which accounted for at least $10 \%$ of the total mortality of the stock group.

### 4.2.2 Explanation of Summary Table

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

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

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

The stock status is followed by an index of the harvest rate in the terminal area relative to the 1979-1982 base period used in the Exploitation Rate Analysis. The annual terminal harvest rate estimates are converted to an index by dividing the observed harvest rate for each year by the average harvest rate during 1979-1982. These annual indices are then averaged for years with valid data during the 1985-1989 period. The terminal harvests reported Part $A$ of the summary tables have been excluded in the stock indices computed in Part $C$ of the summary tables.

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

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

The rebuilding predictions are dependent upon several assumptions used in the model run, including: (1) ceilings are fixed at the levels negotiated and are not exceeded from 1990-1998; (2) size limits are not changed after 1990; (3) season structure is not substantively changed from the base period; (4) chinook non-retention will occur after
ceilings are reached; and (5) stock productivity and marine survival are equal to the average of all available estimates for each model stock beginning with the 1979 brood.

The next column reports the adult equivalent exploitation rate (MSY ER) that is sustainable when spawning escapement is maintained at the established escapement goal for a stock. The MSY ER is computed using the following formulas. First, adult equivalent recruitment ( $\mathrm{R}_{\mathrm{o}}$ ) at optimum escapement is estimated as:

$$
R_{o}=O * S * \exp ^{\left(A *\left(1-\frac{O}{B}\right)\right)}
$$

where: $O=$ Optimum Escapement
A,B $=$ Ricker Stock Productivity Parameters
s = Average Productivity Adjustment Factor

The adult equivalent exploitation rate at the escapement goal (MSY ER) is then computed as:

$$
M S Y E R=1-\frac{O}{R_{o}}
$$

The estimates of the MSY ER are dependent upon the stock specific productivity estimate used in the chinook model. These estimates were derived using the following procedure:

1. Estimate the stock specific intrinsic rate of increase (Ricker A value) for a Ricker type stock/recruitment function. A procedure was developed for estimating the relative stock productivity using available information on harvest rates and trends in abundance (CTC-AWG Model Documentation 1989). This approach uses the following key assumptions:
a. harvest rates (as estimated from CWT recovery data on the stock group of interest) were constant during the base period and the four years prior to the base period;
b. escapement is estimated in a consistent manner and without bias; and
c. the escapement goals supplied by the agencies are optimum goals and are expressed in units consistent with spawning escapement estimates.
2. During the calibration phase of the model, the productivity function is adjusted (by brood year) by fitting observed stock abundance data. This provides a time series of correction factors for the initial productivity estimate and incorporates variations in year to year survival.

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

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

Part B - Distribution of Total Mortality and Fishery Impacts. This section of the summary tables presents additional results from the Exploitation Rate Analysis including the distribution of total fishing mortality, the stock index, and the fishery index.

The total fishing mortality distribution and stock index data presented in the summary tables differ from that given in Sections 3.4 .1 and 3.4.4. Terminal catches are not included in instances when the exploitation rate indicator stock (generally a hatchery stock) was subject to terminal fisheries from which the associated natural stock was exempt. Fisheries excluded from total fishing mortality distribution and stock index data are identified below:

| Stock(s) | Excluded Fishery(les) |
| :---: | :---: |
| Robertson Creek | Mortality distribution and Canada non-ceiling stock index data do not include WCVI net and WCVI sport fisheries |
| Samish, George Adams, South Puget Sound Fingerling | Mortality distribution and U.S. non-ceiling stock index data do not include Puget Sound terminal net fisheries |
| Quinault, Queets, Humptulips | Mortality distribution and U.S. non-ceiling stock index data do not include Washington coastal net fisheries |
| Columbia River Upriver Bright, Lewis River, Wells Hatchery | Mortality distribution and U.S. non-ceiling stock index data do not include Columbia River net and sport fisheries |

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

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

Distribution of Total Fishing Mortality. The first row reports the 1985-1989 average distribution of total fishing mortality (in adult equivalents) for the exploitation rate indicator stocks. The left half of the row shows the total fishing mortality distribution among fisheries operating under PSC ceilings and non-ceiling fisheries, while the right half shows the distribution of total fishing mortality among the ceiling fisheries.

Stock Index. The remaining rows of this section compare observed and 1985 target reductions for the stock index and the fishery index. The 1985-1989 average observed stock index represents the average of the indices for the exploitation rate indicator stocks as presented in Section 3.4 .1 with the exception that terminal fisheries have been excluded in some cases (see Section 4.1).

The index is presented for the following categories:

| All Ceiling | all fisheries operating under PSC catch ceilings; |
| :--- | :--- |
| Canada Non-ceiling | all Canadian fisheries which do not operate under PSC catch <br> ceilings, except for excluded terminal fisheries; |
| US Non-ceiling | all U.S. fisheries which do not operate under PSC catch <br> ceilings, except for excluded terminal fisheries. |

The 1985 target reduction for the ceiling component of the stock index is similar in concept to the 1985 target reduction used to evaluate the fishery index for the ceiling fisheries. In the case of the stock index, however, the target reductions for each ceiling fishery are weighted by the distribution of total fishing mortality to obtain a composite target reduction for the stock. The 1979 brood cohort size and the base period exploitation rates used in the chinook model are used to compute the target stock index according to the following formula:

$$
\frac{\sum_{i=1}^{f} \sum_{j=1}^{a} C_{f} A_{j} \mu_{i j}\left(1-P N V_{i j}\right) R_{i}+\sum_{i=1}^{f} \sum_{j-4}^{5} T_{j} \mu_{i j}\left(1-P N V_{i j}\right) R_{i}}{\sum_{i=1}^{f} \sum_{j=1}^{a} C_{j} A_{j} \mu_{i j}\left(1-P N V_{i j}\right)+\sum_{i=1}^{f} \sum_{j=4}^{5} T_{j} \mu_{i j}\left(1-P N V_{i j}\right)}
$$

where: $f=$ number of fisheries operating under PSC ceiling
$a=$ maximim age ( 5 for sport, troll fisheries, 3 for net fisheries)
$C_{j}=$ cohort size of age $j$ fish
$A_{j}=$ adult equivalence factor for age $j$ fish
$\mu_{i j}=$ base period exploitation rate for age $j$ fish in fishery $i$
$P N V_{i j}=$ proportion of age $j$ fish that is not vulnerable in fishery $i$
$R_{i}=$ catch ceiling as a proportion of the base period catch
$T_{j}=$ terminal run size of age $j$ fish

The 1985 target reductions are then averaged across the PSC model stocks associated with each stock group.

Where reported, target reductions for non-ceiling fisheries in Canada refer to the $25 \%$ reduction expected for net fisheries.

Fishery Index. The 1985-1989 average observed fishery index is compared to the 1985 target fishery index for a subset of gear types within the PSC ceiling fisheries. Values in this portion of the summary tables are extracted from Table 3-6.

Part C-Survival and Escapement Relative to Long Term Averages. This part of the summary table presents data comparing indices of survival and escapement for three time periods: the base period, the rebuilding period, and the projected period.

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

| TMMe. Period | SEAK | Quinsam | All Other Stocks |
| :---: | :---: | :---: | :---: |
| Base | 1978 | 1976-1980 | 1976-1979 |
| Rebuilding | 1981-1984 | 1982-1984 | 1982-1985 |
| Projected | 1985-1986 | 1985-1987 | 1986-1987 |

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

Survival. Survival indices are based upon CWT recovery data for exploitation rate indicator stocks and computed using the methods discussed in Section 3.1.1. The indices are presented to provide an indication of changes in survival of associated exploitation rate indicator stocks relative to a long-term average.

The survival index for each brood year is computed as follows:

$$
\text { Index }_{b y}=\frac{\sum_{i=2}^{n} \frac{\text { Surv }_{i}}{\text { AvgSurv }_{i}}}{(n-1)}
$$

where: Index by $=$ survival index for broodyear by
Surv $_{i}=$ survival of age $i$ fish
AvgSurv ${ }_{i}=$ average survival of age $i$ fish using all years of available data, provided that at least 7 valid years of survival estimates are available
$n=3$ if survival estimates are available for ocean age 2 and ocean age 3 fish for the brood; 2 if a survival estimate is available only for age 2 fish of the brood

The average brood year index (BYIndexAvg) is the average of survival indices for each brood year.

The projected index is the average of indices computed for the brood years that are expected to complete their life cycles in the years 1990-1991. The formula used to compute the survival index for the three periods described above is:

$$
\begin{aligned}
\text { SurvIndex }_{p} & =\frac{100}{\text { BYIndexAvg }} * \frac{\sum_{\text {by-first }}^{\text {last }} \text { Index }_{\text {by }}}{\text { last }- \text { first }+1}-100 \\
\text { where: } \text { SurvIndex } & =\text { Survival Index for period } p \\
\text { BYIndexAvg } & =\text { Average of Index } \text { by for all available years } \\
\text { first } & =\text { first broodyear for period } p \\
\text { last } & =\text { last broodyear for period } p
\end{aligned}
$$

Escapement. Escapement indices for escapement indicator stocks are provided for the purposes of summarizing changes in relative spawning escapement levels and potential changes in natural stock production resulting from those spawning escapements. Indices are presented for two time periods: (1) prior to the rebuilding period (1979-1982); and (2) the rebuilding period (1985-1989).

For each year, an index (AnnualIndex) is computed as the ratio between the observed escapement and the long-term (1979-1989, for years with usable escapement data) average. The escapement index is then computed as:

$$
\begin{aligned}
& \text { EscIndex }_{p}=100 * \frac{\sum_{y \text {-first }}^{\text {last }} \text { AnnualIndex }}{y} \\
& \text { last-first }+1
\end{aligned} 100
$$

### 4.3 STOCK ABUNDANCE

### 4.3.1 Model Projections of Stock Abundance by Fishery

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

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

| Time Peniod | SUAK. | NeBC | wevi | GS |
| :---: | :---: | :---: | :---: | :---: |
| 1985-1989 | 1.27 | 1.01 | 0.90 | 0.55 |
| 1990-1991 | 1.37 | 1.04 | 0.72 | 0.50 |

The abundance of chinook available to the SEAK troll fishery and NCBC troll fisheries are projected to increase $8 \%$ and $3 \%$, respectively, in 1990 and 1991 relative to the rebuilding period.

The abundance of chinook available to the WCVI troll fishery is projected to decline by $20 \%$ in 1990-1991 relative to the rebuilding period and by $28 \%$ relative to the long-term average. This is primarily the result of substantial reductions in the abundance of Columbia River tule stocks.

During the rebuilding period, the abundance of chinook available to the GS fisheries was $45 \%$ below the long-term average. Relative to 1985-1989, the abundance of chinook available to the GS fisheries in 1990-1991 is projected to decline by an additional $8 \%$.

### 4.3.2 Short-Term Survival Projections

Projected survivals of major stock groups indicate that abundance in fisheries operating under PSC ceilings can be expected to decline in the short term. Table 4-2 summarizes these projections for PSC ceiling fisheries that account for at least $10 \%$ of a stock group's total fishing mortality. For the SEAK and NCBC fisheries, only the survival of the WCVI fall stock is indicated to be above average, while survival of the 3 other stock groups are well below average. All 4 stock groups for the WCVI and GS fisheries indicate survival projections below the long-term average; in addition, survival of Columbia River tule hatchery stocks is projected to be below average for all except Spring Creek production.

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

In general, the current calibration of the chinook model estimates the survival of the 1986 and prior broods using observed abundance data. (Note: fitting of the 1986 brood year to observed or predicted stock abundance data was done for the most Columbia River stocks, most Puget Sound Sound stocks, and the WCVI and the Lowere Fraser stocks. For the remaining stocks, fitting is done only up to the 1985 brood year.) Average survival is used for allsucceeeding brood years. The Exploitation Rate Analysis provides actual estimates of survival for the 1986 and 1987 brood years. Since these estimates are usually less than the long-term average, the chinook model estimates of the abundance of chinook available to each fishery may be optimistic.

Table 4-2. Short-term survival projections of stock groups to fisheries operating under PSC ceilings.

| Stock Group | SEAK | NCBC | WCy | Gs |
| :---: | :---: | :---: | :---: | :---: |
| S.E. Alaska Spring | -75\% |  |  |  |
| WCVI Fall | +14\% | +14\% |  |  |
| Upper Strait of Georgia Summer/Fall | -55\% | -55\% |  |  |
| Lower Strait of Georgia Fall |  | -76\% |  | -76\% |
| Lower Fraser (Harrison) Fall |  |  | -22\% | -22\% |
| North Puget Sound Summer/Fall |  |  | -23\% | -23\% |
| South Puget Sound Summer/Fall |  |  | -47\% | -47\% |
| Washington Coastal <br> Spring/Summer/Fall, Columbia River Summer/Fall, and Oregon Coastal Fall North Migrating | -44\% | -44\% | -44\% |  |

### 4.4 RESULTS BY STOCK GROUP

### 4.4.1 Southeast Alaska Spring

Synopsis. The overall rebuilding assessment for this Alaska spring chinook stock group shows mixed results. The escapement analysis shows that 4 of the 7 wild indicator stocks are at least Probably Rebuilding, while the remaining 3 are Indeterminate. Brood-year exploitation rates and the fishery index for the primary fishery on this stock group have been reduced almost to the target levels. However, survival predictions for the next few brood-years of hatchery returns are very low, suggesting reduced returns in the next few years. The PSC chinook model prediction of rebuilding is optimistic and does not account for recent reductions in survival.
A. Analysis of Escapement, Terminal Harvest Rates, and Brood Exploitation Rates

| Escapement Analysis |  |  | PSC Chinook Model |  |  | Exploitation Rate Analysis |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Indicator |  | $1985-89$ <br> Terminal | Indicator | ir Rebuilt or | MSY | Indicator | Brood Exp Ocean | oita | ion |
| Stocks | Status | HR Index | Stocks | $\%$ in 1998 | ER | Stocks | Base 81-84 | Base | 81-84 |
| Andrew Creek | Rebuilding | NA | Alaska South SE | 1990 | 0.55 | Alaska | $0.56 \quad 0.50$ | 0.57 | 0.53 |
| Keta | Rebuilding | NA |  |  |  |  |  |  |  |
| King Salmon | Prob Rebuild | NA |  |  |  |  |  |  |  |
| Chickamin | Prob Rebuild | NA |  |  |  |  |  |  |  |
| Chilkat | Indeterminate | NA |  |  |  |  |  |  |  |
| Unuk | Indeterminate | NA |  |  |  |  |  |  |  |
| Blossom | Indeterminate | NA |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |

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

|  | Major Fishery Categories |  |  | Ceiling Fisheries |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | All <br> Ceiling | Canada Non-Ceiling | $\begin{gathered} \text { US } \\ \text { Non-Ceiling } \\ \hline \end{gathered}$ |  |  |  |  |
|  |  |  |  | SEAK | NCBC | WCVI | GS |
| 1985-89 Average AEQ |  |  |  |  |  |  |  |
| Total Mortality Distribution | 99.2\% | 0.8\% | 0.0\% | 96.5\% | 2.6\% | 0.0\% | 0.0\% |
|  | Stock | Index (\% Chang | from Base) | Fishery Index | (\% Ch | ge from | Base) |
| 1985-89 Observed Index (Age 4) | 17\% | NA | NA | -18\% | -28\% | -18\% | -20\% |
| (Age 5) | -31\% | NA | NA |  |  |  |  |
| 1985 Target Index | -22\% | -25\% | NA | -22\% | -16\% | -24\% | -47\% |

## C. Index (\% Change from Long-Term Average)

|  | Survival | Escapement |  |
| :--- | ---: | ---: | :---: |
| Base Period: | $-69 \%$ | $-39 \%$ |  |
| Rebuilding Period: | $41 \%$ | $26 \%$ |  |
| Projected Period: | $-75 \%$ | NA |  |

Comments. This stock group represents coastal stocks of Southeast Alaska south of Yakutat and is primarily harvested by Alaskan fisheries, which have a collective ceiling. The rebuilding assessment of the 7 escapement indicator wild stocks in this group indicates that

2 are Rebuilding, 2 are Probably Rebuilding, and 3 are Indeterminate. Of these, 3 have met their escapement goals in at least 4 out of the last 5 years. Rebuilding status does not appear to be related to the size of the stocks. All of these stocks with the exception of King Salmon have escapements on the order of a thousand fish per year. King Salmon has escapements of a couple hundred. Only minor terminal harvest occur on these stocks, so no terminal run size or terminal harvest rates are estimated.

The PSC chinook model predicts rebuilding of this stock group by 1990. This may appear optimistic based on other information about the stocks; however, the combined escapements have been relatively high ( 78 to $114 \%$ ) in relation to the combined escapement goal during the last 4 years. As the model only looks at production of the stock group as a whole, escapements greater than the goal for some stocks within the composite model stock mask under-escapements in other stocks. The model estimates an exploitation rate of 0.55 to obtain MSY. The Exploitation Rate Analysis shows that this rate has been achieved for the hatchery indicator stocks for brood-years harvested during the rebuilding period.

The Exploitation Rate Analysis shows a decline in the fishery index of SEAK ceiling fisheries which is consistent with the decline in brood-year exploitation rates estimated for this group. The stock index for the Alaska group was calculated separately for age 4 and 5 fish since data from the 1979-1982 base period were not available. The age classes showed reverse trends for the stock index. The age 4 fish showed an increase relative to the 19821984 base period while the age 5 fish showed a decrease relative to the 1983-1984 base period. This reduction in the exploitation of older fish may be a result of the spring closures of the SEAK troll fishery in recent years. Maturing age 5 fish tend to return to terminal areas earlier in the year than maturing age 4 fish and, therefore, may experience less harvest pressure.

Both survival of hatchery stocks and escapement levels for wild stocks were higher during the rebuilding period (brood years 1981-1984, escapement years 1984-1989) compared to the long-term average. Projected survival based on hatchery survivals is $75 \%$ below the longterm average, suggesting that escapements in 1990 to 1993 may be low. If these low level escapements materialize for the wild stocks, then the rebuilding prognosis for Alaska stocks by 1995 will be poor.

### 4.4.2 Transboundary and Situk Spring

Synopsis. Only 1 of the 4 stocks within this stock group was assessed as Rebuilding. Reasons for the generally poor response of these stocks to conservation actions cannot be determined since there are no data available to use in the chinook model or the Exploitation Rate Analysis.
A. Analysis of Escapement, Terminal Harvest Rates, and Brood Exploitation Rates

| Escapement Analysis |  |  | PSC Chinook Model |  |  | Exploitation Rate Analysis |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Indicator |  | $1985-89$ <br> Terminal | Indicator | Yr Rebuilt or | MSY |  | Brood E Ocean | oitation Total |
| Stocks | Status | HR Index | Stocks | $\% \text { in } 1998$ | $\begin{array}{r} \text { MSY } \\ \text { ER } \\ \hline \end{array}$ | Stocks | $\frac{\text { Ocean }}{\text { Base } 85-89}$ | Base 85-89 |
| Stikine | Rebuilding | 1.69 | None |  |  | None |  |  |
| Taku | Indeterminate | 2.62 |  |  |  |  |  |  |
| Situk | Prob Not Reb | 0.47 |  |  |  |  |  |  |
| Alsek | Prob Not Reb | 0.59 |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |

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

|  | Major Fishery Categories |  |  |  | Ceiling Fisheries |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | All Ceiling | CanadaNon-Ceiling |  |  |  |  |  |  |
|  |  |  |  | SEAK | NCBC | WCVI | GS |
| 1985-89 Average AEQ |  |  |  |  |  |  |  |  |
| Total Mortality Distribution | NA |  | NA |  | NA | NA | NA | NA | NA |
|  | Stock | Index (\% | Chang | from Base) | Fishery Index | (\% Ch | ge from | Base) |
| 1985-89 Observed Index | NA |  | NA | NA | -18\% | -28\% | -18\% | -20\% |
| 1985 Target Index | NA |  | NA | NA | -22\% | -16\% | -24\% | -47\% |

## C. Index (\% Change from Long-Term Average)

|  | Survival | Escapement |
| :--- | :---: | :---: |
| Base Period: | NA | $3 \%$ |
| Rebuilding Period: | NA | $10 \%$ |
| Projected Period: | NA | NA |

Comments. None of the stocks within this stock group is represented in either the PSC chinook model or the Exploitation Rate Analysis due to the lack of tagging data. It is unfortunate not to have data from the Stikine and the Taku since they are major producers of chinook salmon in SEAK.

The stocks in this group actually represent two distributions. The Alsek and Situk are situated near Yakutat, north of the SEAK archipelago. These stocks are probably not impacted by the SEAK troll fishery and, therefore, are not expected to rebuild based on conservation actions in that fishery. The Stikine and Taku stocks spawn far inland on these transboundary rivers and pass through SEAK waters earlier than the SEAK spring group. The spring closure of the Alaska troll fishery should have a positive effect on the rebuilding of these stocks. Although the Stikine is classified as Rebuilding and the Taku as

Indeterminate, annual returns of both of these stocks have been variable since the initiation of the SEAK rebuilding program in 1980, with no evidence of an increasing trend over the long-term.

Despite increases in terminal harvest rates of the Stikine and Taku stocks in recent years, terminal harvests are generally less than 5 and $10 \%$ of the terminal runs, respectively. The terminal fishery harvest rates on both the Alsek and Situk stocks have been reduced during the rebuilding period; however, escapements have continued to lag behind expectations. The increase in escapement relative to the long-term average recorded for this stock group is due to the increased escapements in the Stikine which will mask declines in other stocks during the same time period.

### 4.4.3 North/Central B.C. Spring/Summer

Synopsis. Stocks in this group have displayed an inconsistent response to the rebuilding program. Overall, the earlier run timing components of the stock group are showing a positive response to the rebuilding program; concern remains for the 4 spring/summer stocks in CBC. The NCBC stocks are primarily harvested in SEAK and NCBC fisheries. However, they are not represented by exploitation indicator stocks so a direct determination of fishing impacts cannot be made.
A. Analysis of Escapement, Terminal Harvest Rates, and Brood Exploitation Rates Rate Analyses

Escapement Analysis PSC Chinook Model Exploitation Rate Analysis

| Indicator Stocks | Status | 1985-89 Terminal HR Index |  Yr Rebuilt <br> Indicator or <br> Stocks $\%$ in 1998 |  | $\begin{array}{r} \text { MSY } \\ \text { ER } \\ \hline \end{array}$ | Indicator Stocks | Brood Exploitation |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  |  | $\frac{\text { Ocean }}{\text { Base } 85-89}$ |  | $\frac{\text { Total }}{\text { Base } 85-89}$ |
| Yakoun | Rebuilding | NA | North/Cent BC | 1986 |  | 0.59 | None |  |  |
| Skeena | Rebuilding | 0.72 |  |  |  |  |  |  |
| Nass | Prob Rebuild | 1.41 |  |  |  |  |  |  |
| Rivers Inlet | Indeterminate | NA |  |  |  |  |  |  |
| Area 8 Index | Prob Not Reb | NA |  |  |  |  |  |  |
| Area 6 Index | Prob Not Reb | NA |  |  |  |  |  |  |
| Smith Inlet | Prob Not Reb | NA |  |  |  |  |  |  |

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

|  | Major Fishery Categories |  |  | Ceiling Fisheries |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | All Ceiling | $\begin{gathered} \text { Canada } \\ \text { Non-Ceiling } \end{gathered}$ | $\begin{gathered} \text { US } \\ \text { Non-Ceiling } \end{gathered}$ |  |  |  |  |
|  |  |  |  | SEAK | NCBC | WCVI | GS |
| 1985-89 Average AEQ |  |  |  |  |  |  |  |
| Total Mortality Distribution | 95.7\% | 4.3\% | 0.0\% | 54.2\% | 40.6\% | 0.5\% | 0.4\% |
|  | Stock Ind | (\% Change | from Base) | Fishery Index | x (\% Chan | ge from | Base) |
| 1985-89 Observed Index | NA | NA | NA | -18\% | -28\% | -18\% | -20\% |
| 1985 Target Index | -20\% | -25\% | NA | -22\% | -16\% | -24\% | -47\% |

## C. Index (\% Change from Long-Term Average)

|  | Survival | 'Escapement |
| :--- | :---: | :---: |
| Base Period: | NA | $-12 \%$ |
| Rebuilding Period: | NA | $16 \%$ |
| Projected Period: | NA | NA |

Comments. Of the 7 escapement indicator stocks in this group, 3 are classified in the top two rebuilding categories, one is Indeterminate, and 3 are Probably Not Rebuilding. Terminal harvest indices are presently available for only 2 stocks. Future assessments will incorporate terminal catch information for other where available.

Because no exploitation indicator stocks are available for this stock group, it is difficult to draw conclusions regarding causes for the variable status of rebuilding. The distribution of stock mortality, estimated from the chinook model for this group, indicates that most mortality occurs in the SEAK and NCBC fisheries.

These stocks may have benefitted from the shift in effort in both the SEAK and NCBC fisheries to more outside waters. Tag recoveries from some Central Coast hatcheries have been largely concentrated in the inside waters of SEAK; this may result in a lowering of exploitation on these stocks.

### 4.4.4 WCVI Fall

Synopsis. This stock group is classified as Indeterminate, but is predicted to be within 9 percent of the goal by 1998 if stock productivity remains near the long-term average. Current projections are for survival to be somewhat higher than the long-term average for the 1986-1987 broods. This is the only stock group for which survival is projected to be above the long-term average.
A. Analysis of Escapement, Terminal Harvest Rates, and Brood Exploitation Rates

Escapement Analysis PSC Chinook Model Exploitation Rate Analysis

| Indicator Stocks | $\begin{array}{r} \text { 1985-89 } \\ \text { Terminal } \end{array}$ |  | Yr Rebuilt |  |  | Indicator | Brood Exploitation |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  | Indicator Stocks | $\begin{gathered} \text { or } \\ \% \\ \text { in } 1998 \\ \hline \end{gathered}$ | $\begin{array}{r} \text { MSY } \\ \text { ER } \end{array}$ | Indicator Stocks | $\frac{\text { Ocean }}{\text { Base } 82-85}$ | Base | $\frac{82-85}{}$ |
| WCVI | Indetermina | NA | WCVI wild | 91\% | 0.66 | Robertson Cr | $0.66 \quad 0.63$ | NR | NR |

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

|  | Major Fishery Categories |  |  | Ceiling Fisheries |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | All <br> Ceiling | Canada Non-Ceiling | $\begin{gathered} \text { US } \\ \text { Non-Ceiling } \\ \hline \end{gathered}$ |  |  |  |  |
|  |  |  |  | SEAK | NCBC | WCVI | GS |
| 1985-89 Average AEQ |  |  |  |  |  |  |  |
| Total Mortality Distribution | 95.3\% | 3.2\% | 1.6\% | 56.8\% | 31.6\% | 5.8\% | 1.1\% |
|  | Stock I | ndex (\% Chang | from Base) | Fishery Ind | x (\% ch | ge from | Base) |
| 1985-89 Observed Index | 0\% | -24\% | NA | -18\% | -28\% | - 18\% | -20\% |
| 1985 Target Index | -20\% | -25\% | NA | -22\% | -16\% | -24\% | -47\% |

## C. Index (\% Change from Long-Term Average)

|  | Survival | Escapement |
| :--- | :---: | :---: |
| Base Period: | $33 \%$ | $6 \%$ |
| Rebuilding Period: | $-57 \%$ | $0 \%$ |
| Projected Period: | $14 \%$ | NA |

Comments. Uncertainty exists in the rebuilding assessment for this stock group since the effect of small-scale enhancement on many of the streams used in calculating the escapement index is unknown. No terminal harvest rate data are available for this stock group (terminal harvests are believed to be minimal) and total exploitation is not reported because the associated exploitation indicator stock (Robertson Creek) is a hatchery stock with a large terminal fishery.

The brood year ocean exploitation rate for this stock group showed a slight decline from base period levels, and was close to the MSY level. When calculating the ocean exploitation rate for this stock group, the 1983 brood was eliminated due to very poor survival and possible bias in the estimation of incidental mortalities in this brood year.

The two fisheries that heavily impact the stock group (SEAK and NCBC) show substantial reductions in the fishery index from the base period. Stock indices calculated for age 3 and 4 fish both show declines from the base period. However, due to the large increase in exploitation of age 5 fish, the stock index over all ages did not decrease (a $20 \%$ decrease was expected). Differential exploitation patterns among the age classes of this stock suggest that concentrations of maturing fall-run fish may be heavily impacted by the intensity of the short summer fishery. As noted for the North/Central B.C. stock group, there has been a general shift in effort for the SEAK and NCBC troll fisheries to more outside waters. Tag recoveries for this stock group tend to be concentrated in outside waters and this may partially explain why the reductions in exploitation rates on this stock are minimal, in spite of substantial overall reductions in harvest rates in these fisheries.

Although survival of this stock group was very low during the rebuilding period, projected survival is above the long-term average. This is the only stock group for which short-term increases in survival are projected.

### 4.4.5 Upper Strait of Georgia Summer/Fall

Synopsis. The Upper Strait of Georgia escapement indicator stock is classified as
Indeterminate. Exploitation rates on the stock have been significantly reduced and are now below the estimated MSY ER. Survival during the rebuilding period was near average, but is projected to decline substantially in broods contributing to escapement in 1990-1991. The reduction in survival could slow the rate of rebuilding.

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



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



## C. Index (\% Change from Long-Term Average)

|  | Survival | Escapement |
| :--- | :---: | :---: |
| Base Period: | $6 \%$ | $-31 \%$ |
| Rebuilding Period: | $10 \%$ | $19 \%$ |
| Projected Period: | $-55 \%$ | NA |

Comments. The CTC considered changing the classification of this stock from Indeterminate to Probably Rebuilding, but decided against the change due to uncertainties in recent escapement estimates. The chinook model projections are obviously optimistic since the stock was not rebuilt in 1989. The model projection reflects the higher survival of this stock in the rebuilding period, and high stock productivity is indicated by the atypically high MSY ER.

No terminal harvest rate data are available, but terminal harvests are minimal. There have been substantial decreases in both ocean and total brood year exploitation rates on the associated exploitation indicator stock. In addition, the stock index for ceiling fisheries has averaged below the 1985 target level. The stock index for Canadian non-ceiling fisheries
has achieved target levels. This stock group appears to have benefitted from higher than average survival during the rebuilding period. However, a large downturn in survival is projected and is cause for concern.

Catch and effort in both the SEAK and the NCBC troll fisheries have generally shifted to more northern and outside areas. The observed difference in response between this stock group and the WCVI stock group may reflect differences in ocean distribution of these stock groups within the two northern fisheries.

### 4.4.6 Lower Strait of Georgia Fall

Synopsis. Rebuilding of this stock group is being limited by poor survival and by exploitation rates above the 1985 target levels in fisheries managed under PSC ceilings. Brood year exploitation rates remain substantially above the estimated MSYER. In view of this projected poor survival and the continued high exploitation in GS fisheries, it seems unlikely that this stock group will rebuild by 1998 without additional management action.

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

Escapement Analysis PSC Chinook Model Exploitation Rate Analysis

| Indicator | Status1985-89TerminalHR Index |  | Indicator | $\begin{aligned} & \text { Yr Rebuitt } \\ & \text { or } \end{aligned}$ | MSY | Indicator |  | Brood Exploitation |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Stocks |  |  | Stocks | \% in 1998 | ER | Stocks |  | Base 82-85 | Base | 82-85 |
| Lower Geor St | Prob Not Reb | 2.12 | Lower Geor St | 86\% | 0.62 | Big Qualicum Capilano |  | $\begin{array}{ll} 0.80 & 0.72 \end{array}$ | 0.83 | 0.75 |

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

|  | Major Fishery Categories |  |  | Ceiling Fisheries |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $\begin{array}{r} \text { All } \\ \text { Ceiling } \end{array}$ | $\begin{array}{r} \text { Canada } \\ \text { Non-Ceiling } \\ \hline \end{array}$ | $\begin{gathered} \text { US } \\ \text { Non-Ceiling } \\ \hline \end{gathered}$ |  |  |  |  |
|  |  |  |  | SEAK | NCBC | WCVI | GS |
| 1985-89 Average AEQ |  |  |  |  |  |  |  |
| Total Mortality Distribution | 85.8\% | 11.5\% | 2.7\% | 8.6\% | 24.9\% | 3.7\% | 48.7\% |
|  | Stock | Index (\% Chang | ge from Base) | Fishery Ind | (\% C | nge from | Base) |
| 1985-89 Observed Index | -13\% | -38\% | NA | -18\% | -28\% | -18\% | -20\% |
| 1985 Target Index | -41\% | -25\% | NA | -22\% | - 16\% | -24\% | -47\% |

C. Index (\% Change from Long-Term Average)

|  | Survival | Escapement |
| :--- | :---: | :---: |
| Base Period: | $43 \%$ | $38 \%$ |
| Rebuilding Period: | $-81 \%$ | $-40 \%$ |
| Projected Period: | $-76 \%$ | NA |

Comments. High brood exploitation rates continue to limit rebuilding as assessed by the escapement analysis. Consistent with this assessment, the chinook model predicts this group will not complete rebuilding by the 1998 target date.

Exploitation on this stock group has not been reduced to the 1985 target levels. This stock group is harvested primarily in the GS sport and troll fisheries. The fishery index for the GS ceiling fisheries indicates that less than $50 \%$ of the target reduction in the combined fishery harvest rate has been achieved. The stock index for ceiling fisheries has declined, but has also averaged above the 1985 target level. The stock index for Canada non-ceiling fisheries (mainly Johnstone Strait net for this stock) has declined beyond the $25 \%$ reduction
target and may have achieved the additional reduction (another $20 \%$ from 1987 levels) imposed by the lower Strait of Georgia rebuilding program. Terminal harvest has increased, but is a small portion of the total harvest on this stock group and includes recent increases in brood stock removed from natural spawning populations for enhancement. Increased enhancement was expected to reduce exploitation rates by buffering natural stock harvest and increasing returns to natural spawning escapement.

Survival rates have been substantially less than the long-term average and that assumed during design of the rebuilding program. Survival is projected to remain poor for broods contributing to escapement in 1990-1991.

### 4.4.7 Upper Fraser Spring/Summer

Synopsis. All stocks within this group are classified as Probably Rebuilding. The good progress toward rebuilding that this stock group has achieved likely results from: (1) reductions in the exploitation rates in the SEAK and NCBC fisheries; (2) reductions in terminal harvest rates; and (3) changes in management regimes that have benefitted spring and summer stocks.
A. Analysis of Escapement, Terminal Harvest Rates, and Brood Exploitation Rates

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

|  | Major Fishery Categories |  |  |  | Ceiling FisheriesSEAK NCBC WCVI |  |  | GS |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | All Ceiling | Non- | Canada Ceiling | $\begin{gathered} \text { US } \\ \text { Non-Ceiling } \end{gathered}$ |  |  |  |  |
| 1985-89 Average AEQ |  |  |  |  |  |  |  |  |
| Total Mortality Distribution | 64.8\% |  | 22.3\% | 12.9\% | 32.9\% | 23.8\% | 3.9\% | 4.2\% |
|  | Stock I | Index | (\% Chang | e from Base) | Fishery Ind | dex (\% ch | hange from | Base) |
| 1985-89 Observed Index | NA |  | NA | NA | - 18\% | -28\% | -18\% | -20\% |
| 1985 Target Index | -22\% |  | -25\% | NA | -22\% | -16\% | -24\% | -47\% |

## C. Index (\% Change from Long-Term Average)

|  | Survival | Escapement |
| :--- | :---: | :---: |
| Base Period: | NA | $-40 \%$ |
| Rebuilding Period: | NA | $38 \%$ |
| Projected Period: | NA | NA |

Comments. Terminal harvest rates cannot be estimated for these stocks individually; however, a composite terminal harvest index for all stocks has been developed. This index shows that the terminal harvest rate on this stock group has declined by $50 \%$ from the base period. This has resulted from substantial decreases in catches both by the native food fishery and the terminal gillnet fishery.

Effects of other fisheries on this stock group cannot be directly estimated since it is not represented in the Exploitation Rate Analysis. However, estimates of the 1985-1989 distribution from the chinook model indicate that most mortality on this stock group occurs in the SEAK and NCBC ceiling fisheries and in the Canada non-ceiling fisheries. Reductions in exploitation rates in the SEAK and NCBC fisheries have been near or below the 1985 target reduction levels.

### 4.4.8 Lower Fraser (Harrison) Fall

Synopsis. The Lower Fraser stock is classified as Not Rebuilding. Consistent with this assessment, the chinook model predicts that the stock will achieve only 44\% of the escapement goal in 1998. This stock group is primarily harvested in the GS and WCVI fisheries, fisheries that have not achieved the 1985 target reductions. Survival during the rebuilding period has been poor, and is projected to improve, but remain below the long-term average. In view of the projected low survival and the lack of sufficient reductions in exploitation rates, this stock, like the Lower Strait of Georgia stock group, seems unlikely to rebuild under current management regimes.

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

Escapement Analysis PSC Chinook Model Exploitation Rate Analysis

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

|  | Major Fishery Categories |  |  | Ceiling Fisheries |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $\begin{gathered} \text { All } \\ \text { Ceiling } \end{gathered}$ | Canada Non-Ceiling | $\begin{gathered} \text { US } \\ \text { Non-Ceiling } \\ \hline \end{gathered}$ |  |  |  |  |
|  |  |  |  | SEAK | NCBC | WCVI | GS |
| 1985-89 Average AEQ |  |  |  |  |  |  |  |
| Total Mortality Distribution | 70.7\% | 12.1\% | 17.2\% | 1.0\% | 5.8\% | 24.4\% | 39.5\% |
|  | Stock | Index (\% Chang | from Base) | Fishery Index | (\% Ch | nge from | Base) |
| 1985-89 Observed Index | NA | NA | NA | -18\% | -28\% | -18\% | -20\% |
| 1985 Target Index | -38\% | -25\% | NA | -22\% | -16\% | -24\% | -47\% |

C. Index (\% Change from Long-Term Average)

|  | Survival | Escapement |
| :--- | :---: | :---: |
| Base Period: | NA | NA |
| Rebuilding Period: | $-63 \%$ | $-2 \%$ |
| Projected Period: | $-22 \%$ | NA |

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

Data for the associated exploitation indicator stocks are only sufficient to provide distribution estimates of total fishing related mortality. These estimates show that most of the mortality occurs in the GS and WCVI ceiling fisheries. The GS fishery index remains above the 1985 target. Additional mortality occurs in the WCVI ceiling fisheries where the fishery index also has averaged above the 1985 target. Substantial mortality also occurs in
non-ceiling fisheries (this is the only Canadian stock group with substantial mortality in a U.S. non-ceiling fishery). It is not known if exploitation of this stock has changed in the U.S. non-ceiling fisheries. It is likely that decreases in exploitation rates for Canadian nonceiling fisheries would be similar to those reported for the lower Strait of Georgia stock group (which has met or exceeded the $-25 \%$ target).

Some inferences about the changes in exploitation rates on this stock can be made from the data provided for the lower Strait of Georgia stock group because the distribution data indicates that a large proportion of the harvest on the Harrison stock also occurs in the 2 GS fisheries. The lower Strait of Georgia stock group shows decreases in both the total exploitation estimates and in the stock index, but the decreases are less than those required for stock rebuilding. The situation is also likely true for the Lower Fraser stock group; particularly because, outside of GS, exploitation on the Harrison stock occurs mainly in the WCVI troll fishery, while that on the lower Strait of Georgia stock group occurs mainly in the NBC and CBC fisheries. The WCVI troll fishery index has exceeded the target reduction in 4 of the 5 years of the rebuilding program, while the fishery index for NCBC troll fisheries has declined substantially. Further, troll fisheries in NCBC have moved north and outside, suggesting that impacts would be reduced in the inside waters where lower Strait of Georgia stocks are more prevalent.

Survival of this stock during the rebuilding period was very low; future survival is projected to improve, although it is still expected to remain below the long-term average.

### 4.4.9 North Puget Sound Spring

Synopsis. The Skagit stock is classified as Indeterminate and the associated chinook model stock is not predicted to rebuild by 1998. Stocks within this group are harvested primarily by fisheries in GS and by U.S. non-ceiling fisheries. The MSY ER is likely biased low; even so, brood exploitation rates are likely greater than MSY levels. This may be attributed in part to exploitation in the GS fishery, where exploitation rates remain well above the target levels. Other possible explanations, including reduced survival or increased exploitation rates in U.S nonceiling fisheries, cannot be assessed because of a lack of base period data.
A. Analysis of Escapement, Terminal Harvest Rates, and Brood Exploitation Rates

Escapement Analysis PSC Chinook Model Exploitation Rate Analysis

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

|  | Major Fishery Categories |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | All | Canada Non-Ceiling | $\begin{gathered} \text { US } \\ \text { Non-Ceiling } \\ \hline \end{gathered}$ |  |  |  |  |
|  | Ceiling |  |  | SEAK NCBC WCVI GS |  |  |  |
| 1985-89 Average AEQ |  |  |  |  |  |  |  |
| Total Mortality Distribution | 55.6\% | 12.2\% | 31.1\% | 0.3\% | 9.8\% | 5.7\% | 39.8\% |
|  | Stock I | Index (\% Chang | e from Base) | Fishery In | X (\% Ch | ge fro | Base) |
| 1985-89 Observed Index | NA | NA | NA | -18\% | -28\% | -18\% | -20\% |
| 1985 Target Index | -44\% | NA | NA | -22\% | -16\% | -24\% | -47\% |

## C. Index (\% Change from Long-Term Average)

|  | Survival | Escapement |
| :--- | :---: | :---: |
| Base Period: | NA | $-24 \%$ |
| Rebuilding Period: | NA | $41 \%$ |
| Projected Period: | NA | NA |

Comments. The Nooksack spring stock, which is the associated model stock for this group, is only predicted to achieve $44 \%$ of its goal by the 1998 rebuilding target date. However, trends in the escapement for the Nooksack stock have not been consistent with those for the Skagit stock in recent years; escapement for the Skagit has increased during the rebuilding period while that for the Nooksack has not.

### 4.4.10 North Puget Sound Summer/Fall

Synopsis. Two out of the 3 stocks in this group are classified as Probably Not Rebuilding and 2 of the 3 associated model stocks are predicted to not rebuild by 1998. Nearly $50 \%$ of the fishing mortality on these stocks occurs in U.S. non-ceiling fisheries. Exploitation rates in the preterminal component of the U.S. non-ceiling fisheries has decreased by $1 \%$, and terminal harvest rates have decreased by $27 \%-39 \%$. These reductions have been offset by the failure of the GS and WCVI fisheries to achieve the 1985 target reductions and poor survival during the rebuilding period. Survival is projected to improve but remain below the long-term average.

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

|  | Major Fishery Categories |  |  | Ceiling Fisheries |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | All <br> Ceiling | Canada Non-Ceiling | $\begin{gathered} \text { US } \\ \text { Non-Ceiling } \end{gathered}$ |  |  |  |  |
|  |  |  |  | SEAK | NCBC | WCVI | GS |
| 1985-89 Average AEQ |  |  |  |  |  |  |  |
| Total Mortality Distribution | 44.2\% | 7.6\% | 48.2\% | 4.4\% | 3.5\% | 16.2\% | 20.1\% |
|  | Stock I | ndex (\% Chang | from Base) | Fishery Ind | (\% Ch | nge from | Base) |
| 1985-89 Observed Index | -32\% | NA | -1\% | -18\% | -28\% | -18\% | -20\% |
| 1985 Target Index | -29\% | NA | NA | -22\% | -16\% | -24\% | -47\% |

## C. Index (\% Change from Long-Term Average)

|  | Survival | Escapement |
| :--- | :---: | :---: |
| Base Period: | $-11 \%$ | $3 \%$ |
| Rebuilding Period: | $-92 \%$ | $7 \%$ |
| Projected Period: | $-23 \%$ | NA |

Comments. Stock indices for this group may be misleading since estimates are available for only 1988 and 1989. Hence, the average for the rebuilding period is strongly affected by the large reduction in the harvest rate for the WCVI troll fishery in 1989.

About one third of the total mortality of this group occurs in the WCVI and GS ceiling fisheries; fishery indices for both of these areas have averaged above 1985 target levels. The remainder of fishing mortality for this stock occurs primarily in U.S. non-ceiling fisheries. The stock index for U.S. non-ceiling fisheries in preterminal areas has declined by $1 \%$. Terminal harvest rates on all of these stocks have declined substantially from base
period levels. Ocean exploitation rates have declined below the MSY levels estimated for associated PSC model stocks. The MSY ER for the Stillaguamish appears high and may indicate that the escapement goal is too small or that escapement estimates are biased low.

The survival indices for this stock group are difficult to interpret since they are based upon a single stock (Lummi Ponds) with a discontinuous tagging record. The one brood (1984) tagged during the base period showed survival well below the long-term average. The survival index for the projected period continues to remain below the long-term average.

Overall, this stock group is showing a poor response to the rebuilding program. This is not unexpected given that: (1) less than $50 \%$ of the target reduction has been achieved for the GS fishery; (2) the WCVI index was well above the 1985 target reduction until 1989; and (3) and survival during the rebuilding period was below the long-term average. Even if target reductions for the ceiling fisheries were achieved, these stocks would be expected to rebuild more slowly since a significant portion of the total mortality occurs in non-ceiling fisheries.

### 4.4.11 South Puget Sound Summer/Fall

Synopsis. Escapement of the Green River stock, which is classified as Rebuilding, has increased substantially since the commencement of the PSC management regime. This increase may be attributed to: (1) reductions in exploitation rates in ceiling fisheries; (2) reductions in exploitation rates in U.S. preterminal non-ceiling fisheries; and (3) reductions in the terminal harvest rate. Reductions in fishery exploitation rates have resulted in a reduction in the average ocean brood exploitation rate. Despite increases in the escapement for this stock, projections of poor survival are cause for concern.

## A. Analysis of Escapenent, Terminal Harvest Rates, and Brood Harvest Rates

Escapement Analysis PSC Chinook Model Exploitation Rate Analysis


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

|  | Major Fishery Categories |  |  | Ceiling Fisheries |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Ceiling | CanadaNon-Ceiling | $\begin{gathered} \text { US } \\ \text { Non-Ceiling } \end{gathered}$ |  |  |  |  |
|  |  |  |  | SEAK | NCBC | WCVI | GS |
| 1985-89 Average AEQ |  |  |  |  |  |  |  |
| Total Mortality Distribution | 31.7\% | 7.4\% | 60.9\% | 0.5\% | 2.0\% | 20.5\% | 8.7\% |
|  | Stock I | Index (\% Chang | from Base) | Fishery Index | (\% Ch | nge from | Base) |
| 1985-89 Observed Index | -28\% | NA | -12\% | -18\% | -28\% | -18\% | -20\% |
| 1985 Target Index | -30\% | NA | NA | -22\% | -16\% | -24\% | -47\% |

## C. Index (\% Change from Long-Term Average)

|  | Survival | Escapement |
| :--- | :---: | :---: |
| Base Period: | $44 \%$ | $-7 \%$ |
| Rebuilding Period: | $-35 \%$ | $22 \%$ |
| Projected Period: | $-47 \%$ | NA |

Comments. The Puget Sound stock in the model is used to compute a target stock index, but it cannot be used to calculate MSY exploitation rate because it is a hatchery stock.

The group appears to have shown a positive response to the rebuilding program despite poor survival during the rebuilding period. This is likely because impacts have been reduced to some extent in all fisheries that harvest this stock. Terminal management actions that have been taken include the closure of terminal net and sport fisheries. Nevertheless, the projection of continued low survival is of concern.

### 4.4.12 Columbia Upriver Spring

Synopsis. This stock group is classified as Probably Not Rebuilding. No exploitation rate or model information is available for this stock group, since coded-wire-tagging has been intermittent and at inadequate levels for the analysis of exploitation and catch distribution. However, previous analyses have indicated that survival rates for this stock group are extremely poor. Tagging projects currently underway are expected to provide information usable in the chinook model and in the Exploitation Rate Analysis. Although the terminal harvest rate has increased over base period level, the proportion of the terminal run taken in terminal fisheries is low (typically less than 10\%).
A. Analysis of Escapement, Terminal Harvest Rates, and Brood Exploitation Rates

| Escapemen | ysis | PSC Chinook Model |  |  | Exploitation Rate Analysis |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | 1985-89 |  | Yr Rebuilt |  |  | Brood Exp | itation |
| Indicator |  | Terminal | Indicator | or | MSY | Indicator | Ocean | Total |
| Stocks | Status | HR Index | Stocks | \% in 1998 | ER | Stocks | Base 85-89 | Base 85-89 |
| Col UpR spr | Prob Not | 1.39 | None |  |  | None |  |  |

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

|  | Major Fishery Categories |  |  | Ceiling Fisheries |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $\begin{gathered} \text { All } \\ \text { Ceiling } \\ \hline \end{gathered}$ | $\begin{gathered} \text { Canada } \\ \text { Non-Ceiling } \\ \hline \end{gathered}$ | $\begin{gathered} \text { US } \\ \text { Non-Ceiling } \\ \hline \end{gathered}$ |  |  |  |  |
|  |  |  |  | SEAK | NCBC | WCVI | GS |
| 1985-89 Average AEQ |  |  |  |  |  |  |  |
| Total Mortality Distribution | NA | NA | NA | NA | NA | NA | NA |
|  | Stock | Index (\% Change | from Base) | Fishery Index | (\% C | ge from | Base) |
| 1985-89 Observed Index | NA | NA | NA | -18\% | -28\% | -18\% | -20\% |
| 1985 Target Index | NA | NA | NA | -22\% | -16\% | -24\% | -47\% |

C. Index (\% Change from Long-Term Average)

|  | Survival | Escapement |
| :--- | :---: | :---: |
| Base Period: | NA | $-4 \%$ |
| Rebuilding Period: | NA | $14 \%$ |
| Projected Period: | NA | NA |

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

Synopsis. Overall, this stock group appears to be doing well. Fishery and stock indices applicable to this stock group have been reduced by approximately 25\%. In addition, brood exploitation rates are low and have declined from the base period. This stock group appears to have benefitted from higher than average survivals during the rebuilding period; however, future survival is projected to be well below the long-term average and is cause for concern. The escapement status of the Columbia Upriver Summer stock is inconsistent with those for the rest of the stock group; this is likely due to the extremely poor survival of this stock.

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


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

|  | Major Fishery Categories |  |  | SEAK | $\begin{array}{r} \text { Ceiling } \\ \text { NCBC } \end{array}$ | Fisheries WCVI | GS |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $\begin{gathered} \text { All } \\ \text { Ceiling } \end{gathered}$ | Canada <br> Non-Ceiling | $\begin{gathered} \text { US } \\ \text { Non-Ceiling } \\ \hline \end{gathered}$ |  |  |  |  |
| 1985-89 Average AEQ |  |  |  |  |  |  |  |
| Total Mortality Distribution | 85.0\% | 2.0\% | 13.1\% | 32.8\% | 32.9\% | 18.9\% | 0.3\% |
|  | Stock | ndex (\% Chang | from Base) | Fishery Ind | ex <\% C | ange from | Base) |
| 1985-89 Observed Index | -19\% | NA | -38\% | -18\% | -28\% | -18\% | -20\% |
| 1985 Target Index | -21\% | NA | NA | -22\% | -16\% | -24\% | -47\% |

## C. Index (\% Change from Long-Term Average)

|  | Survival | Escapement |
| :--- | :---: | :---: |
| Base Period: | $-7 \%$ | $-23 \%$ |
| Rebuilding Period: | $31 \%$ | $27 \%$ |
| Projected Period: | $-44 \%$ | NA |

Comments. Of the 12 escapement indicator stocks in the group, 9 are classified as Rebuilding, Probably Rebuilding, or Increasing. Of the remaining 3 stocks, 2 are classified as Indeterminate and 1 as Probably Not Rebuilding. According to the chinook model, the Columbia Upriver summer stock, the 1 stock classified as Probably Not Rebuilding, is predicted to not rebuild by 1998. Terminal harvest rates have increased for many of the stocks in the top assessment categories as well as for the Lewis stock. The average terminal harvest rate on the Columbia Upriver summer stock has declined by nearly one half since the base period.

The MSY ER Columbia Upriver Brights and Oregon Coastal stocks are outside the range observed for most other stocks. A positive bias may result from the estimation technique. When estimates of recruitment are combined with the escapement goals provided by the agencies, very high estimates of productivity result. This suggests that the reported escapement estimates may be inconsistent for the years used to compute the Ricker A values and/or the agency-provided escapement goals for these stocks may be too low.

### 4.5 DISCUSSION

Although chinook stocks have been aggregated into stock groups for this analysis, it is clear that response to the rebuilding program has not been uniform across stocks within these groups. For this reason, generalizations about stock groups should be used with caution.

Stocks have exhibited a varied response to the PSC management regime but, in general, the response has been less than necessary to assure rebuilding by the target date. Seven of the 13 stock groups had no stocks in the top 2 status categories, while only 2 stock groups had no stocks in the two lowest status categories.

Three general patterns emerged from this analysis of the stock groups:

1. Stock groups that have a majority of their fishing related mortality in the northern ceiling fisheries (SEAK and NCBC) appear to be doing fairly well. These groups are SEAK, NCBC, upper Strait of Georgia, and the Washington Coastal Spring/Summer, Columbia River Summer/Fall, and Oregon Fall stock group. According to the PSC chinook model, most of the stocks in these stock groups are predicted to rebuild by the 1998 target rebuilding date. These stocks have benefitted from a combination of declines in fishery exploitation rates to near 1985 target levels, as well as from higher than average survival during the rebuilding period.

Exceptions to this generalization included the WCVI stock group, the CBC component of NCBC, Columbia River Summers, and possibly the Transboundary and Situk stock group (although insufficient information is available to generalize about the latter stock group).
2. Stock groups that have a majority of their fishing mortality in GS are typically classified as Probably Not Rebuilding or Not Rebuilding. These groups are the Lower Strait of Georgia, Lower Fraser Fall, and North Puget Sound Spring. Exploitation rates on these groups have not been reduced to target levels and survival has been well below the long-term average. None of the stocks used in the chinook model to represent these stock groups is predicted to rebuild by 1998.
3. Stock groups harvested primarily in U.S. non-ceiling fisheries have displayed a mixed response to the PSC management regime. The North Puget Sound summer/fall stock group has responded poorly, apparently due to fishery exploitation rates that have not declined to 1985 target levels (particularly in GS fisheries) as well as from very poor survival relative to the long-term average. Two out of 3 stocks in this group are predicted to not rebuild by 1998 by the chinook model. The South Puget Sound summer/fall stock group, which has shown a marked increase in escapement, appears to have benefitted from reductions in exploitation rates in ceiling, U.S. non-ceiling, and terminal fisheries.

Exploitation rates have been reduced but generally not to the 1985 target levels. Brood year ocean exploitation rates have declined on all 7 of the stock groups for which a comparison of the base and rebuilding period can be made. Target reductions in the stock indices for ceiling fisheries were achieved for only 2 of the stock groups; 4 of the 7 stock groups had stock indices for ceiling fisheries within $10 \%$ of the 1985 target reductions.

A basic premise of the rebuilding program was that the fixed ceilings would act in concert with increases in the abundance of chinook to continually reduce harvest rates in the ceiling fisheries. The projected abundance of chinook available to the SEAK and NCBC ceiling fisheries in 1990 and 1991 is expected to be near the average for the rebuilding period. Although the model projects a slight increase in abundance, these projections are optimistic because they do not incorporate the most recent estimates of survival. The survival of stocks contributing to the northern fisheries is projected to be poor relative to recent years. Consequently, the harvest rate reductions expected under the rebuilding program are not likely to be achieved and the rate of rebuilding of stocks that are predominantly harvested in these fisheries is not likely to accelerate in 1990 and 1991.

The abundance of chinook available to the GS fishery during the rebuilding period was $45 \%$ less than the long-term average. An additional reduction of $9 \%$ is projected for 1990-1991. The 1985 target reductions were not achieved during the rebuilding period and are not likely to be achieved in 1990 and 1991 unless additional management actions are implemented.

The abundance of chinook available to the WCVI troll fishery during the rebuilding period was $10 \%$ less than the long-term average. An additional reduction of $8 \%$ is projected for 1990-1991. Consequently, the fishery harvest rate will not attain the 1985 target reductions unless catch is restricted to a level less than the current ceiling.

### 4.6 CONCLUSIONS

1. Harvest rates in the ceiling fisheries have been reduced, but generally not to the 1985 target levels. Target reductions have been achieved or nearly achieved in the northern ceiling fisheries and have not been met in the southern ceiling fisheries.
2. Harvest rates in non-ceiling fisheries have generally declined.
3. Progress toward rebuilding for many of the stocks has been limited by a failure to meet target reductions in the stock indices for ceiling fisheries and by poor survival.
4. Abundance in the SEAK and NCBC troll fisheries is projected by the PSC chinook model to be near the 1985-1989 average but above the 1979-1989 average. Abundance in the WCVI and GS fisheries is projected to be below the 1985-1989 average and substantially below the 1979-1989 average. However, the abundance projections for all ceiling fisheries are optimistic because the current calibration of the chinook model does not incorporate the declines in short-term survival projected in the Exploitation Rate Analysis.
5. Poor survival is projected for broods returning in 1990 and 1991; only one stock group is projected to have a short-term survival index greater than the long-term average. Reduced survivals will generally require reduced brood year exploitation rates to continue rebuilding progress. In particular, in order to meet the rebuilding goals for stocks significantly impacted by the GS and WCVI fisheries, additional management actions will be required to reduce harvest rates for these fisheries.

## APPENDIX A

Tables of Escapements, Terminal Runs, and Changes from 1988
Escapements and terminal runs of escapement indicator stocks, ..... 1975-1989.
Southeast Alaska ..... A-1
Transboundary Rivers ..... A-1
Northern B.C ..... A-2
Southern B.C ..... A-2
Fraser River ..... A-2
Puget Sound ..... A-3
Washington Coast ..... A-3
Columbia River ..... A-4
Oregon ..... A-4
Chinook Salmon indicator stock escapements and terminal runs used in the 1989 and 1988 CTC annual reports, and difference between years ..... A-5

Escapements and terminal runs of PSC Chinook Technical Committee escapement indicator stocks, 1975-1989.

| Year | Southeast Alaska |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | esc. | tuk t.run | $\begin{array}{r} \text { King } \\ \text { Salmon } \\ \text { esc. } \end{array}$ | Andrew esc. | $\begin{gathered} \text { Blossom } \\ \text { esc. } \end{gathered}$ | Keta esc. |
| 1975 | 1510 | 2099 | 53 | 416 | 234 | 325 |
| 1976 | 1433 | 2676 | 81 | 404 | 109 | 134 |
| 1977 | 1732 | 2833 | 168 | 456 | 179 | 368 |
| 1978 | 814 | 1456 | 71 | 388 | 229 | 627 |
| 1979 | 1400 | 2735 | 89 | 327 | 86 | 682 |
| 1980 | 905 | 2284 | 88 | 281 | 142 | 307 |
| 1981 | 702 | 1752 | 113 | 511 | 254 | 526 |
| 1982 | 434 | 772 | 286 | 635 | 552 | 1206 |
| 1983 | 592 | 1033 | 245 | 366 | 942 | 1315 |
| 1984 | 1726 | 2434 | 250 | 355 | 813 | 976 |
| 1985 | 1521 | 2380 | 171 | 510 | 1134 | 998 |
| 1986 | 2067 | 2356 | 245 | 1131 | 2045 | 1104 |
| 1987 | 1884 | 2873 | 193 | 1042 | 2158 | 1229 |
| 1988 | 885 | 1450 | 206 | 752 | 614 | 920 |
| 1989 | 652 | 682 | 238 | 848 | 550 | 1848 |
| Goal | 2100 |  | 250 | 750 | 1280 | 800 |


| Year | Transboundary Rivers |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $\begin{aligned} & \text { U.s. } \\ & \text { esc. } \end{aligned}$ | Alsek t.run | Canadian Alsek esc. t.run |  |  | $\begin{array}{cc} \text { U.S. Taku } \\ \text { esc. } & \text { t. run } \\ \hline \end{array}$ |  | Canadian Taku |  | $\begin{aligned} & \text { U.S. } \\ & \text { Stikine } \end{aligned}$ |  | Canadian Stikine |  | U.S. U.S. Unuk Chickamin |  |
| 1975 | 4214 | 5593 |  |  | 188 | 4609 | 4609 | 5800 | 5800 | 5800 | 6401 | 5800 | 6401 | 1469 | 588 |
| 1976 | 1672 | 2509 | 2231 | 3068 | 223 | 8278 | 8278 | 10300 | 10300 | 3300 | 3840 | 3300 | 3840 | 1469 | 147 |
| 1977 | 4363 | 6315 | 5738 | 7690 | 223 | 10000 | 10000 | 11342 | 12500 | 6600 | 6681 | 6600 | 6681 | 1558 | 363 |
| 1978 | 4050 | 7091 | 5352 | 8393 | 214 | 4987 | 4987 | 6610 | 6200 | 5200 | 5450 | 5200 | 5450 | 1770 | 290 |
| 1979 | 6101 | 9406 | 8028 | 11333 | 214 | 6593 | 6690 | 8312 | 8409 | 9328 | 10465 | 9328 | 10465 | 922 | 224 |
| 1980 | 3770 | 5502 | 4924 | 6656 | 214 | 13402 | 13627 | 15088 | 15313 | 17096 | 18212 | 17096 | 18212 | 1626 | 418 |
| 1981 | 2837 | 4081 | 3761 | 5005 | 1143 | 17900 | 18059 | 19572 | 19731 | 26672 | 27451 | 26672 | 27451 | 1170 | 614 |
| 1982 | 3078 | 4234 | 4114 | 5270 | 799 | 8398 | 8452 | 9626 | 9680 | 22640 | 23834 | 22640 | 23834 | 2162 | 1015 |
| 1983 | 3352 | 4058 | 4462 | 5168 | 1103 | 3020 | 3176 | 4124 | 4280 | 4752 | 5815 | 4752 | 5815 | 1800 | 922 |
| 1984 | 2038 | 2673 | 2769 | 3404 | 1487 | 6307 | 6601 | 7818 | 8112 | 10352 | 10703 | 10352 | 10703 | 2939 | 1763 |
| 1985 | 1853 | 2491 | 2491 | 3129 | 536 | 10851 | 11177 | 14416 | 14732 | 12584 | 13664 | 12584 | 13664 | 1894 | 1530 |
| 1986 | 3966 | 4711 | 5151 | 5896 | 129 | 12178 | 12453 | 15040 | 15315 | 11572 | 13508 | 11572 | 13508 | 3402 | 2683 |
| 1987 | 3598 | 4435 | 4742 | 5579 | 1286 | 8951 | 9078 | 11486 | 11613 | 19108 | 21309 | 19108 | 21309 | 3157 | 1560 |
| 1988 | 2865 | 3406 | 3756 | 4297 | 781 | 13080 | 13635 | 16954 | 17509 | 29168 | 31520 | 29168 | 31520 | 2794 | 1258 |
| 1989 | 3399 | 4066 | 4473 | 5140 | 1362 | 15451 | 16346 | 18784 | 19579 | 18860 | 21529 | 18860 | 21529 | 1838 | 1494 |
| Goal | 5000 |  | 12500 |  | 2000 | 25600 |  | 30000 |  | 13400 |  | 25000 |  | 2880 | 1440 |

Escapements and terminal runs of PSC Chinook Technical Committee escapement indicator stocks, 1975-1989 (cont.).

| Year | Northern B.C. |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | AREA 1 <br> Yakoun esc. |  | $\begin{aligned} & 3 \\ & \text { t.run } \end{aligned}$ | AREA Skee esc. | $4$ <br> na t.run | AREA 6 <br> Index | AREA 8 Index | AREA 9 <br> Rivers <br> Inlet | AREA 10 <br> Smith <br> Inlet |
| 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 | 11431 | 16210 | 59120 | 73038 | 1566 | 1456 | 5239 | 1050 |
| 1988 | 2000 | 10000 | 14248 | 68705 | 89745 | 3165 | 1650 | 4429 | 1050 |
| 1989 | 2800 | 12525 | 17470 | 57202 | 80025 | 998 | 2535 | 3265 | 225 |
| Goal | 1580 | 15900 |  | 41800 |  | 5520 | 5450 | 4950 | 2100 |


| Year |  | Southern B.C. |  |  | Fraser River |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | W. Coast Vancouver I. esc. | $\begin{array}{r} \text { Upper } \\ \text { Georgia St. } \\ \text { esc. } \end{array}$ | Lower esc. | eorgia ait <br> t.run | Upper <br> Fraser <br> esc. | Middle <br> Fraser esc. | Thompson esc. | esc. | ison 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 | 120836 | 131756 |
| 1985 | 4900 | 4600 | 4796 | 6342 | 34527 | 17595 | 39997 | 174777 | 179254 |
| 1986 | 4810 | 1630 | 2830 | 4817 | 41207 | 27349 | 45130 | 162598 | 176537 |
| 1987 | 3520 | 5700 | 2750 | 4569 | 34520 | 27330 | 36730 | 79039 | 81680 |
| 1988 | 5500 | 3300 | 6914 | 9343 | 34248 | 24164 | 47103 | 35116 | 40071 |
| 1989 | 8480 | 6607 | 6830 | 9692 | 25310 | 15095 | 37975 | 74685 | 75485 |
| Goal | 11500 | 5100 | 22300 |  | 24500 | 21100 | 55700 | 241700 |  |

Escapements and terminal runs of PSC Chinook Technical Committee escapement indicator stocks, 1975-1989 (cont.).

| Year | Puget Sound |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Skagit spring esc. | Skagit summe esc. | $\begin{aligned} & \hline \text { River } \\ & \text { r/fall } \\ & \text { t.run } \\ & \hline \end{aligned}$ | Stillagu summer esc. | $\begin{gathered} \hline \text { uamish } \\ \text { r/fall } \\ \text { t.run } \\ \hline \end{gathered}$ |  | mish <br> ffall <br> t.run | Green fa esc. | $\begin{aligned} & \text { River } \\ & \text { II } \\ & \text { t.run } \\ & \hline \end{aligned}$ |
| 1975 | 804 | 11555 | 24625 | 1198 | 1635 | 4485 | 6123 | 3394 | 6217 |
| 1976 | 763 | 14479 | 23306 | 2140 | 4002 | 5315 | 9889 | 3140 | 7679 |
| 1977 | 716 | 9497 | 17693 | 1475 | 2549 | 5565 | 9618 | 3804 | 5339 |
| 1978 | 1079 | 13209 | 20030 | 1232 | 1959 | 7931 | 12591 | 3304 | 4337 |
| 1979 | 1032 | 13605 | 21243 | 1042 | 2366 | 5903 | 12706 | 9704 | 10725 |
| 1980 | 1842 | 20345 | 28938 | 821 | 2647 | 6460 | 16688 | 7743 | 10537 |
| 1981 | 1306 | 8670 | 19675 | 630 | 2783 | 3368 | 8968 | 3606 | 4900 |
| 1982 | 686 | 10439 | 21022 | 773 | 3058 | 4379 | 8470 | 1840 | 3822 |
| 1983 | 710 | 9080 | 14671 | 387 | 925 | 4549 | 10386 | 3679 | 13244 |
| 1984 | 765 | 13239 | 15005 | 374 | 883 | 3762 | 8480 | 3353 | 5339 |
| 1985 | 3265 | 16298 | 25075 | 1409 | 2641 | 4873 | 9005 | 2908 | 7417 |
| 1986 | 1995 | 18127 | 21585 | 1277 | 2416 | 4534 | 8267 | 4792 | 5770 |
| 1987 | 2108 | 9647 | 13037 | 1321 | 1906 | 4689 | 6670 | 10338 | 11666 |
| 1988 | 1988 | 11954 | 14647 | 717 | 1176 | 4513 | 7389 | 7994 | 9185 |
| 1989 | 1853 | 6776 | 13037 | 811 | 1556 | 2947 | 5560 | 11512 | 14917 |
| Goal | 3000 | 14900 |  | 2000 |  | 5250 |  | 5800 |  |


| Year | Washington Coast |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Quillayute summer esc. t.run |  | Quillayute fall esc. t.run |  | Hoh spr/summer esc. t.run |  | Hoh <br> fall <br> esc. t.run |  | Queets spr/surmer esc. t.run |  | ```Queets fall``` |  | Grays Harbor spring |  | Grays Harbor fall |  |
| 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 | 13100 |
| 1978 | 2300 | 2700 | 4700 | 6200 | 1400 | 2500 | 1900 | 2900 | 1100 | 1400 | 2200 | 3200 | 1000 | 1600 | 4800 | 10800 |
| 1979 | 2100 | 3900 | 3900 | 6600 | 1400 | 2300 | 1700 | 2200 | 900 | 1400 | 3900 | 4700 | 300 | 1100 | 9400 | 12300 |
| 1980 | 1000 | 1500 | 6700 | 7600 | 800 | 1000 | 2200 | 2800 | 1000 | 1200 | 3200 | 5800 | 200 | 600 | 11700 | 22100 |
| 1981 | 800 | 1700 | 5700 | 6900 | 1500 | 2100 | 3100 | 4000 | 1000 | 1200 | 4300 | 8000 | 600 | 900 | 7600 | 12300 |
| 1982 | 1200 | 2700 | 7100 | 9600 | 1600 | 2300 | 4500 | 5800 | 800 | 1200 | 4100 | 6200 | 600 | 700 | 5600 | 13700 |
| 1983 | 1400 | 1800 | 2900 | 5600 | 1800 | 1800 | 2500 | 3300 | 1000 | 1200 | 2600 | 3800 | 800 | 900 | 5500 | 9100 |
| 1984 | 600 | 1000 | 9100 | 10300 | 1500 | 2400 | 1900 | 2600 | 1000 | 1200 | 3900 | 5300 | 1100 | 1100 | 21000 | 22600 |
| 1985 | 600 | 700 | 6200 | 8100 | 1000 | 1400 | 1700 | 3500 | 700 | 900 | 3500 | 5300 | 1200 | 1200 | 9500 | 15100 |
| 1986 | 700 | 1000 | 10000 | 13600 | 1500 | 2500 | 5000 | 6000 | 900 | 1200 | 7700 | 8900 | 1800 | 1800 | 10500 | 17500 |
| 1987 | 600 | 1600 | 12400 | 20400 | 1700 | 2600 | 4000 | 5200 | 600 | 1800 | 6000 | 9000 | 900 | 1100 | 18800 | 31200 |
| 1988 | 1300 | 2500 | 15200 | 22400 | 2600 | 3900 | 2700 | 5600 | 1800 | 2300 | 7800 | 10400 | 3000 | 3100 | 28200 | 39200 |
| 1989 | 2200 | 3300 | 10000 | 17100 | 4800 | 7200 | 5100 | 8700 | 2500 | 3900 | 8900 | 11400 | 1900 | 2250 | 26500 | 56200 |
| Goal | 1200 |  | NA |  | NA |  | NA |  | NA |  | NA |  | 1400 |  | 14600 |  |

Escapements and terminal runs of PSC Chinook Technical Committee escapement indicator stocks, 1975-1989 (cont.).

| Year | Columbia River |  |  |  |  |  |  |  | Oregon <br> Oregon <br> Coastal <br> Index esc. |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Col. Upriver spring esc. t.run |  | Col. Upriver summer |  | Col. Upriver bright |  | Lewis River esc. t.run |  |  |
| 1975 |  |  | 33000 | 33000 | 29600 | 112500 | 13859 | 36800 | 60 |
| 1976 |  |  | 26600 | 26700 | 28800 | 115100 | 3371 | 14900 | 50 |
| 1977 | 64900 | 92700 | 33300 | 34300 | 37600 | 95100 | 6930 | 29800 | 73 |
| 1978 | 89600 | 95300 | 37600 | 38700 | 27300 | 85300 | 5363 | 18500 | 77 |
| 1979 | 22300 | 23300 | 26700 | 27800 | 31200 | 89200 | 8023 | 32700 | 90 |
| 1980 | 25700 | 27600 | 25800 | 27000 | 29900 | 76800 | 16394 | 38800 | 95 |
| 1981 | 31500 | 33700 | 21100 | 22400 | 21100 | 66600 | 19297 | 25000 | 81 |
| 1982 | 31700 | 34800 | 18800 | 20100 | 31100 | 79000 | 8370 | 13000 | 99 |
| 1983 | 23600 | 25200 | 17700 | 18000 | 48700 | 86100 | 13540 | 16800 | 49 |
| 1984 | 18600 | 20400 | 22100 | 22400 | 61000 | 131400 | 7132 | 13300 | 100 |
| 1985 | 27200 | 28800 | 23200 | 24200 | 93300 | 195600 | 7491 | 13300 | 133 |
| 1986 | 36500 | 39800 | 25700 | 26200 | 113300 | 281500 | 11983 | 24500 | 121 |
| 1987 | 41400 | 45000 | 31800 | 33000 | 154100 | 419400 | 12935 | 37900 | 129 |
| 1988 | 35100 | 40700 | 30100 | 31300 | 114700 | 339900 | 12059 | 41700 | 221 |
| 1989 | 26100 | 29200 | 28700 | 28800 | 96500 | 259900 | 21199 | 37600 | 151 |
| Goal | 84000 |  | 85000 |  | 40000 |  | NA |  | NA |

Chinook salmon indicator stock escapements and terminal runs used in the 1989 and 1988 Chinook Technical Committee Annual Reports, and differences between years.

| Stock Name | Escapement |  |  |  | Terminal Run |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | 1988 CTC | 1989 CTC |  | 1988 CTC | 1989 CTC |  |
|  | Year | Report | Report | Difference | Report | Report | Difference |
| Situk | 1975 | 1888 | 1510 | -378 | 2073 | 2099 | 26 |
|  | 1976 | 1543 | 1433 | -110 | 1874 | 2676 | 802 |
|  | 1977 |  |  |  | 2251 | 2833 | 582 |
|  | 1978 | 880 | 814 | -66 | 1216 | 1456 | 240 |
|  | 1979 |  |  |  | 2021 | 2735 | 714 |
|  | 1980 |  |  |  | 1578 | 2284 | 706 |
|  | 1981 |  |  |  | 1115 | 1752 | 637 |
|  | 1982 |  |  |  | 579 | 772 | 193 |
|  | 1983 |  |  |  | 749 | 1033 | 284 |
|  | 1984 |  |  |  | 2041 | 2434 | 393 |
|  | 1985 |  |  |  | 1975 | 2380 | 405 |
|  | 1986 |  |  |  | 2134 | 2356 | 222 |
|  | 1987 |  |  |  | 2254 | 2873 | 619 |
|  | 1988 |  |  |  | 1155 | 1450 | 295 |
| Alsek (US est) | 1976 | 1802 | 1672 | -130 | 2639 | 2509 | -130 |
|  | 1977 | 4522 | 4363 | -159 | 6474 | 6315 | -159 |
|  | 1978 | 4181 | 4050 | -131 | 7222 | 7091 | -131 |
|  | 1979 | 6678 | 6101 | -577 | 9983 | 9406 | -577 |
|  | 1980 | 3886 | 3770 | -116 | 5564 | 5502 | -62 |
|  | 1981 | 3067 | 2837 | -230 | 4311 | 4081 | -230 |
|  | 1982 | 3077 | 3078 | 1 | 4233 | 4234 | 1 |
|  | 1983 | 3495 | 3352 | -143 | 4200 | 4058 | -142 |
|  | 1984 | 2456 | 2038 | -418 | 3077 | 2673 | -404 |
|  | 1985 | 2005 | 1853 | -152 | 2643 | 2491 | -152 |
|  | 1986 | 4073 | 3966 | -107 | 4818 | 4711 | -107 |
|  | 1987 | 3892 | 3598 | -294 | 4729 | 4435 | -294 |
|  | 1988 | 3105 | 2865 | -240 | 3615 | 3406 | -209 |
| Alsek (Can est) | 1980 |  |  |  | 6602 | 6656 | 54 |
|  | 1981 |  |  |  | 4987 | 5005 | 18 |
|  | 1985 | 2916 | 2491 | -425 | 3554 | 3129 | -425 |
|  | 1986 | 5418 | 5151 | -267 | 6163 | 5896 | -267 |
|  | 1987 | 5232 | 4742 | -490 | 6067 | 5579 | -488 |
|  | 1988 | 4060 | 3756 | -304 | 4570 | 4297 | -273 |
| Taku (US est) | 1981 | 17889 | 17900 | 11 | 18048 | 18059 | 11 |
|  | 1982 | 8407 | 8398 | -9 | 8434 | 8452 | 18 |
|  | 1983 | 3018 | 3020 | 2 | 3096 | 3176 | 80 |
|  | 1984 |  |  |  | 6454 | 6601 | 147 |
|  | 1985 |  |  |  | 11014 | 11177 | 163 |
|  | 1986 |  |  |  | 12316 | 12453 | 137 |
|  | 1987 |  |  |  | 9015 | 9078 | 63 |
|  | 1988 | 13411 | 13080 | -331 | 13702 | 13635 | -67 |
| Taku (Can est) | 1977 | 12500 | 13342 | 842 |  |  |  |
|  | 1978 | 6200 | 6610 | 410 |  |  |  |
|  | 1982 |  |  |  | 9653 | 9680 | 27 |
|  | 1983 |  |  |  | 4202 | 4280 | 78 |
|  | 1984 |  |  |  | 7965 | 8112 | 147 |
|  | 1985 |  |  |  | 14579 | 14732 | 153 |
|  | 1986 |  |  |  | 15178 | 15315 | 137 |
|  | 1987 |  |  |  | 11550 | 11613 | 63 |
|  | 1988 | 17252 | 16954 | -298 | 17543 | 17509 | -34 |

Escapement and terminal run changes (cont.).

| Stock Name | Escapement |  |  |  | Terminal Run |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  1988 CTC <br> Year Report |  | 1989 CTC |  | $1988 \text { СТС }$ <br> Report | $\begin{array}{r} 1989 \text { CTC } \\ \text { Report } \end{array}$ | Difference |
|  |  |  | Report | Difference |  |  |  |
| Stikine (US est) | 1975 | 4480 | 5800 | 1320 | 5081 | 6401 | 1320 |
|  | 1976 | 2560 | 3300 | 740 | 3140 | 3840 | 700 |
|  | 1977 | 5120 | 6600 | 1480 | 5201 | 6681 | 1480 |
|  | 1978 | 4045 | 5200 | 1155 | 4295 | 5450 | 1155 |
|  | 1979 | 7462 | 9328 | 1866 | 8599 | 10465 | 1866 |
|  | 1980 | 13677 | 17096 | 3419 | 14793 | 18212 | 3419 |
|  | 1981 | 21338 | 26672 | 5334 | 22117 | 27451 | 5334 |
|  | 1982 | 18112 | 22640 | 4528 | 19306 | 23834 | 4528 |
|  | 1983 | 3802 | 4752 | 950 | 4865 | 5815 | 950 |
|  | 1984 | 8282 | 10352 | 2070 | 8633 | 10703 | 2070 |
| Stikine (Can est) | 1975 | 6000 | 5800 | -200 | 6601 | 6401 | -200 |
|  | 1976 | 3400 | 3300 | -100 | 3980 | 3840 | -140 |
|  | 1977 | 6800 | 6600 | -200 | 6881 | 6681 | -200 |
|  | 1978 | 5400 | 5200 | -200 | 5650 | 5450 | -200 |
|  | 1987 | 18132 | 19108 | 976 | 20333 | 21309 | 976 |
| Chilkat | 1981 | 1670 | 1143 | -527 |  |  |  |
|  | 1982 | 500 | 799 | 299 |  |  |  |
|  | 1983 | 1080 | 1103 | 23 |  |  |  |
|  | 1984 | 2045 | 1487 | -558 |  |  |  |
|  | 1985 | 625 | 536 | -89 |  |  |  |
|  | 1986 | 170 | 129 | -41 |  |  |  |
|  | 1987 | 875 | 1286 | 411 |  |  |  |
| Harrison | 1984 | 116791 | 120836 | 4045 | 127719 | 131756 | 4037 |
|  | 1985 | 147620 | 174777 | 27157 | 152099 | 179254 | 27155 |
|  | 1986 | 162393 | 162598 | 205 | 176351 | 176537 | 186 |
|  | 1987 | 78693 | 79039 | 346 | 81340 | 81680 | 340 |
|  | 1988 | 35694 | 35116 | -578 | 40613 | 40071 | -542 |
| Grays Harbor Fall | 1977 |  |  |  | 13500 | 13100 | -400 |
|  | 1978 |  |  |  | 11200 | 10800 | -400 |
|  | 1979 |  |  |  | 12400 | 12300 | -100 |
|  | 1980 |  |  |  | 23700 | 22100 | -1600 |
|  | 1981 |  |  |  | 13200 | 12300 | -900 |
|  | 1982 |  |  |  | 14600 | 13700 | -900 |
|  | 1983 |  |  |  | 9000 | 9100 | 100 |
|  | 1984 |  |  |  | 23600 | 22600 | -1000 |
|  | 1985 |  |  |  | 16900 | 15100 | -1800 |
|  | 1986 |  |  |  | 20200 | 17500 | -2700 |
|  | 1987 |  |  |  | 31800 | 31200 | -600 |
|  | 1988 |  |  |  | 28200 | 39200 | 11000 |
| Col. Upriver Spr. | 1977 | 55300 | 64900 | 9600 | 79092 | 92700 | 13608 |
|  | 1978 | 87800 | 89600 | 1800 | 93300 | 95300 | 2000 |
|  | 1979 | 22100 | 22300 | 200 | 23088 | 23300 | 212 |
|  | 1980 | 26700 | 25700 | -1000 | 27612 | 27600 | -12 |
|  | 1981 | 30700 | 31500 | 800 | 32849 | 33700 | 851 |
|  | 1982 | 30200 | 31700 | 1500 | 33197 | 34800 | 1603 |
|  | 1983 |  |  |  | 25155 | 25200 | 45 |
|  | 1984 |  |  |  | 20382 | 20400 | 18 |
|  | 1985 |  |  |  | 28763 | 28800 | 37 |
|  | 1986 | 38500 | 36500 | -2000 | 39765 | 39800 | 35 |
|  | 1987 |  |  |  | 46030 | 45000 | -1030 |
|  | 1988 |  |  |  | 40740 | 40700 | -40 |

## APPENDIX B

## Stock Specific Chinook Escapement Graphs

Situk ..... B-I
King Salmon ..... B-1
Andrew Creek ..... B-2
Blossom River ..... B-2
Keta River ..... B-3
Chilkat River ..... B-3
Alsek (U.S. Estimates) ..... B-4
Alsek (Canadian Estimates) ..... B-4
Taku (U.S. Estimates) ..... B-5
Taku (Canadian Estimates) ..... B-5
Stikine River (U.S. Estimates) ..... B-6
Stikine River (Canadian Estimates) ..... B-6
Unuk River (U.S. Estimates) ..... B-7
Chickamin River (U.S. Estimates) ..... B-7
Yakoun River ..... B-8
Nass Area ..... B-8
Skeena Area ..... B-9
Area 6 Index ..... B-9
Area 8 Index ..... B-10
Rivers Inlet ..... B-10
Smith Inlet ..... B-11
WCVI ..... B-11
Upper Strait of Georgia ..... B-12
Lower Strait of Georgia ..... B-12
Upper Fraser River ..... B-13
Middle Fraser River ..... B-13
Thompson River ..... B-14
Harrison ..... B-14
Skagit Spring ..... B-15
Skagit Summer/Fall ..... B-15
Stillaguamish River ..... B-16
Snohomish River ..... B-16
Green River ..... B-17
Quillayute Summer ..... B-17
Grays Harbor Spring ..... B-18
Grays Harbor Fall ..... B-18
Columbia River Spring ..... B-19
Columbia River Summer ..... B-19
Columbia River Bright ..... B-20
Quillayute Fall ..... B-20
Hoh Spring/Summer ..... B-21
Hoh Fall ..... B-21
Queets Spring/Summer ..... B-22
Queets Fall ..... B-22
Lewis River Fall ..... B-23
Oregon Coastal ..... B-23

## Situk Chinook Escapements

## Probably Not Rebuilding



|  | Base | 85 | 88 | 87 | 88 | 89 | Goal |
| :--- | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Sltuk Rlvar | 1,298 | 1,521 | 2,087 | 1,884 | 885 | 652 | 2,100 |

sltukreb.chs

## King Salmon Chinook Escapements

Probably Rebuilding


|  | Base | 85 | 88 | 87 | 88 | 89 | Goal |
| :--- | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| King Salmon River | 92 | 171 | 245 | 193 | 206 | 238 | 250 |

## Andrew Creek Chinook Escapements

Rebuilding


|  | Base | 86 | 86 | 87 | 88 | 89 | Goal |
| :--- | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Andrew Creek | 378 | 610 | 1,131 | 1,042 | 762 | 848 | 760 |

## Blossom River Chinook Escapements

Indeterminate


|  | Base | 86 | 86 | 87 | 88 | 88 | Goal |
| :--- | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Bloseom Rlver | 163 | 1,194 | 2,045 | 2,168 | 614 | 560 | 1,280 |

Keta River Chinook Escapements
Rebuilding


|  | Base | 86 | 88 | 87 | 88 | 89 | Goal |
| :--- | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Keta Rlver | 407 | 998 | 1,104 | 1,229 | 920 | 1,848 | 800 |

Chilkat River Chinook Escapements
U. S. Estimates and Goal Indeterminate


|  | Baee | 86 | 88 | 87 | 66 | 89 | Goal |
| :--- | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Chllkat R. (U.8.) | 213 | 636 | 129 | 1,286 | 781 | 1,362 | 2,000 |

## Alsek Chinook Escapements

U.S. Estimates and Goal Probably Not Rebuilding


|  | Bease | 85 | 88 | 87 | 88 | 89 | Goal |
| :--- | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Aleek Rlver (U.8.) | 4,028 | 1,863 | 9,986 | 3,698 | 2,866 | 3,399 | 6,000 |

## Alsek Chinook Escapements Canadian Estimates and Goal Probably Not Rebuilding



|  | Base | 65 | 88 | 87 | 88 | 68 | Goa! |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Alesk Fiver (Can.) | 6,265 | 2,491 | 5,151 | 4,742 | 3,756 | 4,473 | 12,500 |

Taku Chinook Escapements
U. S. Estimates and Goal Indeterminate


|  | Ba日e | 86 | 88 | 87 | 88 | 89 | Goal |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Taku Rlver (U.8.) | 7,078 | 10,861 | 12,178 | 6,951 | 13,080 | 16,461 | 26,600 |

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Taku Chinook Escapements Canadian Estimates and Goal Indeterminate


|  | Bage | 85 | 88 | 87 | 88 | 88 | Goal |
| :--- | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Taku River (Can.) | 9,675 | 14,416 | 15,040 | 11,486 | 16,854 | 18,784 | 30,000 |

## Stikine River Chinook Escapements

U. S. Estimates and Goal

Rebuilding


|  | Base | 85 | 86 | 87 | 88 | 88 | Goal |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Bilkine R. (U.8.) | 7,887 | 12,684 | 11,672 | 19,108 | 28,168 | 18,880 | 13,400 |

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## Stikine Chinook Escapements Canadian Estimates and Goal Rebuilding



|  | Base | 85 | 88 | 87 | 88 | 88 | Goal |
| :--- | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Stikine R. (Can.) | 7,887 | 12,684 | 11,672 | 19,108 | 29,168 | 18,880 | 25,000 |

## Unuk River Chinook Escapements

U. S. Estimates and Goal Indeterminate


|  | B88e | 86 | 88 | 87 | 88 | 89 | Goal |
| :--- | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Unuk RIver (U.8.) | 1,468 | 1,694 | 3,402 | 3,157 | 2,794 | 1,838 | 2,880 |

Chickamin R. Chinook Escapements
U. S. Estimates and Goal Probably Rebuilding


|  | Base | 86 | 86 | 87 | 88 | 88 | Goal |
| :--- | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Chlokamin R. (U.8.) | 338 | 1,530 | 2,683 | 1,580 | 1,268 | 1,494 | 1,440 |

ohtokucb.cht

## Yakoun R. Chinook Escapements

Rebuilding


|  | Bese | 85 | 88 | 87 | 88 | 88 | Goal |
| :--- | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Yakoun Rlver | 788 | 1,500 | 600 | 2,000 | 2,000 | 2,800 | 1,680 |

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Nass Area Chinook Escapements
Probably Rebuilding


|  | Bese | 85 | 88 | 87 | 88 | $8 \theta$ | Goal |
| :--- | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Nass River | 7,944 | 8,002 | 17,390 | 11,431 | 10,000 | 12,525 | 15,800 |

B-8

Skeena Area Chinook Escapements


|  | Base | 86 | 88 | 87 | 88 | 89 | Goal |
| :--- | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Skeena River | 20,883 | 63,699 | 69,988 | 69,120 | 68,706 | 67,202 | 41,800 |

gesnecb.cht

## Area 6 Index Chinook Escapements

Probably Not Rebuilding


|  | Base | 86 | 88 | 87 | 88 | 89 | Goel |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Area 6 Index Stook | 2,781 | 1,609 | 2,615 | 1,688 | 3,186 | 898 | 6,620 |

## Area 8 Index Chinook Escapements

Probably Not Rebuilding


|  | Base | 86 | 88 | 87 | 88 | 80 | Goal |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Area B Index Stook | 2,725 | 4,560 | 9,362 | 1,466 | 1,860 | 2,635 | 6,460 |

## Rivers Inlet Chinook Escapements



|  | Base | 85 | 88 | 87 | 88 | 89 | Goal |
| :--- | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Rivere Inlet | 2,476 | 3,371 | 7,629 | 6,239 | $4,42 \theta$ | 3,266 | 4,960 |

## Smith Inlet Chinook Escapements

Probably Not Rebuilding


|  | Base | 85 | 88 | 87 | 88 | 88 | Goal |
| :--- | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 8mith Inlet | 1,055 | 230 | 632 | 1,060 | 1,050 | 225 | 2,100 |

## WCVI Chinook Escapements

Indeterminate


|  | Ba8e | 86 | 86 | 87 | 88 | 89 | Goal |
| :--- | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| W. C. Vancouver 181. | 6,745 | 4,900 | 4,810 | 3,620 | 6,600 | 6,480 | 11,500 |

## Upper Georgia Str. Chinook Escapements

Indeterminate


|  | Base | 85 | 88 | 87 | 88 | 89 | Goal |
| :--- | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Up. Georgla 8trait | 2,646 | 4,800 | 1,830 | 6,700 | 3,300 | 8,807 | 6,100 |

Lower Georgia Str. Chinook Escapements
Probably Not Rebuilding


|  | Base | 85 | 86 | 87 | 88 | 89 | Goal |
| :--- | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Low. Georgla Stralt | 11,139 | 4,798 | 2,830 | 2,750 | 6,814 | 6,830 | 22,300 |

## Upper Fraser R. Chinook Escapements

Probably Rebuilding


|  | Base | 86 | 88 | 87 | 88 | 89 | Goal |
| :--- | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Upper Fraser River | $12,22 \theta$ | 34,527 | 41,207 | 34,520 | 34,248 | 26,310 | 24,600 |

## Middle Fraser R. Chinook Escapements

Probably Rebuilding


|  | Bage | 86 | 86 | 87 | 88 | 89 | Goal |
| :--- | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Middie Fraser River | 8,216 | 17,595 | 27,349 | 27,330 | 24,164 | 15,095 | 21,100 |

## Thompson R. Chinook Escapements

Probably Rebuilding


|  | Base | 88 | 88 | 87 | 88 | 88 | Qoal |
| :--- | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Thompson Rlver | 22,050 | 39,987 | 46,190 | 38,730 | 47,103 | 37,975 | 55,700 |

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Harrison Chinook Escapements
Not Rebuilding


|  | Base | 88 | 88 | 87 | 86 | 88 | Goal |
| :--- | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Harrison Rlver | 120,838 | 174,777 | 162,688 | 78,038 | 36,118 | 74,885 | 241,700 |

Skagit Spring Chinook Escapements
Indeterminate


|  | Base | 86 | 88 | 87 | 88 | 88 | Goal |
| :--- | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Skaglt R. Spring | 1,217 | 3,265 | 1,895 | 2,108 | 1,888 | 1,863 | 3,000 |

## gkagepob.oht

## Skagit Sum./Fall Chinook Escapements

Probably Not Rebuilding


|  | Base | 85 | 88 | 87 | 88 | 89 | Coal |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 8kagIt R. Bum./Fall | 13,265 | 18,298 | 18,127 | 9,647 | 11,954 | 6,778 | 14,900 |

## Stillaguamish River Chinook Escapements

## Indeterminate



|  | Be8s | 85 | 88 | 87 | 88 | 88 | Goal |
| :--- | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| StIIlaguamish R. | 817 | 1,409 | 1,277 | 1,321 | 717 | 811 | 2,000 |

9tllagb.oht

## Snohomish River Chinook Escapements

Probably Not Rebuilding


|  | Base | 85 | 88 | 87 | 88 | 89 | Goal |
| :--- | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Snohomiah Rlver | 6,028 | 4,873 | 4,534 | 4,689 | 4,613 | 2,947 | 5,250 |

## Green River Chinook Escapements

Rebuilding


|  | Bese | 86 | 88 | 87 | 日8 | 88 | G081 |
| :--- | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Green River | 6,723 | 2,908 | 4,792 | 10,338 | 7,994 | 11,612 | 5,800 |

## Quillayute Summer Chinook Escapements

Indeterminate


|  | Base | 85 | 88 | 87 | 88 | 88 | Goal |
| :--- | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Qulllayute R. Bummer | 1,275 | 800 | 700 | 800 | 1,300 | 2,200 | 1,200 |

quilaucbecht

## Grays Harbor Spring Chinook Escapements

Rebuilding


|  | Base | 85 | 86 | 87 | 88 | 88 | Coal |
| :--- | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Graya Harbor Spr. | 425 | 1,200 | 1,800 | 800 | 3,000 | 1,800 | 1,400 |

## grayapcb.cht

## Grays Harbor Fall Chinook Escapements

Rebuilding


|  | 日ase | 86 | 88 | 87 | 88 | 89 | Goal |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Grays Harbor Fall | 8,675 | 8,600 | 10,600 | 18,800 | 28,200 | 26,600 | 14,600 |

## Columbia R. Spring Chinook Escapements

Probably Not Rebuilding


|  | Base | 85 | 88 | 87 | 88 | 88 | Goal |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Columbla R. 8pring | 27,800 | 27,200 | 36,500 | 41,400 | 35,100 | 26,100 | 84,000 |

## Columbia R. Summer Chinook Escapements

Probably Not Rebuilding


|  | Base | 86 | 88 | 87 | 88 | 89 | Goal |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Columbla R. 8ummer | 23,100 | 23,200 | 25,700 | 31,800 | 30,100 | 28,700 | 86,000 |

arsummob, aht

## Columbia R. Bright Chinook Escapements

Probably Rebuilding


|  | Ba日e | 85 | 88 | 87 | 88 | 88 | Qoal |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Col. R. Brlahte | 28,325 | 93,300 | 113,300 | 164,100 | 114,700 | 88,600 | 40,000 |

arurbtab.aht

## Quillayute Fall Chinook Escapements

## Increasing



|  | Base | 65 | 88 | 87 | 88 | 89 | Floor |
| :--- | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Qullayute R, Fall | 5,860 | 6,200 | 10,000 | 12,400 | 15,200 | 10,000 | 3,000 |

qulliacb.cht

## Hoh Spr/Sum Chinook Escapements

Increasing


|  | Base | 85 | 88 | 87 | 88 | 88 | Floor |
| :--- | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Hoh River Spr./8um. | 1,325 | 1,000 | 1,600 | 1,700 | 2,600 | 4,800 | 900 |

hohropeb.eht

Hoh Fall Chinook Escapements

## Increasing



|  | Base | $\mathbf{8 5}$ | $\mathbf{8 6}$ | 87 | 88 | 89 | Floor |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Hoh Rlver Fall | 2,875 | 1,700 | 5,000 | 4,000 | 2,700 | 5,100 | 1,200 |

## Queets Spr/Sum Chinook Escapements

Increasing


|  | 日ase | 85 | 88 | 87 | 88 | 89 | Floor |
| :--- | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Que日te 8pr./8um. | $\mathbf{8 2 5}$ | 700 | 900 | 800 | 1,800 | 2,500 | 700 |

## Queets Fall Chinook Escapements

Increasing


|  | Base | 85 | 88 | 87 | 88 | 80 | Floor |
| :--- | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Queets Fall | 3,875 | 3,600 | 7,700 | 6,000 | 7,800 | 8,900 | 2,500 |

## Lewis R. Fall Chinook Escapements

Indeterminate


|  | Base | 86 | 88 | 87 | 88 | 89 | Coal |
| :--- | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Lewle Rlver Fall | 13,021 | 7,481 | 11,983 | 12,935 | 12,069 | 21,199 | 10,000 |

lowlyreb.cht

## Oregon Coastal Chinook Escapements

Increasing


|  | Bass | 86 | 86 | 87 | 88 | 89 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Orogon Coastal | 91 | 133 | 121 | 129 | 221 | 161 |

## APPENDIX C

## Detailed Exploitation Rate and Fishery Index Data

Southeast Alaska Troll, Total Mortality ..... C-1
Southeast Alaska Troll, Reported Catch ..... C-2
Southeast Alaska Troll, Total Mortality, SEAK Stock Only ..... C-3
Southeast Alaska Troll, Reported Catch, SEAK Stock Only ..... C-4
North/Central B.C. Troll, Total Mortality ..... C-5
North/Central B.C. Troll, Reported Catch ..... C-6
West Coast Vancouver Island Troll, Total Mortality ..... C-7
West Coast Vancouver Island Troll, Reported Catch ..... C-8
Strait of Georgia Sport and Troll Combined, Total Mortality ..... C-9
Strait of Georgia Sport and Troll Combined, Reported Catch ..... C-10
Strait of Georgia Sport, Total Mortality ..... C- 11
Strait of Georgia Sport, Reported Catch ..... C-12
Strait of Georgia Troll, Total Mortality ..... C-13
Strait of Georgia Troll, Reported Catch ..... C-14
Washington/Oregon Sport and Troll Combined, Total Mortality ..... C-15
Washington/Oregon Sport and Troll Combined, Reported Catch ..... C-16

FISHERY: Southeast Alaska Troll, Total Mortality

| TOTAL <br> Year | MORTALITY AKS | EXPLO <br> LRW | TATION QUI | RATES QUI | $\begin{gathered} \text { BY STOCH } \\ \text { QUI } \end{gathered}$ | RBT | RBT | RBT | URB | URB | URB | WSH |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Age 4 | Age 4 | Age 3 | Age 4 | Age 5 | Age 3 | Age 4 | Age 5 | Age 3 | Age 4 | Age 5 | Age 4 |
| ====== | N | NA | 0.014 | 0.022 | 0.087 | 0.055 | 0.253 | 2 | 0.016 |  |  |  |
| 80 | NA | NA | 0.012 | 0.106 | 0.060 | 0.076 | 0.275 | 0.357 | 0.042 | 0.167 | 0.238 | 0.134 |
| 81 | NA | 0.076 | 0.013 | 0.111 | 0.108 | 0.083 | 0.354 | 0.374 | NA | 0.175 | 0.459 | 0.068 |
| 82 | 0.126 | 0.078 | NA | 0.143 | 0.166 | 0.070 | 0.281 | 0.350 | 0.023 | 0.125 | 0.186 | 0.060 |
| 83 | 0.182 | 0.075 | 0.024 | 0.214 | 0.231 | 0.074 | 0.320 | 0.481 | 0.018 | 0.196 | NA | 0.097 |
| 84 | 0.095 | NA | 0.012 | 0.114 | 0.203 | 0.116 | 0.311 | 0.243 | 0.023 | 0.192 | 0.264 | 0.049 |
| 85 | 0.103 | NA | 0.031 | 0.173 | 0.241 | 0.126 | 0.144 | 0.355 | 0.016 | 0.156 | 0.261 | 0.175 |
| 86 | 0.164 | 0.053 | 0.024 | 0.111 | 0.162 | NA | 0.353 | 0.037 | 0.013 | 0.111 | 0.191 | NA |
| 87 | 0.085 | 0.025 | 0.022 | 0.135 | 0.168 | 0.042 | NA | NA | 0.025 | 0.138 | 0.270 | 0.127 |
| 88 | 0.100 | 0.011 | NA | 0.119 | 0.092 | 0.012 | 0.186 | NA | 0.016 | 0.063 | 0.210 | 0.044 |
| 89 | 0.173 | 0.012 | 0.007 | 0.098 | 0.160 | 0.022 | 0.165 | 0.230 | 0.020 | 0.037 | 0.132 | 0.042 |
| Base | 0.126 | 0.077 | 0.013 | 0.096 | 0.105 | 0.071 | 0.291 | 0.393 | 0.027 | 0.152 | 0.295 | 0.087 |





```
Stock Identifiers
AKS = ALASKA SPRING
LRW = LEWIS RIVER WILD
QUI = QUINSAN
RBT = ROBERTSON CREEK
URB = COLUMBIA RIVER UPRIVER BRIGHT
WSH = WILLAMETTE SPRING
```

FISHERY: Southeast Alaska Troll, Reported Catch

| REPORTED | CATCH AKS <br> Age 4 | EXPLOI LRW Age 4 | TATION QUI Age 3 | RATES B <br> QUI <br> Age 4 | $\begin{gathered} \text { Y stock } \\ \text { QuI } \\ \text { Age } 5 \end{gathered}$ | $\begin{array}{r} \text { RBT } \\ \text { Age } 3 \end{array}$ | $\begin{array}{r} \text { RBT } \\ \text { Age } 4 \end{array}$ | $\begin{array}{r} \text { RBT } \\ \text { Age } 5 \end{array}$ | URB <br> Age 3 | URB <br> Age 4 | URB <br> Age 5 | WSH Age 4 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 79 | NA | NA | 0.006 | 0.022 | 0.085 | 0.026 | 0.252 | 0.492 | 0.000 | 0.141 | NA | NA |
| 80 | NA | NA | 0.002 | 0.106 | 0.060 | 0.047 | 0.274 | 0.353 | 0.023 | 0.166 | 0.238 | 0.114 |
| 81 | NA | 0.074 | 0.004 | 0.108 | 0.106 | 0.056 | 0.345 | 0.366 | NA | 0.170 | 0.450 | 0.056 |
| 82 | 0.084 | 0.068 | NA | 0.127 | 0.151 | 0.031 | 0.251 | 0.308 | 0.006 | 0.112 | 0.167 | 0.042 |
| 83 | 0.126 | 0.063 | 0.011 | 0.196 | 0.213 | 0.024 | 0.293 | 0.443 | 0.001 | 0.180 | NA | 0.075 |
| 84 | 0.055 | NA | 0.003 | 0.102 | 0.185 | 0.056 | 0.278 | 0.218 | 0.004 | 0.172 | 0.236 | 0.038 |
| 85 | 0.067 | NA | 0.002 | 0.147 | 0.207 | 0.061 | 0.123 | 0.307 | 0.004 | 0.133 | 0.224 | 0.105 |
| 86 | 0.113 | 0.047 | 0.007 | 0.101 | 0.147 | NA | 0.319 | 0.037 | 0.005 | 0.101 | 0.173 | NA |
| 87 | 0.034 | 0.020 | 0.001 | 0.108 | 0.134 | 0.024 | NA | NA | 0.004 | 0.110 | 0.218 | 0.085 |
| 88 | 0.051 | 0.010 | NA | 0.106 | 0.081 | 0.004 | 0.166 | NA | 0.000 | 0.055 | 0.187 | 0.029 |
| 89 | 0.085 | 0.010 | 0.000 | 0.082 | 0.134 | 0.009 | 0.139 | 0.196 | 0.001 | 0.031 | 0.111 | 0.029 |
| Base | 0.084 | 0.071 | 0.004 | 0.091 | 0.100 | 0.040 | 0.281 | 0.380 | 0.009 | 0.147 | 0.285 | 0.071 |

 reported catch exploitation rate index by stock

| Year | AKS | $\begin{gathered} \text { LRW } \\ \text { Age } 4 \end{gathered}$ | QUI | QUI | QUI | RBT |  | RBT | URB <br> Age 3 | URB | URB | WSH |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 79 | NA | NA | 1.519 | 0.24 |  |  |  |  |  | 0.955 | NA | NA | 0.973 |
| 79 | NA | NA | 1.519 | 0.24 | 0.84 | 0.653 | 0.897 | 1.296 | 0.00 | 0.955 | NA | NA | 0.973 |
| 80 | NA | NA | 0.556 | 1.165 | 0.595 | 1.174 | 0.977 | 0.929 | 2.401 | 1.128 | 0.834 | 1.616 | 0.982 |
| 81 | NA | 1.042 | 0.925 | 1.192 | 1.056 | 1.398 | 1.231 | 0.963 | NA | 1.155 | 1.581 | 0.795 | 1.181 |
| 82 | 1.000 | 0.958 | NA | 1.399 | 1.505 | 0.775 | 0.895 | 0.812 | 0.599 | 0.762 | 0.585 | 0.590 | 0.864 |
| 83 | 1.494 | 0.881 | 2.761 | 2.158 | 2.132 | 0.592 | 1.046 | 1.166 | 0.112 | 1.223 | NA | 1.065 | 1.271 |
| 84 | 0.654 | NA | 0.849 | 1.123 | 1.852 | 1.385 | 0.990 | 0.573 | 0.421 | 1.171 | 0.829 | 0.538 | 0.903 |
| 85 | 0.793 | NA | 0.433 | 1.613 | 2.071 | 1.517 | 0.437 | 0.809 | 0.474 | 0.906 | 0.786 | 1.487 | 0.925 |
| 86 | 1.338 | 0.656 | 1.726 | 1.116 | 1.471 | NA | 1.138 | 0.097 | 0.509 | 0.686 | 0.607 | NA | 0.723 |
| 87 | 0.408 | 0.279 | 0.188 | 1.184 | 1.334 | 0.586 | NA | NA | 0.427 | 0.749 | 0.764 | 1.200 | 0.816 |
| 88 | 0.601 | 0.140 | NA | 1.169 | 0.809 | 0.099 | 0.591 | NA | 0.000 | 0.377 | 0.658 | 0.406 | 0.584 |
| 89 | 1.011 | 0.146 | 0.043 | 0.903 | 1.342 | 0.233 | 0.495 | 0.515 | 0.158 | 0.209 | 0.391 | 0.415 | 0.530 |

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

FISHERY: Southeast Alaska Troll, Total Mortality (SEAK Spring Stock Only, Base Period 1982-84)

 TOTAL MORTALITY EXPLOITATION RATE INDEX BY STOCK AKS AKS
Year Age 4 Age 5 Fishery



| 79 | NA | NA |  |
| :--- | :--- | :--- | :--- |
| 80 | NA | NA |  |
| 81 | NA | NA |  |
| 82 | 0.940 | NA | 0.940 |
| 83 | 1.356 | 0.827 | 0.977 |
| 84 | 0.705 | 1.173 | 1.040 |
| 85 | 0.766 | 0.532 | 0.598 |
| 86 | 1.223 | 0.401 | 0.634 |
| 87 | 0.636 | 0.880 | 0.811 |
| 88 | 0.746 | 0.682 | 0.700 |
| 89 | 1.288 | 0.451 | 0.688 |

[^2]Fishery: Southeast Alaska Troll, Reported Catch (SEAK Spring Stock Only, Base Period 1982-84)


Stock Identifiers
----------------
AKS $=$ ALASKA SPRING

FISHERY: North/Central Troll, Total Mortality

| TOTAL M Year | MORTALITY <br> AKS <br> Age 4 |  | ITATION BQR Age 4 | RATES <br> QUI <br> Age 3 | BY STOCK QUI Age 4 | QUI Age 5 | $\begin{array}{r} \text { RBT } \\ \text { Age } 3 \end{array}$ | $\begin{array}{r} \text { RBT } \\ \text { Age } 4 \end{array}$ | $\begin{array}{r} \text { RBT } \\ \text { Age } 5 \end{array}$ | SAM <br> Age 4 | URB <br> Age 3 | URB Age 4 | URB <br> Age 5 | $\begin{array}{r} \text { WSH } \\ \text { Age } 4 \end{array}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 79 | NA | 0.084 | 0.099 | 0.048 | 0.174 | 0.113 | 0.093 | 0.167 | 0.109 | NA | 0.013 | 0.085 | NA | NA |
| 80 | NA | 0.087 | 0.080 | 0.051 | 0.166 | 0.220 | 0.088 | 0.132 | 0.161 | NA | 0.026 | 0.085 | 0.066 | 0.132 |
| 81 | NA | 0.094 | 0.084 | 0.081 | 0.177 | 0.191 | 0.062 | 0.145 | 0.267 | NA | NA | 0.075 | 0.162 | 0.087 |
| 82 | 0.005 | 0.070 | 0.103 | 0.035 | 0.083 | 0.127 | 0.070 | 0.167 | 0.067 | NA | 0.026 | 0.041 | 0.025 | 0.024 |
| 83 | 0.008 | NA | 0.104 | 0.063 | 0.150 | 0.233 | 0.080 | 0.121 | 0.082 | NA | 0.034 | 0.068 | NA | 0.028 |
| 84 | 0.006 | 0.062 | NA | 0.011 | 0.064 | 0.073 | 0.041 | 0.150 | 0.254 | NA | 0.025 | 0.105 | NA | 0.025 |
| 85 | 0.005 | 0.033 | NA | 0.018 | 0.046 | 0.036 | 0.089 | 0.243 | 0.211 | NA | 0.021 | 0.084 | 0.071 | 0.023 |
| 86 | 0.008 | 0.065 | 0.199 | 0.052 | 0.094 | 0.089 | NA | 0.140 | NA | NA | 0.019 | 0.066 | 0.077 | NA |
| 87 | 0.002 | 0.012 | 0.072 | 0.028 | 0.079 | 0.140 | 0.055 | NA | NA | NA | 0.035 | 0.108 | 0.126 | 0.023 |
| 88 | 0.009 | NA | NA | 0.012 | 0.050 | 0.021 | 0.035 | 0.100 | NA | NA | 0.017 | 0.053 | 0.106 | 0.029 |
| 89 | NA | 0.028 | NA | 0.005 | 0.027 | 0.036 | 0.029 | 0.105 | 0.181 | NA | 0.012 | 0.047 | 0.147 | 0.019 |
| Base | 0.005 | 0.084 | 0.092 | 0.054 | 0.150 | 0.162 | 0.078 | 0.153 | 0.151 | -1.000 | 0.022 | 0.071 | 0.084 | 0.081 |


| TOTAL M Year | MORTALIT <br> AKS <br> Age 4 |  | ITATION BQR Age 3 | RATE <br> BQR Age 4 | $\begin{gathered} \text { INDEX BY } \\ \text { QUI } \\ \text { Age } 3 \end{gathered}$ | STOCK <br> QUI Age 4 | $\begin{array}{r} \text { QUI } \\ \text { Age } 5 \end{array}$ | $\begin{array}{r} \text { RBT } \\ \text { Age } 3 \end{array}$ | $\begin{array}{r} \text { RBT } \\ \text { Age } 4 \end{array}$ | $\begin{array}{r} \text { RBT } \\ \text { Age } 5 \end{array}$ | SAM <br> Age 4 | URB <br> Age 3 | URB <br> Age 4 | $\begin{array}{r} \text { URB } \\ \text { Age } 5 \end{array}$ | $\begin{array}{r} \text { WSH } \\ \text { Age } 4 \end{array}$ | Fishery |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 79 | NA | NA | 1.000 | 1.079 | 0.896 | 1.161 | 0.693 | 1.190 | 1.092 | 0.725 | NA | 0.612 | 1.194 | NA | NA | 0.969 |
| 80 | NA | NA | 1.044 | 0.874 | 0.957 | 1.106 | 1.355 | 1.120 | 0.861 | 1.066 | NA | 1.200 | 1.183 | 0.788 | 1.632 | 1.095 |
| 81 | NA | NA | 1.121 | 0.922 | 1.501 | 1.179 | 1.173 | 0.796 | 0.951 | 1.767 | NA | NA | 1.053 | 1.922 | 1.072 | 1.228 |
| 82 | 1.000 | NA | 0.835 | 1.125 | 0.646 | 0.553 | 0.779 | 0.895 | 1.095 | 0.442 | NA | 1.188 | 0.571 | 0.290 | 0.296 | 0.709 |
| 83 | 1.649 | NA | NA | 1.130 | 1.168 | 0.997 | 1.436 | 1.023 | 0.794 | 0.542 | NA | 1.579 | 0.956 | NA | 0.345 | 0.953 |
| 84 | 1.371 | NA | 0.740 | NA | 0.213 | 0.429 | 0.451 | 0.527 | 0.980 | 1.682 | NA | 1.170 | 1.462 | NA | 0.304 | 0.808 |
| 85 | 0.996 | NA | 0.392 | NA | 0.335 | 0.308 | 0.222 | 1.141 | 1.587 | 1.397 | NA | 0.960 | 1.176 | 0.839 | 0.282 | 0.803 |
| 86 | 1.716 | NA | 0.772 | 2.168 | 0.976 | 0.629 | 0.550 | NA | 0.918 | NA | NA | 0.897 | 0.927 | 0.915 | NA | 0.925 |
| 87 | 0.467 | NA | 0.146 | 0.784 | 0.522 | 0.526 | 0.864 | 0.706 | NA | NA | NA | 1.615 | 1.505 | 1.495 | 0.279 | 0.770 |
| 88 | 1.907 | NA | NA | NA | 0.226 | 0.334 | 0.130 | 0.450 | 0.653 | NA | NA | 0.774 | 0.742 | 1.255 | 0.353 | 0.502 |
| 89 | NA | NA | 0.337 | NA | 0.100 | 0.179 | 0.222 | 0.364 | 0.686 | 1.198 | NA | 0.550 | 0.651 | 1.738 | 0.229 | 0.582 |

Stock Identifiers
AKS $=$ ALASKA SPRING
$B Q R=$ BIG QUALICUM
QUI = QUINSAM
RBT = ROBERTSON CREEK
SAM $=$ SAMISH FALL FING
URB $=$ COLUMBIA RIVER UPRIVER BRIGHT
WSH = WILLAMETTE SPRING

## FISHERY: North/Central Troll, Reported Catch

| REPORTED Year | CATCH AKS Age 4 | EXPLOI BQR Age 3 | TATION BQR Age 4 | RATES QUI Age 3 |  | $\begin{array}{r} \text { QUI } \\ \text { Age } 5 \end{array}$ | $\begin{array}{r} \text { RBT } \\ \text { Age } 3 \end{array}$ | $\begin{array}{r} \text { RBT } \\ \text { Age } 4 \end{array}$ | $\begin{array}{r} \text { RBT } \\ \text { Age } 5 \end{array}$ | URB <br> Age 3 | URB <br> Age 4 | URB <br> Age 5 | $\begin{array}{r} \text { WSH } \\ \text { Age } 4 \end{array}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 79 | NA | 0.074 | 0.099 | 0.040 | 0.174 | 0.113 | 0.080 | 0.166 | 0.106 | 0.009 | 0.085 | NA | NA |
| 80 | NA | 0.079 | 0.080 | 0.042 | 0.165 | 0.214 | 0.080 | 0.131 | 0.161 | 0.021 | 0.084 | 0.066 | 0.117 |
| 81 | NA | 0.084 | 0.084 | 0.069 | 0.176 | 0.191 | 0.055 | 0.144 | 0.265 | NA | 0.075 | 0.162 | 0.077 |
| 82 | 0.004 | 0.064 | 0.103 | 0.031 | 0.083 | 0.127 | 0.060 | 0.166 | 0.067 | 0.023 | 0.041 | 0.025 | 0.017 |
| 83 | 0.007 | NA | 0.104 | 0.056 | 0.150 | 0.233 | 0.071 | 0.120 | 0.082 | 0.030 | 0.068 | NA | 0.024 |
| 84 | 0.006 | 0.060 | NA | 0.009 | 0.063 | 0.073 | 0.029 | 0.149 | 0.254 | 0.021 | 0.105 | NA | 0.021 |
| 85 | 0.004 | 0.031 | NA | 0.015 | 0.046 | 0.036 | 0.073 | 0.240 | 0.211 | 0.018 | 0.084 | 0.071 | 0.021 |
| 86 | 0.007 | 0.052 | 0.196 | 0.047 | 0.094 | 0.089 | NA | 0.140 | NA | 0.017 | 0.066 | 0.077 | NA |
| 87 | 0.002 | 0.003 | 0.068 | 0.016 | 0.073 | 0.140 | 0.043 | NA | NA | 0.020 | 0.103 | 0.125 | 0.016 |
| 88 | 0.006 | NA | NA | 0.010 | 0.048 | 0.021 | 0.027 | 0.095 | NA | 0.006 | 0.050 | 0.102 | 0.021 |
| 89 | NA | 0.023 | NA | 0.003 | 0.027 | 0.036 | 0.020 | 0.101 | 0.178 | 0.000 | 0.044 | 0.144 | 0.015 |
| Base | 0.004 | 0.075 | 0.092 | 0.045 | 0.149 | 0.161 | 0.069 | 0.152 | 0.150 | 0.018 | 0.071 | 0.084 | 0.070 |

 REPORTED CATCH EXPLOITATION RATE INDEX BY Stock

| Year | AKS Age 4 | $\begin{array}{r} \text { BQR } \\ \text { Age } 3 \end{array}$ | $\begin{array}{r} \text { BQR } \\ \text { Age } 4 \end{array}$ | $\begin{array}{r} \text { QUI } \\ \text { Age } 3 \end{array}$ | $\begin{array}{r} \text { QUI } \\ \text { Age } 4 \end{array}$ | $\begin{array}{r} \text { QUI } \\ \text { Age } 5 \end{array}$ | $\begin{array}{r} \text { RBT } \\ \text { Age } 3 \end{array}$ | $\begin{array}{r} \text { RBT } \\ \text { Age } 4 \end{array}$ | $\begin{array}{r} \text { RBT } \\ \text { Age } 5 \end{array}$ | URB Age 3 | URB <br> Age 4 | URB <br> Age 5 | WSH <br> Age 4 | F |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 79 | NA | 0.980 | 1.079 | 0.885 | 1.164 | 0.700 | 1.167 | 1.093 | 0.711 | 0.506 | 1.195 | NA | NA | 0.963 |
| 80 | NA | 1.052 | 0.874 | 0.921 | 1.106 | 1.331 | 1.163 | 0.862 | 1.074 | 1.188 | 1.178 | 0.788 | 1.661 | 1.091 |
| 81 | NA | 1.121 | 0.922 | 1.518 | 1.175 | 1.183 | 0.795 | 0.948 | 1.770 | NA | 1.052 | 1.922 | 1.091 | 1.235 |
| 82 | 1.000 | 0.847 | 1.125 | 0.676 | 0.555 | 0.786 | 0.874 | 1.096 | 0.445 | 1.306 | 0.575 | 0.290 | 0.247 | 0.710 |
| 83 | 1.749 | NA | 1.130 | 1.241 | 1.000 | 1.449 | 1.031 | 0.794 | 0.546 | 1.679 | 0.963 | NA | 0.347 | 0.964 |
| 84 | 1.468 | 0.801 | NA | 0.200 | 0.424 | 0.455 | 0.426 | 0.983 | 1.695 | 1.175 | 1.474 | NA | 0.295 | 0.820 |
| 85 | 1.026 | 0.419 | NA | 0.321 | 0.309 | 0.224 | 1.060 | 1.583 | 1.408 | 1.010 | 1.185 | 0.839 | 0.293 | 0.810 |
| 86 | 1.843 | 0.696 | 2.134 | 1.036 | 0.631 | 0.555 | NA | 0.926 | NA | 0.937 | 0.929 | 0.915 | NA | 0.923 |
| 87 | 0.473 | 0.041 | 0.743 | 0.355 | 0.489 | 0.872 | 0.626 | NA | NA | 1.146 | 1.456 | 1.477 | 0.224 | 0.727 |
| 88 | 1.642 | NA | NA | 0.223 | 0.321 | 0.131 | 0.396 | 0.624 | NA | 0.313 | 0.699 | 1.207 | 0.298 | 0.468 |
| 89 | NA | 0.300 | NA | 0.067 | 0.180 | 0.224 | 0.288 | 0.668 | 1.190 | 0.000 | 0.617 | 1.712 | 0.219 | 0.566 |

Stock Identifiers
AKS $=$ ALASKA SPRING
BQR = BIG QUALICUM
QUI $=$ QUINSAM
RBT $=$ ROBERTSON CREEK
URB = COLUMBIA RIVER UPRIVER BRIGHT
WSH = WILLAMETTE SPRING

FISHERY: West Coast Vancouver Island Troll, Total Mortality

| TOTAL M | MORTALITY <br> BON Age 3 |  | ITATION CWF Age 3 | RATES CWF Age 4 | BY STOC <br> GAD Age 3 | GAD Age 4 | LRW <br> Age 4 | $\begin{array}{r} \text { RBT } \\ \text { Age } 3 \end{array}$ | $\begin{array}{r} \text { RBT } \\ \text { Age } 4 \end{array}$ | $\begin{array}{r} \text { SAM } \\ \text { Age } 3 \end{array}$ | SAM Age 4 | $\begin{array}{r} \text { SPR } \\ \text { Age } 3 \end{array}$ | $\begin{array}{r} \text { SPR } \\ \text { Age } 4 \end{array}$ | $\begin{array}{r} \text { SPS } \\ \text { Age } 3 \end{array}$ | $\begin{array}{r} \text { SPS } \\ \text { Age } 4 \end{array}$ | $\begin{array}{r} \text { STP } \\ \text { Age } 3 \end{array}$ | $\begin{array}{r} \text { STP } \\ \text { Age } 4 \end{array}$ | URB <br> Age 3 | URB <br> Age 4 | UWA Age 3 | UWA Age 4 | $\begin{array}{r} \text { WSH } \\ \text { Age } 4 \end{array}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 79 | 0.222 | NA | NA | NA | NA | NA | NA | 0.035 | 0.074 | NA | 0.312 | 0.199 | 0.161 | NA | 0.256 | NA | NA | 0.052 | 0.088 | 0.070 | 0.167 | NA |
| 80 | 0.108 | 0.152 | 0.110 | NA | NA | NA | NA | 0.043 | 0.101 | NA | NA | 0.243 | 0.276 | NA | NA | NA | NA | 0.040 | 0.063 | 0.152 | 0.131 | 0.060 |
| 81 | 0.174 | 0.157 | NA | 0.132 | 0.046 | NA | 0.060 | 0.020 | 0.026 | NA | NA | 0.186 | 0.178 | 0.051 | NA | 0.212 | NA | NA | 0.049 | 0.091 | 0.174 | 0.010 |
| 82 | 0.282 | 0.352 | NA | 0.202 | 0.079 | 0.221 | 0.086 | 0.024 | 0.035 | 0.065 | NA | 0.191 | 0.245 | 0.106 | 0.254 | 0.204 | 0.191 | 0.031 | 0.026 | 0.143 | 0.218 | 0.030 |
| 83 | 0.348 | 0.333 | 0.042 | 0.230 | NA | 0.274 | 0.070 | 0.012 | 0.035 | NA | 0.203 | 0.302 | 0.280 | 0.121 | 0.201 | 0.285 | 0.341 | 0.010 | 0.020 | 0.087 | 0.207 | 0.006 |
| 84 | 0.278 | 0.567 | 0.021 | 0.223 | 0.118 | NA | NA | 0.049 | 0.053 | NA | NA | 0.274 | 0.356 | 0.108 | 0.228 | 0.367 | 0.387 | 0.023 | 0.061 | 0.199 | 0.161 | 0.022 |
| 85 | 0.271 | NA | 0.032 | 0.149 | NA | 0.181 | NA | 0.031 | NA | NA | NA | 0.134 | 0.270 | 0.059 | 0.156 | 0.187 | 0.155 | 0.023 | 0.050 | 0.101 | 0.208 | 0.015 |
| 86 | NA | NA | 0.053 | 0.212 | NA | NA | 0.034 | NA | NA | NA | NA | 0.249 | 0.186 | 0.070 | 0.268 | 0.205 | 0.154 | 0.040 | 0.062 | 0.097 | 0.239 | NA |
| 87 | 0.226 | NA | 0.016 | 0.141 | NA | NA | 0.111 | 0.015 | NA | NA | NA | 0.104 | NA | 0.076 | 0.150 | 0.271 | NA | 0.031 | 0.051 | 0.053 | 0.090 | 0.020 |
| 88 | NA | 0.280 | 0.024 | 0.153 | 0.036 | NA | 0.087 | 0.021 | 0.048 | 0.058 | NA | 0.219 | NA | 0.030 | 0.201 | 0.280 | 0.396 | 0.015 | 0.092 | NA | 0.164 | 0.015 |
| 89 | NA | NA | 0.006 | 0.093 | 0.037 | 0.104 | 0.055 | 0.006 | 0.020 | 0.012 | 0.088 | 0.071 | 0.105 | 0.034 | 0.093 | NA | 0.108 | 0.005 | 0.038 | NA | NA | 0.016 |
| Base | 0.197 | 0.220 | 0.110 | 0.167 | 0.062 | 0.221 | 0.073 | 0.031 | 0.059 | 0.065 | 0.312 | 0.205 | 0.215 | 0.079 | 0.255 | 0.208 | 0.191 | 0.041 | 0.056 | 0.114 | 0.173 | 0.033 |


| TOTAL Year | MORTALITY <br> BON <br> Age 3 |  | $\begin{gathered} \text { ITATION } \\ \text { CWF } \\ \text { Age } 3 \end{gathered}$ | RATE <br> CWF <br> Age 4 | NDEX BY <br> GAD <br> Age 3 | STOCK <br> GAD <br> Age 4 | LRW <br> Age 4 | $\begin{array}{r} \text { RBT } \\ \text { Age } 3 \end{array}$ | RBT Age 4 | SAM Age 3 | SAM <br> Age 4 | $\begin{array}{r} \text { SPR } \\ \text { Age } 3 \end{array}$ | SPR Age 4 | $\begin{array}{r} \text { SPS } \\ \text { Age } 3 \end{array}$ | $\begin{array}{r} \text { SPS } \\ \text { Age } 4 \end{array}$ | $\begin{array}{r} \text { STP } \\ \text { Age } 3 \end{array}$ | STP <br> Age 4 | URB <br> Age 3 | URB Age 4 | UWA Age 3 | UWA Age 4 | WSH Age 4 | ishery |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 79 | 1.130 | NA | NA | NA | NA | NA | NA | 1.154 | 1.251 | NA | 1.000 | 0.971 | 0.749 | NA | 1.005 | NA | NA | 1.275 | 1.556 | 0.612 | 0.967 | NA | 0.988 |
| 80 | 0.551 | 0.690 | 1.000 | NA | NA | NA | NA | 1.404 | 1.707 | NA | NA | 1.186 | 1.284 | NA | NA | NA | NA | 0.982 | 1.121 | 1.333 | 0.759 | 1.799 | 1.018 |
| 81 | 0.885 | 0.711 | NA | 0.791 | 0.740 | NA | 0.824 | 0.661 | 0.446 | NA | NA | 0.908 | 0.828 | 0.652 | NA | 1.019 | NA | NA | 0.870 | 0.802 | 1.011 | 0.295 | 0.829 |
| 82 | 1.434 | 1.600 | NA | 1.209 | 1.260 | 1.000 | 1.176 | 0.782 | 0.596 | 1.000 | NA | 0.935 | 1.139 | 1.348 | 0.995 | 0.981 | 1.000 | 0.743 | 0.453 | 1.252 | 1.262 | 0.906 | 1.120 |
| 83 | 1.770 | 1.513 | 0.377 | 1.374 | NA | 1.240 | 0.954 | 0.395 | 0.592 | NA | 0.652 | 1.476 | 1.303 | 1.538 | 0.787 | 1.370 | 1.781 | 0.243 | 0.358 | 0.762 | 1.202 | 0.174 | 1.151 |
| 84 | 1.416 | 2.576 | 0.189 | 1.335 | 1.889 | NA | NA | 1.602 | 0.888 | NA | NA | 1.340 | 1.654 | 1.368 | 0.896 | 1.766 | 2.024 | 0.568 | 1.090 | 1.750 | 0.931 | 0.666 | 1.447 |
| 85 | 1.379 | NA | 0.292 | 0.889 | NA | 0.822 | NA | 1.023 | NA | NA | NA | 0.656 | 1.257 | 0.754 | 0.613 | 0.896 | 0.809 | 0.557 | 0.888 | 0.888 | 1.207 | 0.445 | 0.882 |
| 86 | NA | NA | 0.480 | 1.266 | NA | NA | 0.457 | NA | NA | NA | NA | 1.218 | 0.862 | 0.887 | 1.051 | 0.987 | 0.804 | 0.974 | 1.097 | 0.852 | 1.385 | NA | 0.990 |
| 87 | 1.151 | NA | 0.148 | 0.840 | NA | NA | 1.506 | 0.501 | NA | NA | NA | 0.507 | NA | 0.966 | 0.590 | 1.300 | NA | 0.753 | 0.906 | 0.464 | 0.520 | 0.591 | 0.777 |
| 88 | NA | 1.270 | 0.214 | 0.914 | 0.572 | NA | 1.184 | 0.691 | 0.818 | 0.894 | NA | 1.069 | NA | 0.380 | 0.788 | 1.344 | 2.071 | 0.363 | 1.624 | NA | 0.949 | 0.448 | 1.043 |
| 89 | NA | NA | 0.057 | 0.554 | 0.586 | 0.473 | 0.749 | 0.211 | 0.333 | 0.178 | 0.281 | 0.349 | 0.488 | 0.434 | 0.365 | NA | 0.567 | 0.133 | 0.677 | NA | NA | 0.476 | 0.410 |

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

## FISHERY: West Coast Vancouver Island, Reported Catch

| REPORTED |  | EXPLOI <br> BON Age 4 | TATION CWF Age 3 | RATES CWF Age 4 | $\begin{gathered} \text { Y STOCK } \\ \text { GAD } \\ \text { Age } 3 \end{gathered}$ | $\begin{array}{r} \text { GAD } \\ \text { Age } 4 \end{array}$ | LRW Age 4 | $\begin{array}{r} \text { RBT } \\ \text { Age } 3 \end{array}$ | $\begin{array}{r} \text { RBT } \\ \text { Age } 4 \end{array}$ | SAM Age 3 | SAM Age 4 | $\begin{array}{r} \text { SPR } \\ \text { Age } 3 \end{array}$ | $\begin{array}{r} \text { SPR } \\ \text { Age } 4 \end{array}$ | $\begin{array}{r} \text { SPS } \\ \text { Age } 3 \end{array}$ | $\begin{array}{r} \text { SPS } \\ \text { Age } 4 \end{array}$ | $\begin{array}{r} \text { STP } \\ \text { Age } 3 \end{array}$ | $\begin{array}{r} \text { STP } \\ \text { Age } 4 \end{array}$ | URB <br> Age 3 | URB <br> Age 4 | UWA Age 3 | UWA Age 4 | WSH <br> Age 4 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 79 | 0.207 | NA | NA | NA | NA | NA | NA | 0.031 | 0.073 | NA | 0.310 | 0.185 | 0.157 | NA | 0.253 | NA | NA | 0.048 | 0.087 | 0.065 | 0.165 | NA |
| 80 | 0.098 | 0.152 | 0.101 | NA | NA | NA | NA | 0.038 | 0.100 | NA | NA | 0.226 | 0.272 | NA | NA | NA | NA | 0.037 | 0.062 | 0.142 | 0.128 | 0.052 |
| 81 | 0.157 | 0.152 | NA | 0.129 | 0.039 | NA | 0.060 | 0.019 | 0.026 | NA | NA | 0.173 | 0.176 | 0.042 | NA | 0.195 | NA | NA | 0.049 | 0.086 | 0.174 | 0.008 |
| 82 | 0.262 | 0.349 | NA | 0.198 | 0.067 | 0.218 | 0.084 | 0.022 | 0.034 | 0.056 | NA | 0.167 | 0.239 | 0.095 | 0.251 | 0.187 | 0.187 | 0.028 | 0.026 | 0.126 | 0.214 | 0.026 |
| 83 | 0.313 | 0.317 | 0.035 | 0.225 | NA | 0.274 | 0.069 | 0.010 | 0.034 | NA | 0.201 | 0.284 | 0.276 | 0.110 | 0.197 | 0.264 | 0.337 | 0.009 | 0.019 | 0.078 | 0.206 | 0.005 |
| 84 | 0.262 | 0.567 | 0.011 | 0.221 | 0.109 | NA | NA | 0.044 | 0.051 | NA | NA | 0.263 | 0.356 | 0.096 | 0.225 | 0.339 | 0.379 | 0.021 | 0.061 | 0.189 | 0.157 | 0.019 |
| 85 | 0.232 | NA | 0.028 | 0.149 | NA | 0.179 | NA | 0.030 | NA | NA | NA | 0.115 | 0.270 | 0.052 | 0.154 | 0.166 | 0.151 | 0.021 | 0.049 | 0.095 | 0.208 | 0.013 |
| 86 | NA | NA | 0.047 | 0.212 | NA | NA | 0.034 | NA | NA | NA | NA | 0.223 | 0.180 | 0.062 | 0.268 | 0.202 | 0.154 | 0.036 | 0.061 | 0.089 | 0.239 | NA |
| 87 | 0.184 | NA | 0.005 | 0.133 | NA | NA | 0.106 | 0.013 | NA | NA | NA | 0.085 | NA | 0.051 | 0.142 | 0.182 | NA | 0.023 | 0.047 | 0.038 | 0.084 | 0.017 |
| 88 | NA | 0.255 | 0.000 | 0.139 | 0.024 | NA | 0.081 | 0.018 | 0.046 | 0.044 | NA | 0.198 | NA | 0.016 | 0.189 | 0.183 | 0.350 | 0.002 | 0.084 | NA | 0.152 | 0.012 |
| 89 | NA | NA | 0.000 | 0.090 | 0.031 | 0.101 | 0.053 | 0.005 | 0.019 | 0.010 | 0.083 | 0.060 | 0.100 | 0.023 | 0.089 | NA | 0.108 | 0.000 | 0.035 | NA | NA | 0.014 |
| Base | 0.181 | 0.218 | 0.101 | 0.164 | 0.053 | 0.218 | 0.072 | 0.027 | 0.058 | 0.056 | 0.310 | 0.188 | 0.211 | 0.069 | 0.252 | 0.191 | 0.187 | 0.037 | 0.056 | 0.105 | 0.170 | 0.029 |


REPORTED CATCH EXPLOITATION RATE INDEX BY STOCK

| Year | BON Age 3 | BON Age 4 | CWF Age 3 | CWF Age 4 | GAD Age 3 | $\begin{array}{r} \text { GAD } \\ \text { Age } 4 \end{array}$ | LRW Age 4 | $\begin{array}{r} \text { RBT } \\ \text { Age } 3 \end{array}$ | $\begin{array}{r} \text { RBT } \\ \text { Age } 4 \end{array}$ | SAM Age 3 | SAM Age 4 | SPR Age 3 | $\begin{array}{r} \text { SPR } \\ \text { Age } 4 \end{array}$ | $\begin{array}{r} \text { SPS } \\ \text { Age } 3 \end{array}$ | $\begin{array}{r} \text { SPS } \\ \text { Age } 4 \end{array}$ | Age 3 | $\begin{array}{r} \text { STP } \\ \text { Age } 4 \end{array}$ | URB <br> Age 3 | URB <br> Age 4 | Age 3 | UWA Age 4 | WSH Age 4 |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 79 | 1.142 | NA | NA | NA | NA | NA | NA | 1.122 | 1.249 | NA | 1.000 | 0.985 | 0.743 | NA | 1.00 | NA | NA | 1.271 | 1.552 | 0.618 | 0.969 | NA | 0.989 |
| 80 | 0.543 | 0.698 | 1.000 | NA | NA | NA | NA | 1.405 | 1.708 | NA | NA | 1.203 | 1.290 | NA | NA | NA | NA | 0.977 | 1.113 | 1.356 | 0.753 | 1.808 | 1.020 |
| 81 | 0.866 | 0.699 | NA | 0.789 | 0.738 | NA | 0.835 | 0.681 | 0.453 | NA | NA | 0.924 | 0.833 | 0.615 | NA | 1.021 | NA | NA | 0.878 | 0.819 | 1.024 | 0.282 | 0.830 |
| 82 | 1.448 | 1.603 | NA | 1.211 | 1.262 | 1.000 | 1.165 | 0.792 | 0.590 | 1.000 | NA | 0.888 | 1.134 | 1.385 | 0.997 | 0.979 | 1.000 | 0.752 | 0.457 | 1.207 | 1.254 | 0.910 | 1.116 |
| 83 | 1.727 | 1.458 | 0.345 | 1.376 | NA | 1.252 | 0.957 | 0.357 | 0.584 | NA | 0.649 | 1.514 | 1.307 | 1.593 | 0.783 | 1.378 | 1.805 | 0.253 | 0.334 | 0.744 | 1.210 | 0.175 | 1.147 |
| 84 | 1.447 | 2.606 | 0.112 | 1.348 | 2.052 | NA | NA | 1.615 | 0.876 | NA | NA | 1.401 | 1.687 | 1.393 | 0.893 | 1.771 | 2.031 | 0.550 | 1.100 | 1.804 | 0.922 | 0.663 | 1.467 |
| 85 | 1.281 | NA | 0.281 | 0.909 | NA | 0.818 | NA | 1.096 | NA | NA | NA | 0.614 | 1.282 | 0.750 | 0.610 | 0.869 | 0.807 | 0.549 | 0.883 | 0.907 | 1.222 | 0.452 | 0.874 |
| 86 | NA | NA | 0.468 | 1.294 | NA | NA | 0.464 | NA | NA | NA | NA | 1.189 | 0.855 | 0.902 | 1.064 | 1.057 | 0.824 | 0.974 | 1.087 | 0.853 | 1.402 | NA | 1.003 |
| 87 | 1.018 | NA | 0.051 | 0.814 | NA | NA | 1.459 | 0.461 | NA | NA | NA | 0.452 | NA | 0.745 | 0.562 | 0.948 | NA | 0.602 | 0.837 | 0.363 | 0.495 | 0.577 | 0.675 |
| 88 | NA | 1.172 | 0.000 | 0.850 | 0.458 | NA | 1.122 | 0.648 | 0.790 | 0.793 | NA | 1.056 | NA | 0.237 | 0.749 | 0.957 | 1.877 | 0.050 | 1.496 | NA | 0.893 | 0.420 | 0.930 |
| 89 | NA | NA | 0.000 | 0.548 | 0.588 | 0.463 | 0.739 | 0.195 | 0.327 | 0.185 | 0.268 | 0.320 | 0.474 | 0.336 | 0.352 | NA | 0.581 | 0.000 | 0.633 | NA | NA | 0.496 | 0.394 |

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

FISHERY: Strait of Georgia Sport and Troll Combined, Total Mortality

| TOTAL M | $\begin{gathered} \text { MORTALITY } \\ \text { BQR } \\ \text { Age } 3 \end{gathered}$ |  | ITATION QUI Age 5 | RATES SAM Age 3 | $\begin{gathered} \text { BY STOC } \\ \text { SAM } \\ \text { Age } 4 \end{gathered}$ | $\begin{array}{r} \text { SPS } \\ \text { Age } 3 \end{array}$ | $\begin{array}{r} \text { SPS } \\ \text { Age } 4 \end{array}$ | UWA Age 3 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 79 | 0.230 | 0.179 | 0.060 | NA | 0.094 | NA | 0.060 | 0.041 |
| 80 | 0.317 | 0.311 | NA | NA | NA | NA | NA | 0.041 |
| 81 | 0.316 | 0.471 | 0.246 | NA | NA | 0.090 | NA | 0.035 |
| 82 | 0.151 | 0.138 | 0.087 | 0.061 | NA | 0.026 | 0.052 | 0.012 |
| 83 | 0.300 | 0.207 | 0.053 | NA | 0.080 | 0.020 | 0.032 | 0.026 |
| 84 | 0.373 | NA | 0.043 | NA | NA | 0.056 | 0.045 | 0.049 |
| 85 | 0.184 | 0.130 | 0.043 | NA | NA | NA | 0.046 | 0.022 |
| 86 | 0.263 | 0.214 | 0.055 | NA | NA | NA | NA | 0.017 |
| 87 | 0.156 | 0.267 | 0.014 | NA | NA | 0.055 | NA | 0.027 |
| 88 | 0.234 | 0.209 | 0.056 | 0.051 | NA | 0.010 | NA | NA |
| 89 | 0.207 | 0.339 | 0.060 | 0.062 | 0.093 | 0.015 | 0.039 | NA |
| Base | 0.253 | 0.275 | 0.131 | 0.061 | 0.094 | 0.058 | 0.056 | 0.032 |


TOTAL MORTALITY EXPLOITATION RATE INDEX BY STOCX
Year Age 3 Age 4 Age 5 Age 3 Age 4 Age 3 Age 4 Age 3 Fishery


| 79 | 0.908 | 0.653 | 0.460 | NA | 1.000 | NA | 1.074 | 1.270 | 0.790 |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| 80 | 1.250 | 1.133 | NA | NA | NA | NA | NA | 1.283 | 1.195 |
| 81 | 1.247 | 1.714 | 1.875 | NA | NA | 1.552 | NA | 1.081 | 1.545 |
| 82 | 0.595 | 0.501 | 0.665 | 1.000 | NA | 0.448 | 0.926 | 0.366 | 0.607 |
| 83 | 1.186 | 0.754 | 0.406 | NA | 0.846 | 0.343 | 0.571 | 0.802 | 0.798 |
| 84 | 1.472 | NA | 0.328 | NA | NA | 0.960 | 0.798 | 1.515 | 1.065 |
| 85 | 0.725 | 0.474 | 0.330 | NA | NA | NA | 0.817 | 0.676 | 0.568 |
| 86 | 1.038 | 0.780 | 0.416 | NA | NA | NA | NA | 0.516 | 0.793 |
| 87 | 0.616 | 0.972 | 0.104 | NA | NA | 0.943 | NA | 0.853 | 0.692 |
| 88 | 0.926 | 0.763 | 0.429 | 0.831 | NA | 0.164 | NA | NA | 0.720 |
| 89 | 0.819 | 1.235 | 0.460 | 1.010 | 0.984 | 0.262 | 0.692 | NA | 0.878 |

Stock Identifiers
$B Q R=$ BIG QUALICUM
QUI = QUINSAM
SAM $=$ SAMISH FALL FING
SPS $=$ SO SOUND FALL YEAR
$U W A=U$ OF $W$ FALL ACCEL

FISHERY: Strait of Georgia Sport and Troll Combined, Reported Catch

| REPORTED | $\begin{gathered} \text { CATCH } \\ \text { BQR } \end{gathered}$ | $\begin{gathered} \text { EXPLOI } \\ \text { BQR } \end{gathered}$ | $\begin{array}{r} \text { TATION } \\ \text { QUI } \end{array}$ | RATES B SAM | $\begin{aligned} & \text { STOM } \\ & \text { SAM } \end{aligned}$ | SPS | SPS | UWA |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Year | Age 3 | Age 4 | Age 5 | Age 3 | Age 4 | Age 3 | Age 4 | Age 3 |
| 79 | 0.229 | 0.179 | 0.060 | NA | 0.094 | NA | 0.060 | 0.041 |
| 80 | 0.316 | 0.311 | NA | NA | NA | NA | NA | 0.041 |
| 81 | 0.315 | 0.471 | 0.246 | NA | NA | 0.090 | NA | 0.035 |
| 82 | 0.151 | 0.138 | 0.087 | 0.061 | NA | 0.026 | 0.052 | 0.012 |
| 83 | 0.300 | 0.207 | 0.053 | NA | 0.080 | 0.020 | 0.031 | 0.025 |
| 84 | 0.371 | NA | 0.043 | NA | NA | 0.056 | 0.045 | 0.049 |
| 85 | 0.181 | 0.130 | 0.043 | NA | NA | NA | 0.046 | 0.022 |
| 86 | 0.247 | 0.211 | 0.055 | NA | NA | NA | NA | 0.017 |
| 87 | 0.153 | 0.267 | 0.014 | NA | NA | 0.055 | NA | 0.027 |
| 88 | 0.234 | 0.209 | 0.056 | 0.051 | NA | 0.009 | NA | NA |
| 89 | 0.147 | 0.330 | 0.060 | 0.054 | 0.090 | 0.010 | 0.038 | NA |
| Base | 0.253 | 0.275 | 0.131 | 0.061 | 0.094 | 0.058 | 0.056 | 0.032 |

 REPORTED CATCH EXPLOITATION RATE INDEX BY STOCK

| Year | BQR Age 3 | $\begin{array}{r} \text { BQR } \\ \text { Age } 4 \end{array}$ | $\begin{array}{r} \text { QUI } \\ \text { Age } 5 \end{array}$ | SAM Age 3 | SAM Age 4 | SPS <br> Age 3 | SPS <br> Age 4 | UWA Age 3 | Fishery |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 79 | 0.907 | 0.654 | 0.460 | NA | 1.000 | NA | 1.074 | 1.270 | 0.790 |
| 80 | 1.251 | 1.131 | NA | NA | NA | NA | NA | 1.283 | 1.194 |
| 81 | 1.247 | 1.714 | 1.875 | NA | NA | 1.552 | NA | 1.081 | 1.545 |
| 82 | 0.596 | 0.501 | 0.665 | 1.000 | NA | 0.448 | 0.926 | 0.366 | 0.608 |
| 83 | 1.188 | 0.755 | 0.406 | NA | 0.846 | 0.343 | 0.561 | 0.779 | 0.797 |
| 84 | 1.468 | NA | 0.328 | NA | NA | 0.956 | 0.798 | 1.515 | 1.062 |
| 85 | 0.716 | 0.474 | 0.330 | NA | NA | NA | 0.817 | 0.676 | 0.565 |
| 86 | 0.978 | 0.769 | 0.416 | NA | NA | NA | NA | 0.516 | 0.767 |
| 87 | 0.605 | 0.973 | 0.104 | NA | NA | 0.943 | NA | 0.834 | 0.688 |
| 88 | 0.927 | 0.763 | 0.429 | 0.833 | NA | 0.156 | NA | NA | 0.720 |
| 89 | 0.580 | 1.204 | 0.460 | 0.874 | 0.958 | 0.178 | 0.678 | NA | 0.786 |

[^3]FISHERY: Strait of Georgia Sport, Total Mortality

| TOTAL <br> Year | $\begin{gathered} \text { MORTALIT } \\ \text { BQR } \end{gathered}$ | EXPLOITATION |  | RATES BY STOCK |  |  | UWA |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Age | Age 4 | Age 5 | Age 3 | Age 4 | Age 3 | Age 3 |
|  | = === | ===== |  |  |  |  |  |
| 79 | 0.086 | 0.119 | 0.060 | NA | 0.035 | NA | 0.026 |
| 80 | 0.177 | 0.238 | NA | NA | NA | NA | 0.038 |
| 81 | 0.204 | 0.397 | 0.220 | NA | NA | 0.083 | 0.031 |
| 82 | 0.070 | 0.060 | 0.087 | 0.043 | NA | 0.021 | 0.011 |
| 83 | 0.127 | 0.163 | 0.053 | NA | 0.069 | 0.018 | 0.016 |
| 84 | 0.249 | NA | 0.043 | NA | NA | 0.046 | 0.043 |
| 85 | 0.165 | 0.130 | 0.043 | NA | NA | NA | 0.022 |
| 86 | 0.197 | 0.211 | 0.055 | NA | NA | NA | 0.017 |
| 87 | 0.122 | 0.263 | 0.014 | NA | NA | 0.055 | 0.019 |
| 88 | 0.224 | 0.169 | 0.056 | 0.050 | NA | 0.009 | NA |
| 89 | 0.194 | 0.339 | 0.060 | 0.058 | 0.093 | 0.014 | NA |
| Base | 0.134 | 0.203 | 0.122 | 0.043 | 0.035 | 0.052 | 0.027 |


TOTAL MORTALITY EXPLOITATION RATE INDEX BY STOCK
BQR BQR QUI SAM SAM SPS UWA

Year Age 3 Age 4 Age 5 Age 3 Age 4 Age 3 Age 3 Fishery


| 79 | 0.640 | 0.584 | 0.493 | NA | 1.000 | NA | 0.987 | 0.626 |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| 80 | 1.317 | 1.170 | NA | NA | NA | NA | 1.441 | 1.244 |
| 81 | 1.522 | 1.950 | 1.794 | NA | NA | 1.590 | 1.152 | 1.734 |
| 82 | 0.521 | 0.296 | 0.713 | 1.000 | NA | 0.410 | 0.421 | 0.503 |
| 83 | 0.945 | 0.803 | 0.435 | NA | 1.978 | 0.350 | 0.608 | 0.779 |
| 84 | 1.858 | NA | 0.352 | NA | NA | 0.880 | 1.619 | 1.137 |
| 85 | 1.233 | 0.640 | 0.354 | NA | NA | NA | 0.815 | 0.741 |
| 86 | 1.466 | 1.039 | 0.446 | NA | NA | NA | 0.622 | 0.985 |
| 87 | 0.912 | 1.295 | 0.112 | NA | NA | 1.045 | 0.702 | 0.877 |
| 88 | 1.672 | 0.831 | 0.460 | 1.165 | NA | 0.164 | NA | 0.915 |
| 89 | 1.446 | 1.668 | 0.493 | 1.349 | 2.639 | 0.266 | NA | 1.284 |

Stock Identifiers
$B Q R=B I G$ QUALICUM
QUI = QUINSAM
SAM $=$ SAMISH FALL FING
SPS = SO SOUND FALL YEAR
UWA $=\mathrm{U}$ OF $W$ FALL ACCEL

FISHERY: Strait of Georgia Sport, Reported Catch

| REPORTED | CATCH BQR Age 3 | EXPLOI BQR Age 4 | TATION <br> QUI <br> Age 5 | RATES B SAM Age 3 | $\begin{gathered} \text { Y STOCK } \\ \text { SAM } \\ \text { Age } 4 \end{gathered}$ | $\begin{array}{r} \text { SPS } \\ \text { Age } 3 \end{array}$ | UWA Age 3 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 79 | 0.086 | 0.119 | 0.060 | NA | 0.035 | NA | 0.026 |
| 80 | 0.177 | 0.238 | NA | NA | NA | NA | 0.038 |
| 81 | 0.204 | 0.397 | 0.220 | NA | NA | 0.083 | 0.031 |
| 82 | 0.070 | 0.060 | 0.087 | 0.043 | NA | 0.021 | 0.011 |
| 83 | 0.127 | 0.163 | 0.053 | NA | 0.069 | 0.018 | 0.015 |
| 84 | 0.249 | NA | 0.043 | NA | NA | 0.046 | 0.043 |
| 85 | 0.165 | 0.130 | 0.043 | NA | NA | NA | 0.022 |
| 86 | 0.196 | 0.211 | 0.055 | NA | NA | NA | 0.017 |
| 87 | 0.119 | 0.263 | 0.014 | NA | NA | 0.055 | 0.019 |
| 88 | 0.224 | 0.169 | 0.056 | 0.050 | NA | 0.008 | NA |
| 89 | 0.135 | 0.330 | 0.060 | 0.050 | 0.090 | 0.009 | NA |
| Base | 0.134 | 0.203 | 0.122 | 0.043 | 0.035 | 0.052 | 0.027 |

==========ニ=======================================================1 REPORTED CATCH EXPLOITATION RATE INDEX BY STOCK
BQR BQR QUI SAM SAM SPS UWA

Year Age 3 Age 4 Age 5 Age 3 Age 4 Age 3 Age 3 Fishery


| 79 | 0.640 | 0.584 | 0.493 | NA | 1.000 | NA | 0.987 | 0.626 |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| 80 | 1.317 | 1.170 | NA | NA | NA | NA | 1.441 | 1.244 |
| 81 | 1.522 | 1.950 | 1.794 | NA | NA | 1.590 | 1.152 | 1.734 |
| 82 | 0.521 | 0.296 | 0.713 | 1.000 | NA | 0.410 | 0.421 | 0.503 |
| 83 | 0.945 | 0.803 | 0.435 | NA | 1.978 | 0.350 | 0.580 | 0.778 |
| 84 | 1.858 | NA | 0.352 | NA | NA | 0.880 | 1.619 | 1.137 |
| 85 | 1.233 | 0.640 | 0.354 | NA | NA | NA | 0.815 | 0.741 |
| 86 | 1.462 | 1.039 | 0.446 | NA | NA | NA | 0.622 | 0.984 |
| 87 | 0.889 | 1.295 | 0.112 | NA | NA | 1.045 | 0.702 | 0.872 |
| 88 | 1.672 | 0.831 | 0.460 | 1.169 | NA | 0.155 | NA | 0.914 |
| 89 | 1.009 | 1.625 | 0.493 | 1.161 | 2.570 | 0.181 | NA | 1.145 |

[^4]FISHERY: Strait of Georgia Troll, Total Mortality


Stock Identifiers
$B Q R=B I G$ QUALICUM
SAM = SAMISH FALL FING

FISHERY: Strait of Georgia Troll, Reported Catch


Stock Identifiers
BQR = BIG QUALICUM
SAM = SAMISH FALL FING

FISHERY: Washington/Oregon Sport and Troll Combined, Total Mortality

| TOTAL M | $\begin{gathered} \text { MORTALITY } \\ \text { BON } \\ \text { Age } 3 \end{gathered}$ | CWF Age 3 | ITATION CWF Age 4 | RATES SAM Age 3 | $\begin{gathered} \text { BY STOC } \\ \text { SAM } \\ \text { Age } 4 \end{gathered}$ | $\begin{array}{r} \text { SPR } \\ \text { Age } 3 \end{array}$ | $\begin{array}{r} \text { SPR } \\ \text { Age } 4 \end{array}$ | $\begin{array}{r} \text { SPS } \\ \text { Age } 3 \end{array}$ | $\begin{array}{r} \text { SPS } \\ \text { Age } 4 \end{array}$ | $\begin{array}{r} \text { STP } \\ \text { Age } 3 \end{array}$ | UWA Age 3 |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 79 | 0.126 | NA | NA | NA | 0.008 | 0.183 | 0.172 | NA | 0.021 | NA | 0.016 |  |
| 80 | 0.211 | 0.122 | NA | NA | NA | 0.288 | 0.124 | NA | NA | NA | 0.031 |  |
| 81 | 0.201 | 0.097 | 0.156 | NA | NA | 0.273 | 0.208 | 0.009 | NA | 0.167 | 0.026 |  |
| 82 | 0.180 | 0.157 | 0.278 | 0.012 | NA | 0.322 | 0.124 | 0.008 | 0.048 | 0.296 | 0.028 |  |
| 83 | 0.128 | 0.075 | 0.183 | NA | 0.044 | 0.121 | 0.056 | 0.006 | 0.028 | 0.163 | 0.017 |  |
| 84 | 0.081 | 0.013 | 0.044 | NA | NA | 0.079 | NA | 0.009 | 0.024 | 0.048 | 0.010 |  |
| 85 | 0.169 | 0.078 | 0.042 | NA | NA | 0.170 | NA | NA | 0.023 | 0.185 | 0.015 |  |
| 86 | NA | 0.123 | 0.056 | NA | NA | 0.123 | 0.067 | NA | NA | 0.193 | 0.017 |  |
| 87 | 0.160 | 0.067 | 0.122 | NA | NA | 0.208 | NA | NA | NA | 0.162 | 0.027 |  |
| 88 | NA | 0.053 | 0.150 | NA | NA | 0.119 | NA | 0.016 | NA | 0.213 | NA |  |
| 89 | NA | 0.044 | 0.308 | 0.003 | NA | 0.187 | 0.110 | 0.026 | 0.069 | NA | NA |  |
| Base | 0.180 | 0.125 | 0.217 | 0.012 | 0.008 | 0.267 | 0.157 | 0.009 | 0.035 | 0.232 | 0.025 |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |
| TOTAL MORTALITY BON |  | EXPLOITATION CWF CWF |  | RATE INDEX BY SAM SAM |  | STOCKSPR | SPR | $\begin{array}{r} \text { SPS } \\ \text { Age } 3 \end{array}$ | $\begin{array}{r} \text { SPS } \\ \text { Age } 4 \end{array}$ | $\begin{array}{r} \text { STP } \\ \text { Age } 3 \end{array}$ | UWA |  |
|  |  |  |  |  |  |  |  |  |  |  |
| Year | Age 3 |  |  | Age 3 | Age 4 | Age 3 | Age 4 |  |  |  | Age 3 | Age 4 | Age 3 | Fishery |
| 79 | 0.704 | NA | NA | NA | 1.000 | 0.688 | 1.093 | NA | 0.614 | NA | 0.629 | 0.785 |
| 80 | 1.173 | 0.974 | NA | NA | NA | 1.079 | 0.793 | NA | NA | NA | 1.247 | 1.030 |
| 81 | 1.120 | 0.774 | 0.718 | NA | NA | 1.024 | 1.324 | 1.042 | NA | 0.721 | 1.019 | 0.939 |
| 82 | 1.004 | 1.253 | 1.282 | 1.000 | NA | 1.209 | 0.790 | 0.958 | 1.386 | 1.279 | 1.105 | 1.156 |
| 83 | 0.715 | 0.597 | 0.845 | NA | 5.487 | 0.454 | 0.357 | 0.703 | 0.794 | 0.703 | 0.675 | 0.655 |
| 84 | 0.450 | 0.106 | 0.201 | NA | NA | 0.298 | NA | 1.084 | 0.693 | 0.209 | 0.416 | 0.284 |
| 85 | 0.939 | 0.618 | 0.194 | NA | NA | 0.638 | NA | NA | 0.671 | 0.800 | 0.618 | 0.632 |
| 86 | NA | 0.982 | 0.260 | NA | NA | 0.460 | 0.427 | NA | NA | 0.835 | 0.661 | 0.566 |
| 87 | 0.890 | 0.532 | 0.564 | NA | NA | 0.779 | NA | NA | NA | 0.701 | 1.068 | 0.713 |
| 88 | NA | 0.422 | 0.691 | NA | NA | 0.448 | NA | 1.823 | NA | 0.919 | NA | 0.649 |
| 89 | NA | 0.350 | 1.423 | 0.261 | NA | 0.701 | 0.701 | 2.982 | 1.986 | NA | NA | 0.910 |

Stock Identifiers
BON = BONNEVILLE TULE CWF = COWLITZ FALL TULE SAM = SAMISH FALL FING SPR $=$ SO SOUND FALL FING SPS = SO SOUND FALL YEAR STP $=$ STAYTON POND TULE UWA $=U$ OF $W$ FALL ACCEL

FISHERY: Washington/Oregon Sport and Troll Combined, Reported Catch


Stock Identifiers
BON $=$ BONNEVILLE TULE
CWF = COWLITZ FALL TULE
SAM = SAMISH FALL FING
SPR $=$ SO SOUND FALL FING
SPS = SO SOUND FALL YEAR
STP = STAYTON POND TULE
$U W A=U O F W$ FALL ACCEL

## APPENDIX D

## Fishery Index Figures

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## FISHERY INDEX <br> ALASKA TROLL (ALL AGES)



Fishery: Alaska Troll, All Ages
 total mortality exploitation rate index by stock

Year Age 4 Age 4 Age 3 Age 4 Age 5 Age 3 Age 4 Age 5 Age 3 Age 4 Age 5 Age 4 Fishery


| 79 | NA | NA | 1.064 | 0.232 | 0.824 | 0.776 | 0.871 | 1.252 | 0.595 | 0.929 | NA | NA | 0.942 |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| 80 | NA | NA | 0.932 | 1.114 | 0.567 | 1.075 | 0.947 | 0.907 | 1.551 | 1.099 | 0.808 | 1.534 | 0.960 |
| 81 | NA | 0.987 | 1.004 | 1.160 | 1.033 | 1.169 | 1.216 | 0.951 | NA | 1.149 | 1.560 | 0.776 | 1.153 |
| 82 | 1.000 | 1.013 | NA | 1.495 | 1.577 | 0.979 | 0.965 | 0.890 | 0.853 | 0.822 | 0.632 | 0.690 | 0.935 |
| 83 | 1.443 | 0.968 | 1.806 | 2.237 | 2.200 | 1.043 | 1.101 | 1.223 | 0.654 | 1.287 | NA | 1.108 | 1.328 |
| 84 | 0.750 | NA | 0.929 | 1.193 | 1.929 | 1.630 | 1.071 | 0.618 | 0.840 | 1.265 | 0.895 | 0.560 | 0.979 |
| 85 | 0.816 | NA | 2.306 | 1.805 | 2.294 | 1.770 | 0.495 | 0.904 | 0.590 | 1.024 | 0.885 | 2.003 | 1.074 |
| 86 | 1.301 | 0.680 | 1.815 | 1.166 | 1.542 | NA | 1.215 | 0.094 | 0.470 | 0.733 | 0.649 | NA | 0.774 |
| 87 | 0.677 | 0.321 | 1.611 | 1.411 | 1.597 | 0.594 | NA | NA | 0.909 | 0.904 | 0.917 | 1.458 | 0.987 |
| 88 | 0.794 | 0.147 | NA | 1.248 | 0.872 | 0.164 | 0.639 | NA | 0.568 | 0.415 | 0.712 | 0.503 | 0.642 |
| 89 | 1.371 | 0.154 | 0.509 | 1.021 | 1.519 | 0.310 | 0.569 | 0.585 | 0.726 | 0.245 | 0.449 | 0.479 | 0.633 |

Stock Identifiers

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

FISHERY INDEX
ALASKA TROLL (AGE 3)


Fishery: Alaska Troll, Ocean Age 3
 total mortality exploitation rate index by stock
Year Age 4 Age 3 Age 3 Age 3 Age 4 Fishery


| 79 | NA | 1.064 | 0.776 | 0.595 | NA | 0.766 |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| 80 | NA | 0.932 | 1.075 | 1.551 | 1.534 | 1.332 |
| 81 | NA | 1.004 | 1.169 | NA | 0.776 | 0.957 |
| 82 | 1.000 | NA | 0.979 | 0.853 | 0.690 | 0.896 |
| 83 | 1.443 | 1.806 | 1.043 | 0.654 | 1.108 | 1.214 |
| 84 | 0.750 | 0.929 | 1.630 | 0.840 | 0.560 | 0.906 |
| 85 | 0.816 | 2.306 | 1.770 | 0.590 | 2.003 | 1.385 |
| 86 | 1.301 | 1.815 | NA | 0.470 | NA | 1.206 |
| 87 | 0.677 | 1.611 | 0.594 | 0.909 | 1.458 | 0.926 |
| 88 | 0.794 | NA | 0.164 | 0.568 | 0.503 | 0.549 |
| 89 | 1.371 | 0.509 | 0.310 | 0.726 | 0.479 | 0.810 |

Stock Identifiers

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

FISHERY INDEX
ALASKA TROLL (AGE 4)


Fishery: Alaska Troll, Ocean Age 4

TOTAL MORTALITY EXPLOITATION RATE INDEX BY STOCK
AKS LRW QUI RBT URB

Year Age 5 Age 4 Age 4 Age 4 Age 4 Fishery


| 79 | NA | NA | 0.232 | 0.871 | 0.929 | 0.774 |
| :--- | :--- | :---: | :--- | :--- | :--- | :--- |
| 80 | NA | NA | 1.114 | 0.947 | 1.099 | 1.020 |
| 81 | NA | 0.987 | 1.160 | 1.216 | 1.149 | 1.162 |
| 82 | NA | 1.013 | 1.495 | 0.965 | 0.822 | 1.018 |
| 83 | NA | 0.968 | 2.237 | 1.101 | 1.287 | 1.307 |
| 84 | NA | NA | 1.193 | 1.071 | 1.265 | 1.147 |
| 85 | NA | NA | 1.805 | 0.495 | 1.024 | 0.877 |
| 86 | NA | 0.680 | 1.166 | 1.215 | 0.733 | 1.021 |
| 87 | NA | 0.321 | 1.411 | NA | 0.904 | 0.915 |
| 88 | NA | 0.147 | 1.248 | 0.639 | 0.415 | 0.616 |
| 89 | NA | 0.154 | 1.021 | 0.569 | 0.245 | 0.507 |

Stock Identifiers

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

## FISHERY INDEX

ALASKA TROLL (AGE 5)


Fishery: Alaska Troll, Ocean Age 5
 total mortality exploitation rate index by stock
Year Age 6 Age 5 Age 5 Age 5 Fishery


| 79 | NA | 0.824 | 1.252 | NA | 1.162 |
| :--- | :--- | :--- | :--- | :--- | :--- |
| 80 | NA | 0.567 | 0.907 | 0.808 | 0.825 |
| 81 | NA | 1.033 | 0.951 | 1.560 | 1.188 |
| 82 | NA | 1.577 | 0.890 | 0.632 | 0.885 |
| 83 | NA | 2.200 | 1.223 | NA | 1.429 |
| 84 | NA | 1.929 | 0.618 | 0.895 | 0.895 |
| 85 | NA | 2.294 | 0.904 | 0.885 | 1.081 |
| 86 | NA | 1.542 | 0.094 | 0.649 | 0.492 |
| 87 | NA | 1.597 | NA | 0.917 | 1.096 |
| 88 | NA | 0.872 | NA | 0.712 | 0.754 |
| 89 | NA | 1.519 | 0.585 | 0.449 | 0.659 |

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

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


Fishery: North/Central B.C. Troll, All Ages
 TOTAL MORTALITY EXPLOITATION RATE INDEX BY STOCK
AKS BQR BQR QUI QUI QUI RBT RBT RBT SAM URB URB URB WSH

Year Age 4 Age 3 Age 4 Age 3 Age 4 Age 5 Age 3 Age 4 Age 5 Age 4 Age 3 Age 4 Age 5 Age 4 Fishery


| 79 | NA | 1.000 | 1.079 | 0.896 | 1.161 | 0.693 | 1.190 | 1.092 | 0.725 | NA | 0.612 | 1.194 | NA | NA | 0.969 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 80 | NA | 1.044 | 0.874 | 0.957 | 1.106 | 1.355 | 1.120 | 0.861 | 1.066 | NA | 1.200 | 1.183 | 0.788 | 1.632 | 1.095 |
| 81 | NA | 1.121 | 0.922 | 1.501 | 1.179 | 1.173 | 0.796 | 0.951 | 1.767 | NA | NA | 1.053 | 1.922 | 1.072 | 1.228 |
| 82 | 1.000 | 0.835 | 1.125 | 0.646 | 0.553 | 0.779 | 0.895 | 1.095 | 0.442 | NA | 1.188 | 0.571 | 0.290 | 0.296 | 0.709 |
| 83 | 1.649 | NA | 1.130 | 1.168 | 0.997 | 1.436 | 1.023 | 0.794 | 0.542 | NA | 1.579 | 0.956 | NA | 0.345 | 0.953 |
| 84 | 1.371 | 0.740 | NA | 0.213 | 0.429 | 0.451 | 0.527 | 0.980 | 1.682 | NA | 1.170 | 1.462 | NA | 0.304 | 0.808 |
| 85 | 0.996 | 0.392 | NA | 0.335 | 0.308 | 0.222 | 1.141 | 1.587 | 1.397 | NA | 0.960 | 1.176 | 0.839 | 0.282 | 0.803 |
| 86 | 1.716 | 0.772 | 2.168 | 0.976 | 0.629 | 0.550 | NA | 0.918 | NA | NA | 0.897 | 0.927 | 0.915 | NA | 0.925 |
| 87 | 0.467 | 0.146 | 0.784 | 0.522 | 0.526 | 0.864 | 0.706 | NA | NA | NA | 1.615 | 1.505 | 1.495 | 0.279 | 0.770 |
| 88 | 1.907 | NA | NA | 0.226 | 0.334 | 0.130 | 0.450 | 0.653 | NA | NA | 0.774 | 0.742 | 1.255 | 0.353 | 0.502 |
| 89 | NA | 0.337 | NA | 0.100 | 0.179 | 0.222 | 0.364 | 0.686 | 1.198 | NA | 0.550 | 0.651 | 1.738 | 0.229 | 0.582 |

Stock Identifiers

```
AKS = ALASKA SPRING
BQR = BIG QUALICUM
QUI = QUINSAM
RBT = ROBERTSON CREEK
SAM = SAMISH FALL FING
URB = COLUMBIA RIVER UPRIVER BRIGHT
WSH = WILLAMETTE SPRING
```


## FISHERY INDEX

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


Fishery: North/Central B.C. Troll, Ocean Age 3
 total mortality exploitation rate index by stock

| Year | AKS | BQRAge 3 | QUI | RBTAge 3 | URB | WSH | Fishery |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Age 4 |  | Age 3 |  | Age 3 | Age 4 |  |
|  |  |  |  |  |  |  |  |
| 79 | NA | 1.000 | 0.896 | 1.190 | 0.612 | NA | 1.004 |
| 80 | NA | 1.044 | 0.957 | 1.120 | 1.200 | 1.632 | 1.208 |
| 81 | NA | 1.121 | 1.501 | 0.796 | NA | 1.072 | 1.090 |
| 82 | 1.000 | 0.835 | 0.646 | 0.895 | 1.188 | 0.296 | 0.709 |
| 83 | 1.649 | NA | 1.168 | 1.023 | 1.579 | 0.345 | 0.888 |
| 84 | 1.371 | 0.740 | 0.213 | 0.527 | 1.170 | 0.304 | 0.529 |
| 85 | 0.996 | 0.392 | 0.335 | 1.141 | 0.960 | 0.282 | 0.583 |
| 86 | 1.716 | 0.772 | 0.976 | NA | 0.897 | NA | 0.882 |
| 87 | 0.467 | 0.146 | 0.522 | 0.706 | 1.615 | 0.279 | 0.481 |
| 88 | 1.907 | NA | 0.226 | 0.450 | 0.774 | 0.353 | 0.424 |
| 89 | NA | 0.337 | 0.100 | 0.364 | 0.550 | 0.229 | 0.291 |

## Stock Identifiers

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

ISHERY INDEX NORTH/CENTRAL B.C. TROLL (AGE 4)


Fishery: North/Central B.C. Troll, Ocean Age 4
 total mortality exploitation rate index by stock

AKS BQR QUI RBT SAM URB Year Age 5 Age 4 Age 4 Age 4 Age 4 Age 4 Fishery


| 79 | NA | 1.079 | 1.161 | 1.092 | NA | 1.194 | 1.127 |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| 80 | NA | 0.874 | 1.106 | 0.861 | NA | 1.183 | 0.992 |
| 81 | NA | 0.922 | 1.179 | 0.951 | NA | 1.053 | 1.034 |
| 82 | NA | 1.125 | 0.553 | 1.095 | NA | 0.571 | 0.846 |
| 83 | NA | 1.130 | 0.997 | 0.794 | NA | 0.956 | 0.950 |
| 84 | NA | NA | 0.429 | 0.980 | NA | 1.462 | 0.852 |
| 85 | NA | NA | 0.308 | 1.587 | NA | 1.176 | 0.996 |
| 86 | NA | 2.168 | 0.629 | 0.918 | NA | 0.927 | 1.072 |
| 87 | NA | 0.784 | 0.526 | NA | NA | 1.505 | 0.825 |
| 88 | NA | NA | 0.334 | 0.653 | NA | 0.742 | 0.542 |
| 89 | NA | NA | 0.179 | 0.686 | NA | 0.651 | 0.477 |

[^5]```
AKS = ALASKA SPRING
BQR = BIG QUALICUM
QUI = QUINSAM
RBT = ROBERTSON CREEK
SAM = SAMISH FALL FING
URB = COLUMBIA RIVER UPRIVER BRIGHT
```

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


Fishery: North/Central B.C. Troll, Ocean Age 5
 total mortality exploitation rate index by stock QUI RBT URB
Year Age 5 Age 5 Age 5 Fishery

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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| Yenen |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: |
| 79 | 0.693 | 0.725 | NA | 0.709 |
| 80 | 1.355 | 1.066 | 0.788 | 1.125 |
| 81 | 1.173 | 1.767 | 1.922 | 1.557 |
| 82 | 0.779 | 0.442 | 0.290 | 0.547 |
| 83 | 1.436 | 0.542 | NA | 1.005 |
| 84 | 0.451 | 1.682 | NA | 1.043 |
| 85 | 0.222 | 1.397 | 0.839 | 0.799 |
| 86 | 0.550 | NA | 0.915 | 0.675 |
| 87 | 0.864 | NA | 1.495 | 1.080 |
| 88 | 0.130 | NA | 1.255 | 0.515 |
| 89 | 0.222 | 1.198 | 1.738 | 0.914 |

Stock Identifiers

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

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


Fishery: North B.C. Troll, All Ages
 total mortality exploitation rate index by stock

| Year | AKS | QUI | QUI | $\begin{array}{r} \text { RBT } \\ \text { Age } 3 \end{array}$ | $\begin{array}{r} \text { RBT } \\ \text { Age } 4 \end{array}$ | $\begin{array}{r} \text { RBT } \\ \text { Age } 5 \end{array}$ | $\begin{array}{r} \text { URB } \\ \text { Age } 3 \end{array}$ | $\begin{array}{r} \text { URB } \\ \text { Age } 4 \end{array}$ | $\begin{gathered} \text { URB } \\ \text { Age } 5 \end{gathered}$ | WSH |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Age |  | Age |  |  |  |  |  |  | Age 4 | shers |
| 80 | NA | 0.787 | 1.012 | 1.107 | 0.630 | 0.77 | 1.10 | 1.163 | 0.758 | 1.634 | 0.969 |
| 81 | NA | 1.883 | 1.437 | 0.764 | 1.081 | 1.63 | NA | 1.133 | 1.908 | 1.063 | 1.381 |
| 82 | 1.000 | 0.777 | 0.551 | 1.019 | 1.316 | NA | 1.273 | 0.740 | 0.335 | 0.304 | 0.736 |
| 83 | 1.649 | 1.083 | 1.490 | 1.090 | 0.748 | 0.517 | 1.580 | 1.042 | NA | 0.34 | 0.842 |
| 84 | 1.371 | 0.220 | 0.466 | 0.704 | 1.452 | 1.885 | 0.930 | 1.635 | NA | 0.287 | 1.097 |
| 85 | 0.985 | 0.246 | 0.512 | 1.828 | 2.887 | 1.79 | 1.077 | 1.474 | 0.968 | 0.260 | 1.346 |
| 86 | 1.716 | 0.853 | 0.799 | NA | 1.670 | NA | 0.930 | 1.141 | 0.904 | NA | 1.127 |
| 87 | 0.467 | 0.428 | 0.627 | 0.892 | NA | NA | 1.482 | 1.754 | 1.662 | 0.262 | 0.973 |
| 88 | 1.907 | 0.185 | 0.655 | 0.590 | 1.056 | NA | 0.814 | 0.886 | 1.391 | 0.337 | 0.794 |
| 89 | NA | 0.0 | 0.321 | 0.562 | 1.190 | 1.387 | 0.623 | 0.793 | 2.003 | 0.23 | 0.936 |

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)


Fishery: Central B.C. Troll, All Ages
 TOTAL MORTALITY EXPLOITATION RATE INDEX BY STOCK

|  | BQR | QUI | RBT | RBT | SAM |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Year | Age 3 | Age 4 | Age 3 | Age 4 | Age | Fishery |
| ===== |  |  |  |  |  |  |
| 79 | 1.228 | NA | 1.289 | 1.238 | NA | 1.246 |
| 80 | 0.749 | 1.275 | 1.136 | 1.144 | NA | 1.093 |
| 81 | 1.390 | 1.117 | 0.835 | 0.793 | NA | 1.052 |
| 82 | 0.632 | 0.608 | 0.739 | 0.825 | NA | 0.693 |
| 83 | NA | 0.759 | 0.940 | 0.850 | NA | 0.826 |
| 84 | 0.636 | 0.445 | NA | 0.404 | NA | 0.484 |
| 85 | 0.289 | 0.199 | NA | NA | NA | 0.236 |
| 86 | 0.987 | 0.573 | NA | NA | NA | 0.743 |
| 87 | NA | 0.508 | 0.474 | NA | NA | 0.498 |
| 88 | NA | 0.149 | 0.276 | 0.161 | NA | 0.177 |
| 89 | 0.077 | 0.100 | 0.118 | 0.072 | NA | 0.089 |

```
Stock Identifiers
BQR = BIG QUALICUM
QUI = QUINSAM
RBT = ROBERTSON CREEK
SAM = SAMISH FALL FING
```


## FISHERY INDEX WEST COAST VANCOUVER ISLAND TROLL (ALL AGES)



Fishory: West Coast Vancouver Island Troll, All Ages
 TOTAL MORTALITY EXPLOITATION RATE INDEX BY STOCK

| Year | $\begin{array}{r} \text { BON } \\ \text { Age } 3 \end{array}$ | $\begin{array}{r} \mathrm{BON} \\ \text { Age } 4 \end{array}$ | $\begin{array}{r} \text { CHF } \\ \text { Age } 3 \end{array}$ | $\begin{array}{r} \mathrm{CHF} \\ \text { Age } 4 \end{array}$ | $\begin{array}{r} G A D \\ \text { Age } 3 \end{array}$ | $\begin{array}{r} \text { GAD } \\ \text { Age } 4 \end{array}$ | $\begin{array}{r} \text { LRW } \\ \text { Ago } 4 \end{array}$ | $\begin{array}{r} \text { RBY } \\ \text { Age } 3 \end{array}$ | $\begin{array}{r} \text { RBT } \\ \text { Age } 4 \end{array}$ | SAM Age 3 | SAM Age 4 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  |  |  |  |  |  |  |  | $=$ |
| 79 | 1.130 | NA | NA | NA | NA | NA | NA | 1.154 | 1.251 | NA | 1.000 |
| 80 | 0.551 | 0.690 | 1.000 | NA | NA | NA | NA | 1,404 | 1.707 | NA | NA |
| 81 | 0.885 | 0.711 | NA | 0.791 | 0.740 | NA | 0.824 | 0.661 | 0.446 | NA | NA |
| 82 | 1.434 | 1.600 | NA | 1.209 | 1.260 | 1.000 | 1.176 | 0.782 | 0.596 | 1,000 | NA |
| 83 | 1.770 | 1.513 | 0.377 | 1.374 | NA | 1.240 | 0.954 | 0.395 | 0.592 | NA | 0.652 |
| 84 | 1.416 | 2.576 | 0.189 | 1.335 | 1.889 | NA | NA | 1.602 | 0.888 | NA | NA |
| 85 | 1,379 | NA | 0.292 | 0.889 | NA | 0.822 | NA | 1,023 | NA | NA | NA |
| 86 | NA | NA | 0.480 | 1.266 | NA | NA | 0.457 | NA | NA | NA | NA |
| 87 | 1,151 | NA | 0.148 | 0.840 | NA | NA | 1.506 | 0.501 | NA | NA | NA |
| 88 | NA | 1.270 | 0.214 | 0.914 | 0.572 | NA | 1.184 | 0.691 | 0.818 | 0.894 | NA |
| 89 | NA | NA | 0.057 | 0.554 | 0.586 | 0.473 | 0.749 | 0.211 | 0.333 | 0.178 | 0.281 |

TOTAL MORTALITY EXPLOITATION RATE INDEX BY STOCK


## FISHERY INDEX WEST COAST VANCOUVER ISLAND TROLL (AGE 3)



Fishery: West Coast Vancouver Island Troll, Ocean Age 3
 total mortality exploitation rate index by stock

Year Age 3 Age 3 Age 3 Age 3 Age 3 Age 3 Age 3 Age 3 Age 3 Age 3 Age 4 Fishery


| 79 | 1.130 | - NA | NA | 1.154 | NA | 0.971 | NA | NA | 1.275 | 0.612 | NA | 0.986 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 80 | 0.551 | 1.000 | NA | 1.404 | NA | 1.186 | NA | NA | 0.982 | 1.333 | 1.799 | 1.036 |
| 81 | 0.885 | NA | 0.740 | 0.661 | NA | 0.908 | 0.652 | 1.019 | NA | 0.802 | 0.295 | 0.852 |
| 82 | 1.434 | NA | 1.260 | 0.782 | 1.000 | 0.935 | 1.348 | 0.981 | 0.743 | 1.252 | 0.906 | 1.116 |
| 83 | 1.770 | 0.377 | NA | 0.395 | NA | 1.476 | 1.538 | 1.370 | 0.243 | 0.762 | 0.174 | 1.192 |
| 84 | 1.416 | 0.189 | 1.889 | 1.602 | NA | 1.340 | 1.368 | 1.766 | 0.568 | 1.750 | 0.666 | 1.353 |
| 85 | 1.379 | 0.292 | NA | 1.023 | NA | 0.656 | 0.754 | 0.896 | 0.557 | 0.888 | 0.44 | 0.839 |
| 86 | NA | 0.480 | NA | NA | NA | 1.218 | 0.887 | 0.987 | 0.974 | 0.852 | NA | 0.944 |
|  | 1.151 | 0.148 | NA | 0.501 | NA | 0.507 | 0.966 | 1.300 | 0.753 | 0.464 | 0.591 | 0.798 |
|  | NA. | 0.214 | 0.572 | 0.691 | 0.894 | 1.069 | 0.380 | 1.344 | 0.363 | NA | 0.448 | 0.835 |
|  | NA | 0.05 | 0.586 | 0.2 | 0.178 | 0.349 | 0.434 | NA | 0.133 | NA | 0.476 | 0.300 |

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

FISHERY INDEX WEST COAST VANCOUVER ISLAND TROLL (AGE 4)


Fishery: West Coast Vancouver Island Troll, Ocean Age 4

total mortality exploitation rate index by stock


Stock Identifiers

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



Fishery: Georgia Strait Troll and Sport, All Ages

total mortality exploitation rate index by stock


Stock Identifiers
$B Q R=$ BIG QUALICUM
QUI $=$ QUINSAM
SAM $=$ SAMISH FALL FING
SPS = SO SOUND FALL YEAR
UWA $=U$ OF W FALL ACCEL


Fishery: Georgia Strait Troll and Sport, Ocean Age 3
 total mortality exploitation rate index by stock

|  | BQR | SAM | SPS | UWA |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Year | Age 3 | Age 3 | Age 3 | Age 3 | Fishery |
| === $=$ |  |  |  |  |  |
| 79 | 0.908 | NA | NA | 1.270 | 0.948 |
| 80 | 1.250 | NA | NA | 1.283 | 1.254 |
| 81 | 1.247 | NA | 1.552 | 1.081 | 1.283 |
| 82 | 0.595 | 1.000 | 0.448 | 0.366 | 0.617 |
| 83 | 1.186 | NA | 0.343 | 0.802 | 1.008 |
| 84 | 1.472 | NA | 0.960 | 1.515 | 1.390 |
| 85 | 0.725 | NA | NA | 0.676 | 0.720 |
| 86 | 1.038 | NA | NA | 0.516 | 0.979 |
| 87 | 0.616 | NA | 0.943 | 0.853 | 0.693 |
| 88 | 0.926 | 0.831 | 0.164 | NA | 0.791 |
| 89 | 0.819 | 1.010 | 0.262 | NA | 0.764 |

## Stock Identifiers

$B Q R=B I G$ QUALICUM
SAM = SAMISH FALL FING
SPS = SO SOUND FALL YEAR
$U W A=U$ OF W FALL ACCEL

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


Fishery: Georgia Strait Troll and Sport, Ocean Age 4

TOTAL MORTALITY EXPLOITATION RATE INDEX BY STOCK
BQR SAM SPS
Year Age 4 Age 4 Age 4 Fishery


| 79 | 0.653 | 1.000 | 1.074 | 0.786 |
| :--- | :--- | :--- | :--- | :--- |
| 80 | 1.133 | NA | NA | 1.133 |
| 81 | 1.714 | NA | NA | 1.714 |
| 82 | 0.501 | NA | 0.926 | 0.573 |
| 83 | 0.754 | 0.846 | 0.571 | 0.750 |
| 84 | NA | NA | 0.798 | 0.798 |
| 85 | 0.474 | NA | 0.817 | 0.532 |
| 86 | 0.780 | NA | NA | 0.780 |
| 87 | 0.972 | NA | NA | 0.972 |
| 88 | 0.763 | NA | NA | 0.763 |
| 89 | 1.235 | 0.984 | 0.692 | 1.107 |

Stock Identifiers
$B Q R=$ BIG QUALICUM
SAM = SAMISH FALL FING
SPS $=$ SO SOUND FALL YEAR

FISHERY INDEX GEORGIA STRAIT TROLL (ALL AGES)


Fishery: Georgia Strait Troll, All Ages
 total mortality exploitation rate index by stock

| BQR | SAM | SAM |  |
| ---: | ---: | ---: | ---: |
| Year | Age 3 | Age 3 | Age 4 | Fishery



| 79 | 1.209 | NA | 1.000 | 1.140 |
| :---: | :---: | :---: | :---: | :---: |
| 80 | 1.176 | NA | NA | 1.176 |
| 81 | 0.938 | NA | NA | 0.938 |
| 82 | 0.677 | 1.000 | NA | 0.721 |
| 83 | 1.457 | NA | 0.173 | 1.031 |
| 84 | 1.038 | NA | NA | 1.038 |
| 85 | 0.154 | NA | NA | 0.154 |
| 86 | 0.556 | NA | NA | 0.556 |
| 87 | 0.282 | NA | NA | 0.282 |
| 88 | 0.087 | NA | NA | 0.087 |
| 89 | 0.113 | 0.228 | NA | 0.129 |

Stock Identifiers
-----------------
BQR = BIG QUALICUM
SAM $=$ SAMISH FALL FING

FISHERY INDEX GEORGIA STRAIT SPORT (ALL AGES)


Fishery: Georgia Strait Sport, All Ages

total mortality exploitation rate index by stock

|  | BQR | BQR | QUI | SAM | SAM | SPS | UWA |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Year | Age 3 | Age 4 | Age 5 | Age 3 | Age 4 | Age 3 | Age 3 | Fishery |
| ===== |  |  |  |  |  |  |  |  |
| 79 | 0.640 | 0.584 | 0.493 | NA | 1.000 | NA | 0.987 | 0.626 |
| 80 | 1.317 | 1.170 | NA | NA | NA | NA | 1.441 | 1.244 |
| 81 | 1.522 | 1.950 | 1.794 | NA | NA | 1.590 | 1.152 | 1.734 |
| 82 | 0.521 | 0.296 | 0.713 | 1.000 | NA | 0.410 | 0.421 | 0.503 |
| 83 | 0.945 | 0.803 | 0.435 | NA | 1.978 | 0.350 | 0.608 | 0.779 |
| 84 | 1.858 | NA | 0.352 | NA | NA | 0.880 | 1.619 | 1.137 |
| 85 | 1.233 | 0.640 | 0.354 | NA | NA | NA | 0.815 | 0.741 |
| 86 | 1.466 | 1.039 | 0.446 | NA | NA | NA | 0.622 | 0.985 |
| 87 | 0.912 | 1.295 | 0.112 | NA | NA | 1.045 | 0.702 | 0.877 |
| 88 | 1.672 | 0.831 | 0.460 | 1.165 | NA | 0.164 | NA | 0.915 |
| 89 | 1.446 | 1.668 | 0.493 | 1.349 | 2.639 | 0.266 | NA | 1.284 |

Stock Identifiers
$B Q R=$ BIG QUALICUM
QUI = QUINSAM
SAM $=$ SAMISH FALL FING
SPS = SO SOUND FALL YEAR $U W A=U O F W$ FALL ACCEL

## FISHERY INDEX <br> WA/OR TROLL \& WA SPORT (ALL AGES)



Fishery: WA/OR Sport and Troll Combined, All Ages
 total mortality exploitation rate index by stock

|  | BON | CWF | CWF | SAM | SAM | SPR | SPR | SPS | SPS | STP | UWA |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| ar | Age 3 | Age 3 | Age 4 | Age 3 | Age 4 | Age 3 | Age 4 | Age 3 | Age 4 | Age 3 | Age 3 | Fisher |
| - |  |  |  |  |  |  |  |  |  |  |  | 析 |
| 79 | 0.704 | NA | NA | NA | 1.000 | 0.688 | 1.093 | NA | 0.614 | NA | 0.629 | 0.785 |
| 80 | 1.173 | 0.974 | NA | NA | NA | 1.079 | 0.793 | NA | NA | NA | 1.247 | 1.030 |
| 81 | 1.120 | 0.774 | 0.718 | NA | NA | 1.024 | 1.324 | 1.042 | NA | 0.721 | 1.019 | 0.939 |
| 82 | 1.004 | 1.253 | 1.282 | 1.000 | NA | 1.209 | 0.790 | 0.958 | 1.386 | 1.279 | 1.105 | 1.156 |
| 83 | 0.715 | 0.597 | 0.845 | NA | 5.487 | 0.454 | 0.357 | 0.703 | 0.794 | 0.703 | 0.675 | 0.655 |
| 84 | 0.450 | 0.106 | 0.201 | NA | NA | 0.298 | NA | 1.084 | 0.693 | 0.209 | 0.416 | 0.284 |
| 85 | 0.939 | 0.618 | 0.194 | NA | NA | 0.638 | NA | NA | 0.671 | 0.800 | 0.618 | 0.632 |
| 86 | NA | 0.982 | 0.260 | NA | NA | 0.460 | 0.427 | NA | NA | 0.835 | 0.661 | 0.566 |
| 87 | 0.890 | 0.532 | 0.564 | NA | NA | 0.779 | NA | NA | NA | 0.701 | 1.068 | 0.713 |
| 88 | NA | 0.422 | 0.691 | NA | NA | 0.448 | NA | 1.823 | NA | 0.919 | NA | 0.649 |
| 89 | NA | 0.350 | 1.423 | 0.261 | NA | 0.701 | 0.701 | 2.982 | 1.986 | NA | NA | 0.910 |

Stock Identifiers

BON = BONNEVILLE TULE
CWF = COWLITZ FALL TULE
SAM = SAMISH FALL FING
SPR $=$ SO SOUND FALL FING
SPS = SO SOUND FALL YEAR
STP $=$ STAYTON POND TULE
UWA $=\mathrm{U}$ OF W FALL ACCEL

FISHERY INDEX
WA/OR TROLL \& WA SPORT (AGE 3)


Fishery: WA/OR Sport and Troll Combined, Ocean Age 3
 TOTAL MORTALITY EXPLOITATION RATE INDEX BY STOCK
BON CWF SAM SPR SPS STP UWA

Year Age 3 Age 3 Age 3 Age 3 Age 3 Age 3 Age 3 Fishery

$=============================================================$

| 79 | 0.704 | NA | NA | 0.688 | NA | NA | 0.629 | 0.691 |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| 80 | 1.173 | 0.974 | NA | 1.079 | NA | NA | 1.247 | 1.092 |
| 81 | 1.120 | 0.774 | NA | 1.024 | 1.042 | 0.721 | 1.019 | 0.923 |
| 82 | 1.004 | 1.253 | 1.000 | 1.209 | 0.958 | 1.279 | 1.105 | 1.183 |
| 83 | 0.715 | 0.597 | NA | 0.454 | 0.703 | 0.703 | 0.675 | 0.610 |
| 84 | 0.450 | 0.106 | NA | 0.298 | 1.084 | 0.209 | 0.416 | 0.289 |
| 85 | 0.939 | 0.618 | NA | 0.638 | NA | 0.800 | 0.618 | 0.745 |
| 86 | NA | 0.982 | NA | 0.460 | NA | 0.835 | 0.661 | 0.703 |
| 87 | 0.890 | 0.532 | NA | 0.779 | NA | 0.701 | 1.068 | 0.752 |
| 88 | NA | 0.422 | NA | 0.448 | 1.823 | 0.919 | NA | 0.634 |
| 89 | NA | 0.350 | 0.261 | 0.701 | 2.982 | NA | NA | 0.630 |

Stock Identifiers

BON $=$ BONNEVILLE TULE
CWF = COWLITZ FALL TULE
SAM = SAMISH FALL FING
SPR $=$ SO SOUND FALL FING
SPS = SO SOUND FALL YEAR
STP = STAYTON POND TULE
UWA $=U$ OF $W$ FALL ACCEL

FISHERY INDEX WA/OR TROLL \& WA SPORT (AGE 4)


Fishery: WA/OR Troll and Sport Combined, Ocean Age 4
 TOTAL MORTALITY EXPLOITATION RATE INDEX BY STOCK

|  | CWF | SAM | SPR | SPS |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Year | Age 4 | Age 4 | Age 4 | Age 4 | Fishery |
| 79 | NA | 1.000 | 1.093 | 0.614 | 1.006 |
| 80 | NA | NA | 0.793 | NA | 0.793 |
| 81 | 0.718 | NA | 1.324 | NA | 0.973 |
| 82 | 1.282 | NA | 0.790 | 1.386 | 1.102 |
| 83 | 0.845 | 5.487 | 0.357 | 0.794 | 0.746 |
| 84 | 0.201 | NA | NA | 0.693 | 0.269 |
| 85 | 0.194 | NA | NA | 0.671 | 0.260 |
| 86 | 0.260 | NA | 0.427 | NA | 0.330 |
| 87 | 0.564 | NA | NA | NA | 0.564 |
| 88 | 0.691 | NA | NA | NA | 0.691 |
| 89 | 1.423 | NA | 0.701 | 1.986 | 1.193 |

## Stock Identifiers

CWF = COWLITZ FALL TULE
SAM $=$ SAMISH FALL FING
SPR $=$ SO SOUND FALL FING
SPS $=$ SO SOUND FALL YEAR

## APPENDIX E

Fishery Index Figures Comparison of Total Mortality and Reported Catch Indices
Southeast Alaska Troll ..... E-1
West Coast Vancouver Island Troll (All Ages) ..... E-1
West Coast Vancouver Island Troll (Age 3) ..... E-2
West Coast Vancouver Island Troll (Age 4) ..... E-2


FISHERY INDEX
TOTAL MORTALITY \& REPORTED CATCH WCVI TROLL (ALL AGES)


TOTAL MORTALITY
REPORTED CATCH

## FISHERY INDEX <br> TOTAL MORTALITY \& REPORTED CATCH WCVI TROLL (AGE 3)



FISHERY INDEX
TOTAL MORTALITY \& REPORTED CATCH WCVI TROLL (AGE 4)


TOTAL MORTALITY
REPORTED CATCH

## APPENDIX F

## Stock Index Figures

## Summary Stock Indices

Robertson Creek ..... F-1
Quinsam ..... F-1
Big Qualicum ..... F-2
Capilano ..... F-3
Capilano (Without Age 4 Other U.S.) ..... F-3
South Puget Sound Yearling ..... F-4
University of Washington Accelerated ..... F-4
Samish Fingerling ..... F-5
George Adams Fingerling ..... F-5
South Puget Sound Fingerling ..... F-6
Cowlitz ..... F-7
Spring Creek ..... F-7
Bonneville ..... F-8
Stayton Pond ..... F-8
Upriver Bright ..... F-9
Lewis River ..... F-9
Wells Hatchery ..... F-10
Wells Hatchery (W/O Ages 3-5 Other U.S.) ..... F-10
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Age-Specific Stock Indices
Southeast Alaska (Age 4) ..... F-12
Southeast Alaska (Age 5) ..... F-12
Robertson Creek (Age 3) ..... F-13
Robertson Creek (Age 4) ..... F-13
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Quinsam (Age 3) ..... F-14
Quinsam (Age 4) ..... F-15
Quinsam (Age 5) ..... F-15
Big Qualicum (Age 3) ..... F-16
Big Qualicum (Age 4) ..... F-16
Capilano (Age 3) ..... F-17
Capilano (Age 4) ..... F-18
Capilano (Age 4) (Without Other U.S. Fisheries) ..... F-18
South Puget Sound Yearling (Age 3) ..... F-19
South Puget Sound Yearling (Age 4) ..... F-19
University of Washington Accelerated (Age 3) ..... F-20
University of Washington Accelerated (Age 4) ..... F-20
Samish Fingerling (Age 3) ..... F-21
Samish Fingerling (Age 4) ..... F-21
George Adams Fingerling (Age 3) ..... F-22
George Adams Fingerling (Age 4) ..... F-22
South Puget Sound Fingerling (Age 3) ..... F-23
South Puget Sound Fingerling (Age 4) ..... F-23
White River (Age 3) ..... F-24
Cowlitz (Age 3) ..... F-25
Cowlitz (Age 4) ..... F-25
Spring Creek (Age 3) ..... F-26
Spring Creek (Age 4) ..... F-26
Bonneville (Age 3) ..... F-27
Bonneville (Age 4) ..... F-27
Stayton Pond (Age 3) ..... F-28
Stayton Pond (Age 4) ..... F-28
Upriver Bright (Age 3) ..... F-29
Upriver Bright (Age 4) ..... F-29
Upriver Bright (Age 5) ..... F-30
Lewis River (Age 3) ..... F-30
Lewis River (Age 4) ..... F-31
Lewis River (Age 5) ..... F-31
Wells Hatchery (Age 3) ..... F-32
Wells Hatchery (Age 3) (Without Other U.S. Fisheries) ..... F-32
Wells Hatchery (Age 4) ..... F-33
Wells Hatchery (Age 4) (Without Other U.S. Fisheries) ..... F-33
Wells Hatchery (Age 5) ..... F-34
Wells Hatchery (Age 5) (Without Other U.S. Fisheries) ..... F-34
Willamette (Age 4) ..... F-35
Willamette (Age 5) ..... F-35

## STOCK INDEX

ROBERTSON CREEK SUMMARY


TOTAL MORTALITY

## STOCK INDEX

QUINSAM SUMMARY


TOTAL MORTALITY

## STOCK INDEX

BIG QUALICUM SUMMARY


TOTAL MORTALITY

## STOCK INDEX

CAPILANO SUMMARY


TOTAL MORTALITY

## STOCK INDEX

CAPILANO SUMMARY
Without Age 4 Other U.S.


TOTAL MORTALITY

## STOCK INDEX

SOUTH SOUND FALL YEARLING SUMMARY


TOTAL MORTALITY

## STOCK INDEX

UNIV OF WASHINGTON ACCELERATED SUMMARY


## STOCK INDEX

SAMISH FALL FINGERLING SUMMARY


TOTAL MORTALITY

## STOCK INDEX

GEORGE ADAMS FALL FINGERLING SUMMARY


## STOCK INDEX

SOUTH SOUND FALL FINGERLING SUMMARY


TOTAL MORTALITY

## STOCK INDEX

## COWLITZ TULE SUMMARY



TOTAL MORTALITY

## STOCK INDEX

SPRING CREEK TULE SUMMARY


TOTAL MORTALITY

## STOCK INDEX

BONNEVILLE TULE SUMMARY


TOTAL MORTALITY

## STOCK INDEX

STAYTON POND SUMMARY


TOTAL MORTALITY

## STOCK INDEX

## COLUMBIA RIVER UPRIVER BRIGHT SUMMARY



TOTAL MORTALITY

## STOCK INDEX

LEWIS RIVER WILD SUMMARY


TOTAL MORTALITY

## STOCK INDEX

WELLS HATCHERY SUMMER/FALL SUMMARY


TOTAL MORTALITY

## STOCK INDEX

WELLS HATCHERY SUMMER/FALL SUMMARY
Without Ages 3-5 Other U.S.


TOTAL MORTALITY

## STOCK INDEX

## WILLAMETTE SPRING SUMMARY



TOTAL MORTALITY

## STOCK INDEX

ALASKA SPRING AGE 4


TOTAL MORTALITY

- NOTE BASE PERIOD USED IS 82-84


## sTOCK INDEX

ALASKA SPRING AGE 5


- Ceilinged Fisheries

[^6]
## 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

QUINSAM AGE 3


## STOCK INDEX

QUINSAM AGE 4


TOTAL MORTALITY

## STOCK INDEX

QUINSAM AGE 5


## STOCK INDEX

## BIG QUALICUM AGE 3



TOTAL MORTALITY

## STOCK INDEX

BIG QUALICUM AGE 4


## STOCK INDEX

CAPILANO AGE 3


TOTAL MORTALITY

STOCK INDEX
CAPILANO AGE 4


TOTAL MORTALITY

## STOCK INDEX

CAPILANO AGE 4
Without Other U.S. Fisheries


TOTAL MORTALITY

## STOCK INDEX

SOUTH SOUND FALL YEARLING AGE 3

$-\Delta-$ Other U.S. Fisheries * Other B.C. Fisheries
total mortality

## STOCK INDEX

SOUTH SOUND FALL YEARLING AGE 4


TOTAL MORTALITY

## STOCK INDEX

UNIV OF WASHINGTON ACCELERATED AGE 3

$\rightarrow$ Ceilinged Fisheries $-\Delta-$ Other U.S. Fisheries

TOTAL MORTALITY

## STOCK INDEX

UNIV OF WASHINGTON ACCELERATED AGE 4


TOTAL MORTALITY

## STOCK INDEX

## SAMISH FALL FINGERLING AGE 3



TOTAL MORTALITY

## STOCK INDEX

SAMISH FALL FINGERLING AGE 4


## STOCK INDEX

## GEORGE ADAMS FALL FINGERLING AGE 3


$\square$ Ceilinged Fisheries $\quad-\Delta--$ Other U.S. Fisheries

TOTAL MORTALITY

## STOCK INDEX

GEORGE ADAMS FALL FINGERLING AGE 4


## STOCK INDEX

SOUTH SOUND FALL FINGERLING AGE 3


TOTAL MORTALITY

## STOCK INDEX

SOUTH SOUND FALL FINGERLING AGE 4


## STOCK INDEX

WHITE RIVER SPRING YEARLING AGE 3

-A-- Other U.S. Fisheries

TOTAL MORTALITY

## STOCK INDEX

## COWLITZ TULE AGE 3



TOTAL MORTALITY

## STOCK INDEX

COWLITZ TULE AGE 4


## 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


## STOCK INDEX

## STAYTON POND AGE 3



TOTAL MORTALITY

## STOCK INDEX

STAYTON POND AGE 4


TOTAL MORTALITY

## STOCK INDEX

## COLUMBIA RIVER UPRIVER BRIGHT AGE 3



TOTAL MORTALITY

STOCK INDEX
COLUMBIA RIVER UPRIVER BRIGHT AGE 4


- Ceilinged Fisheries --A-- Other U.S. Fisheries
total mortality


## STOCK INDEX

COLUMBIA RIVER UPRIVER BRIGHT AGE 5

$\rightarrow$ Ceilinged Fisheries ---- Other U.S. Fisheries

TOTAL MORTALITY

## STOCK INDEX

LEWIS RIVER WILD AGE 3


- Ceilinged Fisheries -- -- Other U.S. Fisheries


## STOCK INDEX

## LEWIS RIVER WILD AGE 4


$\square$ Ceilinged Fisheries $\quad-\Delta--$ Other U.S. Fisheries

TOTAL MORTALITY

## STOCK INDEX

## LEWIS RIVER WILD AGE 5



TOTAL MORTALITY

## STOCK INDEX

WELLS HATCHERY SUMMER/FALL AGE 3


TOTAL MORTALITY

## STOCK INDEX

WELLS HATCHERY SUMMER/FALL AGE 3
Without Other U.S. Fisheries


-     - Ceilinged Fisheries


## STOCK INDEX

WELLS HATCHERY SUMMER/FALL AGE 4

$\square$ Ceilinged Fisheries $\quad-\Delta-$ Other U.S. Fisheries

TOTAL MORTALITY

## STOCK INDEX

WELLS HATCHERY SUMMER/FALL AGE 4
without Other U.S. Fisheries


- Ceilinged Fisheries


## STOCK INDEX

WELLS HATCHERY SUMMER/FALL AGE 5

total mortality

## STOCK INDEX

WELLS HATCHERY SUMMER/FALL AGE 5
Without Other U.S. Fisheries

$\rightarrow$ Ceilinged Fisheries $\quad-$ - Other B.C. Fisheries

## STOCK INDEX

WILLAMETTE SPRING AGE 4


TOTAL MORTALITY

## STOCK INDEX

WILLAMETTE SPRING AGE 5


TOTAL MORTALITY

## APPENDIX G

## Stock Index Tables

Southeast Alaska (Age 4) ..... G-1
Southeast Alaska (Age 5) ..... G-2
Robertson Creek ..... G-3
Quinsam ..... G-4
Big Qualicum ..... G-5
Capilano ..... G-6
South Puget Sound Yearling ..... G-7
University of Washington Accelerated ..... G-8
Samish Fingerling ..... G-9
George Adams Fingerling ..... G-10
South Puget Sound Fingerling ..... G-11
White River ..... G-12
Cowlitz ..... G-13
Spring Creek ..... G-14
Bonneville ..... G-15
Stayton Pond ..... G-16
Upriver Bright ..... G-17
Lewis River ..... G-18
Wells Hatchery ..... G-19
Willamette ..... G-20

## STOCK: Alaska Spring Age 4

## Base Period 1982-84

| TOTAL MORTALITY EXPLOITATION RATE 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 | 0.1630 | NA | NA |
| 83 | 0.2322 | NA | NA |
| 84 | 0.1275 | NA | NA |
| 85 | 0.1566 | NA | NA |
| 86 | 0.2716 | NA | NA |
| 87 | 0.1505 | NA | NA |
| 88 | 0.1912 | NA | NA |
| 89 | 0.2524 | NA | NA |
| Base | 0.1742 | 0.0000 | 0.0000 |

Fisheries represented in ALLCEIATR 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 CAN/NO
WCVN JDFN JSN FRN WCVS

## STOCK: Alaska Spring Age 5

## Base Period 1983-84

| total mortality exploitation rate by fishery |  |  |  |
| :---: | :---: | :---: | :---: |
|  | ALLCEI | US/NON | CAN/NO |
| Year | Age 5 | Age 5 | Age 5 |
| = = = = | $===$ |  |  |
| 79 | NA | NA | NA |
| 80 | NA | NA | NA |
| 81 | NA | NA | NA |
| 82 | NA | NA | NA |
| 83 | 0.3363 | NA | NA |
| 84 | 0.4971 | NA | NA |
| 85 | 0.2677 | NA | NA |
| 86 | 0.2602 | NA | NA |
| 87 | 0.3852 | NA | NA |
| 88 | 0.3126 | NA | NA |
| 89 | 0.2113 | NA | NA |
| Base | 0.4167 | 0.0000 | 0.0000 |


| TOTAL MORTALITY ALLCEI |  | STOCK INDEX BY FISHERY |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | ALLCEI | US/NON | US/NON | CAN/NO | CAN/NO |
| 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 | 0.8070 | 0.8070 | NA | NA | NA | NA |
| 84 | 1.1930 | 1.1930 | NA | NA | NA | NA |
| 85 | 0.6423 | 0.6423 | NA | NA | NA | NA |
| 86 | 0.6245 | 0.6245 | NA | NA | NA | NA |
| 87 | 0.9243 | 0.9243 | NA | NA | NA | NA |
| 88 | 0.7502 | 0.7502 | NA | NA | NA | NA |
| 89 | 0.5072 | 0.5072 | NA | NA | NA | NA |

Fisheries represented in ALLCEI

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

Fisheries represented in CAN/NO WCVN JDFN JSN FRN WCVS

## STOCK: Robertson Creek

 total mortality exploitation rate by fishery

| Year | ALLCEI <br> Age 3 | ALLCEI Age 4 | ALLCEI <br> Age 5 | US/NON Age 3 | US/NON Age 4 | US/NON Age 5 | $\begin{gathered} \text { CAN/NO } \\ \text { Age } 3 \end{gathered}$ | CAN/NO Age 4 | $\begin{array}{r} \text { CAN/NO } \\ \text { Age } 5 \end{array}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 79 | 0.2253 | 0.5604 | 0.7508 | 0.0001 | 0.0023 | NA | 0.0179 | 0.0706 | 0.0638 |
| 80 | 0.2668 | 0.6061 | 0.6469 | 0.0000 | 0.0044 | NA | 0.0609 | 0.1455 | 0.1573 |
| 81 | 0.1870 | 0.5636 | 0.7776 | 0.0016 | 0.0033 | NA | 0.0605 | 0.1488 | 0.1956 |
| 82 | 0.2046 | 0.5549 | 0.5167 | 0.0053 | 0.0025 | NA | 0.0451 | 0.1401 | 0.4500 |
| 83 | 0.2001 | 0.5297 | 0.7110 | 0.0004 | 0.0039 | NA | 0.0275 | 0.1594 | 0.2719 |
| 84 | 0.2264 | 0.6075 | 0.6469 | 0.0000 | 0.0051 | NA | 0.0719 | 0.2142 | 0.3256 |
| 85 | 0.3179 | 0.5573 | 0.8133 | 0.0083 | 0.0560 | NA | 0.0513 | 0.0987 | 0.1084 |
| 86 | 0.2277 | 0.6170 | 0.8519 | 0.0198 | 0.0000 | NA | 0.0000 | 0.0511 | 0.1296 |
| 87 | 0.1486 | 0.5370 | 0.8205 | 0.0020 | 0.0000 | NA | 0.0379 | 0.0370 | 0.0000 |
| 88 | 0.1038 | 0.4521 | 1.0000 | 0.0048 | 0.0111 | NA | 0.0228 | 0.1881 | 0.0000 |
| 89 | 0.1014 | 0.3340 | 0.4752 | 0.0019 | 0.0123 | NA | 0.0851 | 0.3222 | 0.4876 |
| Base | 0.2209 | 0.5713 | 0.6730 | 0.0017 | 0.0031 | 0.0000 | 0.0461 | 0.1263 | . 2167 |


TOTAL MORTALITY STOCK INDEX BY FISHERY
Year Age 3 Age 4 Age 5 Total Age 3 Age 4 Age 5 Total Age 3 Age 4 Age 5 Total


| 79 | 1.0196 | 0.9810 | 1.1156 | 1.0487 | 0.0559 | 0.7424 | NA | 0.4984 | 0.3889 | 0.5595 | 0.2946 | 0.3917 |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| 80 | 1.2077 | 1.0609 | 0.9612 | 1.0372 | 0.0000 | 1.4039 | NA | 0.9049 | 1.3202 | 1.1526 | 0.7261 | 0.9349 |
| 81 | 0.8466 | 0.9867 | 1.1555 | 1.0431 | 0.9117 | 1.0511 | NA | 1.0015 | 1.3131 | 1.1783 | 0.9026 | 1.0407 |
| 82 | 0.9261 | 0.9714 | 0.7677 | 0.8710 | 3.0324 | 0.8026 | NA | 1.5951 | 0.9778 | 1.1096 | 2.0767 | 1.6326 |
| 83 | 0.9056 | 0.9273 | 1.0565 | 0.9834 | 0.2335 | 1.2396 | NA | 0.8820 | 0.5974 | 1.2622 | 1.2546 | 1.1792 |
| 84 | 1.0246 | 1.0634 | 0.9613 | 1.0106 | 0.0000 | 1.6269 | NA | 1.0487 | 1.5596 | 1.6965 | 1.5025 | 1.5722 |
| 85 | 1.4388 | 0.9756 | 1.2085 | 1.1524 | 4.7731 | 17.8053 | NA | 13.1732 | 1.1133 | 0.7815 | 0.5004 | 0.643 |
| 86 | 1.0308 | 1.0801 | 1.2658 | 1.1580 | 11.4176 | 0.0000 | NA | 4.0582 | 0.0000 | 0.4045 | 0.5982 | 0.645 |
| 87 | 0.6726 | 0.9401 | 1.2192 | 1.0280 | 1.1512 | 0.0000 | NA | 0.4092 | 0.8228 | 0.2934 | 0.0000 | 0.1927 |
| 88 | 0.4699 | 0.7914 | 1.4859 | 1.0619 | 2.7732 | 3.5287 | NA | 3.2601 | 0.4955 | 1.4898 | 0.0000 | 0.5422 |
| 89 | 0.4588 | 0.5846 | 0.7062 | 0.6215 | 1.0842 | 3.9253 | NA | 2.9155 | 1.8465 | 2.5522 | 2.2503 | 2.3004 |

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 CAN/NO
WCVN JDFN JSN FRN WCVS

## STOCK: Quinsam

 TOTAL MORTALITY EXPLOITATION RATE BY FISHERY

| Year | ALLCEI <br> Age 3 | ALLCEI Age 4 | ALLCEI <br> Age 5 | US/NON Age 3 | US/NON Age 4 | US/NON Age 5 | $\begin{array}{r} \text { CAN/NO } \\ \text { Age } 3 \end{array}$ | CAN/NO Age 4 | CAN/NO Age 5 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 79 | 0.1679 | 0.2785 | 0.4990 | NA | NA | NA | 0.0073 | 0.0000 | 0.0644 |
| 80 | 0.1753 | 0.4314 | 0.5774 | NA | NA | NA | 0.0139 | 0.0438 | 0.1310 |
| 81 | 0.1971 | 0.4359 | 0.6982 | NA | NA | NA | 0.0018 | 0.0486 | 0.0848 |
| 82 | 0.1574 | 0.3498 | 0.6084 | NA | NA | NA | 0.0059 | 0.0252 | 0.1476 |
| 83 | 0.1420 | 0.4614 | 0.6511 | NA | NA | NA | 0.0155 | 0.0322 | 0.0822 |
| 84 | 0.0776 | 0.3281 | 0.4784 | NA | NA | NA | 0.0091 | 0.0303 | 0.0603 |
| 85 | 0.1602 | 0.3176 | 0.4410 | NA | NA | NA | 0.0094 | 0.0356 | 0.0867 |
| 86 | 0.2246 | 0.3229 | 0.5068 | NA | NA | NA | 0.0144 | 0.0329 | 0.0494 |
| 87 | 0.1382 | 0.3113 | 0.4795 | NA | NA | NA | 0.0129 | 0.0244 | 0.0548 |
| 88 | 0.0576 | 0.2267 | 0.2606 | NA | NA | NA | 0.0061 | 0.0175 | 0.0493 |
| 89 | 0.0315 | 0.2037 | 0.3408 | NA | NA | NA | 0.0042 | 0.0509 | 0.1100 |
| Base | 0.1744 | 0.3739 | 0.5958 | 0.0000 | 0.0000 | 0.0000 | 0.0072 | 0.0294 | 0.1069 |


| TOTAL <br> Year | $\begin{gathered} \text { MORTALITY } \\ \text { ALLCEI } \\ \text { Age } 3 \end{gathered}$ | STOCK I <br> ALLCEI Age 4 | NDEX BY ALLCEI Age 5 | FISHERY <br> ALLCEI <br> Total | $\begin{array}{r} \text { US/NON } \\ \text { Age } 3 \end{array}$ | US/NON Age 4 | $\begin{array}{r} \text { US/NON } \\ \text { Age } 5 \end{array}$ | US/NON Total | $\begin{array}{r} \text { CAN/NO } \\ \text { Age } 3 \end{array}$ | $\begin{array}{r} \text { CAN/NO } \\ \text { Age } 4 \end{array}$ | $\begin{array}{r} \text { CAN/NO } \\ \text { Age } 5 \end{array}$ | CAN/NO Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 79 | 0.9627 | 0.7448 | 0.8376 | 0.8263 | NA | NA | NA | NA | 1.0038 | 0.0000 | 0.6021 | 0.4991 |
| 80 | 1.0052 | 1.1538 | 0.9692 | 1.0350 | NA | NA | NA | NA | 1.9238 | 1.4905 | 1.2245 | 1.3143 |
| 81 | 1.1297 | 1.1658 | 1.1720 | 1.1635 | NA | NA | NA | NA | 0.2526 | 1.6520 | 0.7933 | 0.9419 |
| 82 | 0.9024 | 0.9356 | 1.0213 | 0.9752 | NA | NA | NA | NA | 0.8198 | 0.8575 | 1.3801 | 1.2448 |
| 83 | 0.8142 | 1.2341 | 1.0929 | 1.0966 | NA | NA | NA | NA | 2.1427 | 1.0937 | 0.7688 | 0.9047 |
| 84 | 0.4448 | 0.8776 | 0.8031 | 0.7728 | NA | NA | NA | NA | 1.2516 | 1.0317 | 0.5643 | 0.6947 |
| 85 | 0.9186 | 0.8496 | 0.7402 | 0.8031 | NA | NA | NA | NA | 1.3008 | 1.2096 | 0.8112 | 0.9174 |
| 86 | 1.2874 | 0.8635 | 0.8508 | 0.9215 | NA | NA | NA | NA | 1.9894 | 1.1176 | 0.4621 | 0.6734 |
| 87 | 0.7924 | 0.8327 | 0.8048 | 0.8120 | NA | NA | NA | NA | 1.7776 | 0.8296 | 0.5124 | 0.6412 |
| 88 | 0.3304 | 0.6063 | 0.4374 | 0.4763 | NA | NA | NA | NA | 0.8372 | 0.5953 | 0.4610 | 0.5075 |
| 89 | 0.1803 | 0.5448 | 0.5721 | 0.5034 | NA | NA | NA | NA | 0.5804 | 1.7320 | 1.0287 | 1.1501 |

[^7]
## STOCK: Big Qualicum

| total <br> Year | Mortality ALLCEI | EXPLOITATION RATE BY FISHERY |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | ALLCEI | US/NON Age 3 | US/NON Age 4 | $\begin{gathered} \text { CAN/NO } \\ \text { Age } 3 \end{gathered}$ | CAN/NO Age |
|  | Age 3 |  |  |  |  |  |
|  |  |  |  |  |  |  |
| 79 | 0.3938 | 0.3799 | 0.0018 | 0.0092 | 0.0423 | 0.1082 |
| 80 | 0.4533 | 0.5251 | 0.0014 | 0.009 | 0.0290 | 0.0899 |
| 81 | 0.4547 | 0.6431 | 0.0071 | 0.003 | 0.0418 | 0.050 |
| 82 | 0.3245 | 0.4155 | 0.0000 | 0.034 | 0.035 | 0.0974 |
| 83 | 0.4085 | 0.4462 | 0.0000 | 0.000 | 0.056 | 0.183 |
| 84 | 0.4658 | 0.6102 | 0.0000 | 0.000 | 0.01 | 0.000 |
| 85 | 0.2638 | 0.3136 | 0.0000 | 0.0828 | 0.0184 | 0.094 |
| 86 | 0.4124 | 0.5186 | 0.0058 | 0.0000 | 0.0314 | 0.0870 |
| 87 | 0.2569 | 0.5580 | 0.0000 | 0.0203 | 0.0245 | 0.0239 |
| 88 | 0.3069 | 0.3919 | 0.0000 | 0.0541 | 0.0103 | 0.0405 |
| 89 | 0.3078 | 0.5652 | 0.0068 | 0.000 | 0.02 | 0.02 |
| se | 0.4066 | 0.490 | 0.0026 | 0.01 | 0.037 | 0.0864 |

 total mortality stock index by fishery

ALLCEI ALLCEI ALLCEI US/NON US/NON US/NON CAN/NO CAN/NO CAN/NO
Year Age 3 Age 4 Total Age 3 Age 4 Total Age 3 Age 4 Total


| 79 | 0.9685 | 0.7740 | 0.8621 | 0.7015 | 0.6569 | 0.6638 | 1.1368 | 1.2526 | 1.2177 |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| 80 | 1.1150 | 1.0696 | 1.0902 | 0.5370 | 0.6522 | 0.6344 | 0.7791 | 1.0404 | 0.9618 |
| 81 | 1.1183 | 1.3101 | 1.2232 | 2.7614 | 0.2453 | 0.6339 | 1.1234 | 0.5789 | 0.7428 |
| 82 | 0.7982 | 0.8464 | 0.8245 | 0.0000 | 2.4457 | 2.0679 | 0.9607 | 1.1280 | 1.0777 |
| 83 | 1.0046 | 0.9090 | 0.9523 | 0.0000 | 0.0000 | 0.0000 | 1.5154 | 2.1220 | 1.9395 |
| 84 | 1.1456 | 1.2430 | 1.1989 | 0.0000 | 0.0000 | 0.0000 | 0.3067 | 0.0000 | 0.0923 |
| 85 | 0.6488 | 0.6389 | 0.6433 | 0.0000 | 5.8924 | 4.9822 | 0.4942 | 1.0962 | 0.9151 |
| 86 | 1.0144 | 1.0565 | 1.0374 | 2.2650 | 0.0000 | 0.3499 | 0.8450 | 1.0069 | 0.9582 |
| 87 | 0.6318 | 1.1367 | 0.9080 | 0.0000 | 1.4409 | 1.2183 | 0.6581 | 0.2772 | 0.3918 |
| 88 | 0.7548 | 0.7983 | 0.7786 | 0.0000 | 3.8448 | 3.2509 | 0.2783 | 0.4694 | 0.4119 |
| 89 | 0.7570 | 1.1514 | 0.9727 | 2.6338 | 0.0000 | 0.4068 | 0.6975 | 0.3021 | 0.4211 |

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 CAN/NO WCVN JDFN JSN FRN WCVS

## STOCK: Capilano

| total mortality ALLCEI |  | EXPLOITATION RATE BY FISHERY |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | ALLCEI | US/NON | US/NON | CAN/NO | CAN/NO |
| Year | Age 3 | Age 4 | Age 3 | Age 4 | Age 3 | Age 4 |
| 79 | 0.5474 | 0.5897 | 0.0066 | 0.0000 | 0.0377 | 0.1880 |
| 80 | 0.5182 | 0.6444 | 0.0078 | 0.0196 | 0.0314 | 0.0783 |
| 81 | 0.6555 | 0.6895 | 0.0045 | 0.0255 | 0.0267 | 0.1401 |
| 82 | 0.5485 | 0.6062 | 0.0619 | 0.0154 | 0.0628 | 0.1969 |
| 83 | 0.5063 | 0.6434 | 0.0173 | 0.0078 | 0.0496 | 0.0853 |
| 84 | 0.5325 | 0.7141 | 0.0035 | 0.0287 | 0.0196 | 0.0492 |
| 85 | 0.3835 | 0.5911 | 0.0194 | 0.0000 | 0.0583 | 0.1340 |
| 86 | 0.5054 | 0.7385 | 0.0092 | 0.0000 | 0.0431 | 0.1846 |
| 87 | 0.3246 | 0.6338 | 0.0175 | 0.1479 | 0.0421 | 0.0493 |
| 88 | 0.3846 | 0.6422 | 0.0000 | 0.0560 | 0.0000 | 0.0043 |
| 89 | 0.6889 | 0.4444 | 0.0222 | 0.0000 | 0.0603 | 0.4444 |
| Base | 0.5674 | 0.6324 | 0.0202 | 0.0151 | 0.0397 | 0.1508 |


| TOTAL <br> Year | $\begin{gathered} \text { MORTALI TY } \\ \text { ALLCEI } \\ \text { Age } 3 \end{gathered}$ | STOCK <br> ALLCEI <br> Age 4 | INDEX BY <br> ALLCEI Total | FISHERY US/NON Age 3 | US/NON Age 4 | US/NON Total | $\begin{array}{r} \text { CAN/NO } \\ \text { Age } 3 \end{array}$ | $\begin{gathered} \text { CAN/NO } \\ \text { Age } 4 \end{gathered}$ | CAN/NO Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| ====== |  |  |  |  |  |  |  |  |  |
| 80 | 0.9132 | 1.0189 | 0.9689 | 0.3845 | 1.2943 | 0.7743 | 0.7915 | 0.5191 | 0.5758 |
| 81 | 1.1553 | 1.0902 | 1.1210 | 0.2205 | 1.6845 | 0.8477 | 0.6733 | 0.9290 | 0.8757 |
| 82 | 0.9666 | 0.9585 | 0.9623 | 3.0693 | 1.0211 | 2.1919 | 1.5843 | 1.3054 | 1.3635 |
| 83 | 0.8924 | 1.0173 | 0.9582 | 0.8595 | 0.5125 | 0.7109 | 1.2496 | 0.5653 | 0.7078 |
| 84 | 0.9385 | 1.1291 | 1.0390 | 0.1731 | 1.8994 | 0.9127 | 0.4933 | 0.3265 | 0.3612 |
| 85 | 0.6759 | 0.9346 | 0.8122 | 0.9622 | 0.0000 | 0.5500 | 1.4687 | 0.8885 | 1.0093 |
| 86 | 0.8907 | 1.1676 | 1.0367 | 0.4581 | 0.0000 | 0.2619 | 1.0878 | 1.2239 | 1.1955 |
| 87 | 0.5720 | 1.0021 | 0.7987 | 0.8694 | 9.7781 | 4.6858 | 1.0616 | 0.3268 | 0.4798 |
| 88 | 0.6779 | 1.0155 | 0.8558 | 0.0000 | 3.7049 | 1.5872 | 0.0000 | 0.0286 | 0.0226 |
| 89 | 1.2141 | 0.7027 | 0.9446 | 1.1012 | 0.0000 | 0.6294 | 1.5208 | 2.9464 | 2.6496 |

## 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 CAN/NO
WCVN JDFN JSN FRN WCVS

## STOCK: South Sound Fall Yearling



| TOTAL <br> Year | hortality ALLCEI | STOCK INDEX BY FISHERY |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | ALLCEI | ALLCEI | US/NON | US/NON | US/NON | CAN/NO | CAN/NO | CAN/NO |
|  | Age 3 | Age 4 | Total | Age 3 | Age 4 | Total | Age 3 | Age 4 | Total |
| 79 | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 80 | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 81 | 0.0000 | NA | 0.0000 | 0.8457 | NA | 0.8457 | 2.0000 | NA | 2.0000 |
| 82 | 2.0000 | 1.0000 | 1.0772 | 1.1543 | 1.0000 | 1.0718 | 0.0000 | NA | 0.0000 |
| 83 | 3.7745 | 0.0000 | 0.2914 | 1.0520 | 1.5981 | 1.3440 | 0.0000 | NA | 0.0000 |
| 84 | 1.7385 | 0.7758 | 0.8501 | 1.1483 | 1.1493 | 1.1488 | 0.0000 | NA | 0.0000 |
| 85 | NA | 1.3026 | 1.3026 | NA | 1.2447 | 1.2447 | NA | NA | NA |
| 86 | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 87 | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 88 | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 89 | 0.0000 | NA | 0.0000 | 0.7391 | NA | 0.7391 | 0.0000 | NA | 0.0000 |

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 CAN/NO
WCVN JDFN JSN FRN WCVS

## STOCK: University of Washington Fall Accelerated

| TOTAL <br> Year | MORTALITY <br> ALLCE I Age 3 | EXPLOITATION RATE BY FISHERY |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | ALLCEI | US/NON | US/NON | CAN/NO | CAN/NO |
|  |  | Age 4 | Age 3 | Age 4 | Age 3 | Age 4 |
|  |  |  |  |  |  |  |
| 79 | 0.1109 | 0.1941 | 0.3473 | 0.1727 | 0.0202 | 133 |
| 80 | 0.1993 | 0.1634 | 0.2830 | 0.1958 | 0.0135 | 0.0117 |
| 81 | 0.1316 | 0.1745 | 0.4867 | 0.2953 | 0.0188 | 0.0604 |
| 82 | 0.1571 | 0.2573 | 0.3169 | 0.3257 | 0.0070 | 0.0104 |
| 83 | 0.1227 | 0.2732 | 0.4071 | 0.3930 | 0.0044 | 0.0000 |
| 84 | 0.2547 | 0.1821 | 0.3851 | 0.5750 | 0.0125 | 0.0000 |
| 85 | 0.1228 | 0.2500 | 0.3199 | 0.3417 | 0.0155 | 0.0250 |
| 86 | 0.1136 | 0.2709 | 0.2216 | 0.3347 | 0.0221 | 0.0319 |
| 87 | 0.0833 | 0.1187 | 0.2805 | 0.6596 | 0.0056 | 0.0237 |
| 88 | NA | 0.1954 | NA | 0.5862 | NA | 0.0101 |
| 89 | NA | NA | NA | NA | NA | NA |
| Base | 0.1497 | 0.1973 | 0.3585 | 0.2474 | 0.0149 | 0.0239 |


TOTAL MORTALITY STOCK INDEX BY FISHERY

| Year | $\begin{array}{r} \text { ALLCE I } \\ \text { Age } 3 \end{array}$ | ALLCEI Age 4 | ALLCEI Total | $\begin{array}{r} \text { US/NON } \\ \text { Age } 3 \end{array}$ | US/NON Age 4 | US/NON Total | $\begin{gathered} \text { CAN/NO } \\ \text { Age } 3 \end{gathered}$ | CAN/NO Age 4 | CAN/NO Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  |  |  |  |  |  |  |
| 79 | 0.7410 | 0.9837 | 0.8790 | 0.9689 | 0.6982 | 0.8583 | 1.3606 | 0.5552 | 0.8639 |
| 80 | 1.3310 | 0.8282 | 1.0451 | 0.7894 | 0.7916 | 0.7903 | 0.9058 | 0.4877 | 0.6480 |
| 81 | 0.8790 | 0.8843 | 0.8820 | 1.3577 | 1.1936 | 1.2907 | 1.2639 | 2.5237 | 2.0408 |
| 82 | 1.0490 | 1.3038 | 1.1939 | 0.8841 | 1.3166 | 1.0607 | 0.4697 | 0.4334 | 0.4473 |
| 83 | 0.8195 | 1.3845 | 1.1407 | 1.1355 | 1.5887 | 1.3205 | 0.2964 | 0.0000 | 0.1136 |
| 84 | 1.7010 | 0.9231 | 1.2587 | 1.0744 | 2.3241 | 1.5847 | 0.8397 | 0.0000 | 0.3219 |
| 85 | 0.8202 | 1.2670 | 1.0742 | 0.8924 | 1.3810 | 1.0919 | 1.0406 | 1.0445 | 1.0430 |
| 86 | 0.7584 | 1.3730 | 1.1078 | 0.6182 | 1.3527 | 0.9181 | 1.4823 | 1.3317 | 1.3894 |
| 87 | 0.5566 | 0.6017 | 0.5822 | 0.7824 | 2.6662 | 1.5516 | 0.3762 | 0.9922 | 0.7561 |
| 88 | NA | 0.9903 | 0.9903 | NA | 2.3694 | 2.3694 | NA | 0.4202 | 0.4202 |
| 89 | NA | NA | NA | NA | NA | NA | NA | NA | NA |

[^8]
## STOCK: Samish Fall Fingerling

| TOTAL <br> Year | ORTALITY ALLCEI | EXPLOITATION RATE BY FISHERY |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | ALLCEI | US/NON | US/NON | CAN/NO | CAN/NO |
|  | Age 3 | Age 4 | Age 3 | Age 4 | Age 3 | Age 4 |
|  |  |  |  |  |  | $=$ |
| 79 | NA | 0.4166 | NA | 0.5307 | NA | 0.0040 |
| 80 | NA | NA | NA | NA | NA | NA |
| 81 | NA | NA | NA | NA | NA | NA |
| 82 | 0.1352 | NA | 0.1885 | NA | 0.0107 | NA |
| 83 | NA | 0.3093 | NA | 0.4376 | NA | 0.0080 |
| 84 | NA | NA | NA | NA | NA | NA |
| 85 | NA | NA | NA | NA | NA | NA |
| 86 | NA | NA | NA | NA | NA | NA |
| 87 | NA | NA | NA | NA | NA | NA |
| 88 | 0.1165 | NA | 0.2653 | NA | 0.0044 | NA |
| 89 | 0.0769 | 0.1976 | 0.1325 | 0.6756 | 0.0127 | 0.0244 |
| Base | 0.1352 | 0.4166 | 0.1885 | 0.5307 | 0.0107 | 0.0040 |


total mortality stock index by fishery
ALLCEI ALLCEI ALLCEI US/NON US/NON US/NON CAN/NO CAN/NO CAN/NO
Year Age 3 Age 4 Total Age 3 Age 4 Total Age 3 Age 4 Total


| 79 | NA | 1.0000 | 1.0000 | NA | 1.0000 | 1.0000 | NA | 1.0000 | 1.0000 |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| 80 | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 81 | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 82 | 1.0000 | NA | 1.0000 | 1.0000 | NA | 1.0000 | 1.0000 | NA | 1.0000 |
| 83 | NA | 0.7424 | 0.7424 | NA | 0.8245 | 0.8245 | NA | 2.0163 | 2.0163 |
| 84 | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 85 | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 86 | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 87 | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 88 | 0.8622 | NA | 0.8622 | 1.4072 | NA | 1.4072 | 0.4144 | NA | 0.4144 |
| 89 | 0.5686 | 0.4742 | 0.4973 | 0.7032 | 1.2730 | 1.1236 | 1.1845 | 6.1122 | 2.5218 |

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 CAN/NO
WCVN JDFN JSN FRN WCVS

## STOCK: George Adams Fall Fingerling

| total mortality ALLCEI |  | EXPLOITATION RATE BY FISHERY |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | ALLCEI | US/NON | US/NON | CAN/NO | CAN/NO |
| Year | Age 3 | Age 4 | Age 3 | Age 4 | Age 3 | Age 4 |
| 79 | NA | 0.2045 | NA | 0.5909 | NA | NA |
| 80 | NA | NA | NA | NA | NA | NA |
| 81 | 0.0790 | NA | 0.2870 | NA | 0.0206 | NA |
| 82 | 0.0907 | 0.2416 | 0.2434 | 0.4380 | 0.0000 | NA |
| 83 | 0.1708 | 0.3234 | 0.4083 | 0.4378 | 0.0375 | NA |
| 84 | 0.1898 | 0.1786 | 0.3488 | 0.6250 | 0.0074 | NA |
| 85 | NA | 0.2347 | NA | 0.5307 | NA | NA |
| 86 | NA | NA | NA | NA | NA | NA |
| 87 | NA | NA | NA | NA | NA | NA |
| 88 | 0.0534 | NA | 0.1901 | NA | 0.0044 | NA |
| 89 | 0.0604 | 0.1308 | 0.3810 | 0.6628 | 0.0623 | NA |
| Base | 0.0848 | 0.2231 | 0.2652 | 0.5145 | 0.0103 | 0.0000 |

 TOTAL MORTALITY STOCK INDEX BY FISHERY

| Year | $\begin{array}{r} \text { ALLCEI } \\ \text { Age } 3 \end{array}$ | $\begin{aligned} & \text { ALLCEI } \\ & \text { Age } 4 \end{aligned}$ | ALLCEI Total | $\begin{array}{r} \text { US/NON } \\ \text { Age } 3 \end{array}$ | US/NON Age 4 | US/NON Total | $\begin{array}{r} \text { CAN/NO } \\ \text { Age } 3 \end{array}$ | CAN/NO Age 4 | CAN/NO Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  |  |  |  |  |  |  |
| 79 | NA | 0.9170 | 0.9170 | NA | 1.1486 | 1.1486 | NA | NA | NA |
| 80 | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 81 | 0.9310 | NA | 0.9310 | 1.0821 | NA | 1.0821 | 2.0000 | NA | 2.0000 |
| 82 | 1.0690 | 1.0830 | 1.0792 | 0.9179 | 0.8514 | 0.8740 | 0.0000 | NA | 0.0000 |
| 83 | 2.0136 | 1.4497 | 1.6051 | 1.5397 | 0.8510 | 1.0853 | 3.6429 | NA | 3.6429 |
| 84 | 2.2372 | 0.8005 | 1.1964 | 1.3151 | 1.2148 | 1.2489 | 0.7167 | NA | 0.7167 |
| 85 | NA | 1.0520 | 1.0520 | NA | 1.0315 | 1.0315 | NA | NA | NA |
| 86 | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 87 | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 88 | 0.6291 | NA | 0.6291 | 0.7169 | NA | 0.7169 | 0.4285 | NA | 0.4285 |
| 89 | 0.7124 | 0.5862 | 0.6209 | 1.4364 | 1.2884 | 1.3387 | 6.0492 | NA | 6.0492 |

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 CAN/NO
WCVN IDFN JSN FRN WCVS

## STOCK: South Sound Fall Fingerling

| TOTAL <br> Year | MORTALITY <br> ALLCEI <br> Age 3 | EXPLOITATION RATE BY FISHERY |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | ALLCEI | US/NON | US/NON | CAN/NO | CAN/NO |
|  |  | Age 4 | Age 3 | Age 4 | Age 3 | Age 4 |
| 79 | NA | 0.3387 | NA | 0.2057 | NA | 0.0080 |
| 80 | NA | NA | NA | NA | NA | NA |
| 81 | 0.1437 | NA | 0.1305 | NA | 0.0347 | NA |
| 82 | 0.1374 | 0.3325 | 0.1768 | 0.3743 | 0.0075 | 0.0047 |
| 83 | 0.1592 | 0.2704 | 0.2590 | 0.4789 | 0.0110 | 0.0067 |
| 84 | 0.1829 | 0.2896 | 0.2417 | 0.5596 | 0.0096 | 0.0000 |
| 85 | 0.0773 | 0.2196 | 0.1418 | 0.4884 | 0.0387 | 0.0090 |
| 86 | 0.1163 | 0.2887 | 0.1240 | 0.2320 | 0.0039 | 0.0000 |
| 87 | 0.1307 | 0.1858 | 0.1590 | 0.2832 | 0.0106 | 0.0000 |
| 88 | 0.0548 | 0.3173 | 0.0769 | 0.2610 | 0.0081 | 0.0080 |
| 89 | 0.0548 | 0.1348 | 0.1639 | 0.3231 | 0.0200 | 0.0286 |
| Base | 0.1405 | 0.3356 | 0.1537 | 0.2900 | 0.0211 | 0.0064 |


TOTAL MORTALITY STOCK INDEX BY FISHERY
ALLCEI ALLCEI ALLCEI US/NON US/NON US/NON CAN/NO CAN/NO CAN/NO
Year Age 3 Age 4 Total Age 3 Age 4 Total Age 3 Age 4 Total


| 79 | NA | 1.0091 | 1.0091 | NA | 0.7092 | 0.7092 | NA | 1.2558 | 1.2558 |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| 80 | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 81 | 1.0226 | NA | 1.0226 | 0.8493 | NA | 0.8493 | 1.6441 | NA | 1.6441 |
| 82 | 0.9774 | 0.9909 | 0.9869 | 1.1507 | 1.2908 | 1.2422 | 0.3559 | 0.7442 | 0.4457 |
| 83 | 1.1327 | 0.8057 | 0.9022 | 1.6852 | 1.6515 | 1.6632 | 0.5208 | 1.0617 | 0.6459 |
| 84 | 1.3011 | 0.8630 | 0.9923 | 1.5729 | 1.9296 | 1.8060 | 0.4571 | 0.0000 | 0.3514 |
| 85 | 0.5501 | 0.6545 | 0.6237 | 0.9225 | 1.6841 | 1.4203 | 1.8315 | 1.4235 | 1.7371 |
| 86 | 0.8273 | 0.8601 | 0.8505 | 0.8071 | 0.7999 | 0.8024 | 0.1836 | 0.0000 | 0.1411 |
| 87 | 0.9302 | 0.5538 | 0.6649 | 1.0348 | 0.9765 | 0.9967 | 0.5022 | 0.0000 | 0.3860 |
| 88 | 0.3896 | 0.9454 | 0.7813 | 0.5006 | 0.9002 | 0.7618 | 0.3859 | 1.2642 | 0.5891 |
| 89 | 0.3901 | 0.4017 | 0.3982 | 1.0668 | 1.1141 | 1.0977 | 0.9459 | 4.4970 | 1.7674 |

[^9]
## STOCK: White River Spring Yearling



TOTAL MORTALITY STOCK INDEX BY FISHERY ALLCEI ALLCEI US/NON US/NON CAN/NO CAN/NO
Year Age 3 Total Age 3 Total Age 3 Total


| 79 | NA | NA | NA | NA | NA | NA |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| 80 | NA | NA | NA | NA | NA | NA |
| 81 | NA | NA | NA | NA | NA | NA |
| 82 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | NA | NA |
| 83 | 6.9667 | 6.9667 | 0.5686 | 0.5686 | NA | NA |
| 84 | 0.0000 | 0.0000 | 0.2273 | 0.2273 | NA | NA |
| 85 | 0.0000 | 0.0000 | 0.6833 | 0.6833 | NA | NA |
| 86 | 1.9903 | 1.9903 | 0.9447 | 0.9447 | NA | NA |
| 87 | 0.0000 | 0.0000 | 0.5356 | 0.5356 | NA | NA |
| 88 | 1.2488 | 1.2488 | 0.9386 | 0.9386 | NA | NA |
| 89 | 0.0000 | 0.0000 | 0.9330 | 0.9330 | NA | NA |

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 CAN/NO WCVN JDFN JSN FRN WCVS

## STOCK: Cowlitz Tule

| TOTAL <br> Year | MORTALITY <br> ALLCEI <br> Age 3 | EXPLOITATION RATE BY FISHERY |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | ALLCEI | US/NON | US/NON | CAN/NO | CAN/NO |
|  |  | Age 4 | Age 3 | Age 4 | Age 3 | Age 4 |
| 79 | NA | NA | NA | NA | NA | NA |
| 80 | 0.1418 | NA | 0.1870 | NA | 0.0030 | NA |
| 81 | 0.0655 | 0.3212 | 0.1129 | 0.2947 | 0.0090 | 0.0000 |
| 82 | 0.0405 | 0.2897 | 0.2095 | 0.3651 | 0.0000 | 0.0040 |
| 83 | 0.0956 | 0.3380 | 0.0949 | 0.2488 | 0.0000 | 0.0141 |
| 84 | 0.0473 | 0.3610 | 0.0455 | 0.1853 | 0.0076 | 0.0068 |
| 85 | 0.0548 | 0.3315 | 0.1229 | 0.0843 | 0.0038 | 0.0000 |
| 86 | 0.0625 | 0.2450 | 0.3302 | 0.2616 | 0.0051 | 0.0132 |
| 87 | 0.0456 | 0.2335 | 0.1623 | 0.4132 | 0.0052 | 0.0037 |
| 88 | 0.0333 | 0.1889 | 0.1000 | 0.4182 | 0.0059 | 0.0020 |
| 89 | 0.0204 | 0.1377 | 0.0926 | 0.4072 | 0.0094 | 0.0000 |
| Base | 0.0826 | 0.3054 | 0.1698 | 0.3299 | 0.0040 | 0.0020 |

 TOTAL MORTALITY STOCK INDEX BY FISHERY ALLCEI ALLCEI ALLCEI US/NON US/NON US/NON CAN/NO CAN/NO CAN/NO
Year Age 3 Age 4 Total Age 3 Age 4 Total Age 3 Age 4 Total


| 79 | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 80 | 1.7170 | NA | 1.7170 | 1.1014 | NA | 1.1014 | 0.7513 | NA | 0.7513 |
| 81 | 0.7928 | 1.0516 | 0.9965 | 0.6647 | 0.8933 | 0.8156 | 2.2487 | 0.0000 | 1.5050 |
| 82 | 0.4902 | 0.9484 | 0.8509 | 1.2339 | 1.1067 | 1.1499 | 0.0000 | 2.0000 | 0.6614 |
| 83 | 1.1581 | 1.1067 | 1.1176 | 0.5588 | 0.7543 | 0.6878 | 0.0000 | 7.0986 | 2.3476 |
| 84 | 0.5734 | 1.1820 | 1.0525 | 0.2677 | 0.5617 | 0.4618 | 1.8867 | 3.4332 | 2.3982 |
| 85 | 0.6639 | 1.0852 | 0.9955 | 0.7236 | 0.2554 | 0.4145 | 0.9416 | 0.0000 | 0.6302 |
| 86 | 0.7573 | 0.8022 | 0.7927 | 1.9448 | 0.7930 | 1.1844 | 1.2689 | 6.6755 | 3.0569 |
| 87 | 0.5521 | 0.7645 | 0.7193 | 0.9560 | 1.2525 | 1.1518 | 1.2923 | 1.8484 | 1.4762 |
| 88 | 0.4037 | 0.6183 | 0.5727 | 0.5889 | 1.2676 | 1.0369 | 1.4650 | 1.0020 | 1.3119 |
| 89 | 0.2472 | 0.4509 | 0.4075 | 0.5455 | 1.2343 | 1.0002 | 2.3458 | 0.0000 | 1.5700 |

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 CAN/NO WCVN JDFN JSN FRN WCVS

## STOCK: Spring Creek Tule

| TOTAL MORTALITY ALLCEI |  | EXPLOITATION RATE BY FISHERY |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | ALLCEI | US/NON | US/NON | CAN/NO | CAN/NO |
| Year | Age 3 | Age 4 | Age 3 | Age 4 | Age 3 | Age 4 |
| 79 | 0.2095 | 0.1761 | 0.3393 | 0.5925 | 0.0092 | NA |
| 80 | 0.2625 | 0.3051 | 0.4866 | 0.4925 | 0.0029 | NA |
| 81 | 0.2003 | 0.3045 | 0.4398 | 0.4752 | 0.0076 | NA |
| 82 | 0.1978 | 0.2529 | 0.6278 | 0.5264 | 0.0000 | NA |
| 83 | 0.3049 | 0.3037 | 0.2870 | 0.2944 | 0.0030 | NA |
| 84 | 0.3020 | 0.3559 | 0.3468 | 0.2458 | 0.0000 | NA |
| 85 | 0.1349 | 0.2705 | 0.3941 | 0.2459 | 0.0056 | NA |
| 86 | 0.2491 | 0.2242 | 0.5911 | 0.4330 | 0.0149 | NA |
| 87 | 0.1038 | 0.0000 | 0.4340 | 0.5000 | 0.0000 | NA |
| 88 | 0.2358 | 0.2857 | 0.2956 | 0.5238 | 0.0000 | NA |
| 89 | 0.0737 | 0.1050 | 0.5801 | 0.8100 | 0.0016 | NA |
| Base | 0.2175 | 0.2596 | 0.4734 | 0.5217 | 0.0049 | 0.0000 |


TOTAL MORTALITY STOCK INDEX BY FISHERY

| Year | ALLCEI <br> Age 3 | ALLCEI Age 4 | ALLCEI Total | US/NON Age 3 | US/NON Age 4 | US/NON Total | CAN/NO Age 3 | CAN/NO Age 4 | CAN/NO Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 79 | 0.9633 | 0.6783 | 0.8082 | 0.7167 | 1.1359 | 0.9365 | 1.8709 | NA | 1.8709 |
| 80 | 1.2069 | 1.1749 | 1.1895 | 1.0280 | 0.9441 | 0.9840 | 0.5886 | NA | 0.5886 |
| 81 | 0.9207 | 1.1726 | 1.0578 | 0.9291 | 0.9110 | 0.9196 | 1.5405 | NA | 1.5405 |
| 82 | 0.9092 | 0.9741 | 0.9445 | 1.3262 | 1.0090 | 1.1599 | 0.0000 | NA | 0.0000 |
| 83 | 1.4019 | 1.1698 | 1.2756 | 0.6063 | 0.5643 | 0.5843 | 0.6051 | NA | 0.6051 |
| 84 | 1.3885 | 1.3709 | 1.3789 | 0.7325 | 0.4711 | 0.5955 | 0.0000 | NA | 0.0000 |
| 85 | 0.6203 | 1.0418 | 0.8497 | 0.8326 | 0.4714 | 0.6432 | 1.1235 | NA | 1.1235 |
| 86 | 1.1451 | 0.8636 | 0.9919 | 1.2487 | 0.8300 | 1.0292 | 3.0097 | NA | 3.0097 |
| 87 | 0.4771 | 0.0000 | 0.2175 | 0.9168 | 0.9585 | 0.9386 | 0.0000 | NA | 0.0000 |
| 88 | 1.0843 | 1.1004 | 1.0931 | 0.6245 | 1.0041 | 0.8235 | 0.0000 | NA | 0.0000 |
| 89 | 0.3390 | 0.4044 | 0.3746 | 1.2255 | 1.5527 | 1.3971 | 0.3302 | NA | 0.3302 |

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 CAN/NO
WCVN JDFN JSN FRN WCVS

## STOCK: Bonneville Tule


 TOTAL MORTALITY STOCK INDEX BY FISHERY

ALLCEI ALLCEI ALLCEI US/NON US/NON US/NON CAN/NO CAN/NO CAN/NO
Year Age 3 Age 4 Total Age 3 Age 4 Total Age 3 Age 4 Total


| 79 | 1.2347 | NA | 1.2347 | 0.9546 | NA | 0.9546 | 0.0000 | NA | 0.0000 |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |


| 80 | 0.5093 | 0.7887 | 0.6552 | 0.8506 | 0.8806 | 0.8668 | 0.4886 | NA | 0.4886 |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |


| 81 | 0.9762 | 0.6502 | 0.8059 | 0.9823 | 1.1523 | 1.0741 | 2.6977 | NA | 2.6977 |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |


| 82 | 1.2798 | 1.5612 | 1.4267 | 1.2125 | 0.9671 | 1.0800 | 0.8137 | $N A$ |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | 0.8137


| 83 | 1.7385 | 2.3077 | 2.0357 | 0.7550 | 0.5784 | 0.6596 | 0.0000 | NA | 0.0000 |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |


| 84 | 1.6452 | 2.3565 | 2.0166 | 0.9071 | 0.7645 | 0.8300 | 1.6064 | NA | 1.6064 |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| 85 | 1.2304 | 1.2373 | 1.2340 | 0.9263 | 0.0000 | 0.4259 | 1.8689 | NA | 1.8689 |


| 86 | 1.4333 | 0.8308 | 1.1187 | 1.0244 | 1.1779 | 1.1073 | 0.0000 | NA | 0.0000 |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |


| 87 | 1.1178 | 2.7692 | 1.9801 | 1.3651 | 0.0000 | 0.6276 | 1.0161 | NA | 1.0161 |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| 88 | NA | 1.3168 | 1.3168 | NA | 1.2892 | 1.2892 | NA | NA | NA |
| 89 | NA | NA | NA | NA | NA | NA | NA | NA | NA |



[^10]
## STOCK: Stayton Pond Tule

 total mortality exploitation rate by fishery

| Year | $\begin{array}{r} \text { ALLCE I } \\ \text { Age } 3 \end{array}$ | ALLCEI Age 4 | US/NON Age 3 | $\begin{gathered} \text { US/NON } \\ \text { Age } 4 \end{gathered}$ | CAN/NO Age 3 | CAN/NO Age 4 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 79 | NA | NA | NA | NA | NA | NA |
| 80 | NA | NA | NA | NA | NA | NA |
| 81 | 0.2253 | NA | 0.1970 | NA | 0.0083 | NA |
| 82 | 0.2217 | 0.2131 | 0.4018 | 0.2120 | 0.0023 | 0.0058 |
| 83 | 0.3065 | 0.3841 | 0.2525 | 0.1630 | 0.0000 | 0.0000 |
| 84 | 0.3938 | 0.4032 | 0.1045 | 0.1129 | 0.0048 | 0.0000 |
| 85 | 0.2034 | 0.1883 | 0.2067 | 0.0837 | 0.0090 | 0.0000 |
| 86 | 0.2054 | 0.1538 | 0.2738 | 0.0974 | 0.0000 | 0.0462 |
| 87 | 0.2879 | 0.4571 | 0.3302 | 0.1143 | 0.0120 | 0.0000 |
| 88 | 0.2822 | 0.4078 | 0.3292 | 0.4333 | 0.0000 | 0.0178 |
| 89 | 0.0694 | 0.1084 | 0.5972 | 0.1325 | 0.0139 | 0.0000 |
| Base | 0.2235 | 0.2131 | 0.2994 | 0.2120 | 0.0053 | 0.0058 |


total mortality stock index by fishery

| Y | ALLCEI | AL | ALL | US/NON | US/NON | US/NON | CAN/NO | CAN/NO | CAN/NO |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Year | Age 3 | Age 4 | Total | Age 3 | Age 4 | Total | Age 3 | Age 4 | Tota |



| 79 | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| 80 | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 81 | 1.0080 | NA | 1.0080 | 0.6580 | NA | 0.6580 | 1.5594 | NA | 1.5594 |
| 82 | 0.9920 | 1.0000 | 0.9959 | 1.3420 | 1.0000 | 1.2002 | 0.4406 | 1.0000 | 0.7318 |
| 83 | 1.3712 | 1.8020 | 1.5814 | 0.8435 | 0.7691 | 0.8127 | 0.0000 | 0.0000 | 0.0000 |
| 84 | 1.7615 | 1.8919 | 1.8252 | 0.3490 | 0.5326 | 0.4251 | 0.9129 | 0.0000 | 0.4377 |
| 85 | 0.9098 | 0.8834 | 0.8969 | 0.6905 | 0.3948 | 0.5679 | 1.6939 | 0.0000 | 0.8122 |
| 86 | 0.9187 | 0.7218 | 0.8226 | 0.9145 | 0.4596 | 0.7260 | 0.0000 | 8.0123 | 4.1704 |
| 87 | 1.2880 | 2.1449 | 1.7062 | 1.1029 | 0.5391 | 0.8692 | 2.2685 | 0.0000 | 1.0877 |
| 88 | 1.2623 | 1.9131 | 1.5800 | 1.0996 | 2.0442 | 1.4911 | 0.0000 | 3.0952 | 1.6110 |
| 89 | 0.3107 | 0.5088 | 0.4073 | 1.9947 | 0.6252 | 1.4270 | 2.6173 | 0.0000 | 1.2550 |

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 CAN/NO
WCVN JDFN JSN FRN WCVS

## STOCK: Columbia River Upriver Bright

| TOTAL <br> Year ====== | MORTALITY <br> ALLCEI Age 3 | EXPLOITATION RATE BY FISHERY |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | ALLCEI | ALLCEI | US/NON | US/NON | US/NON | CAN/NO | CAN/NO | CAN/NO |
|  |  | Age 4 | Age 5 | Age 3 | Age 4 | Age 5 | Age 3 | Age 4 | Age 5 |
|  |  |  |  |  |  |  |  |  |  |
| 79 | 0.1176 | 0.3394 | NA | 0.0483 | 0.1901 | NA | 0.0036 | 0.0016 | NA |
| 80 | 0.1342 | 0.3790 | 0.3518 | 0.0349 | 0.0651 | 0.0765 | 0.0000 | 0.0039 | 0.0010 |
| 81 | 0.0399 | 0.3286 | 0.6667 | 0.0123 | 0.0571 | 0.1216 | 0.0000 | 0.0108 | 0.0000 |
| 82 | 0.0870 | 0.2092 | 0.3039 | 0.0282 | 0.0383 | 0.0294 | 0.0016 | 0.0077 | 0.0000 |
| 83 | 0.0711 | 0.2919 | 0.2759 | 0.0121 | 0.0714 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| 84 | 0.0824 | 0.3871 | 0.3626 | 0.0753 | 0.0878 | 0.0879 | 0.0000 | 0.0040 | 0.0385 |
| 85 | 0.0707 | 0.3218 | 0.4873 | 0.1074 | 0.2738 | 0.2635 | 0.0015 | 0.0146 | 0.0057 |
| 86 | 0.0817 | 0.2588 | 0.3309 | 0.0933 | 0.2651 | 0.3676 | 0.0015 | 0.0004 | 0.0000 |
| 87 | 0.1001 | 0.3060 | 0.4159 | 0.0982 | 0.2293 | 0.3889 | 0.0011 | 0.0022 | 0.0015 |
| 88 | 0.0547 | 0.2195 | 0.4501 | 0.0659 | 0.3613 | 0.3035 | 0.0012 | 0.0000 | 0.0000 |
| 89 | 0.0397 | 0.1304 | 0.3605 | 0.1182 | 0.4358 | 0.5303 | 0.0000 | 0.0084 | 0.0000 |
| Base | 0.0947 | 0.3141 | 0.4408 | 0.0309 | 0.0876 | 0.0758 | 0.0013 | 0.0060 | 0.0003 |


TOTAL MORTALITY STOCK INDEX BY FISHERY
ALLCEI ALLCEI ALLCEI ALLCEI US/NON US/NON US/NON US/NON CAN/NO CAN/NO CAN/NO CAN/NO
Year Age 3 Age 4 Age 5 Total Age 3 Age 4 Age 5 Total Age 3 Age 4 Age 5 Total


| 79 | 1.2424 | 1.0807 | NA | 1.1182 | 1.5613 | 2.1687 | NA | 2.0104 | 2.7682 | 0.2725 | NA | 0.7202 |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |


| 80 | 1.4177 | 1.2068 | 0.7981 | 1.0183 | 1.1299 | 0.7429 | 1.0085 | 0.9080 | 0.0000 | 0.6500 | 3.0000 | 0.6367 |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |


| 82 | 0.9186 | 0.6661 | 0.6895 | 0.7064 | 0.9118 | 0.4366 | 0.3878 | 0.4931 | 1.2318 | 1.2796 | 0.0000 | 1.2178 |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |


| 83 | 0.7510 | 0.9295 | 0.6258 | 0.7520 | 0.3919 | 0.8150 | 0.0000 | 0.4298 | 0.0000 | 0.0000 | 0.0000 |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| 0.0 .0000 |  |  |  |  |  |  |  |  |  |  |  |


| 84 | 0.8709 | 1.2325 | 0.8227 | 0.9796 | 2.4367 | 1.0017 | 1.1592 | 1.2913 | 0.0000 | 0.6672120 .6923 | 5.5809 |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |


| 85 | 0.7469 | 1.0245 | 1.1054 | 1.0355 | 3.4761 | 3.1240 | 3.4739 | 3.3165 | 1.1369 | 2.4401 | 17.7790 | 2.8587 |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |


| 86 | 0.8627 | 0.8240 | 0.7506 | 0.7903 | 3.0199 | 3.0246 | 4.8478 | 3.7351 | 1.1441 | 0.0619 | 0.0000 | 0.2453 |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |


| 87 | 1.0574 | 0.9743 | 0.9435 | 0.9676 | 3.1769 | 2.6168 | 5.1279 | 3.6855 | 0.8784 | 0.3635 | 4.7117 | 0.6342 |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| 88 | 0.5781 | 0.6989 | 1.0211 | 0.8526 | 2.1330 | 4.1224 | 4.0014 | 3.7589 | 0.9514 | 0.0000 | 0.0000 | 0.1635 |


| 89 | 0.4198 | 0.4151 | 0.8179 | 0.6246 | 3.8256 | 4.9719 | 6.9928 | 5.5781 | 0.0000 | 1.4012 | 0.0000 | 1.1017 |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |

[^11]
## STOCK: Lewis River Wild

| TOTAL MORTALITY EXPLOITATION RATE BY FISHERY |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Allcel | ALLCEI | ALLCEI | US/NON | US/NON | US/NON | CAN/NO | CAN/NO | CAN/NO |
| Year | Age 3 | Age 4 | Age 5 | Age 3 | Age 4 | Age 5 | Age 3 | Age 4 | Age 5 |
| 79 | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 80 | 0.0642 | NA | NA | 0.0463 | NA | NA | 0.0000 | NA | NA |
| 81 | 0.0337 | 0.2153 | NA | 0.0886 | 0.0848 | NA | 0.0050 | 0.0000 | NA |
| 82 | 0.0538 | 0.2249 | 0.2011 | 0.0958 | 0.1667 | 0.2291 | 0.0020 | 0.0060 | NA |
| 83 | NA | 0.2085 | 0.2290 | NA | 0.0668 | 0.1603 | NA | 0.0000 | NA |
| 84 | NA | NA | 0.2055 | NA | NA | 0.2877 | NA | NA | NA |
| 85 | 0.0525 | NA | NA | 0.0691 | NA | NA | 0.0101 | NA | NA |
| 86 | 0.0329 | 0.1241 | NA | 0.0626 | 0.2029 | NA | 0.0107 | 0.0058 | NA |
| 87 | 0.0223 | 0.1901 | 0.1919 | 0.0678 | 0.2087 | 0.3173 | 0.0019 | 0.0000 | NA |
| 88 | 0.0155 | 0.1168 | 0.2207 | 0.1088 | 0.1239 | 0.4615 | 0.0000 | 0.0000 | NA |
| 89 | 0.0129 | 0.1114 | 0.1458 | 0.0492 | 0.2021 | 0.1790 | 0.0022 | 0.0000 | NA |
| Base | 0.0506 | 0.2201 | 0.2011 | 0.0769 | 0.1258 | 0.2291 | 0.0023 | 0.0030 | 0.0000 |


| TOTAL MO | $\begin{gathered} \text { MORTALITY } \\ \text { ALLCEI } \\ \text { Age } 3 \end{gathered}$ | STOCK <br> ALLCEI <br> Age 4 | INDEX BY ALLCEI Age 5 | FISHERY ALLCEI Total | US/NON Age 3 | US/NON Age 4 | US/NON Age 5 | US/NON Total | $\begin{gathered} \text { CAN/NO } \\ \text { Age } 3 \end{gathered}$ | $\begin{array}{r} \text { CAN/NO } \\ \text { Age } 4 \end{array}$ | CAN/NO Age 5 | CAN/NO Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 79 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 80 | 1.2702 | NA | NA | 1.2702 | 0.6017 | NA | NA | 0.6017 | 0.0000 | NA | NA | 0.0000 |
| 81 | 0.6666 | 0.9781 | NA | 0.9199 | 1.1526 | 0.6746 | NA | 0.8560 | 2.1560 | 0.0000 | NA | 0.9372 |
| 82 | 1.0632 | 1.0219 | 1.0000 | 1.0170 | 1.2457 | 1.3254 | 1.0000 | 1.1385 | 0.8440 | 2.0000 | NA | 1.4975 |
| 83 | NA | 0.9475 | 1.1387 | 1.0388 | NA | 0.5314 | 0.6999 | 0.6402 | NA | 0.0000 | NA | 0.0000 |
| 84 | NA | NA | 1.0217 | 1.0217 | NA | NA | 1.2559 | 1.2559 | NA | NA | NA | NA |
| 85 | 1.0389 | NA | NA | 1.0389 | 0.8989 | NA | NA | 0.8989 | 4.3770 | NA | NA | 4.3770 |
| 86 | 0.6511 | 0.5638 | NA | 0.5801 | 0.8134 | 1.6137 | NA | 1.3100 | 4.6193 | 1.9387 | NA | 3.1040 |
| 87 | 0.4411 | 0.8636 | 0.9541 | 0.8569 | 0.8822 | 1.6596 | 1.3855 | 1.3757 | 0.8025 | 0.0000 | NA | 0.3488 |
| 88 | 0.3075 | 0.5307 | 1.0975 | 0.7484 | 1.4154 | 0.9855 | 2.0150 | 1.6083 | 0.0000 | 0.0000 | NA | 0.0000 |
| 89 | 0.2542 | 0.5064 | 0.7249 | 0.5725 | 0.6398 | 1.6070 | 0.7816 | 0.9968 | 0.9568 | 0.0000 | NA | 0.4160 |

[^12]
## STOCK: Wells Hatchery Summer/Fall

| TOTAL MORTALITY EXPLOITATION RATE BY FISHERY |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | ALLCE I | ALLCEI | ALLCEI | US/NON | US/NON | US/NON | CAN/NO | CAN/NO | CAN/NO |
| Year | Age 3 | Age 4 | Age 5 | Age 3 | Age 4 | Age 5 | Age 3 | Age 4 | Age 5 |
|  |  |  |  |  |  |  |  |  |  |
| 79 | 0.0759 | NA | NA | 0.0133 | NA | NA | 0.0038 | NA | NA |
| 80 | 0.0913 | 0.3887 | NA | 0.0000 | 0.0225 | NA | 0.0000 | NA | NA |
| 81 | NA | 0.4774 | 0.2000 | NA | 0.0323 | 0.0077 | NA | NA | 0.0154 |
| 82 | NA | NA | 0.3158 | NA | NA | 0.0000 | NA | NA | 0.0526 |
| 83 | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 84 | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 85 | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 86 | 0.1898 | NA | NA | 0.0803 | NA | NA | 0.0219 | NA | NA |
| 87 | 0.0700 | 0.3030 | NA | 0.1440 | 0.2727 | NA | 0.0000 | NA | NA |
| 88 | 0.0318 | 0.1679 | 0.7273 | 0.0191 | 0.2357 | 0.0000 | 0.0000 | NA | 0.0000 |
| 89 | 0.0000 | 0.2308 | 0.1890 | 0.0000 | 0.1026 | 0.3228 | 0.0000 | NA | 0.0000 |
| Base | 0.0836 | 0.4331 | 0.2579 | 0.0066 | 0.0274 | 0.0038 | 0.0019 | 0.0000 | 0.0340 |


| TOTAL M | $\begin{gathered} \text { MORTALITY } \\ \text { ALLCEI } \\ \text { Age } 3 \end{gathered}$ | STOCK <br> ALLCEI Age 4 | NDEX BY <br> ALLCEI Age 5 | FISHERY <br> ALLCEI Total | US/NON Age 3 | $\begin{array}{r} \text { US/NON } \\ \text { Age } 4 \end{array}$ | US/NON Age 5 | US/NON Total | CAN/NO Age 3 | $\begin{array}{r} \mathrm{CAN} / \mathrm{NO} \\ \text { Age } 4 \end{array}$ | $\begin{array}{r} \text { CAN/NO } \\ \text { Age } 5 \end{array}$ | CAN/NO Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 79 | 0.9078 | NA | NA | 0.9078 | 2.0000 | NA | NA | 2.0000 | 2.0000 | NA | NA | 2.0000 |
| 80 | 1.0922 | 0.8976 | NA | 0.9291 | 0.0000 | 0.8226 | NA | 0.6621 | 0.0000 | NA | NA | 0.0000 |
| 81 | NA | 1.1024 | 0.7755 | 0.9804 | NA | 1.1774 | 2.0000 | 1.2787 | NA | NA | 0.4524 | 0.4524 |
| 82 | NA | NA | 1.2245 | 1.2245 | NA | NA | 0.0000 | 0.0000 | NA | NA | 1.5476 | 1.5476 |
| 83 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 84 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 85 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 86 | 2.2698 | NA | NA | 2.2698 | 12.0897 | NA | NA | 12.0897 | 11.5401 | NA | NA | 11.5401 |
| 87 | 0.8367 | 0.6997 | NA | 0.7219 | 21.6872 | 9.9548 | NA | 12.2440 | 0.0000 | NA | NA | 0.0000 |
| 88 | 0.3809 | 0.3876 | 2.8200 | 1.1967 | 2.8772 | 8.6038 | 0.0000 | 6.7264 | 0.0000 | NA | 0.0000 | 0.0000 |
| 89 | 0.0000 | 0.5329 | 0.7328 | 0.5419 | 0.0000 | 3.7437 | 83.9370 | 11.2289 | 0.0000 | NA | 0.0000 | 0.0000 |

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 CAN/NO WCVN JDFN JSN FRN WCVS

## STOCK: Willamette Spring

| TOTAL <br> Year | $\begin{gathered} \text { MORTALITY } \\ \text { ALLCEI } \\ \text { Age } 4 \end{gathered}$ | EXPLOITATION RATE BY FISHERY |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | ALLCEI | US/NON | US/NON | CAN/NO | CAN/NO |
|  |  | Age 5 | Age 4 | Age 5 | Age 4 | Age 5 |
| =ニニ== |  |  |  |  |  |  |
| 79 | 0.1796 | NA | 0.3772 | NA | NA | NA |
| 80 | 0.3431 | 0.0000 | 0.2086 | 0.2727 | NA | NA |
| 81 | 0.1725 | 0.0408 | 0.1557 | 0.6812 | NA | NA |
| 82 | 0.1175 | 0.0478 | 0.2120 | 0.3652 | NA | NA |
| 83 | 0.1373 | 0.0029 | 0.2419 | 0.7519 | NA | NA |
| 84 | 0.1051 | 0.0139 | 0.2827 | 0.6004 | NA | NA |
| 85 | 0.2232 | 0.0300 | 0.2608 | 0.6989 | NA | NA |
| 86 | 0.1260 | 0.0246 | 0.0236 | 0.5660 | NA | NA |
| 87 | 0.1734 | 0.0000 | 0.2759 | 0.6885 | NA | NA |
| 88 | 0.0927 | 0.1268 | 0.2013 | 0.8271 | NA | NA |
| 89 | 0.0801 | 0.0284 | 0.2822 | 0.7198 | NA | NA |
| Base | 0.2032 | 0.0295 | 0.2384 | 0.4397 | 0.0000 | 0.0000 |

 TOTAL MORTALITY STOCK INDEX BY FISHERY
alLCEI ALLCEI ALLCEI US/NON US/NON US/NON CAN/NO CAN/NO CAN/NO
Year Age 4 Age 5 Total Age 4 Age 5 Total Age 4 Age 5 Total


| 79 | 0.8840 | NA | 0.8840 | 1.5825 | NA | 1.5825 | NA | NA | NA |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| 80 | 1.6885 | 0.0000 | 1.4742 | 0.8750 | 0.6203 | 0.7098 | NA | NA | NA |
| 81 | 0.8491 | 1.3804 | 0.9165 | 0.6533 | 1.5491 | 1.2342 | NA | NA | NA |
| 82 | 0.5784 | 1.6196 | 0.7105 | 0.8893 | 0.8306 | 0.8512 | NA | NA | NA |
| 83 | 0.6757 | 0.0966 | 0.6022 | 1.0148 | 1.7100 | 1.4656 | NA | NA | NA |
| 84 | 0.5171 | 0.4703 | 0.5112 | 1.1858 | 1.3655 | 1.3023 | NA | NA | NA |
| 85 | 1.0983 | 1.0150 | 1.0877 | 1.0942 | 1.5895 | 1.4154 | NA | NA | NA |
| 86 | 0.6200 | 0.8334 | 0.6471 | 0.0991 | 1.2872 | 0.8695 | NA | NA | NA |
| 87 | 0.8533 | 0.0000 | 0.7451 | 1.1572 | 1.5659 | 1.4222 | NA | NA | NA |
| 88 | 0.4561 | 4.2941 | 0.9430 | 0.8444 | 1.8810 | 1.5166 | NA | NA | NA |
| 89 | 0.3941 | 0.9615 | 0.4661 | 1.1839 | 1.6369 | 1.4777 | NA | NA | NA |

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 CAN/NO WCVN JDFN JSN FRN WCVS

## APPENDIX H

## Brood Year Exploitation Rate Figures

Southeast Alaska ..... H-1
Robertson Creek ..... H-2
Quinsam ..... H-2
Big Qualicum ..... H-3
Capilano ..... H-3
South Puget Sound Yearling ..... H-4
University of Washington Accelerated ..... H-4
Samish Fingerling ..... H-5
George Adams Fingerling ..... H-5
South Puget Sound Fingerling ..... H-6
Skagit ..... H-7
Nooksack ..... H-7
Quilcene ..... H-8
White River ..... H-8
Cowlitz ..... H-9
Spring Creek ..... H-9
Bonneville ..... H-10
Stayton Pond ..... H-10
Upriver Bright ..... $\mathrm{H}-11$
Lewis River ..... H-11
Wells Hatchery ..... H-12
Willamette ..... H- 12

## BROOD YEAR OCEAN EXPLOITATION RATE ALASKA SPRING



Reported Catch
IWIV Incident. Mortality

* 1984 Brood Year Is Incomplete


## BROOD YEAR OCEAN EXPLOITATION RATE ROBERTSON CREEK



* 1985 Brood Year is Incomplete


## BROOD YEAR OCEAN EXPLOITATION RATE QUINSAM



* 1984 Brood Year is incomplete

BROOD YEAR OCEAN EXPLOITATION RATE BIG QUALICUM


* 1985 Brood Year is incomplete


## BROOD YEAR OCEAN EXPLOITATION RATE CAPILANO



* 1985 Brood Year is Incomplete

BROOD YEAR OCEAN EXPLOITATION RATE SOUTH PUGET SOUND FALL YEARLING


Reported Catch
Incident. Mortality

BROOD YEAR OCEAN EXPLOITATION RATE UNIVERSITY OF WASHINGTON ACCELERATED


## BROOD YEAR OCEAN EXPLOITATION RATE SAMISH FALL FINGERLING



* 1985 Brood Year is incomplete


## BROOD YEAR OCEAN EXPLOITATION RATE george adams fall fingerling



## BROOD YEAR OCEAN EXPLOITATION RATE SOUTH PUGET SOUND FALL FINGERLING



Reported Catch
Incident. Mortality

- 1985 Brood Year is incomplete


## BROOD YEAR OCEAN EXPLOITATION RATE SKAGIT SPRING YEARLING



- 1985 Brood Year is Incomplete


## BROOD YEAR OCEAN EXPLOITATION RATE NOOKSACK SPRING YEARLING



## BROOD YEAR OCEAN EXPLOITATION RATE QUILCENE SPRING YEARLING



- 1985 Brood Year is incomplete


## BROOD YEAR OCEAN EXPLOITATION RATE WHITE RIVER SPRING YEARLING



- 1985 Brood Year is incomplete

BROOD YEAR OCEAN EXPLOITATION RATE COWLITZ TULE


- 1985 Brood Year is incomplete


## BROOD YEAR OCEAN EXPLOITATION RATE SPRING CREEK TULE



Reported Catch Incident. Mortality

- 1985 Brood Year is incomplete


## BROOD YEAR OCEAN EXPLOITATION RATE BONNEVILLE TULE



## BROOD YEAR OCEAN EXPLOITATION RATE STAYTON POND TULE



Reported Catch
Incident. Mortality

BROOD YEAR OCEAN EXPLOITATION RATE COLUMBIA RIVER UPRIVER BRIGHT


- 1985 Brood Year is incomplete


## BROOD YEAR OCEAN EXPLOITATION RATE LEWIS RIVER WILD



Reported Catch Incident. Mortality

BROOD YEAR OCEAN EXPLOITATION RATE WELLS HATCHERY SUMMER/FALL


* 1985 Brood Year is incomplete


## BROOD YEAR OCEAN EXPLOITATION RATE WILLAMETTE SPRING



Reported Catch Incident. Mortality

* 1984 Brood Year is incomplete


## APPENDIX I

## Survival Rate Figures

Southeast Alaska ..... I-1
Robertson Creek ..... I-2
Quinsam ..... I-2
Big Qualicum ..... I-3
Capilano ..... I-3
Chehalis ..... I-4
Chilliwack ..... I-4
South Puget Sound Yearling ..... I-5
University of Washington Accelerated ..... I-5
Samish Fingerling ..... I-6
Lummi Ponds Fingerling ..... I-6
Stillaguamish Fingerling ..... I-7
George Adams Fingerling ..... I-7
South Puget Sound Fingerling ..... I-8
Kalama Creek Fingerling ..... I-8
Elwha Fingerling ..... I-9
Skagit ..... I-9
Nooksack ..... I-10
Skookum ..... I-10
Quilcene ..... I-11
White River ..... I-11
Quinault ..... I-12
Queets ..... I-12
Humptulips ..... I-13
Cowlitz ..... I-14
Spring Creek ..... I-14
Bonneville ..... I-15
Stayton Pond ..... I-15
Upriver Bright ..... I-16
Lewis River ..... I-16
Wells Hatchery ..... I-17
Willamette ..... J-17

## INDEX OF SURVIVAL <br> ALASKA SPRING


--日- 3 Year Old Index --z- 4 Year Old Index

## INDEX OF SURVIVAL

 ROBERTSON CREEK
--曰- 2 Year Old Index -z 3 Year Old Index

INDEX OF SURVIVAL QUINSAM

--曰-2 Year Old Index -z 3 Year Old Index

INDEX OF SURVIVAL BIG QUALICUM


INDEX OF SURVIVAL CAPILANO


70717273747576777879808182838485868788 BROOD YEAR
---- 2 Year Old Index -8 - 3 Year Old Index

## INDEX OF SURVIVAL CHEHALIS (HARRISON STOCK)


--日- 2 Year Old Index $\quad$ - 3 Year Old Index

## INDEX OF SURVIVAL CHILLIWACK (HARRISON STOCK)



## INDEX OF SURVIVAL SOUTH PUGET SOUND FALL YEARLING



- -a- 2 Year Old Index -3 Year Old Index


## INDEX OF SURVIVAL UNIVERSITY OF WASHINGTON ACCELERATED


--a- 2 Year Old Index -3 Year Old Index

INDEX OF SURVIVAL
SAMISH FALL FINGERLING

--曰-- 2 Year Old Index -z- 3 Year Old Index

INDEX OF SURVIVAL
LUMMI PONDS FALL FINGERLING


## INDEX OF SURVIVAL STILLAGUAMISH FALL FINGERLING


--a-- 2 Year Old Index -z- 3 Year Old Index

INDEX OF SURVIVAL
GEORGE ADAMS FALL FINGERLING


## INDEX OF SURVIVAL SOUTH PUGET SOUND FALL FINGERLING



INDEX OF SURVIVAL
KALAMA CREEK FALL FINGERLING

---- 2 Year Old Index $\quad$ §- 3 Year Old Index

INDEX OF SURVIVAL ELWHA FALL FINGERLING


INDEX OF SURVIVAL SKAGIT SPRING YEARLING

---- 2 Year Old Index -z- 3 Year Old Index

INDEX OF SURVIVAL NOOKSACK SPRING YEARLING

--日- 2 Year Old Index $\quad$ \& 3 Year Old Index

INDEX OF SURVIVAL skookum spring yearling

--- 2 Year Old Index $\varangle 3$ Year Old Index

## INDEX OF SURVIVAL QUILCENE SPRING YEARLING


--- 2 Year Old Index -z 3 Year Old Index

INDEX OF SURVIVAL WHITE RIVER SPRING YEARLING

--- 2 Year Old Index $-\boxed{-} 3$ Year Old Index

## INDEX OF SURVIVAL QUINAULT FALL FINGERLING



INDEX OF SURVIVAL QUEETS FALL FINGERLING


INDEX OF SURVIVAL HUMPTULIPS FALL FINGERLING

--日- 2 Year Old Index -\& 3 Year Old Index

## INDEX OF SURVIVAL

COWLITZ TULE


INDEX OF SURVIVAL SPRING CREEK TULE

--日- 2 Year Old Index $\quad$ - 3 Year Old Index

--a-- 2 Year Old Index -z- 3 Year Old Index

INDEX OF SURVIVAL STAYTON POND TULE

--a-- 2 Year Old Index -\&- 3 Year Old Index

## INDEX OF SURVIVAL COLUMBIA RIVER UPRIVER BRIGHT


--a- 2 Year Old Index -3 Year Old Index

## INDEX OF SURVIVAL LEWIS RIVER WILD



## INDEX OF SURVIVAL WELLS HATCHERY SUMMER/FALL


--- 2 Year Old Index $\quad<-3$ Year Old Index

INDEX OF SURVIVAL WILLAMETTE SPRING


## APPENDIX J

## Anıual Distribution of Reported Catch and Total Fishing Mortality by Stock

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## CEILING FISHERIES:

## All Alaska:

Southeast Alaska Troll
Southeast Alaska Net
Southeast Alaska Sport
All North Central:
Northern B.C. Troll
Central B.C. Troll
Northern B.C. Net
Central B.C. Net
North/Central B.C. Sport
West Coast Vancouver Island Troll
Strait of Georgia:
Strait of Georgia Troll
Strait of Georgia Sport

## OTHER FISHERIES:

Other Canada Net:
West Coast Vancouver Island Net
Juan De Fuca Net
Johnstone Strait Net
Fraser River Net
Terminal/Freshwater Net
Other Canada Sport:
West Coast Vancouver Island Sport
Terminal/Freshwater Sport
Other U.S. Net:
Puget Sound Net
Washington Coastal Net
Columbia River Net
Terminal Freshwater Net

Other U.S. Troll:
Washington/Oregon Troll
Other U.S. Sport:
Washington/Oregon Sport
Puget Sound Sport
Columbia River Sport
Terminal/Freshwater Sport

Criteria Used in Calculating Distributions:

1) All age classes were adjusted for adult equivalents.
2) Tags were expanded to reflect the magnitude of associated releases.
3) Only years with three age classes were included.
4) Averages were unweighted.

## Stock: Alaska Spring

Reported Catch Only

| Catch Year | -------Fisheries wi |  | Ceilings |  | Other Canada Net | Other Canada Sport | Other <br> U.S. <br> Troll | Other U.S. Net | Alaska Term. Troll |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | All | All | WCVI | Total |  |  |  |  |  |
|  | Alaska | Nth/Cent | Troll | Geo St |  |  |  |  |  |
| 83 | 95.3\% | 4.8\% | 0.0\% | 0.0\% | 0.0\% | 0.0\% | 0.0\% | 0.0\% | 0.0\% |
| 84 | 94.8\% | 5.2\% | 0.0\% | 0.0\% | 0.0\% | 0.0\% | 0.0\% | 0.0\% | 0.0\% |
| 85 | 95.5\% | 4.5\% | 0.0\% | 0.0\% | 0.0\% | 0.0\% | 0.0\% | 0.0\% | 0.0\% |
| 86 | 96.8\% | 3.2\% | 0.0\% | 0.0\% | 0.0\% | 0.0\% | 0.0\% | 0.0\% | 0.0\% |
| 87 | 98.3\% | 1.7\% | 0.0\% | 0.0\% | 0.0\% | 0.0\% | 0.0\% | 0.0\% | 0.0\% |
| 88 | 92.7\% | 4.3\% | 0.0\% | 0.0\% | 0.0\% | 0.0\% | 0.0\% | 0.0\% | 3.0\% |
| 89 | 93.0\% | 4.3\% | 0.0\% | 0.0\% | 0.0\% | 0.0\% | 0.0\% | 0.0\% | 2.8\% |
| Avg | 95.2\% | 4.0\% | 0.0\% | 0.0\% | 0.0\% | 0.0\% | 0.0\% | 0.0\% | 0.8\% |

Total Mortalities

| Catch Year | -------Fisheries |  | with Ceilings------ |  | Other Canada Net | Other Canada sport | $\begin{aligned} & \text { Other } \\ & \text { U.s. } \\ & \text { Troli } \end{aligned}$ | Other U.s. Net | Alaska Term. Troll |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | All | All | WCVI | Total |  |  |  |  |  |
|  | Alaska | $N$ th/Cent | Troll | Geo St |  |  |  |  |  |
| 83 | 95.7\% | 4.3\% | 0.0\% | 0.0\% | 0.0\% | 0.0\% | 0.0\% | 0.0\% | 0.0\% |
| 84 | 95.5\% | 4.5\% | 0.0\% | 0.0\% | 0.0\% | 0.0\% | 0.0\% | 0.0\% | 0.0\% |
| 85 | 97.1\% | 2.9\% | 0.0\% | 0.0\% | 0.0\% | 0.0\% | 0.0\% | 0.0\% | 0.0\% |
| 86 | 97.9\% | 2.1\% | 0.0\% | 0.0\% | 0.0\% | 0.0\% | 0.0\% | 0.0\% | 0.0\% |
| 87 | 98.6\% | 1.4\% | 0.0\% | 0.0\% | 0.0\% | 0.0\% | 0.0\% | 0.0\% | 0.0\% |
| 88 | 94.5\% | 3.5\% | 0.0\% | 0.0\% | 0.0\% | 0.0\% | 0.0\% | 0.0\% | 2.0\% |
| 89 | 94.7\% | 3.3\% | 0.0\% | 0.0\% | 0.0\% | 0.0\% | 0.0\% | 0.0\% | 2.0\% |
| Avg | 96.3\% | 3.1\% | 0.0\% | 0.0\% | 0.0\% | 0.0\% | 0.0\% | 0.0\% | 0.6\% |

## Stock: Robertson Creek

Reported Catch Only

| Catch Year |  | Fisheries All Nth/Cent | with Ceilings-.....- <br> WCVI <br> Total |  | Other Canada Net | Other Canada Sport | $\begin{aligned} & \text { Other } \\ & \text { U.s. } \\ & \text { Trol } \end{aligned}$ | Other U.S. Net | Other U.S. Sport |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  |  |  |  |  |  |  |
|  |  |  | Troll | Geo St |  |  |  |  |  |
| 79 | 25.1\% | 45.8\% | 13.6\% | 2.6\% | 2.8\% | 9.9\% | 0.0\% | 0.2\% | 0.0\% |
| 80 | 39.6\% | 25.1\% | 12.4\% | 0.0\% | 15.3\% | 7.1\% | 0.0\% | 0.4\% | 0.0\% |
| 81 | 36.8\% | 28.6\% | 6.0\% | 0.5\% | 16.0\% | 11.4\% | 0.0\% | 0.6\% | 0.0\% |
| 82 | 35.9\% | 31.4\% | 7.0\% | 0.8\% | 18.8\% | 5.1\% | 0.1\% | 0.7\% | 0.2\% |
| 83 | 44.6\% | 25.0\% | 5.9\% | 0.4\% | 20.0\% | 3.8\% | 0.0\% | 0.2\% | 0.0\% |
| 84 | 37.9\% | 22.7\% | 8.6\% | 0.7\% | 19.4\% | 10.5\% | 0.0\% | 0.2\% | 0.0\% |
| 85 | 35.0\% | 39.6\% | 3.3\% | 0.7\% | 5.8\% | 10.8\% | 0.0\% | 4.8\% | 0.0\% |
| 86 | 40.6\% | 30.0\% | 10.5\% | 0.0\% | 2.4\% | 16.2\% | 0.0\% | 0.0\% | 0.3\% |
| 87 | 29.8\% | 35.4\% | 7.2\% | 0.6\% | 3.3\% | 22.6\% | 0.0\% | 0.4\% | 0.6\% |
| 88 | 28.5\% | 25.1\% | 9.7\% | 1.1\% | 18.1\% | 16.0\% | 0.0\% | 0.6\% | 0.8\% |
| 89 | 18.9\% | 18.5\% | 2.9\% | 1.7\% | 35.2\% | 22.4\% | 0.0\% | 0.1\% | 0.3\% |
| Avg | 33.9\% | 29.7\% | 7.9\% | 0.8\% | 14.3\% | 12.4\% | 0.0\% | 0.8\% | 0.2\% |

Total Mortalities

| Catch Year | All <br> Alaska | isheries All Nth/Cent | with Ceili WCVI Troll | Total Geo St | Other Canada Net | Other Canada Sport |  | Other U.S. Net | Other U.S. Sport |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 79 | 30.9\% | 44.1\% | 12.3\% | 1.9\% | 2.9\% | 7.8\% | 0.0\% | 0.2\% | 0.0\% |
| 80 | 42.4\% | 28.4\% | 10.3\% | 0.0\% | 13.2\% | 5.3\% | 0.0\% | 0.5\% | 0.0\% |
| 81 | 40.0\% | 28.9\% | 5 5.4\% | 0.4\% | 15.4\% | 9.2\% | 0.0\% | 0.7\% | 0.0\% |
| 82 | 41.1\% | 30.5\% | 6.3\% | 0.7\% | 16.4\% | 4.0\% | 0.1\% | 0.8\% | 0.2\% |
| 83 | 49.3\% | 23.5\% | 5.4\% | 0.4\% | 18.0\% | 3.2\% | 0.0\% | 0.2\% | 0.0\% |
| 84 | 42.9\% | 22.0\% | 8.2\% | 0.6\% | 17.1\% | 9.0\% | 0.0\% | 0.2\% | 0.0\% |
| 85 | 47.0\% | 32.8\% | 2.8\% | 0.6\% | 4.7\% | 8.2\% | 0.0\% | 4.0\% | 0.0\% |
| 86 | 65.1\% | 22.6\% | 4.2\% | 0.0\% | 1.8\% | 5.9\% | 0.0\% | 0.0\% | 0.3\% |
| 87 | 43.0\% | 32.2\% | 6.3\% | 0.5\% | 2.9\% | 14.2\% | 0.0\% | 0.3\% | 0.5\% |
| 88 | 42.5\% | 23.9\% | 7.4\% | 0.8\% | 14.1\% | 10.0\% | 0.0\% | 0.5\% | 0.7\% |
| 89 | 33.5\% | 17.2\% | 2.5\% | 1.8\% | 28.5\% | 16.1\% | 0.0\% | 0.1\% | 0.3\% |
| Avg | 43.4\% | 27.8\% | 6.5\% | 0.7\% | 12.3\% | 8.4\% | 0.0\% | 0.7\% | 0.2\% |

## Stock: Quinsam

Reported Catch Only

| Catch Year |  | Fisheries All <br> Nth/Cent | with Ceilings---...WCVI Total |  | Other <br> Canada Net | Other <br> Canada Sport | Other U.S. Troll | Other u.s. Net | $\begin{aligned} & \text { Other } \\ & \text { U.S. } \\ & \text { Sport } \end{aligned}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  |  |  |  |  |  |  |
|  |  |  | Troll | Geo St |  |  |  |  |  |
| 79 | 18.2\% | 63.5\% | 0.0\% | 11.5\% | 6.8\% | 0.0\% | 0.0\% | 0.0\% | 0.0\% |
| 80 | 23.7\% | 54.8\% | 0.0\% | 11.7\% | 9.8\% | 0.0\% | 0.0\% | 0.0\% | 0.0\% |
| 81 | 16.3\% | 60.3\% | 0.5\% | 15.8\% | 7.1\% | 0.0\% | 0.0\% | 0.0\% | 0.0\% |
| 82 | 37.7\% | 48.1\% | 0.5\% | 4.8\% | 8.9\% | 0.0\% | 0.0\% | 0.0\% | 0.0\% |
| 83 | 34.1\% | 50.4\% | 0.8\% | 5.1\% | 9.6\% | 0.0\% | 0.0\% | 0.0\% | 0.0\% |
| 84 | 36.3\% | 40.8\% | 1.3\% | 12.1\% | 9.5\% | 0.0\% | 0.0\% | 0.0\% | 0.0\% |
| 85 | 45.9\% | 35.2\% | 0.2\% | 6.8\% | 11.4\% | 0.5\% | 0.0\% | 0.0\% | 0.0\% |
| 86 | 21.8\% | 61.2\% | 0.0\% | 8.9\% | 8.1\% | 0.0\% | 0.0\% | 0.0\% | 0.0\% |
| 87 | 22.5\% | 59.6\% | 0.7\% | 5.9\% | 11.0\% | 0.3\% | 0.0\% | 0.0\% | 0.0\% |
| 88 | 43.6\% | 36.4\% | 1.6\% | 8.5\% | 8.7\% | 0.8\% | 0.0\% | 0.0\% | 0.4\% |
| 89 | 31.4\% | 27.9\% | 0.6\% | 15.3\% | 24.6\% | 0.0\% | 0.0\% | 0.3\% | 0.0\% |
| Avg | 30.1\% | 48.9\% | 0.6\% | 9.7\% | 10.5\% | 0.1\% | 0.0\% | 0.0\% | 0.0\% |

Total Mortalities


## Stock: Big Qualicum

Reported Catch Only


Total Mortalities

| Catch Year | $\square$ | isheries All Nth/Cent | With Ceilings----- |  | Other <br> Canada Net | Other Canada Sport | Other U.S. Troll | Other U.S. Net | Other U.S. Sport |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  |  |  |  |  |  |  |
|  |  |  | Troll | Geo St |  |  |  |  |  |
| 79 | 8.2\% | 24.3\% | 2.9\% | 49.6\% | 14.4\% | 0.1\% | 0.0\% | 0.5\% | 0.1\% |
| 80 | 3.9\% | 22.0\% | 4.2\% | 57.3\% | 11.9\% | 0.0\% | 0.1\% | 0.4\% | 0.2\% |
| 81 | 3.8\% | 22.0\% | 2.0\% | 58.0\% | 13.1\% | 0.2\% | 0.0\% | 0.3\% | 0.6\% |
| 82 | 9.0\% | 30.4\% | 4.0\% | 32.3\% | 22.4\% | 0.0\% | 0.0\% | 1.2\% | 0.8\% |
| 83 | 5.2\% | 29.8\% | 0.0\% | 41.6\% | 23.3\% | 0.0\% | 0.0\% | 0.0\% | 0.0\% |
| 84 | 0.4\% | 19.8\% | 1.3\% | 69.8\% | 8.7\% | 0.0\% | 0.0\% | 0.0\% | 0.0\% |
| 85 | 7.9\% | 22.1\% | 1.4\% | 47.7\% | 16.1\% | 0.4\% | 0.0\% | 4.4\% | 0.0\% |
| 86 | 6.3\% | 33.5\% | 1.4\% | 48.0\% | 10.0\% | 0.8\% | 0.0\% | 0.0\% | 0.0\% |
| 87 | 25.1\% | 17.3\% | 5.7\% | 42.2\% | 7.4\% | 0.0\% | 1.7\% | 0.6\% | 0.0\% |
| 88 | 6.7\% | 38.3\% | 3.4\% | 41.7\% | 7.4\% | 1.4\% | 0.0\% | 1.1\% | 0.0\% |
| 89 | 14.5\% | 10.6\% | 4.7\% | 58.8\% | 9.6\% | 0.0\% | 0.2\% | 0.0\% | 1.7\% |
| Avg | 8.3\% | 24.6\% | 2.8\% | 49.7\% | 13.1\% | 0.3\% | 0.2\% | 0.8\% | 0.3\% |

## Stock: Capilano

Reported Catch Only

| Catch Year | --.....-Fisheries wit |  | Ceilings |  | Other Canada Net | Other Canada Sport | $\begin{aligned} & \text { Other } \\ & \text { U.s. } \\ & \text { Troll } \end{aligned}$ | Other U.S. Net | Other U.S. Sport |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  | WCVI | Total |  |  |  |  |  |
|  | Alaska | Nth/Cent | Troll | Geo St |  |  |  |  |  |
| 79 | 0.0\% | 21.1\% | 1.0\% | 68.8\% | 7.8\% | 0.0\% | 0.0\% | 0.8\% | 0.5\% |
| 80 | 1.4\% | 12.7\% | 5.3\% | 70.6\% | 8.3\% | 0.0\% | 0.0\% | 1.5\% | 0.2\% |
| 81 | 0.4\% | 8.1\% | 1.1\% | 78.0\% | 10.6\% | 0.0\% | 0.1\% | 1.0\% | 0.8\% |
| 82 | 1.9\% | 14.2\% | 2.0\% | 54.1\% | 21.1\% | 0.4\% | 0.1\% | 6.3\% | 0.1\% |
| 83 | 1.0\% | 21.1\% | 2.6\% | 58.5\% | 14.7\% | 0.1\% | 0.1\% | 1.1\% | 0.9\% |
| 84 | 0.7\% | 22.6\% | 2.2\% | 68.6\% | 4.4\% | 0.0\% | 0.0\% | 1.3\% | 0.2\% |
| 85 | 12.9\% | 12.1\% | 1.8\% | 52.0\% | 17.7\% | 1.6\% | 0.0\% | 2.0\% | 0.0\% |
| 86 | 3.1\% | 15.8\% | 5.0\% | 64.8\% | 9.9\% | 0.0\% | 0.0\% | 0.5\% | 1.0\% |
| 87 | 1.6\% | 13.8\% | 7.7\% | 57.4\% | 9.5\% | 1.2\% | 0.0\% | 8.8\% | 0.0\% |
| 88 | 2.1\% | 20.2\% | 1.0\% | 65.4\% | 6.8\% | 0.0\% | 0.5\% | 4.0\% | 0.0\% |
| 89 | 1.5\% | 18.5\% | 5.6\% | 59.2\% | 12.1\% | 0.0\% | 3.0\% | 0.0\% | 0.0\% |
| Avg | 2.4\% | 16.4\% | 3.2\% | 63.4\% | 11.2\% | 0.3\% | 0.3\% | 2.5\% | 0.3\% |

Total Mortalities

| Catch Year | All <br> Alaska | Fisheries All <br> Nth/Cent | with Ceiling WCVI Troll | $\begin{aligned} & \text { Total } \\ & \text { Geo St } \end{aligned}$ | Other Canada Net | Other Canada Sport | $\begin{aligned} & \text { Other } \\ & \text { U.S. } \\ & \text { Trol } \end{aligned}$ | $\begin{aligned} & \text { Other } \\ & \text { U.S. } \\ & \text { Net } \end{aligned}$ | Other U.S. Sport |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 79 | 0.2\% | 26.0\% | 1.2\% | 60.2\% | 10.8\% | 0.0\% | 0.0\% | 1.0\% | 0.6\% |
| 80 | 1.6\% | 15.8\% | 5.3\% | 64.8\% | 10.6\% | 0.0\% | 0.0\% | 1.6\% | 0.3\% |
| 81 | 0.6\% | 10.3\% | 1.3\% | 70.6\% | 14.9\% | 0.0\% | 0.1\% | 1.2\% | 0.9\% |
| 82 | 3.0\% | 24.1\% | -1.3\% | 38.1\% | 27.9\% | 0.2\% | 0.1\% | 5.1\% | 0.1\% |
| 83 | 1.2\% | 25.7\% | 2.1\% | 49.6\% | 19.4\% | 0.1\% | 0.1\% | 1.0\% | 0.9\% |
| 84 | 0.9\% | 24.0\% | - 2.3\% | 66.8\% | 4.6\% | 0.0\% | 0.0\% | 1.3\% | 0.2\% |
| 85 | 12.4\% | 19.5\% | 1.3\% | 41.9\% | 21.9\% | 1.1\% | 0.0\% | 1.9\% | 0.0\% |
| 86 | 5.8\% | 17.5\% | 4.6\% | 58.5\% | 12.3\% | 0.0\% | 0.0\% | 0.5\% | 0.9\% |
| 87 | 2.4\% | 14.4\% | - 9.1\% | 54.5\% | 9.7\% | 1.1\% | 0.0\% | 8.8\% | 0.0\% |
| 88 | 0.9\% | 56.5\% | - 0.4\% | 33.5\% | 6.5\% | 0.0\% | 0.2\% | 2.1\% | 0.0\% |
| 89 | 3.6\% | 18.9\% | 5.4\% | 60.3\% | 9.1\% | 0.0\% | 2.6\% | 0.0\% | 0.0\% |
| Avg | 3.0\% | 23.0\% | 3.1\% | 54.4\% | 13.4\% | 0.2\% | 0.3\% | 2.2\% | 0.4\% |

## Stock: Chehalis (Harrison Stock)

Reported Catch Only

| Catch Year | All <br> Alaska | Fisheries Al. Nth/Cent | with Ceilin <br> WCVI <br> Troll | Total Geo St | Other Canada Net | Other Canada Sport | Other U.S. Troll | Other U.S. Net | Other U.S. Sport |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 85 | 0.1\% | 5.4\% | 30.7\% | 44.5\% | 5.5\% | 0.7\% | 1.0\% | 5.7\% | 6.4\% |
| 86 | 2.0\% | 8.1\% | 18.0\% | 52.4\% | 13.3\% | 0.2\% | 0.0\% | 1.1\% | 4.9\% |
| 87 | 0.7\% | 1.0\% | 19.8\% | 59.2\% | 4.1\% | 0.0\% | 1.7\% | 11.0\% | 2.5\% |
| 88 | 2.0\% | 5.9\% | 5.9\% | 51.1\% | 9.8\% | 2.3\% | 5.1\% | 14.2\% | 3.7\% |
| 89 | 0.0\% | 1.8\% | 27.1\% | 36.3\% | 13.6\% | 0.3\% | 4.8\% | 7.3\% | 8.8\% |
| Avg | 1.0\% | 4.4\% | 20.3\% | 48.7\% | 9.3\% | 0.7\% | 2.5\% | 7.9\% | 5.2\% |

Total Mortalities


## Stock: Chilliwack (Harrison Stock)

Reported Catch Only

| Catch Year |  | $\begin{gathered} \text { Fisheries } \\ \text { All } \\ \text { Nth/Cent } \end{gathered}$ | with Ceilings <br> WCVI <br> Total |  | Other Canada Net | Other <br> Canada Sport | Other U.S. Troll | Other U.S. Net | Other U.S. Sport |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  |  |  |  |  |  |  |
|  |  |  | Troll | Geo St |  |  |  |  |  |
| 85 | 0.5\% | 4.5\% | 36.2\% | 31.4\% | 8.7\% | 1.2\% | 4.3\% | 5.2\% | 8.1\% |
| 86 | 0.0\% | 5.7\% | 27.1\% | 34.5\% | 15.3\% | 1.5\% | 0.5\% | 7.8\% | 7.6\% |
| 87 | 0.1\% | 2.8\% | 24.5\% | 50.4\% | 3.1\% | 2.1\% | 6.0\% | 4.5\% | 6.6\% |
| 88 | 1.0\% | 0.3\% | 39.5\% | 34.1\% | 4.8\% | 3.8\% | 8.5\% | 5.1\% | 3.0\% |
| 89 | 0.0\% | 1.2\% | 38.4\% | 33.8\% | 8.7\% | 1.1\% | 4.9\% | 8.4\% | 3.6\% |
| Avg | 0.3\% | 2.9\% | 33.2\% | 36.8\% | 8.1\% | 1.9\% | 4.8\% | 6.2\% | 5.8\% |

Total Mortalities


## Stock: South Sound Fall Yearling

Reported Catch Only


Total Mortalities

| Catch Year | -------Fisheries wit <br> All <br> All |  | Ceilings------ |  | Other Canada Net | Other <br> Canada Sport | $\begin{aligned} & \text { Other } \\ & \text { U.S. } \\ & \text { Troli } \end{aligned}$ | Other U.S. Net | Other U.S. Sport |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  |  |  |  |  |  |  |
| 82 | 0.0\% | 2.1\% | 3.3\% | 2.2\% | 0.0\% | 0.0\% | 0.8\% | 17.2\% | 74.2\% |
| 83 | 0.0\% | 1.7\% | 6.0\% | 0.4\% | 0.0\% | 0.0\% | 0.0\% | 10.0\% | 81.9\% |
| 84 | 0.0\% | 0.0\% | 7.8\% | 1.8\% | 0.0\% | 0.0\% | 0.0\% | 38.3\% | 52.2\% |
| Avg | 0.0\% | 1.3\% | 5.7\% | 1.5\% | 0.0\% | 0.0\% | 0.3\% | 21.8\% | 69.4\% |

## Stock: University of Washington Fall Accelerated

Reported Catch Only

| Catch Year | ------ <br> Alaska | Fisheries All <br> Nth/Cent | with Ceilings----WCVI Total |  | Other Canada Net | Other Canada Sport | $\begin{aligned} & \text { Other } \\ & \text { U.s. } \\ & \text { Troli } \end{aligned}$ | Other U.S. Net | Other U.S. Sport |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  |  |  |  |  |  |  |
|  |  |  | Troll | Geo St |  |  |  |  |  |
| 79 | 0.0\% | 0.4\% | 18.3\% | 8.0\% | 5.2\% | 0.1\% | 2.3\% | 7.2\% | 58.5\% |
| 80 | 0.0\% | 0.5\% | 11.2\% | 6.3\% | 2.3\% | 0.3\% | 2.1\% | 18.7\% | 58.5\% |
| 81 | 0.0\% | 0.6\% | 10.7\% | 5.7\% | 4.3\% | 0.1\% | 2.4\% | 12.4\% | 63.8\% |
| 82 | 0.2\% | 0.5\% | 23.9\% | 3.2\% | 1.2\% | 0.2\% | 3.2\% | 21.2\% | 46.6\% |
| 83 | 0.0\% | 1.6\% | 13.1\% | 5.1\% | 2.0\% | 0.1\% | 1.8\% | 31.8\% | 44.6\% |
| 84 | 0.0\% | 0.7\% | 25.3\% | 6.2\% | 1.4\% | 0.5\% | 2.1\% | 30.5\% | 33.2\% |
| 85 | 0.0\% | 0.5\% | 20.2\% | 5.6\% | 6.6\% | 1.3\% | 2.8\% | 20.2\% | 42.5\% |
| 86 | 0.0\% | 0.7\% | 22.0\% | 3.6\% | 9.2\% | 1.2\% | 1.8\% | 33.0\% | 28.5\% |
| 87 | 0.3\% | 0.3\% | 12.2\% | 5.8\% | 0.3\% | 1.8\% | 4.3\% | 55.4\% | 19.6\% |
| Avg | 0.1\% | 0.6\% | 17.4\% | 5.5\% | 3.6\% | 0.6\% | 2.5\% | 25.6\% | 44.0\% |

Total Mortalities

| Catch Year | -------Fisheries |  | Ceilings--.--- |  | Other Canada Net | Other Canada Sport | Other U.S. Troll | Other U.S. Net | Other U.S. Sport |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  | WCVI | Total |  |  |  |  |  |
|  | Alaska | Nth/Cent | Troll | Geo St |  |  |  |  |  |
| 79 | 0.0\% | 0.4\% | 17.0\% | 6.6\% | 6.7\% | 0.1\% | 2.3\% | 7.2\% | 59.6\% |
| 80 | 0.0\% | 0.5\% | 10.5\% | 4.1\% | 3.7\% | 0.2\% | 2.1\% | 15.6\% | 63.4\% |
| 81 | 0.0\% | 0.5\% | 8.7\% | 3.8\% | 6.0\% | 0.1\% | 2.0\% | 9.8\% | 69.1\% |
| 82 | 0.2\% | 0.4\% | 24.2\% | 3.0\% | 1.4\% | 0.2\% | 3.5\% | 21.0\% | 46.1\% |
| 83 | 0.0\% | 1.5\% | 10.7\% | 4.4\% | 2.9\% | 0.1\% | 1.5\% | 30.3\% | 48.5\% |
| 84 | 0.0\% | 0.7\% | 22.9\% | 5.7\% | 2.0\% | 0.5\% | 2.0\% | 29.5\% | 36.8\% |
| 85 | 0.0\% | 1.5\% | 17.2\% | 5.0\% | 10.8\% | 1.2\% | 2.4\% | 17.7\% | 44.0\% |
| 86 | 0.0\% | 1.0\% | 20.1\% | 3.4\% | 12.7\% | 0.9\% | 1.8\% | 29.5\% | 30.3\% |
| 87 | 0.5\% | 0.5\% | 14.2\% | 5.6\% | 0.3\% | 1.6\% | 4.7\% | 53.9\% | 18.6\% |
| Avg | 0.1\% | 0.8\% | 16.2\% | 4.6\% | 5.2\% | 0.6\% | 2.5\% | 23.8\% | 46.3\% |

## Stock: Lummi Ponds Fall Fingerling

Reported Catch Only

| Catch Year | ------ <br> Alaska | isheries All Nth/Cent | Ceilings------ |  | Other Canada Net | Other Canada Sport | Other U.S. Troll | Other U.S. Net | Other U.S. Sport |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  | $\begin{aligned} & \text { WCVI } \\ & \text { Troll } \end{aligned}$ | $\begin{aligned} & \text { Total } \\ & \text { Geo St } \end{aligned}$ |  |  |  |  |  |
| 79 | 0.3\% | 10.1\% | 24.4\% | 14.7\% | 4.2\% | 0.0\% | 0.0\% | 27.5\% | 18.8\% |
| 80 | 0.0\% | 2.8\% | 21.4\% | 20.2\% | 1.9\% | 0.0\% | 2.0\% | 29.8\% | 21.9\% |
| 81 | 0.0\% | 2.5\% | 12.8\% | 23.4\% | 1.2\% | 0.0\% | 1.6\% | 37.0\% | 21.4\% |
| 82 | 0.1\% | 3.3\% | 15.5\% | 5.7\% | 1.1\% | 0.0\% | 0.0\% | 60.3\% | 14.1\% |
| 83 | 0.4\% | 1.1\% | 20.9\% | 13.9\% | 6.7\% | 0.0\% | 2.9\% | 29.4\% | 24.4\% |
| 84 | 0.0\% | 4.3\% | 12.3\% | 30.4\% | 1.9\% | 0.0\% | 0.0\% | 29.4\% | 21.7\% |
| 89 | 0.0\% | 0.4\% | 2.9\% | 23.5\% | 5.5\% | 0.0\% | 3.8\% | 37.6\% | 26.3\% |
| Avg | 0.1\% | 3.5\% | 15.7\% | 18.8\% | 3.2\% | 0.0\% | 1.5\% | 35.8\% | 21.2\% |

Total Mortalities

| Catch |  | Fisheries All Nth/Cent | Ceilings---... WCVI <br> Total |  | Other Canada Net | Other Canada Sport | Other U.S. <br> Troll | Other U.S. Net | Other U.S. Sport |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  |  |  |  |  |  |  |
| Year |  |  | Troll | Geo St |  |  |  |  |  |
| 79 | 0.3\% | 11.1\% | 23.0\% | 12.3\% | 5.7\% | 0.0\% | 0.4\% | 23.6\% | 23.7\% |
| 80 | 0.0\% | 3.1\% | 22.7\% | 19.2\% | 2.1\% | 0.0\% | 2.1\% | 28.9\% | 21.9\% |
| 81 | 0.0\% | 2.6\% | 13.2\% | 22.8\% | 1.5\% | 0.0\% | 1.7\% | 36.5\% | 21.7\% |
| 82 | 0.1\% | 3.9\% | - 15.7\% | 6.0\% | 1.5\% | 0.0\% | 0.0\% | 58.3\% | 14.5\% |
| 83 | 0.6\% | 1.9\% | 19.6\% | 14.1\% | 7.4\% | 0.0\% | 2.6\% | 26.1\% | 27.8\% |
| 84 | 0.0\% | 4.3\% | 12.6\% | 29.6\% | 1.9\% | 0.0\% | 0.0\% | 29.6\% | 21.5\% |
| 89 | 0.0\% | 0.4\% | 3.1\% | 26.2\% | 5.5\% | 0.0\% | 3.9\% | 35.8\% | 25.1\% |
| Avg | 0.1\% | 3.9\% | 15.7\% | 18.6\% | 3.6\% | 0.0\% | 1.5\% | 34.1\% | 22.3\% |

## Stock: Stillaguamish Fall Fingerling

Reported Catch Only

| Catch Year | -------Fisheries with Ceilings------ |  |  |  | Other Canada Net | Other Canada Sport | Other U.S. Troll | $\begin{aligned} & \text { Other } \\ & \text { U.S. } \\ & \text { Net } \end{aligned}$ | Other U.S. Sport |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | All | All | WCVI | Total |  |  |  |  |  |
|  | Alaska | Nth/Cent | Troll | Geo St |  |  |  |  |  |
| 84 | 0.0\% | 28.4\% | 6.8\% | 14.8\% | 23.9\% | 0.0\% | 0.0\% | 4.5\% | 21.6\% |
| 85 | 9.2\% | 6.7\% | 26.9\% | 9.2\% | 9.2\% | 8.4\% | 0.0\% | 8.4\% | 21.8\% |
| 86 | 4.5\% | 4.5\% | 33.7\% | 21.3\% | 0.0\% | 0.0\% | 0.0\% | 19.1\% | 16.9\% |
| Avg | 4.6\% | 13.2\% | 22.5\% | 15.1\% | 11.0\% | 2.8\% | 0.0\% | 10.7\% | 20.1\% |

Total Mortalities

| Catch Year | AllAlaska | Fisheries All <br> Nth/Cent | Ceilings-----WCVI <br> Total |  | Other Canada Net | Other <br> Canada <br> Sport | $\begin{aligned} & \text { Other } \\ & \text { U.S. } \\ & \text { Troli } \end{aligned}$ | $\begin{aligned} & \text { Other } \\ & \text { U.s. } \\ & \text { Net } \end{aligned}$ | Other U.s. Sport |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  |  |  |  |  |  |  |
|  |  |  | Troll | Geo St |  |  |  |  |  |
| 84 | 1.4\% | 22.5\% | 9.2\% | 12.0\% | 27.5\% | 0.7\% | 0.0\% | 3.5\% | 23.9\% |
| 85 | 11.3\% | 8.8\% | 24.4\% | 8.1\% | 11.9\% | 7.5\% | 0.0\% | 6.9\% | 21.3\% |
| 86 | 6.5\% | 4.3\% | 34.4\% | 20.4\% | 0.0\% | 0.0\% | 0.0\% | 18.3\% | 16.1\% |
| Avg | 6.4\% | 11.9\% | 22.6\% | 13.5\% | 13.1\% | 2.7\% | 0.0\% | 9.6\% | 20.4\% |

## Stock: George Adams Fall Fingerling

Reported Catch Only


Total Mortalities

| Catch Year | All <br> Alaska | Fisheries All <br> Nth/Cent | with Ceilings------ |  | other Canada Net | Other Canada Sport | Other U.S. Troll | Other u.s. Net | Other U.S. Sport |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  | $\begin{aligned} & \text { WCVI } \\ & \text { Troll } \end{aligned}$ | Total Geo St |  |  |  |  |  |
| 82 | 0.0\% | 1.7\% | 27.4\% | 2.4\% | 1.8\% | 0.0\% | 4.2\% | 47.6\% | 15.0\% |
| 83 | 0.0\% | 6.9\% | 11.8\% | 3.3\% | 7.2\% | 0.2\% | 0.1\% | 27.4\% | 43.0\% |
| 84 | 0.2\% | 5.7\% | 21.6\% | 6.4\% | 1.5\% | 0.0\% | 2.6\% | 38.4\% | 23.6\% |
| 89 | 0.5\% | 0.0\% | 10.9\% | 3.4\% | 3.8\% | 1.0\% | 11.1\% | 46.3\% | 22.8\% |
| Avg | 0.2\% | 3.6\% | 17.9\% | 3.9\% | 3.6\% | 0.3\% | 4.5\% | 39.9\% | 26. |

## Stock: South Sound Fall Fingerling

Reported Catch Only


Total Mortalities

| Catch Year | All <br> Alaska | Fisheries All Nth/Cent | with Ceilin WCVI Troll | Total Geo St | Other Canada Net | Other Canada Sport | Other U.S. Troll | Other U.S. Net | Other U.S. Sport |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 82 | 0.3\% | 1.7\% | - 27.2\% | 7.2\% | 2.9\% | 0.2\% | 2.7\% | 24.2\% | 33.6\% |
| 83 | 0.2\% | 4.1\% | 21.2\% | 4.7\% | 3.7\% | 0.2\% | 2.0\% | 29.6\% | 34.4\% |
| 84 | 0.3\% | 3.1\% | 26.0\% | 9.8\% | 1.1\% | 0.3\% | 2.1\% | 33.1\% | 24.2\% |
| 85 | 1.3\% | 1.0\% | \% 21.6\% | 6.1\% | 0.6\% | 0.9\% | 2.2\% | 39.1\% | 27.2\% |
| 86 | 0.0\% | 0.9\% | \% 21.2\% | 7.8\% | 0.9\% | 0.0\% | 7.6\% | 25.5\% | 36.1\% |
| 87 | 0.0\% | 0.0\% | 24.5\% | 14.2\% | 10.4\% | 0.0\% | 10.3\% | 14.6\% | 26.1\% |
| 88 | 0.5\% | 6.2\% | - 15.4\% | 10.4\% | 11.2\% | 1.1\% | 6.1\% | 26.4\% | 22.8\% |
| 89 | 0.1\% | 1.8\% | \% 15.0\% | 6.7\% | 5.8\% | 2.8\% | 9.1\% | 35.2\% | 23.3\% |
| Avg | 0.4\% | 2.4\% | \% 21.5\% | 8.4\% | 4.6\% | 0.7\% | 5.2\% | 28.5\% | 28.5\% |

## Stock: Kalama Creek Fall Fingerling

Reported Catch Only

| Catch Year | All Alaska | Fisheries All Nth/Cent | with Ceilin WCVI Troll | $\begin{aligned} & \text { Total } \\ & \text { Geo St } \end{aligned}$ | Other Canada Net | Other Canada Sport | Other U.S. Troll | Other U.S. Net | Other U.S. Sport |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 83 | 0.0\% | 0.3\% | 35.3\% | 7.8\% | 0.7\% | 0.0\% | 10.5\% | 4.7\% | 40.8\% |
| 84 | 0.0\% | 0.0\% | 41.7\% | 1.0\% | 1.9\% | 0.0\% | 0.0\% | 40.4\% | 15.0\% |
| 85 | 0.0\% | 0.0\% | 9.4\% | 0.0\% | 1.8\% | 1.3\% | 0.0\% | 9.9\% | 78.0\% |
| 86 | 0.0\% | 0.0\% | 27.3\% | 24.5\% | 0.5\% | 0.0\% | 0.0\% | 44.7\% | 3.3\% |
| 87 | 0.0\% | 5.0\% | 21.3\% | 2.9\% | 0.8\% | 0.0\% | 2.0\% | 56.3\% | 11.8\% |
| 88 | 0.0\% | 7.9\% | 11.7\% | 13.3\% | 6.6\% | 0.0\% | 11.0\% | 26.4\% | 23.1\% |
| 89 | 0.0\% | 1.2\% | 6.2\% | 2.5\% | 4.2\% | 3.7\% | 3.7\% | 51.5\% | 26.9\% |
| Avg | 0.0\% | 2.0\% | 21.8\% | 7.4\% | 2.4\% | 0.7\% | 3.9\% | 33.4\% | 28.4\% |

Total Mortalities

| Catch Year |  | $\begin{aligned} & \text { Fisheries } \\ & \text { All } \\ & \text { Nth/Cent } \end{aligned}$ | Ceilings----.WCVI <br> Total |  | Other Canada Net | Other Canada Sport | Other U.S. Troll | Other U.S. Net | Other U.S. Sport |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  |  |  |  |  |  |  |
|  |  |  | Troll | Geo St |  |  |  |  |  |
| 83 | 0.0\% | 0.2\% | \% 33.8\% | 7.4\% | 1.5\% | 0.0\% | 10.0\% | 5.1\% | 41.9\% |
| 84 | 0.0\% | 0.0\% | 39.7\% | 0.8\% | 2.5\% | 0.0\% | 0.0\% | 40.6\% | 16.4\% |
| 85 | 0.0\% | 0.0\% | 16.8\% | 0.0\% | 5.3\% | 0.9\% | 0.0\% | 9.2\% | 67.7\% |
| 86 | 0.0\% | 0.0\% | 28.2\% | 23.2\% | 0.6\% | 0.0\% | 0.0\% | 44.3\% | 3.9\% |
| 87 | 0.0\% | 6.0\% | \% 19.8\% | 4.6\% | 1.0\% | 0.0\% | 2.3\% | 47.1\% | 19.1\% |
| 88 | 0.0\% | 9.9\% | 9.5\% | 11.2\% | 9.8\% | 0.0\% | 8.7\% | 23.2\% | 27.7\% |
| 89 | 0.0\% | 1.3\% | 7.3\% | 3.4\% | 4.1\% | 3.5\% | 4.1\% | 50.7\% | 25.6\% |
| Avg | 0.0\% | 2.5\% | 22.2\% | 7.3\% | 3.5\% | 0.6\% | 3.6\% | 31.5\% | 28.9\% |

## Stock: Elwha Fall Fingerling

Reported Catch Only


Total Mortalities

| Catch Year | All <br> Alaska | Fisheries <br> All <br> Nth/Cent | ith Ceilings-----WCVI <br> Total |  | Other Canada Net | Other Canada Sport | Other U.S.Troll | Other U.S. Net | Other U.S. Sport |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  |  |  |  |  |  |  |
|  |  |  | Troll | Geo St |  |  |  |  |  |
| 86 | 12.5\% | 26.6\% | 25.0\% | 4.7\% | 3.9\% | 2.0\% | 1.4\% | 8.9\% | 15.0\% |
| 87 | 6.4\% | 20.4\% | 20.7\% | 14.2\% | 0.6\% | 3.8\% | 3.8\% | 6.6\% | 23.4\% |
| 88 | 14.4\% | 8.2\% | 26.7\% | 0.0\% | 1.0\% | 3.5\% | 10.6\% | 18.0\% | 17.5\% |
| 89 | 18.8\% | 17.7\% | 10.6\% | 0.0\% | 0.0\% | 0.0\% | 4.0\% | 35.2\% | 13.7\% |
| Avg | 13.0\% | 18.2\% | 20.8\% | 4.7\% | 1.4\% | 2.3\% | 5.0\% | 17.2\% | 17.4\% |

## Stock: Skagit Spring Yearling

Reported Catch Only


Total Mortalities

| Catch Year | All <br> Alaska | Fisheries All <br> Nth/Cent | with Ceilin WCVI Troll | Total Geo St | Other Canada Net | Other Canada Sport | Other U.S. Troll | $\begin{aligned} & \text { Other } \\ & \text { U.S. } \\ & \text { Net } \end{aligned}$ | Other U.S. Sport |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 85 | 0.0\% | 6.2\% | 7.0\% | 31.8\% | 25.6\% | 0.0\% | 0.0\% | 9.3\% | 18.6\% |
| 86 | 2.5\% | 16.7\% | 7.1\% | 43.9\% | 3.5\% | 6.1\% | 0.0\% | 3.5\% | 15.7\% |
| 87 | 0.0\% | 26.6\% | 2.3\% | 9.3\% | 12.6\% | 0.0\% | 0.9\% | 14.0\% | 33.6\% |
| 88 | 0.0\% | 10.8\% | 4.1\% | 17.7\% | 12.8\% | 3.5\% | 0.0\% | 31.7\% | 19.5\% |
| 89 | 0.0\% | 1.4\% | 5.9\% | 22.6\% | 2.0\% | 1.6\% | 4.3\% | 44.8\% | 17.4\% |
| Avg | 0.5\% | 12.3\% | 5.3\% | 25.1\% | 11.3\% | 2.2\% | 1.0\% | 20.7\% | 21.0\% |

## Stock: Skookum Spring Yearling

Reported Catch Only

| Catch Year | All Alaska | isheries All <br> Nth/Cent | Ceilin WCVI Troll | $\begin{aligned} & \text { Total } \\ & \text { Geo St } \end{aligned}$ | Other Canada Net | Other <br> Canada Sport | Other U.S. Troll | Other U.S. Net | Other U.s. Sport |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 85 | 0.0\% | 5.4\% | 20.9\% | 45.0\% | 18.6\% | 0.0\% | 0.0\% | 1.6\% | 8.5\% |
| 86 | 0.0\% | 12.9\% | 0.0\% | 77.4\% | 0.0\% | 0.0\% | 0.0\% | 0.0\% | 9.7\% |
| 87 | 0.0\% | 5.9\% | 0.0\% | 62.7\% | 3.9\% | 0.0\% | 0.0\% | 21.6\% | 3.9\% |
| 88 | 0.0\% | 7.9\% | 2.2\% | 73.0\% | 4.5\% | 0.0\% | 6.7\% | 1.1\% | 4.5\% |
| 89 | 0.0\% | 0.0\% | 9.3\% | 14.0\% | 14.0\% | 11.6\% | 0.0\% | 11.6\% | 39.5\% |
| Avg | 0.0\% | 6.4\% | 6.5\% | 54.4\% | 8.2\% | 2.3\% | 1.3\% | 7.2\% | 13.2\% |

Total Mortalities

| Catch Year | ------Fisheries with |  | Ceilings------ <br> WCVI Total |  | Other <br> Canada Net | Other Canada Sport | Other U.S. Troll | $\begin{aligned} & \text { Other } \\ & \text { U.s. } \\ & \text { Net } \end{aligned}$ | Other U.S. Sport |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  |  |  |  |  |  |  |
|  | Alaska | Nth/Cent | Troll | Geo St |  |  |  |  |  |
| 85 | 0.0\% | 5.8\% | 20.1\% | 44.6\% | 18.7\% | 0.0\% | 0.0\% | 1.4\% | 8.6\% |
| 86 | 0.0\% | 11.1\% | 0.0\% | 77.8\% | 0.0\% | 0.0\% | 0.0\% | 0.0\% | 8.3\% |
| 87 | 0.0\% | 9.7\% | 0.0\% | 66.7\% | 5.6\% | 0.0\% | 0.0\% | 11.1\% | 5.6\% |
| 88 | 0.0\% | 9.3\% | 1.9\% | 70.1\% | 4.7\% | 0.0\% | 6.5\% | 0.9\% | 4.7\% |
| 89 | 0.0\% | 0.0\% | 9.1\% | 13.6\% | 13.6\% | 11.4\% | 0.0\% | 11.4\% | 38.6\% |
| Avg | 0.0\% | 7.2\% | 6.2\% | 54.6\% | 8.5\% | 2.3\% | 1.3\% | 5.0\% | 13.2\% |

## Stock: Quilcene Spring Yearling

Reported Catch Only

| Catch Year | -----Fisheries with Ceilings------ |  |  |  | other Canada Net | Other Canada Sport | Other U.S. Troll | Other U.S. Net | Other U.S. Sport |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $\begin{array}{r} \text { All } \\ \text { Alaska } \end{array}$ | All <br> Nth/Cent | $\begin{aligned} & \text { WCVI } \\ & \text { Troll } \end{aligned}$ | $\begin{aligned} & \text { Total } \\ & \text { Geo St } \end{aligned}$ |  |  |  |  |  |
| 85 | 0.0\% | 0.0\% | 15.6\% | 0.0\% | 2.8\% | 2.8\% | 0.0\% | 50.3\% | 27.9\% |
| 86 | 0.0\% | 1.7\% | 0.0\% | 2.4\% | 0.0\% | 0.0\% | 0.0\% | 2.7\% | 93.2\% |
| 87 | 0.0\% | 9.5\% | 4.1\% | 5.4\% | 32.0\% | 0.0\% | 8.2\% | 0.0\% | 42.2\% |
| 88 | 0.0\% | 7.1\% | 54.9\% | 0.0\% | 2.7\% | 0.0\% | 9.7\% | 18.6\% | 7.1\% |
| Avg | 0.0\% | 4.6\% | 18.6\% | 2.0\% | 9.4\% | 0.7\% | 4.5\% | 17.9\% | 42.6\% |

Total Mortalities


## Stock: White River Spring Yearling

Reported Catch Only

| Catch Year | All Alaska | Fisheries All <br> Nth/Cent | Ceilings-----WCVI Total |  | Other Canada Net | Other Canada Sport | $\begin{aligned} & \text { Other } \\ & \text { U.s. } \\ & \text { Troll } \end{aligned}$ | Other U.S. Net | Other U.S. Sport |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  |  |  |  |  |  |  |
|  |  |  | Troll | Geo St |  |  |  |  |  |
| 83 | 0.0\% | 2.1\% | 5.6\% | 0.0\% | 0.0\% | 0.0\% | 2.1\% | 14.7\% | 76.2\% |
| 84 | 0.0\% | 10.8\% | 8.4\% | 9.6\% | 0.0\% | 0.0\% | 4.8\% | 15.7\% | 50.6\% |
| 85 | 0.0\% | 0.0\% | 0.0\% | 0.0\% | 13.8\% | 7.7\% | 0.0\% | 21.5\% | 56.9\% |
| 86 | 0.0\% | 0.5\% | 0.9\% | 2.6\% | 3.1\% | 0.0\% | 0.0\% | 18.2\% | 74.9\% |
| 87 | 0.0\% | 0.0\% | 0.0\% | 1.3\% | 0.6\% | 0.0\% | 2.9\% | 20.6\% | 74.6\% |
| 88 | 0.0\% | 0.0\% | 0.3\% | 2.0\% | 0.3\% | 0.5\% | 1.1\% | 18.5\% | 77.3\% |
| 89 | 0.0\% | 0.0\% | 1.6\% | 1.9\% | 1.3\% | 0.0\% | 6.6\% | 17.9\% | 70.6\% |
| Avg | 0.0\% | 1.9\% | 2.4\% | 2.5\% | 2.7\% | 1.2\% | 2.5\% | 18.2\% | 68.7\% |

Total Mortalities

| Catch Year | All <br> Alaska | Fisheries All <br> Nth/Cent | with Ceilin <br> WCVI <br> Troll | $\begin{aligned} & \text { Total } \\ & \text { Geo St } \end{aligned}$ | Other Canada Net | Other Canada Sport | $\begin{aligned} & \text { Other } \\ & \text { U.s. } \\ & \text { Troli } \end{aligned}$ | Other U.S. Net | Other U.S. Sport |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |
| 83 | 0.0\% | 2.0\% | 5.2\% | 0.0\% | 0.0\% | 0.0\% | 2.0\% | 14.4\% | 75.2\% |
| 84 | 0.0\% | 10.9\% | 8.7\% | 9.8\% | 0.0\% | 0.0\% | 4.3\% | 15.2\% | 51.1\% |
| 85 | 0.0\% | 0.0\% | 0.0\% | 0.0\% | 18.0\% | 4.1\% | 0.0\% | 9.0\% | 68.9\% |
| 86 | 0.0\% | 0.6\% | 0.9\% | 2.5\% | 3.1\% | 0.0\% | 0.0\% | 18.2\% | 74.5\% |
| 87 | 0.0\% | 0.0\% | 0.0\% | 1.0\% | 1.0\% | 0.0\% | 1.9\% | 11.4\% | 84.7\% |
| 88 | 0.0\% | 0.0\% | 0.4\% | 1.9\% | 0.3\% | 0.4\% | 1.2\% | 18.5\% | 77.2\% |
| 89 | 0.0\% | 0.0\% | 1.6\% | 1.9\% | 1.3\% | 0.0\% | 6.6\% | 18.3\% | 70.1\% |
| Avg | 0.0\% | 1.9\% | 2.4\% | 2.5\% | 3.4\% | 0.6\% | 2.3\% | 15.0\% | 71.7\% |

## Stock: Quinault Fall Fingerling

Reported Catch Only

| Catch Year | All Alaska | Fisheries All Nth/Cent | with Ceilings------ |  | Other Canada Net | Other Canada Sport | $\begin{aligned} & \text { Other } \\ & \text { U.S. } \\ & \text { Troll } \end{aligned}$ | Other U.S. Net | Other U.S. Sport |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  |  |  |  |  |  |  |
|  |  |  | Troll | Geo St |  |  |  |  |  |
| 79 | 11.9\% | 17.7\% | 9.5\% | 0.7\% | 0.7\% | 0.0\% | 0.0\% | 55.0\% | 4.6\% |
| 80 | 12.8\% | 16.1\% | 5.3\% | 0.0\% | 1.5\% | 0.0\% | 1.4\% | 61.2\% | 1.8\% |
| 81 | 6.9\% | 22.6\% | 12.9\% | 0.0\% | 18.2\% | 0.0\% | 0.0\% | 39.3\% | 0.0\% |
| 82 | 8.6\% | 8.5\% | 9.3\% | 0.0\% | 0.0\% | 0.0\% | 0.0\% | 73.1\% | 0.5\% |
| 83 | 19.4\% | 22.6\% | 7.0\% | 0.1\% | 0.2\% | 0.1\% | 0.0\% | 50.2\% | 0.2\% |
| 84 | 15.4\% | 11.9\% | 14.6\% | 0.0\% | 0.0\% | 0.0\% | 0.5\% | 56.1\% | 1.4\% |
| 85 | 13.3\% | 28.9\% | 2.9\% | 0.0\% | 10.4\% | 0.0\% | 0.0\% | 44.5\% | 0.0\% |
| 86 | 5.5\% | 15.3\% | 15.3\% | 1.0\% | 1.3\% | 2.1\% | 0.0\% | 54.8\% | 4.6\% |
| 87 | 32.2\% | 33.6\% | 26.9\% | 0.0\% | 0.0\% | 1.3\% | 0.7\% | 0.5\% | 4.8\% |
| 88 | 36.1\% | 38.1\% | 21.5\% | 0.0\% | 0.5\% | 0.0\% | 1.2\% | 1.5\% | 1.1\% |
| 89 | 31.0\% | 40.4\% | 14.8\% | 0.0\% | 0.8\% | 3.1\% | 0.4\% | 2.9\% | 6.4\% |
| Avg | 17.6\% | 23.3\% | 12.7\% | 0.2\% | 3.1\% | 0.6\% | 0.4\% | 39.9\% | 2.3\% |

Total Mortalities

| Catch Year | All <br> Alaska | Fisheries All Nth/Cent | with Ceilings-----WCVI Total |  | Other Canada Net | Other Canada Sport | Other U.s. Troll | Other U.s. Net | Other U.s. Sport |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  |  |  |  |  |  |  |
|  |  |  | Troll | Geo St |  |  |  |  |  |
| 79 | 12.5\% | 18.5\% | 9.5\% | 0.7\% | 1.0\% | 0.0\% | 0.2\% | 53.5\% | 4.3\% |
| 80 | 14.1\% | 17.1\% | 5.7\% | 0.0\% | 2.3\% | 0.0\% | 1.6\% | 57.1\% | 2.1\% |
| 81 | 10.0\% | 30.3\% | 11.8\% | 0.0\% | 19.5\% | 0.0\% | 0.0\% | 28.5\% | 0.0\% |
| 82 | 12.0\% | 9.5\% | 8.7\% | 0.0\% | 0.0\% | 0.0\% | 0.0\% | 68.9\% | 0.8\% |
| 83 | 20.9\% | 22.1\% | 7.1\% | 0.1\% | 0.2\% | 0.1\% | 0.0\% | 49.2\% | 0.2\% |
| 84 | 17.1\% | 12.2\% | 14.3\% | 0.0\% | 0.0\% | 0.0\% | 0.5\% | 54.5\% | 1.4\% |
| 85 | 18.3\% | 41.1\% | 11.6\% | 0.4\% | 8.4\% | 0.9\% | 0.2\% | 15.3\% | 3.7\% |
| 86 | 11.4\% | 16.3\% | 15.3\% | 0.8\% | 1.3\% | 1.7\% | 0.1\% | 49.3\% | 4.0\% |
| 87 | 38.5\% | 32.0\% | 23.6\% | 0.0\% | 0.0\% | 1.0\% | 0.6\% | 0.6\% | 3.8\% |
| 88 | 38.9\% | 35.4\% | 21.8\% | 0.0\% | 0.5\% | 0.0\% | 1.1\% | 1.4\% | 0.7\% |
| 89 | 39.5\% | 35.6\% | 13.2\% | 0.0\% | 0.7\% | 2.6\% | 0.4\% | 2.5\% | 5.6\% |
| Avg | 21.2\% | 24.6\% | 13.0\% | 0.2\% | 3.1\% | 0.6\% | 0.4\% | 34.6\% | 2.4\% |



## Stock: Queets Fall Fingerling

Reported Catch Only

| Catch Year | AllAlaska | Fisheries All <br> Nth/Cent | with Ceilings----WCVI <br> Total |  | Other Canada Net | Other <br> Canada Sport | $\begin{aligned} & \text { Other } \\ & \text { U.S. } \\ & \text { Troll } \end{aligned}$ | Other U.S. Net | Other U.S. Sport |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  |  |  |  |  |  |  |
|  |  |  | Troll | Geo St |  |  |  |  |  |
| 81 | 13.9\% | 21.8\% | 15.2\% | 0.0\% | 0.3\% | 0.0\% | 7.0\% | 40.6\% | 1.2\% |
| 82 | 10.1\% | 41.1\% | 17.3\% | 0.0\% | 0.0\% | 0.0\% | 0.0\% | 31.3\% | 0.0\% |
| 83 | 53.1\% | 6.3\% | 2.5\% | 0.0\% | 4.4\% | 0.0\% | 1.4\% | 32.3\% | 0.0\% |
| 84 | 7.3\% | 59.4\% | 2.2\% | 0.0\% | 0.0\% | 0.0\% | 10.8\% | 20.6\% | 0.0\% |
| 85 | 25.6\% | 45.5\% | 3.4\% | 0.0\% | 2.3\% | 0.0\% | 0.0\% | 22.7\% | 1.1\% |
| 86 | 36.3\% | 29.5\% | 13.7\% | 0.0\% | 2.1\% | 0.0\% | 0.0\% | 18.5\% | 0.0\% |
| 87 | 58.1\% | 37.2\% | 1.9\% | 0.0\% | 0.0\% | 0.0\% | 1.4\% | 0.5\% | 1.4\% |
| 88 | 49.0\% | 29.2\% | 12.6\% | 0.0\% | 0.0\% | 1.2\% | 0.0\% | 0.0\% | 7.9\% |
| 89 | 22.7\% | 39.3\% | 32.0\% | 0.0\% | 0.0\% | 0.0\% | 0.0\% | 0.0\% | 5.3\% |
| Avg | 30.7\% | 34.4\% | 11.2\% | 0.0\% | 1.0\% | 0.1\% | 2.3\% | 18.5\% | 1.9\% |

Total Mortalities

| Catch Year | $\begin{array}{r} \text { All } \\ \text { Alaska } \end{array}$ | Fisheries All <br> Nth/Cent | with Ceiling WCVI Troll | $\begin{aligned} & \text { Total } \\ & \text { Geo St } \end{aligned}$ | Other Canada Net | Other Canada Sport | $\begin{aligned} & \text { Other } \\ & \text { U.s. } \\ & \text { Troll } \end{aligned}$ | Other U.S. Net | Other U.S. Sport |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 81 | 24.4\% | 33.0\% | - 10.8\% | 0.0\% | 3.8\% | 0.0\% | 5.3\% | 22.2\% | 0.6\% |
| 82 | 12.2\% | 41.2\% | - 17.2\% | 0.0\% | 0.0\% | 0.0\% | 0.0\% | 29.3\% | 0.0\% |
| 83 | 55.6\% | 6.0\% | \% 2.4\% | 0.0\% | 4.3\% | 0.0\% | 1.3\% | 30.4\% | 0.0\% |
| 84 | 8.5\% | 58.3\% | - 2.3\% | 0.0\% | 0.0\% | 0.0\% | 10.6\% | 20.1\% | 0.0\% |
| 85 | 30.3\% | 42.5\% | - 3.2\% | 0.0\% | 4.5\% | 0.0\% | 0.0\% | 18.1\% | 1.4\% |
| 86 | 45.5\% | 25.9\% | \% 12.2\% | 0.0\% | 1.6\% | 0.0\% | 0.0\% | 14.8\% | 0.0\% |
| 87 | 65.0\% | 29.6\% | \% 2.9\% | 0.0\% | 0.0\% | 0.0\% | 1.0\% | 0.3\% | 1.3\% |
| 88 | 51.2\% | 28.4\% | \% 12.9\% | 0.0\% | 0.0\% | 0.9\% | 0.0\% | 0.0\% | 6.3\% |
| 89 | 28.8\% | 37.3\% | 29.4\% | 0.0\% | 0.0\% | 0.0\% | 0.0\% | 0.0\% | 4.5\% |
| Avg | 35.7\% | 33.6\% | 10.4\% | 0.0\% | 1.6\% | 0.1\% | 2.0\% | 15.0\% | 1.6\% |

## Stock: Humtulips Fall Fingerling

Reported Catch Only


Total Mortalities

| Catch Year | -------Fisheries with |  | Ceilings------ |  | Other Canada Net | Other Canada Sport | Other U.S. Troll | Other U.S. Net | Other U.S. Sport |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | All | All | WCVI | Total |  |  |  |  |  |
|  | Alaska | Nth/Cent | Troll | Geo St |  |  |  |  |  |
| 87 | 32.6\% | 14.7\% | 0.8\% | 0.0\% | 1.6\% | 0.0\% | 0.0\% | 44.2\% | 6.2\% |
| 88 | 22.3\% | 45.7\% | 11.7\% | 1.1\% | 0.0\% | 0.0\% | 1.1\% | 19.1\% | 1.1\% |
| 89 | 25.3\% | 44.3\% | 3.3\% | 3.5\% | 0.0\% | 0.0\% | 1.5\% | 20.3\% | 2.0\% |
| Avg | 26.7\% | 34.9\% | 5.3\% | 1.5\% | 0.5\% | 0.0\% | 0.8\% | 27.9\% | 3.1\% |

## Stock: Cowlitz Tule

## Reported Catch Only

| Catch Year | -----Fisheries with |  | Ceilings------ |  | Other Canada Net | Other Canada Sport | Other <br> U.S. <br> Troll | Other U.S. Net | Other U.S. Sport |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | All | All | WCVI | Total |  |  |  |  |  |
|  | Alaska | Nth/Cent | Troll | Geo St |  |  |  |  |  |
| 81 | 3.1\% | 5.9\% | 24.0\% | 0.0\% | 7.9\% | 0.0\% | 12.1\% | 18.2\% | 28.8\% |
| 82 | 5.3\% | 5.8\% | 21.3\% | 0.0\% | 1.0\% | 0.4\% | 31.1\% | 15.4\% | 19.7\% |
| 83 | 6.8\% | 15.4\% | 28.5\% | 0.6\% | 1.0\% | 0.0\% | 11.2\% | 7.5\% | 29.0\% |
| 84 | 6.9\% | 15.8\% | 37.6\% | 0.0\% | 3.3\% | 0.0\% | 6.0\% | 23.7\% | 6.7\% |
| 85 | 7.9\% | 16.4\% | 22.0\% | 0.8\% | 2.5\% | 0.0\% | 7.3\% | 13.1\% | 29.9\% |
| 86 | 0.7\% | 2.1\% | 18.0\% | 0.4\% | 1.5\% | 0.0\% | 17.8\% | 43.1\% | 16.3\% |
| 87 | 5.4\% | 6.7\% | 13.9\% | 0.0\% | 0.9\% | 0.6\% | 15.2\% | 37.0\% | 20.1\% |
| 88 | 3.1\% | 2.7\% | 23.5\% | 0.0\% | 0.9\% | 0.0\% | 21.6\% | 35.5\% | 12.8\% |
| 89 | 5.6\% | 7.1\% | 10.3\% | 0.0\% | 2.1\% | 0.0\% | 35.2\% | 22.7\% | 17.0\% |
| Avg | 5.0\% | 8.6\% | 22.1\% | 0.2\% | 2.3\% | 0.1\% | 17.5\% | 24.0\% | 20.0\% |

Total Mortalities

| Catch Year | All Alaska | isheries All Nth/Cent | with Ceilin WCVI <br> Troll | Total Geo St | Other Canada Net | Other Canada Sport | Other U.S. Troll | Other U.S. Net | Other U.S. Sport |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 81 | 5.4\% | 7.0\% | 24.1\% | 0.0\% | 8.8\% | 0.0\% | 16.2\% | 15.3\% | 23.3\% |
| 82 | 6.6\% | 9.3\% | 20.6\% | 0.0\% | 2.3\% | 0.3\% | 29.7\% | 14.1\% | 17.2\% |
| 83 | 8.3\% | 15.9\% | 28.3\% | 0.5\% | 1.0\% | 0.0\% | 11.7\% | 7.0\% | 27.3\% |
| 84 | 8.1\% | 15.7\% | 36.8\% | 0.0\% | 4.6\% | 0.0\% | 6.1\% | 22.5\% | 6.2\% |
| 85 | 10.5\% | 25.4\% | 18.5\% | 0.7\% | 4.2\% | 0.0\% | 6.4\% | 11.0\% | 23.3\% |
| 86 | 1.3\% | 2.9\% | 18.1\% | 0.4\% | 1.9\% | 0.0\% | 18.5\% | 40.5\% | 16.4\% |
| 87 | 7.9\% | 7.5\% | 15.1\% | 0.0\% | 0.9\% | 0.6\% | 15.4\% | 33.5\% | 19.1\% |
| 88 | 4.2\% | 2.9\% | 25.7\% | 0.0\% | 1.2\% | 0.0\% | 21.7\% | 32.6\% | 11.8\% |
| 89 | 7.7\% | 7.7\% | 11.0\% | 0.0\% | 2.3\% | 0.0\% | 35.8\% | 20.1\% | 15.5\% |
| Avg | 6.6\% | 10.5\% | 22.0\% | 0.2\% | 3.0\% | 0.1\% | 17.9\% | 21.9\% | 17.8\% |

## Stock: Spring Creek Tule

Reported Catch Only

| Catch Year |  | Fisheries All <br> Nth/Cent | with Ceilings--...WCVI <br> Total |  | Other Canada Net | Other Canada Sport | $\begin{aligned} & \text { Other } \\ & \text { U.S. } \\ & \text { Troll } \end{aligned}$ | Other U.S. Net | Other U.S. Sport |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  |  |  |  |  |  |  |
| 79 | 0.0\% | 0.6\% | 26.0\% | 3.0\% | 4.4\% | 0.1\% | 16.7\% | 29.9\% | 19.2\% |
| 80 | 0.1\% | 0.7\% | 29.3\% | 3.4\% | 1.3\% | 0.3\% | 27.8\% | 24.3\% | 12.9\% |
| 81 | 0.0\% | 0.4\% | 23.4\% | 2.6\% | 3.1\% | 0.7\% | 25.8\% | 24.2\% | 19.8\% |
| 82 | 0.0\% | 0.6\% | 23.9\% | 0.3\% | 0.1\% | 0.0\% | 25.4\% | 39.3\% | 10.4\% |
| 83 | 0.0\% | 0.6\% | 43.7\% | 1.7\% | 0.0\% | 0.4\% | 12.3\% | 28.0\% | 13.3\% |
| 84 | 0.0\% | 3.9\% | 44.5\% | 0.0\% | 0.0\% | 0.5\% | 7.7\% | 37.9\% | 5.4\% |
| 85 | 0.0\% | 0.0\% | 43.7\% | 0.0\% | 0.1\% | 0.3\% | 9.0\% | 45.0\% | 1.9\% |
| 86 | 0.0\% | 2.3\% | 26.9\% | 0.8\% | 1.7\% | 1.6\% | 7.1\% | 49.6\% | 9.9\% |
| 87 | 0.0\% | 0.0\% | 4.5\% | 0.0\% | 0.0\% | 0.0\% | 4.1\% | 42.4\% | 49.0\% |
| 88 | 0.0\% | 1.9\% | 31.8\% | 0.9\% | 1.8\% | 0.8\% | 17.9\% | 35.9\% | 9.0\% |
| 89 | 0.0\% | 0.0\% | 9.7\% | 0.4\% | 0.3\% | 0.5\% | 21.7\% | 60.3\% | 7.1\% |
| Avg | 0.0\% | 1.0\% | 28.0\% | 1.2\% | 1.2\% | 0.5\% | 16.0\% | 37.9\% | 14.4\% |

Total Mortalities

| Catch Year | All Alaska | Fisheries All <br> Nth/Cent | with Ceilings--.... WCVI Total |  | Other Canada Net | Other Canada Sport | Other U.S. Troll | Other U.S. Net | Other U.S. Sport |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  |  |  |  |  |  |  |
|  |  |  | Troll | Geo St |  |  |  |  |  |
| 79 | 0.0\% | 1.1\% | 26.0\% | 2.2\% | 7.0\% | 0.1\% | 17.5\% | 25.5\% | 20.6\% |
| 80 | 0.1\% | 0.8\% | 29.1\% | 2.7\% | 2.0\% | 0.3\% | 28.3\% | 23.0\% | 13.7\% |
| 81 | 0.0\% | 0.4\% | 22.7\% | 2.1\% | 4.9\% | 0.7\% | 25.9\% | 23.9\% | 19.4\% |
| 82 | 0.0\% | 0.6\% | 24.3\% | 0.2\% | 0.1\% | 0.0\% | 28.0\% | 37.1\% | 9.6\% |
| 83 | 0.0\% | 0.6\% | 43.1\% | 1.8\% | 0.0\% | 0.4\% | 12.5\% | 26.8\% | 14.7\% |
| 84 | 0.0\% | 3.8\% | 43.4\% | 0.0\% | 0.2\% | 0.5\% | 7.6\% | 38.3\% | 6.2\% |
| 85 | 0.0\% | 0.1\% | 42.8\% | 0.0\% | 0.2\% | 0.2\% | 11.3\% | 43.6\% | 1.9\% |
| 86 | 0.0\% | 2.3\% | 27.6\% | 0.8\% | 1.9\% | 1.6\% | 7.7\% | 48.5\% | 9.7\% |
| 87 | 0.0\% | 0.0\% | 16.0\% | 0.0\% | 0.0\% | 0.0\% | 11.3\% | 43.1\% | 29.6\% |
| 88 | 0.0\% | 2.9\% | 30.9\% | 0.9\% | 3.7\% | 0.8\% | 15.6\% | 33.5\% | 11.6\% |
| 89 | 0.0\% | 0.0\% | 11.0\% | 0.8\% | 0.5\% | 0.4\% | 23.3\% | 56.7\% | 7.4\% |
| Avg | 0.0\% | 1.2\% | 28.8\% | 1.0\% | 1.9\% | 0.5\% | 17.2\% | 36.4\% | 13.1\% |

## Stock: Bonneville Tule

Reported Catch Only


Total Mortalities

| Catch Year | All Alaska | isheries All Nth/Cent | Ceilings----- |  | Other Canada Net | Other Canada Sport | Other U.S. Troll | $\begin{aligned} & \text { Other } \\ & \text { U.S. } \\ & \text { Net } \end{aligned}$ | Other U.S. Sport |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  | WCVI | Total |  |  |  |  |  |
| 80 | 0.0\% | 4.5\% | 22.9\% | 2.1\% | 13.0\% | 2.5\% | 16.6\% | 7.7\% | 30.8\% |
| 81 | 0.0\% | 0.6\% | - 35.2\% | 7.4\% | 4.6\% | 0.0\% | 36.2\% | 3.1\% | 12.9\% |
| 82 | 0.0\% | 1.8\% | - 46.6\% | 0.0\% | 1.4\% | 0.6\% | 11.7\% | 30.0\% | 7.9\% |
| 83 | 0.0\% | 5.4\% | 57.5\% | 3.5\% | 0.4\% | 0.1\% | 16.8\% | 7.7\% | 8.7\% |
| 84 | 0.0\% | 8.4\% | 53.5\% | 0.0\% | 3.1\% | 0.0\% | 5.6\% | 25.6\% | 3.8\% |
| 85 | 0.0\% | 1.7\% | -60.4\% | 0.0\% | 1.8\% | 0.8\% | 22.2\% | 7.9\% | 5.2\% |
| 86 | 0.0\% | 0.0\% | - 4.8\% | 1.6\% | 21.1\% | 2.7\% | 2.2\% | 25.2\% | 42.4\% |
| 87 | 0.0\% | 2.9\% | 37.5\% | 0.4\% | 0.3\% | 1.1\% | 22.2\% | 28.1\% | 7.5\% |
| Avg <br> == | $0.0 \%$ | $3.2 \%$ | $\% \quad 39.8 \%$ | $1.9 \%$ | $5.7 \%$ | $1.0 \%$ | $16.7 \%$ | $16.9 \%$ | 14.9\% |

## Stock: Stayton Pond Tule

Reported Catch Only

| Catch Year | -------Fisheries with Ce |  |  |  | Other Canada Net | Other Canada Sport | $\begin{aligned} & \text { Other } \\ & \text { U.S. } \\ & \text { Troli } \end{aligned}$ | Other U.S. Net | Other U.S. Sport |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | All | All | WCVI | Total |  |  |  |  |  |
|  | Alaska | Nth/Cent | Troll | Geo St |  |  |  |  |  |
| 82 | 0.0\% | 2.9\% | 33.2\% | 0.5\% | 0.4\% | 0.4\% | 29.0\% | 19.5\% | 14.1\% |
| 83 | 0.0\% | 4.0\% | 50.8\% | 1.7\% | 0.9\% | 0.6\% | 18.5\% | 10.2\% | 13.4\% |
| 84 | 0.0\% | 2.8\% | 70.2\% | 2.7\% | 2.2\% | 0.4\% | 6.5\% | 10.4\% | 4.9\% |
| 85 | 0.0\% | 1.9\% | 45.1\% | 3.3\% | 1.8\% | 0.7\% | 31.2\% | 4.8\% | 11.2\% |
| 86 | 0.0\% | 2.2\% | 31.2\% | 2.9\% | 11.0\% | 5.0\% | 17.2\% | 14.2\% | 16.3\% |
| 87 | 0.0\% | 1.9\% | 37.2\% | 0.5\% | 0.3\% | 2.2\% | 21.5\% | 26.2\% | 10.1\% |
| 88 | 0.6\% | 0.5\% | 43.0\% | 0.0\% | 0.0\% | 1.8\% | 18.1\% | 31.4\% | 4.6\% |
| 89 | 0.0\% | 0.0\% | 16.9\% | 0.0\% | 2.6\% | 0.0\% | 62.0\% | 12.1\% | 6.4\% |
| Avg | 0.1\% | 2.0\% | 40.9\% | 1.5\% | 2.4\% | 1.4\% | 25.5\% | 16.1\% | 10.1\% |

Total Mortalities

| Catch Year | -------Fisheries with Ceilings------ |  |  |  | Other Canada Net | Other Canada Sport | Other U.S. Troll | $\begin{aligned} & \text { Other } \\ & \text { U.S. } \\ & \text { Net } \end{aligned}$ | Other U.S. Sport |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | All | All | WCVI | Total |  |  |  |  |  |
|  | Alaska | Nth/Cent | Troll | Geo St |  |  |  |  |  |
| 82 | 0.0\% | 2.9\% | 33.6\% | 0.6\% | 0.6\% | 0.3\% | 29.4\% | 18.8\% | 13.8\% |
| 83 | 0.0\% | 4.4\% | 49.8\% | 1.7\% | 1.4\% | 0.6\% | 18.8\% | 9.5\% | 13.7\% |
| 84 | 0.0\% | 2.8\% | 69.5\% | 2.7\% | 3.3\% | 0.3\% | 6.7\% | 9.6\% | 5.1\% |
| 85 | 0.0\% | 2.0\% | 44.9\% | 3.0\% | 1.9\% | 0.6\% | 32.8\% | 4.7\% | 10.2\% |
| 86 | 0.0\% | 9.7\% | 19.7\% | 2.9\% | 21.8\% | 3.6\% | 11.1\% | 9.1\% | 22.2\% |
| 87 | 0.0\% | 2.3\% | 43.3\% | 0.4\% | 0.3\% | 1.7\% | 21.4\% | 21.7\% | 8.9\% |
| 88 | 0.7\% | 0.5\% | 46.6\% | 0.0\% | 0.0\% | 1.7\% | 17.7\% | 28.5\% | 4.2\% |
| 89 | 0.0\% | 0.0\% | 18.3\% | 0.0\% | 3.7\% | 0.0\% | 59.4\% | 11.4\% | 7.3\% |
| Avg | 0.1\% | 3.1\% | 40.7\% | 1.4\% | 4.1\% | 1.1\% | 24.7\% | 14.2\% | 10.7\% |

## Stock: Columbia River Upriver Bright

Reported Catch Only

| Catch Year | All <br> Alaska | isheries Al Nth/Cent | with Ceil <br> WCVI <br> Troll | Total Geo St | Other Canada Net | Other Canada Sport | Other U.S. Troll | Other U.S. Net | Other U.S. Sport |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 79 | 25.9\% | 20.2\% | 17.2\% | 0.4\% | 0.8\% | 0.0\% | 2.1\% | 31.1\% | 2.3\% |
| 80 | 46.4\% | 20.1\% | 13.2\% | 1.5\% | 0.6\% | 0.0\% | 1.9\% | 13.4\% | 2.8\% |
| 81 | 41.3\% | 22.3\% | 10.5\% | 1.3\% | 2.6\% | 0.8\% | 1.4\% | 9.9\% | 10.0\% |
| 82 | 27.0\% | 27.0\% | 21.1\% | 0.0\% | 2.4\% | 0.0\% | 5.7\% | 12.9\% | 3.8\% |
| 83 | 36.2\% | 36.3\% | 8.1\% | 0.4\% | 0.1\% | 0.0\% | 0.9\% | 17.9\% | 0.0\% |
| 84 | 32.5\% | 22.2\% | 13.5\% | 0.2\% | 0.7\% | 0.8\% | 0.3\% | 27.0\% | 3.0\% |
| 85 | 24.4\% | 14.7\% | 10.4\% | 0.1\% | 2.2\% | 0.1\% | 1.1\% | 42.4\% | 4.7\% |
| 86 | 17.1\% | 13.7\% | 13.6\% | 0.2\% | 0.2\% | 0.2\% | 1.8\% | 49.2\% | 4.1\% |
| 87 | 19.0\% | 19.0\% | 9.9\% | 0.0\% | 0.0\% | 0.4\% | 1.8\% | 47.5\% | 2.3\% |
| 88 | 14.4\% | 10.9\% | 13.0\% | 0.0\% | 0.1\% | 0.0\% | 2.1\% | 57.4\% | 2.1\% |
| 89 | 8.0\% | 10.2\% | 5.0\% | 0.0\% | 0.7\% | 0.0\% | 2.3\% | 71.2\% | 2.5\% |
| Avg | 26.6\% | 19.7\% | 12.3\% | 0.4\% | 0.9\% | 0.2\% | 1.9\% | 34.5\% | 3.4\% |

Total Mortalities

| Catch Year | All <br> Alaska | isheries All Nth/Cent | with Ceiling <br> WCVI <br> Troll | Total Geo St | Other Canada Net | Other Canada Sport | Other U.S. Troll | Other U.S. Net | Other U.S. Sport |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 79 | 26.4\% | 20.8\% | 17.0\% | 0.4\% | 1.0\% | 0.0\% | 2.1\% | 30.0\% | 2.3\% |
| 80 | 46.5\% | 21.1\% | 13.1\% | 1.4\% | 0.8\% | 0.0\% | 1.9\% | 12.5\% | 2.7\% |
| 81 | 42.8\% | 25.4\% | 9.4\% | 0.9\% | 2.8\% | 0.6\% | 1.4\% | 8.7\% | 8.0\% |
| 82 | 36.4\% | 26.6\% | 17.3\% | 0.0\% | 3.2\% | 0.0\% | 4.8\% | 8.9\% | 2.7\% |
| 83 | 42.3\% | 35.8\% | 7.0\% | 0.3\% | 0.2\% | 0.0\% | 0.8\% | 13.6\% | 0.0\% |
| 84 | 37.2\% | 21.4\% | 12.6\% | 0.1\% | 0.8\% | 0.7\% | 0.3\% | 24.0\% | 2.9\% |
| 85 | 28.1\% | 14.7\% | 9.8\% | 0.1\% | 2.6\% | 0.1\% | 1.0\% | 39.0\% | 4.5\% |
| 86 | 20.8\% | 14.1\% | 13.5\% | 0.2\% | 0.2\% | 0.2\% | 1.9\% | 44.9\% | 4.2\% |
| 87 | 25.1\% | 19.5\% | 10.5\% | 0.0\% | 0.0\% | 0.4\% | 1.7\% | 40.6\% | 2.1\% |
| 88 | 19.7\% | 12.6\% | 14.7\% | 0.0\% | 0.2\% | 0.0\% | 2.1\% | 48.8\% | 1.8\% |
| 89 | 14.4\% | 13.0\% | 5.9\% | 0.0\% | 1.1\% | 0.0\% | 2.2\% | 61.2\% | 2.2\% |
| Avg | 30.9\% | 20.5\% | 11.9\% | 0.3\% | 1.2\% | 0.2\% | 1.8\% | 30.2\% | 3.0\% |

## Stock: Lewis River Wild

Reported Catch Only

| Catch Year | All Alaska | isheries All Nth/Cent | with Ceili <br> WCVI <br> Troll | Total Geo St | Other Canada Net | Other Canada Sport | Other U.S. Troll | Other U.S. Net | Other U.S. Sport |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 81 | 16.4\% | 16.5\% | \% 14.7\% | 0.0\% | 1.8\% | 0.0\% | 4.9\% | 8.0\% | 37.8\% |
| 82 | 12.8\% | 9.3\% | 18.7\% | 0.8\% | 1.3\% | 0.0\% | 8.9\% | 10.9\% | 37.4\% |
| 86 | 8.4\% | 8.1\% | 11.2\% | 0.0\% | 0.0\% | 4.5\% | 4.9\% | 43.2\% | 19.8\% |
| 87 | 5.6\% | 10.5\% | \% 14.4\% | 0.0\% | 0.0\% | 0.4\% | 4.6\% | 41.6\% | 22.9\% |
| 88 | 7.0\% | 5.2\% | \% 15.3\% | 0.0\% | 0.0\% | 0.0\% | 8.1\% | 38.9\% | 25.5\% |
| 89 | 5.5\% | 14.5\% | \% 9.7\% | 0.0\% | 0.4\% | 1.1\% | 11.9\% | 47.3\% | 9.6\% |
| Avg | 9.3\% | 10.7\% | 14.0\% | 0.1\% | 0.6\% | 1.0\% | 7.2\% | 31.6\% | 25.5\% |

Total Mortalities

| Catch Year |  | $\begin{gathered} \text { Fisheries } \\ \text { All } \\ \text { Nth/Cent } \end{gathered}$ | Ceilings-----WCVI <br> Total |  | Other Canada Net | Other Canada Sport | Other U.S. Troll | Other U.S. Net | Other U.S. Sport |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  |  |  |  |  |  |  |
|  |  |  | Troll | Geo St |  |  |  |  |  |
| 81 | 17.8\% | 16.3\% | 15.1\% | 0.0\% | 2.2\% | 0.0\% | 5.4\% | 8.6\% | 34.7\% |
| 82 | 15.6\% | 9.3\% | 18.3\% | 0.7\% | 1.2\% | 0.0\% | 8.8\% | 10.1\% | 35.9\% |
| 86 | 10.1\% | 8.4\% | 12.4\% | 0.0\% | 0.0\% | 3.9\% | 5.3\% | 41.6\% | 18.4\% |
| 87 | 7.4\% | 10.9\% | 15.2\% | 0.0\% | 0.0\% | 0.3\% | 4.6\% | 39.6\% | 21.9\% |
| 88 | 7.6\% | 6.8\% | 16.5\% | 0.0\% | 0.0\% | 0.0\% | 8.0\% | 37.4\% | 23.7\% |
| 89 | 8.0\% | 15.8\% | 10.2\% | 0.0\% | 0.5\% | 1.0\% | 12.0\% | 43.7\% | 8.9\% |
| Avg | 11.1\% | 11.3\% | 14.6\% | 0.1\% | 0.6\% | 0.9\% | 7.3\% | 30.2\% | 23.9\% |

## Stock: Wells Hatchery Summer/Fall

Reported Catch Only

| Catch | -------Fisheries with Ceilings----- |  |  |  | Other Canada | Other Canada | Other U.S. | OtherU.S. | Other |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | All | All | WCVI | Total |  |  |  |  | U.S. |
| Year | Alaska | Nth/Cent | Troll | Geo St | Net | Sport | Troll | Net | Sport |
| 87 | 8.3\% | 18.6\% | 7.6\% | 0.0\% | 0.0\% | 0.0\% | 7.9\% | 56.5\% | 1.1\% |
| 88 | 12.1\% | 19.5\% | 12.6\% | 0.0\% | 0.0\% | 0.0\% | 0.0\% | 55.8\% | 0.0\% |
| 89 | 16.6\% | 19.3\% | 12.3\% | 0.0\% | 0.0\% | 0.0\% | 4.9\% | 44.4\% | 2.5\% |
| Avg(87-89) | 12.4\% | 19.1\% | 10.9\% | 0.0\% | 0.0\% | 0.0\% | 4.3\% | 52.2\% | 1.2\% |

Total Mortalities

| Catch | -------Fisheries with Ceilings----- |  |  |  | Other Canada Net | Other Canada Sport | Other U.S. Troll | Other U.S. Net | Other U.S. <br> Sport |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | All | All | WCVI | Total |  |  |  |  |  |
| Year | Alaska | Nth/Cent | Troll | Geo St |  |  |  |  |  |
| 87 | 11.6\% | 20.0\% | 9.2\% | 0.0\% | 0.0\% | 0.0\% | 7.3\% | 51.0\% | 1.0\% |
| 88 | 14.3\% | 21.3\% | 13.8\% | 0.0\% | 0.0\% | 0.0\% | 0.0\% | 50.6\% | 0.0\% |
| 89 | 21.6\% | 18.3\% | 11.7\% | 0.0\% | 0.0\% | 0.0\% | 4.6\% | 41.5\% | 2.3\% |
| Avg (87-89) | 15.8\% | 19.8\% | 11.6\% | 0.0\% | 0.0\% | 0.0\% | 4.0\% | 47.7\% | 1.1\% |

## Stock: Willamette Spring

Reported Catch Only

| Catch Year | All Alaska | isheries All Nth/Cent | with Ceilin WCVI Troll | $\begin{aligned} & \text { Total } \\ & \text { Geo St } \end{aligned}$ | Other Canada Net | Other Canada Sport | $\begin{aligned} & \text { Other } \\ & \text { U.S. } \\ & \text { Troll } \end{aligned}$ | $\begin{aligned} & \text { Other } \\ & \text { U.S. } \\ & \text { Net } \end{aligned}$ | Other U.S. Sport |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 80 | 19.4\% | 39.4\% | 10.9\% | 1.3\% | 0.0\% | 0.0\% | 2.1\% | 0.1\% | 26.8\% |
| 81 | 17.0\% | 36.7\% | 5.9\% | 0.1\% | 0.0\% | 0.0\% | 1.7\% | 6.6\% | 32.0\% |
| 82 | 12.5\% | 11.1\% | 8.9\% | 0.0\% | 0.0\% | 0.0\% | 1.7\% | 10.0\% | 55.8\% |
| 83 | 8.5\% | 3.2\% | 0.7\% | 0.2\% | 0.0\% | 0.0\% | 2.2\% | 26.6\% | 58.6\% |
| 84 | 4.8\% | 3.9\% | 2.6\% | 0.1\% | 0.2\% | 0.0\% | 1.6\% | 31.7\% | 55.1\% |
| 85 | 19.0\% | 3.4\% | 2.0\% | 0.3\% | 0.0\% | 0.0\% | 1.0\% | 23.1\% | 51.1\% |
| 86 | 2.8\% | 16.8\% | 6.5\% | 0.0\% | 0.0\% | 0.7\% | 0.5\% | 35.7\% | 37.0\% |
| 87 | 12.3\% | 57.3\% | 3.5\% | 0.0\% | 0.0\% | 0.0\% | 2.0\% | 3.8\% | 21.1\% |
| 88 | 14.5\% | 14.4\% | 5.6\% | 0.0\% | 0.0\% | 0.0\% | 3.2\% | 5.9\% | 56.4\% |
| 89 | 6.7\% | 4.6\% | 2.5\% | 0.1\% | 0.2\% | 0.2\% | 1.5\% | 26.5\% | 57.8\% |
| Avg | 11.7\% | 19.1\% | 4.9\% | 0.2\% | 0.0\% | 0.1\% | 1.8\% | 17.0\% | 45.2\% |

Total Mortalities

| Catch Year | All <br> Alaska | Fisheries All <br> Nth/Cent | with Ceilings------ |  | Other Canada Net | Other Canada Sport | $\begin{aligned} & \text { Other } \\ & \text { U.S. } \\ & \text { Troll } \end{aligned}$ | $\begin{aligned} & \text { Other } \\ & \text { U.S. } \\ & \text { Net } \end{aligned}$ | $\begin{aligned} & \text { Other } \\ & \text { U.s. } \\ & \text { Sport } \end{aligned}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  |  |  |  |  |  |  |
|  |  |  | Troll | Geo St |  |  |  |  |  |
| 80 | 21.5\% | 39.2\% | 9.7\% | 0.9\% | 0.0\% | 0.0\% | 2.2\% | 0.5\% | 26.0\% |
| 81 | 18.0\% | 36.4\% | 5.6\% | 0.0\% | 0.0\% | 0.0\% | 1.6\% | 5.4\% | 32.9\% |
| 82 | 15.1\% | 10.9\% | 8.2\% | 0.0\% | 0.0\% | 0.0\% | 1.6\% | 8.4\% | 55.9\% |
| 83 | 10.1\% | 3.5\% | 0.7\% | 0.2\% | 0.0\% | 0.0\% | 2.3\% | 24.8\% | 58.4\% |
| 84 | 6.2\% | 4.7\% | 3.0\% | 0.1\% | 0.3\% | 0.0\% | 1.7\% | 29.4\% | 54.6\% |
| 85 | 25.2\% | 3.1\% | 1.9\% | 0.3\% | 0.0\% | 0.0\% | 1.0\% | 19.2\% | 49.3\% |
| 86 | 4.2\% | 24.0\% | 7.3\% | 0.0\% | 0.0\% | 0.8\% | 0.6\% | 31.0\% | 32.2\% |
| 87 | 43.0\% | 30.6\% | 6.1\% | 0.0\% | 0.0\% | 0.0\% | 5.2\% | 1.8\% | 13.3\% |
| 88 | 20.2\% | 14.1\% | 5.2\% | 0.0\% | 0.0\% | 0.0\% | 2.6\% | 5.8\% | 52.0\% |
| 89 | 9.6\% | 5.7\% | 2.8\% | 0.2\% | 0.3\% | 0.2\% | 1.6\% | 23.2\% | 56.5\% |
| Avg | 17.3\% | 17.2\% | 5.0\% | 0.2\% | 0.1\% | 0.1\% | 2.0\% | 15.0\% | 43.1\% |


[^0]:    a/ Individuals primarily responsible for completion of Chapter 3, Exploitation Rate Analysis
    b/ Individuals primarily responsible for completion of Chapter 2, Escapement Assessment

[^1]:    2 Starr, P. J. and N. D. Schubert. 1990. Assessment of Harrison River chinook salmon. Can. MS Rep. Fish. Aquat. Sci. 2085:49p.

[^2]:    Stock Identifiers
    AKS = ALASKA SPRING

[^3]:    Stock Identifiers
    BQR = BIG QUALICUM
    QUI $=$ QUINSAM
    SAM = SAMISH FALL FING SPS $=$ SO SOUND FALL YEAR UWA $=U$ OF W FALL ACCEL

[^4]:    Stock Identifiers
    $B Q R=B I G Q U A L I C U M$
    QUI $=$ QUINSAM
    SAM = SAMISH FALL FING
    SPS = SO SOUND FALL YEAR
    UWA $=U$ OF W FALL ACCEL

[^5]:    Stock Identifiers

[^6]:    TOTAL MORTALITY

    * NOTE BASE PERIOD USED IS 83-84

[^7]:    Fisheries represented in ALLCE] 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 CAN/NO WCVN JDFN JSN FRN WCVS

[^8]:    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 CAN/NO WCVN JDFN JSN FRN WCVS

[^9]:    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 CAN/NO WCVN JDFN JSN FRN WCVS

[^10]:    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 CAN/NO WCVN JDFN JSN FRN WCVS

[^11]:    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 CAN/NO WCVN JDFN JSN FRN WCVS

[^12]:    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 CAN/NO WCVN JDFN JSN FRN WCVS

