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# Mixed Stock Analysis of Sublegal Chinook Salmon Encountered In The Southeast Alaska Troll Fishery, 1998-2003

**by**

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**Alaska Department of Fish and Game** **Divisions of Sport Fish and Commercial Fisheries**

## Symbols and Abbreviations

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**Weights and measures (metric)**

| | |
|---|---|
| centimeter | cm |
| deciliter | dL |
| gram | g |
| hectare | ha |
| kilogram | kg |
| kilometer | km |
| liter | L |
| meter | m |
| milliliter | mL |
| millimeter | mm |

**Weights and measures (English)**

| | |
|---|---|
| cubic feet per second | $ft^3/s$ |
| foot | ft |
| gallon | gal |
| inch | in |
| mile | mi |
| nautical mile | nmi |
| ounce | oz |
| pound | lb |
| quart | qt |
| yard | yd |

**Time and temperature**

| | |
|---|---|
| day | d |
| degrees Celsius | °C |
| degrees Fahrenheit | °F |
| degrees kelvin | K |
| hour | h |
| minute | min |
| second | s |

**Physics and chemistry**

| | |
|---|---|
| all atomic symbols | |
| alternating current | AC |
| ampere | A |
| calorie | cal |
| direct current | DC |
| hertz | Hz |
| horsepower | hp |
| hydrogen ion activity (negative log of) | pH |
| parts per million | ppm |
| parts per thousand | ppt, ‰ |
| volts | V |
| watts | W |

**General**

| | |
|---|---|
| Alaska Administrative Code | AAC |
| all commonly accepted abbreviations | e.g., Mr., Mrs., AM, PM, etc. |
| all commonly accepted professional titles | e.g., Dr., Ph.D., R.N., etc. |
| at | @ |
| compass directions: | |
| east | E |
| north | N |
| south | S |
| west | W |
| copyright | © |
| corporate suffixes: | |
| Company | Co. |
| Corporation | Corp. |
| Incorporated | Inc. |
| Limited | Ltd. |
| District of Columbia | D.C. |
| et alii (and others) | et al. |
| et cetera (and so forth) | etc. |
| exempli gratia (for example) | e.g. |
| Federal Information Code | FIC |
| id est (that is) | i.e. |
| latitude or longitude | lat. or long. |
| monetary symbols (U.S.) | $, ¢ |
| months (tables and figures): first three letters | Jan,...,Dec |
| registered trademark | ® |
| trademark | ™ |
| United States (adjective) | U.S. |
| United States of America (noun) | USA |
| U.S.C. | United States Code |
| U.S. state | use two-letter abbreviations (e.g., AK, WA) |

**Measures (fisheries)**

| | |
|---|---|
| fork length | FL |
| mideye-to-fork | MEF |
| mideye-to-tail-fork | METF |
| standard length | SL |
| total length | TL |

**Mathematics, statistics**

| | |
|---|---|
| *all standard mathematical signs, symbols and abbreviations* | |
| alternate hypothesis | $H_A$ |
| base of natural logarithm | *e* |
| catch per unit effort | CPUE |
| coefficient of variation | CV |
| common test statistics | (F, t, $\chi^2$, etc.) |
| confidence interval | CI |
| correlation coefficient (multiple) | R |
| correlation coefficient (simple) | r |
| covariance | cov |
| degree (angular ) | ° |
| degrees of freedom | df |
| expected value | *E* |
| greater than | > |
| greater than or equal to | ≥ |
| harvest per unit effort | HPUE |
| less than | < |
| less than or equal to | ≤ |
| logarithm (natural) | ln |
| logarithm (base 10) | log |
| logarithm (specify base) | $log_{2,}$ etc. |
| minute (angular) | ' |
| not significant | NS |
| null hypothesis | $H_O$ |
| percent | % |
| probability | P |
| probability of a type I error (rejection of the null hypothesis when true) | α |
| probability of a type II error (acceptance of the null hypothesis when false) | β |
| second (angular) | " |
| standard deviation | SD |
| standard error | SE |
| variance | |
| population | Var |
| sample | var |

*FISHERY DATA SERIES NO. 12-32*

# MIXED STOCK ANALYSIS OF SUBLEGAL CHINOOK SALMON ENCOUNTERED IN THE SOUTHEAST ALASKA TROLL FISHERY, 1998-2003

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# ABSTRACT

Commercial troll fisheries in Southeast Alaska harvest Chinook salmon originating from Alaska, British Columbia, and the Pacific Northwest. Only individuals larger than 711 mm may be retained; smaller individuals must be released. Encounters with sublegal-sized Chinook are not recorded and the subsequent mortality is unknown. Beginning in 1998, studies were conducted to estimate the rate at which sublegal-sized Chinook salmon are incidentally caught by this fishery. As part of these studies tissue samples were taken from sublegal-sized individuals for mixed stock analyses using genetic information. The estimation of stock composition of the samples taken during the 1998–2003 summer troll fisheries is described in this report. The Upper Columbia River(Summer, Fall)/Snake River (Fall), Southern Southeast Alaska, and Strait of Georgia were consistently the largest contributors to the annual sublegal incidental encounters. Results indicate considerable variation in the composition of sublegal-sized individuals encountered by troll fishers within years, but consistent patterns of composition by major groups across years.



Key words: Chinook salmon, Southeast Alaska, troll fishery, genetic mixed stock analysis, allozyme, sublegal


# INTRODUCTION

The Southeast Alaska commercial troll fishery harvests mixed stocks of Chinook salmon, including salmon originating from Alaska, British Columbia, and the Pacific Northwest and is therefore under the jurisdiction of the Pacific Salmon Treaty. The treaty provides for cooperative management and research on fisheries harvesting Chinook salmon from populations in Canada and the United States. The Pacific Salmon Treaty annexes and related agreements provide for the management of the troll fishery under a quota specified by the Pacific Salmon Commission. This quota depends on the projected abundance of Chinook salmon forecasted by the Chinook Technical Committee of the Pacific Salmon Commission using the Chinook salmon model (CTC 2001; Lynch and Skannes 2001). Projected abundances rely on estimates of total mortality, which is calculated from both landed mortality and incidental mortality (salmon released but die as result of encountering fishing gear). While landed mortality can be estimated by direct observation of harvested salmon, incidental mortality must be obtained by estimating the number of Chinook salmon released and their postrelease mortality rate. In 1998 the Alaska Department of Fish and Game (ADF&G) initiated a study to estimate the encounter rates for Chinook salmon in Southeast Alaska troll fisheries (Bloomquist et al. 1999). These results have been used to update estimates of incidental mortality, which previously relied on data collected from 1985 to 1998.

In the troll fishery, Chinook salmon larger than 711 mm (28 inches) may be kept and sold during periods when retention is allowed, while smaller Chinook salmon are released. During Chinook nonretention periods, both legal-sized and nonlegal sized (sublegal) Chinook must be released. As part of studies to estimate incidental mortality, tissues were sampled from sublegal-sized Chinook salmon for the purpose of estimating stock composition (e.g. Bloomquist et al. 1999, Stopha et al. 2000, Bloomquist and Carlile 2002).

Mixed stock analysis (MSA) uses the genetic stock structure of a species (baseline) to estimate the contribution of each stock to a mixture given the frequency of genetic marks in the baseline populations and the genotypes in the mixture. Between 1999 and 2003, ADF&G used MSA based on a coastwide allozyme database (Teel et al. 1999) to estimate the composition of the commercial troll fishery harvest (Crane et al. 2000; Templin et al. 2011) from 28 reporting regions (Table 1; Appendix A). At the same time, samples were collected from sublegal-sized Chinook salmon encountered in the summer troll fishery, providing important information for evaluating assumptions of stock-specific survival rates. It has been assumed for management purposes that sublegal stock compositions were similar to those of legal-sized fish, however, initial estimates demonstrated that the stock composition of the sublegal and legal encounters were different (Bloomquist and Carlile 2002).

Here we present estimates of the stock composition of samples taken from sublegal-sized Chinook salmon encountered during the summer troll fisheries in Southeast Alaska from 1998 to 2003. These samples were collected as part of a series of studies designed to provide direct measures of encounter rates for the Chinook Technical Committee Chinook cohort analysis model (e.g. Bloomquist et al. 1999, Stopha et al. 2000, Bloomquist and Carlile 2002). Results for 1998 and 1999 have previously been reported (Crane et al. 2000, Crane et al. 2001), but are included here to provide a comprehensive set of estimates for 1998 to 2003.

# OBJECTIVES

The goal of the stock identification effort reported here was to estimate the stock composition of sublegal-sized Chinook salmon encountered in the Southeast Alaska commercial troll fisheries during accounting years 1998 to 2003. To accomplish this task, the following objectives were to be met:

1. Assay Chinook salmon sampled from encounters the Southeast Alaska troll fishery for individual genotypes at 26 allozyme loci in the coastwide baseline.
2. Estimate the relative contribution of each stock group to samples from the 1998 to 2003 summer troll fisheries.

# METHODS

## FISHERY SAMPLING

The tissue samples used for this analysis were taken from sublegal-sized Chinook salmon (less than 711 mm in total length) encountered in the Southeast Alaska summer troll fishery (Figure 1). Eye, muscle, and fin tissue were dissected from sampled Chinook salmon and placed in 2 ml cryovials on wet ice. Target sample sizes were set for each fishing period and port to estimate the stock composition of the incidental harvest at acceptable levels of accuracy and precision given the potential availability of samples. Thompson (1987) demonstrated that under a worst-case scenario with no prior information, multinomial proportions could be estimated to within 5% of the true value 90% of the time with a sample size of approximately 400. Under the same assumptions, multinomial proportions can be estimated to within 7% of the true value 90% of the time with a sample size of approximately 200.

During the 1998–2000 seasons, onboard observers collected MSA samples for sublegal-size Chinook salmon encountered in the fishery, during which time there were not port-specific sampling goals (Bloomquist et al. 1999, Stopha et al. 2000, Bloomquist and Carlile 2001). Actual samples sizes were not available for AY 1999 and 2000. During the 2001–2003 seasons, a subset of troll logbook program participants retained sublegal-size Chinook salmon for the purpose of continuing sublegal Chinook MSA sampling (Bloomquist and Carlile 2002). At the end of the season, samples were shipped to the ADF&G Gene Conservation Laboratory in Anchorage for analysis. Overall sampling goals and sampling goals per port are listed in Table 2.

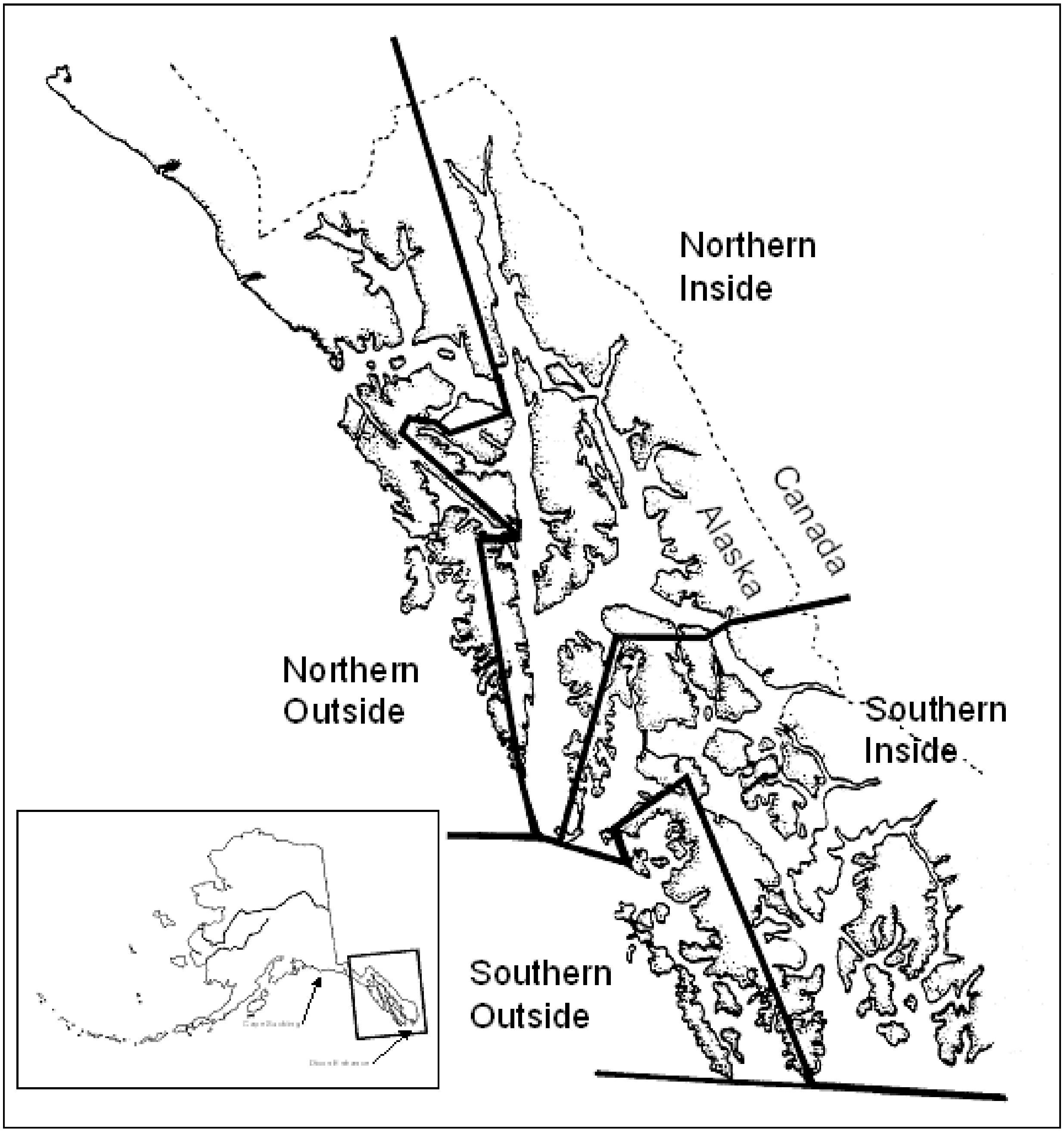


**Figure 1.–**Location of Southeast Alaska troll fishing quadrants.

## LABORATORY ANALYSIS

Tissue samples were assayed for genetic variation at the following allozyme loci: _mAAT-1*_; _sAAT-1,2*; sAAT-3*; sAH*; GPI-A*; GPI-B2*; GPI-B2a*; GPIr*; mIDHP-2*; sIDHP-1*; sIDHP-2*; LDH-B2*; LDH-C*; mMDH-2*; sMDH-A1,2*; sMDH-B1,2*; sMEP-1*; sMEP-2*; MPI*; PEPA*; PEPB-1*; PGDH*; PGK-2*; sSOD-1*; TPI-3*;_ and _TPI-4*_. Laboratory analyses followed Crane et al. (1996) using the general protocols outlined in Harris and Hopkinson (1976), May et al. (1979), Aebersold et al. (1987) and Van Doornik et al. (1999). Genotypes were scored from observed phenotypes according to coastwide accepted standards presented in Teel et al. (1999).

### STOCK COMPOSITION ANALYSIS

The estimated composition of Chinook salmon from each of the 28 reporting regions (Table 1; see Teel et al. [1999] for description of groups) in each sample were estimated first by calculating individual estimates for each of the 252 populations and next summing these estimates across reporting regions (Appendix A). These composition estimates were made using the maximum likelihood methods implemented in SPAM version 3.6 (Debevec et al. 2000). Ninety percent confidence intervals for all regional contribution estimates were computed from 1000 parametric bootstrap resamples of the baseline frequencies matched with nonparametric resamples of the mixture genotypes. For each resample, contribution estimates were generated for all populations and summed to the regional level. The 1000 estimates for a region were then sorted from lowest to highest with the $51^{st}$ and $950^{th}$ values in the sequence taken respectively as the lower and upper bounds of the 90% confidence interval for that region.

Genotypes were removed from the estimation procedure if their probability of occurring was near zero ($P < 1.0\times10^{-45}$). For these cases, the mixture estimates have an “unknown” group containing the portion of the mixture that is removed for this reason. Further, individuals missing data at five or more loci were not included in the analysis. Sample sizes were calculated to reflect the exclusion of individuals.

## RESULTS

### FISHERY SAMPLING

Sublegal-size Chinook salmon were sampled via the observer program during the summer troll seasons of 1998–2000 (Bloomquist et al. 1999, Stopha et al. 2000, Bloomquist and Carlile 2001). In 1998, tissue samples were collected from 133 sublegal Chinook salmon (Table 2), with the majority of samples collected during the second and third troll openings. Sample size goals were increased in subsequent years to achieve greater precision surrounding Chinook encounter estimates. In 1999, observers on board troll vessels collected tissue samples from 373 sublegal Chinook salmon, and 300 sublegal Chinook salmon were sampled in 2000.

In 2001, the observer program was discontinued, and Chinook salmon in 2001–2003 were sampled from a subset of participants in the troll logbook program who retained sublegal-size Chinook salmon (e.g. Bloomquist and Carlile 2002). In 2001, 303 sublegal Chinook were sampled, and sample goals for the overall season and for individual ports were not met (Table 2). In 2002, 468 sublegal Chinook were sampled and sample goals were met for some individual ports but not for the overall season. In 2003, 374 sublegal Chinook were sampled and sample goals were met for most ports but not the overall season. The failure to meet sample size goals is likely a reflection of the year to year variability of local availability of sublegal-size Chinook salmon.

All samples taken from sublegal Chinook salmon were assayed in the laboratory for multilocus genotypes. In some cases, genotypes could not be resolved. Individuals missing genotypes at more than four loci were removed from the analysis and the sample size used to estimate stock composition was reduced accordingly.

## STOCK COMPOSITION ANALYSIS

### 1998

Based on the genetic mixed stock analysis estimates, the largest contributors to sublegal samples during the AY 1998 troll fishery were the Upper Columbia River (Summer/Fall)/Snake River (Fall) (22%), followed by Strait of Georgia (14%) and Southern Southeast Alaska (13%) reporting groups (Table 3). The following reporting groups comprised much of the remainder of the samples: Thompson River (7%), Washington Coastal (7%), Alaska/British Columbia Transboundary (6%), and Mid- and North Oregon Coastal (5%).

### 1999

The largest contributor to sublegal samples collected during the AY 1999 troll fisheries were the Southern Southeast Alaska (22%), Upper Columbia River (Summer/Fall)/Snake River (Fall) (18%), Strait of Georgia (14%), and Central British Columbia Coastal (11%) reporting groups (Table 3). Much of the remainder of the samples were comprised of the Puget Sound (6%), Lower Columbia Spring (Spring/Fall) (5%), West Coast Vancouver Island (5%), and Mid- and North Oregon Coastal (5%) reporting groups.

### 2000

The largest contributors to sublegal samples during AY 2000 were the Puget Sound (15%) and Upper Columbia River (Summer/Fall)/Snake River (Fall) (15%) reporting groups, followed by the Strait of Georgia (11%), Southern Southeast Alaska (10%), Skeena (10%), and West Coast Vancouver Island (10%) stock groups (Table 3). The remainder of the samples were comprised primarily of the Lower Columbia (Spring/Fall) (7%) and Mid- and North Oregon Coastal (6%) reporting groups.

### 2001

The Upper Columbia River (Summer/Fall)/Snake River (Fall) reporting group was the largest contributor (21%) to the AY 2001 troll fishery sublegal catches, followed by the Puget Sound (16%), Southern Southeast Alaska (12%), and Willamette (11%) reporting groups (Table 3). Much of the remainder of the samples were comprised of the Lower Columbia (Spring/Fall) (8%) and Thompson River (6%) reporting groups.

### 2002

The largest contributor to the AY 2002 fishery sublegal samples was the Upper Columbia River (Summer/Fall)/Snake River (Fall) reporting group (26%), followed by the Central British Columbia Coastal (15%), Strait of Georgia (13%), and Southern Southeast Alaska (11%) reporting groups (Table 3). Much of the remainder of the samples was comprised of the Mid- and North Oregon Coastal (8%) and Puget Sound (5%) reporting groups.

### 2003

The Southern Southeast Alaska (15%) and West Coast Vancouver Island (14%) reporting groups were the largest contributors to sublegal samples from the AY 2003 troll fishery (Table 3). The remainder of the samples were comprised primarily of fish from the Puget Sound (13%), Upper Columbia River (Summer/Fall)/Snake River (Fall) (12%), Strait of Georgia (11%), Thompson River (10%), and Willamette River (6%) reporting groups.

# DISCUSSION

MSA based on the allozyme baseline for Chinook salmon was used to estimate the stock composition of sublegal samples from troll fishery harvests in Southeast Alaska from AY 1998 through AY 2003. The estimates varied between years, but indicate that the consistently large contributors to the annual sublegal incidental encounters were the Upper Upper Columbia River (Summer/Fall)/Snake River (Fall), Strait of Georgia, and Southern Southeast Alaska reporting groups (36–54% combined in all years). Other important contributors were the Puget Sound, Central British Columbia Coast, Thompson River, Mid- and North Oregon Coastal, Lower Columbia (Spring), and West Coast Vancouver Island stock groups (23–47% combined in all years). When each year was considered separately, the composition was more variable, but these stock groups remained important contributors.

When reporting groups were combined by geographic area, Washington/Oregon/California stocks consistently were the largest contributors to the sublegal samples (36–65% over all years). Of these, Columbia River stocks typically were the largest contributors (12–27%) followed by Washington Coastal and Puget Sound stocks (5–19% combined). British Columbia stocks were also important contributors (17–41% over all years) followed by Alaskan stocks (11–25% over all years). Alaska/British Columbia Transboundary stocks comprised 0–6% of stock compositions. The stock composition of the sublegal catch is different than the legal catch, with Southern Southeast Alaska, Puget Sound, and the Strait of Georgia contributing more to the sublegal catch, and the Mid- and North Oregon Coastal, Washington Coastal and Thompson River contributing more to the summer legal catch (Templin et al. 2011).

These results demonstrate the successful application of genetic MSA to estimate the stock composition of the sublegal Chinook salmon encountered in the Southeast Alaska troll fisheries. Comparison of these results with estimates based on coded-wire tags and the PSC Chinook model will require additional analysis, but already information is available on the harvest of stocks of Chinook salmon that were not observable under previous methods.

# CONCLUSIONS

1. The major stocks present in samples from sublegal-sized Chinook salmon encountered in the Southeast Alaska summer troll fisheries on an annual basis were the Upper Columbia River (Summer/Fall)/Snake River (Fall), Strait of Georgia, and Southern Southeast Alaska reporting groups. Other important contributors were the Puget Sound, Central British Columbia Coast, Thompson River, Mid and North Oregon Coastal, Lower Columbia (Spring), and West Coast Vancouver Island stock groups.
2. When reporting groups were combined by geographic area, Washington/Oregon/California stocks consistently were the largest contributors to the sublegal samples. Of these, the largest year-to-year contributors were typically Columbia River stocks.

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# TABLES

**Table 1.–**Broad-scale reporting regions for the Chinook salmon coastwide baseline (Teel et al. 1999) used to report stock composition of Southeast Alaska troll fishery harvests. The Russian populations were not included in the analysis.

| | Reporting regions | Population numbers |
|---|---|---|
| 1 | Central Valley | 1-6 |
| 2 | California, Southern Oregon Coastal | 7-16, 23-31 |
| 3 | Klamath River Basin | 17-22 |
| 4 | Mid/North Oregon Coastal | 32-49 |
| 5 | Lower Columbia River | 50-55, 63,64 |
| 6 | Willamette River | 56-62 |
| 7 | Mid/Upper Columbia River (Spring), Snake River (Spring/Summer) | 65-79, 94-109 |
| 8 | Upper Columbia River (Summer/Fall) and Snake River (Fall) | 80-93 |
| 9 | Washington Coastal | 110-120 |
| 10 | Puget Sound | 121-143 |
| 11 | Lower Fraser River | 144,145 |
| 12 | Thompson River | 146-159 |
| 13 | Mid/Upper Fraser River | 160-175 |
| 14 | Strait of Georgia | 176-183 |
| 15 | West Vancouver Island | 184-186 |
| 16 | Central British Columbia Coastal | 187-189 |
| 17 | Skeena River | 190-197 |
| 18 | Nass River | 198,199 |
| 19 | Alaska/British Columbia Transboundary | 200,207, 210-215 |
| 20 | Southern Southeast Alaska | 201-206, 208, 220-227 |
| 21 | King Salmon River | 209, 228 |
| 22 | Chilkat River | 216, 217, 229 |
| 23 | Gulf of Alaska | 218, 219, 230-233 |
| 24 | Susitna River | 234-237 |
| 25 | Kodiak Island | 238,239 |
| 26 | Alaska Peninsula | 240, 241 |
| 27 | Western Alaska | 242-250, 252 |
| 28 | Canadian Yukon | 251 |
| 29 | Russia | 253, 254 |

*Note*: Population numbers are listed in Appendix A.

**Table 2.–**Number of sublegal-sized Chinook salmon encountered by troll gear in Southeast Alaska, 1998-2003. Accounting years begin October 1 of the previous year through September 30 of the indicated year.

| | Accounting Year | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1998[a] | | 1999[a] | | 2000[a] | | 2001 | | 2002 | | 2003 | |
| Port | Goal | Actual | Goal | Actual | Goal | Actual | Goal | Actual | Goal | Actual | Goal | Actual |
| Yakutat | | | | | | | 30 | 27 | 30 | 43 | 30 | 52 |
| Pelican | | | | | | | 30 | 24 | 30 | 60 | 30 | 86 |
| Hoonah | | | | | | | 30 | 12 | 30 | 30 | 30 | 36 |
| Juneau | | 48 | | | | | | | | | | |
| Sitka | | 56 | | | | | 300 | 199 | 300 | 273 | 300 | 93 |
| Petersburg | | | | | | | 30 | 17 | 30 | 8 | 30 | 7 |
| Craig | | 22 | | | | | 40 | 4 | 40 | 27 | 40 | 45 |
| Ketchikan | | 7 | | | | | 30 | 20 | 30 | 27 | 30 | 55 |
| Total | | 133 | | 374 | | 300 | 490 | 303 | 490 | 468 | 490 | 374 |

[a]Port-specific sample size goals were not present in AY 1998-2000, and actual sample sizes by port were not available for AY 1999-2000.

**Table 3.–**Estimated contribution of 28 stock groups of Chinook salmon to summer troll fishery harvests in Southeast Alaska, 1998-2003.

| | | 1998 | | 1999 | | 2000 | | 2001 | | 2002 | | 2003 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | N = 122 | | N = 374 | | N = 277 | | N = 297 | | N = 447 | | N = 363 | |
| | Region | Est | 90% CI | Est | 90% CI | Est | 90% CI | Est | 90% CI | Est | 90% CI | Est | 90% CI |
| 1 | Central Valley (Sp/F/W) | 0.025 | (0.000-0.072) | 0.000 | (0.000-0.009) | 0.000 | (0.000-0.031) | 0.000 | (0.000-0.024) | 0.002 | (0.000-0.026) | 0.000 | (0.000-0.000) |
| 2 | California, S. Oregon Coastal | 0.000 | (0.000-0.008) | 0.001 | (0.000-0.032) | 0.000 | (0.000-0.057) | 0.025 | (0.000-0.074) | 0.039 | (0.007-0.076) | 0.016 | (0.000-0.063) |
| 3 | Klamath River Basin (Sp/ F) | 0.000 | (0.000-0.001) | 0.000 | (0.000-0.000) | 0.004 | (0.000-0.025) | 0.000 | (0.000-0.026) | 0.039 | (0.006-0.064) | 0.034 | (0.006-0.064) |
| 4 | Mid/N Oregon Coastal | 0.052 | (0.001-0.140) | 0.048 | (0.015-0.078) | 0.056 | (0.014-0.101) | 0.038 | (0.011-0.101) | 0.082 | (0.027-0.127) | 0.041 | (0.015-0.071) |
| 5 | Lower Columbia River (Sp/F) | 0.041 | (0.000-0.136) | 0.052 | (0.016-0.102) | 0.074 | (0.005-0.105) | 0.080 | (0.020-0.148) | 0.014 | (0.000-0.062) | 0.019 | (0.000-0.085) |
| 6 | Willamette River | 0.033 | (0.000-0.068) | 0.012 | (0.000-0.029) | 0.012 | (0.000-0.050) | 0.111 | (0.056-0.149) | 0.032 | (0.012-0.061) | 0.059 | (0.020-0.092) |
| 7 | Mid/Up Columbia, Snake R. (Sp) | 0.000 | (0.000-0.015) | 0.000 | (0.000-0.022) | 0.020 | (0.002-0.039) | 0.019 | (0.000-0.058) | 0.012 | (0.002-0.031) | 0.000 | (0.000-0.010) |
| 8 | Up Columbia (Su/F), Snake R. (F) | 0.216 | (0.116-0.328) | 0.180 | (0.111-0.230) | 0.145 | (0.079-0.223) | 0.209 | (0.125-0.276) | 0.261 | (0.176-0.305) | 0.122 | (0.067-0.176) |
| 9 | Washington Coastal | 0.065 | (0.000-0.156) | 0.012 | (0.000-0.036) | 0.040 | (0.000-0.084) | 0.007 | (0.000-0.066) | 0.005 | (0.000-0.074) | 0.000 | (0.000-0.029) |
| 10 | Puget Sound | 0.037 | (0.000-0.153) | 0.057 | (0.024-0.118) | 0.146 | (0.063-0.223) | 0.158 | (0.062-0.203) | 0.048 | (0.021-0.114) | 0.125 | (0.056-0.196) |
| 11 | Lower Fraser River | 0.000 | (0.000-0.050) | 0.005 | (0.000-0.017) | 0.017 | (0.000-0.047) | 0.000 | (0.000-0.000) | 0.000 | (0.000-0.000) | 0.000 | (0.000-0.016) |
| 12 | Thompson River | 0.067 | (0.012-0.150) | 0.015 | (0.000-0.072) | 0.017 | (0.000-0.064) | 0.056 | (0.020-0.107) | 0.039 | (0.003-0.083) | 0.100 | (0.037-0.139) |
| 13 | Mid/Upper Fraser River | 0.000 | (0.000-0.039) | 0.006 | (0.000-0.022) | 0.008 | (0.000-0.047) | 0.000 | (0.000-0.035) | 0.003 | (0.000-0.033) | 0.000 | (0.000-0.022) |
| 14 | Strait of Georgia | 0.143 | (0.063-0.239) | 0.143 | (0.076-0.195) | 0.107 | (0.057-0.189) | 0.045 | (0.005-0.113) | 0.125 | (0.073-0.163) | 0.105 | (0.054-0.188) |
| 15 | West Vancouver Island | 0.014 | (0.000-0.080) | 0.051 | (0.000-0.110) | 0.097 | (0.007-0.168) | 0.044 | (0.000-0.117) | 0.000 | (0.000-0.067) | 0.142 | (0.012-0.213) |
| 16 | Central British Columbia Coastal | 0.016 | (0.000-0.068) | 0.109 | (0.002-0.175) | 0.005 | (0.000-0.093) | 0.018 | (0.000-0.076) | 0.145 | (0.047-0.177) | 0.040 | (0.017-0.102) |
| 17 | Skeena River | 0.011 | (0.000-0.110) | 0.023 | (0.000-0.070) | 0.103 | (0.005-0.137) | 0.013 | (0.000-0.056) | 0.025 | (0.000-0.074) | 0.009 | (0.000-0.053) |
| 18 | Nass River | 0.033 | (0.000-0.087) | 0.005 | (0.000-0.045) | 0.011 | (0.000-0.051) | 0.000 | (0.000-0.012) | 0.000 | (0.000-0.031) | 0.018 | (0.000-0.036) |
| 19 | Alaska/B.C. Transboundary | 0.059 | (0.000-0.098) | 0.043 | (0.003-0.093) | 0.018 | (0.000-0.062) | 0.000 | (0.000-0.030) | 0.000 | (0.000-0.031) | 0.006 | (0.000-0.059) |
| 20 | Southern Southeast Alaska | 0.133 | (0.038-0.245) | 0.220 | (0.111-0.287) | 0.103 | (0.033-0.179) | 0.119 | (0.037-0.157) | 0.112 | (0.049-0.184) | 0.146 | (0.054-0.185) |
| 21 | King Salmon River | 0.020 | (0.000-0.062) | 0.000 | (0.000-0.015) | 0.007 | (0.000-0.029) | 0.010 | (0.000-0.021) | 0.000 | (0.000-0.002) | 0.004 | (0.000-0.011) |
| 22 | Chilkat River | 0.000 | (0.000-0.000) | 0.012 | (0.000-0.041) | 0.000 | (0.000-0.000) | 0.032 | (0.001-0.056) | 0.014 | (0.000-0.036) | 0.001 | (0.000-0.028) |
| 23 | Gulf of Alaska | 0.022 | (0.000-0.073) | 0.000 | (0.000-0.016) | 0.000 | (0.000-0.000) | 0.018 | (0.000-0.035) | 0.000 | (0.000-0.007) | 0.008 | (0.000-0.020) |
| 24-28 | Central and Western Alaska | 0.013 | (0.000-0.000) | 0.007 | (0.000-0.069) | 0.000 | (0.000-0.000) | 0.000 | (0.000-0.030) | 0.004 | (0.000-0.029) | 0.000 | (0.000-0.019) |
| | Unknown | 0.000 | | 0.001 | | 0.011 | | 0.000 | | 0.000 | | 0.006 | |

*Note*: Run timing components are abbreviated as Sp (spring), Su (summer), F (fall), and W (winter).
*Note*: The proportions of genotypes not explained by the baseline are indicated by the "Unknown" category.
*Note*: Sample sizes are indicated (N).

# APPENDIX

**Appendix A–**Location and collection details for each population of Chinook salmon included in the coastwide baseline of allozyme data. Population numbers given correspond to the population numbers referenced in Table 1.

| Geographic Area | Reporting Group | Pop Number | Source | Run Time | Total N | Brood or Return Years | Sample Years | Age |
|---|---|---|---|---|---|---|---|---|
| Sacramento and San Joaquin rivers | Central Valley | 1 | Mokelumne and Nimbus Hatcheries | fall | 350 | 80, 80, 83, 87 | 81, 81, 84, 88 | J, J, J, J |
| | | 2 | Merced Hatchery | fall | 100 | 87 | 88 | J |
| | | 3 | Feather Hatchery | fall | 300 | 80, 83, 87 | 81, 84, 88 | J, J, J |
| | | 4 | Feather Hatchery | spring | 244 | 80, 83, 88 | 81, 84, 88 | J, J, A |
| | | 5 | Coleman Hatchery | fall | 200 | 80, 86 | 81, 87 | J, J |
| | | 6 | Upper Sacramento River | winter | 94 | 86 | 87 | J |
| California Coast | California, Southern Oregon Coastal | 7 | Mattole River | fall | 150 | 83, 86 | 84, 87 | J, J |
| | | 8 | Van Duzen River | fall | 100 | 86 | 87 | J |
| | | 9 | Salmon Creek | fall | 96 | 86 | 87 | J |
| | | 10 | Redwood Creek | fall | 93 | 86 | 87 | J |
| | | 11 | Benbow Creek | fall | 99 | 86 | 87 | J |
| | | 12 | Hollow Tree Creek | fall | 100 | 86 | 87 | J |
| | | 13 | Mid Fork Eel River | fall | 95 | 86 | 87 | J |
| | | 14 | Mad River Hatchery | fall | 149 | 83, 86 | 84, 87 | J, J |
| | | 15 | North Fork Mad River | fall | 61 | 86 | 87 | J |
| | | 16 | Redwood Creek | fall | 195 | 86, 86 | 87, 87 | J, J |
| Klamath River Basin | Klamath River Basin | 17 | Iron Gate Hatchery | fall | 247 | 80, 83, 86 | 81, 84, 87 | J, J, J |
| | | 18 | Trinity Hatchery | fall | 370 | 80, 83, 86, 97 | 81, 84, 87, 98 | J, J, J, J |
| | | 19 | Trinity Hatchery | spring | 250 | 81, 83, 97 | 82, 84, 98 | J, J, J |
| | | 20 | Salmon and Scott Rivers | fall | 198 | 83, 86 | 84, 87 | J, J |
| | | 21 | Shasta River and Bogus Creek | fall | 259 | 83, 86, 86 | 84, 87, 87 | J, J, J |
| | | 22 | South Fork Trinity River | fall | 100 | 86 | 87 | J |
| South Oregon and North California Coasts | California, Southern Oregon Coastal | 23 | Rowdy Creek Hatchery | fall | 112 | 83, 86 | 84, 87 | J, J |
| | | 24 | Mid fork Smith River | fall | 99 | 86 | 87 | J |
| | | 25 | Winchuck Risver | fall | 170 | 84, 94 | 84, 95 | A, J |

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| Geographic Area | Reporting Group | Pop Number | Source | Run Time | Total N | Brood or Return Years | Sample Years | Age |
|---|---|---|---|---|---|---|---|---|
| South Oregon and North California Coasts | California, Southern Oregon Coastal | 26 | Chetco River | fall | 343 | 80, 83, 87, 95 | 81, 84, 88, 96 | J, J, J, J |
| | | 27 | Pistol River | fall | 200 | 83, 94 | 84, 95 | J, J |
| | | 28 | Hunter Creek | fall | 100 | 94 | 95 | J |
| | | 29 | Cole Rivers Hatchery | spring | 263 | 80, 84, 94 | 81, 85, 95 | J, J, J |
| | | 30 | Applegate River | fall | 181 | 83, 87 | 84, 88 | J, J |
| | | 31 | Rogue River at Gold Hill | fall | 100 | 87 | 88 | J |
| Mid and North Oregon Coast | Mid/North Oregon Coastal | 32 | Euchre Creek | fall | 57 | 95 | 96 | J |
| | | 33 | Elk River and Elk River Hatchery | fall | 400 | 80, 84, 87, 94 | 81, 85, 88, 95 | J, J, J, J |
| | | 34 | Sixes River | fall | 268 | 80, 82, 94 | 81, 83, 95 | J, J, J |
| | | 35 | South Fork Coquille River | fall | 100 | 87 | 88 | J |
| | | 36 | Coquille River and Bandon Hatchery | fall | 224 | 80, 82, 94, 95 | 81, 83, 95, 95 | J, J, J, A |
| | | 37 | Millicoma River | fall | 100 | 87 | 88 | J |
| | | 38 | Morgan Creek Hatchery | fall | 100 | 87 | 88 | J |
| | | 39 | Noble Creek Hatchery | fall | 100 | 95 | 95 | A |
| | | 40 | Rock Creek Hatchery | spring | 300 | 80, 84, 94 | 81, 85, 95 | J, J, J |
| | | 41 | Rock Creek Hatchery | fall | 100 | 94 | 95 | J |
| | | 42 | West Fork Smith River (Umpqua Basin) | fall | 80 | 97 | 98 | J |
| | | 43 | Siuslaw River | fall | 160 | 80, 82, 95 | 81, 83, 96 | J, J, J |
| | | 44 | Alsea River | fall | 181 | 80, 82, 95 | 81, 83, 95 | J, J, A |
| | | 45 | Fall Creek Hatchery | fall | 300 | 80, 84, 87 | 81, 85, 88 | J, J, J |
| | | 46 | Siletz River | fall | 184 | 80, 82, 95, 97 | 81, 83, 95, 97 | J, J, A, A |
| | | 47 | Trask Hatchery | spring | 300 | 80, 84, 96 | 81, 85, 97 | J, J, J |
| | | 48 | Trask Hatchery | fall | 400 | 80, 84, 87, 96 | 81, 85, 87, 97 | J, J, A, J |
| | | 49 | Nehalem River | summer | 53 | 96 | 96 | A |

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| Geographic Area | Reporting Group | Pop Number | Source | Run Time | Total N | Brood or Return Years | Sample Years | Age |
|---|---|---|---|---|---|---|---|---|
| Lower Columbia River | Lower Columbia River | 50 | Cowlitz Hatchery | spring | 152 | 82, 87 | 82, 87 | A, A |
| | | 51 | Cowlitz Hatchery | fall | 198 | 81, 81, 88 | 81, 82, 88 | A, J, A |
| | | 52 | Kalama Hatchery | spring | 159 | 82, 87 | 82, 87 | A, A |
| | | 53 | Kalama Hatchery | fall | 199 | 81, 88, 89 | 82, 88, 89 | J, A, A |
| | | 54 | Lewis Hatchery | spring | 135 | 88 | 88 | A |
| | | 55 | Lewis River | fall | 120 | 90 | 90 | A |
| Willamette River | Willamette River | 56 | Mckenzie and Dexter Hatcheries | spring | 248 | 82, 87, 88 | 82, 87, 88 | A, A, A |
| | | 57 | Mckenzie River | spring | 100 | | | |
| | | 58 | North Santiam River | spring | 99 | 97 | 98 | J |
| | | 59 | Clackamas Hatchery | spring | 100 | 88 | 88 | A |
| | | 60 | North Fork Clackamas River | spring | 80 | 96 | 97 | J |
| | | 61 | Marion Forks Hatchery | spring | 100 | 90 | 90 | A |
| | | 62 | Sandy River | spring | 93 | 96 | 97 | J |
| | Lower Columbia River | 63 | Sandy River | fall | 140 | 90, 91, 92 | 90, 91, 92 | A, A, A |
| | | 64 | Spring Creek and Big Creek Hatcheries | fall | 454 | 81, 81, 87, 90, 90 | 82, 82, 87, 90, 90 | J, J, A, A, A |
| Mid and Upper Columbia River (Sp) | Mid/Upper Columbia (Sp) Snake River (Sp/Su) | 65 | Carson Hatchery | spring | 250 | 82, 89, 89 | 82, 89, 89 | A, A, A |
| | | 66 | Klickitat River | spring | 261 | 90, 91, 92, 93 | 90, 91, 92, 93 | A, A, A, A |
| | | 67 | Warm Springs Hatchery and River | spring | 210 | 82, 87, 87 | 82, 87, 87 | A, A, A |
| | | 68 | Round Butte Hatchery | spring | 159 | 82, 90 | 82, 90 | A, A |
| | | 69 | North Fork John Day River | spring | 85 | 90, 91, 92 | 90, 91, 92 | A, A, A |
| | | 70 | Yakima and Cle Elum Rivers | spring | 401 | 86, 89, 89, 90 | 86, 89, 89, 90 | A, A, A, A |

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| Geographic Area | Reporting Group | Pop Number | Source | Run Time | Total N | Brood or Return Years | Sample Years | Age |
|---|---|---|---|---|---|---|---|---|
| Mid and Upper Columbia River spring | Mid/Upper Columbia (Sp) Snake River (Sp/Su) | 71 | American River | spring | 226 | 86, 89, 90 | 86, 89, 90 | A, A, A |
| | | 72 | Naches, Little Naches, and Bumping Rivers | spring | 251 | 89, 89, 89, 90, 90, 90 | 89, 89, 89, 90, 90, 90 | A, A, A, A, A, A |
| | | 73 | Leavenworth Hatchery | spring | 250 | 82, 86, 91 | 82, 86, 91 | A, A, A |
| | | 74 | White River | spring | 137 | 89, 91, 92 | 89, 91, 92 | A, A, A |
| | | 75 | Nason River | spring | 122 | 89, 92, 93 | 89, 92, 93 | A, A, A |
| | | 76 | Chiwawa River | spring | 247 | 89, 90,91, 92, 93, 94 | 89, 90, 91, 92, 93, 94 | A, A, A, A, A, A |
| | | 77 | Methow River | spring | 93 | 93 | 93 | A |
| | | 78 | Chewack River | spring | 151 | 92, 93 | 92, 93 | A, A |
| | | 79 | Twisp River | spring | 107 | 92, 93 | 92, 93 | A, A |
| Mid and Upper Columbia River (Su/F) | Upper Columbia (Su/F) and Snake (F) | 80 | Klickitat River | summer | 324 | 91, 92, 93, 94 | 91, 92, 93, 94 | A, A, A, A |
| | | 81 | Klickitat River | fall | 250 | 91, 92, 93, 94 | 91, 92, 93, 94 | A, A, A, A |
| | | 82 | Bonneville Hatchery | fall | 200 | 89, 90 | 89, 90 | J, A |
| | | 83 | Little White Salmon Hatchery | fall | 200 | 89, 90 | 89, 90 | J, A |
| | | 84 | Deschutes River | fall | 179 | 82, 84, 90, 91, 92 | 82, 85, 90, 91, 92 | A, J, A, A, A |
| | | 85 | Yakima River | fall | 109 | 90 | 90 | A |
| | | 86 | Marion Drain | fall | 153 | 89, 90 | 89, 90 | A, A |
| | | 87 | Hanford Reach | fall | 258 | 82, 82, 90 | 82, 82, 90 | A, A, A |
| | | 88 | Priest Rapids Hatchery | fall | 400 | 80, 86, 87, 90 | 81, 86, 87, 90 | J, A, A, A |
| | | 89 | Wells Hatchery | summer | 202 | 91, 92 | 91, 92 | A, A |
| | | 90 | Wenatchee River | summer | 350 | 84, 88, 89, 90 | 85, 88, 89, 90 | J, A, A, A |
| | | 91 | Similkameen River | summer | 206 | 91, 92, 93 | 91, 92, 93 | A, A, A |
| | | 92 | Methow River | summer | 59 | 92, 93 | 92, 93 | A, A |

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| Geographic Area | Reporting Group | Pop Number | Source | Run Time | Total N | Brood or Return Years | Sample Years | Age |
|---|---|---|---|---|---|---|---|---|
| Snake River | Upper Columbia River (Su/F) and Snake River (F) | 93 | Lyons Ferry Hatchery | fall | 399 | 84, 86, 87, 90 | 85, 86, 87, 90 | J, A, A, A |
| | Mid/Upper Columbia River (Sp)and Snake River (Sp/Su) | 94 | Tucannon Hatchery | spring | 758 | 83, 84, 85, 86, 87, 86, 88, 89, 90, 90 | 85, 86, 87, 86, 87, 88 88, 89, 90, 90 | J, J, J, A, A, J, A, A, J, J |
| | | 95 | Rapid River | spring | 293 | 81, 81, 84, 88 | 82, 82, 85, 90 | J, J, J, J |
| | | 96 | Lookingglass Hatchery | spring | 100 | 90 | 91 | J |
| | | 97 | Minam River | spring | 100 | 89 | 90 | J |
| | | 98 | Lostine River | spring | 297 | 88, 89, 90 | 89, 90, 91 | J, J, J |
| | | 99 | Catherine Creek | spring | 100 | 89 | 90 | J |
| | | 100 | McCall Hatchery | summer | 350 | 81, 88, 89, 90 | 82, 89, 90, 91 | J, J, J, J |
| | | 101 | Secesh River | summer | 254 | 88, 89, 90 | 89, 90, 91 | J, J, J |
| | | 102 | Johnson Creek | summer | 316 | 81, 88, 89, 90 | 82, 89, 90, 91 | J, J, J, J |
| | | 103 | Marsh Creek | spring | 259 | 88, 89, 90 | 89, 90, 91 | J, J, J |
| | | 104 | Sawtooth Hatchery | spring | 350 | 81, 88, 89, 90 | 82, 89, 90, 91 | J, J, J, J |
| | | 105 | Valley Creek | spring | 279 | 88, 89, 90 | 89, 90, 91 | J, J, J |
| | | 106 | Upper Salmon River at Blaine Bridge | spring | 60 | 88 | 89 | J |
| | | 107 | Upper Salmon River at Frenchman Creek | spring | 60 | 90 | 91 | J |
| | | 108 | Upper Salmon River at Sawtooth | spring | 100 | 90 | 91 | J |
| | | 109 | Imnaha River and Hatchery | spring | 480 | 88, 88, 89, 89, 90 | 89, 90, 90, 91, 91 | J, J, J, J, J |

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| Geographic Area | Reporting Group | Pop Number | Source | Run Time | Total N | Brood or Return Years | Sample Years | Age |
|---|---|---|---|---|---|---|---|---|
| Washington Coast | Washington Coastal | 110 | Naselle Hatchery | fall | 448 | 87, 88, 89, 90 | 87, 88, 89, 90 | A, A, A, A |
| | | 111 | Wynoochee River and Hatchery | fall | 209 | 90, 93 | 90, 93 | A, A |
| | | 112 | Wishkah River | fall | 96 | 90, 93 | 90, 93 | A, A |
| | | 113 | East Fork Satsop River | fall | 102 | 93 | 93 | A |
| | | 114 | Skookumchuck River | spring | 74 | 90, 91, 92, 93, 94 | 90, 91, 92, 93, 94 | A, A, A, A |
| | | 115 | Humptulips Hatchery | fall | 103 | 90 | 90 | A |
| | | 116 | Quinault Hatchery | fall | 200 | 80, 90 | 81, 90 | J, A |
| | | 117 | Queets River | fall | 190 | 80, 90 | 81, 90 | J, A |
| | | 118 | Hoh River | fall | 176 | 80, 81, 90 | 81, 82, 90 | J, J, A |
| | | 119 | Sol Duc | spring | 264 | 87, 88, 90 | 87, 88, 90 | A, A, A |
| Strait of Juan de Fuca | | 120 | Hoko River | fall | 80 | 93 | 93 | A |
| | Puget Sound | 121 | Elwha River | fall | 200 | 88, 90 | 88, 90 | A, A |
| Puget Sound | | 122 | North Fork Nooksack Hatchery and River | spring | 255 | 85, 88, 93 | 85, 88, 93 | A, A, A |
| | | 123 | South Fork Nooksack River | spring | 51 | 93 | 93 | A |
| | | 124 | Skagit Hatchery | spring | 92 | 90 | 90 | A |
| | | 125 | Skagit River | fall | 69 | 87 | 87 | A |
| | | 126 | Sauk River | summer | 74 | 86 | 86 | A |
| | | 127 | Suiattle River | spring | 543 | 85, 86, 87, 88, 89, 90 | 85, 86, 87, 88, 89, 90 | A, A, A, A, A, A |
| | | 128 | Sauk River | spring | 147 | 86, 94 | 86, 94 | A, A |
| | | 129 | Cascade River | spring | 84 | 93, 94 | 93, 94 | A, A |
| | | 130 | Skagit River | summer | 284 | 86, 94, 95 | 86, 94, 95 | A, A, A |
| | | 131 | North Fork Stilliguamish River | summer | 106 | 87, 88 | 87, 88 | A, A |
| | | 132 | Skykomish River | summer | 235 | 87, 88, 89 | 87, 88, 89 | A, A, A |

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| Geographic Area | Reporting Group | Pop Number | Source | Run Time | Total N | Brood or Return Years | Sample Years | Age |
|---|---|---|---|---|---|---|---|---|
| Puget Sound | Puget Sound | 133 | Bridal Veil Creek | summer | 87 | 87, 88 | 87, 88 | A, A |
| | | 134 | Skykomish Hatchery | fall | 106 | 87 | 87 | A |
| | | 135 | Wallace River | fall | 82 | 89 | 89 | A |
| | | 136 | Sultan River | fall | 95 | 87, 88, 89 | 87, 88, 89 | A, A, A |
| | | 137 | Snoqualmie River | fall | 101 | 88 | 88 | A |
| | | 138 | Green River Hatchery | fall | 398 | 80, 87, 88, 90 | 81, 87, 88, 90 | J, A, A, A |
| | | 139 | Puyallup Hatchery | fall | 150 | 92, 93 | 92, 93 | A, A |
| | | 140 | White River Hatchery | spring | 400 | 92, 93 | 92, 93 | A, A |
| | | 141 | South Prairie Creek | fall | 86 | 92, 93 | 92, 93 | A, A |
| | | 142 | Deschutes Hatchery | fall | 250 | 80, 87 | 80, 87 | J, A |
| | | 143 | Hoodsport Hatchery | fall | 248 | 80, 88 | 81, 88 | J, A |
| Lower Fraser River | Lower Fraser River | 144 | Chehalis Hatchery and Harrison River | fall | 440 | 88, 89, 89, 90 | 88, 89, 89, 90 | A, A, A, A |
| | | 145 | Chilliwack Hatchery | fall | 87 | 89, 90 | 89, 90 | A, A |
| Lower Thompson River | Thompson River | 146 | Spius Creek | spring | 158 | 86 | 87 | J |
| | | 147 | Nicola River | summer | 196 | 86 | 87 | J |
| | | 148 | Coldwater River | spring | 202 | 82, 86 | 82, 87 | A, J |
| | | 149 | Bonaparte River | spring | 120 | 86 | 87 | J |
| | | 150 | Deadman River | spring | 120 | 86 | 87 | J |
| South Thompson River | | 151 | Adams River | summer | 102 | 87 | 87 | A |
| | | 152 | Salmon River and Hatchery | summer | 500 | 84, 86, 87 | 85, 87, 88 | J, J, J |
| | | 153 | Eagle River and Hatchery | summer | 460 | 84, 86, 87 | 85, 87, 88 | J, J, J |
| | | 154 | Lower Shuswap River | summer | 120 | 86 | 87 | J |
| | | 155 | Middle Shuswap River | summer | 160 | 86 | 87 | J |

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Appendix A. Page 8 of 11.

| Geographic Area | Reporting Group | Pop Number | Source | Run Time | Total N | Brood or Return Years | Sample Years | Age |
|---|---|---|---|---|---|---|---|---|
| North Thompson River | Thompson River | 156 | Clearwater Hatchery and Horseshoe River | summer | 342 | 82, 84, 86 | 82, 85, 87 | A, J, J |
| | | 157 | White Horse Bluff | summer | 120 | 86 | 87 | J |
| | | 158 | Finn Creek | summer | 160 | 86 | 87 | J |
| | | 159 | North Thompson River | summer | 185 | 86 | 87 | J |
| Mid Fraser River | Mid/Upper Fraser River | 160 | Chilcotin River | spring | 120 | 86 | 88 | J |
| | | 161 | Chilko River | spring | 267 | 82, 86, 88 | 82, 87, 88 | A, J, A |
| | | 162 | Quesnel Hatchery and River | spring | 716 | 84, 84, 86, 86, 87, 88, 89 | 85, 85, 87, 87, 88, 88, 89 | J, J, J, J, J, A, J |
| | | 163 | Lower Cariboo River | spring | 160 | 86 | 87 | J |
| | | 164 | Upper Cariboo River | spring | 180 | 84, 86 | 85, 87 | J, J |
| | | 165 | Cottonwood River | spring | 220 | 84, 86 | 85, 87 | J, J |
| | | 166 | Blackwater River | spring | 334 | 84, 86 | 85, 87 | J, J |
| | | 167 | Baezaeko River | spring | 300 | 84, 86 | 85, 87 | J, J |
| Upper Fraser River | | 168 | Willow River | spring | 256 | 84, 86 | 85, 87 | J, J |
| | | 169 | Bowron River | spring | 270 | 84, 86 | 85, 87 | J, J |
| | | 170 | Slim Creek | spring | 140 | 86 | 87 | J |
| | | 171 | Walker Creek | spring | 120 | 86 | 87 | J |
| | | 172 | Morkill River | spring | 120 | 86 | 87 | J |
| | | 173 | Horsey River | spring | 160 | 86 | 87 | J |
| | | 174 | Swift Creek | spring | 120 | 87 | 87 | A |
| | | 175 | Fraser River at Tete Jaune | spring | 137 | 82, 88 | 82, 88 | A, A |
| Southern British Columbia | Strait of Georgia | 176 | Tenderfoot Hatchery | summer | 435 | 84, 88, 91, 92 | 85, 88, 91, 92 | J, A, A, A |
| | | 177 | Bute Inlet | fall | 109 | 91 | 91 | A |
| | | 178 | Cowichan Hatchery | fall | 484 | 88, 89, 90 | 88, 89, 90 | A, A, A |
| | | 179 | Nanaimo Hatchery | fall | 241 | 84, 88, 89, 90 | 85, 88, 89, 90 | J, A, A, A |

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| Geographic Area | Reporting Group | Pop Number | Source | Run Time | Total N | Brood or Return Years | Sample Years | Age |
|---|---|---|---|---|---|---|---|---|
| Southern British Columbia | Strait of Georgia | 180 | Nanaimo Lake | summer | 104 | 89, 90 | 89, 90 | A, A |
| | | 181 | Big Qualicum Hatchery | fall | 537 | 80, 84, 88, 89, 90 | 81, 85, 88, 89, 90 | J, J, A, A, A |
| | | 182 | Puntledge Hatchery | summer | 60 | 91 | 91 | A |
| | | 183 | Quinsam Hatchery | fall | 643 | 81, 84, 88, 89, 90 | 81, 85, 88, 89, 90 | A, J, A, A, A |
| | West Vancouver Island | 184 | Robertson Creek Hatchery | fall | 300 | 81, 84, 91 | 81, 85, 91 | A, J, A |
| | | 185 | Kennedy River | fall | 150 | 91, 92 | 91, 92 | A, A |
| | | 186 | Sucwoa and Conuma Rivers | fall | 180 | 84, 84, 92 | 85, 85, 92 | J, J, A |
| Central Coast British Columbia | Central British Columbia Coastal | 187 | Wannock River | fall | 180 | 88, 91 | 88, 91 | A, A |
| | | 188 | Kitimat River | summer | 190 | 84, 88 | 85, 88 | J, A |
| | | 189 | Atnarko River | spring | 329 | 84, 90, 91 | 85, 90, 91 | J, A, A |
| Skeena River | Skeena River | 190 | Kitsumkalum River | summer | 338 | 88, 89, 91, 91, 95, 96 | 88, 89, 91, 91, 95, 96 | A, A, A, A, A, A |
| | | 191 | Cedar River | spring | 100 | 91 | 91 | A |
| | | 192 | Kitwanga River | spring | 111 | 91 | 91 | A |
| | | 193 | Bulkley River | spring | 272 | 88, 91, 95 | 89, 91, 95 | J, A, A |
| | | 194 | Morice River | spring | 176 | 91, 95, 96 | 91, 95, 96 | A, A, A |
| | | 195 | Kispiox River | spring | 105 | 88, 95 | 89, 95 | J, A |
| | | 196 | Babine River | spring | 313 | 82, 88, 95, 96 | 82, 88, 95, 96 | A, A, A, A |
| | | 197 | Bear River | spring | 243 | 88, 91, 95 | 88, 91, 95 | A, A, A |
| Nass River | Nass River | 198 | Cranberry River | spring | 93 | 88, 89 | 88, 89 | A, A |
| | | 199 | Damdochax River | spring | 75 | 88 | 88 | A |
| Southeast Alaska | Alaska/British Columbia Transboundary | 200 | Little Tahltan River | spring | 328 | 89,90,90,91 | 89,90,90,91 | A,A,A,A |
| | Southern Southeast Alaska | 201 | Chickamin River | | 151 | 89, 90 | 89, 90 | A |
| | | 202 | Clear Creek | | 33 | 89 | 89 | A |
| | | 203 | Cripple Creek | | 121 | 88 | 88 | A |
| | | 204 | Gene's Lake Creek | | 67 | 89 | 89 | A |
| | | 205 | Harding River | | 45 | 89 | 89 | A |

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| Geographic Area | Reporting Group | Pop Number | Source | Run Time | Total N | Brood or Return Years | Sample Years | Age |
|---|---|---|---|---|---|---|---|---|
| Southeast Alaska | Southern Southeast Alaska | 206 | North Arm Creek and Andrews Creek | | 168 | 89, 89 | 89, 89 | A, A |
| | Alaska/British Columbia Transboundary | 207 | Shakes Creek | | 29 | 93 | 93 | A |
| | Southern Southeast Alaska | 208 | Farragut River | | 186 | 89, 92, 93, 93 | 89, 93, 93, 94 | A, J, A, J |
| | King Salmon River | 209 | King Salmon River | | 100 | 88, 89, 90,92 | 88, 89, 90,92 | A, A, A, A |
| | Alaska/British Columbia Transboundary | 210 | Nakina River | | 198 | 89, 90 | 89, 90 | A, A |
| | | 211 | Kowatua Creek | | 190 | 89, 90 | 89, 90 | A, A |
| | | 212 | Tatsatua Creek | | 228 | 89, 90 | 89, 90 | A, A |
| | | 213 | Dudidontu River | | 28 | 90 | 90 | A |
| | | 214 | Tseta River | | 81 | 89 | 89 | A |
| | | 215 | Upper Nahlin River | | 129 | 89, 90 | 89, 90 | A, A |
| | Chilkat River | 216 | Big Boulder Creek | | 73 | 91, 92, 93 | 91, 92, 93 | A, A, A |
| | | 217 | Tahini River | | 162 | 89, 90, 91, 92 | 89, 90, 91,92 | A, A, A ,A |
| | Gulf of Alaska | 218 | Klukshu River | | 250 | 89, 90, 91 | 89, 90, 91 | A, A, A |
| | | 219 | Situk River | | 174 | 90, 91, 92 | 90, 91, 92 | A, A, A |
| | Southern Southeast Alaska | 220 | Chickamin River LPW | | 100 | 93 | 93 | A |
| | | 221 | Chickamin River WHL | | 155 | 92, 94 | 92, 94 | A, A |
| | | 222 | Chickamin River | | 150 | 94 | 95 | J |
| | | 223 | Unuk River DMT | | 153 | 92, 94 | 92, 94 | A, A |
| | | 224 | Unuk River LPW | | 100 | 93 | 93 | A |
| | | 225 | Unuk River | | 150 | 93 | 94 | J |
| Southeast Alaska | | 226 | Andrew Creek CRL | | 100 | 92 | 92 | A |
| | | 227 | Andrew Creek HFL | | 210 | 94, 93 | 94, 94 | A, J |
| | King Salmon River | 228 | King Salmon River LPW | | 100 | 93 | 93 | A |

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| Geographic Area | Reporting Group | Pop Number | Source | Run Time | Total N | Brood or Return Years | Sample Years | Age |
|---|---|---|---|---|---|---|---|---|
| Southeast Alaska | Chilkat River | 229 | Kelsall River | | 45 | 92 | 92 | A |
| Copper River | Gulf of Alaska | 230 | Klutina River | | 23 | 91 | 91 | A |
| | | 231 | Gulkana River | | 94 | 93 | 94 | J |
| | | 232 | Kasilof River CCR | | 87 | 92 | 92 | A |
| Kenai River | | 233 | Kenai River | | 150 | 92 | 93 | J |
| Susitna River | Susitna River | 234 | Talachulitna Creek | | 53 | 95 | 95 | A |
| | | 235 | Deception Creek | | 103 | 91 | 91 | A |
| | | 236 | Moose Creek Deshka | | 51 | 95 | 95 | A |
| | | 237 | Prairie Creek | | 52 | 95 | 95 | A |
| Kodiak Island | Kodiak Island | 238 | Karluk River | | 67 | 93 | 93 | A |
| | | 239 | Ayakulik River | | 100 | 93 | 93 | A |
| South Peninsula | Alaska Peninsula | 240 | Chignik River | | 47 | 95 | 95 | A |
| North Peninsula | | 241 | Nelson Lagoon | | 150 | 94 | 95 | J |
| Bristol Bay | Western Alaska | 242 | Naknek River | | 100 | 95 | 95 | A |
| | | 243 | Stuyahok River | | 87 | 93, 94 | 93, 94 | A, A |
| | | 244 | Nushagak River | | 153 | 93, 94 | 93, 94 | A, A |
| | | 245 | Togiak River | | 163 | 93, 94 | 93, 94 | A, A |
| Goodnews River | | 246 | Goodnews River | | 40 | 93 | 93 | A |
| Kanektok River | | 247 | Kanektok River | | 78 | 92, 93 | 92, 93 | A, A |
| Kuskokwim River | | 248 | Tuluksak River | | 50 | 93 | 93 | A |
| | | 249 | Kogrukluk River | | 100 | 92, 93 | 92, 93 | A, A |
| | | 250 | Stony River | | 100 | 94 | 94 | A |
| Yukon River, Canada | Canadian Yukon | 251 | Stony Creek | | 185 | 91 | 92 | J |
| Norton Sound | Western Alaska | 252 | Unalakleet River | | 95 | 92, 93 | 92, 93 | A, A |
| Russia | Russia | 253 | Kamchatka River | | 121 | 92, 95 | 92, 95 | A, A |
| | | 254 | Voroskaia River | | 55 | 92, 95 | 92, 95 | A, A |

*Source:* This table is adapted from Teel et al. 1999.

*Note*: Run timing components are abbreviated as Sp (spring), Su (summer), and F (fall).

*Note*: LPW = Little Port Walter, WHL = Whitman Lake, DMF = Deer Mountain, CRL = Crystal lake, HFL = Hidden Falls, CCR = Crooked Creek.