STOCK COMPOSITIONS OF SOCKEYE SALMON CATCHES IN SOUTHEAST ALASKA DISTRICT 111 AND THE TAKU RIVER, 1990, ESTIMATED WITH SCALE PATTERN ANALYSIS

by

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ABSTRACT

Linear discriminant function analysis of scale patterns was used for sockeye stock identification in the U.S. District 111 and Canadian inriver-commercial sockeye fisheries. The District 111 harvest of 126,884 sockeye salmon was comprised of an estimated 85.5% (108,499 fish) of Taku River origin and 14.5% (18,385 fish) destined for lake systems in the Port Snettisham systems. Stock-specific contributions were; 3.6% from Kuthai Lake, 19.7% from Trapper Lake, 33.6% from Mainstem, 28.6% from Tatsamenie Lake, 11.2% from Crescent Lake, and 3.3% from Speel Lake. The Canadian inriver commercial fishery harvested 21,100 sockeye salmon of which an estimated 11.2% were of Kuthai Lake, 38.8% Trapper Lake, 33.8% Mainstem, and 16.3% Tatsamenie Lake origin. U.S. fishers harvested an estimated 71.8% to 76.3% of the Total Allowable Catch (TAC) of sockeye salmon bound for the Taku River, which is less than the 82% to which they were entitled by provisions of the U.S./Canada Pacific Salmon Treaty. Canadian fishers harvested an estimated 13.8% to 14.7% of the TAC, less then their entitlement of 18%. A minimum estimate of the total Port Snettisham sockeye run was 37,768 fish, and the estimated above-border Taku River run was 115,160 fish. Port Snettisham escapements to Crescent and Speel Lakes totaled 19,326 sockeye salmon, however, an unknown proportion of the Crescent escapement passed over or through the weir without enumeration. The escapement past Canyon Island in the Taku River was estimated at 93,701 fish. Exploitation rates for sockeye stocks of above-border origin were estimated at 58.5% for U.S. fisheries and 19.2% for Canadian fisheries.

Key Words: sockeye salmon, stock identification, scale pattern analysis, Taku River, District 111

INTRODUCTION

The Taku River is a transboundary river which originates in central British Columbia and flows southwest through the Coastal Range mountains and Southeast Alaska to the Pacific Ocean (Figure 1). The river supports numerous stocks of salmon that are harvested in U.S. and Canadian fisheries. The U.S. gillnet fishery in District 111 targets Taku River and Port Snettisham sockeye salmon *Oncorhynchus nerka* stocks, and the Canadian fishery in the river targets Taku sockeye stocks. The U.S./Canada Pacific Salmon Treaty of 1985 established conservation and harvest sharing objectives for the Taku sockeye run. Cooperative international management of transboundary river sockeye salmon is mandated by this treaty. Provisions specified by the Treaty for the Taku River in 1985 and 1986 were to achieve a spawning escapement goal of 71,000 to 80,000 sockeye salmon into Canadian portions of the Taku River. Harvest sharing arrangements were to allow the U.S. an 85% share and Canada a 15% share of the total allowable catch (TAC) of sockeye salmon of above-border Taku River origin. Negotiations between the two governments to develop harvest-sharing agreements for the 1987 fishing season were unsuccessful and fishing proceeded without such an agreement. In 1988 the two nations agreed to a five-year harvest-sharing plan that allowed the U.S. 82% and Canada 18% of the TAC. The agreement was contingent upon initiation of cooperative international sockeye salmon enhancement projects on the transboundary Taku and Stikine Rivers. Knowledge of stock-specific harvest is needed to: (1) implement and assess compliance with the harvest sharing guidelines of the Treaty, and (2) develop long-term stock-specific run reconstructions for use in stock assessment and fisheries management.

Objectives

The purpose of this ongoing study is to generate inseason and postseason estimates of the stock composition of weekly sockeye salmon catches in the District 111 gillnet fishery based on analysis of scale patterns. Postseasonally, scale pattern analysis (SPA) is used to estimate the stock composition of weekly sockeye salmon catches in the Canadian-Taku River gillnet fishery. Age and sex compositions of catches and escapements are estimated with a precision of ±5% and 95% simultaneous confidence intervals for weekly District 111 gillnet harvests, tri-weekly Canadian inriver gillnet harvests, bi-weekly escapements past Canyon Island, and Kuthai Lake, Mainstem, Little Trapper Lake, Little Tatsamenie Lake, Crescent Lake, and Speel Lake escapements. We provide basic statistics for use in assessing the treaty performance of the U.S. and Canadian fisheries targeting on Taku River sockeye salmon. Additional years of data for reconstruction of the major Taku River sockeye runs will enable us to develop spawner-recruit relationships, estimate optimum sustainable yield and escapement, and improve forecasting abilities and stock-specific management capabilities.

Fisheries

The U.S. allotment of Taku River sockeye salmon is taken primarily in the District 111 gillnet fishery which includes Taku Inlet, Stephens Passage, and Port Snettisham (Figure 1); however, unknown but assumed small numbers of Taku sockeye salmon may be taken in other Southeast Alaska fishing districts (McGregor 1985). Sockeye salmon bound for spawning sites in Crescent and Speel Lakes in Port Snettisham, Southeast Alaska, are also harvested in the District 111 fishery. The 1980 to 1989 annual catches in District 111 have averaged 71,412 sockeye salmon and have ranged from 31,627 to 123,117 fish. The majority of the District 111 harvest is generally taken in Taku Inlet. In recent years, Port Snettisham has been closed to commercial fishing during much of the season to reduce the catch of Snettisham sockeye stocks and begin rebuilding these runs.

The Canadian allotment of Taku River sockeye salmon is taken in a gillnet fishery that operates in the Taku River within 20km upstream of the Alaska-British Columbia border (Figure 1). Inriver catches have averaged 15,406 sockeye salmon (1980-1989) and have ranged from 3,144 to 27,242 fish.

Stock Identification and Escapement Estimation

Scale pattern analysis has been used since 1983 to estimate the contributions of Taku River and Port Snettisham sockeye salmon to the District 111 fishery on a postseasonal basis. Originally, two composite stock groups were identified in the catches: the Taku group, represented by scales collected from fish wheel catches at Canyon Island in the Taku River, and the Snettisham group, represented by scales collected from the Crescent and Speel Lake Weirs (McGregor 1985, 1986). The scale patterns of Taku River fish changed through the migration and it became apparent that early-migrating stocks had different patterns than late-migrating stocks. To better reflect this temporal variation in scale patterns, scales used to represent the Taku River run were taken from fish wheel catches in 1985 and were grouped into five sequential periods. A temporal series of five linear discriminant functions was developed using these grouped samples and samples from the Port Snettisham systems. The weekly catch in District 111 was classified with the appropriate function with an assumed one-week lag between the District 111 fishery and Canyon Island (Oliver and McGregor 1986). In 1986, the models were further refined by using separate standards for the Kuthai, Little Trapper, and Little Tatsamenie Lake systems and for the mainstem composite group composed of mainstem, tributary, and small lake spawners. The Crescent and Speel stocks were also separated and the District 111 discriminant functions were developed for six stock groups (McGregor and Jones 1987, 1988, and 1989; Jensen et al. 1993). Since 1986, inseason SPA, based on escapement standards from the previous year, has been used to estimate stock compositions of District 111 catches. Inriver samples from the Canadian fishery and the Canyon Island fish wheel catches have also been classified postseasonally to stock group of origin since 1986.

An adult mark-recapture program has been jointly operated on the Taku River at Canyon Island and the inriver fisheries by the Alaska Department of Fish and Game (ADF&G) and the Canadian Department of Fisheries and Oceans (DFO) since 1984 (McGregor and Clark 1987, 1988, 1989; McGregor et al. 1990; TTC 1991). The program provides inseason and postseason estimates of sockeye escapement to the Taku River.

METHODS

Numbers of Fish

We obtained catch statistics for District 111 from ADF&G records of fishery sales receipts (fish tickets); these records were taken from the database on October 3, 1991. Harvest statistics for the Canadian inriver fishery were taken from a Transboundary Technical Committee report (TTC 1991). Catches were reported by fishing period and were assigned to a Statistical Week. Each Statistical Week began at 12:01 p.m. Sunday and ended the following Saturday at midnight. Weeks were sequentially numbered beginning with the first Sunday of the calendar year.

The escapement to Port Snettisham was enumerated at counting weirs located at the outlets of Crescent and Speel Lakes. Mark-recapture methods were used to estimate the sockeye salmon run size to the Taku River upstream of the U.S./Canada border (TTC 1991). DFO operated weirs at Little Trapper and Little Tatsamenie Lakes to count escapements of these spawning stocks.

Collection and Preparation of Scale Samples

Scales were taken from the left side of the fish approximately two rows above the lateral line along a diagonal from the posterior insertion of the dorsal fin to the anterior insertion of the anal fin (INPFC 1963). Scales on salmon fry first develop in this area, and thus, for purposes of aging and digitizing, it is the preferred area. Scales were mounted on gum cards and impressions made in cellulose acetate (Clutter and Whitesel 1956).

Employees of the ADF&G, Commercial Fisheries Management and Development Division sampled District 111 catches aboard tenders, fishing vessels, and at the fishing ports of Douglas, Petersburg, and Excursion Inlet. Samplers recorded the sex of each fish sampled and collected one scale. DFO and ADF&G employees sampled the Canadian inriver harvest. Samplers recorded the sex of each fish sampled and took five scales as required by DFO sampling guidelines. Fish captured in the Canyon Island fish wheels were sampled by ADF&G and DFO employees.

Similar procedures were used to sample escapements; one to three scales per fish were taken from Alaskan systems and five scales per fish were taken from headwater systems in Canada. Scales were collected at enumeration weirs at Crescent and Speel Lakes in the Port Snettisham drainages, and at Little Trapper and Little Tatsamenie Lakes in the Taku drainage. Samples were collected periodically throughout the run from fish captured in traps at each of the weir sites. Other Taku River spawning sites including Kuthai Lake, Nahlin River, and sloughs, side channels, and spawning areas on the mainstem river were sampled on one or several days. Scale samples were also taken in conjunction with the escapement estimation program at Canyon Island. Fish wheels were used at this location to capture fish for tagging and sampling throughout the duration of the run. The abundance and age composition of the Taku River run past Canyon Island was estimated using this data.

Sex was determined by examination of external sexual maturation characteristics, including kype development, belly, vent, and jaw shapes, or, when possible, by examination of gonads. A study conducted by ADF&G to determine the accuracy of its samplers in sexing ocean-caught salmon showed that an average of 94% of the sockeye salmon sampled were sexed correctly (Pahlke 1988). Sex determination of sockeye salmon from inriver fishery catches or the spawning grounds is probably higher, due to the pronounced secondary maturation characteristics of fish at these locations.

Scale sampling goals of 600 fish per Statistical Week were used to determine the age composition of the District 111 harvest. A sample of 500 ageable scales enabled the proportion of each major age group in the catch during each fishing period to be estimated to within 5% of the true proportion 95% of the time (Cochran 1977, Rowse and McPherson 1992). However, additional scales were needed to account for scale regeneration and to ensure adequate numbers of scales from minor age classes were available each week for digitizing. Sampling goals were met for most fishing periods in the District 111 commercial fishery. Because of low catches and limited fish availability in the Canadian commercial catch, the scale-sampling goal was 700 fish per three-week period. Age composition of catches often changed significantly between fishing periods; therefore, samples from several periods were seldom combined. This resulted in relatively low levels of accuracy and precision of age composition estimates for the Canadian fishery. All fish caught in the Canyon Island fish wheels were sampled for scales. Sample goals for Kuthai Lake and the mainstem Taku River were 700 fish; because sampling of these systems was conducted over a short time, all samples were pooled to represent the age composition of each escapement. DFO personnel sampled sockeye salmon from Little Trapper and Little Tatsamenie Lake Weirs and ADF&G personnel sampled fish from Crescent and Speel Lake Weirs. The sampling goal for weir escapements was 750 samples collected throughout the salmon migration.

Age Composition

Fish ages, determined by visually examining images of scale impressions magnified to 70x on a microfiche reader, were recorded in European notation. Criteria used to determine ages were similar to those of Moser (1968).

Scales from fish sampled on the spawning grounds occasionally exhibited resorption along the outer edges. Sockeye salmon length was used to help determine marine ages because fish length is highly correlated with marine age (McPherson et al. 1990). In cases where scale resorption made distinguishing marine age difficult, sex-specific length frequency histograms were used to assist in determining the correct marine age.

Scale Digitizing

Scale images magnified at 100X were projected onto a digitizing tablet using equipment similar to that described by Ryan and Christie (1976). Scale measurements were made and recorded with an IBM microcomputer-controlled digitizing system.

An axis approximately perpendicular to the anterior edge of the unsculptured posterior field is best for consistently measuring sockeye scales (Clutter and Whitesel 1956; Narver 1963). All circuli counts and scale measurements in the lacustrine and first-year marine zone were made along this axis which is approximately 20° dorsal or ventral from the anterior-posterior axis. Measurements were made in three or four zones: (1) the first freshwater zone (the scale center to the last circulus of the first freshwater annulus), (2) the second freshwater zone (when present, the first circuli of the second year of freshwater growth to the end of the second freshwater annulus), (3) the plus growth zone (the scale growth after the last freshwater annulus and before the first marine circulus) (Moser 1968), and (4) the first-year marine growth zone (the first marine circulus to the end of the first marine annulus) (Figure 2). A total of 76 variables, including circuli counts, incremental distances, and ratios and/or combinations of the measured variables were calculated for samples with a single freshwater annular zone and 108 variables for samples with two freshwater annular zones (Appendix A.2).

Scale Pattern Analysis

Linear Discriminant Analysis (LDA)

We used linear discriminant analysis (LDA), a multivariate technique, to develop classification rules to assign a sockeye salmon sampled in a mixed stock fishery to a stock of origin. The variables calculated from the circuli counts and incremental distances on scales from fish of known origin provide a set of measurements used to define these rules. Scale variables are selected based on their ability to differentiate between stocks included in the analysis. The accuracy of classification of stocks represented by standards depends upon the precision with which the regions defining each stock or group are described and the inherent separations between them. The linear discriminant function (LDF) is the linear combination of the variables, which maximizes the between-group variance relative to the within-group variance (Fisher 1936).

Assuming that: (1) the groups being investigated are discrete and identifiable, (2) the parent distributions of the measured variables are multivariate normal, and (3) the variance-covariance matrices for all groups are equal, LDA provides the best discriminant rule, in the sense of minimizing the expected probability of misclassification. Gilbert (1969) found LDA satisfactory if the variance-covariance's matrices were not too different. In addition, large sample sizes appear to make LDA robust to the assumption of common variance-covariance matrices (Issacson 1954; Anas and Murai 1969). The method also appears to be robust to violations of the normality assumption for some discrete distributions; however, it is not robust for continuous non-Gaussian parent distributions (Lachenbruch et al. 1973; Krzanowski 1977). Unpublished results from ADF&G studies which compare LDA, QDA (quadratic discriminant analysis), NNN (nearest neighbor analysis), and MLE (maximum likelihood estimation) indicate that LDA has a higher classification accuracy than does QDA or NNN and has an accuracy nearly identical to MLE. This indicates that the above assumptions are met or that LDA is robust to violations of them for the variables used in scale pattern analysis of Southeast Alaska mixed-stock sockeye catches.

Scale variables to be used in the LDA are selected with a stepwise analysis. In this process variables are added until the partial F-statistic of all variables available for entry into the model is less than 4.00 and all variables in the function have F-values greater than 4.00 (Enslein et al. 1977). An almost unbiased estimate of classification accuracy for each LDF was determined using a "leaving-one-out" procedure (Lachenbruch 1967). One sample is "left out," the discriminant rule is estimated, and the "left out" sample is classified using the discriminant rule, then checked to see if it was classified correctly. This procedure is repeated for all samples. Thus, when an LDF is run using the leaving-one-out procedure, a classification matrix is developed which gives the proportion of correctly identified fish and the proportion of misclassification of each stock to each of the other stocks (Appendix B.).

When more than two stock groups were analyzed, the stepwise procedure did not always result in maximum classification accuracies or the most balanced classification matrix. Frequently, well separated groups were separated even further, while poorly separated groups remained poorly separated (Habbema and Hermans 1977). Scale variables that provided the best discrimination between the groups that most often misclassified as each other were occasionally added to, or substituted for other variables used in the LDF to provide either a better balance to the classification matrix or to increase the mean classification accuracy.

The estimates of stock composition in the mixed-stock harvests, referred to as initial estimates, were adjusted with a classification matrix correction procedure (Cook and Lord 1978). The fish in the mixed-stock sample were classified with the LDA. The vector of proportional estimates for each stock or stock group was multiplied by the inverse transposed classification matrix to give new estimates, referred to as adjusted estimates, for the true proportions of stocks and stock groups in the mixed-stock fishery. In cases where the adjusted estimated proportion for a stock group was less than zero, the entire catch sample was reclassified with a function, which excluded that stock group. This process was repeated until all adjusted estimated proportions were positive.

The variance and 90% confidence intervals of the adjusted estimates of stock proportions were computed according to Pella and Robertson (1979). Variance-covariance matrices for the misclassification matrix and the variances for the proportions of each stock were a function of: (1) the sampling variation in estimation of the probability of assignment of the known stock group, and (2) the sampling variation in estimation of the assignment composition of the mixed-stock group.

Developing Standards

In 1990, three age groups (1.2, 1.3, and 2.3) contributed 85% of the sockeye catches in District 111 and 87% for the Canadian inriver commercial fishery. Age-specific models, where standards from a specific age class were used to classify catches of fish of the same age class, were used in the analysis to: (1) account for differences in age composition among stocks, (2) remove potential bias due to differences in migratory timing of different age fish, and (3) eliminate the effect of different environmental conditions on the scale patterns of different age fish. Standards were developed for each age class for Kuthai, Trapper, Tatsamenie, Speel, and Crescent Lakes. Standards for the Mainstem composite were developed only for ages 1.2 and 1.3. The desired sample size for each age-specific standard was 200 fish per stock group. Conrad (1985) showed that, over a wide range of classification accuracies, only a minimal decrease in the variance of stock composition estimates is achieved by enlarging sample sizes of standards above 200. Standards were not developed for ages which contributed only a minor fraction (<5%) of the escapement because of insufficient availability of scales.

Classification of Catches

The District 111 catches were classified postseasonally with standards built from the 1990 escapements. The age-1.2, -1.3, and -2.3 fish from the District 111 catches and the Canadian commercial catches in the Taku River were analyzed. The desired sample size for "unknown" or mixed-stock catches was 100 fish per age class per fishing period. Conrad (1985) analyzed scale pattern data and showed that, within a wide range of classification accuracies, the variance of stock composition estimates decreases rapidly as the sample size of unknowns is increased from 50 to 100, but further increases in sample size have a lesser effect on the variance. The sample size of mixed-stock catches varied on a weekly basis and was dependent on age composition. Generally, 100 scales from age 1.3 and as many scales as possible, up to 100, from ages 1.2 and 2.3 were analyzed for each fishery and each week (Appendix A.1). District 111 commercial catches were analyzed inseason with discriminant functions developed from the previous year's escapement standards. Stock contributions were estimated and summaries were provided to managers within 48 hours of the fishery closures from mid-June through mid-August. Only age-1.3 fish were analyzed inseason because of time constraints.

Stock contributions were estimated for each week to track temporal patterns. However, in some weeks catches were small, and samples of the less common age groups were insufficient to classify, unless pooled with the adjacent week's sample. The proportion of each stock in a weekly catch sample was expanded to the weekly catch by:

$$C_{ijt} = C_t\,(P_{it})\,(S_{ijt}), \tag{1}$$

where:
- C_{ijt} = estimated catch of fish of age i in group j in period t;
- C_t = total catch in period t;
- P_{it} = estimated proportion of fish of age i in the catch in period t; and
- S_{ijt} = proportion of fish of age i and estimated with LDA to be in group j in the catch in period t.

The stock apportionment of the minor age groups not classified with LDA assumed that the proportion of the minor ages belonging to any given stock in a catch is equal to the proportion of all LDA classified age classes of that stock in the catch:

$$C_{mjt} = C_t \, (P_{mt}) \, (S_{\cdot jt}), \qquad (2)$$

where: C_{mjt} = estimated catch of fish of minor age class m of group j in period t;
P_{mt} = estimated proportion of fish of minor age group m in the catch in period t; and
$S_{\cdot jt}$ = proportion of fish estimated with LDF (all analyzed ages combined) to be in-group j in the catch in period t.

Age-0. fish are absent or extremely rare in Taku River and Port Snettisham systems except for the mainstem Taku and Tatsamenie spawning groups. Age-0. fish were apportioned to the mainstem and Tatsamenie groups by multiplying C_{0jt} by:

$$P_{0jt} = S_{ljt}/S_{\cdot\cdot t}, \qquad (3)$$

where: j is restricted to the Tatsamenie and Mainstem stock groups and
P_{0jt} = estimated proportion of catch of age-0. fish of group j in period t.

The variances (V) of the weekly ($C_{\cdot jt}$) and seasonal ($C_{\cdot j\cdot}$) stock composition estimates were estimated by the method reported in Oliver et al. (1985) (Seber 1982). The variance estimates were functions of: (1) the accuracy of the age-specific models used to classify the unknowns, (2) the sample size of each standard used to develop the age-specific models, (3) the proportions of each stock in the initial and in the adjusted stock composition estimates, (4) the age-specific stock composition sample sizes, (5) the age composition sample sizes, and (6) the catch size. However, it was a minimum estimate of variance because it did not include any variance associated with the age classes not classified with LDA, any variance for stocks not contributing fish during a given week, nor any variance due to errors in aging or in reporting of catches. Variances of proportions of stock contributions and standard errors were calculated with formulae from Pella and Robertson (1979).

Comparison of Inseason and Postseason Estimates

Inseason stock composition estimates were compared to postseason estimates for the District 111 catches. The weekly inseason estimates were derived in a different manner than were the postseason methods. The inseason stock composition estimates were based on LDA of age-1.3 fish; stock proportions of age-1.2 and age-2. fish were based on the stock composition estimates from the age-1.3 fish; age-0. fish were all apportioned to the Mainstem group. Because the Trapper and Mainstem groups were combined in the inseason analysis, the estimates of Trapper and of Mainstem fish in the postseason analysis were combined to facilitate comparison of the inseason and postseason estimates.

The actual numbers of fish in a sample classified to each stock group in the inseason analysis were compared to the postseason numbers. Chi-square analysis was deemed inappropriate because the data did not conform to the general rule that none of the expected frequencies should be <1.0 and no more than 20% of expected frequencies should be <5.0 (Zar 1984). Log-likelihood ratio analysis is not as sensitive to small frequencies and was therefore deemed the more appropriate analysis to use. "One" was added to each cell count to avoid calculating the logarithm of zero.

In addition to comparing the weekly inseason estimates with the weekly postseason estimates, the set of weekly differences was also tested for heterogeneity (Sokal and Rohlf 1981). Significant heterogeneity indicated either differences in sign or magnitude among the weekly differences. If heterogeneity was not significant, the sum of the weekly "G" statistic was used to test for an overall seasonal difference.

Because the same scales used for the inseason estimates were also used, along with additional scales, for the postseason analysis, the G-test described above was not entirely appropriate. This test assumes independent samples, i.e., a different set of scales for the inseason and postseason analysis. Because our samples were not independent, the G-test tended to be conservative i.e.; the actual probability was less than that stated. Therefore, some tests may not have been declared significant (α = 0.05) when they really were. Unfortunately, methods which would have correctly recognized the dependencies among samples (Agresti 1990), required that each scale be assigned to a specific stock. Although discriminant analysis makes such an assignment, the subsequent adjustments to estimate the mixing proportions address proportions rather than individual fish, such that individual assignments are lost.

In light of the above, test results were used to bring attention to differences that may need further examination. Significant test results, for example, did not always correspond to practical significant differences.

RESULTS

Numbers of Fish

The harvest of 126,884 sockeye salmon by the commercial drift gillnet fleet in District 111 in 1990 (Table 1) was a record high and 77.7% above the 1980 to 1989 average of 71,412 fish. The fishery was open 39.4 days. The majority of the catch, 86.7%, was taken in Taku Inlet, Subdistrict 111-32, (Figure 1). Approximately 13.3% of the catch was taken in Stephens Passage, Subdistrict 111-31, which was close to the historical average of 12.0% (1964 to 1989). Catches in Port Snettisham, Subdistrict 111-34, were <1.0% of the total harvest. A test fishery in Port Snettisham harvested 57 sockeye salmon (Table 2). The U.S. personal-use fishery in the Taku River harvested an estimated 1,560 sockeye salmon.

The Canadian commercial fishery in the Taku River harvested 21,100 sockeye salmon (Table 3), 37.0% above the 1980-1989 average of 15,406 fish. The fishery was open 28.3 days. The Canadian food fishery harvested 74 sockeye salmon and the inriver test fishery catch totaled 285 fish.

Age and Sex Composition

Age-1.3 fish were the dominant age class in the District 111 sockeye fishery, comprised 67.8% of the catch (Appendix C.1), and ranged from 59.1% to 84.0% of the weekly catches. Other major ages included 0.3, which represented 10.7% of the catch, 1.2, 8.7%, and 2.3, 8.2%. Age-0. fish were uncommon prior to mid-season, Statistical Week 28. Females comprised 59.2% of the total catch.

Age-1.3 fish dominated the Canadian commercial catches in the Taku River at 66.0% of the total catch and ranged from 55.9% to 77.8% of the weekly catches (Appendix C.2). Age 0.3 comprised 7.5% of the catch, 1.2 comprised 14.5%, and 2.3 comprised 6.4%. No other age class contributed more than 2.0% of the total catch. Age-0. fish became relatively more abundant as the season progressed. Females comprised 53.6% of the catch in Week 26 and 37.0% during Week 27. Sex ratios were not available for the remainder of the season.

The Canyon Island fish wheel catches had a more diverse age composition and a higher abundance of younger fish than did the inriver commercial catch (Appendix C.3). The catch was comprised of ages 1.3 (48.5%), 1.2 (26.3%), 2.2 (6.4%), 0.2 (4.9%), 0.3 (4.7%), and 2.3 (4.8%). No other age class composed more than 4.0% of the catch. Age-1.3 fish contributed >40.0% of the weekly catches in all but Statistical Weeks 30 and 31, in late July and early August, when the age-0. fish peaked and contributed >18% of the catch. Females comprised 46.6% of the season's catch and were less abundant than males in all but the first and last weeks of the season.

Individual Taku River stocks exhibited a wide diversity in age composition (Appendix C.4). Age-0. fish were absent from Kuthai and Little Trapper Lakes, comprised 6.7% of the Little Tatsamenie Lake samples, and ranged from 0.2% to 51.6% of the mainstem and slough samples. Age-1.3 fish were the most abundant age class in all systems except for Tatsamenie Lake, where age-1.2 fish were slightly more abundant, and from the mainstem group, where age-0.3 fish were more abundant in some spawning locations.

Port Snettisham escapements were dominated by age-1.3 for Crescent Lake, and by age-1.3 and -1.2 fish for Speel Lake. Age-0. fish contributed <4.0% of the Crescent and Speel escapements.

Escapement Standards

Scales from Kuthai Lake fish exhibited the greatest freshwater growth, followed by fish from Little Tatsamenie Lake. Crescent Lake fish had the smallest freshwater growth. Speel Lake, Little Trapper Lake, and the Mainstem Taku conglomerate had intermediate freshwater growth.

Standards were built for all stock groups for ages 1.2 and 1.3. There was no age-2.3 standard for the Mainstem composite because this age was a very minor component of the escapement and there were insufficient scales. District 111 catches were initially classified using functions that included all stock groups, but Snettisham standards were not included in the LDA used to classify inriver commercial catches.

Mean classification accuracies for age-1.2 functions ranged from 74.1% to 89.4% (Appendix B.1). The Kuthai Lake fish had the highest individual classification rates (>90.0%). Classification rates for other stocks were generally between 60.0% and 80.0%. Mean classification accuracies for age-1.3 fish ranged from 61.4% to 86.2% (Appendix B.2). Kuthai Lake again had the greatest individual classification rates (97.4%). The other stock groups had accuracies ranging from 53.2% to 80.8%. The age-2.3 models had mean classification accuracies ranging from 78.9% to 99.1% (Appendix B.3). Individual stock classification accuracies were variable among models and were generally >80.0% for all stocks except Crescent Lake.

Stock Composition Estimates

The Mainstem group contributed an estimated 42,676 fish or 33.6% of the District 111 catch. Little Tatsamenie contributed 36,332 (28.6%), Little Trapper 24,952 (19.7%), Crescent 14,242 (11.2%), Kuthai 4,539 (3.6%), and Speel 4,143 (3.3%) fish to the District 111 catch (Appendix C.5). Port Snettisham stocks contributed 14.5% of the District 111 harvest, and Taku River sockeye salmon contributed the remaining 85.5% of the catch. Kuthai Lake fish contributed 36.0% of the catch during mid-June, Statistical Week 25, then declined in abundance through the remainder of the season. Trapper fish comprised nearly 30.0% of the weekly catch from late June through mid-July and declined through the remainder of the season. Mainstem fish comprised a substantial portion of the catch during all weeks and were most abundant during the latter half of the season, as were the Little Tatsamenie stocks. Crescent fish were most abundant during the first half of the season, and Speel fish during the last half of the season.

The peak catch of 26,245 fish occurred during Statistical Week 30, in late July, while the peak CPUE of 83 fish per boat day occurred in Statistical Week 29, in mid-July (Appendix C.6). The peak CPUE for Kuthai fish occurred during the first week of the season, Little Trapper, Little Tatsamenie, and Crescent during mid-to-late July, Mainstem in early August, and Speel during mid-August.

Since 1986, the Taku River contribution has averaged 79.4% of the District 111 catch (Appendix D.1). The highest total catch of 108,499 Taku fish occurred in 1990, while the highest catch of 21,082 Port Snettisham fish occurred in 1987 (Appendix D.2).

The Little Trapper group contributed an estimated 8,183 fish, or 38.8%, of the Canadian commercial catch in the Taku River. The Mainstem composite contributed 7,131 (33.8%), Little Tatsamenie 3,431 (16.3%), and Kuthai 2,355 (11.2%) of the catch (Appendix C.7). Little Trapper and Mainstem stock were major catch components throughout most the season, but Little Trapper stocks were not a major component after July. Kuthai fish were only abundant early in the season, and Little Tatsamenie fish late in the season.

The peak catch occurred during Statistical Week 30 in late July. However, CPUE was fairly stable throughout the season until August after which it remained at approximately half the level observed in June and July (Appendix C.8). The highest peak CPUE for an individual stock, 50 fish of Little Trapper origin, occurred during Statistical Week 27, in early July.

In 1990 the relative abundances of the stock groups were similar to those in 1986 (Appendix D.3). However, estimated catches for all groups were much higher than the 1986 to 1988 averages (Appendix D.4).

Scale samples collected from the test-fishery catches were insufficient to analyze for stock composition. Therefore, weekly stock compositions in these catches were assumed to be the same as for the commercial fishery (Appendix C.9).

Total Run Estimates

The total estimated run of Taku River sockeye salmon was 225,219 fish (Table 2); the mark-recapture estimate of the sockeye salmon run past Canyon Island was 115,160 fish, of which 93,701 escaped to spawn (TTC 1991). The escapement was above the U.S./Canada goal range of 71,000 to 80,000 fish, thus, the catch of 131,518 fish was below the TAC. Under a TAC range of 144,313 to 153,313 fish, the U.S. harvested 71.8% to 76.3%, and Canada harvested 13.8% to 14.7% of the TAC. Estimated exploitation rates on the Tatsamenie stock were 79.8% for the U.S. and 7.5% for Canada, and on the Trapper stock were 58.5% for the U.S. and 19.2% for Canada. Estimated exploitation rates on the entire Taku run were 48.9% for the U.S. and 9.4% for Canada. Exploitation rates in District 111 were estimated at 18.7% for the Speel stock and were unknown for the Crescent stock because of an inaccurate escapement estimation.

Inseason Versus Postseason Estimates

The inseason stock composition estimates for the District 111 catches did not differ significantly from the postseason estimates (log likelihood ratio analysis, α=0.05) for five of nine weeks (Table 4, Appendix E). Heterogeneity was significant. Although differences were statistically significant for Statistical Weeks 25, 29, 30, and 33, they were numerically small in the first and last weeks (Appendix E.1). Differences between estimates of Taku River versus Port Snettisham fish ranged from 47 to 2,151 fish and were not of practical significance for fishery management (Appendix E.2). The inseason analysis tended to underestimate the Taku stocks, and the season's total was underestimated by 5,688 fish.

DISCUSSION

The sockeye runs to systems within the Taku River and Port Snettisham drainages ranged from good to record. The District 111 sockeye catch in 1990 was a record high and 41.7% above the 1964 to 1989 average of 59,648. The Canadian commercial catch in the Taku River was the second highest observed since the fishery was started in 1979. The escapements through the Little Trapper and Little Tatsamenie Weirs were slightly below the 1983 to 1989 averages, while the Speel Lake escapement was the highest recorded since 1983. These runs appeared to be correlated with the high escapements in 1985, the dominant parent year. In 1985, escapements were high for Crescent and Speel Lakes and were records for Little Trapper and Little Tatsamenie Lakes, and the above-border escapement for the Taku River was the second-highest estimated since 1983.

The weir count of 1,262 fish into Crescent Lake was an underestimate of the total escapement in 1990. Age, length, and sex were recorded for most fish counted through the weir. Biological data was also collected from a sample of fish on the spawning grounds. The age compositions from the two sample groups were different (McGregor and Bergander 1993). McGregor and Bergander found that the length frequency distributions of the two groups were also different. They concluded that the differences were so large that the only explanation was the passage of uncounted fish through the weir. There is insufficient information to estimate the true magnitude of the escapement through Crescent Lake Weir.

The exploitation rate for Speel Lake fish in District 111 was estimated at 18.7% and, if the Crescent Lake Weir count had been accurate, would have been 91.9%. The difference in exploitation rates indicates that the underestimate of the Crescent escapement was substantial. Crescent fish have an earlier migratory timing than Speel fish; however, timing alone cannot account for the difference in exploitation rates. The migratory timing curve of the Crescent fish was slightly steeper but overall was similar to that of the Trapper Lake fish. The exploitation rate on Trapper Lake fish was estimated at 58.5% in the District 111 commercial catch. The migratory pathways of these stocks are different. Since the bulk of the District 111 fishery occurs in Taku Inlet it seems reasonable to assume Taku River stocks would experience different exploitation rates than Port Snettisham stocks. However, there is no scientific data on potential differences in catchability of the Taku and Port Snettisham stocks. Although identical exploitation rates cannot be assumed for Crescent and Trapper sockeye salmon, it seems reasonable that the exploitation rate for Crescent sockeye salmon is between that estimated for Trapper and Speel fish rather than the 91.9% based on the Crescent Lake weir count.

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Table 1. District 111 fishery openings, effort, and harvest of sockeye salmon by subdistrict, 1990.

Stat. Week	Dates Open	Days Open	Boats	Effort (Boat days)	Catch per Subdistrict 31	32	34	Total Catch	CPUE
25[ab]	6/17-6/21	3.0	56	168.0	102	3,185		3,287	19.57
26[ab]	6/24-6/27	3.0	77	231.0	595	7,775		8,370	36.23
27[ab]	7/01-7/04	3.0	71	213.0	1,608	9,492		11,100	52.11
28[bcd]	7/08-7/11	2.7	94	250.7	3,477	15,227		18,704	74.62
29[bcd]	7/15-7/18	2.7	113	301.3	1,612	23,769		25,381	84.23
30[bce]	7/22-7/26	4.0	99	396.0	3,894	22,351		26,245	66.28
31[f]	7/29-8/01	3.0	52	156.0	1,357	5,367		6,724	43.10
32[bg]	8/06-8/09	3.0	87	261.0	2,009	10,576		12,585	48.22
33[b]	8/12-8/15	3.0	78	234.0	1,182	8,052		9,234	39.46
34[bh]	8/19-8/22	3.0	162	486.0	937	3,039		3,976	8.18
35[b]	8/26-8/28	2.0	57	114.0	23	681		704	6.18
36[i]	9/02-9/04	2.0	78	156.0	66	316	8	390	2.50
37[ai]	9/09-9/11	2.0	64	128.0	8	128	0	136	1.06
38[ai]	9/16-9/17	1.0	68	68.0	0	47		47	0.69
39[eij]	9/23-9/25	2.0	23	46.0	0	1		1	0.02
Totals		39.4		3,209.0	16,870	110,006	8	126,884	39.54

[a] Taku Inlet closed north of Jaw Point.
[b] Port Snettisham closed east of a line from Point Styleman to Point Anmer.
[c] Stephens Passage closed within 2 miles from the eastern shore of Stephens Passage south of the latitude of Grand Island Light.
[d] Night closures from 10 p.m. to 4 a.m. Last day open until 10 p.m.
[e] Fishery extended 24 hours.
[f] Port Snettisham closed inside a line from one-mile north of Point Styleman to one-mile south of Point Anmer.
[g] Fishery openings in 111 and 115 delayed from 12:01 p.m. Sunday to 12:01 p.m. Monday (to reduce fishing vessel congestion during the Juneau Salmon Derby).
[h] High effort observed due to the complete closure of District 115.
[i] Port Snettisham closed inside a line from Prospect to Bogert Points.
[j] Taku Inlet was closed north of a line from Cooper Point to Greely Point.

Table 2. Catch and escapement of Port Snettisham and Taku River sockeye salmon stocks, 1990.[a]

Port Snettisham Stocks	Crescent	Speel	Total
U.S. District 111 Commercial Catch	14,242	4,143	18,385
Test Fishery[b]			57
Spawning Escapement[c]	1,262	18,064	19,326
Total Run	15,504	22,207	37,768
Exploitation Rate		0.187	

Taku River Stocks	Kuthai	Trapper	Mainstem	Tatsamenie	Total
U.S. Catch					
District 111	4,539	24,952	42,676	36,332	108,499
Inriver personal use					1,560
Total U.S. Catch	4,539	24,952	42,676	36,332	110,059
Canadian Catch					
Commercial	2,355	8,183	7,131	3,431	21,100
Food					74
Total Canadian Catch	2,355	8,183	7,131	3,431	21,174
Canadian Test Fishery	46	97	102	40	285
Total Catch	6,940	33,232	49,909	39,803	131,518
Spawning Escapement[d]		9,443		5,706	93,701
Total Above Border Run		17,723		9,177	115,160
Total Run		42,675		45,509	225,219
Exploitation Rates					
U.S. Commercial		0.585		0.798	0.489
Canadian Commercial		0.192		0.075	0.094

[a] Taku River escapment estimates do not include stocks which spawn below the U.S./Canada border.

[b] The U.S. test fishery was operated in Port Snettisham.

[c] Escapement to Crescent Lake was higher than counted due to fish passage through the weir or over the weir during high water. Underestimation of escapement prevents accurate estimation of exploitation rate.

[d] The Tatsamenie escapement includes 30 fish holding below weir and 807 fish collected for broodstock and the Little Trapper escapement includes 1,666 fish collected for broodstock.

Table 3. Canadian commercial fishery openings, effort, and harvest of sockeye salmon in the Taku River, 1990.

Stat. Week	Opening Date	Days Open	Permits	Permit Days	Catch	CPUE
26	24-Jun	2.3	11.0	25.3	2,217	88
27	01-Jul	2.0	10.0	20.0	1,508	75
28	08-Jul	4.0	13.0	52.0	3,709	71
29	15-Jul	3.0	11.0	33.0	2,922	89
30	22-Jul	4.0	13.0	52.0	4,394	85
31	29-Jul	4.0	11.9	47.6	3,478	73
32	05-Aug	3.0	10.7	32.1	1,453	45
33	12-Aug	2.0	5.0	10.0	474	47
34	19-Aug	4.0	5.8	23.2	945	41
Total		28.3		295.2	21,100	71

Table 4. Log-likelihood (G) ratio test for differences in weekly inseason and postseason stock composition estimates for District 111 sockeye catches, 1990.[a]

				Maximum Change		
Week	df	G	P	Proportion	Catch	Total Catch
25	4	16.1	<0.005	0.125	411	3,287
26	4	3.1	NS	0.073	608	8,370
27	4	7.2	NS	0.052	581	11,100
28	4	8.1	NS	0.074	1377	18,704
29	4	27.0	<0.001	-0.224	-5678	25,381
30	4	11.6	<0.025	-0.210	-5500	26,245
31	4	9.3	NS	0.174	1171	6,724
32	4	5.3	NS	0.055	697	12,585
33	4	24.2	<0.001	-0.156	-2267	14,488
Total	28	111.9	<0.001			
Pooled	2	27.4	<0.001	-0.074	-9373	126,884
Heterogen	26	84.5	<0.001			

[a] Maximum change is the greatest stock specific difference between estimates. Ho: Inseason and postseason estimates are the same α=0.05

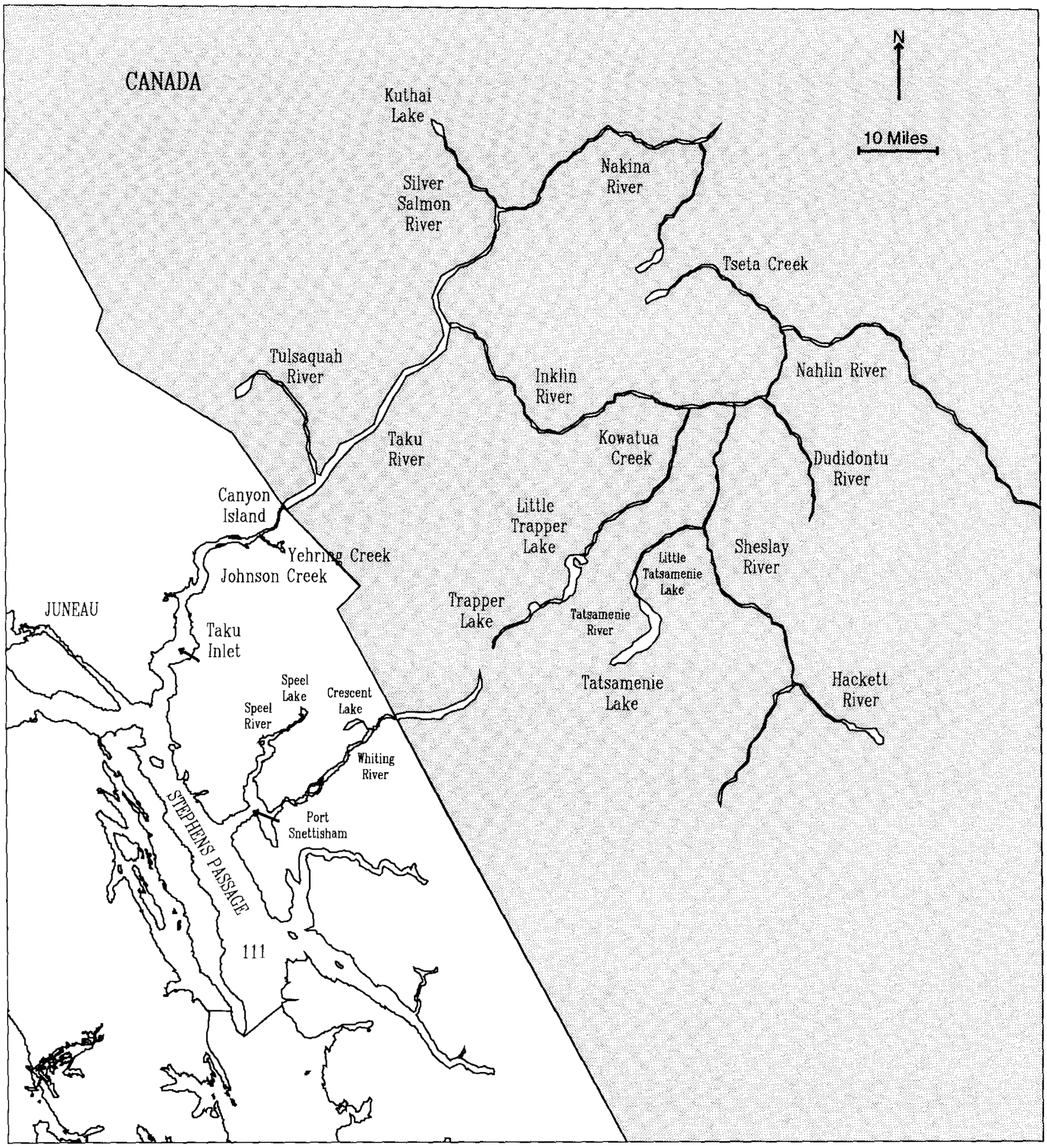

Figure 1. The Taku River, major tributaries, and fishing areas.

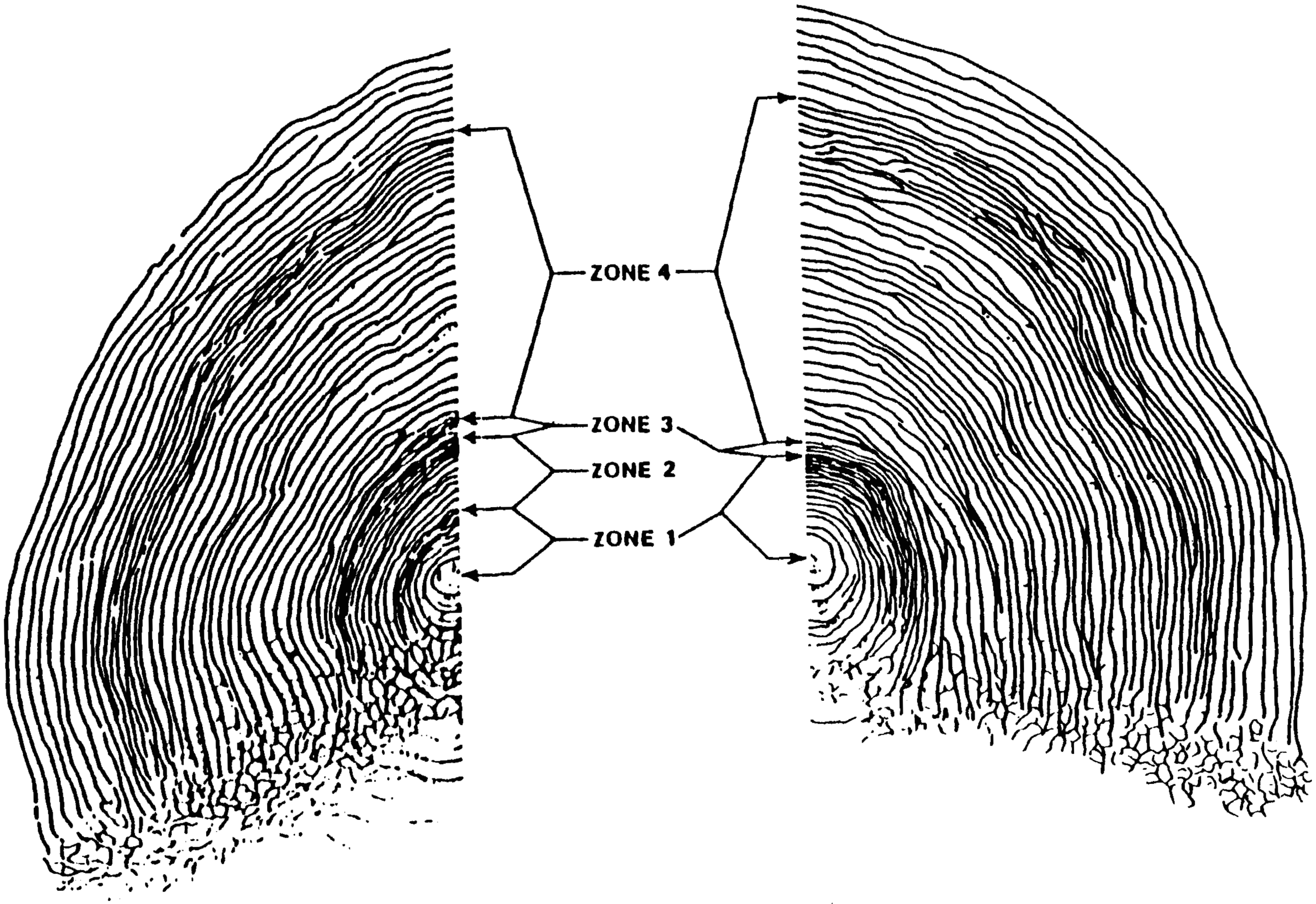

Figure 2. Typical scale for age-2 and age-1 sockeye salmon with zones used for scale pattern analysis delineated.

Appendix A.1. Sample sizes from inseason and postseason sockeye salmon stock composition analysis of catches in District 111, and the Taku River, 1990.

Stat. Week	Date	1.2	1.3	2.3	Total
Inseason U.S. District 111					
25	6/17-6/23		100		100
26	6/24-6/30		100		100
27	7/01-7/07		100		100
28	7/08-7/14		80		80
29	7/15-7/21		100		100
30	7/22-7/28		100		100
31	7/29-8/04		70		70
32	8/05-8/11		101		101
33	8/12-8/18		100		100
Total			851		851
Postseason U.S. District 111					
25	6/17-6/23	27	100	20	147
26	6/24-6/30	51	100	38	189
27	7/01-7/07	28	100	59	187
28	7/08-7/14	19	101	61	181
29	7/15-7/21	35	100	53	188
30	7/22-7/28	59	100	29	188
31	7/29-8/04	29	100	20	149
32	8/05-8/11	67	100	19	186
33	8/12-8/18	58	100	26	184
34	8/19-8/25	48	100	56	204
Total		421	1,001	381	1,803
Postseason Canadian Inriver					
26	6/24-6/30	26	102	15	143
27	7/01-7/07	23	101	10	134
28	7/08-7/14	25	100	9	134
29	7/15-7/21	16	100	24	140
30	7/22-7/28	34	94	11	139
31	7/29-8/04	23	95	6	124
32	8/05-8/11	28	100	4	132
33	8/12-8/18	20	77	6	103
34	8/19-8/25	12	70	2	84
Total		207	839	87	1,133

Appendix A.2. Scale variables used for age-1.2, -1.3, -2.2, and -2.3 sockeye salmon scale pattern analysis.

Variable Number	Description
	First Freshwater (FW) Annular Zone
1	Number of circuli in the zone
2	Distance across the zone
3	Distance: scale focus (CO) to the second circulus in zone (C2)
4	Distance: C0 to C4
5	Distance: C0 to C6
6	Distance: C0 to C8
7	Distance: C2 to C4
8	Distance: C2 to C6
9	Distance: C2 to C8
10	Distance: C4 to C6
11	Distance: C4 to C8
12	Distance: fourth from the last circulus of zone to end of zone
13	Distance: second from the last circulus of zone to end of zone
14	Distance: C2 to end of zone
15	Distance: C4 to end of zone
16	Relative Distance: (Variable #3)/(Variable #2)
17	Relative Distance: (Variable #4)/(Variable #2)
18	Relative Distance: (Variable #5)/(Variable #2)
19	Relative Distance: (Variable #6)/(Variable #2)
20	Relative Distance: (Variable #7)/(Variable #2)
21	Relative Distance: (Variable #8)/(Variable #2)
22	Relative Distance: (Variable #9)/(Variable #2)
23	Relative Distance: (Variable #10)/(Variable #2)
24	Relative Distance: (Variable #11)/(Variable #2)
25	Relative Distance: (Variable #12)/(Variable #2)
26	Relative Distance: (Variable #13)/(Variable #2)
27	Average Distance between circuli: (Variable #2)/(Variable #1)
28	Number of circuli in the first 3/4 of the zone
29	Maximum distance between two adjacent circuli in the zone
30	Relative Distance: (Variable #29)/(Variable #2)
	Second Freshwater (FW) Annular Zone
31	Number of circuli in the zone
32	Distance across the zone
33	Distance: end first annular zone (E1FW) to second circulus in zone
34	Distance: E1FW to C4
35	Distance: E1FW to C6
36	Distance: E1FW to C8
37	Distance: C2 to C4
38	Distance: C2 to C6
39	Distance: C2 to C8
40	Distance: C4 to C6
41	Distance: C4 to C8
42	Distance: fourth from the last circulus of zone to end of zone
43	Distance: second from the last circulus of zone to end of zone
44	Distance: C2 to end of zone
45	Distance: C4 to end of zone
46	Relative Distance: Variable #33/Variable #32
47	Relative Distance: Variable #34/Variable #32
48	Relative Distance: Variable #35/Variable #32
49	Relative Distance: Variable #36/Variable #32
50	Relative Distance: Variable #37/Variable #32
51	Relative Distance: Variable #38/Variable #32
52	Relative Distance: Variable #39/Variable #32
53	Relative Distance: Variable #40/Variable #32

-Continued-

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Variable Number	Description
54	Relative Distance: Variable #41/Variable #32
55	Relative Distance: Variable #42/Variable #32
56	Relative Distance: Variable #43/Variable #32
57	Average Distance between circuli: Variable 32/Variable 31
58	Number of circuli in first 3/4 of zone
59	Maximum distance between two adjacent circuli in the zone
60	Relative Distance: Variable 59/Variable 32
	Freshwater Plus Growth (PG)
61	Number of circuli in the zone
62	Distance across the zone
	Combined Freshwater Zones
63	Total number annular circuli, Variable 1 + Variable 31
64	Total distance across freshwater zones, Variable 2 + Variable 32
65	Total number of circuli in the combined zones, NC1FW+NC2FW+NCPG
66	Total distance across the combined zones, S1FW+S2FW+SPGZ
67	Relative Distance: (Variable #2)/(Variable #66)
	First Marine (C) Annular Zone
70	Number of circuli in the zone
71	Distance across the zone
72	Distance: end of FW (EFW) to the third circulus in zone (C3)
73	Distance: EFW to C6
74	Distance: EFW to C9
75	Distance: EFW to C12
76	Distance: EFW to C15
77	Distance: C3 to C6
78	Distance: C3 to C9
79	Distance: C3 to C12
80	Distance: C3 to C15
81	Distance: C6 to C9
82	Distance: C6 to C12
83	Distance: C6 to C15
84	Distance: C9 to C15
85	Distance: sixth from the last circulus of zone to end of zone
86	Distance: third from the last circulus of zone to end of zone
87	Distance: C3 to end of zone
88	Distance: C9 to end of zone
89	Distance: C15 to end of zone
90	Relative Distance: (Variable #72)/(Variable #71)
91	Relative Distance: (Variable #73)/(Variable #71)
92	Relative Distance: (Variable #74)/(Variable #71)
93	Relative Distance: (Variable #75)/(Variable #71)
94	Relative Distance: (Variable #76)/(Variable #71)
95	Relative Distance: (Variable #77)/(Variable #71)
96	Relative Distance: (Variable #78)/(Variable #71)
97	Relative Distance: (Variable #79)/(Variable #71)
98	Relative Distance: (Variable #80)/(Variable #71)
99	Relative Distance: (Variable #81)/(Variable #71)
100	Relative Distance: (Variable #82)/(Variable #71)
101	Relative Distance: (Variable #83)/(Variable #71)
102	Relative Distance: (Variable #84)/(Variable #71)
103	Relative Distance: (Variable #85)/(Variable #71)
104	Relative Distance: (Variable #86)/(Variable #71)
105	Relative Distance: (Variable #87)/(Variable #71)
106	Number of circuli in the first 1/2 of the zone
107	Maximum distance between two adjacent circuli in the zone
108	Relative Distance: (Variable #107)/(Variable #71)

Appendix B.1. Classification matrices from discriminant functions used postseasonally to classify age-1.2 sockeye salmon from District 111 and inriver catches, 1990.

Actual Group	Sample Size	Kuthai	Trapper	Mainstem	Tatsamenie	Crescent	Speel	Mean	
		Classified Group							
6-Stock Function:									
Kuthai	31	0.935	0.000	0.000	0.065	0.000	0.000		
Trapper	58	0.000	0.603	0.138	0.000	0.000	0.259		
Mainstem	58	0.000	0.103	0.672	0.069	0.000	0.155		
Tatsamenie	203	0.005	0.069	0.113	0.793	0.000	0.020		
Crescent	71	0.000	0.085	0.042	0.000	0.831	0.042		
Speel	201	0.000	0.199	0.104	0.000	0.020	0.677	0.752	
5-Stock Functions:									
Kuthai	31	0.968	0.000	0.000	0.032	0.000			*
Trapper	58	0.000	0.586	0.155	0.000	0.259			
Mainstem	58	0.000	0.069	0.690	0.086	0.155			
Tatsamenie	203	0.049	0.049	0.128	0.754	0.020			
Speel	201	0.000	0.184	0.109	0.000	0.706		0.741	
Kuthai	31	0.968		0.000	0.032	0.000	0.000		*
Mainstem	58	0.000		0.759	0.034	0.000	0.207		
Tatsamenie	203	0.005		0.158	0.783	0.005	0.049		
Crescent	71	0.000		0.099	0.000	0.803	0.099		
Speel	201	0.005		0.154	0.000	0.025	0.816	0.826	
4-Stock Functions:									
Kuthai	31	1.000	0.000	0.000	0.000				*
Trapper	58	0.000	0.776	0.172	0.052				
Mainstem	58	0.000	0.207	0.724	0.069				
Tatsamenie	203	0.000	0.074	0.113	0.813			0.828	
Kuthai	31	1.000		0.000	0.000		0.000		
Mainstem	58	0.000		0.724	0.052		0.224		
Tatsamenie	203	0.054		0.133	0.768		0.044		
Speel	201	0.000		0.154	0.000		0.746	0.835	
3-Stock Functions:									
Kuthai	31	0.968		0.000	0.032				*
Mainstem	58	0.017		0.897	0.086				
Tatsamenie	203	0.010		0.172	0.818			0.894	
Mainstem	58	0.741		0.086			0.172		*
Tatsamenie	203	0.143		0.808			0.049		
Speel	201	0.149		0.005			0.846	0.798	

* Indicates functions used in final classification, others were used only for intermediate steps.

Appendix B.2. Classification matrices from discriminant functions used postseasonally to classify age-1.3 sockeye salmon from District 111 and inriver catches, 1990.

Actual Group	Sample Size	Classified Group Kuthai	Trapper	Mainstem	Tatsamenie	Crescent	Speel	Mean
6-Stock Function:								
Kuthai	193	0.990	0.000	0.000	0.010	0.000	0.000	
Trapper	202	0.000	0.624	0.153	0.025	0.124	0.074	
Mainstem	198	0.005	0.101	0.540	0.141	0.116	0.096	
Tatsamenie	201	0.020	0.104	0.249	0.532	0.025	0.070	
Crescent	200	0.000	0.140	0.170	0.015	0.590	0.085	
Speel	201	0.000	0.100	0.119	0.050	0.035	0.697	0.662
5-Stock Functions								
Kuthai	193	0.974	0.000	0.000	0.026	0.000		
Trapper	202	0.000	0.668	0.183	0.020	0.129		
Mainstem	198	0.005	0.146	0.571	0.141	0.136		
Tatsamenie	201	0.015	0.139	0.284	0.547	0.015		
Crescent	200	0.000	0.170	0.185	0.015	0.630		0.688 *
Trapper	202		0.634	0.153	0.005	0.079	0.129	
Mainstem	198		0.101	0.576	0.126	0.116	0.081	
Tatsamenie	201		0.119	0.279	0.532	0.005	0.065	
Crescent	200		0.125	0.160	0.020	0.565	0.140	
Speel	201		0.070	0.080	0.035	0.055	0.761	0.614 *
4-Stock Functions								
Kuthai	193	0.974	0.000	0.000	0.026			
Trapper	202	0.000	0.752	0.203	0.045			
Mainstem	198	0.005	0.202	0.606	0.187			
Tatsamenie	201	0.010	0.134	0.284	0.572			0.726 *
Kuthai	193	1.000	0.000	0.000		0.000		
Trapper	202	0.000	0.663	0.178		0.158		
Mainstem	198	0.005	0.121	0.712		0.162		
Crescent	200	0.000	0.160	0.210		0.630		0.751 *
Trapper	202		0.693	0.178	0.020	0.109		
Mainstem	198		0.126	0.586	0.136	0.152		
Tatsamenie	201		0.129	0.284	0.552	0.035		
Crescent	200		0.160	0.205	0.010	0.625		0.614 *
Mainstem	198			0.586	0.157	0.162	0.096	
Tatsamenie	201			0.333	0.542	0.035	0.090	
Crescent	200			0.180	0.025	0.670	0.125	
Speel	201			0.139	0.045	0.070	0.746	0.636 *
3-Stock Functions								
Kuthai	193	1.000	0.000	0.000				
Trapper	202	0.000	0.777	0.223				
Mainstem	198	0.005	0.187	0.808				0.862 *
Trapper	202		0.772	0.193	0.035			
Mainstem	198		0.172	0.672	0.157			
Tatsamenie	201		0.134	0.289	0.577			0.674 *

* Indicates functions used in final classification, others were used only for intermediate steps.

Appendix B.3. Classification matrices from discriminant functions used postseasonally to classify age-2.3 sockeye salmon from District 111 and inriver catches, 1990.

		Classified Group						
Actual Group	Sample Size	Kuthai	Trapper	Mainstem	Tatsamenie	Crescent	Speel	Mean
5-Stock Function								
Kuthai	36	0.861	0.056		0.083	0.000	0.000	
Trapper	107	0.000	0.832		0.009	0.028	0.131	
Tatsamenie	16	0.000	0.000		0.938	0.000	0.063	
Crescent	71	0.014	0.197		0.000	0.535	0.254	
Speel	36	0.028	0.028		0.028	0.139	0.778	0.789
4-Stock Functions								
Kuthai	36	0.861	0.056		0.083	0.000		
Trapper	107	0.009	0.888		0.019	0.084		
Tatsamenie	16	0.000	0.000		1.000	0.000		
Crescent	71	0.028	0.254		0.000	0.718		0.867 *
Kuthai	36	0.861	0.056		0.083		0.000	
Trapper	107	0.000	0.888		0.000		0.112	
Tatsamenie	16	0.000	0.000		0.938		0.063	
Speel	36	0.028	0.028		0.000		0.944	0.908
3-Stock Functions								
Kuthai	36	0.861	0.056		0.083			
Trapper	107	0.000	0.981		0.019			
Tatsamenie	16	0.063	0.000		0.938			0.927 *
Trapper	107		0.832		0.019		0.150	
Tatsamenie	16		0.000		1.000		0.000	
Speel	36		0.083		0.028		0.889	0.907 *
2-Stock Functions								
Kuthai	36	0.944	0.056					
Trapper	107	0.000	1.000					0.972 *
Trapper	107		0.981		0.019			
Tatsamenie	16		0.000		1.000			0.991 *

* Indicates functions used in final classification, others were used only for intermediate steps.

Appendix C.1. Age and sex composition of the District 111 gillnet harvest of sockeye salmon, 1990.

			Brood Year and Age Class												
			1987		1986		1985			1984		1983		
Stat. Week	%Males		0.2	1.1	0.3	1.2	0.4	1.3	2.2	1.4	2.3	2.4	3.3	Total
6/17-6/23	57.5	Sample	0	0	7	28	0	314	0	1	24	0	0	374
Week 25		Percent			1.9	7.5		84.0		0.3	6.4			
		S.E.			0.7	1.3		1.8		0.3	1.2			
		Catch			62	246		2,759		9	211			3,287
6/24-6/30	67.5	Sample	0	0	18	52	0	491	4	1	51	1	0	618
Week 26		Percent			2.9	8.4		79.4	0.6	0.2	8.3	0.2		
		S.E.			0.7	11.0		1.6	0.3	0.2	1.1	0.2		
		Catch			244	704		6,649	54	14	691	14		8,370
7/01-7/07	47.1	Sample	1	0	24	30	0	481	7	1	64	0	0	608
Week 27		Percent	0.2		3.9	4.9		79.1	1.2	0.2	10.5			
		S.E.	0.2		0.8	0.9		1.6	0.4	0.2	1.2			
		Catch	18		439	548		8,781	128	18	1,168			11,100
7/08-7/14	42.1	Sample	1	0	39	40	0	415	14	2	74	0	0	585
Week 28		Percent	0.2		6.7	6.8		70.9	2.4	0.3	12.6			
		S.E.	0.2		1.0	1.0		1.8	0.6	0.2	1.4			
		Catch	32		1,247	1,279		13,268	448	64	2,366			18,704
7/15-7/21	34.3	Sample	4	0	57	36	3	433	13	2	59	0	0	607
Week 29		Percent	0.7		9.4	5.9	0.5	71.3	2.1	0.3	9.7			
		S.E.	0.3		1.2	0.9	0.3	1.8	0.6	0.2	1.2			
		Catch	167		2,383	1,506	125	18,106	543	84	2,467			25,381
7/22-7/28	37.0	Sample	10	0	114	64	2	359	12	2	31	0	0	594
Week 30		Percent	1.7		19.2	10.8	0.3	60.4	2.0	0.3	5.2			
		S.E.	0.5		1.6	1.3	0.2	2.0	0.6	0.2	0.9			
		Catch	442		5,037	2,828	88	15,862	530	88	1,370			26,245
7/29-8/04	30.1	Sample	2	0	56	32	1	229	13	1	23	0	0	357
Week 31		Percent	0.6		15.7	9.0	0.3	64.1	3.6	0.3	6.4			
		S.E.	0.4		1.9	1.5	0.3	2.5	1.0	0.3	1.3			
		Catch	38		1,055	603	19	4,312	245	19	433			6,724
8/05-8/11	31.9	Sample	11	0	79	78	0	348	41	6	25	0	1	589
Week 32		Percent	1.9		13.4	13.2		59.1	7.0	1.0	4.2		0.2	
		S.E.	0.5		1.4	1.4		2.0	1.0	0.4	0.8		0.2	
		Catch	235		1,688	1,667		7,436	876	128	534		21	12,585
8/12-8/18	47.6	Sample	9	1	62	70	6	348	36	2	29	0	0	563
Week 33		Percent	1.6	0.2	11.0	12.4	1.1	61.8	6.4	0.4	5.2			
		S.E.	0.5	0.2	1.3	1.3	0.4	2.0	1.0	0.2	0.9			
		Catch	148	16	1,017	1,148	99	5,707	590	33	476			9,234
8/19-9/29	43.2	Sample	2	1	37	54	0	325	40	2	73	0	1	535
Wks 34-39		Percent	0.4	0.2	6.9	10.1		60.7	7.5	0.4	13.6		0.2	
		S.E.	0.3	0.2	1.0	1.2		2.0	1.1	0.3	1.4		0.2	
		Catch	20	10	363	530		3,191	393	20	717		10	5,254
Season	40.8	Sample	40	2	493	484	12	3,743	180	20	453	1	2	5,430
Totals		Percent	0.9	<0.1	10.7	8.7	0.3	67.8	3.0	0.4	8.2	<0.1	<0.1	
		S.E.	0.1	<0.1	0.5	0.4	0.1	0.7	0.2	0.1	0.4	<0.1	<0.1	
		Catch	1,100	26	13,535	11,059	331	86,071	3,807	477	10,433	14	31	126,884

Appendix C.2. Age and sex composition of the Canadian gillnet harvest of sockeye salmon in the Taku River, 1990.

			Brood Year and Age Class									
			1987		1986		1985			1984		
Stat. Week	%Males		0.2	1.1	0.3	1.2	0.4	1.3	2.2	1.4	2.3	Total
6/24-6/30	46.4	Sample	0	0	2	26	0	146	2	2	16	194
Week 26		Percent			1.0	13.4		75.3	1.0	1.0	8.2	
		S.E.			0.7	2.3		3.0	0.7	0.7	1.9	
		Catch			23	297		1,668	23	23	183	2,217
7/01-7/07	63.0	Sample	0	0	4	25	0	147	2	0	11	189
Week 27		Percent			2.1	13.2		77.8	1.1		5.8	
		S.E.			1.0	2.3		2.8	0.7		1.6	
		Catch			32	199		1,173	16		88	1,508
7/08-7/14	[a]	Sample	3	0	7	26	1	143	1	0	10	191
Week 28		Percent	1.6		3.7	13.6	0.5	74.9	0.5		5.2	
		S.E.	0.9		1.3	2.4	0.5	3.1	0.5		1.6	
		Catch	58		136	506	19	2,777	19		194	3,709
7/15-7/21		Sample	2	0	14	17	0	132	6	0	25	196
Week 29		Percent	1.0		7.1	8.7		67.3	3.1		12.8	
		S.E.	0.7		1.8	1.9		3.2	1.2		2.3	
		Catch	30		209	253		1,968	89		373	2,922
7/22-7/28		Sample	6	0	12	36	1	102	11	0	11	179
Week 30		Percent	3.4		6.7	20.1	0.6	57.0	6.1		6.1	
		S.E.	1.3		1.8	2.9	0.5	3.6	1.8		1.8	
		Catch	147		295	883	25	2,504	270		270	4,394
7/29-8/04		Sample	4	0	24	25	0	102	8	0	8	171
Week 31		Percent	2.3		14.0	14.6		59.6	4.7		4.7	
		S.E.	1.1		2.6	2.6		3.7	1.6		1.6	
		Catch	81		488	508		2,075	163		163	3,478
8/05-8/11		Sample	11	0	30	30	0	107	7	0	5	190
Week 32		Percent	5.8		15.8	15.8		56.3	3.7		2.6	
		S.E.	1.6		2.5	2.5		3.4	1.3		1.1	
		Catch	84		229	230		818	54		38	1,453
8/12-8/18		Sample	4	1	25	20	1	80	6	0	6	143
Week 33		Percent	2.8	0.7	17.5	14.0	0.7	55.9	4.2		4.2	
		S.E.	1.2	0.6	2.7	2.4	0.6	3.5	1.4		1.4	
		Catch	14	3	83	66	3	265	20		20	474
8/19-8/25		Sample	1	0	10	13	0	80	4	0	2	110
Week 34		Percent	0.9		9.1	11.8		72.7	3.6		1.8	
		S.E.	0.9		2.6	2.9		4.0	1.7		1.2	
		Catch	9		86	112		687	34		17	945
Season		Sample	31	1	128	218	3	1,039	47	2	94	1,563
Totals		Percent	2.0	<0.1	7.5	14.5	0.2	66.0	3.3	0.1	6.4	
		S.E.	0.4	<0.1	0.7	1.0	0.1	1.3	0.5	0.1	0.7	
		Catch	423	3	1,581	3,054	47	13,935	688	23	1,346	21,100

[a] Sex ratios are available only for Statistical Week 26 and 27.

Appendix C.3. Age and sex composition of Taku River sockeye salmon caught in the Canyon Island fish wheels, 1990.

			Brood Year and Age Class												
			1988	1987		1986			1985			1984		1983	
Stat. Week	%Males		0.1	0.2	1.1	0.3	1.2	2.1	0.4	1.3	2.2	1.4	2.3	2.4	Total
6/03-6/23	39.8	Sample	0	1	0	3	27	0	0	195	2	0	22	0	250
Wks 23-25		Percent		0.4		1.2	10.8			78.0	0.8		8.8		
		S.E.		0.4		0.7	2.0			2.6	0.6		1.8		
6/24-6/30	54.1	Sample	0	5	0	8	104	0	0	208	17	1	8	0	351
Week 26		Percent		1.4		2.3	29.6			59.3	4.8	0.3	2.3		
		S.E.		0.6		0.8	2.4			2.6	1.1	0.3	0.8		
7/01-7/07	57.5	Sample	1	8	9	11	239	0	0	414	25	4	62	0	773
Week 27		Percent	0.1	1.0	1.2	1.4	30.9			53.6	3.2	0.5	8.0		
		S.E.	0.1	0.4	0.4	0.4	1.6			1.8	0.6	0.3	1.0		
7/08-7/14	55.7	Sample	0	19	11	15	180	1	1	280	35	0	37	0	579
Week 28		Percent		3.3	1.9	2.6	31.1	0.2	0.2	48.4	6.0		6.4		
		S.E.		0.7	0.6	0.7	1.9	0.2	0.2	2.0	1.0		1.0		
7/15-7/21	60.7	Sample	1	11	8	13	103	1	0	213	15	0	28	0	393
Week 29		Percent	0.3	2.8	2.0	3.3	26.2	0.3		54.2	3.8		7.1		
		S.E.	0.3	0.8	0.7	0.9	2.2	0.3		2.5	1.0		1.3		
7/22-7/28	57.4	Sample	2	49	23	35	133	1	0	161	49	3	19	0	475
Week 30		Percent	0.4	10.3	4.8	7.4	28.0	0.2		33.9	10.3	0.6	4.0		
		S.E.	0.3	1.4	1.0	1.2	2.0	0.2		2.1	1.4	0.4	0.9		
7/29-8/04	50.2	Sample	5	66	39	54	178	3	1	262	44	1	12	0	665
Week 31		Percent	0.8	9.9	5.9	8.1	26.8	0.5	0.2	39.4	6.6	0.2	1.8		
		S.E.	0.3	1.1	0.9	1.0	1.7	0.3	0.1	1.9	0.9	0.1	0.5		
8/05-8/11	50.6	Sample	5	37	16	34	93	0	0	213	32	2	19	0	451
Week 32		Percent	1.1	8.2	3.5	7.5	20.6			47.2	7.1	0.4	4.2		
		S.E.	0.5	1.3	0.9	1.2	1.9			2.3	1.2	0.3	0.9		
8/12-8/18	54.7	Sample	2	18	21	21	65	1	0	127	25	0	5	0	285
Week 33		Percent	0.7	6.3	7.4	7.4	22.8	0.4		44.6	8.8		1.8		
		S.E.	0.5	1.4	1.5	1.5	2.5	0.3		2.9	1.7		0.8		
8/19-8/25	51.0	Sample	1	4	21	7	33	1	1	54	23	0	2	0	147
Week 34		Percent	0.7	2.7	14.3	4.8	22.4	0.7	0.7	36.7	15.6		1.4		
		S.E.	0.7	1.3	2.9	1.8	3.4	0.7	0.7	4.0	3.0		1.0		
8/26-9/22	35.8	Sample	1	1	12	10	26	0	0	49	19	0	1	1	120
Wks 35-38		Percent	0.8	0.8	10.0	8.3	21.7			40.8	15.8		0.8	0.8	
		S.E.	0.8	0.8	2.7	2.5	3.8			4.5	3.3		0.8	0.8	
	53.4	Sample	18	219	160	211	1,181	8	3	2,176	286	11	215	1	4,489
Season		Percent	0.4	4.9	3.6	4.7	26.3	0.2	0.1	48.5	6.4	0.2	4.8	0.0	

Appendix C.4. Age and sex composition of Taku River and Port Snettisham sockeye salmon escapements, 1990.[a]

			Brood Year and Age Class												
			1988	1987		1986			1985			1984		1983	
System	Percent Males		0.1	0.2	1.1	0.3	1.2	2.1	0.4	1.3	2.2	1.4	2.3	2.4	Total
Port Snettisham															
Crescent Lake	31.3	Sample	1	3	0	20	69	0	1	530	5	14	89	1	733
		Percent	0.2	0.4		2.8	9.1		0.1	72.9	0.7	1.9	11.9	0.2	
		S.E.	0.1	0.1		0.4	0.7		0.1	1.1	0.2	0.3	0.8	0.1	
		Escape.	2	5		35	114		1	921	8	24	150	2	1,262
Speel Lake	54.2	Sample	0	9	0	1	844	1	0	935	26	3	43	0	1,862
		Percent		0.5		0.1	45.2	<0.1		50.3	1.4	0.2	2.4		
		S.E.		0.2		0.1	1.2	<0.1		1.2	0.3	0.1	0.4		
		Escape.		87		10	8,188	10		9,071	252	29	417		18,064
Taku River															
Lake Systems															
Kuthai Lake	40.9	Sample	0	0	0	0	34	0	0	238	9	0	44	0	325
		Percent					10.5			73.2	2.8		13.5		
		S.E.					2			2	1		2		
Trapper Lake	55.2	Sample	0	0	0	0	71	0	0	483	51	2	89	0	696
		Percent					10.2			69.8	7.1	0.3	12.5		
		S.E.					1.1			1.6	0.9	0.2	1.2		
		Escape.					966			6,590	675	27	1,185		9,443
Tatsamenie Lake	41.3	Sample	0	47	0	4	300	0	0	280	85	0	28	0	744
		Percent		6.0		0.7	37.1			34.6	15.4		6.2		
		S.E.		0.9		0.3	1.8			1.8	1.5		1.1		
		Escape.		342		38	2,116			1,977	877		356		5,706
Mainstem, River, and Slough Spawners															
Nahlin River	50.3	Sample	0	0	0	1	5	0	0	420	0	0	19	0	445
		Percent				0.2	1.1			94.4			4.3		
		S.E.				0.2	0.5			1.0			0.9		
Shustahini Slough	58.1	Sample	2	5	2	9	4	0	0	8	1	0	0	0	31
		Percent	6.5	16.1	6.5	29.0	12.9			25.8	3.2				
		S.E.	4.5	6.7	4.5	8.3	6.1			8.0	3.2				
Stuhini Creek	56.7	Sample	0	7	3	21	17	0	0	78	1	0	0	0	127
		Percent		5.5	2.4	16.5	13.4			61.4	0.8				
		S.E.		2.0	1.3	3.3	3.0			4.3	0.8				
Tuskwa Slough	62.1	Sample	2	26	6	24	19	0	1	45	0	1	0	0	124
		Percent	1.6	21.0	4.8	19.4	15.3		0.8	36.3		0.8			
		S.E.	1.1	3.6	1.9	3.5	3.2		0.8	4.3		0.8			
Fish Creek	48.4	Sample	0	0	1	2	11	0	0	48	0	0	2	0	64
		Percent			1.6	3.1	17.2			75.0			3.1		
		S.E.			1.6	2.2	4.7			5.4			2.2		

[a] Escapement numbers are from systems which had weirs, the other systems were sampled during spawning ground surveys.

Appendix C.5. Estimated contributions of sockeye salmon stocks originating in Alaska and Canada to Alaska's District 111 drift gillnet fishery, 1990.

		Catch By Age Class								Standard	90% C.I.[a]	
Dates	Group	1.2	1.3	2.2	2.3	0.+	Other	Total	Percent	Error[a]	Lower	Upper
6/17-6/23	Kuthai	198	894	0	88	0	3	1,183	36.0	136.2	959	1,407
Week 25	L. Trapper	11	251	0	104	0	1	367	11.2	185.0	63	671
	Mainstem	11	976	0	0	49	3	1,039	31.6	353.6	457	1,621
	L. Tatsamenie	26	232	0	16	8	1	283	8.6	226.2	0	655
	Crescent	0	406	0	3	5	1	415	12.6	186.2	109	721
	Speel	0	0	0	0	0	0	0	0.0			
	Total	246	2,759	0	211	62	9	3,287				
6/24-6/30	Kuthai	569	372	4	287	0	4	1,236	14.8	198.2	910	1,562
Week 26	L. Trapper	31	2,061	23	341	0	9	2,465	29.5	600.1	1,478	3,452
	Mainstem	31	2,221	1	0	164	8	2,425	29.0	975.0	821	4,029
	L. Tatsamenie	73	1,470	26	53	70	5	1,697	20.3	666.4	601	2,793
	Crescent	0	525	0	10	10	2	547	6.5	440.4	0	1,271
	Speel	0	0	0	0	0	0	0	0.0			
	Total	704	6,649	54	691	244	28	8,370				
7/01-7/07	Kuthai	281	149	6	90	0	1	527	4.7	148.3	283	771
Week 27	L. Trapper	22	2,213	107	1,044	0	6	3,392	30.6	788.9	2,094	4,690
	Mainstem	101	5,453	6	0	433	9	6,002	54.1	924.1	4,482	7,522
	L. Tatsamenie	72	0	6	34	5	0	117	1.1	48.4	37	197
	Crescent	0	966	3	0	19	2	990	8.9	831.8	0	2,358
	Speel	72	0	0	0	0	0	72	0.6	49.9	0	154
	Total	548	8,781	128	1,168	457	18	11,100				
7/08-7/14	Kuthai	654	212	12	59	0	3	940	5.0	263.0	507	1,373
Week 28	L. Trapper	52	3,503	189	1,564	0	19	5,327	28.5	1194.9	3,361	7,293
	Mainstem	235	3,105	4	0	665	13	4,022	21.5	1896.1	903	7,141
	L. Tatsamenie	169	3,064	229	277	421	13	4,173	22.3	1280.4	2,067	6,279
	Crescent	0	3,384	13	466	192	15	4,070	21.8	1091.1	2,275	5,865
	Speel	169	0	1	0	1	1	172	0.9	162.7	0	440
	Total	1,279	13,268	448	2,366	1,279	64	18,704				
7/15-7/21	Kuthai	160	0	3	126	0	1	290	1.1	110.6	108	472
Week 29	L. Trapper	81	5,576	187	1,658	0	28	7,530	29.7	1640.2	4,832	10,228
	Mainstem	254	1,629	2	0	662	7	2,554	10.1	2265.0	0	6,280
	L. Tatsamenie	870	6,556	339	98	1,588	29	9,480	37.4	1789.4	6,537	12,423
	Crescent	0	4,200	11	585	421	18	5,235	20.6	1513.0	2,746	7,724
	Speel	141	145	1	0	4	1	292	1.2	927.8	0	1,818
	Total	1,506	18,106	543	2,467	2,675	84	25,381				
7/22-7/28	Kuthai	300	0	3	34	0	1	338	1.3	146.3	97	579
Week 30	L. Trapper	153	3,268	110	720	0	18	4,269	16.3	1349.5	2,049	6,489
	Mainstem	478	3,252	3	0	2,177	16	5,926	22.6	2176.7	2,345	9,507
	L. Tatsamenie	1,631	6,567	404	448	3,034	39	12,123	46.2	1758.1	9,231	15,015
	Crescent	0	2,125	6	168	335	10	2,644	10.1	1163.4	730	4,558
	Speel	266	650	4	0	21	4	945	3.6	864.4	0	2,367
	Total	2,828	15,862	530	1,370	5,567	88	26,245				
7/29-8/04	Kuthai	0	0	0	11	0	0	11	0.2	45.0	0	85
Week 31	L. Trapper	0	612	51	228	0	3	894	13.3	365.8	292	1,496
	Mainstem	75	2,325	5	0	769	8	3,182	47.3	646.5	2,118	4,246
	L. Tatsamenie	459	1,129	186	141	333	7	2,255	33.5	478.3	1,468	3,042
	Crescent	0	17	0	53	6	0	76	1.1	319.0	0	601
	Speel	69	229	3	0	4	1	306	4.6	227.7	0	680
	Total	603	4,312	245	433	1,112	19	6,724				
8/05-8/11	Kuthai	0	0	1	13	0	0	14	0.1	58.4	0	110
Week 32	L. Trapper	0	208	116	281	0	8	613	4.9	669.4	0	1,714
	Mainstem	208	6,603	56	0	1,675	106	8,648	68.7	1176.1	6,713	10,583
	L. Tatsamenie	1,267	164	674	174	238	24	2,541	20.2	806.7	1,214	3,868
	Crescent	0	0	1	66	4	1	72	0.6	158.2	0	332
	Speel	192	461	28	0	6	10	697	5.5	420.5	5	1,389
	Total	1,667	7,436	876	534	1,923	149	12,585				
8/12-8/18	Kuthai	0	0	0	0	0	0	0	0.0			
Week 33	L. Trapper	0	0	6	31	0	0	37	0.4	19.3	5	69
	Mainstem	412	4,149	28	0	1,028	31	5,648	61.2	657.3	4,567	6,729
	L. Tatsamenie	544	782	522	339	226	11	2,424	26.3	486.2	1,624	3,224
	Crescent	0	0	0	0	0	0	0	0.0			
	Speel	192	776	34	106	10	7	1,125	12.2	423.9	428	1,822
	Total	1,148	5,707	590	476	1,264	49	9,234				
8/19-9/29	Kuthai	0	0	0	0	0	0	0	0.0			
Wks 34-39	L. Trapper	0	0	11	47	0	0	58	1.1	46.6	0	135
	Mainstem	190	2,670	23	0	320	27	3,230	61.5	580.1	2,276	4,184
	L. Tatsamenie	251	80	334	511	56	7	1,239	23.6	390.6	596	1,882
	Crescent	0	182	4	0	5	2	193	3.7	289.0	0	668
	Speel	89	259	21	159	2	4	534	10.2	234.0	149	919
	Total	530	3,191	393	717	383	40	5,254				
Season	Kuthai	2,162	1,627	29	708	0	13	4,539	3.6	425.0	3,840	5,238
Totals	L. Trapper	350	17,692	800	6,018	0	92	24,952	19.7	2736.9	20,450	29,454
	Mainstem	1,995	32,383	128	0	7,942	228	42,676	33.6	4234.8	35,710	49,642
	L. Tatsamenie	5,362	20,044	2,720	2,091	5,979	136	36,332	28.6	3107.8	31,220	41,444
	Crescent	0	11,805	38	1,351	997	51	14,242	11.2	2437.3	10,233	18,251
	Speel	1,190	2,520	92	265	48	28	4,143	3.3	1443.0	1,769	6,517
	Total	11,059	86,071	3,807	10,433	14,966	548	126,884				

[a] The standard errors are minimum estimates since no estimates of the variance for stocks contributing 0 fish during a given week or for fish other than age-1.2, -1.3, or -2.3 are available. The 90% confidence intervals are affected in like manner.

Appendix C.6. Estimated CPUE and migratory timing of sockeye salmon stocks in the Alaska District 111 drift gillnet fishery, 1990.

CPUE

Stat. Week	Days Open	Average Number Boats	Catch per Boat Day Kuthai	Trapper	Mainstem	L. Tats.	Crescent	Speel	Total
25	3.0	56	7	2	6	2	2	0	20
26	3.0	77	5	11	10	7	2	0	36
27	3.0	71	2	16	28	1	5	0	52
28	2.7	94	4	21	16	16	16	1	74
29	2.7	113	1	25	8	31	17	1	83
30	4.0	99	1	11	15	31	7	2	66
31	3.0	52	0	6	20	14	0	2	43
32	3.0	87	0	2	33	10	0	3	48
33	3.0	78	0	0	24	10	0	5	39
34-39	12.0	75	0	0	4	1	0	1	6
Total			20	94	165	124	50	14	468

Migratory Timing

Stat. Week	Proportion of Catch per Boat Day Kuthai	Trapper	Mainstem	L. Tats.	Crescent	Speel	Total
25	0.34	0.02	0.04	0.01	0.05	0.00	0.04
26	0.26	0.11	0.06	0.06	0.05	0.00	0.08
27	0.12	0.17	0.17	0.00	0.09	0.02	0.11
28	0.18	0.22	0.10	0.13	0.32	0.05	0.16
29	0.05	0.26	0.05	0.25	0.34	0.07	0.18
30	0.04	0.12	0.09	0.25	0.13	0.17	0.14
31	0.00	0.06	0.12	0.12	0.01	0.14	0.09
32	0.00	0.03	0.20	0.08	0.01	0.19	0.10
33	0.00	0.00	0.15	0.08	0.00	0.33	0.08
34-39	0.00	0.00	0.02	0.01	0.00	0.04	0.01
Total	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Appendix C.7. Estimated contributions of sockeye salmon stocks to the Canadian commercial fishery in the Taku River, 1990.

		Catch By Age Class									90% C.I.[a]	
Dates	Group	1.2	1.3	2.2	2.3	0.+	Other	Total	Percent	Standard Error[a]	Lower	Upper
6/24-6/30	Kuthai	275	616	7	109	0	11	1,018	45.9	92.2	866	1,170
Week 26	L. Trapper	0	526	11	74	0	6	617	27.8	133.2	398	836
	Mainstem	20	374	0	0	19	4	417	18.8	185.2	112	722
	L. Tatsamenie	2	152	5	0	4	2	165	7.4	133.8	0	385
	Total	297	1,668	23	183	23	23	2,217				
7/01-7/07	Kuthai	185	59	1	52	0	0	297	19.7	58.7	200	394
Week 27	L. Trapper	0	955	13	36	0	0	1,004	66.6	121.8	804	1,204
	Mainstem	13	50	0	0	16	0	79	5.2	149.2	0	324
	L. Tatsamenie	1	109	2	0	16	0	128	8.5	94.8	0	284
	Total	199	1,173	16	88	32	0	1,508				
7/08-7/14	Kuthai	308	189	2	0	0	0	499	13.5	95.8	341	657
Week 28	L. Trapper	123	1,438	17	194	0	0	1,772	47.8	257.7	1,348	2,196
	Mainstem	74	1,150	0	0	213	0	1,437	38.7	255.2	1,017	1,857
	L. Tatsamenie	1	0	0	0	0	0	1	0.0	16.9	0	29
	Total	506	2,777	19	194	213	0	3,709				
7/15-7/21	Kuthai	154	0	3	0	0	0	157	5.4	68.0	45	269
Week 29	L. Trapper	62	854	72	373	0	0	1,361	46.6	196.6	1,038	1,684
	Mainstem	36	992	2	0	223	0	1,253	42.9	257.4	830	1,676
	L. Tatsamenie	1	122	12	0	16	0	151	5.2	167.3	0	426
	Total	253	1,968	89	373	239	0	2,922				
7/22-7/28	Kuthai	201	50	7	0	0	0	258	5.9	68.6	145	371
Week 30	L. Trapper	122	1,755	158	247	0	0	2,282	51.9	281.2	1,819	2,745
	Mainstem	141	346	1	0	236	0	724	16.5	349.3	149	1,299
	L. Tatsamenie	419	353	104	23	231	0	1,130	25.7	245.3	726	1,534
	Total	883	2,504	270	270	467	0	4,394				
7/29-8/04	Kuthai	116	0	3	0	0	0	119	3.4	80.3	0	251
Week 31	L. Trapper	70	575	53	149	0	0	847	24.4	214.2	495	1,199
	Mainstem	81	861	2	0	362	0	1,306	37.6	299.0	814	1,798
	L. Tatsamenie	241	639	105	14	207	0	1,206	34.7	257.7	782	1,630
	Total	508	2,075	163	163	569	0	3,478				
8/05-8/11	Kuthai	4	0	0	0	0	0	4	0.3	3.9	0	10
Week 32	L. Trapper	8	99	12	35	0	0	154	10.6	649.8	0	1,223
	Mainstem	64	626	2	0	257	0	949	65.3	117.0	757	1,141
	L. Tatsamenie	154	93	40	3	56	0	346	23.8	94.4	191	501
	Total	230	818	54	38	313	0	1,453				
8/12-8/18	Kuthai	1	0	0	0	0	0	1	0.2	4.9	0	9
Week 33	L. Trapper	2	6	4	18	0	0	30	6.3	43.7	0	102
	Mainstem	18	242	1	0	87	2	350	73.8	53.3	262	438
	L. Tatsamenie	45	17	15	2	13	1	93	19.6	51.0	9	177
	Total	66	265	20	20	100	3	474				
8/19-8/25	Kuthai	2	0	0	0	0	0	2	0.2	6.8	0	13
Week 34	L. Trapper	4	87	9	16	0	0	116	12.3	77.4	0	243
	Mainstem	31	504	1	0	80	0	616	65.2	116.6	424	808
	L. Tatsamenie	75	96	24	1	15	0	211	22.3	97.0	52	370
	Total	112	687	34	17	95	0	945				
	Kuthai	1,246	914	23	161	0	11	2,355	11.2	180.0	2,059	2,651
	L. Trapper	391	6,295	349	1,142	0	6	8,183	38.8	825.4	6,825	9,541
Season	Mainstem	478	5,145	9	0	1,493	6	7,131	33.8	647.3	6,066	8,196
Totals	L. Tatsamenie	939	1,581	307	43	558	3	3,431	16.3	438.8	2,709	4,153
	Total	3,054	13,935	688	1,346	2,051	26	21,100				

[a] The standard errors are minimum estimates since no estimates of the variance for stocks contributing 0 fish during a given week or for the fish other than age-1.2, 1.3, and 2.3 are available. The 90% confidence intervals are affected in like manner.

Appendix C.8. Estimated CPUE and migratory timing of sockeye salmon stocks caught in the Taku River commercial fishery, 1990.

CPUE

Stat. Week	Days Open	Average Number Permits	Catch per Permit Day: Kuthai	Trapper	Mainstem	L. Tats.	Total
26	2.3	11.0	40	24	16	7	88
27	2.0	10.0	15	50	4	6	75
28	4.0	13.0	10	34	28	0	71
29	3.0	11.0	5	41	38	5	89
30	4.0	13.0	5	44	14	22	85
31	4.0	11.9	3	18	27	25	73
32	3.0	10.7	0	5	30	11	45
33	2.0	5.0	0	3	35	9	47
34	4.0	5.8	0	5	27	9	41
Total			77	224	219	94	614

Migratory Timing

Stat. Week	Proportion of Catch per Boat Day: Kuthai	Trapper	Mainstem	L. Tats.	Total
26	0.52	0.11	0.08	0.07	0.14
27	0.19	0.22	0.02	0.07	0.12
28	0.12	0.15	0.13	0.00	0.12
29	0.06	0.18	0.17	0.05	0.14
30	0.06	0.20	0.06	0.23	0.14
31	0.03	0.08	0.13	0.27	0.12
32	0.00	0.02	0.14	0.11	0.07
33	0.00	0.01	0.16	0.10	0.08
34	0.00	0.02	0.12	0.10	0.07
Total	1.00	1.00	1.00	1.00	1.00

Appendix C.9. Estimated contributions of sockeye salmon stocks to the Canadian test fishery in the Taku River, 1990.[a]

		Catch By Age Class							
Dates	Group	1.2	1.3	2.2	2.3	0.+	Other	Total	Percent
6/17-6/23 Week 25	Kuthai	2	4	0	1	0	0	7	43.8
	L. Trapper	0	4	0	1	0	0	5	31.3
	Mainstem	0	3	0	0	0	0	3	18.8
	L. Tatsamenie	0	1	0	0	0	0	1	6.3
	Total	2	12	0	2	0	0	16	
6/24-6/30 Week 26	Kuthai	6	16	0	2	0	0	24	47.1
	L. Trapper	0	13	0	2	0	0	15	29.4
	Mainstem	0	9	0	0	0	0	9	17.6
	L. Tatsamenie	0	3	0	0	0	0	3	5.9
	Total	6	41	0	4	0	0	51	
7/01-7/07 Week 27	Kuthai	6	2	0	2	0	0	10	18.9
	L. Trapper	0	34	0	1	0	0	35	66.0
	Mainstem	0	2	0	0	1	0	3	5.7
	L. Tatsamenie	0	4	0	0	1	0	5	9.4
	Total	6	42	0	3	2	0	53	
7/08-7/14 Week 28	Kuthai	2	1	0	0	0	0	3	12.0
	L. Trapper	1	11	0	1	0	0	13	52.0
	Mainstem	0	8	0	0	1	0	9	36.0
	L. Tatsamenie	0	0	0	0	0	0	0	0.0
	Total	3	20	0	1	1	0	25	
7/15-7/21 Week 29	Kuthai	1	0	0	0	0	0	1	5.9
	L. Trapper	0	5	0	2	0	0	7	41.2
	Mainstem	0	7	0	0	1	0	8	47.1
	L. Tatsamenie	0	1	0	0	0	0	1	5.9
	Total	1	13	0	2	1	0	17	
7/22-7/28 Week 30	Kuthai	1	0	0	0	0	0	1	4.8
	L. Trapper	1	8	1	1	0	0	11	52.4
	Mainstem	1	2	0	0	1	0	4	19.0
	L. Tatsamenie	2	2	0	0	1	0	5	23.8
	Total	5	12	1	1	2	0	21	
7/29-8/04 Week 31	Kuthai	0	0	0	0	0	0	0	0.0
	L. Trapper	0	1	0	0	0	0	1	11.1
	Mainstem	0	3	0	0	1	0	4	44.4
	L. Tatsamenie	1	2	0	0	1	0	4	44.4
	Total	1	6	0	0	2	0	9	
8/05-8/11 Week 32	Kuthai	0	0	0	0	0	0	0	0.0
	L. Trapper	0	1	0	0	0	0	1	7.7
	Mainstem	1	6	0	0	2	0	9	69.2
	L. Tatsamenie	1	1	0	0	1	0	3	23.1
	Total	2	8	0	0	3	0	13	
8/12-8/18 Week 33	Kuthai	0	0	0	0	0	0	0	0.0
	L. Trapper	0	0	0	0	0	0	0	0.0
	Mainstem	0	4	0	0	1	0	5	83.3
	L. Tatsamenie	1	0	0	0	0	0	1	16.7
	Total	1	4	0	0	1	0	6	
8/19-9/15 Wks 34-37	Kuthai	0	0	0	0	0	0	0	0.0
	L. Trapper	0	7	1	1	0	0	9	12.2
	Mainstem	2	40	0	0	6	0	48	64.9
	L. Tatsamenie	6	8	2	0	1	0	17	23.0
	Total	8	55	3	1	7	0	74	
Season Totals	Kuthai	18	23	0	5	0	0	46	16.1
	L. Trapper	2	84	2	9	0	0	97	34.0
	Mainstem	4	84	0	0	14	0	102	35.8
	L. Tatsamenie	11	22	2	0	5	0	40	14.0
	Total	35	213	4	14	19	0	285	

[a] Weekly age and stock compositions were assumed to be the same as for the commercial catch.

Appendix C.10. Estimated contributions of sockeye salmon stocks to the Canadian test fishery in the Taku River, 1990.

Dates	Group	Catch By Age Class 1.2	1.3	2.2	2.3	0.+	Other	Total	Percent
6/17-6/23	Kuthai	2	4	0	1	0	0	7	43.8
Week 25	L. Trapper	0	4	0	1	0	0	5	31.3
	Mainstem	0	3	0	0	0	0	3	18.8
	L. Tatsamenie	0	1	0	0	0	0	1	6.3
	Total	2	12	0	2	0	0	16	
6/24-6/30	Kuthai	6	16	0	2	0	0	24	47.1
Week 26	L. Trapper	0	13	0	2	0	0	15	29.4
	Mainstem	0	9	0	0	0	0	9	17.6
	L. Tatsamenie	0	3	0	0	0	0	3	5.9
	Total	6	41	0	4	0	0	51	
7/01-7/07	Kuthai	6	2	0	2	0	0	10	18.9
Week 27	L. Trapper	0	34	0	1	0	0	35	66.0
	Mainstem	0	2	0	0	1	0	3	5.7
	L. Tatsamenie	0	4	0	0	1	0	5	9.4
	Total	6	42	0	3	2	0	53	
7/08-7/14	Kuthai	2	1	0	0	0	0	3	12.0
Week 28	L. Trapper	1	11	0	1	0	0	13	52.0
	Mainstem	0	8	0	0	1	0	9	36.0
	L. Tatsamenie	0	0	0	0	0	0	0	0.0
	Total	3	20	0	1	1	0	25	
7/15-7/21	Kuthai	1	0	0	0	0	0	1	5.9
Week 29	L. Trapper	0	5	0	2	0	0	7	41.2
	Mainstem	0	7	0	0	1	0	8	47.1
	L. Tatsamenie	0	1	0	0	0	0	1	5.9
	Total	1	13	0	2	1	0	17	
7/22-7/28	Kuthai	1	0	0	0	0	0	1	4.8
Week 30	L. Trapper	1	8	1	1	0	0	11	52.4
	Mainstem	1	2	0	0	1	0	4	19.0
	L. Tatsamenie	2	2	0	0	1	0	5	23.8
	Total	5	12	1	1	2	0	21	
7/29-8/04	Kuthai	0	0	0	0	0	0	0	0.0
Week 31	L. Trapper	0	1	0	0	0	0	1	11.1
	Mainstem	0	3	0	0	1	0	4	44.4
	L. Tatsamenie	1	2	0	0	1	0	4	44.4
	Total	1	6	0	0	2	0	9	
8/05-8/11	Kuthai	0	0	0	0	0	0	0	0.0
Week 32	L. Trapper	0	1	0	0	0	0	1	7.7
	Mainstem	1	6	0	0	2	0	9	69.2
	L. Tatsamenie	1	1	0	0	1	0	3	23.1
	Total	2	8	0	0	3	0	13	
8/12-8/18	Kuthai	0	0	0	0	0	0	0	0.0
Week 33	L. Trapper	0	0	0	0	0	0	0	0.0
	Mainstem	0	4	0	0	1	0	5	83.3
	L. Tatsamenie	1	0	0	0	0	0	1	16.7
	Total	1	4	0	0	1	0	6	
8/19-9/15	Kuthai	0	0	0	0	0	0	0	0.0
Wks 34-37	L. Trapper	0	7	1	1	0	0	9	12.2
	Mainstem	2	40	0	0	6	0	48	64.9
	L. Tatsamenie	6	8	2	0	1	0	17	23.0
	Total	8	55	3	1	7	0	74	
	Kuthai	18	23	0	5	0	0	46	16.1
	L. Trapper	2	84	2	9	0	0	97	34.0
Season	Mainstem	4	84	0	0	14	0	102	35.8
Totals	L. Tatsamenie	11	22	2	0	5	0	40	14.0
	Total	35	213	4	14	19	0	285	

[a] Weekly age and stock compositions were assumed to be the same as for the commercial catch.

Appendix D.1. Stock compositions of sockeye salmon harvested in Alaska District 111 drift gillnet fishery, 1986-1990.[a]

Stat. Week	Stock Group	Year and Start Date of Week 25 6/15 1986	6/14 1987	6/19 1988	6/18 1989	6/17 1990	Average[b]
25	Kuthai	0.783			0.493	0.360	0.572
	Little Trapper	0.048			0.431	0.112	0.080
	Mainstem	0.057				0.316	0.187
	Little Tatsamenie	0.050			0.020	0.086	0.068
	Crescent	0.033			0.016	0.126	0.079
	Speel	0.029			0.041	0.000	0.015
	Percent Taku	0.938			0.943	0.874	0.906
26	Kuthai	0.689	0.615	0.658	0.159	0.148	0.527
	Little Trapper	0.123	0.000	0.193	0.743	0.295	0.153
	Mainstem	0.125	0.352	0.000		0.290	0.192
	Little Tatsamenie	0.015	0.014	0.113	0.088	0.203	0.086
	Crescent	0.006	0.018	0.019	0.000	0.065	0.027
	Speel	0.041	0.000	0.017	0.011	0.000	0.015
	Percent Taku	0.952	0.982	0.964	0.989	0.935	0.958
27	Kuthai	0.341	0.311	0.408	0.085	0.047	0.277
	Little Trapper	0.319	0.216	0.390	0.805	0.306	0.308
	Mainstem	0.208	0.336	0.000		0.541	0.271
	Little Tatsamenie	0.005	0.037	0.089	0.089	0.011	0.035
	Crescent	0.096	0.013	0.081	0.000	0.089	0.070
	Speel	0.031	0.086	0.033	0.021	0.006	0.039
	Percent Taku	0.874	0.901	0.886	0.979	0.904	0.891
28	Kuthai	0.068	0.097	0.136	0.013	0.050	0.088
	Little Trapper	0.666	0.347	0.597	0.755	0.285	0.474
	Mainstem	0.103	0.385	0.000		0.215	0.176
	Little Tatsamenie	0.042	0.054	0.156	0.083	0.223	0.119
	Crescent	0.107	0.072	0.080	0.063	0.218	0.119
	Speel	0.013	0.045	0.031	0.086	0.009	0.025
	Percent Taku	0.880	0.884	0.889	0.852	0.773	0.856
29	Kuthai	0.048	0.067	0.024	0.012	0.011	0.038
	Little Trapper	0.384	0.590	0.143	0.663	0.297	0.354
	Mainstem	0.303	0.235	0.252		0.101	0.223
	Little Tatsamenie	0.116	0.056	0.090	0.159	0.374	0.159
	Crescent	0.126	0.016	0.447	0.049	0.206	0.199
	Speel	0.022	0.036	0.043	0.116	0.012	0.028
	Percent Taku	0.852	0.948	0.510	0.835	0.782	0.773
30	Kuthai	0.003	0.044	0.012	0.014	0.013	0.018
	Little Trapper	0.249	0.178	0.020	0.329	0.163	0.152
	Mainstem	0.292	0.182	0.568		0.226	0.317
	Little Tatsamenie	0.234	0.010	0.043	0.298	0.462	0.187
	Crescent	0.112	0.304	0.188	0.062	0.101	0.176
	Speel	0.111	0.281	0.169	0.297	0.036	0.149
	Percent Taku	0.778	0.414	0.643	0.641	0.863	0.674
31	Kuthai	0.000	0.000	0.000	0.021	0.002	0.000
	Little Trapper	0.171	0.084	0.000	0.261	0.133	0.097
	Mainstem	0.392	0.498	0.562		0.473	0.481
	Little Tatsamenie	0.288	0.037	0.115	0.399	0.335	0.194
	Crescent	0.047	0.301	0.273	0.134	0.011	0.158
	Speel	0.102	0.080	0.050	0.186	0.046	0.069
	Percent Taku	0.851	0.619	0.677	0.681	0.943	0.773
32	Kuthai	0.013	0.022	0.005	0.000	0.001	0.010
	Little Trapper	0.082	0.158	0.000	0.572	0.049	0.072
	Mainstem	0.262	0.509	0.404		0.687	0.466
	Little Tatsamenie	0.399	0.000	0.118	0.347	0.202	0.180
	Crescent	0.143	0.139	0.452	0.061	0.006	0.185
	Speel	0.100	0.172	0.020	0.020	0.055	0.087
	Percent Taku	0.757	0.689	0.528	0.919	0.939	0.728
33	Kuthai	0.001	0.000	0.013	0.023	0.000	0.003
	Little Trapper	0.003	0.152	0.032	0.323	0.004	0.048
	Mainstem	0.474	0.643	0.389		0.612	0.529
	Little Tatsamenie	0.416	0.046	0.044	0.331	0.263	0.192
	Crescent	0.000	0.159	0.466	0.190	0.000	0.156
	Speel	0.107	0.000	0.056	0.134	0.122	0.071
	Percent Taku	0.893	0.841	0.478	0.676	0.878	0.772
34-40	Kuthai	0.001	0.000	0.000		0.000	0.000
	Little Trapper	0.111	0.000	0.094		0.011	0.054
	Mainstem	0.404	0.693	0.252		0.615	0.491
	Little Tatsamenie	0.223	0.037	0.000		0.236	0.124
	Crescent	0.115	0.035	0.585		0.037	0.193
	Speel	0.146	0.234	0.069		0.102	0.138
	Percent Taku	0.739	0.731	0.346		0.862	0.669
Season Totals	Kuthai	0.061	0.078	0.119	0.077	0.036	0.074
	Little Trapper	0.266	0.234	0.158	0.616	0.197	0.214
	Mainstem	0.303	0.376	0.305		0.336	0.330
	Little Tatsamenie	0.204	0.031	0.082	0.156	0.286	0.151
	Crescent	0.091	0.157	0.265	0.051	0.112	0.156
	Speel	0.076	0.123	0.071	0.100	0.033	0.076
	Total Taku	0.834	0.720	0.665	0.848	0.855	0.794
	Total Snettisham	0.166	0.280	0.335	0.152	0.145	0.206

[a] The last figures in each column include catch from that week through the end of the season.
[b] Averages do not include 1989 because the Mainstem and Trapper groups were combined.

Appendix D.2. Stock specific weekly catches of sockeye salmon in Alaska District 111 drift gillnet fisheries, 1986-1990.[a]

Stat. Week	Stock Group	Year and Start Date of Week 25 6/15 1986	6/14 1987	6/19 1988	6/18 1989	6/17 1990	Average[b]
25	Kuthai	506			3,014	1,183	845
	Little Trapper	31			2,636	367	199
	Mainstem	37				1,039	538
	Little Tatsamenie	32			120	283	158
	Crescent	21			99	415	218
	Speel	19			250	0	10
	Total	646			6,119	3,287	1,967
26	Kuthai	1,113	1,607	1,808	1,125	1,236	1,441
	Little Trapper	199	0	530	5,267	2,465	799
	Mainstem	202	920	0		2,425	887
	Little Tatsamenie	25	36	311	626	1,697	517
	Crescent	10	48	53	0	547	164
	Speel	67	0	47	75	0	29
	Total	1,616	2,611	2,749	7,093	8,370	3,837
27	Kuthai	1,486	1,934	1,982	880	527	1,482
	Little Trapper	1,390	1,344	1,895	8,353	3,392	2,005
	Mainstem	904	2,085	0		6,002	2,248
	Little Tatsamenie	23	231	431	923	117	201
	Crescent	416	80	395	0	990	470
	Speel	134	535	158	222	72	225
	Total	4,353	6,209	4,861	10,378	11,100	6,631
28	Kuthai	614	531	535	219	940	655
	Little Trapper	5,994	1,906	2,354	13,103	5,327	3,895
	Mainstem	931	2,114	0		4,022	1,767
	Little Tatsamenie	381	297	615	1,448	4,173	1,366
	Crescent	960	395	315	1,090	4,070	1,435
	Speel	120	244	124	1,485	172	165
	Total	9,000	5,487	3,943	17,345	18,704	9,284
29	Kuthai	641	935	147	181	290	503
	Little Trapper	5,138	8,260	862	9,944	7,530	5,448
	Mainstem	4,051	3,289	1,516		2,554	2,852
	Little Tatsamenie	1,551	781	541	2,390	9,480	3,088
	Crescent	1,690	220	2,691	741	5,235	2,459
	Speel	294	507	257	1,737	292	338
	Total	13,365	13,992	6,014	14,993	25,381	14,688
30	Kuthai	31	674	111	112	338	288
	Little Trapper	2,744	2,756	186	2,643	4,269	2,489
	Mainstem	3,222	2,813	5,287		5,926	4,312
	Little Tatsamenie	2,582	160	398	2,391	12,123	3,816
	Crescent	1,230	4,703	1,751	498	2,644	2,582
	Speel	1,222	4,351	1,573	2,388	945	2,023
	Total	11,031	15,457	9,306	8,032	26,245	15,510
31	Kuthai	2	0	0	83	11	3
	Little Trapper	2,747	1,189	0	1,037	894	1,207
	Mainstem	6,301	7,024	2,393		3,182	4,725
	Little Tatsamenie	4,622	519	488	1,586	2,255	1,971
	Crescent	753	4,253	1,161	531	76	1,561
	Speel	1,634	1,130	214	739	306	821
	Total	16,059	14,115	4,256	3,976	6,724	10,289
32	Kuthai	69	205	15	1	14	76
	Little Trapper	439	1,508	0	1,440	613	640
	Mainstem	1,409	4,844	1,135		8,648	4,009
	Little Tatsamenie	2,144	0	331	873	2,541	1,254
	Crescent	769	1,327	1,268	153	72	859
	Speel	538	1,637	57	51	697	732
	Total	5,368	9,521	2,806	2,518	12,585	7,570
33	Kuthai	3	0	27	81	0	8
	Little Trapper	15	628	66	1,150	37	187
	Mainstem	2,358	2,662	812		5,648	2,870
	Little Tatsamenie	2,067	192	91	1,179	2,424	1,194
	Crescent	0	660	972	677	0	408
	Speel	530	0	117	478	1,125	443
	Total	4,973	4,142	2,085	3,565	9,234	5,109
34-40	Kuthai	8	0	0		0	2
	Little Trapper	736	0	273		58	267
	Mainstem	2,688	2,549	729		3,230	2,299
	Little Tatsamenie	1,482	138	0		1,239	715
	Crescent	767	129	1,696		193	696
	Speel	969	862	201		534	641
	Total	6,650	3,678	2,898		5,254	4,620
Season Totals	Kuthai	4,473	5,885	4,625	5,696	4,539	4,880
	Little Trapper	19,433	17,591	6,166	45,573	24,952	17,036
	Mainstem	22,103	28,300	11,872		42,676	26,238
	Little Tatsamenie	14,909	2,354	3,206	11,536	36,332	14,200
	Crescent	6,616	11,815	10,302	3,789	14,242	10,744
	Speel	5,527	9,267	2,748	7,425	4,143	5,421
	Total	73,061	75,212	38,918	74,019	126,884	78,519
	Total Taku	60,918	54,130	25,868	62,805	108,499	62,354
	Total Snettisham	12,143	21,082	13,050	11,214	18,385	16,165

[a] The last figures in each column include catch for that week through the end of the season.
[b] Averages do not include 1989 because the Mainstem and Trapper groups were combined.

Appendix D.3. Stock compositions of sockeye salmon harvested in the Canadian commercial fishery in Taku River, 1986-1990.

		Year and Start Date Week 26					
Stat. Week	Stock Group	6/22 1986	6/21 1987	6/19 1988	6/25 1989	6/24 1990	Average[a]
26	Kuthai				0.316	0.459	
	Little Trapper					0.278	
	Mainstem				0.649	0.188	
	Little Tatsamenie				0.035	0.074	
27	Kuthai	0.694	0.405	0.650	0.108	0.197	0.487
	Little Trapper	0.244	0.208	0.218		0.666	0.334
	Mainstem	0.060	0.343	0.076	0.789	0.052	0.133
	Little Tatsamenie	0.001	0.044	0.057	0.103	0.085	0.047
28	Kuthai	0.348	0.405	0.334	0.008	0.135	0.305
	Little Trapper	0.475	0.208	0.433		0.478	0.399
	Mainstem	0.161	0.343	0.208	0.860	0.387	0.275
	Little Tatsamenie	0.016	0.044	0.025	0.133	0.000	0.021
29	Kuthai	0.114	0.171	0.060	0.009	0.054	0.100
	Little Trapper	0.582	0.623	0.585		0.466	0.564
	Mainstem	0.275	0.206	0.192	0.904	0.429	0.276
	Little Tatsamenie	0.029	0.000	0.163	0.087	0.052	0.061
30	Kuthai	0.039	0.075	0.043	0.006	0.059	0.054
	Little Trapper	0.518	0.294	0.641		0.519	0.493
	Mainstem	0.323	0.578	0.273	0.856	0.165	0.335
	Little Tatsamenie	0.120	0.053	0.043	0.138	0.257	0.118
31	Kuthai	0.005	0.019	0.042	0.004	0.034	0.025
	Little Trapper	0.351	0.162	0.369		0.244	0.282
	Mainstem	0.421	0.762	0.366	0.520	0.376	0.481
	Little Tatsamenie	0.224	0.057	0.223	0.477	0.347	0.213
32	Kuthai	0.018	0.015	0.003	0.012	0.003	0.010
	Little Trapper	0.138	0.150	0.274		0.106	0.167
	Mainstem	0.541	0.650	0.685	0.595	0.653	0.632
	Little Tatsamenie	0.303	0.186	0.038	0.394	0.238	0.191
33	Kuthai	0.001	0.000	0.003	0.000	0.002	0.002
	Little Trapper	0.200	0.000	0.272		0.063	0.134
	Mainstem	0.484	0.927	0.674	0.632	0.738	0.706
	Little Tatsamenie	0.314	0.073	0.051	0.368	0.196	0.159
34	Kuthai	0.002	0.000	0.002	0.000	0.002	0.002
	Little Trapper	0.136	0.000	0.207		0.123	0.116
	Mainstem	0.621	1.000	0.742	0.632	0.652	0.754
	Little Tatsamenie	0.241	0.000	0.049	0.368	0.223	0.128
	Kuthai	0.111	0.062	0.143	0.053	0.112	0.107
Season Totals	Little Trapper	0.397	0.201	0.417		0.388	0.351
	Mainstem	0.350	0.649	0.343	0.744	0.338	0.420
	Little Tatsamenie	0.143	0.088	0.098	0.203	0.163	0.123

[a] Averages do not include 1989 because the Trapper and Mainstem groups were combined.

Appendix D.4. Stock specific weekly catches of sockeye salmon in the Canadian commercial fishery in Taku River, 1986-1990.

		Year and Start Date Week 26					
Stat. Week	Stock Group	6/22 1986	6/21 1987	6/19 1988	6/25 1989	6/24 1990	Average[a]
26	Kuthai				493	1,018	
	Little Trapper					617	
	Mainstem				1,014	417	
	Little Tatsamenie				55	165	
	Total				1,562	2,217	
27	Kuthai	484	72	1,142	398	297	499
	Little Trapper	170	37	383		1,004	399
	Mainstem	42	61	133	2,908	79	79
	Little Tatsamenie	1	8	100	381	128	59
	Total	697	178	1,758	3,687	1,508	1,035
28	Kuthai	729	206	241	16	499	419
	Little Trapper	996	106	312		1,772	796
	Mainstem	337	174	150	1,795	1,437	525
	Little Tatsamenie	34	22	18	277	1	19
	Total	2,096	508	721	2,088	3,709	1,759
29	Kuthai	220	134	158	21	157	167
	Little Trapper	1,119	487	1,547		1,361	1,129
	Mainstem	530	161	508	2,057	1,253	613
	Little Tatsamenie	55	0	432	197	151	160
	Total	1,924	782	2,645	2,275	2,922	2,068
30	Kuthai	158	348	92	21	258	214
	Little Trapper	2,072	1,357	1,388		2,282	1,775
	Mainstem	1,293	2,669	591	2,799	724	1,319
	Little Tatsamenie	480	247	93	451	1,130	488
	Total	4,003	4,621	2,164	3,271	4,394	3,796
31	Kuthai	14	14	73	9	119	55
	Little Trapper	1,020	122	646		847	659
	Mainstem	1,223	572	640	1,185	1,306	935
	Little Tatsamenie	650	43	390	1,087	1,206	572
	Total	2,907	751	1,749	2,281	3,478	2,221
32	Kuthai	21	60	3	32	4	22
	Little Trapper	165	619	235		154	293
	Mainstem	647	2,675	588	1,635	949	1,215
	Little Tatsamenie	362	764	33	1,083	346	376
	Total	1,195	4,118	859	2,750	1,453	1,906
33	Kuthai	1	0	3	0	1	1
	Little Trapper	162	0	235		30	107
	Mainstem	391	1,462	582	168	350	696
	Little Tatsamenie	254	115	44	97	93	127
	Total	808	1,577	864	265	474	931
34	Kuthai	2	0	3	0	2	2
	Little Trapper	151	0	259		116	132
	Mainstem	689	1,019	930	231	616	814
	Little Tatsamenie	267	0	62	135	211	135
	Total	1,109	1,019	1,254	366	945	1,082
Season Totals	Kuthai	1,629	834	1,715	990	2,355	1,633
	Little Trapper	5,855	2,728	5,005		8,183	5,443
	Mainstem	5,152	8,793	4,122	13,792	7,131	6,300
	Little Tatsamenie	2,103	1,199	1,172	3,763	3,431	1,976
	Total	14,739	13,554	12,014	18,545	21,100	15,352

[a] Averages do not include 1989 because the Trapper and Mainstem groups were combined.

Appendix E.1. Differences between inseason and postseason stock composition estimates for the Alaska District 111 sockeye catches, 1990.

		Proportions			Catches		
Stat. Week	Stock Group	Inseason	Post Season	Change	Inseason	Post Season	Change
6/18-6/24	Kuthai	0.235	0.360	0.125	772	1,183	411
Week 25	Trapper/Mainstem	0.541	0.428	-0.113	1,778	1,406	-372
	L. Tatsamenie	0.195	0.086	-0.109	641	283	-358
	Crescent	0.029	0.126	0.097	95	415	320
	Speel	0.000	0.000	0.000	0	0	0
6/25-7/01	Kuthai	0.075	0.148	0.073	628	1,236	608
Week 26	Trapper/Mainstem	0.612	0.584	-0.028	5,122	4,890	-232
	L. Tatsamenie	0.242	0.203	-0.039	2,026	1,697	-329
	Crescent	0.071	0.065	-0.006	594	547	-47
	Speel	0.000	0.000	0.000	0	0	0
7/02-7/08	Kuthai	0.016	0.047	0.031	178	527	349
Week 27	Trapper/Mainstem	0.794	0.846	0.052	8,813	9,394	581
	L. Tatsamenie	0.062	0.011	-0.051	688	117	-571
	Crescent	0.128	0.089	-0.039	1,421	990	-431
	Speel	0.000	0.006	0.006	0	72	72
7/09-7/15	Kuthai	0.020	0.050	0.030	374	940	566
Week 28	Trapper/Mainstem	0.504	0.500	-0.004	9,427	9,349	-78
	L. Tatsamenie	0.254	0.223	-0.031	4,751	4,173	-578
	Crescent	0.144	0.218	0.074	2,693	4,070	1377
	Speel	0.078	0.009	-0.069	1,459	172	-1287
7/16-7/22	Kuthai	0.000	0.011	0.011	0	290	290
Week 29	Trapper/Mainstem	0.621	0.397	-0.224	15,762	10,084	-5678
	L. Tatsamenie	0.246	0.374	0.128	6,244	9,480	3236
	Crescent	0.055	0.206	0.151	1,396	5,235	3839
	Speel	0.078	0.012	-0.066	1,980	292	-1688
7/23-7/29	Kuthai	0.013	0.013	-0.000	341	338	-3
Week 30	Trapper/Mainstem	0.598	0.388	-0.210	15,695	10,195	-5500
	L. Tatsamenie	0.328	0.462	0.134	8,608	12,123	3515
	Crescent	0.051	0.101	0.050	1,338	2,644	1306
	Speel	0.010	0.036	0.026	262	945	683
7/30-8/05	Kuthai	0.021	0.002	-0.019	141	11	-130
Week 31	Trapper/Mainstem	0.432	0.606	0.174	2,905	4,076	1171
	L. Tatsamenie	0.410	0.335	-0.075	2,757	2,255	-502
	Crescent	0.010	0.011	0.001	67	76	9
	Speel	0.127	0.046	-0.081	854	306	-548
8/06-8/12	Kuthai	0.000	0.001	0.001	0	14	14
Week 32	Trapper/Mainstem	0.770	0.736	-0.034	9,690	9,261	-429
	L. Tatsamenie	0.230	0.202	-0.028	2,895	2,541	-354
	Crescent	0.000	0.006	0.006	0	72	72
	Speel	0.000	0.055	0.055	0	697	697
8/13-8/19	Kuthai	0.005	0.000	-0.005	72	0	-72
Week 33	Trapper/Mainstem	0.539	0.616	0.077	7,809	8,920	1111
	L. Tatsamenie	0.419	0.263	-0.156	6,070	3,803	-2267
	Crescent	0.016	0.000	-0.016	232	0	-232
	Speel	0.021	0.122	0.101	304	1,765	1461
	Kuthai	0.020	0.036	0.016	2,507	4,539	2032
Fishery	Trapper/Mainstem	0.607	0.533	-0.074	77,001	67,628	-9373
Totals	L. Tatsamenie	0.273	0.286	0.013	34,679	36,332	1653
	Crescent	0.062	0.112	0.050	7,837	14,242	6405
	Speel	0.038	0.033	-0.006	4,859	4,143	-716

Appendix E.2. Differences between inseason and postseason estimates of Taku River and Port Snettisham stocks in the Alaska District 111 sockeye catches, 1990.

		Proportions			Catches		
Stat. Week	Stock Group	Inseason	Post Season	Change	Inseason	Post Season	Change
6/18-6/24	Taku River	0.971	0.874	-0.097	3,192	2,872	-320
Week 25	Port Snettisham	0.029	0.126	0.097	95	415	320
6/25-7/01	Taku River	0.929	0.935	0.006	7,776	7,823	47
Week 26	Port Snettisham	0.071	0.065	-0.006	594	547	-47
7/02-7/08	Taku River	0.872	0.904	0.032	9,679	10,038	359
Week 27	Port Snettisham	0.128	0.096	-0.032	1,421	1,062	-359
7/09-7/15	Taku River	0.778	0.773	-0.005	14,552	14,462	-90
Week 28	Port Snettisham	0.222	0.227	0.005	4,152	4,242	90
7/16-7/22	Taku River	0.867	0.782	-0.085	22,005	19,854	-2151
Week 29	Port Snettisham	0.133	0.218	0.085	3,376	5,527	2151
7/23-7/29	Taku River	0.939	0.863	-0.076	24,644	22,656	-1988
Week 30	Port Snettisham	0.061	0.137	0.076	1,601	3,589	1988
7/30-8/05	Taku River	0.863	0.943	0.080	5,803	6,342	539
Week 31	Port Snettisham	0.137	0.057	-0.080	921	382	-539
8/06-8/12	Taku River	1.000	0.939	-0.061	12,585	11,816	-769
Week 32	Port Snettisham	0.000	0.061	0.061	0	769	769
8/13-8/19	Taku River	0.963	0.878	-0.085	13,952	12,723	-1229
Week 33	Port Snettisham	0.037	0.122	0.085	536	1,765	1229
Fishery	Taku River	0.900	0.855	-0.045	114,187	108,499	-5688
Totals	Port Snettisham	0.100	0.145	0.045	12,697	18,385	5688

Appendix E.3. Log-likelihood (G) values for a comparison of weekly inseason and postseason stock composition estimates for the Alaska District 111 drift gillnet sockeye harvest, 1990.

Date and Week	Estimate	Stock Grouping: Kuthai	Trapper/ Mainstem	Tatsamenie	Crescent	Speel	Total	G
6/18-6/24	In	25	55	21	4	1	106	
Week 25	Post	54	64	14	20	1	153	
	Total	79	119	35	24	2	259	16.057
6/25-7/01	In	9	62	25	8	1	105	
Week 26	Post	29	111	39	13	1	193	
	Total	38	173	64	21	2	298	3.058
7/02-7/08	In	3	80	7	14	1	105	
Week 27	Post	10	159	3	18	2	192	
	Total	13	239	10	32	3	297	7.211
7/09-7/15	In	3	41	21	13	7	85	
Week 28	Post	10	91	41	40	3	185	
	Total	13	132	62	53	10	270	8.099
7/16-7/22	In	1	63	26	7	9	106	
Week 29	Post	3	76	71	40	3	193	
	Total	4	139	97	47	12	299	27.013
7/23-7/29	In	2	61	34	6	2	105	
Week 30	Post	3	74	88	20	8	193	
	Total	5	135	122	26	10	298	11.636
7/30-8/05	In	2	31	30	2	10	75	
Week 31	Post	1	91	51	3	8	154	
	Total	3	122	81	5	18	229	9.280
8/06-8/12	In	1	79	24	1	1	106	
Week 32	Post	1	138	39	2	11	191	
	Total	2	217	63	3	12	297	5.272
8/13-8/19	In	2	55	43	3	3	106	
Week 33	Post	1	240	103	1	48	393	
	Total	3	295	146	4	51	499	24.183
	In	17	516	233	53	33	852	
Totals[a]	Post	64	961	516	202	59	1,802	
	Total	81	1,477	749	255	92	2,654	27.449

[a] Totals are for weighted weekly samples and thus are not direct sums of weekly samples.

Appendix E.4. Log-likelihood (G) values for a comparison of weekly inseason and postseason stock composition estimates for Alaska's District 111 drift gillnet sockeye harvest, 1990.

Date and Week	Estimate	Taku River	Port Snettisham	Total	G
6/18-6/24	In	99	4	103	
Week 25	Post	130	20	150	
	Total	229	24	253	7.071
6/25-7/01	In	94	8	102	
Week 26	Post	177	13	190	
	Total	271	21	292	0.098
7/02-7/08	In	88	14	102	
Week 27	Post	170	19	189	
	Total	258	33	291	0.868
7/09-7/15	In	63	19	82	
Week 28	Post	140	42	182	
	Total	203	61	264	0.000
7/16-7/22	In	88	15	103	
Week 29	Post	148	42	190	
	Total	236	57	293	2.513
7/23-7/29	In	95	7	102	
Week 30	Post	163	27	190	
	Total	258	34	292	3.758
7/30-8/05	In	61	11	72	
Week 31	Post	141	10	151	
	Total	202	21	223	4.012
8/06-8/12	In	102	1	103	
Week 32	Post	176	12	188	
	Total	278	13	291	5.714
8/13-8/19	In	98	5	103	
Week 33	Post	342	48	390	
	Total	440	53	493	5.535
	In	766	86	852	
Totals[a]	Post	1,541	261	1802	
	Total	2,307	347	2654	10.207

[a] Totals are for weighted weekly samples and thus are not direct sums of weekly samples.