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SEPARATION OF PRINCIPAL TAKU RIVER AND PORT SNETTISHAM SOCKEYE SALMON (*Oncorhynchus nerka*) STOCKS IN SOUTHEASTERN ALASKA AND CANADIAN FISHERIES OF 1986 BASED ON SCALE PATTERN ANALYSIS

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August 1987

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Don W. Collinsworth
Commissioner

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Technical Data Report No. 213
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ABSTRACT

Linear discriminant function analysis of scale patterns and age composition data were used to allocate District 111 and Canadian Taku River commercial catches and the Canadian Taku River escapement to stock group of origin. The total District 111 harvest of 72,780 sockeye salmon was comprised of an estimated 83.4% (60,700 fish) bound for spawning sites in the Taku River drainage and 16.6% (12,080 fish) destined for lake systems in the Port Snettisham drainages. The contributions of specific stock groups were: 30.3% from Mainstem Taku River, 26.6% from Little Trapper Lake, 20.4% from Tatsamenie Lake, 9.0% from Crescent Lake, 7.6% from Speel Lake, and 6.1% from Kuthai Lake. The contributions of Snettisham stocks (Crescent Lake and Speel Lake) were much higher (44.2%) in the supplemental fishery openings in southern District 111 than in the traditional District 111 fishery openings (15.0%). The Canadian inriver harvest of sockeye salmon was comprised of an estimated 39.7% Little Trapper Lake, 35.0% Mainstem, 14.3% Tatsamenie Lake, and 11.0% Kuthai Lake fish. United States fishermen harvested an estimated 64.0% to 70.7% of the Total Allowable Catch (TAC) of sockeye salmon bound for the Taku River drainage, which is less than the 85% to which they were entitled by provisions of the U.S.-Canada Pacific Salmon Treaty of 1985. Canadian fishermen took an estimated 15.5% to 17.2% of the TAC, slightly more than their entitlement of 15%. Temporal trends in stock composition were similar among samples from the District 111 and Canadian inriver fisheries and the inriver escapement past Canyon Island. Results from adult tagging studies provide independent stock timing data that agree closely with results from analysis of scale patterns and age composition data.

KEY WORDS: sockeye salmon, *Oncorhynchus nerka*, scale patterns, age composition, Taku River, catch allocation, Pacific Salmon Treaty.

INTRODUCTION

The Taku River is a 'transboundary' river; it originates in central British Columbia and flows southwest through the Coastal Range mountains and Southeast Alaska to the Pacific Ocean (Figure 1). The Taku River supports numerous stocks of salmon that are harvested in U.S. and Canadian fisheries. The U.S.-Canada Pacific Salmon Treaty of 1985 established conservation and harvest sharing objectives for the Taku River sockeye salmon run. Provisions specified by the Treaty for the Taku River in 1985 and 1986 were to achieve an interim escapement goal of 71,000 to 80,000 sockeye salmon into Canadian portions of the Taku River and allow the U.S. an 85% share and Canada a 15% share of the additional sockeye salmon of Canadian Taku River origin available for harvest (the total allowable catch, or TAC).

The U.S. allotment of Taku River sockeye salmon is taken primarily in the traditional District 111 gillnet fishery in the Taku Inlet-Stephens Passage-Port Snettisham area (Figure 2), although unknown but assumed small numbers are taken in other Southeastern Alaska fisheries (McGregor 1985). Sockeye salmon bound for Alaskan spawning sites in Port Snettisham (Crescent and Speel lakes) are also harvested in the District 111 fishery. Catches in District 111 have averaged 76,266 sockeye salmon annually from 1976-1985, and have ranged from 31,821 to 123,451 fish. The majority of the District 111 harvest has been taken in Taku Inlet. Port Snettisham sockeye salmon stocks are extremely depressed relative to historical levels. Port Snettisham has been closed to fishing during much of the season in recent years to reduce the catch of Snettisham stocks and begin rebuilding these runs. In 1986 an experimental 1-day per week drift gillnet fishery was conducted during the month of July in southern District 111, south of the entrance to Port Snettisham (Figure 2), to assess the availability of hatchery origin chum salmon in this area.

The Canadian allotment of Taku River sockeye salmon is taken in a gillnet fishery that occurs in the Taku River within 20 kilometers upstream of the border between Alaska and Canada (Figure 1). Catches have averaged 15,541 sockeye salmon since the fishery began in 1979, and have ranged from 3,144 to 27,242 fish.

Implementation of Treaty guidelines requires two critical pieces of information: 1) escapement estimates for the Taku River, and; 2) estimates of the contribution of Taku River stocks to the District 111 fishery. An adult mark-recapture program has been jointly operated on the Taku River at Canyon Island by the Alaska Department of Fish and Game (ADF&G) and the Canadian Department of Fisheries and Oceans (DFO) since 1984 to provide inseason escapement estimates. Scale pattern analysis (SPA) has been used since 1983 to estimate contributions of Taku River and Port Snettisham sockeye salmon to the District 111 fishery on a post-season basis. In 1986, an inseason SPA program based on data from historical scale collections was instituted to allocate District 111 catches.

SPA studies were modified on a post-season basis in 1986 to provide finer resolution of stocks in District 111 catches. In contrast to the prior years' and inseason analyses in which mixed-stock catches were allocated only to either the pooled Taku River (Canada) or Port Snettisham (U.S.) groups, the

1986 post-season analysis was refined using extensive scale collections from all known major Taku River and Port Snettisham spawning groups to develop more stock-specific standards for classifying catches. In addition, inriver samples from the Canadian fishery and the Taku River escapement by Canyon Island were classified for the first time to stock group of origin.

The purpose of this report is to document the methodology used and results obtained from 1986 SPA studies of Taku River and Port Snettisham sockeye salmon. The data provide basic statistics for use in assessing the treaty performance of the U.S. and Canadian fisheries targeting on Taku River sockeye salmon and in developing a more stock-specific data base than was previously available.

METHODS

Number of Fish

We obtained catch statistics for District 111 from the Division of Commercial Fisheries, ADF&G; these statistics were compilations of fishermen sales receipts (fish tickets) and were current as of 18 February 1987. Supplemental southern District 111 catches were all assigned by ADF&G to Subdistrict 20, even though some of the catch was taken in Subdistrict 31 (see Figure 2 for the locations of the subdistricts). Since Subdistrict 20 was not open during the traditional District 111 fishery, catches from this subdistrict represent the entire supplemental fishery catch. Harvest statistics for the Canadian inriver fishery were provided by the Canadian Department of Fisheries and Oceans (Sandy Johnston, DFO, Whitehorse, Yukon Territory). 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 Lake and Speel Lake. Tagging and recapture methods were used to estimate the escapement of sockeye salmon to the Canadian portion of the Taku River drainage (McGregor and Clark 1987). Weirs were operated by the DFO at Little Trapper Lake, Little Tatsamenie Lake, and the Hackett River to count escapements of these specific spawning stocks in the Taku River drainage.

Sample Collection and Preparation

Scales were collected and prepared using procedures described by Clutter and Whitesel (1956). Scales were taken from the 'preferred area' of the fish, located on the left side of the fish approximately two rows above the lateral line and on the diagonal row of scales downward from the posterior insertion of the dorsal fin. Scales were mounted on gummed cards.

Employees of the ADF&G, Commercial Fisheries Division, sampled District 111 catches aboard tenders and at the fishing ports of Douglas, Petersburg, and Excursion Inlet. Samplers recorded the sex of each fish sampled, took 1 scale, and subsampled approximately 25% of the fish for length (mid-eye to fork of tail) measurements. The Canadian inriver harvest was sampled by

ADF&G and DFO employees. Samplers recorded the sex of each fish sampled, took 5 scales, and recorded length (post-orbit to hypural plate) measurements from all fish. Similar procedures were used to sample escapements; 1 scale per fish and mid-eye to fork length measurements (MEF) were taken from Alaskan systems, while 5 scales per fish and post-orbit to hypural plate length measurements (POH) were taken from Canadian headwater systems. Several hundred fish were sampled from the Canadian inriver harvest for both MEF and POH lengths. POH lengths were then standardized to MEF measurements according to the following linear regression developed from the paired lengths:

$$MEF = 1.039767 (POH) + 45.30311$$

Permanent transparent impressions of the scales were made by attaching strips of cellulose acetate to the gummed cards and subjecting them to heat and pressure in a hydraulic scale press. Scale images were enlarged and projected by transmitted light onto a reflective surface for aging and digitizing.

Age and Sex Composition

Ages were determined by visually examining images of scale impressions projected at moderate (80X) magnification with a microfiche reader. Criteria used to determine ages were similar to those of Mosher (1968). Scales from fish sampled on the spawning grounds occasionally exhibited resorption along their outer edges. In cases where scale resorption made distinguishing marine age difficult, length frequency histograms were used to assist in determining the correct marine age (Tesch 1970). Ages were recorded in European notation (numerals preceding the decimal refer to the number of freshwater annuli; numerals following the decimal are the number of marine annuli; total age is the sum of these two numbers plus one). Detailed age, sex, and size data are not presented in this report, but can be found in McPherson et al. (1987).

Catch:

Sampling goals for determining the age composition of the harvests were set to enable the true proportion of each major age group in the catch during each fishing period to be simultaneously estimated to within +/-5 percentage points nine times out of ten (Bernard, D.R. 1982. Statewide standards for sampling sizes for AWL. ADF&G, Commercial Fisheries Division. Unpublished memorandum). Sample goals were met for most fishing periods in the District 111 fishery. Low catches and limited availability of fish to sample in the Canadian inriver and U.S. supplemental southern District 111 fisheries, however, prevented desired sample sizes from being achieved in each fishing period for these fisheries. Because the age composition of catches often changed significantly between fishing periods, samples from several periods were seldom combined, and lower levels of the accuracy and precision of age composition estimates resulted for these fisheries. Standard errors (SE) of the age class proportions were calculated using standard binomial formulas, where:

$$\text{SE of age i in strata j } (SE_{ij}) = \sqrt{\frac{P_{ij}(1-P_{ij})}{n_j-1}}$$

where i = age class
j = sample stratum
P_{ij} = proportion of fish caught of age i in stratum j
n_j = sample size for stratum j

The age distribution and associated standard errors for the total catch in each fishery were estimated by weighting the estimated sample distribution and its standard error for each stratum by the total catch during the same stratum, where:

$$\text{SE of total for age i } (SE_i) = \sqrt{\frac{\sum_j SE_{ij}^2 C_j^2}{\left[\sum_j C_j\right]^2}}$$

where C_j = catch of fish in stratum j.

Escapement:

Scales were collected from escapements to the Port Snettisham and Taku River drainages, and age compositions were estimated for various spawning stocks. The age compositions of Snettisham returns to Crescent and Speel lakes were estimated by aging scales collected at counting weirs on the outlet streams of each system. Scales were also collected at counting weirs in the Taku River drainage, at Little Trapper Lake, Tatsamenie Lake, and the Hackett River. Samples were periodically taken throughout the return in weir traps at each of the weir sites. Numerous other spawning sites in the Taku River drainage were sampled with beach seines, gillnets, spears, and by carcass sampling. These locations were sampled on only one or several days, thus samples might not have represented the true age composition of spawners from these sites over the entire season as closely as did samples collected through time at the weirs. Scale samples were also taken in conjunction with the Taku River escapement enumeration program at Canyon Island. Fishwheels 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 entire Taku River escapement past Canyon Island were estimated using this data (McPherson et al. 1987).

Stock Identification

Age composition data and linear discriminant function (LDF) analysis of scale measurements were used to allocate District 111 and Canadian inriver harvests and the Taku River escapement to run of origin.

Scale Measurements:

Scale images were magnified to 100 power and projected onto a Talos Digitizing Tablet using equipment similar to that described by Ryan and Christie (1976). Measurements were made and recorded with an IBM microcomputer-controlled digitizing system using software modified by Larry Talley (ADF&G, Commercial Fisheries Division, Douglas). Measurements were made along the anterior-posterior axis of the scale. Circuli were counted and distance measurements between circuli were taken in each of three scale zones (Figure 3). The zones were: (1) the center of the scale focus to the last circulus of the first freshwater annulus, (2) the last circulus of the freshwater annulus to the last circulus of freshwater growth (plus growth), and (3) the last circulus of freshwater growth to the last circulus of the first ocean annulus. Seventy-four scale characters, including circuli counts, incremental distances, and ratios and/or combinations of these variables, were calculated from the basic measurements (Appendix Table 1).

Discriminant Analysis:

Linear discriminant function analysis of scale patterns has been used since 1983 to classify District 111 catches to run (and nation) of origin (McGregor 1985, 1986; Oliver and McGregor 1986). Mixed-stock samples from the 1983 and 1984 fishing seasons were allocated to either the Taku River (Canada) or Port Snettisham (U.S.) using linear discriminant functions based on pooled scale samples from each drainage. Because the Taku River run is comprised of a number of stocks that exhibit different scale patterns and the migratory timing of these stocks vary through District 111 and the lower Taku River, a series of time-specific linear discriminant functions were developed to improve classification methods used to apportion District 111 catches in 1985 (Oliver and McGregor 1986). Scales collected at the Canyon Island tagging site during two week time intervals were used to represent the Taku River run in LDF models which, when adjusted for a 3-4 day lag time for fish to travel between District 111 and Canyon Island, were used to classify 1985 District 111 catches.

A program was initiated in 1986 to provide estimates of the stock composition in District 111 on an inseason basis. Pooled samples from 1985 escapements to the Taku River and Port Snettisham were used as 'historical standards' for creating linear discriminant functions used to classify catches. Stock composition estimates were provided to fishery managers within 24 to 48 hours after each fishing period, and prior to the formulation of the following week's fishing plan.

Extensive scale sampling of all known major Taku River and Port Snettisham spawning stocks was conducted by the ADF&G, DFO, and National Marine Fisheries Service-Auke Bay Laboratory (NMFS) in 1986. This data set enabled us to develop more stock-specific standards on a post-season basis to reclassify 1986 District 111 catches. In addition, appropriate LDF's were created to classify inriver samples from the catch (Canadian gillnet harvest) and escapement (past Canyon Island), allowing total return and exploitation rates to be developed for specific Taku River stocks.

We performed the LDF analyses on an IBM-compatible microcomputer and used a series of FORTRAN programs developed by Bob Conrad (ADF&G, Sport Fish Division, Anchorage). The programs use a stepwise procedure to select scale variables for each LDF; partial F-statistics were used as the main criteria for entry and removal of variables. Only 1 variable from a group of highly related variables was generally allowed to enter the functions. Variables were added until the partial F-statistics of all remaining variables available for entry into the function were below a threshold value of 4.0. The stepwise procedure used for variable selection does not necessarily result in maximum classification accuracies or the most balanced classification matrix when it is used to discriminate more than 2 groups, tending to differentiate well-separated groups further instead of differentiating poorly-separated groups (Habbema and Hermans 1977). Scale variables that provided the best discrimination between the groups that misclassified most often were occasionally added to or substituted for other variables to either increase the mean classification accuracy or provide better balance to the classification matrix. A nearly unbiased estimate of classification accuracy for each LDF was determined using a leaving-one-out procedure (Lachenbruch 1967).

Construction of Standards:

We developed LDF standards for the 1.2 and 1.3 age classes. We attempted to use at least 100 scales per group but fewer scales were available for particular stocks in both age classes. Standards were not constructed for fish aged 0.3 and 2.3, despite their contribution to the District 111 catch (12.8% and 11.9%, respectively), because of a lack of scales from these age classes in several escapement collections.

Classification of Catches of Age 1.2 and 1.3 Fish:

Age-specific LDF's were used to assign stock group of origin to mixed- stock samples of age 1.2 and 1.3 fish. Point estimates of stock composition were adjusted for classification errors using the methods of Cook and Lord (1978). The variances and 90% confidence intervals were computed for adjusted estimates of stock proportions (Pella and Robertson 1979). In cases where adjusted proportions for a stock group were less than zero, catch samples were reclassified with an LDF excluding that stock group.

The numbers of fish by stock group for each of the 1.2 and 1.3 age classes in a catch were computed for each fishing period by multiplying the total estimated catch of an age by the adjusted LDF estimate of contribution of that group, where:

$$C_{ijt} = C_t * P_{it} * S_{ijt}$$

where:

C_{ijt} = estimated catch of fish of age i and 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.
S_{ijt} = estimated proportion of fish of group j in the catch of age i in period t.

Contributions by age class and stock group for each fishing period were added to compute the group's contribution of each age class for the entire fishing season.

Catch Allocation for the Other Age Classes:

The catches of fish of age groups other than 1.3 and 1.2 were apportioned to stock group of origin based on a function of the sum of estimates for fish aged 1.3 and 1.2 in the catch and the ratio of the sum of the estimates of fish aged 1.3 and 1.2 to other age groups in the respective escapements:

$$\hat{S}_{ij} = \frac{\hat{S}_j(1.3+1.2)\left(\dfrac{\hat{E}_{ij}}{\hat{E}_j(1.3+1.2)}\right)}{\sum_{j=1}^{n}\hat{S}_j(1.3+1.2)\left(\dfrac{\hat{E}_{ij}}{\hat{E}_j(1.3+1.2)}\right)}$$

where $\hat{S}_{ij}$ = estimated proportion of stock j in the catch of fish aged i.

$\hat{S}_j(1.3+1.2)$ = estimated proportion of stock j in the catches of fish aged 1.3 and 1.2.

$\hat{E}_{ij}$ = estimated proportion of fish aged i in the escapement of stock j.

$\hat{E}_j(1.3+1.2)$ = estimated proportion of fish aged 1.3 and 1.2 in the escapement of stock j.

n = number of stocks.

The variances of the weekly and seasonal allocations to a group were approximated using the procedure described in Appendix C of Oliver et al. (1985). Factors contributing to the variance estimate include: (1) the age composition of the catch in each fishing period; (2) the stock composition each period for age classes classified with age-specific LDF's; (3) the variance of the age-specific period stock composition estimates; (4) the number of ageable scales each period; and (5) the catch during each period. This actually is a minimum estimate of the variance of the allocation because no variance component is included for age classes apportioned using methods other than by linear discriminant functions analysis.

RESULTS

Numbers of Fish

A total of 72,780 sockeye salmon was harvested by the drift gillnet fleet in District 111 in 1986. The vast majority (94.6%, or 68,836 fish) of the catch was taken in the traditional District 111 fishery (Table 1). Fishing began the third week of June and continued through the middle of September. Specific time and area regulatory measures are summarized in Table 1. The fishery was open a total of 28.5 days. A maximum of 104 boats delivered fish in any one fishing period. Two peaks in the harvest occurred; the first from 13-15 July (statistical week 29) when 12,196 fish were taken, and the second from 27-30 July (statistical week 31) when 15,245 fish were harvested. Catch-per-unit-effort (CPUE) peaked during 13-15 July. A smaller and later peak in CPUE occurred during 10-12 August (statistical week 33). Approximately 87% (59,862 fish) of the catch was taken in Taku Inlet (111-32; Figure 2). Slightly over 12% (8,626 fish) of the catch was taken in Stephens Passage (111-31). Catches in Port Snettisham (111-34) accounted for less than 1% of the harvest (348 fish). Port Snettisham was closed to fishing from 2 July through 16 August to allow increased passage of sockeye salmon into Crescent Lake and Speel Lake and to protect Snettisham Hatchery chum salmon brood stock.

The remainder of the District 111 harvest (3,944 fish) was taken in five supplemental 1-day openings in southern portions of the district (Table 2). The mean sockeye salmon CPUE level in the supplemental openings was only 38% of the mean CPUE in the traditional District 111 fishery during the same fishing periods.

A total of 14,739 sockeye salmon was taken in the Canadian inriver fishery (Table 3). The fishery was open a total of 17 days. The maximum number of fishermen in any fishing period was 11. The catch peaked during the 21-24 July opening (statistical week 30), while CPUE peaked the following week (28-30 July).

An estimated 90,370 sockeye salmon escaped to Canadian spawning grounds in the Taku River drainage (McGregor and Clark 1987), exceeding the interim escapement goal of 71,000 to 80,000 fish. Counting weirs were operated at Little Trapper Lake, Tatsamenie Lake, and the Hackett River, and 13,820, 11,368, and 1,004 sockeye salmon were counted at the respective sites (McPherson et al. 1987). Escapement to U.S. portions of the Taku River was unknown. The escapement to Port Snettisham was 9,271 sockeye salmon (McPherson et al 1987), representing 45.7% of the average 1983 to 1985 escapement of 20,266 fish and only 27.3% of the escapement goal for these systems of 34,000 fish (Transboundary Technical Committee 1987).

Age and Sex Composition

Age and sex composition data summarized in this report are presented in detail in McPherson et al.(1987).

Catch:

Fish aged 1.3 dominated the District 111 harvest of sockeye salmon. In the traditional fishery age 1.3 fish comprised 61.5% of the harvest, followed by age 0.3 (12.8%), 2.3 (11.9%), and 1.2 (11.3%; Table 4). Other age classes comprised the remaining 2.5% of the catch. Temporal trends in the age composition of the catch were apparent. Age 1.2 fish comprised a larger proportion of the catch during the first three weeks of the season than later in the season. Age 0.3 and 2.3 fish comprised larger proportions of catches late in the fishing season. Males and females were approximately equally represented in the catch (51.8% males).

The age composition of the supplemental southern District 111 harvest is summarized in Table 5. Age 1.3 fish comprised the majority of the harvest (54.8%), but age 1.2 fish were also common (25.9%). Age 0.3 and 2.3 fish represented 8.0% and 7.6%, respectively, of the catch. Males contributed 57.1% of the samples from this fishery.

The age composition of the Canadian Taku River harvest (Table 6) was similar to the District 111 age composition. Age 1.3 fish comprised 61.0% of the catch, followed by age 0.3 (14.3%), 1.2 (10.8%), 2.3 (10.4%), and other age groups (3.5%). As seen in the traditional District 111 harvest, the proportion of age 1.2 fish decreased after the first several fishing periods of the season, while the proportion of age 0.3 fish increased through the season. Approximately equal numbers of males and females were taken in the fishery (48.7% males).

Escapement:

Large differences in age composition were apparent in escapements to the Taku River and Port Snettisham drainages. The estimated age composition of the portion of the Taku River run that passed Canyon Island was comprised primarily of age 1.3 fish (50.2%), followed by age 1.2 (28.8%), 0.3 (7.8%), and 2.3 fish (7.5%; Table 7). Age 1.2 fish predominated in Canyon Island fishwheel catches through statistical week 27 (ending July 5). Age 0.3 fish increased in abundance throughout the season, from 0% caught during statistical weeks 24-25 (June 14 to 21) to almost 20% during the month of August. Approximately equal numbers of males and females were caught in the fishwheels (49.3% males).

Taku River stocks exhibited an extreme diversity in age and sex composition (Table 8). Zero-freshwater-check fish comprised 39.5% of the ageable scales taken from river spawners, but were absent or comprised less than 2% of the samples from each lake system sampled. Fish with two freshwater annuli were far more common in returns to Little Trapper Lake and Tatsamenie Lake than in other stocks. Age 1.2 fish comprised a little over one-half of the Kuthai Lake run. Males outnumbered females in the samples taken at the Little Trapper Lake (58.9% males) and Hackett River (71.0% males) weirs, while females were more common in samples taken at the Tatsamenie Lake weir (55.9%

females). Precise estimates of the sex compositions of samples from non-weired systems were not available because of small sample sizes and non-random sampling procedures.

Within the Port Snettisham drainages, age 1.3 fish comprised the majority (73.2%) of the Crescent Lake escapement, while age 1.3 and 1.2 fish represented approximately equal proportions (48.1% and 47.6%, respectively) of the escapement to Speel Lake. Males represented 64.6% of the escapement to Speel Lake, primarily because of the high proportion of age 1.2 male returns to this system (McPherson et al. 1987). No significant difference existed between the proportion of males and females in the Crescent Lake escapement (51.6% males).

Stock Identification

Inseason Analysis:

Model parameters used to allocate District 111 catches to either the Taku River or Port Snettisham drainages were based on 1985 data. Standards were developed for the 1.2 and 1.3 age classes only.

Post-Season Analysis:

Small numbers of samples were taken at several spawning locations within the Taku River drainage in 1986. Preliminary analysis of these collections allowed us to pool some of the samples together before developing classification models to allocate catches. For instance, only 73 ageable scales were taken from fish spawning in Kuthai Lake. An additional 148 samples were available from unspawned mortalities at the Nakina River chinook salmon carcass weir (Figure 1). These fish are believed to have died as a result of attempting to ascend barriers in the nearby outlet stream to Kuthai Lake[1] (P. Kissner, personal communication). Comparison of the age compositions and frequency distributions of several important scale variables revealed that samples from Kuthai Lake and the unspawned mortalities collected at the Nakina River weir had many measureable similarities, and that both differed dramatically from samples collected from sockeye salmon spawning in mainstem and slough areas of the lower Nakina River (Figure 4). Therefore we pooled the Nakina River weir samples with samples collected at Kuthai Lake to represent the Kuthai Lake stock. We then developed two-way LDF parameters to discriminate between the Kuthai Lake-Nakina River Weir group and the Nakina River spawner group. Mean classification accuracies for the 1.2 and 1.3 age classes were 1.000 and .995, respectively, using only one scale variable, suggesting that these groups represent separate spawning populations (Table 9).

Limited scale sampling was done at 11 spawning locations along the mainstem of the Taku River and several important tributaries (see Table 8). LDF

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[1] This phenomenon was first noted by the ADF&G in their Taku River studies in the 1950's (ADF&G 1958). The fish are easily identified from others because at the time of death their secondary sexual characteristics (e.g., gamete size and development) are still immature.

analysis of sample scale patterns from the various locations resulted in very low classification accuracies. A five-way LDF analysis of age 1.2 river spawners produced a mean classification accuracy of only .403, while the mean classification accuracy of a six-way comparison of age 1.3 fish was just .274 (Table 10). All mainstem, river, and slough spawners were therefore pooled to represent this 'non-lake' portion of the Taku River run in later analyses; these samples are hereafter referred to as the Mainstem group.

Scale Measurements:

The scale pattern variables that were best for discriminating between Kuthai Lake, Little Trapper Lake, Tatsamenie Lake, Mainstem, Crescent Lake, and Speel Lake fish were the number of circuli in and width of the freshwater growth zone (Table 11, Figure 5). Relationships of scale variable values between stocks were similar for the two age classes. Kuthai Lake fish exhibited by far the greatest freshwater growth, followed by fish from Tatsamenie Lake. The smallest freshwater growth was exhibited by the Crescent Lake group. Scales from Little Trapper Lake fish displayed the second smallest freshwater growth zone. Scales from the Mainstem and Speel Lake groups were intermediate to Kuthai Lake and Crescent Lake scales in the amount of freshwater growth displayed. Other scale variables from the freshwater growth zone that were useful in distinguishing between groups included variables 14, 17, and 26 (Appendix Table 1).

Differences in scale growth in the first marine zone were also apparent (Figure 6). Snettisham fish (from Crescent Lake and Speel Lake) exhibited the greatest growth in this zone, while Kuthai Lake fish had the least growth. The number of circuli in and width of the zone were again the most important variables.

Classification Accuracies:

In-Season. The mean classification accuracies of the historical age 1.3 and 1.2 standards used for in-season analysis were .838 and .799, respectively (Appendix Table 2). Snettisham fish were correctly classified at higher levels than were the Taku River fish.

Post-Season. Catches of age 1.3 and 1.2 fish in the District 111 fisheries were initially classified into one of 6 groups, which included Tatsamenie Lake, Kuthai Lake, Little Trapper Lake, Mainstem, Crescent Lake and Speel Lake. The mean classification accuracy of the age 1.3 linear discriminant function was .762 (Table 12), compared to .661 for the age 1.2 LDF (Table 13). The Kuthai Lake run was easily distinguished, as it correctly classified in over 90% of the cases for each age class. Crescent Lake, Speel Lake, and Tatsamenie Lake groups classified at intermediate values (.609 to .798). Little Trapper Lake and Mainstem spawners classified with the lowest accuracies in each LDF (.429 to .724).

When the estimated contribution of a group in a catch sample was less than or equal to zero, a new LDF excluding that group was developed and used to reclassify the sample. The mean classification accuracies of five-way LDF's ranged from .702 to .794, while four-way and three-way LDF accuracies ranged from .616 to .846 and .775 to .906, respectively (Tables 12 and 13).

Catches of age 1.3 and 1.2 fish in the Canadian Taku River fishery and the Canyon Island fishwheels were initially classified into four groups, excluding the Snettisham groups. The mean classification accuracy of the age 1.3 LDF was .797 (Table 14), compared to .731 for the age 1.2 LDF (Table 15). In both models, the Kuthai Lake group again classified correctly most often. Mainstem and Little Trapper Lake spawners classified with lower accuracy than the other groups and were misclassified most often as each other.

Run Apportionment

Age 1.3 and 1.2 Fish:

Temporal and spatial differences in post-season stock composition estimates of age 1.3 (Table 16) and age 1.2 (Table 17) fish were apparent in District 111, southern District 111, Canyon Island, and Canadian Taku River catches. An orderly progression of Taku River stocks was seen through each fishery (Figure 7). Kuthai Lake fish appeared earliest, representing the majority of the age 1.3 and 1.2 fish during the first two fishing periods (statistical weeks 25-26; 15-28 June). Fish bound for Little Trapper Lake increased in abundance and comprised the majority of age 1.3 catches from early to mid-July, but few age 1.2 fish were bound for this system. By late July Tatsamenie Lake and Mainstem spawners comprised the majority of the fish present that were bound for the drainage. Little or no time lag in stock composition estimates was noted between the fisheries, except early-season contribution estimates for the Kuthai Lake and Little Trapper Lake stocks in District 111 tended to be very similar to the contributions of these groups at Canyon Island and in the Canadian inriver fishery during the following week.

The Snettisham contribution of age 1.3 fish to the District 111 fishery was small but tended to increase as the season progressed (Figure 8). Age 1.2 returns to Crescent Lake peaked in mid-July, while age 1.2 Speel Lake fish peaked later and comprised the majority of the harvest of this age class during August. The percent contributions of age 1.3 and 1.2 Crescent Lake and Speel Lake fish were higher in catches in the supplemental southern District 111 fishery than the traditional fishery catches during the weeks when both areas were open to fishing.

All Age Groups:

The traditional District 111 harvest of all age classes of sockeye salmon was comprised of the following estimated stock proportions: 30.5% from Mainstem spawners, 26.9% from Little Trapper Lake, 21.2% from Tatsamenie Lake, 8.0% from Crescent Lake, 7.0% from Speel Lake, and 6.4% from Kuthai Lake (Table 18). The combined contribution of Taku River stocks equalled 85.0% of the harvest of 68,836 fish, or 58,500 fish. An estimated 95.7% of the harvest of fish with zero freshwater annuli (age 0.) were river spawners from the Taku River drainage. Principal contributors to the catch of age 2. fish (those with two freshwater annuli) were Little Trapper Lake and Tatsamenie Lake, which contributed an estimated 38.7% and 36.8% of these age classes, respectively.

Contributions of Snettisham fish were much higher in the supplemental southern District 111 fishery (Table 19), representing 44.2% of the harvest of 3,944 fish. Crescent Lake fish comprised 27.7% of the southern District 111 catch and were more common than any other group. Mainstem spawners were the next highest contributor (25.5%), followed by Little Trapper Lake (21.6%), Speel Lake (16.5%), Tatsamenie Lake (6.3%), and Kuthai Lake (2.4%).

The total District 111 catch (traditional and supplemental fisheries combined) of 72,780 fish was comprised of the following proportions: 30.3% from Mainstem spawners, 26.6% from Little Trapper Lake, 20.4% from Tatsamenie Lake, 9.0% from Crescent Lake, 7.6% from Speel Lake, and 6.1% from Kuthai lake (Table 20). The combined contribution of Taku River stocks represented 83.4% of the harvest, while Snettisham stocks comprised 16.6%.

The Canadian Taku River fishery harvested 14,739 fish, or 14.0% of the estimated inriver return of 105,109 fish past Canyon Island. The harvest was comprised primarily of fish from Little Trapper Lake (39.7%) and Mainstem spawners (35.0%; Table 21). Fish from Tatsamenie Lake represented 14.3% of the catch, while Kuthai Lake fish comprised 11.0% of the catch.

While fishery catch statistics are presumed to be highly accurate, a degree of uncertainty is connected with the mark- recapture estimate of the inriver return. The 95% confidence interval of the seasonal estimate of inriver return ranged from approximately 90,000 to 120,000 fish (McGregor and Clark 1987). The variances of the weekly inriver abundance estimates were large. Estimates of the total inriver return by stock group are highly dependent on weekly inriver abundance indices used to weight the age-specific stock composition estimates. Due to the uncertainty in these abundance indices, the Canyon Island stock composition estimates are not used in this report to apportion the total inriver return by stock group; these estimates are simply presented as weekly proportions of the fish passing Canyon Island (Table 22).

Comparison of Inseason and Post-Season Analyses:

A rigorous comparison of inseason and post-season analyses was not conducted because the comparison is not a straightforward one. The proportion of District 111 catches apportioned to Port Snettisham by the inseason analysis based on historical data was .107, while the combined contribution estimates of Crescent and Speel lakes using models based on current year stock-specific data was .166. Post-season analysis estimated higher contributions of Snettisham fish in later weeks of the season than did the inseason analysis (Figure 9).

Variation in results between inseason and post-season analyses is caused by 2 principal factors: 1) the use of different stock groupings in the inseason and post-season analyses and; 2) interannual variation in scale patterns. A full complement of scale collections for 1985 was not available for all the Taku River stock groupings used in the 1986 post-season analyses, which precludes us from adequately describing the interannual variability in scale patterns found in these stocks. This comparison will be available next year, however, when we will compare scale pattern variables used to develop historical inseason models for the 1987 fishing season with similar data collected in 1987 for use in developing 1987 post-season models.

Run Reconstruction

The estimated total return of Taku River and Port Snettisham sockeye salmon stocks in 1986 was 187,160 fish (Table 23). The return was comprised of 165,809 Taku River fish (88.6%) and 21,351 Snettisham fish (11.4%). Estimated exploitation rates of the runs were .455 for the Taku River and .566 for the Snettisham systems. The reader should be aware that the escapement of sockeye salmon to Taku River spawning sites in Alaskan portions of the lower Taku River are unknown and have not been included in these total return estimates.

Total return estimates were generated for the four specific stocks for which the escapements were enumerated with counting weirs. The return of Little Trapper Lake fish totaled 39,041 fish, while returns of the Tatsamenie Lake, Speel Lake, and Crescent Lake stocks totaled 28,314, 11,352, and 9,999 fish respectively. Exploitation rates for the stocks in the District 111 fisheries were .659 for Crescent Lake, .524 for Tatsamenie Lake, .496 for Little Trapper Lake, and .484 for Speel Lake. The Taku River stocks were subject to further exploitation by the Canadian inriver fishery.

DISCUSSION

Numerous spawning populations of sockeye salmon have been identified in both the Taku River and Port Snettisham drainages. Optimization of Taku River and Port Snettisham sockeye salmon production requires that catches and escapements be distributed among component stocks. To estimate production from each stock (or group of stocks) and regulate fisheries to achieve appropriate harvest distribution requires that we estimate the contribution by stock through time. Differences in age composition, run timing, and scale pattern features among several of these stock groups have been previously documented (McGregor 1986, Clark et al. 1986). We utilized these differences in 1986 to refine techniques for allocating mixed-stock catches. We used SPA models to resolve up to 6 stock-groupings in catches, in contrast to past years' classification models that were capable of discriminating only between pooled Taku River and Port Snettisham runs. Additionally, by allocating Canadian Taku River catches to stock group of origin for the first time, we were able to estimate exploitation rates and generate total run estimates for several individual Taku River stocks in 1986.

Similar trends in stock composition are apparent in a variety of independent data sets. Examination of age composition data from escapements and catches reveals trends comparable to results from adult tagging studies. For instance, tagging studies reveal that the Kuthai Lake stock is one of the earliest returning to the Taku River drainage (McGregor and Clark 1987). The age composition of the 1986 Kuthai Lake escapement was distinct from other Taku River stocks by its high proportion of age 1.2 returns. The elevated proportions of age 1.2 fish in early-season District 111, Canyon Island, and Canadian inriver catches therefore likely represent the passage of the Kuthai stock through the fisheries. Likewise, SPA stock composition estimates of age 1.2 and 1.3 fish reveal high proportions of Kuthai Lake fish during the early weeks of the return. The increase in freshwater age 0. fish in the mid- and late-season catches is indicative of the passage of Mainstem spawners through the fisheries, since zero-check sockeye salmon were found almost exclusively in river spawning locations in the Taku River drainage. This trend in timing of river stocks is also apparent in spawning ground tag recoveries (McGregor and Clark 1987), and age 1.2 and age 1.3 SPA allocations. Trends in tagging and SPA results for each of the Little Trapper Lake and Tatsamenie Lake systems compare closely as well. Close agreement between independent data sets suggests that SPA models are reflecting the actual mixtures of stock compositions present.

Results of SPA of catches and monitoring of escapements allow assessment of the treaty performance of U.S. and Canadian fisheries targeting on Taku River sockeye salmon to be assessed. The estimated return of sockeye salmon destined for the Taku River drainage totaled 165,809 fish. After the 71,000 to 80,000 fish needed to realize the Taku River interim escapement goal are subtracted from the total return, the TAC of Taku River fish to be shared among the two nations was 85,809 to 94,809 fish. Under the 85% U.S.:15% Canada harvest sharing specifications of the Treaty, U.S. fishermen were entitled to catch between 72,938 and 80,588 Taku River fish, but actually took an estimated 60,700 fish (75.3% to 83.2% of their entitlement). The Canadian fishery catch of 14,739 fish was close to but slightly exceeded the Canadian entitlement of 12,871 to 14,221 fish. The failure of the U.S. to harvest its entitlement resulted in increased escapement to the Taku River.

The sockeye salmon escapement to Snettisham systems (9,271 fish) represents only 27.3% of the escapement goal (34,000 fish) for these drainages. The estimated total return of Port Snettisham sockeye salmon was so small (21,351 fish) that even if no commercial fishery had been allowed in District 111 the escapement would have represented only 62.8% of the desired goal.

It should be recognized that the stock composition and Taku River escapement estimates are indeed estimates, each with an underlying variance. The variability inherent in these estimates complicates both the task of fishery managers to achieve prescribed catch allocations and our ability to provide an accurate assessment of their relative success. Further work at increasing accuracies and reducing variances associated with classification techniques used to allocate catches is currently underway. The incidence of a brain parasite, *Myxobolus neurobius*, differs among stocks contributing to the District 111 and inriver fisheries (Transboundary Technical Committee 1987). Incorporation of brain parasite incidence with scale pattern and age composition data may allow the accuracy and precision of stock composition estimates to be improved in future years.

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LITERATURE CITED

Clark, J.E., A.J. McGregor, and F.E. Bergander. 1986. Migratory timing and escapement of Taku River salmon stocks, 1984-1985. Component section of Alaska Department of Fish and Game-National Marine Fisheries Service Contract No. 85-ABC-00142 completion report, Juneau, Alaska.

Clutter, R. and L. Whitesel. 1956. Collection and interpretation of sockeye salmon scales. Bulletin of the International Pacific Salmon Fisheries Commission, No. 9. Vancouver, British Columbia.

Cook, R. and G. Lord. 1978. Identification of stocks of Bristol Bay sockeye salmon by evaluating scale patterns with a polynomial discriminant method. Fishery Bulletin 76:415-23.

Habbema, J.D.F., and J. Hermans. 1977. Selection of variables in discriminant analysis by F-statistic and error rate. Technometrics 19(4):487-493.

Lachenbruch, P.A. 1967. An almost unbiased method of obtaining confidence intervals for the probability of misclassification in discriminant analysis. Biometrics 23(4): 639-645.

McGregor, A.J. 1985. Origins of sockeye salmon (*Oncorhynchus nerka* Walbaum) in the Taku-Snettisham drift gillnet fishery of 1983 based on scale pattern analysis. Alaska Department of Fish and Game, Division of Commercial Fisheries, Informational Leaflet 246. Juneau, Alaska.

McGregor, A.J. 1986. Origins of sockeye salmon (*Oncorhynchus nerka* Walbaum) in the Taku-Snettisham drift gillnet fishery of 1984 based on scale pattern analysis. Alaska Department of Fish and Game, Division of Commercial Fisheries, Technical Data Report 174. Juneau, Alaska.

McGregor, A.J. and J.E. Clark. 1987. Migratory timing and escapement of Taku River salmon stocks, 1986. Final Report-1986 salmon research conducted in Southeast Alaska by the Alaska Department of Fish and Game in conjunction with the National Marine Fisheries Service Auke Bay Laboratory for joint U.S.-Canada interception studies, Douglas, Alaska.

McPherson, S.A., F.E. Bergander, and A.J.McGregor. 1987. Abundance, age, sex, and size of sockeye salmon (*Oncorhynchus nerka* Walbaum) catches and escapements in Southeastern Alaska in 1986. Final Report-1986 salmon research conducted in Southeast Alaska by the Alaska Department of Fish and Game in conjunction with the National Marine Fisheries Service Auke Bay Laboratory for joint U.S.-Canada interception studies, Douglas, Alaska.

Mosher, K.H. 1968. Photographic atlas of sockeye salmon scales. Fishery Bulletin 67(2):243-279.

Oliver, G.T, and A.J. McGregor. 1986. Estimated contribution of transboundary sockeye salmon stocks to commercial fisheries in Alaska Districts 106 and 111 in 1985, based on scale pattern analysis. Component section of Alaska Department of Fish and Game-National Marine Fisheries Service Contract No. 85-ABC-00142 completion report, Juneau, Alaska.

Oliver, G.T., S.L. Marshall, D.R.Bernard, S.A. McPherson, and S.L. Walls. 1985. Estimated contributions from Alaska and Canada stocks to the catches of sockeye salmon (*Oncorhynchus nerka*) in southern Southeastern Alaska, 1982 and 1983 based on scale pattern analysis. Alaska Department of Fish and Game, Division of Commercial Fisheries, Technical Data Report 137, Douglas, Alaska.

Pella, J. and T. Robertson. 1979. Assessment of composition of stock mixtures. Fishery Bulletin 77:387-389.

Ryan, P. and M. Christie. 1976. Scale reading equipment. Fisheries and Marine Service, Canada Technical Report No. PAC/T -75-8. 38 pp.

Tesch, F. 1970. Age and growth. Pages 98-126 in W.E. Ricker, editor. Methods of assessment of fish production in fresh waters. IBP Handbook No. 3. Blackwell Scientific Publications, Oxford and Edinburgh.

Transboundary Technical Committee. 1987. Report of the Pacific Salmon Commission Transboundary Technical Committee - Feb. 8, 1987. Unpublished report prepared for members of the Pacific Salmon Commission and Northern Panel.

Table 1. Traditional District 111 fishery openings, effort, and harvest of sockeye salmon by statistical week and subdistrict, 1986.

Statistical Week	Dates Fished	Number of Days Fished	Number of Boats	Effort (Boat Days)	Subdistrict 31	Subdistrict 32	Subdistrict 34	Total Catch	CPUE Catch/Boat Day
25	6/15-17	2	32	64	0	646	0	646	10.09
26 1/	6/22-24	1.5	39	58.5	28	1,588	0	1,616	27.62
27	6/29-7/1	2	54	108	423	3,318	192	3,933	36.42
28 2/	7/6-7	1	104	104	1,140	7,160	0	8,300	79.81
29 1,2/	7/13-15	1.5	96	144	1,618	10,578	0	12,196	84.69
30 1,2,3/	7/20-22	1.5	102	153	1,670	8,257	0	9,927	64.88
31 2,3/	7/27-30	3	92	276	1,689	13,556	0	15,245	55.24
32 2,3,4/	8/3-5	2	63	126	457	4,911	0	5,368	42.60
33 2/	8/10-12	2	39	78	93	4,880	0	4,973	63.76
34 5/	8/17-20	3	37	111	478	3,136	54	3,668	33.05
35 5/	8/24-27	3	94	282	1,022	1,347	79	2,448	8.68
36	8/31-9/2	2	58	116	3	360	21	384	3.31
37	9/7-9	2	27	54	5	76	0	81	1.50
38	9/14-16	2	39	78	0	49	2	51	0.65
Total		28.5	876	1752.5	8,626	59,862	348	68,836	39.28

1/ No fishing was allowed between 10:00 p.m. and 4:00 a.m. (to reduce the catch of immature chinook salmon.

2/ Port Snettisham was closed east of a line from Point Styleman to Point Amner.

3/ The Mainland shore was closed within two nautical miles of the eastern shore of Stephens Passage south of the latitude of Graves Point and north of the latitude of Point Amner (to increase local area chum salmon escapements).

4/ Fishery opening was delayed from 12:01 p.m. Sunday to 12:01 p.m. Monday (to reduce fishing vessel congestion during the Juneau Salmon Derby).

5/ Speel Arm was closed north of a line from Prospect Point to Bogert Point.

Table 2. Supplemental southern District 111 fishery openings, effort, and harvest of sockeye salmon by statistical week, 1986[1/].

Statistical Week	Dates Fished	# Days Fished	Number of Boats	Effort (Boat Days)	Total Catch	CPUE Catch/Boat Day
27	7/1-2	1	18	18	420	23.33
28	7/7-8	1	48	48	700	14.58
29	7/15-16	1	51	51	1,169	22.92
30 2/	7/22-23	0.75	30	22.5	841	37.38
31	7/30-31	1	33	33	814	24.67
Total		4.75	180	172.5	3,944	22.86

1/ Catches in the supplemental fishery were made in Subdistricts 20 and 31, however all catches were assigned to Subdistrict 20 in the ADF&G fish ticket data base.

2/ No fishing was allowed from 10:00 p.m. through 4:00 p.m. (to reduce the catch of immature chinook salmon).

Table 3. Canadian commercial gillnet harvest of sockeye salmon in the Taku River, 1986.

Statistical Week	Dates Fished	# Days Fished	Number of Fishermen	Effort (Boat Days)	Catch	CPUE Catch/Boat Day
27	6/30-7/1	1	7	7	697	99.57
28	7/7-10	3	8	24	2,096	87.33
29	7/14-17	3	10	30	1,924	64.13
30	7/21-24	3	11	33	4,003	121.30
31	7/28-30	2	10	20	2,907	145.35
32	8/4-5	1	10	10	1,195	119.50
33	8/11-12	1	8	8	808	101.00
34	8/18-20	2	7	14	1,000	71.43
35	8/25-26	1	2	2	109	54.50
Total		17	73	148	14,739	99.59

Table 4. Age and sex composition of the traditional District 111 gillnet harvest of sockeye salmon by statistical week, 1986.

				Brood Year and Age Class													
				1983		1982			1981			1980			1979		
Statistical Week	Sample Size	Sex Composition (% Males)		0.2	1.1	0.3	1.2	2.1	0.4	1.3	2.2	1.4	2.3	3.2	2.4	3.3	Total
25	82	50.7	%			3.7	25.6			65.9			4.9				
(6/15-6/17)			SE			2.1	4.8			5.3			2.4				
			Catch			24	165			425			32				646
26	381	51.7	%	0.3		4.5	31.8			53.8	2.9	0.5	6.3				
(6/22-6/24)			SE	0.3		1.1	2.4			2.6	0.9	0.4	1.2				
			Catch	4		72	513			870	47	8	102				1,616
27	583	50.6	%	0.3		4.6	21.3			64.3	0.7	0.5	8.1		0.2		
(6/29-7/01)			SE	0.2		0.9	1.7			2.0	0.3	0.3	1.1		0.2		
			Catch	13		182	837			2,530	27	20	317		7		3,933
28	1,236	52.6	%	0.3		3.7	9.5	0.1	0.1	71.6	1.1	0.2	13.4				
(7/06-7/07)			SE	0.2		0.5	0.8	0.1	0.1	1.3	0.3	0.1	1.0				
			Catch	27		309	786	7	7	5,943	87	20	1,114				8,300
29	899	50.4	%	0.1		5.5	12.5		0.3	69.9	1.0	0.3	10.5				
(7/13-7/15)			SE	0.1		0.8	1.1		0.2	1.5	0.3	0.2	1				
			Catch	14		665	1,519		41	8,519	122	41	1,275				12,196
30	878	52.2	%	1.0		16.4	8.1			64.9	0.7	0.2	8.5		0.1		
(7/20-7/22)			SE	0.3		1.3	0.9			1.6	0.3	0.2	0.9		0.1		
			Catch	101		1,628	803			6,446	68	22	848		11		9,927
31	792	53.9	%	0.6		17.0	9.7			61.5	1.0	0.1	9.7		0.3		
(7/27-7/30)			SE	0.2		1.3	1.1			1.7	0.4	0.1	1.1		0.2		
			Catch	96		2,599	1,482			9,375	154	19	1,482		38		15,245
32	1,126	47.6	%	0.6		16.1	9.9			56.8	1.4	0.3	14.7	0.1	0.1		
(8/03-8/05)			SE	0.2		1.1	0.9			1.5	0.4	0.2	1.1	0.1	0.1		
			Catch	33		863	529			3,052	76	14	791	5	5		5,368
33	472	46.5	%	0.6	0.2	24.2	8.1			48.9	1.5	1.3	14.8			0.4	
(8/10-8/12)			SE	0.4	0.2	2.0	1.3			2.3	0.6	0.5	1.6			0.3	
			Catch	32	11	1,200	400			2,433	74	63	738			22	4,973
34-38	234	55.9	%	0.4		18.8	11.5			41.5	4.3	0.4	22.2	0.4		0.4	
(8/17-9/16)			SE	0.4		2.6	2.1			3.2	1.3	0.4	2.7	0.4		0.4	
			Catch	28		1,247	765			2,750	283	28	1,475	28		28	6,632
Total	6,683	51.8	%	0.5	<0.1	12.8	11.3	<0.1	0.1	61.5	1.4	0.3	11.9	<0.1	0.1	0.1	
			SE	0.1	<0.1	0.5	0.4	<0.1	<0.1	0.7	0.2	0.1	0.5	<0.1	<0.1	<0.1	
			Catch	348	11	8,789	7,799	7	48	42,343	938	235	8,174	33	61	50	68,836

Table 5. Age and sex composition of the supplemental southern District 111 gillnet harvest of sockeye salmon by statistical week, 1986.

				Brood Year and Age Class									
				1983	1982		1981			1980		1979	
Statistical Week	Sample Size	Sex Composition (% Males)		0.2	0.3	1.2	0.4	1.3	2.2	1.4	2.3	2.4	Total
27 (7/01-7/02)	58	41.4	%		24.1	25.9		43.1	3.4		3.4		
			SE		5.7	5.8		6.6	2.4		2.4		
			Catch		102	109		181	14		14		420
28 (7/07-7/08)	163	52.1	%	1.8	7.4	23.3		58.9	2.5	0.6	5.5		
			SE	1.1	2.1	3.3		3.9	1.2	0.6	1.8		
			Catch	13	52	163		412	17	4	39		700
29 (7/15-7/16)	173	61.8	%	0.6	4.6	26.0		56.1	2.9		9.8		
			SE	0.6	1.6	3.3		3.8	1.3		2.3		
			Catch	7	54	304		655	34		115		1,169
30 (7/22-7/23)	212	66.0	%	0.5	8.5	22.6	0.5	59.8	0.5		7.1	0.5	
			SE	0.5	1.9	2.9	0.5	3.4	0.5		1.8	0.5	
			Catch	4	71	190	4	504	4		60	4	841
31 (7/30-7/31)	125	53.6	%		4.8	31.2		50.4	2.4	2.4	8.8		
			SE		1.9	4.2		4.5	1.4	1.4	2.5		
			Catch		39	254		409	20	20	72		814
Total	731	57.1	%	0.6	8.0	25.9	0.1	54.8	2.3	0.6	7.6	0.1	
			SE	0.3	1.0	1.7	0.1	1.9	0.6	0.3	1.0	0.1	
			Catch	24	318	1,020	4	2,161	89	24	300	4	3,944

Table 6. Age and sex composition of the Canadian Taku River gillnet harvest of sockeye salmon by statistical week, 1986.

Statistical Week	Sample Size	Sex Composition (% Males)		Brood Year and Age Class									
				1983		1982		1981			1980		
				0.2	1.1	0.3	1.2	0.4	1.3	2.2	1.4	2.3	Total
27	119	60.5	%			0.8	33.6		58.5	1.7		5.0	
(6/30-7/01)			SE			0.8	4.3		4.5	1.2		2.0	
			Catch			6	234		410	12		35	697
28	206	47.1	%	0.5		1.5	19.9		69.4			8.7	
(7/07-7/10)			SE	0.5		0.8	2.8		3.2			2	
			Catch	10		31	417		1,455			183	2,096
29	196	43.9	%	2.6		2.0	11.7		65.3	3.6	0.5	14.3	
(7/14-7/17)			SE	1.1		1.0	2.3		3.4	1.3	0.5	2.5	
			Catch	49		39	226		1,256	69	10	275	1,924
30	194	51.5	%	2.6		13.9	5.2		70.6	0.5		7.2	
(7/21-7/24)			SE	1.1		2.5	1.6		3.3	0.5		1.9	
			Catch	103		557	206		2,827	21		289	4,003
31	189	45.5	%	3.7		18.0	9.0	0.5	53.4	1.1		14.3	
(7/28-7/30)			SE	1.4		2.8	2.1	0.5	3.6	0.7		2.6	
			Catch	108		523	261	15	1,554	31		415	2,907
32	125	52.8	%	0.8		28.8	7.2		52.0			11.2	
(8/04-8/05)			SE	0.8		4.1	2.3		4.5			2.8	
			Catch	10		344	86		621			134	1,195
33	102	48.0	%			25.5	4.9		54.9	1.0		13.7	
(8/11-8/12)			SE			4.3	2.1		5	1		3.4	
			Catch			206	40		443	8		111	808
34-35	94	46.8	%	4.3	1.1	36.2	10.6	1.1	38.3			8.5	
(8/18-8/26)			SE	2.1	1.1	5.0	3.2	1.1	5.0			2.9	
			Catch	47	12	401	118	12	425			94	1,109
Total	1,225	48.7	%	2.2	0.1	14.3	10.8	0.2	61.0	0.9	0.1	10.4	
			SE	0.5	0.1	1.0	0.9	0.1	1.5	0.3	0.1	0.9	
			Catch	327	12	2,107	1,588	27	8,991	141	10	1,536	14,739

Table 7. Age and sex composition of the Canyon Island fishwheel catch of sockeye salmon by statistical week, 1986.

Statistical Week	Sample Size	Sex Composition (% Males)		Brood Year and Age Class: 1983		1982			1981		1980	
				0.2	1.1	0.3	1.2	2.1	1.3	2.2	1.4	2.3
24–25	108	40.7	%				49.1		46.3	0.9		3.7
(6/14–6/21)			SE				4.8		4.8	0.9		1.8
26	310	51.0	%	0.3	0.3	1.9	49.0		42.6	2.6	0.3	2.9
(6/22–6/28)			SE	0.3	0.3	0.8	2.8		2.8	0.9	0.3	1.0
27	667	54.1	%	0.9		1.3	51.0		37.8	1.8	0.4	6.7
(6/29–7/05)			SE	0.4		0.4	1.9		1.9	0.5	0.3	1.0
28	578	51.6	%	2.2	0.2	1.7	34.8		50.3	2.8	0.7	7.3
(7/06–7/12)			SE	0.6	0.2	0.5	2.0		2.1	0.7	0.3	1.1
29	394	45.8	%	3.6		3.8	23.6		56.8	3.8		8.4
(7/13–7/19)			SE	0.9		1.0	2.1		2.5	1.0		1.4
30	683	49.7	%	4.2	0.4	6.6	14.6		61.8	1.9	0.1	10.2
(7/20–7/26)			SE	0.8	0.3	0.9	1.4		1.9	0.5	0.1	1.2
31	233	54.1	%	5.2	1.3	17.6	11.6	0.4	53.6	1.7		8.6
(7/27–8/02)			SE	1.5	0.7	2.5	2.1	0.4	3.3	0.9		1.8
32	212	52.4	%	5.2	1.4	18.9	13.7		49.5	2.8		8.5
(8/03–8/09)			SE	1.5	0.8	2.7	2.4		3.4	1.1		1.9
33–35	204	44.1	%	3.9	0.5	18.1	11.8		52.9	0.5	1.0	11.3
(8/10–8/24)			SE	1.4	0.5	2.7	2.3		3.5	0.5	0.7	2.2
Total	3,389	49.3	%	2.8	0.5	7.8	28.8	<0.1	50.2	2.1	0.3	7.5
			SE	0.3	0.1	0.5	0.9	<0.1	1.0	0.3	0.1	0.5

Table 8. Age and sex composition of Taku River and Port Snettisham drainage sockeye salmon escapements, 1986.

				Brood Year and Age Class												
		Sex		1984	1983		1982			1981			1980		1979	
System	Sample Size	Composition (% 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	826	51.6	%		0.2		0.1	15.7		0.1	73.2	0.9	0.7	8.7	0.1	
			SE		0.2		0.1	1.3		0.1	1.5	0.3	0.3	1.0	0.1	
			Numbers		8		12	536		4	2,499	29	24	298	4	3,414
Speel Lake	873	64.6	%		0.2		0.2	47.6			48.1	0.8	0.1	3.1		
			SE		0.1		0.2	1.8			1.8	0.3	0.1	0.6		
			Numbers		13		10	2,786			2,817	47	4	180		5,857
Taku River																
Lake Systems:																
L. Trapper Lake	671	58.9	%				0.1	5.5			77.5	1.3		15.5		
			SE				0.1	0.9			1.6	0.4		1.4		
			Numbers				21	762			10,710	185		2,142		13,820
Tatsamenie Lake	723	44.1	%		1.0		0.8	9.4			73.0	0.8		14.9		
			SE		0.4		0.3	1.1			1.7	0.3		1.3		
			Numbers		110		94	1,069			8,303	94		1,698		11,368
Kuthai Lake	73	54.8	%					57.5			38.4	2.7		1.4		
			SE					5.8			5.7	1.9		1.4		
Nakina R. (Kuthai Lake) 1/	148	33.8	%					51.4			44.6	2.0		2.0		
			SE					4.1			4.1	1.2		1.2		
Mainstem, River, and Slough Spawners:																
Hackett River	124	71.0	%		16.9		22.6	21.0			38.7			0.8		
			SE		3.4		3.8	3.7			4.4			0.8		
			Numbers		170		227	211			388			8		1,004
Nakina River	62	71.7	%	1.6	3.2	3.2	29.0	22.6	1.6		32.3	1.6	1.6	3.2		
			SE	1.6	2.3	2.3	5.8	5.4	1.6		6.0	1.6	1.6	2.3		
Fish Creek	19	73.7	%			5.3	42.1	31.6			21.1					
			SE			5.3	11.6	11			9.6					
Yehring Creek	189	51.9	%		1.1	0.5	7.9	21.7			64.0	1.6		3.2		
			SE		0.7	0.5	2.0	3.0			3.5	0.9		1.3		
South Fork Slough	54	90.7	%	1.9	22.2	3.7	40.7	1.9			29.6					
			SE	1.9	5.7	2.6	6.7	1.9			6.3					
Chum Salmon Slough	5	20.0	%		20.0		40.0	20.0			20.0					
			SE		20.0		40.0	20.0			20.0					
Honakta Slough	50	64.6	%		24.0	2.0	38.0	16.0			14.0			6.0		
			SE		6.1	2.0	6.9	5.2			5.0			3.4		
Shustahini Slough	93	76.3	%		12.9		38.7	24.7			21.5	2.2				
			SE		3.5		5.1	4.5			4.3	1.5				
Coffee's Slough	24	87.5	%	8.3	50.0	4.2	20.8	12.5			4.2					
			SE	5.8	10.4	4.2	8.5	6.9			4.2					
Tuskwa Slough	48	91.7	%		54.2	2.1	14.6	22.9			6.3					
			SE		7.3	2.1	5.1	6.1			3.5					
Canoe Slough	1	100.0	%								100.0					
			SE								----					
Subtotal River Spawners	667		%	0.6	14.8	1.3	24.1	20.1	0.1		36.2	0.9	0.1	1.8		

1/ Samples were taken from unspawned mortalities at the Nakina River carcass weir; these fish are thought to have died attempting to ascend barriers in the outlet stream of Kuthai Lake, located nearby the weir (Kissner, personal communication).

Table 9. Classification matrices from discriminant function analysis of age 1.2 and 1.3 sockeye salmon used to compare samples from the Nakina River drainage, 1986.

Age 1.2

Actual Group of Origin	Sample Size	Classified Group of Origin: Kuthai Lk.-Nakina Weir	Nakina River
Kuthai Lk.-Nakina Weir	60	1.000	0.000
Nakina River	11	0.000	1.000

Mean Proportion Correctly Classified = 1.000

Age 1.3

Actual Group of Origin	Sample Size	Classified Group of Origin: Kuthai Lk.-Nakina Weir	Nakina River
Kuthai Lk.-Nakina Weir	91	0.989	0.011
Nakina River	16	0.000	1.000

Mean Proportion Correctly Classified = .995

Table 10. Classification matrices from discriminant function analysis of age 1.2 and 1.3 sockeye salmon used to compare samples from river and slough spawners from the Taku River drainage, 1986.

Age 1.2

Actual Group of Origin	Sample Size	Classified Group of Origin				
		Yehring Cr.	Nakina R.	Shustahini Sl.	Hackett R.	Other Sloughs
Yehring Cr.	20	0.350	0.250	0.150	0.200	0.050
Nakina R.	11	0.182	0.545	0.273	0.000	0.000
Shustahini Sl.	16	0.063	0.313	0.438	0.188	0.000
Hackett R.	22	0.136	0.045	0.227	0.545	0.045
Other Sloughs	29	0.172	0.310	0.276	0.103	0.138

Mean Proportion Correctly Classified = .403

Age 1.3

Actual Group of Origin	Sample Size	Classified Group of Origin					
		Yehring Cr.	South Fork Sl.	Nakina R.	Shustahini Sl.	Hackett R.	Other Sloughs
Yehring Cr.	49	0.061	0.224	0.204	0.163	0.184	0.163
South Fork Sl.	15	0.133	0.267	0.267	0.133	0.133	0.067
Nakina R.	16	0.000	0.250	0.250	0.250	0.000	0.250
Shustahini Sl.	12	0.000	0.083	0.333	0.417	0.167	0.000
Hackett R.	52	0.038	0.154	0.058	0.250	0.462	0.038
Other Sloughs	16	0.063	0.250	0.188	0.313	0.000	0.188

Mean Proportion Correctly Classified = .274

Table 11. Group means and standard errors (in parentheses) of basic scale variables used in discriminant analyses (scale measurements are in 0.01's of inches at 100X).

		First Freshwater Zone		First Marine Zone	
Age Class	Group	No. Circuli Var. No. 1	Width Zone Var. No. 2	No. Circuli Var. No. 70	Width Zone Var. No. 71
1.2	Kuthai Lake 1/	21.83 (.20)	225.29 (2.05)	24.37 (.23)	330.79 (3.59)
	L. Trapper Lake	7.48 (.37)	84.88 (3.85)	30.10 (.54)	411.07 (8.20)
	Mainstem 2/	9.08 (.24)	99.44 (2.97)	29.94 (.35)	395.20 (4.92)
	Tatsamenie Lake	11.73 (.38)	136.02 (4.65)	28.34 (.38)	392.00 (4.69)
	Crescent Lake	6.19 (.19)	69.46 (1.98)	31.32 (.29)	456.23 (4.28)
	Speel Lake	9.87 (.10)	109.23 (1.03)	29.88 (.20)	433.21 (2.90)
1.3	Kuthai Lake 1/	17.86 (.21)	178.29 (2.03)	24.60 (.26)	321.35 (3.42)
	L. Trapper Lake	8.51 (.13)	94.03 (1.18)	29.90 (.26)	408.00 (3.15)
	Mainstem 2/	9.33 (.19)	108.39 (2.00)	29.64 (.28)	398.58 (3.97)
	Tatsamenie Lake	14.64 (.23)	164.29 (2.67)	27.44 (.28)	382.64 (3.83)
	Crescent Lake	6.38 (.13)	72.58 (1.24)	31.80 (.28)	458.79 (3.84)
	Speel Lake	11.13 (.12)	115.50 (1.22)	30.46 (.20)	434.12 (3.04)

1/ Comprised of samples taken at Kuthai Lake and the Nakina River carcass weir.

2/ Comprised of samples taken from mainstem, river and slough spawners at the lower Taku and Nakina Rivers and the Hackett River.

Table 12. Classification matrices from discriminant function analyses of age 1.3 sockeye salmon scales used to allocate District 111 catches.

Actual Group of Origin	Sample Size	Classified Group of Origin: Tatsamenie	Kuthai	Trapper	Mainstem	Crescent	Speel
Tatsamenie	100	0.770	0.070	0.030	0.070	0.010	0.050
Kuthai	91	0.088	0.901	0.000	0.000	0.000	0.011
Trapper	98	0.000	0.000	0.724	0.163	0.020	0.092
Mainstem	160	0.050	0.013	0.112	0.594	0.075	0.156
Crescent	99	0.000	0.000	0.091	0.071	0.798	0.040
Speel	150	0.013	0.000	0.120	0.073	0.007	0.787

Mean Proportion Correctly Classified = .762

Actual Group of Origin	Sample Size	Classified Group of Origin: Tatsamenie	Kuthai	Trapper	Mainstem	Crescent
Tatsamenie	100	0.780	0.090	0.060	0.070	0.000
Kuthai	91	0.066	0.923	0.011	0.000	0.000
Trapper	98	0.000	0.000	0.806	0.163	0.031
Mainstem	160	0.125	0.006	0.175	0.613	0.081
Crescent	100	0.000	0.000	0.110	0.040	0.850

Mean Proportion Correctly Classified = .794

Actual Group of Origin	Sample Size	Classified Group of Origin: Tatsamenie	Trapper	Mainstem	Crescent	Speel
Tatsamenie	100	0.830	0.040	0.070	0.010	0.050
Trapper	98	0.000	0.735	0.163	0.020	0.082
Mainstem	160	0.050	0.125	0.575	0.075	0.175
Crescent	100	0.000	0.130	0.050	0.800	0.020
Speel	150	0.013	0.100	0.087	0.007	0.793

Mean Proportion Correctly Classified = .747

-Continued-

Table 12. Classification matrices from discriminant function analyses of age 1.3 sockeye salmon scales used to allocate District 111 catches (continued).

Actual Group of Origin	Sample Size	Classified Group of Origin: Kuthai	Trapper	Mainstem	Crescent	Speel
Kuthai	91	0.978	0.000	0.011	0.000	0.011
Trapper	98	0.000	0.735	0.163	0.020	0.082
Mainstem	160	0.013	0.131	0.613	0.069	0.175
Crescent	100	0.000	0.140	0.040	0.800	0.020
Speel	150	0.000	0.133	0.093	0.007	0.767

Mean Proportion Correctly Classified = .778

Actual Group of Origin	Sample Size	Classified Group of Origin: Tatsamenie	Trapper	Mainstem	Crescent
Tatsamenie	100	0.850	0.050	0.090	0.010
Trapper	98	0.000	0.796	0.173	0.031
Mainstem	160	0.081	0.162	0.688	0.069
Crescent	100	0.000	0.110	0.050	0.840

Mean Proportion Correctly Classified = .793

Actual Group of Origin	Sample Size	Classified Group of Origin: Kuthai	Mainstem	Crescent	Trapper
Kuthai	91	0.978	0.011	0.011	0.000
Trapper	98	0.000	0.827	0.143	0.031
Mainstem	160	0.019	0.175	0.738	0.069
Crescent	100	0.000	0.120	0.030	0.850

Mean Proportion Correctly Classified = .848

Actual Group of Origin	Sample Size	Classified Group of Origin: Tatsamenie	Mainstem	Speel
Tatsamenie	100	0.810	0.100	0.090
Mainstem	160	0.044	0.744	0.213
Speel	150	0.013	0.093	0.893

Mean Proportion Correctly Classified = .816

Table 13. Classification matrices from discriminant function analyses of age 1.2 sockeye salmon scales used to allocate District 111 catches.

Actual Group of Origin	Sample Size	Classified Group of Origin					
		Tatsamenie	Kuthai	Trapper	Mainstem	Crescent	Speel
Tatsamenie	64	0.609	0.000	0.094	0.188	0.000	0.109
Kuthai	100	0.020	0.980	0.000	0.000	0.000	0.000
Trapper	42	0.000	0.024	0.429	0.190	0.214	0.143
Mainstem	98	0.122	0.020	0.184	0.480	0.031	0.163
Crescent	88	0.000	0.000	0.114	0.023	0.716	0.148
Speel	150	0.027	0.000	0.040	0.173	0.007	0.753

Mean Proportion Correctly Classified = .661

Actual Group of Origin	Sample Size	Classified Group of Origin				
		Tatsamenie	Kuthai	Mainstem	Crescent	Speel
Tatsamenie	64	0.625	0.000	0.266	0.000	0.109
Kuthai	100	0.030	0.970	0.000	0.000	0.000
Mainstem	98	0.153	0.020	0.571	0.092	0.163
Crescent	88	0.023	0.000	0.102	0.773	0.102
Speel	150	0.020	0.000	0.167	0.013	0.800

Mean Proportion Correctly Classified = .748

Actual Group of Origin	Sample Size	Classified Group of Origin				
		Tatsamenie	Kuthai	Trapper	Crescent	Speel
Tatsamenie	64	0.641	0.000	0.141	0.000	0.219
Kuthai	100	0.030	0.970	0.000	0.000	0.000
Trapper	42	0.048	0.024	0.595	0.238	0.095
Crescent	88	0.034	0.000	0.114	0.739	0.114
Speel	150	0.067	0.000	0.100	0.013	0.820

Mean Proportion Correctly Classified = .753

-Continued-

Table 13. Classification matrices from discriminant function analyses of age 1.2 sockeye salmon scales used to allocate District 111 catches (continued).

Actual Group of Origin	Sample Size	Classified Group of Origin: Kuthai	Trapper	Mainstem	Crescent	Speel
Kuthai	100	0.990	0.000	0.010	0.000	0.000
Trapper	42	0.024	0.476	0.190	0.190	0.119
Mainstem	98	0.020	0.194	0.541	0.031	0.214
Crescent	88	0.000	0.102	0.034	0.727	0.136
Speel	150	0.000	0.047	0.173	0.007	0.773

Mean Proportion Correctly Classified = .702

Actual Group of Origin	Sample Size	Classified Group of Origin: Kuthai	Trapper	Mainstem	Speel
Kuthai	100	0.990	0.000	0.010	0.000
Trapper	42	0.024	0.619	0.214	0.143
Mainstem	98	0.020	0.204	0.571	0.204
Speel	150	0.000	0.040	0.173	0.787

Mean Proportion Correctly Classified = .742

Actual Group of Origin	Sample Size	Classified Group of Origin: Tatsamenie	Kuthai	Trapper	Speel
Tatsamenie	64	0.641	0.016	0.109	0.234
Kuthai	100	0.020	0.980	0.000	0.000
Trapper	42	0.095	0.024	0.738	0.143
Speel	150	0.127	0.000	0.053	0.820

Mean Proportion Correctly Classified = .795

Actual Group of Origin	Sample Size	Classified Group of Origin: Kuthai	Mainstem	Crescent	Speel
Kuthai	100	0.990	0.010	0.000	0.000
Mainstem	98	0.020	0.673	0.092	0.214
Crescent	88	0.000	0.080	0.795	0.125
Speel	150	0.000	0.187	0.013	0.800

Mean Proportion Correctly Classified = .815

-Continued-

Table 13. Classification matrices from discriminant function analyses of age 1.2 sockeye salmon scales used to allocate District 111 catches (continued).

Actual Group of Origin	Sample Size	Classified Group of Origin: Tatsamenie	Kuthai	Crescent	Speel
Tatsamenie	64	0.688	0.000	0.031	0.281
Kuthai	100	0.030	0.970	0.000	0.000
Crescent	88	0.045	0.000	0.807	0.148
Speel	150	0.067	0.000	0.013	0.920

Mean Proportion Correctly Classified = .846

Actual Group of Origin	Sample Size	Classified Group of Origin: Trapper	Mainstem	Crescent	Speel
Trapper	42	0.476	0.190	0.143	0.190
Mainstem	98	0.224	0.531	0.020	0.224
Crescent	88	0.125	0.034	0.705	0.136
Speel	150	0.060	0.173	0.013	0.753

Mean Proportion Correctly Classified = .616

Actual Group of Origin	Sample Size	Classified Group of Origin: Kuthai	Trapper	Speel
Kuthai	100	1.000	0.000	0.000
Trapper	42	0.024	0.786	0.190
Speel	150	0.000	0.067	0.933

Mean Proportion Correctly Classified = .906

Actual Group of Origin	Sample Size	Classified Group of Origin: Mainstem	Crescent	Speel
Mainstem	98	0.724	0.041	0.235
Crescent	88	0.068	0.807	0.125
Speel	150	0.200	0.007	0.793

Mean Proportion Correctly Classified = .775

Table 14. Classification matrices from discriminant function analyses of age 1.3 sockeye salmon scales used to allocate Canadian Taku River and Canyon Island catches.

Actual Group of Origin	Sample Size	Classified Group of Origin			
		Tatsamenie	Kuthai	Trapper	Mainstem
Tatsamenie	100	0.810	0.070	0.060	0.060
Kuthai	91	0.099	0.890	0.011	0.000
Trapper	98	0.010	0.000	0.827	0.163
Mainstem	160	0.081	0.025	0.231	0.663

Mean Proportion Correctly Classified = .794

Actual Group of Origin	Sample Size	Classified Group of Origin		
		Tatsamenie	Trapper	Mainstem
Tatsamenie	100	0.870	0.060	0.070
Trapper	98	0.010	0.765	0.224
Mainstem	160	0.106	0.262	0.631

Mean Proportion Correctly Classified = .756

Actual Group of Origin	Sample Size	Classified Group of Origin		
		Kuthai	Trapper	Mainstem
Kuthai	91	0.978	0.000	0.022
Trapper	98	0.000	0.837	0.163
Mainstem	160	0.025	0.225	0.750

Mean Proportion Correctly Classified = .855

Actual Group of Origin	Sample Size	Classified Group of Origin	
		Kuthai	Mainstem
Kuthai	91	0.978	0.022
Mainstem	160	0.038	0.962

Mean Proportion Correctly Classified = .970

Table 15. Classification matrices from discriminant function analyses of age 1.2 sockeye salmon scales used to allocate Canadian Taku River and Canyon Island catches.

Actual Group of Origin	Sample Size	Classified Group of Origin			
		Tatsamenie	Kuthai	Trapper	Mainstem
Tatsamenie	64	0.672	0.000	0.094	0.234
Kuthai	100	0.020	0.980	0.000	0.000
Trapper	42	0.048	0.024	0.690	0.238
Mainstem	98	0.163	0.020	0.235	0.582

Mean Proportion Correctly Classified = .731

Actual Group of Origin	Sample Size	Classified Group of Origin		
		Tatsamenie	Kuthai	Trapper
Tatsamenie	64	0.859	0.000	0.141
Kuthai	100	0.020	0.980	0.000
Trapper	42	0.143	0.024	0.833

Mean Proportion Correctly Classified = .891

Actual Group of Origin	Sample Size	Classified Group of Origin		
		Kuthai	Trapper	Mainstem
Kuthai	100	0.990	0.000	0.010
Trapper	42	0.024	0.619	0.357
Mainstem	98	0.020	0.245	0.735

Mean Proportion Correctly Classified = .781

Actual Group of Origin	Sample Size	Classified Group of Origin		
		Tatsamenie	Kuthai	Mainstem
Tatsamenie	64	0.672	0.000	0.328
Kuthai	100	0.030	0.970	0.000
Mainstem	98	0.245	0.01	0.745

Mean Proportion Correctly Classified = .796

Table 16. Age class-specific stock composition estimates and 90% confidence intervals calculated from scale pattern analysis of age 1.3 sockeye salmon in the District 111, supplemental southern District 111, and Taku River commercial gillnet fisheries, and the Taku River escapement by statistical week, 1986.

Fishery	Statistical Week	Sample Size	Classification Group					
			Tatsamenie	Kuthai	Trapper	Mainstem	Crescent	Speel
111								
	25	53	.056±.215	.770±.239	.059±.146	.031±.155	.042±.102	.043±.137
	26	101	.022±.143	.623±.185	.160±.164	.129±.189	.008±.058	.058±.129
	27	105	Trace	.270±.125	.423±.226	.167±.231	.118±.116	.021±.131
	28	100	.028±.078	.040±.061	.780±.249	.043±.274	.109±.122	Trace
	29	100	.105±.128	.043±.077	.447±.260	.308±.311	.096±.134	.002±.156
	30	100	.275±.153	Trace	.296±.212	.204±.256	.119±.123	.106±.160
	31	100	.291±.159	Trace	.232±.202	.352±.284	.044±.101	.081±.167
	32	100	.441±.212	.019±.088	.097±.170	.156±.238	.190±.154	.098±.161
	33	100	.495±.148	Trace	Trace	.405±.173	Trace	.100±.135
	34-38	91	.159±.136	Trace	.127±.196	.406±.296	.175±.154	.132±.188
111 (South End)								
	27	25	Trace	.114±.169	.267±.351	.427±.380	.191±.252	Trace
	28	90	.039±.113	.031±.059	.382±.237	.275±.274	.274±.169	Trace
	29	94	.072±.085	Trace	.377±.204	.161±.201	.390±.162	Trace
	30	100	.093±.112	.013±.050	.141±.204	.109±.229	.485±.211	.160±.176
	31	59	.140±.174	.006±.061	.094±.240	.139±.294	.341±.242	.280±.259
Taku River								
	27	68	Trace	.569±.135	.346±.171	.085±.149		
	28	100	.020±.088	.229±.119	.558±.215	.193±.221		
	29	100	.021±.080	.082±.079	.672±.229	.225±.246		
	30	114	.144±.112	.023±.052	.588±.275	.185±.226		
	31	99	.255±.146	.007±.056	.485±.217	.254±.232		
	32	62	.394±.213	.031±.099	.197±.232	.378±.280		
	33	56	.426±.185	Trace	.218±.252	.356±.298		
	34-35	26	.310±.247	Trace	.368±.393	.323±.440		
Taku River Escapement 1/	25	43	Trace	.949±.073	Trace	.051±.073		
	26	100	Trace	.817±.093	.129±.095	.055±.098		
	27	100	Trace	.579±.112	.287±.138	.134±.132		
	28	100	.006±.075	.187±.109	.690±.221	.116±.226		
	29	100	.117±.107	.046±.064	.804±.225	.033±.229		
	30	100	.275±.145	.020±.062	.588±.216	.117±.217		
	31	100	.268±.129	Trace	.322±.217	.411±.249		
	32	96	.475±.154	Trace	.001±.180	.525±.244		
	33-35	100	.414±.179	.032±.085	.045±.173	.510±.238		

1/ Escapement samples were taken in fishwheels at Canyon Island.

Table 17. Age class-specific stock composition estimates and 90% confidence intervals calculated from scale pattern analysis of age 1.2 sockeye salmon in the District 111, supplemental southern District 111, and Taku River commercial gillnet fisheries, and the Taku River escapement by statistical week, 1986.

Fishery	Statistical Week	Sample Size	Classification Group					
			Tatsamenie	Kuthai	Trapper	Mainstem	Crescent	Speel
111								
	25	21	Trace	1.000±.000	.000±.000	Trace	Trace	.000±.000
	26	100	Trace	.970±.037	.011±.028	Trace	Trace	.019±.034
	27	89	Trace	.872±.096	Trace	.076±.119	.019±.053	.033±.082
	28	103	.165±.208	.400±.152	.134±.354	.120±.380	.062±.167	.119±.182
	29	93	.224±.256	.158±.120	.061±.406	.237±.469	.195±.221	.123±.220
	30	54	.319±.313	.024±.071	.331±.256	Trace	Trace	.325±.289
	31	70	.629±.282	.000±.000	Trace	Trace	.023±.090	.348±.271
	32	70	.383±.344	.011±.046	.046±.438	.111±.569	.077±.189	.371±.307
	33-38	65	.415±.313	.008±.043	.024±.156	Trace	Trace	.554±.285
111 (South End)								
	27	15	.173±.538	.061±.203	.171±.972	.120±1.134	.032±.410	.441±.646
	28	36	Trace	.156±.179	.229±.602	.326±.589	.154±.314	.135±.345
	29	46	Trace	.034±.088	.242±.536	.220±.507	.254±.317	.251±.339
	30	45	.092±.236	.021±.064	.058±.308	Trace	.211±.260	.617±.318
	31	37	Trace	Trace	Trace	.309±.328	.079±.125	.612±.322
Taku River								
	27	40	.025±.028	.995±.047	Trace	Trace		
	28	41	.001±.119	.919±.124	.066±.151	.015±.157		
	29-30	33	.070±.333	.432±.193	Trace	.498±.366		
	31-35	39	.349±.407	.013±.069	.049±.388	.588±.618		
Taku River Escapement 1/	25	36	.008±.051	.992±.052	Trace	Trace		
	26	100	.020±.041	.980±.040	Trace	Trace		
	27	100	Trace	.959±.033	Trace	.041±.034		
	28	100	Trace	.711±.077	Trace	.289±.077		
	29	87	.123±.209	.449±.140	.006±.209	.422±.341		
	30	93	.113±.219	.284±.124	.067±.253	.537±.382		
	31	25	.424±.494	.113±.169	.025±.416	.438±.702		
	32	28	.307±.320	Trace	Trace	.693±.320		
	33-35	24	.541±.531	.082±.126	Trace	.377±.533		

1/ Escapement samples were taken in fishwheels at Canyon Island.

Table 18. Estimated contribution of sockeye salmon stocks to the District 111 gillnet fishery, 1986 (not including special openings).

Stat Week		Age Groups 1.2	1.3	0.+	2.+	Other	Total	90% C.I. 1/ Lower	Upper	Percent
25	Kuthai	165	328	0	13	0	506	444	568	78.3%
	Trapper	0	24	0	7	0	31	-3	65	4.8%
	Mainstem	0	13	23	1	0	37	1	73	5.7%
	Tatsamenie	0	24	1	7	0	32	-18	32	5.0%
	Crescent	0	18	0	3	0	21	-3	45	3.3%
	Speel	0	18	0	1	0	19	-13	51	2.9%
	Total	165	425	24	32	0	646			100.0%
26	Kuthai	497	543	0	73	0	1,113	1,015	1,211	68.9%
	Trapper	6	139	0	54	0	199	120	278	12.3%
	Mainstem	0	112	76	10	4	202	112	292	12.5%
	Tatsamenie	0	19	0	6	0	25	-42	92	1.5%
	Crescent	0	7	0	1	2	10	-17	37	0.6%
	Speel	10	50	0	5	2	67	5	129	4.1%
	Total	513	870	76	149	8	1,616			100.0%
27	Kuthai	729	684	0	43	0	1,456	1,249	1,663	37.0%
	Trapper	0	1,071	1	240	0	1,312	972	1,652	33.4%
	Mainstem	64	423	193	21	5	706	355	1,057	18.0%
	Tatsamenie	0	0	0	0	0	0	0	0	0.0%
	Crescent	16	299	1	44	15	375	198	552	9.5%
	Speel	28	53	0	3	0	84	-116	284	2.1%
	Total	837	2,530	195	351	20	3,933			100.0%
28	Kuthai	314	238	0	22	0	574	348	800	6.9%
	Trapper	105	4,635	11	1,018	0	5,769	4,873	6,665	69.5%
	Mainstem	94	256	312	24	2	688	-284	1,660	8.3%
	Tatsamenie	130	166	7	60	0	363	77	649	4.4%
	Crescent	49	648	13	80	18	808	372	1,244	9.7%
	Speel	94	0	0	4	0	98	19	177	1.2%
	Total	786	5,943	343	1,208	20	8,300			100.0%
29	Kuthai	240	366	0	24	0	630	260	1,000	5.2%
	Trapper	93	3,804	2	841	0	4,740	3,487	5,993	38.9%
	Mainstem	361	2,620	668	143	14	3,806	2,319	5,293	31.2%
	Tatsamenie	341	894	6	253	0	1,494	865	2,123	12.2%
	Crescent	297	818	44	128	26	1,313	670	1,956	10.8%
	Speel	187	17	0	8	1	213	-529	955	1.7%
	Total	1,519	8,519	720	1,397	41	12,196			100.0%
30	Kuthai	19	0	0	0	0	19	-19	57	0.2%
	Trapper	267	1,908	7	399	0	2,581	1,761	3,401	26.0%
	Mainstem	0	1,315	1,645	55	5	3,020	2,045	3,020	30.4%
	Tatsamenie	256	1,773	61	353	0	2,443	1,836	3,050	24.6%
	Crescent	0	767	10	86	15	878	410	1,346	8.8%
	Speel	261	683	6	34	2	986	356	1,616	9.9%
	Total	803	6,446	1,729	927	22	9,927			100.0%
31	Kuthai	0	0	0	0	0	0	0	0	0.0%
	Trapper	0	2,175	5	516	0	2,696	1,575	3,817	17.7%
	Mainstem	0	3,300	2,613	183	10	6,106	4,529	7,683	40.1%
	Tatsamenie	932	2,728	68	819	0	4,547	3,610	5,484	29.8%
	Crescent	34	413	4	95	7	553	-13	1,119	3.6%
	Speel	516	759	5	61	2	1,343	379	2,307	8.8%
	Total	1,482	9,375	2,695	1,674	19	15,245			100.0%
32	Kuthai	6	58	0	5	0	69	-78	216	1.3%
	Trapper	24	296	1	118	0	439	131	747	8.2%
	Mainstem	59	475	825	47	3	1,409	984	1,834	26.2%
	Tatsamenie	203	1,345	56	538	2	2,144	1,776	2,512	39.9%
	Crescent	41	579	10	127	12	769	508	1,030	14.3%
	Speel	196	299	4	37	2	538	256	820	10.0%
	Total	529	3,052	896	872	19	5,368			100.0%
33	Kuthai	3	0	0	0	0	3	-8	14	0.1%
	Trapper	10	0	0	5	0	15	-26	56	0.3%
	Mainstem	0	985	1,190	113	70	2,358	2,026	2,690	47.4%
	Tatsamenie	166	1,205	39	648	9	2,067	1,765	2,369	41.6%
	Crescent	0	0	0	0	0	0	0	0	0.0%
	Speel	221	243	3	46	17	530	261	799	10.7%
	Total	400	2,433	1,232	812	96	4,973			100.0%
34-38	Kuthai	6	0	0	2	0	8	-25	41	0.1%
	Trapper	18	349	1	360	6	734	392	1,076	11.1%
	Mainstem	0	1,118	1,244	287	32	2,681	2,180	3,182	40.4%
	Tatsamenie	317	438	20	691	12	1,478	1,138	1,818	22.3%
	Crescent	0	482	6	254	23	765	507	1,023	11.5%
	Speel	424	363	4	164	11	966	572	1,360	14.6%
	Total	765	2,750	1,275	1,758	84	6,632			100.0%
Total	Kuthai	1,979	2,217	0	182	0	4,378	3,860	4,896	6.4%
	Trapper	523	14,401	28	3,558	6	18,516	16,363	20,669	26.9%
	Mainstem	578	10,617	8,789	884	145	21,013	18,317	23,709	30.5%
	Tatsamenie	2,345	8,592	258	3,375	23	14,593	13,155	16,031	21.2%
	Crescent	437	4,031	88	818	118	5,492	4,348	6,636	8.0%
	Speel	1,937	2,485	22	363	37	4,844	3,351	6,337	7.0%
	Total	7,799	42,343	9,185	9,180	329	68,836			100.0%

1/ Confidence intervals are minimum estimates based on the allocation of the 1.2 and 1.3 age classes.

Table 19. Estimated contribution of sockeye salmon stocks to the supplemental southern District 111 gillnet fishery, 1986.

Statistical Week		Age Groups 1.2	1.3	0.+	2.+	Other	Total	90% C.I. 1/ Lower	Upper	Percent
27	Kuthai	7	21	0	2	0	30	6	54	7.1%
(7/01-7/02)	Trapper	19	48	0	11	0	78	6	150	18.6%
	Mainstem	13	77	101	7	0	198	115	281	47.1%
	Tatsamenie	19	0	1	3	0	23	-9	55	5.5%
	Crescent	3	35	0	3	0	41	2	80	9.8%
	Speel	48	0	0	2	0	50	8	92	11.9%
	Total	109	181	102	28	0	420			100.0%
28	Kuthai	25	13	0	2	0	40	17	63	5.7%
(7/07-7/08)	Trapper	37	157	0	31	0	225	142	308	32.1%
	Mainstem	54	113	65	9	2	243	155	331	34.7%
	Tatsamenie	0	16	0	2	0	18	-10	46	2.6%
	Crescent	25	113	0	12	2	152	100	204	21.7%
	Speel	22	0	0	0	0	22	-12	56	3.1%
	Total	163	412	65	56	4	700			100.0%
29	Kuthai	10	0	0	1	0	11	-5	27	0.9%
(7/15-7/16)	Trapper	74	247	0	77	0	398	266	530	34.0%
	Mainstem	67	105	60	13	0	245	119	371	21.0%
	Tatsamenie	0	47	0	10	0	57	20	94	4.9%
	Crescent	77	256	1	43	0	377	284	470	32.2%
	Speel	76	0	0	5	0	81	18	144	6.9%
	Total	304	655	61	149	0	1,169			100.0%
30	Kuthai	4	7	0	0	0	11	-4	26	1.3%
(7/22-7/23)	Trapper	11	71	0	16	0	98	32	164	11.7%
	Mainstem	0	55	68	2	0	125	62	188	14.9%
	Tatsamenie	17	47	2	11	0	77	36	118	9.2%
	Crescent	40	243	8	32	0	323	256	390	38.4%
	Speel	118	81	1	7	0	207	144	270	24.6%
	Total	190	504	79	68	0	841			100.0%
31	Kuthai	0	2	0	0	0	2	-12	16	0.2%
(7/30-7/31)	Trapper	0	38	0	13	0	51	-3	105	6.3%
	Mainstem	78	57	38	13	9	195	103	287	24.0%
	Tatsamenie	0	57	0	18	0	75	35	115	9.2%
	Crescent	20	140	1	28	11	200	139	261	24.6%
	Speel	156	115	0	20	0	291	202	380	35.7%
	Total	254	409	39	92	20	814			100.0%
Total	Kuthai	46	43	0	5	0	94	52	136	2.4%
	Trapper	141	561	0	148	0	850	659	1,041	21.6%
	Mainstem	212	407	332	44	11	1,006	799	1,213	25.5%
	Tatsamenie	36	167	3	44	0	250	170	330	6.3%
	Crescent	165	787	10	118	13	1,093	948	1,238	27.7%
	Speel	420	196	1	34	0	651	514	788	16.5%
	Total	1,020	2,161	346	393	24	3,944			100.0%

1/ Confidence intervals are minimum estimates based on the allocation of the 1.2 and 1.3 age classes.

Table 20. Estimated contribution of sockeye salmon stocks to the District 111 drift gillnet fishery, traditional and supplemental southern openings combined, 1986.

Stat Week		Age Groups 1.2	1.3	0.+	2.+	Other	Total	Percent	Effort Boat Days	CPUE
25	Kuthai	165	328	0	13	0	506	78.3%	96	5.27
	Trapper	0	24	0	7	0	31	4.8%		0.32
	Mainstem	0	13	23	1	0	37	5.7%		0.39
	Tatsamenie	0	24	1	7	0	32	5.0%		0.33
	Crescent	0	18	0	3	0	21	3.3%		0.22
	Speel	0	18	0	1	0	19	2.9%		0.20
	Total	165	425	24	32	0	646	100.0%		6.73
26	Kuthai	497	543	0	73	0	1,113	68.9%	78	14.27
	Trapper	6	139	0	54	0	199	12.3%		2.55
	Mainstem	0	112	76	10	4	202	12.5%		2.59
	Tatsamenie	0	19	0	6	0	25	1.5%		0.32
	Crescent	0	7	0	1	2	10	0.6%		0.13
	Speel	10	50	0	5	2	67	4.1%		0.86
	Total	513	870	76	149	8	1,616	100.0%		20.72
27	Kuthai	736	705	0	45	0	1,486	34.1%	180	8.26
	Trapper	19	1,119	1	251	0	1,390	31.9%		7.72
	Mainstem	77	500	294	28	5	904	20.8%		5.02
	Tatsamenie	19	0	1	3	0	23	0.5%		0.13
	Crescent	19	334	1	47	15	416	9.6%		2.31
	Speel	76	53	0	5	0	134	3.1%		0.74
	Total	946	2,711	297	379	20	4,353	100.0%		24.18
28	Kuthai	339	251	0	24	0	614	6.8%	152	4.04
	Trapper	142	4,792	11	1,049	0	5,994	66.6%		39.43
	Mainstem	148	369	377	33	4	931	10.3%		6.13
	Tatsamenie	130	182	7	62	0	381	4.2%		2.51
	Crescent	74	761	13	92	20	960	10.7%		6.32
	Speel	116	0	0	4	0	120	1.3%		0.79
	Total	949	6,355	408	1,264	24	9,000	100.0%		59.21
29	Kuthai	250	366	0	25	0	641	4.8%	195	3.29
	Trapper	167	4,051	2	918	0	5,138	38.4%		26.35
	Mainstem	428	2,725	728	156	14	4,051	30.3%		20.77
	Tatsamenie	341	941	6	263	0	1,551	11.6%		7.95
	Crescent	374	1,074	45	171	26	1,690	12.6%		8.67
	Speel	263	17	0	13	1	294	2.2%		1.51
	Total	1,823	9,174	781	1,546	41	13,365	100.0%		68.54
30	Kuthai	23	7	0	0	0	30	0.3%	175.5	0.17
	Trapper	278	1,979	7	415	0	2,679	24.9%		15.26
	Mainstem	0	1,370	1,713	57	5	3,145	29.2%		17.92
	Tatsamenie	273	1,820	63	364	0	2,520	23.4%		14.36
	Crescent	40	1,010	18	118	15	1,201	11.2%		6.84
	Speel	379	764	7	41	2	1,193	11.1%		6.80
	Total	993	6,950	1,808	995	22	10,768	100.0%		61.36
31	Kuthai	0	2	0	0	0	2	0.0%	309	0.01
	Trapper	0	2,213	5	529	0	2,747	17.1%		8.89
	Mainstem	78	3,357	2,651	196	19	6,301	39.2%		20.39
	Tatsamenie	932	2,785	68	837	0	4,622	28.8%		14.96
	Crescent	54	553	5	123	18	753	4.7%		2.44
	Speel	672	874	5	81	2	1,634	10.2%		5.29
	Total	1,736	9,784	2,734	1,766	39	16,059	100.0%		51.97
32	Kuthai	6	58	0	5	0	69	1.3%	126	0.55
	Trapper	24	296	1	118	0	439	8.2%		3.48
	Mainstem	59	475	825	47	3	1,409	26.2%		11.18
	Tatsamenie	203	1,345	56	538	2	2,144	39.9%		17.02
	Crescent	41	579	10	127	12	769	14.3%		6.10
	Speel	196	299	4	37	2	538	10.0%		4.27
	Total	529	3,052	896	872	19	5,368	100.0%		42.60
33	Kuthai	3	0	0	0	0	3	0.1%	78	0.04
	Trapper	10	0	0	5	0	15	0.3%		0.19
	Mainstem	0	985	1,190	113	70	2,358	47.4%		30.23
	Tatsamenie	166	1,205	39	648	9	2,067	41.6%		26.50
	Crescent	0	0	0	0	0	0	0.0%		0.00
	Speel	221	243	3	46	17	530	10.7%		6.79
	Total	400	2,433	1,232	812	96	4,973	100.0%		63.76
34-38	Kuthai	6	0	0	2	0	8	0.1%	641	0.01
	Trapper	18	349	1	360	6	734	11.1%		1.15
	Mainstem	0	1,118	1,244	287	32	2,681	40.4%		4.18
	Tatsamenie	317	438	20	691	12	1,478	22.3%		2.31
	Crescent	0	482	6	254	23	765	11.5%		1.19
	Speel	424	363	4	164	11	966	14.6%		1.51
	Total	765	2,750	1,275	1,758	84	6,632	100.0%		10.35
Total	Kuthai	2,025	2,260	0	187	0	4,472	6.1%	2030.5	2.20
	Trapper	664	14,962	28	3,706	6	19,366	26.6%		9.54
	Mainstem	790	11,024	9,121	928	156	22,019	30.3%		10.84
	Tatsamenie	2,381	8,759	261	3,419	23	14,843	20.4%		7.31
	Crescent	602	4,818	98	936	131	6,585	9.0%		3.24
	Speel	2,357	2,681	23	397	37	5,495	7.6%		2.71
	Total	8,819	44,504	9,531	9,573	353	72,780	100.0%		35.84

Table 21. Estimated contribution of sockeye salmon stocks to the 1986 Canadian Taku River commercial gillnet fishery.

Statistical Week		Age Class						90% C. I. 1/				
		1.2	1.3	0.+	2.+	Other	Total	Lower	Upper	Percent	Effort (Boat Days)	CPUE
27	Kuthai	233	233	0	18	0	484	432	536	69.5%	7	69.14
(6/30-7/01)	Trapper	0	142	0	28	0	170	124	216	24.4%		24.29
	Mainstem	0	35	6	1	0	42	-5	89	6.0%		6.00
	Tatsamenie	1	0	0	0	0	1	-10	12	0.1%		0.14
	Total	234	410	6	47	0	697			100.0%		99.57
28	Kuthai	383	333	0	13	0	729	590	868	34.8%	24	30.38
(7/07-7/10)	Trapper	28	812	0	156	0	996	862	1,130	47.5%		41.50
	Mainstem	6	281	41	9	0	337	120	554	16.1%		14.04
	Tatsamenie	0	29	0	5	0	34	-56	124	1.6%		1.42
	Total	417	1,455	41	183	0	2,096			100.0%		87.33
29	Kuthai	98	103	0	19	0	220	141	299	11.4%	30	7.33
(7/14-7/17)	Trapper	0	844	0	275	0	1,119	1,022	1,216	58.2%		37.30
	Mainstem	112	283	88	37	10	530	315	745	27.5%		17.67
	Tatsamenie	16	26	0	13	0	55	-33	143	2.9%		1.83
	Total	226	1,256	88	344	10	1,924			100.0%		64.13
30	Kuthai	89	65	0	4	0	158	47	269	3.9%	33	4.79
(7/21-7/24)	Trapper	0	1,832	3	237	0	2,072	1,902	2,242	51.8%		62.79
	Mainstem	103	523	649	18	0	1,293	865	1,721	32.3%		39.18
	Tatsamenie	14	407	8	51	0	480	264	696	12.0%		14.55
	Total	206	2,827	660	310	0	4,003			100.0%		121.30
31	Kuthai	3	11	0	0	0	14	-44	72	0.5%	20	0.70
(7/28-7/30)	Trapper	13	753	1	253	0	1,020	774	1,266	35.1%		51.00
	Mainstem	154	395	634	40	0	1,223	957	1,489	42.1%		61.15
	Tatsamenie	91	395	11	153	0	650	479	821	22.4%		32.50
	Total	261	1,554	646	446	0	2,907			100.0%		145.35
32	Kuthai	1	19	0	1	0	21	-20	62	1.8%	10	2.10
(8/04-8/05)	Trapper	4	122	1	38	0	165	66	264	13.8%		16.50
	Mainstem	51	235	346	15	0	647	522	772	54.1%		64.70
	Tatsamenie	30	245	7	80	0	362	267	457	30.3%		36.20
	Total	86	621	354	134	0	1,195			100.0%		119.50
33	Kuthai	1	0	0	0	0	1	-1	3	0.1%	8	0.13
(8/11-8/12)	Trapper	2	118	0	42	0	162	85	239	20.0%		20.25
	Mainstem	23	153	201	14	0	391	300	482	48.4%		48.88
	Tatsamenie	14	172	5	63	0	254	196	312	31.4%		31.75
	Total	40	443	206	119	0	808			100.0%		101.00
34-35	Kuthai	2	0	0	0	0	2	-3	7	0.2%	16	0.13
(8/18-8/26)	Trapper	6	113	1	31	0	151	70	232	13.6%		9.44
	Mainstem	69	147	451	10	12	689	585	793	62.1%		43.06
	Tatsamenie	41	165	8	53	0	267	198	336	24.1%		16.69
	Total	118	425	460	94	12	1,109			100.0%		69.31
Total	Kuthai	810	764	0	55	0	1,629	1,410	1,848	11.0%	148	11.01
	Trapper	53	4,736	6	1,060	0	5,855	5,452	6,258	39.7%		39.56
	Mainstem	518	2,052	2,416	144	22	5,152	4,493	5,811	35.0%		34.81
	Tatsamenie	207	1,439	39	418	0	2,103	1,739	2,467	14.3%		14.21
	Total	1,588	8,991	2,461	1,677	22	14,739			100.0%		99.59

1/ Confidence intervals are minimum estimates based on the allocation of the 1.2 and 1.3 age classes.

Table 22. Estimated proportions of sockeye salmon stocks in fishwheel catches by age class at Canyon Island, Taku River, 1986.

Stat Week		Age Class 1.2	1.3	0.+	2.+	Other	Total	90% C.I.1/ Lower	Upper
24-25	Kuthai	0.992	0.949		0.931		0.970	0.918	1.022
(6/14-6/21)	Trapper	0.000	0.000		0.000		0.000	0.000	0.000
	Mainstem	0.000	0.051		0.042		0.025	-0.009	0.059
	Tatsamenie	0.008	0.000		0.027		0.005	-0.020	0.030
26	Kuthai	0.980	0.817	0.000	0.731	0.000	0.868	0.824	0.912
(6/22-6/28)	Trapper	0.000	0.129	0.000	0.213	0.000	0.067	0.035	0.099
	Mainstem	0.000	0.055	0.989	0.022	1.000	0.053	0.021	0.085
	Tatsamenie	0.020	0.000	0.011	0.000	0.000	0.012	-0.008	0.032
27	Kuthai	0.959	0.579	0.000	0.473	0.000	0.748	0.707	0.789
(6/29-7/05)	Trapper	0.000	0.287	0.003	0.462	0.000	0.148	0.107	0.189
	Mainstem	0.041	0.134	0.995	0.062	1.000	0.104	0.062	0.146
	Tatsamenie	0.000	0.000	0.002	0.000	0.000	0.000	0.000	0.000
28	Kuthai	0.711	0.187	0.000	0.200	0.000	0.362	0.313	0.411
(7/06-7/12)	Trapper	0.000	0.690	0.000	0.703	0.000	0.418	0.341	0.495
	Mainstem	0.289	0.116	1.000	0.091	1.000	0.216	0.136	0.296
	Tatsamenie	0.000	0.006	0.000	0.006	0.000	0.004	-0.021	0.029
29	Kuthai	0.449	0.046	0.000	0.090	0.000	0.143	0.108	0.178
(7/13-7/19)	Trapper	0.006	0.804	0.004	0.715	0.000	0.546	0.450	0.642
	Mainstem	0.422	0.033	0.984	0.066	0.000	0.199	0.097	0.301
	Tatsamenie	0.123	0.117	0.012	0.129	0.000	0.112	0.060	0.164
30	Kuthai	0.284	0.020	0.000	0.026	0.000	0.057	0.028	0.086
(7/20-7/26)	Trapper	0.067	0.588	0.000	0.619	0.000	0.449	0.356	0.542
	Mainstem	0.537	0.117	0.978	0.070	1.000	0.267	0.171	0.363
	Tatsamenie	0.113	0.275	0.022	0.285	0.000	0.223	0.160	0.286
31	Kuthai	0.113	0.000	0.000	0.007	0.000	0.014	0.001	0.027
(7/27-8/02)	Trapper	0.025	0.322	0.000	0.390	0.000	0.218	0.122	0.314
	Mainstem	0.438	0.411	0.986	0.206	1.000	0.530	0.412	0.648
	Tatsamenie	0.424	0.268	0.014	0.397	0.000	0.238	0.171	0.305
32	Kuthai	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
(8/03-8/09)	Trapper	0.000	0.001	0.000	0.171	0.000	0.020	-0.048	0.088
	Mainstem	0.693	0.525	0.986	0.218	1.000	0.630	0.523	0.737
	Tatsamenie	0.307	0.475	0.014	0.611	0.000	0.350	0.273	0.427
33-35	Kuthai	0.082	0.032	0.000	0.011	0.000	0.028	-0.004	0.060
(8/10-8/24)	Trapper	0.000	0.045	0.000	0.067	0.000	0.032	-0.028	0.092
	Mainstem	0.377	0.510	0.983	0.169	1.000	0.565	0.465	0.665
	Tatsamenie	0.541	0.413	0.017	0.753	0.000	0.375	0.293	0.457

1/ Confidence intervals are minimum estimates based on the allocation of the 1.2 and 1.3 age classes.

Table 23. Estimated catches, escapements, total returns, and exploitation rates of Snettisham and Taku River sockeye salmon, 1986.

Stock Group	District 111 Catches	Inriver Catch	Total Catch	Escapement	Total Run	Exploitation Rates
Crescent Lake	6,585	0	6,585	3,414	9,999	0.659
Speel Lake	5,495	0	5,495	5,857	11,352	0.484
Snettisham Total	12,080	0	12,080	9,271	21,351	0.566
L. Trapper Lake	19,366	5,855	25,221	13,820	39,041	0.646
Tatsamenie Lake	14,843	2,103	16,946	11,368	28,314	0.599
Kuthai Lake	4,472	1,629	6,101	N/D	N/D	N/D
Mainstem Spawners 1/	22,019	5,152	27,171	N/D	N/D	N/D
Taku Total	60,700	14,739	75,439	90,370	165,809	0.455
Total (all systems)	72,780	14,739	87,519	99,641	187,160	0.468

1/ Comprised of samples taken from mainstem, river, and slough spawners at the lower Taku and Nakina Rivers and the Hackett River.

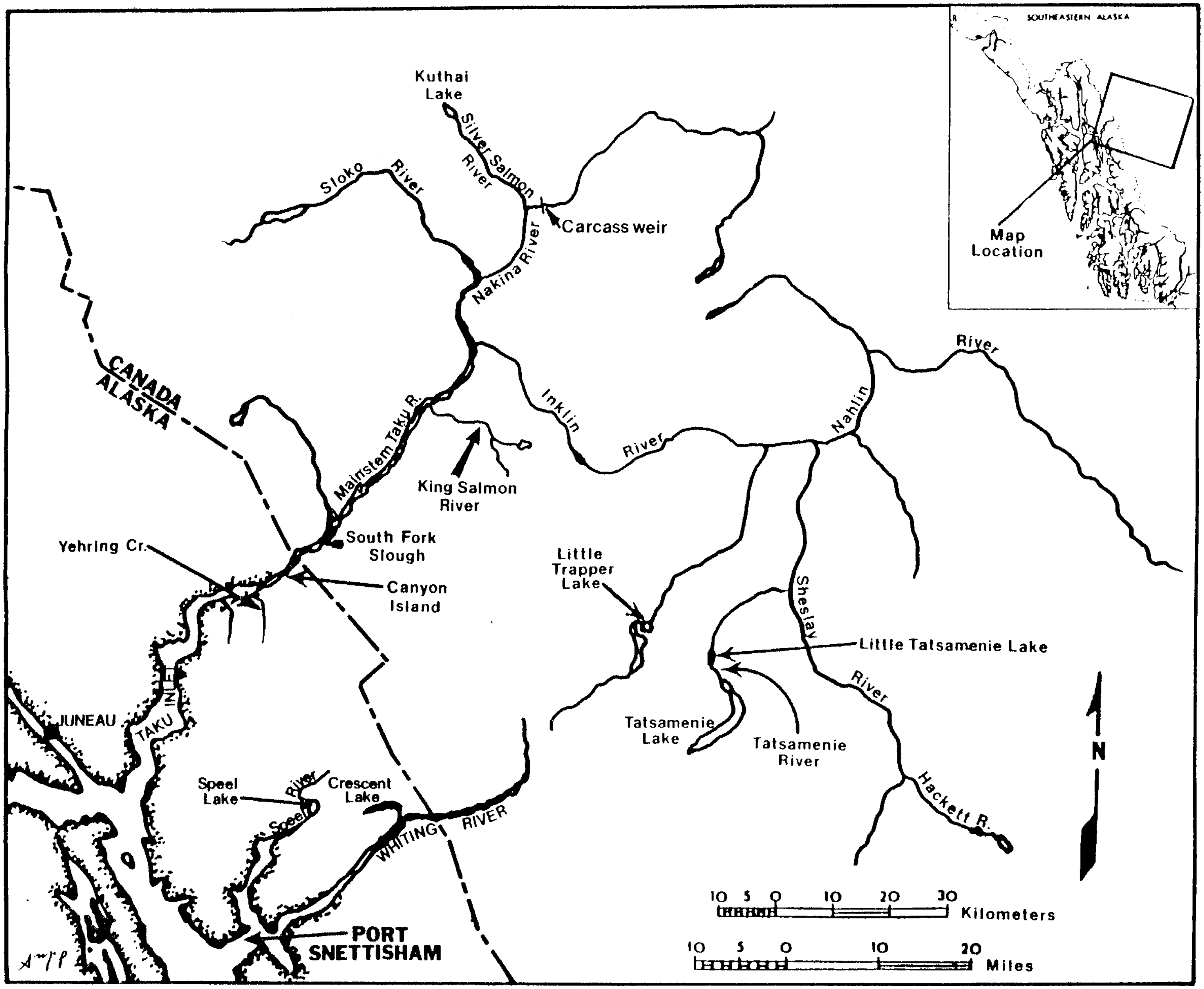

Figure 1. Taku River and Port Snettisham drainages.

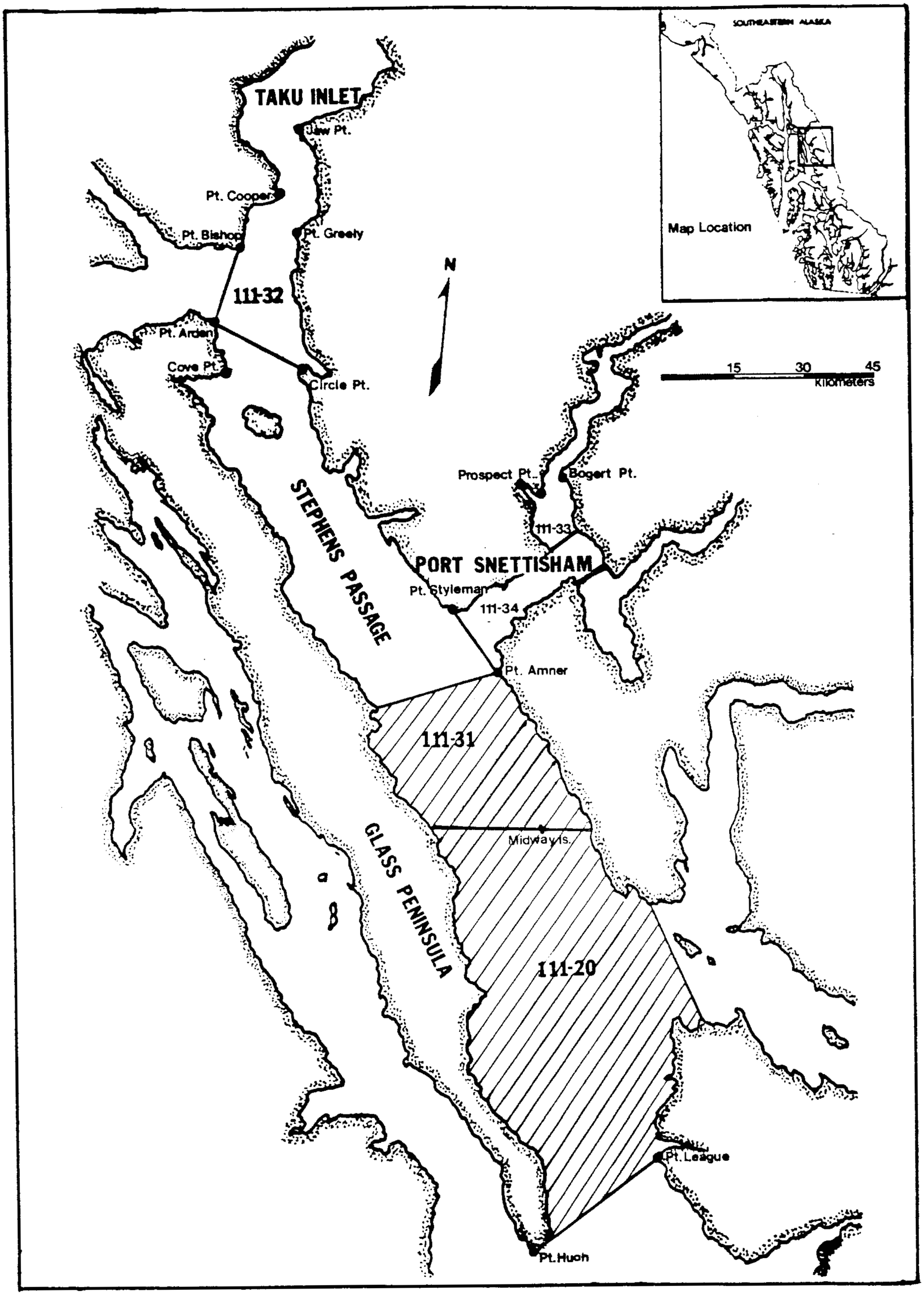

Figure 2. District 111 gillnet fishing area, with subdistricts. Shaded area represents the portion of the district open in the supplemental fishery.

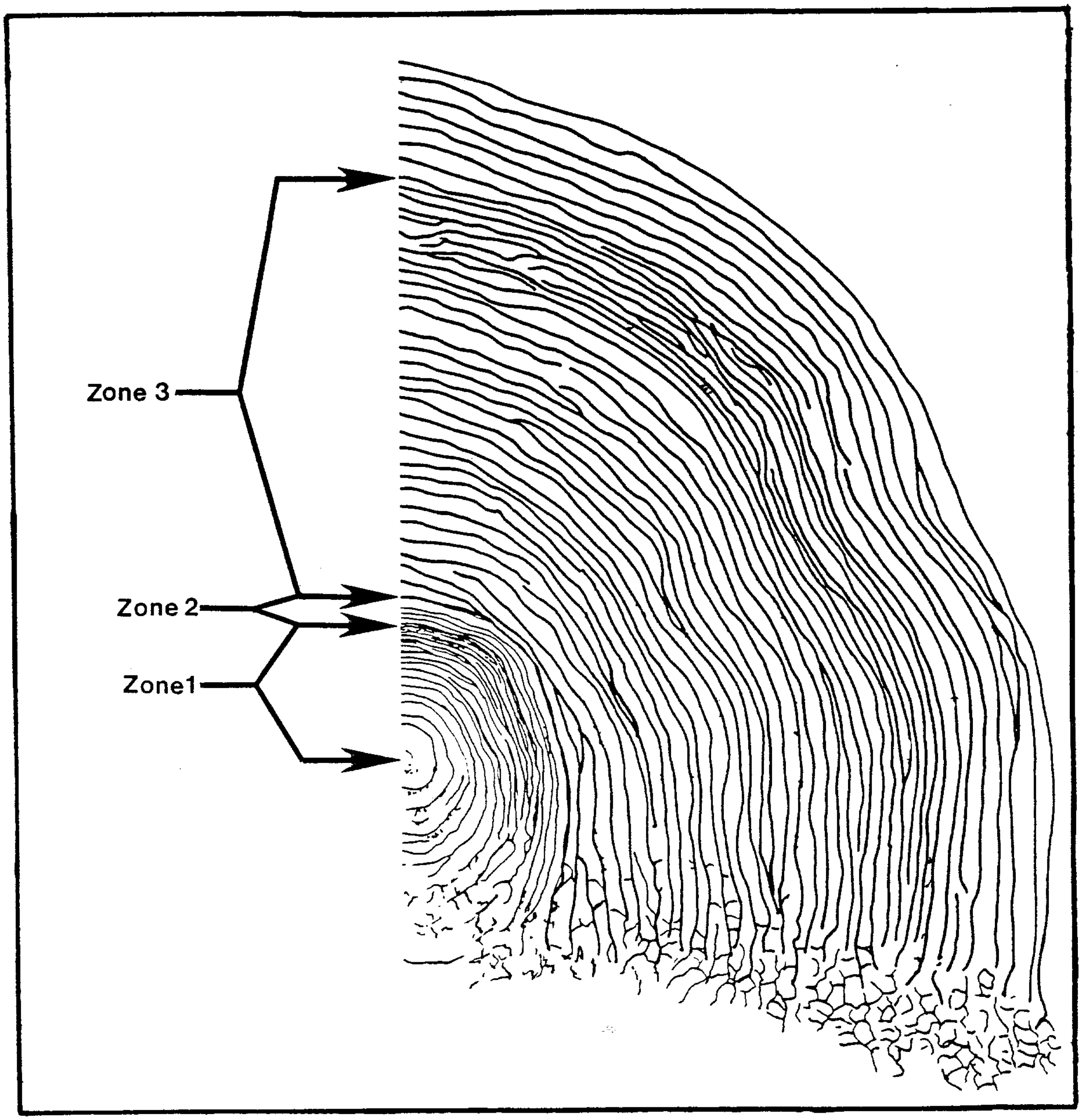

Figure 3. Typical age 1. sockeye salmon scale showing the zones used to measure scale patterns.

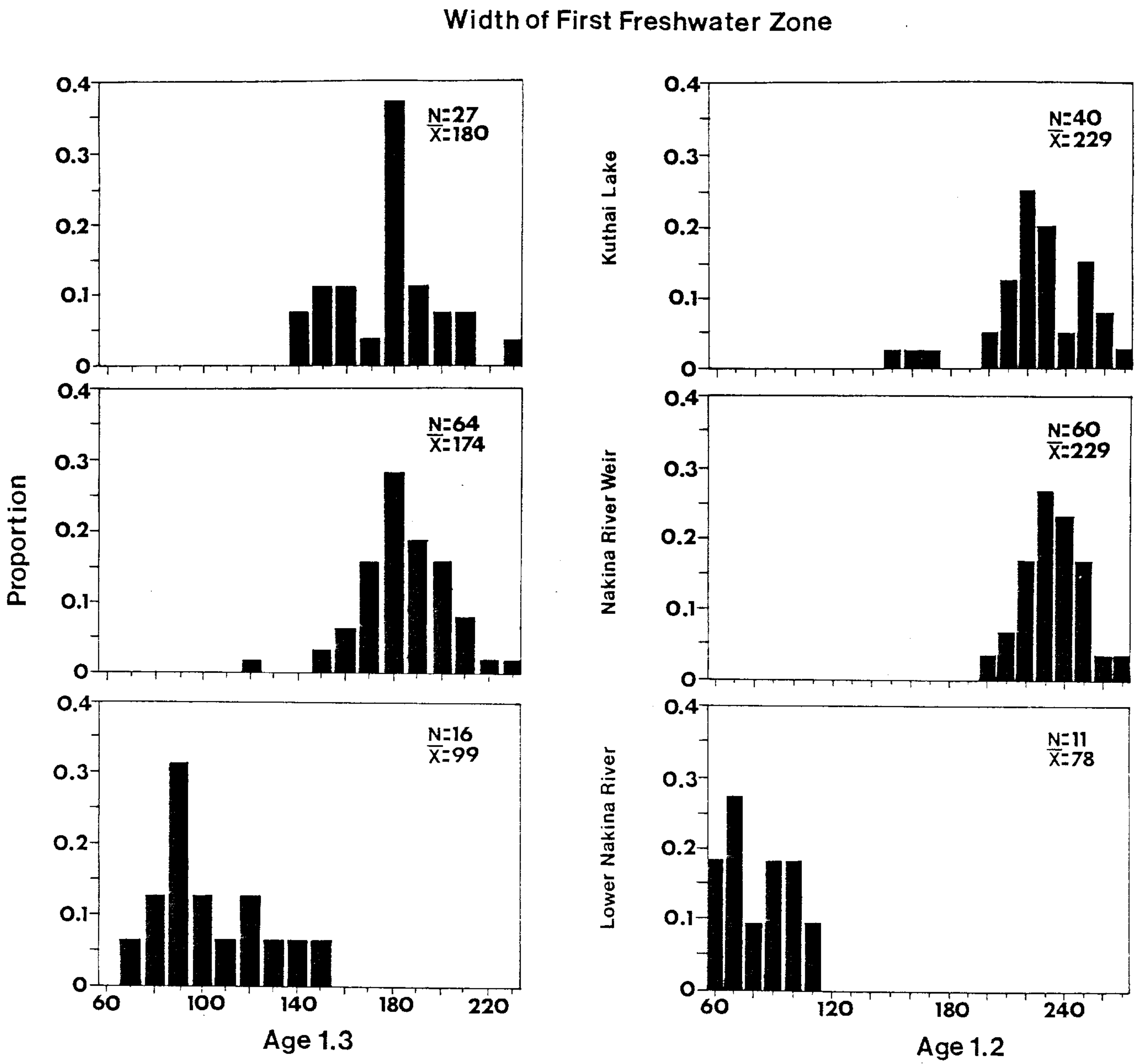

Figure 4. Size of the first zone of freshwater growth measured from scales of age 1.3 and 1.2 sockeye salmon sampled at the Nakina River carcass weir, Kuthai Lake, and the lower portions of the Nakina River, 1986.

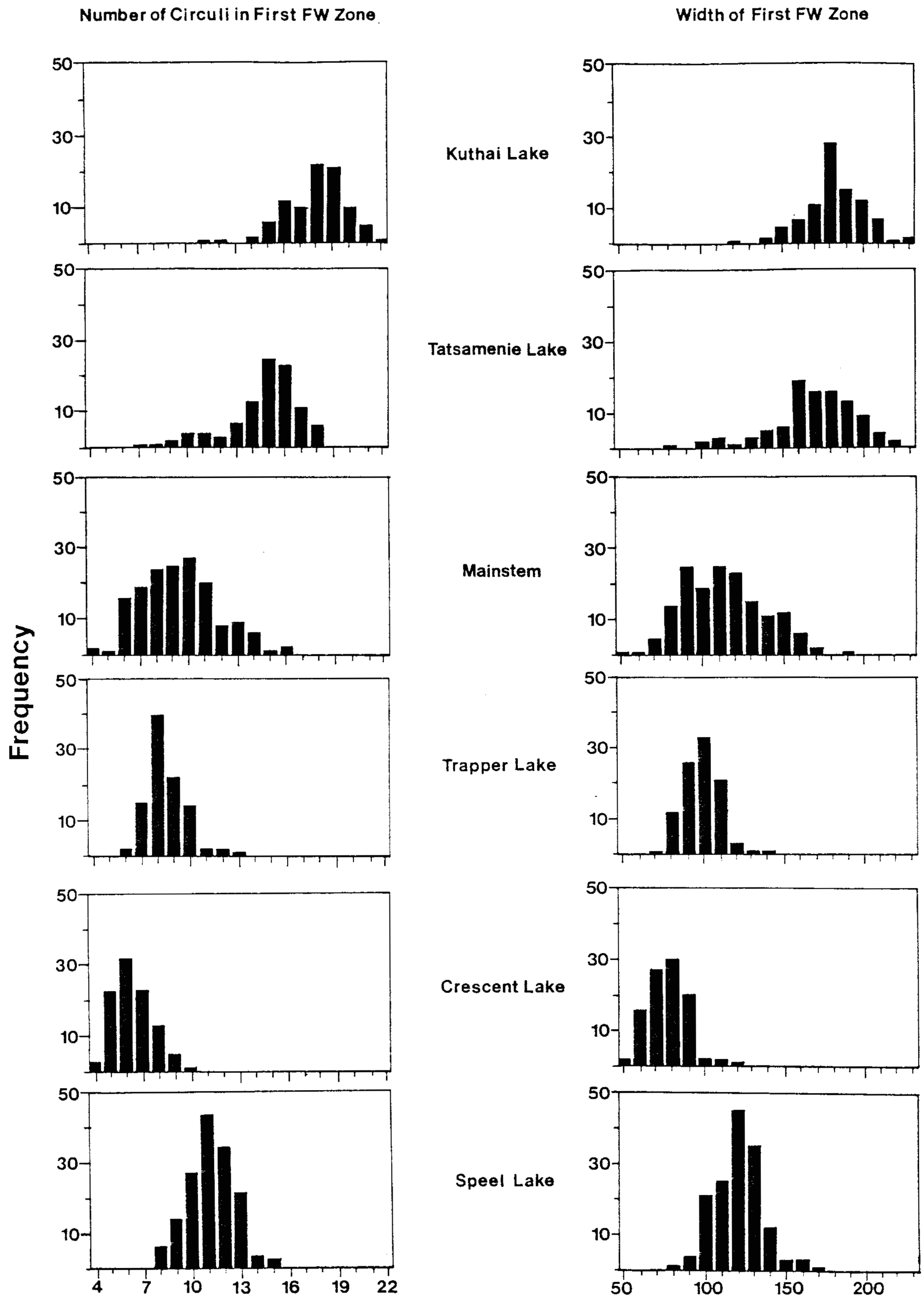

Figure 5. Number of circuli and size of the first freshwater growth zone measured from scales of age 1.3 sockeye salmon sampled from escapements of the principal stock groupings contributing to the District 111 fishery, 1986.

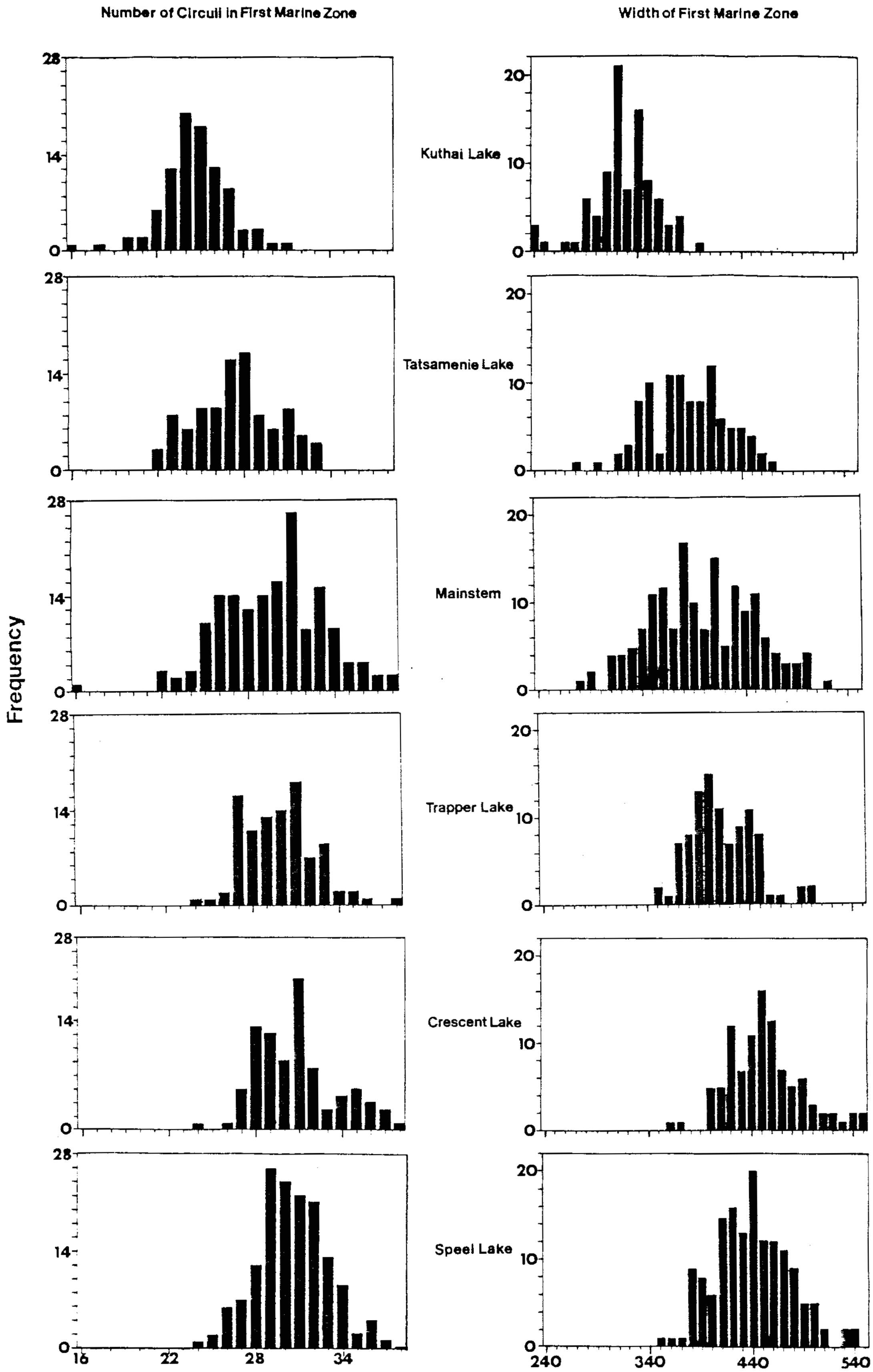

Figure 6. Number of circuli and size of the first marine growth zone measured from scales of age 1.3 sockeye salmon sampled from escapements of the principal stock groupings contributing to the District 111 fishery, 1986.

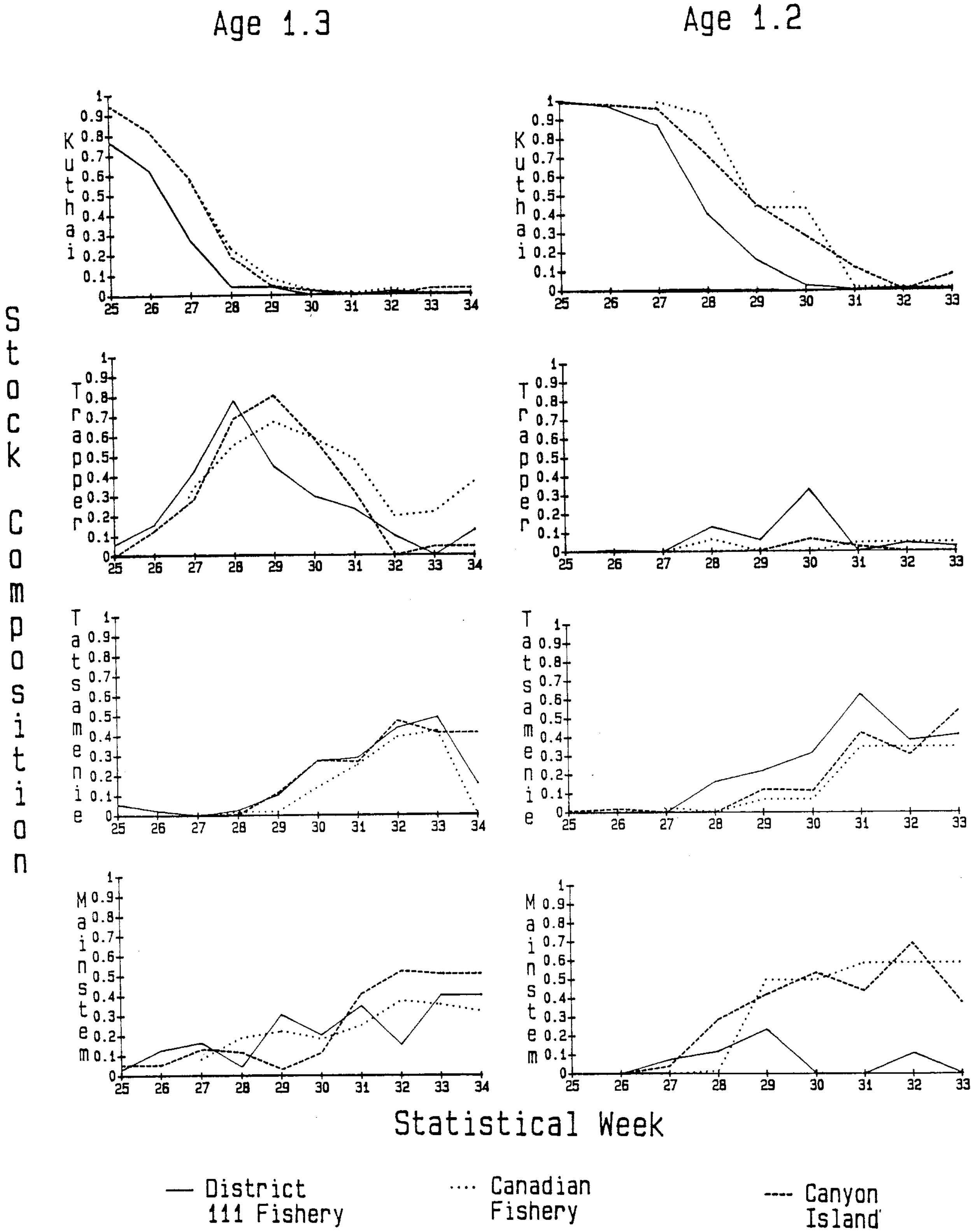

Figure 7. Estimates of the percent contributions of age 1.3 and 1.2 Taku River stock groupings to the traditional District 111 fishery, Canyon Island fishwheel catches, and the Canadian Taku River fishery, 1986.

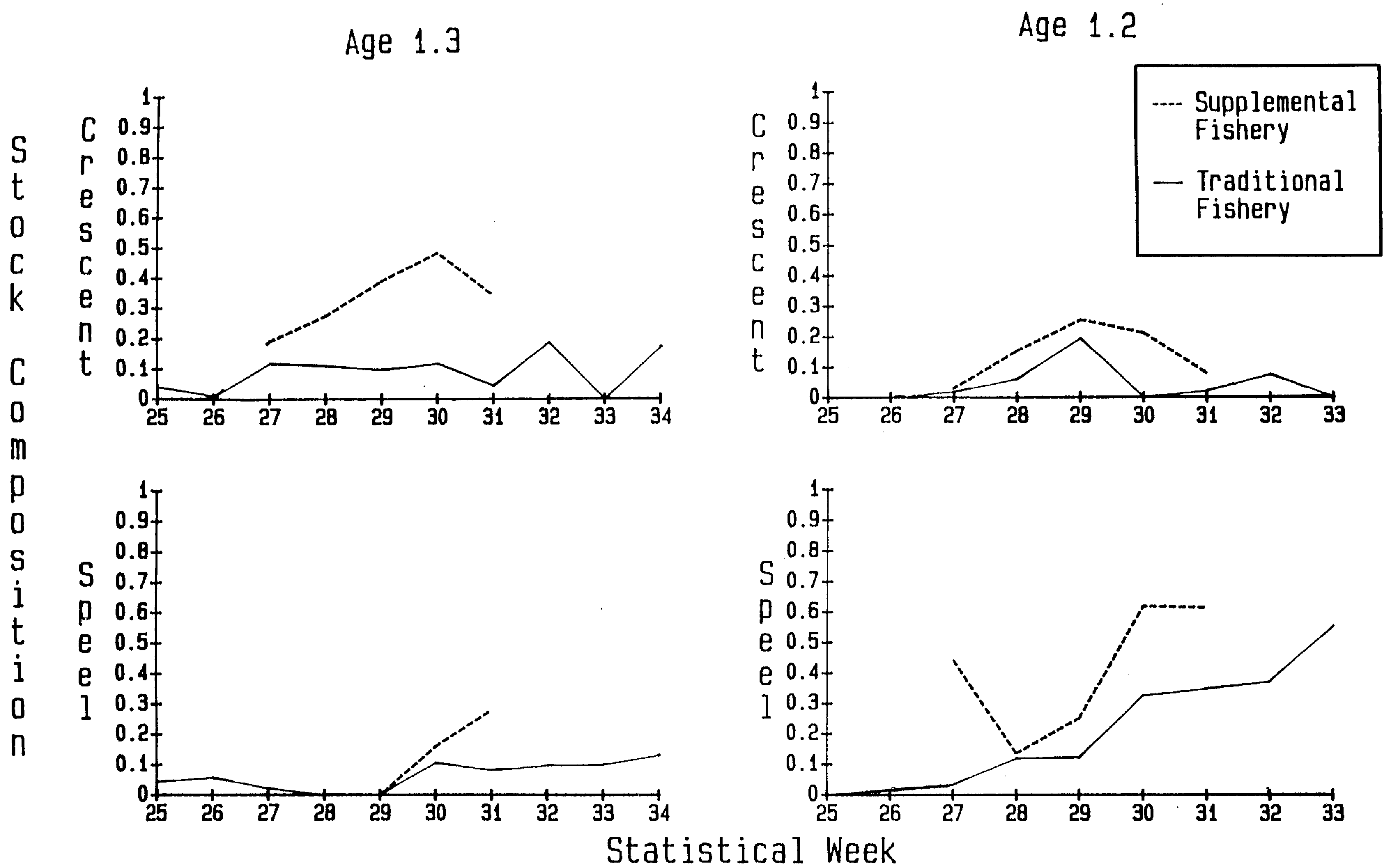

Figure 8. Estimates of the percent contributions of age 1.3 and 1.2 Snettisham stocks to the traditional and supplemental District 111 fisheries, 1986.

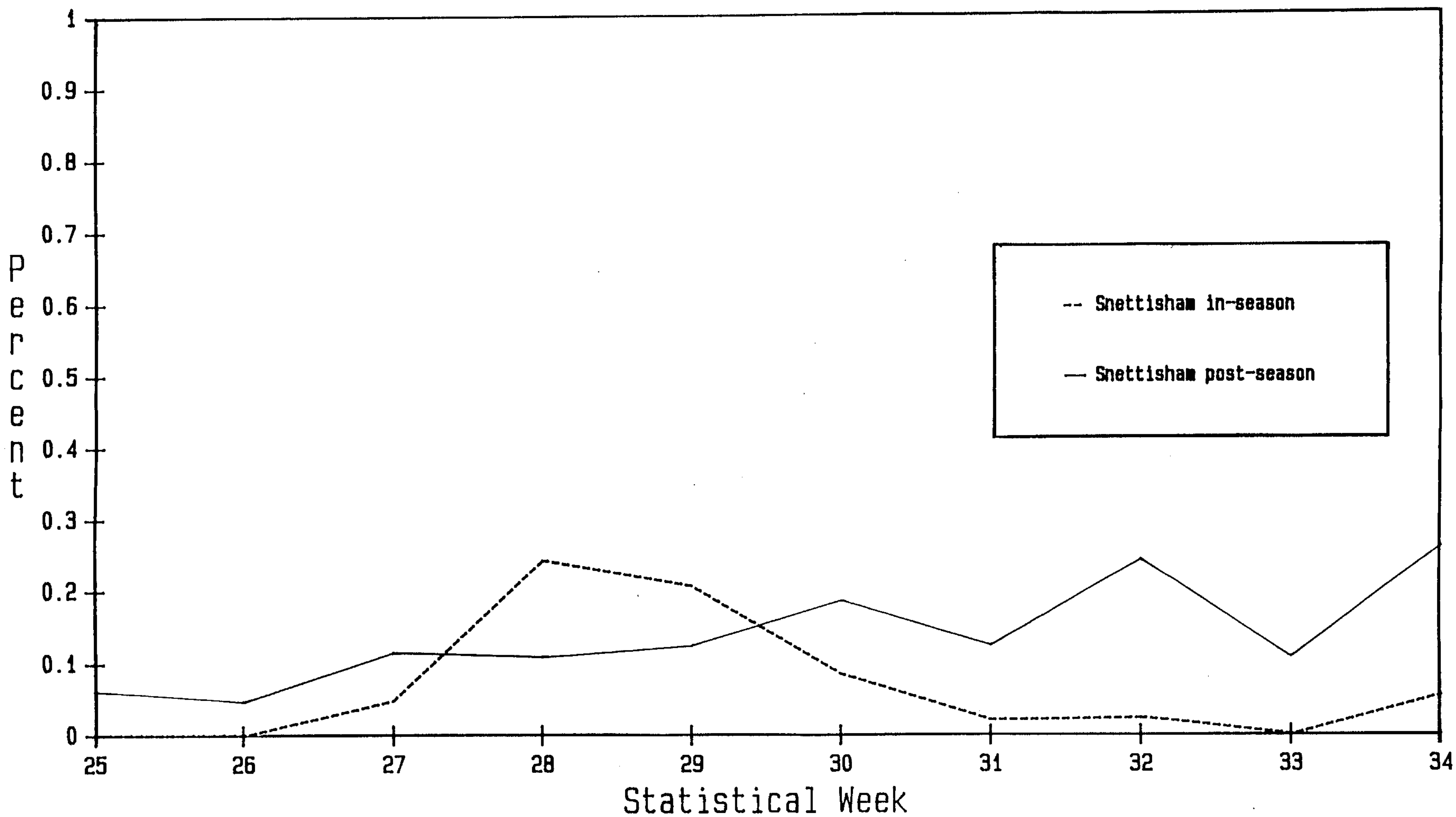

Figure 9. Comparison of inseason and post-season stock composition estimates for the total District 111 harvest, 1986. The area above the lines represents the percent contribution of Taku River stocks each week.

APPENDICES

Appendix Table 1. Scale pattern variables.

Variable No.	Description
	First Freshwater (FW) Annular Zone
1	Number of circuli in the zone
2	Distance across the zone
3	Distance: scale focus (C0) 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)
	Freshwater Plus Growth (PG)
61	Number of circuli in the zone
62	Distance across the zone
	Combined Freshwater Zones
65	Total number of circuli in the combined zones
66	Total distance across the combined zones
67	Relative Distance: (Variable #2)/(Variable #66)

-Continued-

Appendix Table 1. Scale pattern variables (continued).

Variable No.	Description
	First Freshwater (FW) 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	Average distance between circuli: (Variable #71)/(Variable #70)
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 Table 2. Classification matrices from discriminant function analyses of age 1.2 and 1.3 sockeye salmon scales used inseason to allocate District 111 catches.

		Age 1.3	
		Classified Group of Origin	
Actual Group of Origin	Sample Size	Snettisham	Taku
Snettisham	210	0.895	0.105
Taku	247	0.219	0.781

Mean Proportion Correctly Classified = 0.838

		Age 1.2	
		Classified Group of Origin	
Actual Group of Origin	Sample Size	Snettisham	Taku
Snettisham	125	0.832	0.168
Taku	128	0.234	0.766

Mean Proportion Correctly Classified = 0.799