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Taku River and Port Snettisham Sockeye Salmon Stock Proportions in 1987 Southeast Alaska and Canadian Fisheries

by

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and

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ABSTRACT

Linear discriminant function analysis of scale patterns and age composition data were used to calculate estimates of the stock composition of sockeye salmon (*Oncorhynchus nerka)* in Southeast Alaskan District 111 and Canadian Taku River commercial catches and in the Canadian Taku River escapement. We estimated that 72% of the District 111 harvest of 75,035 sockeye salmon were bound for spawning sites in the Taku River drainage and that 28% were destined for lake systems in the Port Snettisham drainages. The estimated contributions of specific stock groups were: 38% from Mainstem Taku River, 23% from Little Trapper Lake, 16% from Crescent Lake, 12% from Speel Lake, 8% from Kuthai Lake, and 3% from Little Tatsamenie Lake. The Canadian inriver harvest of 13,554 sockeye salmon was estimated to be 65% Mainstem Taku River, 20% Little Trapper Lake, 9% Little Tatsamenie Lake, and 6% Kuthai Lake fish. The total run of Taku River sockeye salmon was 142,155 fish, of which 73,339 escaped to spawn. United States fishermen harvested 80% of the catch of Taku River sockeye salmon, while Canadian fishermen took 20%. The total run of Snettisham stocks was 38,632 fish. The District 111 fishery exploited Snettisham stocks at a higher rate (55%) than Taku River stocks (38%). Temporal trends in the contribution of Taku River stocks to the District 111 and Canadian inriver fisheries and the inriver return past Canyon Island were similar. In- and postseason District 111 stock composition estimates differed in most weeks, but in-season analysis detected the poor return of Little Tatsamenie Lake fish and the strong Mainstem Taku River and Snettisham stock contributions. Results of independent scale pattern and brain parasite analyses agreed very closely.

KEY WORDS: Scale pattern analysis, sockeye salmon, *Oncorhynchus nerka*, discriminant function analysis, age composition, stock composition, exploitation rates, Taku River, Snettisham, transboundary river

INTRODUCTION

The Taku River is a transboundary river which originates in central British Columbia and flows southwest through the Coastal Range mountains and Southeast Alaska to the Pacific Ocean (Figure 1). The 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 1985 and 1986 Taku River sockeye salmon (*Oncorhynchus nerka*) runs. The treaty specified an interim spawning escapement goal of 71,000 to 80,000 sockeye salmon into Canadian portions of the Taku River. The total allowable catch (TAC) of Canadian Taku River origin sockeye salmon was to be divided into an 85% share for the U.S. and a 15% share for Canada. Negotiations between the two governments to develop new harvest sharing agreements for the 1987 fishing season were unsuccessful and fishing proceeded without such an agreement.

Although an unknown, but assumed small number, of Taku River sockeye salmon are harvested in other Southeast Alaskan fisheries, the U.S. allotment is taken primarily in the District 111 gill net fishery (McGregor 1985). The District 111 gill net fishery occurs in Taku Inlet, Stephens Passage and Port Snettisham (Figure 2). Sockeye salmon bound for Alaskan spawning sites in Port Snettisham (Crescent and Speel Lakes) are also harvested in the District 111 fishery but are not included in formulation of the TAC. Catches in District 111 have averaged 75,949 sockeye salmon annually from 1976-86, and have ranged from 31,821 to 123,451. The majority of the District 111 harvest is generally taken in Taku Inlet. Port Snettisham sockeye salmon stocks are extremely depressed relative to historical levels. Port Snettisham has been closed to commercial fishing during much of the season in recent years to reduce the catch of Snettisham stocks and to begin rebuilding these runs.

The Canadian allotment of Taku River sockeye salmon is taken in a gill net fishery that occurs in the Taku River within a 20-km section immediately upstream of the border between Alaska and Canada (Figure 1). Catches have averaged 15,441 sockeye salmon since the fishery began in 1979, and have ranged from 3,144 to 27,242.

Stock assessment programs have recently been developed to provide in-season estimates of the sockeye salmon escapement to the Taku River and the contribution of Taku River and Port Snettisham stocks to the District 111 fishery. An adult mark-recapture program has been jointly operated on the Taku River by the Alaska Department of Fish and Game (ADF&G) and the Canadian Department of Fisheries and Oceans (CDFO) since 1984 to provide in-season escapement estimates. Scale pattern analysis (SPA) has been used since 1983 to estimate the contributions of Taku River and Port Snettisham sockeye salmon to the District 111 fishery on a postseason basis. Since 1986, in-season SPA based on data from prior years' scale collections has been used to allocate District 111 catches. In addition, inriver samples from the Canadian fishery and the Taku River return by Canyon Island (Figure 1) have been classified to stock group of origin since 1986.

This report documents the methodology used and results obtained from 1987 SPA studies of Taku River and Port Snettisham sockeye salmon. The data were gathered to enable the U.S. and Canadian fisheries targeting on Taku River sockeye salmon to be evaluated for treaty compliance and to contribute to developing a more stock-specific data base that may enhance management capabilities.

METHODS

Estimating Catch and Escapement

We obtained catch statistics for District 111 from ADF&G records of fishermen sales receipts (fish tickets) that included editorial corrections through 14 March 1988. Harvest statistics for the Canadian inriver fishery were provided by the CDFO (P. Milligan, CDFO, Whitehorse, Yukon Territory, personal communication). 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. The escapement of sockeye salmon into Canadian portions of the Taku River drainage was estimated using mark-recapture techniques (McGregor and Clark 1988). Adult sockeye salmon were captured in fish wheels at Canyon Island and were tagged and later recaptured upstream in the Canadian inriver fishery. An escapement estimate was developed from tag and recovery data using a stratified Petersen method (Seber 1982). Weirs were operated by the CDFO at Little Trapper and Little Tatsamenie Lakes and at the Hackett River to count escapements of these specific spawning stocks in the Taku River drainage.

Sample Collection and Processing

Fish scales were collected and prepared using procedures described by Clutter and Whitesel (1956). Scales were taken from the left side of the fish approximately two rows above the lateral line and along a diagonal downward from the posterior insertion of the dorsal fin to the anterior insertion of the anal fin. Scales were mounted on gummed cards.

Employees of the ADF&G, Commercial Fisheries Division, sampled District 111 catches aboard tenders, fishing vessels, and at the fishing ports of Douglas, Petersburg, and Excursion Inlet. Samplers recorded the sex of each fish sampled and took one scale. The Canadian inriver harvest was sampled by CDFO and ADF&G employees. Samplers recorded the sex of each fish sampled and took five scales, according to CDFO sampling guidelines.

Similar procedures were used to sample escapements. One to three scales per fish were taken from Alaskan systems, while five scales per fish were taken from Canadian headwater systems. Scales were collected at counting weirs at Crescent and Speel Lakes in the Snettisham drainages, and in the Taku River drainage at Little Trapper Lake, Little 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, gill nets, 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 escapement enumeration program at Canyon Island. The age composition of the Taku River run past Canyon Island was estimated using this data.

Sex was determined by examination of external sexual maturation characteristics, including kype development, belly and jaw shapes, and vent disposition or, when possible, by examination of gonads. The accuracy of sex determination from external morphometric characteristics alone was not tested.

Permanent transparent impressions of the scales were made by attaching strips of cellulose acetate to the gummed cards containing the scales 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 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, sex-specific length frequency histograms were used to assist in determining the correct marine age. Ages were recorded in European notation.

Sample goals for determining the age composition of the harvests were designed to enable the proportion of each major (>10% of the run) age group in the catch during each fishing period to be estimated to within 5 percentage points 90% of the time (Cochran 1977). The sample goal of 700 fish per week was met for most fishing periods in the District 111 commercial fishery. Low catches and limited availability of fish to sample in the Canadian fishery prevented desired sample sizes from being achieved in each fishing period for this fishery. 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 this fishery. All sockeye salmon taken in the District 111 test gill net fishery were sampled for scales.

Estimates of the total catch or escapement by age class were made by multiplying the age composition proportions from each time period by the number of fish present during the corresponding time period and summing the estimates within age classes across time periods. Standard errors of the proportions in each time period were calculated with standard binomial formulae, using a finite correction factor,

$$SE_{ij} = \sqrt{\left[\frac{[\hat{P}_{ij}](1 - \hat{P}_{ij}]}{\hat{n}_j - 1} \right] * \left[1 - \frac{n_j}{N_j} \right]}$$

where:

i = age class,

j = sample stratum (time period),

P_{ij} = proportion of fish of age i in stratum j,

n_j = sample size for stratum j, and

N_j = size of catch.

The standard error of the total catch or escapement for each age class was calculated by weighting the standard error for each sample period by the abundance during the sample period as follows:

$$SE_{i.} = \sqrt{\frac{\sum_{1}^{j}[SE_{ij}]^2 * C_j^2}{\sum_{1}^{j}C_j^2}}$$

where:

C_j = catch or escapement of fish in stratum j.

Analytical Procedures

Age composition data and linear discriminant function (LDF) analysis of scale measurements were used to estimate the stock composition of District 111 and Canadian inriver harvests and the Taku River escapement past Canyon Island.

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 L. 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, ratios, and combinations of these variables, were calculated from the basic measurements (Appendix A.1).

Discriminant Analysis

Scales from the principal stock groups were collected on the spawning grounds and used as standards (samples of known origin used to build linear discriminant functions). Scales from mixed stock catches were classified using the discriminant functions based on these standards to estimate the contributions of each stock to the catches of age-1.3 fish.

The stock composition of District 111 catch samples of age-1.3 fish was estimated on an in-season basis in 1987. Linear discriminant functions developed with age-1.3 escapement scales from 1986 were used for this analysis. Stock composition estimates were provided to fishery managers within 24 h to 48 h after each fishing period, prior to the formulation of the following week's fishing plan. Escapement scale samples taken in 1987 were used to develop new current-year standards to reclassify the catches after the fishing season was over. In addition, appropriate LDF's were created to classify inriver samples of the Canadian Taku River harvest and the Taku River escapement past Canyon Island, allowing total returns and exploitation rate estimates to be developed for specific Taku River stocks.

We performed the LDF analyses on an IBM-compatible microcomputer using a series of FORTRAN programs developed by B. Conrad (ADF&G, Commercial Fisheries Division, Anchorage). The programs used 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 one 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 the 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 discriminating more than two groups. Instead it tends to differentiate well-separated groups further instead of improving differentiation of 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 by the operator 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 (jackknife) procedure (Lachenbruch 1967). The jackknife procedure was used to reduce bias caused by using the same set of samples both for calculating the discriminant function and for determining its accuracy.

Construction of Standards. Standards were developed for six stock groups. Five of the groups represented individual lake systems, while the remaining "non-lake" group was a conglomeration of samples taken from river, slough, and stream spawners along the mainstem of the Taku River and several important tributaries. We created standards only for the age-1.3 fish due to the scarcity of scales of other age classes available from several of the stock groups. We used at least 100 scales from each group with the exception of Kuthai Lake, for which only 63 scales were available.

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

Catch samples were analyzed on an in-season basis with standards developed from escapements in 1986. Catches were reclassified after the fishing season was over using standards built from 1987 escapement samples.

The numbers of fish by stock group for the catch of age-1.3 fish were computed for each fishing period by multiplying the total estimated catch of age-1.3 fish by the adjusted LDF estimate of contribution of each group;

$$C_{i1.3} = C*P_{1.3}*S_{i1.3}$$

where:

$C_{i1.3}$ = estimated catch of fish aged 1.3 returning to group i,

C = total catch in a fishing period,

$P_{1.3}$ = estimated proportion of fish aged 1.3 in the catch,

$S_{i1.3}$ = estimated proportion of group i in the catch of fish aged 1.3 in a fishing period.

Catches of each stock group for each fishing period were added to compute each group's contribution of age-1.3 fish for the entire fishing season.

The catches of fish of age groups other than age-1.3 were assigned to stock group of origin based on a function of the estimated proportion of fish aged 1.3 in the catch and the ratio of the estimated proportions of fish aged 1.3 to other age groups in the respective stock groups;

$$\hat{S}_{ij} = \frac{\hat{S}_{j(1.3)} * \left[\dfrac{\hat{E}_{ij}}{\hat{E}_{j(1.3)}} \right]}{\sum_{j=1}^{n} \hat{S}_{j(1.3)} * \left[\dfrac{\hat{E}_{ij}}{\hat{E}_{j(1.3)}} \right]}$$

where:

S_{ij} = estimated proportion of stock j in the catch of fish aged i,

$S_{j(1.3)}$ = estimated proportion of stock j in the catch of fish aged 1.3,

E_{ij} = estimated proportion of fish aged i in the escapement of stock j,

$E_{j(1.3)}$ = estimated proportion of fish age 1.3 in the escapement of stock j,

n = number of stocks.

The variances of the weekly and seasonal stock composition estimates were approximated using the delta method (Seber 1982). Factors contributing to the variance estimate included: (1) the age composition of the catch, (2) the age-1.3 stock composition estimate made using LDF, (3) the variance of the age-specific stock composition estimates, (4) the sample size used to estimate the age composition of the catch, and (5) the magnitude of the catch. This was a minimum estimate of the variance of the stock composition because no variance component was included for age classes not classified with LDF.

Log-likelihood ratio analysis (Zar 1984) was used to test for differences between in-season and postseason weekly age-1.3 stock composition estimates differed significantly. Data was arranged in a contingency table format and tested with the G-statistic.

Comparison of Scale Pattern and Brain Parasite Data

The prevalence of the myxosporidian brain parasite *Myxobolus neurobius* differs among sockeye salmon stocks returning to the Taku River and Port Snettisham drainages (Moles et al. *In press*). This biological characteristic offers promise in separating mixed stocks of sockeye salmon.

In 1987, the ADF&G collected heads from a subsample of the sockeye salmon sampled for scales from District 111 catches. The National Marine Fisheries Service-Auke Bay Laboratory dissected the brains from the heads and analyzed the brains for the presence or absence of the parasite. A goal of obtaining at least 200 matched brain parasite and scale samples per week from the District 111 harvest was established. Examination of historical age composition data for District 111 revealed that this number of samples was necessary to ensure the availability of at least 100 age-1.3 fish each week for scale digitizing.

The 1987 SPA estimates of stock composition presented in this report were derived using scales from only those fish that were also sampled for parasite incidence. Limited matched brain parasite and scale sampling was also undertaken in 1986 (Moles et al. *In press*). Because of the smaller number of samples taken in 1986 for parasite analysis, some of the scales used in developing SPA estimates of stock composition came from fish that were not sampled for parasites.

Results of the independent analyses of scale patterns and brain parasites were compared. We multiplied SPA stock composition estimates by the parasite incidence found in samples from the appropriate stocks to develop a projected brain parasite incidence for each week's catch and compared these projections with the actual brain parasite incidence found in the catch samples. The following algorithm was used to develop the projected brain parasite incidence (BP_p) for the 1987 data:

$$BP_p = (1.0*SPA_K) + (0.13*SPA_M) + (0.85*SPA_C) + (0.74*SPA_S),$$

where:

SPA_K = SPA estimate of the Kuthai Lake stock contribution,

SPA_M = SPA estimate of the Mainstem Taku River stock contribution,

SPA_C = SPA estimate of the Crescent Lake stock contribution,

SPA_S = SPA estimate of the Speel Lake stock contribution.

RESULTS AND DISCUSSION

Numbers of Fish

A total of 75,035 sockeye salmon were harvested by the commercial drift gill net fleet in District 111 in 1987. Fishing began in the third week of June and continued through the end of September. Weekly catches and specific time and area regulatory measures are summarized in Table 1. The fishery was open a total of 35.75 d. A maximum of 153 boats delivered fish in any one fishing period. Catches were greatest during 19-22 July (statistical week 30), when 15,457 fish were harvested. Catch-per-unit-effort (CPUE) was highest during the prior fishing period (12-14 July). Approximately 72% of the catch was taken in Taku Inlet (Subdistrict 111-32; Figure 2), while 22% was taken in upper Stephens Passage (Subdistrict 111-31), and 5% in lower Stephens Passage (Subdistrict 111-20). Catches in Port Snettisham (Subdistricts 111-33 and 111-34) accounted for less than 1% of the harvest. Port Snettisham was closed to fishing until 17 August to allow increased passage of sockeye salmon into Crescent and Speel Lakes and to protect Snettisham Hatchery chum and chinook salmon brood stocks.

Canadian commercial fishermen harvested 13,554 sockeye salmon in the Taku River fishery (Table 2). The fishery was open a total of 26.2 d. The maximum number of fishermen participating in any week of the fishery was 13. The catch and CPUE were highest during the 20-23 July opening (statistical week 30).

ADF&G operated a test gill net fishery in District 111 designed to examine the relative effectiveness of several types of gill nets (TTC 1988). Two boats fished one day each week in July (statistical weeks 28-31) and from late August through mid-September (statistical weeks 35-38). A total of 1,431 sockeye salmon were taken in this test fishery (Table 3).

CDFO operated an inriver test fishery to provide an index of coho and chum salmon abundance (TTC 1988). One fisherman made five standardized drifts in the morning and in the evening each day the commercial fishery was not open between 27 July and 16 October. A total of 237 sockeye salmon was taken in this test fishery (Table 3).

Age and Sex Composition

Age and sex composition data summarized in this report are presented in greater detail in McPherson et al. (1988).

Catch

Fish aged 1.3 dominated the District 111 harvest of sockeye salmon, representing 77% of the total catch (Table 4). Weekly proportions of age-1.3 fish in the catch ranged from a high of 86% during the first week of the season to a low of 60% during the last sample period (17 August - 28 September). Age-0.3 fish were the second most common (10%), as was the case in the 1986 District 111 fishery. The contribution of this age class increased steadily through the season from a low of 3% during the first week to 19% during the last sample period. A similar seasonal trend was apparent for the age-2.3 fish, which comprised 7% of the total harvest. The sex composition of the catch was 44% males and 56% females.

The age composition of the Canadian Taku River harvest (Table 5) was similar to the District 111 age composition, except that fish aged 0.3 were more prevalent in the inriver fishery. Age-1.3 fish comprised 66% of the catch, followed by age-0.3 (20%), age-1.2 (7%), age-2.3 (4%) and other age groups (2%). As seen in the District 111 commercial fishery, the contribution of fish aged 0.3 increased through the season. Males and females comprised 46% and 54% of the catch, respectively.

Fish aged 1.3 (69%) and 0.3 (18%) were most common in the District 111 test fishery catch (Table 6). The inriver Canadian test fishery was not sampled for scales due to the low numbers of fish caught.

Escapement

Large differences in age composition were apparent in escapements to the Taku River and Port Snettisham drainages. The portion of the Taku River run that migrated upriver past Canyon Island was comprised of age groups 1.3 (54%), 1.2 (17%), 0.3 (13%), 1.1 (5%), 2.3 (5%), and others (6%; Table 7). Fish aged 1.3 were the most common age class throughout the season. Age-1.2 fish were most prevalent during 5-11 July, when they comprised 38% of the fish wheel catches. Age-0.3 fish increased in abundance during the season from a low of 1% during 21-27 June to a high of 21% during 2-8 August. The contribution of jacks (sockeye salmon aged .1) was higher (8%) than in any year since 1984 and may indicate healthy returns from the 1984 brood year in 1988 and 1989. Males were more common (58%) in fish wheel catches than were females (42%).

Taku River stocks exhibited an extreme diversity in age composition (Table 8), as also seen in other years (McGregor et al. 1984; McGregor and McPherson 1986; McPherson and McGregor 1986; McPherson et al. 1988). Fish classified as age-0. comprised 47% of the ageable scales taken from river spawners, but were absent or represented less than 3% of samples from each lake system. Fish with two freshwater annuli were more common in returns to lake systems than in river spawners. Age-1.2 fish predominated in fish sampled at Kuthai Lake (52%).

In contrast, fish from escapements to Port Snettisham drainages exhibited little diversity in age composition. Age-1.3 sockeye salmon comprised over 90% of the escapement to each of Crescent and Speel Lakes. The sex composition of samples taken at these lakes was distinctive; females made up an estimated 81% of the Speel Lake escapement and 62% of the Crescent Lake escapement.

Stock Identification

Scale Measurements

The two scale pattern variables that were most valuable for discriminating between stocks were the number of circuli in and the width of the freshwater growth zone (Table 9). Relationships of scale variable values between stocks were similar as in 1986 (McGregor and Walls 1987). Kuthai Lake fish exhibited by far the greatest freshwater growth, followed by fish from the Tatsamenie Lake system. 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 Taku River and Speel Lake groups were intermediate to Kuthai Lake and Crescent Lake scales in the amount of freshwater growth. Other scale variables from the freshwater growth zone that were useful in distinguishing between groups included variables 4 (the distance between the scale focus and the fourth freshwater circulus), 14 (the distance from the second freshwater circulus to the end of the first freshwater annular zone), and 17 (variable 4 divided by the distance across the first freshwater annular zone) (Appendix A.1).

Differences in scale growth in the first marine zone between stocks were also apparent. As with freshwater growth, the marine growth of Kuthai and Crescent Lake groups showed the greatest separation between stocks.

Classification Accuracies

The mean classification accuracy of 1986 standards used in-season to classify the District 111 catch of age-1.3 fish was 0.738, while the mean classification accuracy of 1987 standards used on a postseason basis to classify catches was 0.672 (Table 10). The Kuthai Lake run classified most accurately (>0.930) in both in-season and postseason analyses. Crescent, Speel, Little Trapper, and Little Tatsamenie Lake groups were correctly assigned at intermediate values (0.614 to 0.807) with slightly lower accuracies in the postseason analysis. Mainstem Taku River spawners classified with the lowest accuracy in both in-season (0.481) and postseason (0.500) analyses. Classification matrices of all in- and postseason LDF's used to classify District 111 catches are included in Appendices B.1 and B.2, respectively.

Catches of age-1.3 fish in the Canadian Taku River fishery and the Canyon Island fish wheels were classified on a postseason basis into four groups, excluding the Snettisham systems. The mean classification accuracy of the four-way LDF was 0.779 (Appendix B.3). The Kuthai Lake group classified correctly most often (0.968), followed by Little Trapper Lake (0.760), Little Tatsamenie Lake (0.704), and Mainstem Taku River (0.683).

Estimates of Stock Composition

Age-1.3 Fish

Trends in weekly postseason stock composition estimates were similar for District 111, Canadian Taku River, and Canyon Island fish wheel catches of age-1.3 fish (Table 11; Figure 4). Kuthai Lake fish comprised high proportions of catches through the end of June (statistical week 27). Fish bound for Little Trapper Lake increased in abundance in early July and represented the majority of age-1.3 catches during the second full week of July (statistical week 29). The Mainstem Taku River group dominated catches from late July (statistical week 31) through the end of the season. Fish from Little Tatsamenie Lake were present at low levels throughout the season.

The Snettisham contribution of age-1.3 fish was very low in the District 111 fishery until mid-July (Table 11; Figure 5). Age-1.3 returns to Crescent Lake peaked in late July (statistical weeks 30 and 31). Speel Lake accounted for large proportions (>30%) of age-1.3 catches during statistical week 30 (19-22 July) and the last sample period of the season (statistical weeks 34-40 pooled).

All Ages

The District 111 harvest of all age classes of sockeye salmon was comprised of the following estimated stock proportions: 38% Mainstem Taku River, 23% Little Trapper Lake, 16% Crescent Lake, 12% Speel Lake, 8% Kuthai Lake, and 3% Little Tatsamenie Lake (Table 12). The combined contribution of Taku River stocks equaled 72% of the harvest, or 53,997 fish. The relative contributions of the six stock groups were similar in 1987 to those of 1986, with the exception of the Little Tatsamenie Lake group. In 1986 this group was the third most prevalent, comprising 20% of the catch, but in 1987 it was the least important of any stock group. Snettisham stocks were more prevalent in 1987 (28%) than in 1986 (17%). Approximately 68% of the total estimated Snettisham harvest was taken in statistical weeks 30 and 31. Maximum harvests outside of Taku Inlet (Subdistricts 111-31 and 111-20) also occurred during these two weeks. An estimated 95% of the harvest of age-0. fish were from the Mainstem Taku River. Principal contributors to the catch of age-2. fish were Little Trapper Lake, Mainstem Taku River, and Crescent Lake.

The Canadian Taku River harvest was also comprised predominantly of the Mainstem Taku River group (65%; Table 13). The remainder of the harvest was contributed by Little Trapper Lake (20%), Little Tatsamenie Lake (9%), and Kuthai Lake (6%). Sockeye salmon taken late in the season, between early August (statistical week 32) and the last week of fishing, represented 50% of the 1987 catch, higher than in any other year of the fishery except 1979. The contribution of age-0. fish, which are almost all bound for Mainstem Taku River spawning sites, to the fishery was higher (20%) than in any previous year that age composition data have been collected.

The total commercial harvest of Taku River sockeye salmon stocks in District 111 and the Taku River was estimated at 67,551 fish. The Canadian harvest of 13,554 represents 20% of that total. An additional 1,265 Taku River and 402 Snettisham sockeye salmon were taken in test fisheries in District 111 and the Taku River;

these estimates were derived by applying the stock composition estimates for weekly District 111 and inriver commercial harvests to the test fishery harvests during the same weeks.

While fishery catch statistics are presumed to be highly accurate, a degree of uncertainty is connected with the mark-recapture estimate of the inriver escapement. The 95% confidence interval of the seasonal estimate of escapement to Canadian portions of the Taku River drainage ranged from approximately 74,000 to 100,000 fish (McGregor and Clark 1988). The variances of the weekly inriver abundance indices used to weight the stock composition estimates were large. Due to the uncertainty in these weekly abundance indices, the Canyon Island stock composition estimates were not used in this report to estimate the total inriver return by stock group; these estimates are simply presented as weekly proportions of the fish passing Canyon Island (Table 14).

Total Run Estimates

The mark-recapture estimate of sockeye salmon escapement past Canyon Island was 87,130 fish, of which 73,339 escaped to spawn (McGregor and Clark 1988). The escapement falls within the interim U.S. and Canadian escapement goal range of 71,000 to 80,000 sockeye salmon. The total estimated run of Taku River sockeye salmon was 142,155 (Table 15). The commercial catch of 67,551 fish was midway within the TAC range of 62,155-71,155 fish.

Total run and exploitation rate estimates are available for four individual weired systems in the Taku River and Port Snettisham drainages (Table 15). Total runs of Crescent and Speel Lake stocks were each near 20,000 fish. The Crescent Lake stock was exploited at a slightly higher rate than the Speel Lake stock, as was the case in 1986. The return of Little Trapper Lake sockeye salmon totaled nearly 33,000 fish of which 54% were taken in District 111 (compared to an SPA estimated exploitation rate of 50% in 1986). The Little Tatsamenie Lake return totaled slightly over 6,000 fish (compared to 28,000 in 1986), of which 37% were taken in the District 111 fishery.

The interannual variability in exploitation rates of the Taku River run as a whole has been very small in the four years for which we have data (Table 16). The District 111 fishery has harvested an average of 36% of the run, ranging from a low of 31% in 1984 to a high of 39% in 1985. The combined U.S. and Canadian utilization of this run has averaged 46%, varying within the narrow range of 45%-48%. As in previous years, the 1987 Snettisham run was exploited in District 111 at a higher rate (55%) than Taku River returns. Exploitation rates on Snettisham stocks have also varied little from 1984 through 1987, averaging 54% during this time. In 1983 the Snettisham run was exploited at only 21%; this was likely caused by fishery restrictions, low effort levels in the fishery, and the preponderance of 4-year-olds in the returns (McGregor 1985).

The reader should be aware that total run estimates for Taku River and Port Snettisham sockeye salmon stocks included in this report do not take into account the possible interception of these stocks in other fisheries. In 1987 large numbers of sockeye salmon (44,766) were taken in the Southeast Alaska District 112 purse seine fishery. This fishery targets primarily on pink and chum salmon. Incidental catches of sockeye salmon in the District 112 fishery were largest from mid- to late July (statistical weeks 30-31), when approximately 56% of the total sockeye salmon catch in the district was taken. The incidence of age-0. sockeye salmon in District 112 catches during these two weeks was approximately 10% (McPherson et al. 1988), similar to the incidence of age-0. fish in the District 111 gill net harvest during statistical weeks 30-32. It is likely that a large portion of the District 112 harvest during these two weeks was from the Taku River. Lynn Canal sockeye salmon are the only other known northern Southeast Alaska stocks that contribute age-0. fish to the fisheries in this area, and most of these are early run fish that typically pass through the District 115 fishery by statistical week 29 (McPherson and Jones 1987). No quantitative efforts have been made to estimate the magnitude of these interceptions because the extreme mixed-stock nature of the District 112 fishery complicates efforts to accurately estimate stock compositions. It is apparent, however, that in years when large catches of sockeye salmon are taken in District 112, significant numbers of Taku River and Port Snettisham sockeye salmon may be intercepted.

Comparison of In- and Postseason Estimates

Differences between the weekly in-season and postseason age-1.3 stock composition estimates were generally small, especially for the Kuthai, Little Tatsamenie, Crescent, and Speel Lake stocks. Seasonal trends and peak weeks in the contribution of the individual stocks varied little between in- and postseason analyses. In-season analysis detected the poor return of the Little Tatsamenie Lake run and also the strong contributions of Mainstem Taku River and Snettisham stocks. However, log-likelihood analysis revealed that significant differences were present in seven of the nine strata compared (Table 17). The Little Trapper Lake stock was not present in the catch after statistical week 29 in the in-season analysis, but postseason analysis with current year standards indicated that this stock remained present at low to moderate levels through statistical week 33. Of the other stock groups, the contribution estimates of the Mainstem Taku River group differed the most. Weekly postseason estimates of this group were generally, but not always, lower then in-season estimates.

When stock composition estimates were pooled into Taku and Snettisham groups, differences were noted in only three of the nine strata (Table 18). Differences were present in early weeks of the season (statistical weeks 26, 28, and 29). After this time the estimates were extremely close.

Comparison of Scale Pattern and Brain Parasite Data

Differences in the incidence of *Myxobolus neurobius* in 1987 District 111 catch samples and the projected incidence one would expect based on SPA stock composition estimates were very small (Figure 6). The average weekly deviation between the SPA projections and actual brain parasite incidence was 6%, with a minimum weekly difference of 2% and a maximum difference of 12%. The projected incidence was greater than the actual incidence in five cases and less in four cases (no apparent seasonal trend to the differences). Differences between weekly SPA projections and actual brain parasite incidence in District 111 during the 1986 fishing season were even smaller, averaging only 3% and ranging from 0% to 8% (Figure 6).

High proportions of Crescent, Speel, and Kuthai Lake sockeye salmon harbor the *Myxobolus* parasite. Variable, but generally low, proportions of parasitized fish are found in stocks spawning along the mainstem of the Taku River, and stocks from Little Trapper and Little Tatsamenie Lakes do not harbor the parasite (Moles et al. *in press*). Because some stocks in both the Taku River and Port Snettisham drainages are parasitized, this biological characteristic is not by itself useful in assigning specific stock of origin information to District 111 catches. It does offer promise in several respects, however. It provides an independent method of assessing the relative accuracy of SPA stock composition estimates, and in combination with other biological characteristics, such as scale patterns, it may increase the accuracy and precision of stock composition estimates. Analysis combining paired scale pattern and brain parasite data has not been conducted; however, independent SPA and parasite data sets from 1986 and 1987 agreed very closely.

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TABLES AND FIGURES

Table 1. District 111 fishery openings, effort, and harvest of sockeye salmon by statistical week and subdistrict, 1987.

					Catch						
					Subdistrict						
Statistical Week	Dates Fished	# of Days Fished	# of Boats	Effort (Boat Days)	20	31	32	33	34	Total Catch	CPUE Catch/Boat Day
26[a,b]	6/21-6/24	3	50	150		88	2,523			2,611	17.41
27[a,b]	6/28-7/1	3	55	165		321	5,888			6,209	37.63
28[b,c]	7/5-7/8	2.25	68	153		1,409	4,028			5,437	35.54
29[b,c]	7/12-7/14	1.5	70	105	211	1,773	11,984			13,968	133.03
30[b,d]	7/19/7/22	3	82	246		5,723	9,734			15,457	62.83
31[b,e]	7/26-7/31	5	97	485	1,908	5,354	6,773			14,035	28.94
32[b,f]	8/2-8/6	4	56	224	1,819	283	7,419			9,521	42.50
33[b,g]	8/9-8/12	3	52	156		310	3,832			4,142	26.55
34[h,i]	8/17-8/19	2	86	172		675	1,109		206	1,990	11.57
35	9/23-9/25	2	121	242		430	840		144	1,414	5.84
36	8/30-9/1	2	153	306		39	163	3	6	211	0.69
37[j]	9/6-9/8	2	66	132		14	11		9	34	0.26
38[k]	9/13-9/14	1	19	19			3			3	0.16
39[k]	9/20-9/21	1	10	10			3			3	0.30
40[k]	9/27-9/28	1	5	5							0.00
Total		35.75	990	2,570	3,938	16,419	54,310	3	365	75,035	29.20

[a] Taku Inlet closed north of Jaw Point.
[b] Port Snettisham closed east of a line from Point Styleman to Point Amner.
[c] No fishing was allowed between 10 p.m. and 4 a.m. (to reduce the catch of immature chinook salmon).
[d] Fishing area was limited to portions of District 111 south of the latitude of Graves Pt. light from 12:01 p.m. on 7/21 to 12:00 noon on 7/22 (to harvest surplus pink and chum salmon while minimizing the take of sockeye).
[e] Fishing area was limited to portions of District 111 south of Midway Island to a line from Pt. League to Pt. Hugh from 12:01 p.m. on 7/29 through 12:00 noon on 7/31.
[f] Fishing was allowed in those portions of District 111 south of Midway Island to a line from Pt. League to Pt. Hugh during the entire opening. Taku Inlet and Stephens Passage were both open to fishing from 12:01 p.m. on 8/2 until 12:00 noon on 8/4. Fishing Taku Inlet north of the latitude of Pete's Rock was extended through 12:00 noon on 8/5.
[g] Fishing was extended for 24 hours after the initial two day opening only in those waters of Taku Inlet north of Pete's Rock.
[h] 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).
[i] Port Snettisham was closed from a line from Sharp Point to Sentinel Point.
[j] Fishing was allowed for 1 day in those waters north of Circle Point, and two days in those waters south of Circle Point.
[k] Taku Inlet was closed north of a line from Greely to Cooper Points.

Table 2. Canadian commercial gill net harvest of sockeye salmon in the Taku River, 1987.

Statistical Week	Dates Fished	# Days Fished	Number of Fishermen	Effort (Boat Days)	Catch	CPUE (Catch/ Boat Day)
27	6/29-6/30	1	11	11	178	16.18
28	7/6-7/7	1	13	13	508	39.08
29	7/13-7/15	2	13	26	782	30.08
30	7/20-7/23	3	12	36	4,621	128.36
31	7/27-7/29	2	12	24	751	31.29
32	8/3-8/7	4	12	48	4,118	85.79
33	8/10-8/12	2	13	26	1,577	60.65
34	8/17-8/18	1	13	13	624	48.00
35	8/24-8/25	1	12	12	195	16.25
36	8/31-9/2	2	12	24	148	6.17
37	9/7-9/9	2	11	22	30	1.36
38	9/14-9/16	2.2	5	11	16	1.45
39	9/21-9/24	3	5	15	6	0.40
Total		26.2	144	281	13,554	48.23

Table 3. Test fishery catches of sockeye salmon in District 111 and the Taku River, 1987.

Statistical Week	Inclusive Dates	Catch	
		111	Taku River
28	(7/5-11)	166	
29	(7/12-18)	544	
30	(7/19-7/25)	392	
31	(7/26-8/1)	317	59
32	(8/2-8/8)		51
33	(8/9-8/15)		38
34	(8/16-8/22)		59
35	(8/23-8/29)	5	11
36	(8/30-9/5)	4	8
37	(9/6-9/12)	2	2
38	(9/13-9/19)	1	6
39	(9/20-9/26)		2
40	(9/27-10/3)		1
41	(10/4-10/10)		0
42	(10/11-10/16)		0
		1,431	237

Table 4. Age and sex composition of the District 111 gill net harvest of sockeye salmon by statistical week, 1987.

Statistical Week	Sample Size	Sex Composition (% Males)		1984	1983			1982			1981			1980		Total
				0.2	0.3	1.2	2.1	0.4	1.3	2.2	1.4	2.3	3.2	2.4	3.3	
26 (6/21-6/24)	703	52.8	%		2.6	6.4			86.2	1.7	0.1	2.8	0.1			
			S.E.		0.5	0.8			1.1	0.4	0.1	0.5	0.1			
			Catch		67	167			2,251	44	4	74	4			2,611
27 (6/28-7/1)	709	53.3	%		5.1	7.3			79.1	1.7	0.4	6.2			0.1	
			S.E.		0.8	0.9			1.4	0.5	0.2	0.9			0.1	
			Catch		316	455			4,913	105	26	385			9	6,209
28 (7/5-7/8)	661	48.7	%	0.2	7.1	5.7			78.2	0.5	0.2	8.2				
			S.E.	0.1	0.9	0.8			1.5	0.2	0.1	1				
			Catch	8	387	313			4,253	24	8	444				5,437
29 (7/12-7/14)	675	45.4	%	0.1	6.5	8.1		0.1	75.3	1	0.6	8.1				
			S.E.	0.1	0.9	1.0		0.1	1.6	0.4	0.3	1				
			Catch	21	911	1,138		21	10,511	145	83	1,138				13,968
30 (7/19-7/22)	782	34.4	%	0.3	10.4	2.6			80.2	0.5		6.1				
			S.E.	0.2	1.1	0.6			1.4	0.2		0.8				
			Catch	40	1,601	395			12,393	79		949				15,457
31 (7/26-7/31)	702	41.9	%		10.4	3.4			79.9	0.6	0.1	5.6				
			S.E.		1.1	0.7			1.5	0.3	0.1	0.8				
			Catch		1,459	480			11,216	80	20	780				14,035
32 (8/2-8/6)	653	45.5	%		15.8	2.8			75.2	0.8		5.5				
			S.E.		1.4	0.6			1.6	0.3		0.9				
			Catch		1,502	262			7,159	73		525				9,521
33 (8/9-8/12)	595	42.7	%	0.3	17.6	4.0	0.2	0.2	60.7	3.7		12.8	0.2	0.3		
			S.E.	0.2	1.4	0.7	0.2	0.2	1.9	0.7		1.3	0.2	0.2		
			Catch	14	731	167	7	7	2,513	153		529	7	14		4,142
34-40 (8/17-9/28)	155	49.7	%		18.7	3.2			60.0	4.5		13.5				
			S.E.		3.1	1.4			3.9	1.6		2.7				
			Catch		684	118			2,193	165		495				3,655
Total	5,635	43.7	%	0.1	10.2	4.7	<0.1	<0.1	76.5	1.2	0.2	7.1	<0.1	<0.1	<0.1	
			S.E.	<0.1	0.4	0.3	<0.1	<0.1	0.6	0.1	0.1	0.4	<0.1	<0.1	<0.1	
			Catch	83	7,658	3,495	7	28	57,402	868	141	5,319	11	14	9	75,035

Brood Year and Age Class

Table 5. Age and sex composition of the Canadian Taku River gill net harvest of sockeye salmon by statistical week, 1987.

Statistical Week	Sample Size	Sex Composition (% Males)		Brood Year and Age Class: 1984		1983			1983			1981			Total
				0.2	1.1	0.3	1.2	2.1	0.4	1.3	2.2	1.4	2.3	3.2	
27-28 (6/29-7/7)	66	56.1	%			7.6	15.2			66.7	3.0		6.1	1.5	
			S.E.			3.1	4.2			5.6	2.0		2.8	1.4	
			Catch			52	104			458	20		42	10	686
29 (7/13-7/15)	85	61.2	%			1.2	14.1			71.8	3.5	1.2	8.2		
			S.E.			1.1	3.6			4.6	1.9	1.1	2.8		
			Catch			9	111			561	28	9	64		782
30 (7/20-7/23)	190	42.6	%	0.5		10.5	7.4			75.3	0.5		5.8		
			S.E.	0.5		2.2	1.9			3.1	0.5		1.7		
			Catch	24		486	341			3,478	24		268		4,621
31 (7/27-7/29)	148	45.9	%	1.4	0.7	18.2	6.8			66.9	1.4		4.7		
			S.E.	0.9	0.6	2.9	1.9			3.5	0.9		1.6		
			Catch	10	5	137	51			502	10		36		751
32 (8/3-8/7)	189	41.8	%	0.5		30.7	5.8	0.5	0.5	58.2	0.5		3.2		
			S.E.	0.5		3.3	1.7	0.5	0.5	3.5	0.5		1.2		
			Catch	22		1,263	240	22	22	2,396	22		131		4,118
33 (8/10-8/12)	182	56.6	%	1.1	0.5	31.3	5.5			58.8	1.6		1.1		
			S.E.	0.7	0.5	3.2	1.6			3.4	0.9		0.7		
			Catch	17	9	494	87			927	26		17		1,577
34-39 (8/17-8/18)	193	47.2	%	0.5		27.5	5.7	0.5		62.7			3.1		
			S.E.	0.5		2.9	1.5	0.5		3.1			1.1		
			Catch	5		280	58	5		639			32		1,019
Total	1,053	46.3	%	0.6	0.1	20.1	7.3	0.2	0.2	66.1	1.0	0.1	4.3	0.1	
			S.E.	0.3	0.1	1.3	0.9	0.2	0.2	1.6	0.3	0.1	0.7	0.1	
			Catch	78	14	2,721	992	27	22	8,961	130	9	590	10	13,554

Table 6. Age and sex composition of the District 111 test fishery harvest of sockeye salmon by statistical week, 1987.

Statistical Week	Sample Size	Sex Composition (% Males)		Brood Year and Age Class 1984	1983		1982			1981		Total
				0.2	0.3	1.2	0.4	1.3	2.2	1.4	2.3	
28 (7/5)	67	53.7	%		6.0	6.0		77.6			10.4	
			S.E.		2.3	2.3		4.0			2.9	
			Catch		10	10		128			18	166
29 (7/12)	414	53.9	%	0.2	14.7	3.1	0.2	73.9	0.5	0.2	7.0	
			S.E.	0.1	0.9	0.4	0.1	1.1	0.2	0.1	0.6	
			Catch	1	80	17	1	403	3	1	38	544
30 (7/19)	312	49.5	%	0.3	25.0	4.5	0.3	60.6	0.6	1.3	7.4	
			S.E.	0.1	1.1	0.5	0.1	1.3	0.2	0.3	0.7	
			Catch	1	98	16	1	238	3	5	30	392
31-38 (7/26-9/13)	267	55.8	%	0.4	22.5	5.6	0.4	68.2	0.4		2.6	
			S.E.	0.2	1.1	0.6	0.2	1.2	0.2		0.4	
			Catch	1	74	18	1	225	1		9	329
Total	1,060	53.1	%	0.3	18.3	4.4	0.3	69.4	0.4	0.4	6.5	
			S.E.	0.1	0.6	0.4	0.1	0.8	0.1	0.1	0.5	
			Catch	3	262	61	3	994	7	6	95	1,431

Table 7. Age and sex composition of the Canyon Island (Taku River) fish wheel catch of sockeye salmon by statistical week, 1987.

				Brood Year and Age Class											
				1985	1984		1983			1982			1981		1980
Statistical Week	Sample Size	Sex 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
24-25	91	45.1	%				1.1	9.9			82.4	3.3		3.3	
(6/15-6/20)			S.E.				1.1	3.1			4.0	1.9		1.9	
26	156	60.9	%		1.3		0.6	19.9			74.4	2.6		1.3	
(6/21-6/27)			S.E.		0.9		0.6	3.2			3.5	1.3		0.9	
27	165	63.8	%				1.8	17.0			67.3	7.9	0.6	5.5	
(6/28-7/4)			S.E.				1.0	2.9			3.6	2.1	0.6	1.8	
28	229	66.2	%		0.4		4.4	38.0			40.6	7.0		9.6	
(7/5-7/11)			S.E.		0.4		1.3	3.2			3.2	1.7		1.9	
29	251	66.5	%		0.8		3.2	29.1			59.0	3.2		4.8	
(7/12-7/18)			S.E.		0.6		1.1	2.9			3.1	1.1		1.3	
30	664	52.8	%	0.2	1.4	1.7	12.8	16.6	0.6	0.2	59.8	0.6	0.3	6.0	
(7/19-7/25)			S.E.	0.1	0.4	0.5	1.3	1.4	0.3	0.1	1.9	0.3	0.2	0.9	
31	470	53.5	%	0.2	1.7	3.6	18.5	9.1	1.5	0.2	59.1	0.6	0.4	4.7	0.2
(7/26-8/1)			S.E.	0.2	0.6	0.9	1.8	1.3	0.6	0.2	2.2	0.4	0.3	1.0	0.2
32	538	57.4	%	0.9	0.7	8.0	20.8	14.7	5.2	0.2	44.1	1.9		3.5	
(8/2-8/8)			S.E.	0.4	0.4	1.2	1.7	1.5	0.9	0.2	2.1	0.6		0.8	
33	257	58.4	%	3.5	0.8	14.8	17.9	14.8	7.0	0.4	38.1	1.2		1.6	
(8/9-8/15)			S.E.	1.1	0.5	2.2	2.4	2.2	1.6	0.4	3.0	0.7		0.8	
34-39	166	59.0	%	4.2	0.6	24.1	15.7	11.4	0.6	0.6	38.6	1.8		2.4	
(8/16-9/20)			S.E.	1.6	0.6	3.3	2.8	2.5	0.6	0.6	3.8	1.0		1.2	
Total	2,987	57.6	%	0.8	1.0	5.0	12.7	17.3	1.9	0.2	54.1	2.2	0.2	4.6	<0.1
			S.E.	0.1	0.2	0.4	0.6	0.6	0.2	0.1	0.8	0.2	0.1	0.4	<0.1

Table 8. Age and sex composition of Taku River and Port Snettisham drainage sockeye salmon escapements, 1987.

System	Sample Size	Sex Composition (% Males)		Brood Year and Age Class														Total
				1985	1984		1983			1982			1981			1980		
				0.1	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	
Port Snettisham																		
Crescent Lake	2,548	38.2	%				1.4	0.4			91.3	0.3	0.5	6.1			0.1	
			S.E.				0.2	0.1			0.6	0.1	0.1	0.5			<0.1	
			Number				110	33			7,154	24	37	480			1	7,839
Speel Lake	1,341	18.6	%				1.2	3.9			93.3	0.1		1.6				
			S.E.				0.3	0.4			0.6	0.1		0.4				
			Number				109	364			8,728	5		146				9,353
Taku River																		
Lake Systems:																		
Little Trapper Lake	714	57.8	%			0.2		11.8			78.6	0.6		8.8				
			S.E.			0.2		1.3			1.6	0.3		1.1				
			Number			19		1,420			9,440	67		1,061				12,007
Little Tatsamenie Lake	321	39.9	%		0.9		18.4	9.3			61.1	3.1		7.2				
			S.E.		0.5		2.0	1.5			2.6	0.9		1.4				
			Number		26		513	262			1,706	87		200				2,794
Kuthai Lake	98	61.2	%					52.0			45.9	1.0		1.0				
			S.E.					5.1			5.0	1.0		1.0				
Nakina River (Kuthai Lake)[a]	36	36.1	%					13.9			77.8	8.3						
			S.E.					5.8			7.0	4.7						
Mainstem, River and Slough Spawners:																		
Hackett River	401	68.3	%		3.2	0.5	49.9	3.7			41.6	0.2		0.7				
			S.E.		0.7	0.3	1.9	0.7			1.8	0.2		0.3				
			Number		30	5	453	34			379	2		7				910
Nakina River	26	-	%			7.7	7.7	23.1			57.7			3.8				
			S.E.			5.3	5.3	8.4			9.9			3.8				
Chum Salmon Slough	112	60.7	%		2.7	1.8	47.3	12.5			33.9			1.8				
			S.E.		1.5	1.3	4.7	3.1			4.5			1.3				
Coffee's Slough	35	74.3	%		2.9	2.9	45.7	20.0			20.0	2.9		5.7				
			S.E.		2.9	2.9	8.5	6.9			6.9	2.9		4.0				

-Continued-

Table 8. (page 2 of 2).

System	Sample Size	Sex Composition (% Males)		Brood Year and Age Class: 1985	1984		1983			1982			1981			1980		Total
				0.1	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	
Tuskwa Slough	56	50	%	1.8	12.5	3.6	53.6	16.1			10.7			1.8				
			S.E.	1.8	4.5	2.5	6.7	5.0			4.2			1.8				
South Fork Slough	14	42.9	%		7.1	7.1	64.3	14.3			7.1							
			S.E.		7.1	7.1	13.3	9.7			7.1							
Yehring Creek	92	51.1	%		2.2	14.1	4.3	12.0			58.7			8.7				
			S.E.		1.5	3.7	2.1	3.4			5.2			3.0				
Subtotal River Spawners	742		%	0.1	3.6	3.1	43.0	8.6			39.0	0.3		2.3				

[a] Samples were taken from unspawned mortalities at the Nakina River carcass weir; Kissner (ADF&G, personal communication) believes these fish died attempting to ascend barriers in the outlet stream to Kuthai Lake.

Table 9. Means and standard errors (in parentheses) of basic age-1.3 scale variables used in postseason 1987 discriminant analyses (scale measurements are in 0.01's of inches at 100X).

	First Freshwater Zone		First Marine Zone	
Group	No. Circuli Var. No. 1	Width Zone Var. No. 2	No. Circuli Var. No. 1	Width Zone Var. No. 2
Kuthai Lake[a]	20.95 (.32)	226.83 (3.27)	23.60 (.35)	335.19 (4.60)
L. Trapper Lake	6.86 (.10)	79.62 (1.08)	29.63 (.20)	419.89 (2.47)
Mainstem[b]	9.09 (.14)	105.51 (1.57)	30.39 (.25)	433.64 (3.61)
L. Tatsamenie Lake	10.61 (.22)	131.36 (2.68)	26.75 (.20)	382.97 (2.80)
Crescent Lake	5.97 (.17)	67.30 (1.78)	30.61 (.28)	448.35 (4.65)
Speel Lake	9.36 (.13)	110.22 (0.99)	28.77 (.25)	422.06 (3.60)

[a] Comprised of samples taken at Kuthai Lake and the Nakina River carcass weir.

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

Table 10. Proportions of age-1.3 standards used to estimate stock composition of District 111 sockeye salmon catches that were classified correctly with in-season and postseason LDF analysis.

	Proportion Correctly Classified	
Stock Group	In-Season	Postseason
Kuthai Lake	0.933	0.968
L.Trapper Lake	0.665	0.615
Mainstem Taku River	0.481	0.500
L.Tatsamenie Lake	0.807	0.614
Crescent Lake	0.780	0.697
Speel Lake	0.760	0.640
Mean	0.738	0.672

Table 11. Age class-specific stock composition estimates and 90% confidence intervals calculated from scale pattern analysis of age 1.3 sockeye salmon by fishery and statistical week in 1987.

Fishery	Stat Week	Sample Size	Classification Group					
			Kuthai	L.Trapper	Mainstem	L.Tatsamenie	Crescent	Speel
District 111	26	126	.623±.118	Trace	.346±.164	.013±.097	.018±.055	Trace
	27	117	.309±.134	.226±.242	.314±.403	.036±.138	.010±.102	.105±.244
	28	108	.095±.088	.367±.308	.348±.443	.053±.158	.082±.163	.055±.298
	29	121	.059±.067	.640±.329	.190±.403	.053±.141	.012±.159	.046±.261
	30	202	.041±.043	.183±.219	.093±.333	.008±.101	.340±.175	.335±.270
	31	166	.000±.001	.089±.245	.432±.393	.035±.135	.347±.191	.097±.278
	32	143	.022±.034	.177±.209	.411±.381	Trace	.169±.140	.221±.297
	33	100	Trace	.172±.236	.576±.256	.040±.159	.212±.164	Trace
	34-40	58	Trace	Trace	.577±.546	.026±.188	.042±.127	.355±.488
Taku River Escapement[a]	25	71	.829±.131	.073±.113	.081±.172	.017±.084		
	26	108	.812±.112	.000±.064	.107±.152	.081±.103		
	27	98	.664±.130	.202±.144	.040±.155	.094±.111		
	28	63	.279±.145	.393±.242	.283±.281	.045±.163		
	29	100	.072±.066	.524±.215	.291±.247	.113±.160		
	30	99	.010±.026	.532±.224	.434±.269	.024±.154		
	31	99	.010±.026	.298±.215	.643±.279	.048±.184		
	32	100	.021±.031	.291±.184	.689±.185	Trace		
	33	93	.011±.027	.086±.201	.824±.293	.080±.217		
	34	40	Trace	Trace	.925±.182	.075±.182		
Taku River Catch	27-28	44	.422±.193	.229±.247	.305±.316	.044±.189		
	29	61	.152±.101	.647±.217	.201±.207	Trace		
	30	100	.082±.071	.328±.208	.535±.265	.055±.170		
	31	95	.021±.039	.203±.210	.714±.285	.062±.198		
	32	99	.020±.036	.221±.201	.539±.267	.221±.207		
	33	100	.000±.001	Trace	.910±.185	.090±.186		
	34	77	Trace	Trace	1.000±.000	Trace		

[a] Escapement samples were taken in fishwheels at Canyon Island.

Table 12. Estimated contribution of sockeye salmon stocks by age class to the District 111 drift gill net fishery, 1987.

Statistical Week		Age Groups						90% C.I.[a]			Effort	
		1.3	1.2	0.+	2.+	Others	Total	Lower	Upper	Percent	Boat Days	CPUE
26	Kuthai	1,402	143	0	59	3	1,607	1,429	1,785	61.5%		10.7
(6/21-6/24)	L. Trapper	0	0	0	0	0	0	0	0	0.0%		0.0
	Mainstem	779	23	66	51	1	920	676	1,164	35.2%		6.1
	L. Tatsamenie	29	1	1	5	0	36	0	0	1.4%		0.2
	Crescent	41	0	0	3	4	48	0	130	1.8%		0.3
	Speel	0	0	0	0	0	0	0	0	0.0%		0.0
	Total	2,251	167	67	118	8	2,611				150	17.4
27	Kuthai	1,518	308	0	105	3	1,934	1,573	2,295	31.2%		11.7
(6/28-7/1)	L. Trapper	1,110	44	0	188	2	1,344	699	1,989	21.7%		8.1
	Mainstem	1,543	90	306	143	3	2,085	1,013	3,157	33.6%		12.6
	L. Tatsamenie	177	7	9	38	0	231	0	599	3.7%		1.4
	Crescent	49	0	0	5	26	80	0	351	1.3%		0.5
	Speel	516	6	1	11	1	535	0	1,304	8.6%		3.2
	Total	4,913	455	316	490	35	6,209				165	37.6
28	Kuthai	404	106	0	16	0	526	323	729	9.7%		3.4
(7/5-7/8)	L. Trapper	1,561	80	0	248	0	1,889	1,178	2,600	34.7%		12.3
	Mainstem	1,480	111	378	126	0	2,095	1,074	3,116	38.5%		13.7
	L. Tatsamenie	225	12	15	42	0	294	0	657	5.4%		1.9
	Crescent	349	1	1	32	8	391	15	767	7.2%		2.6
	Speel	234	3	1	4	0	242	0	928	4.5%		1.6
	Total	4,253	313	395	468	8	5,437				153	35.5
29	Kuthai	620	266	0	47	0	933	552	1,314	6.7%		8.9
(7/12-7/14)	L. Trapper	6,727	566	0	953	0	8,246	6,356	10,136	59.0%		78.5
	Mainstem	1,997	247	882	157	0	3,283	986	5,580	23.5%		31.3
	L. Tatsamenie	557	48	67	108	0	780	0	2,043	5.6%		7.4
	Crescent	126	0	1	10	83	220	0	1,126	1.6%		2.1
	Speel	484	11	3	8	0	506	0	1,991	3.6%		4.8
	Total	10,511	1,138	953	1,283	83	13,968				105	133.0
30	Kuthai	508	129	0	37	0	674	384	964	4.4%		2.7
(7/19-7/22)	L. Trapper	2,268	113	0	375	0	2,756	1,288	4,224	17.8%		11.2
	Mainstem	1,153	84	1,471	105	0	2,813	574	5,052	18.2%		11.4
	L. Tatsamenie	99	5	35	21	0	160	0	844	1.0%		0.7
	Crescent	4,213	6	74	410	0	4,703	3,523	5,883	30.4%		19.1
	Speel	4,152	58	61	80	0	4,351	2,532	6,170	28.1%		17.7
	Total	12,393	395	1,641	1,028	0	15,457				246	62.8

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Table 12. (page 2 of 2).

Statistical Week		Age Groups						90% C.I.[a]			Effort	
		1.3	1.2	0.+	2.+	Others	Total	Lower	Upper	Percent	Boat Days	CPUE
31	Kuthai	0	0	0	0	0	0	0	11	0.0%		0.0
(7/26-7/31)	L. Trapper	998	54	0	130	0	1,182	0	2,672	8.4%		2.4
	Mainstem	4,845	382	1,408	349	0	6,984	4,594	9,374	49.8%		14.4
	L. Tatsamenie	393	22	31	70	0	516	0	1,331	3.7%		1.1
	Crescent	3,892	6	16	295	20	4,229	3,064	5,394	30.1%		8.7
	Speel	1,088	16	4	16	0	1,124	0	2,809	8.0%		2.3
	Total	11,216	480	1,459	860	20	14,035				485	28.9
32	Kuthai	157	31	0	17	0	205	59	351	2.2%		0.9
(8/2-8/6)	L. Trapper	1,267	48	0	193	0	1,508	626	2,390	15.8%		6.7
	Mainstem	2,943	165	1,484	252	0	4,844	3,229	6,459	50.9%		21.6
	L. Tatsamenie	0	0	0	0	0	0	0	0	0.0%		0.0
	Crescent	1,210	1	9	107	0	1,327	735	1,919	13.9%		5.9
	Speel	1,582	17	9	29	0	1,637	379	2,895	17.2%		7.3
	Total	7,159	262	1,502	598	0	9,521				224	42.5
33	Kuthai	0	0	0	0	0	0	0	0	0.0%		0.0
(8/9-8/12)	L. Trapper	432	27	0	168	1	628	236	1,020	15.2%		4.0
	Mainstem	1,447	133	734	343	5	2,662	2,231	3,093	64.3%		17.1
	L. Tatsamenie	101	6	14	71	0	192	0	456	4.6%		1.2
	Crescent	533	1	4	121	1	660	388	932	15.9%		4.2
	Speel	0	0	0	0	0	0	0	0	0.0%		0.0
	Total	2,513	167	752	703	7	4,142				156	26.6
34-40	Kuthai	0	0	0	0	0	0	0	0	0.0%		0.0
(8/17-9/28)	L. Trapper	0	0	0	0	0	0	0	0	0.0%		0.0
	Mainstem	1,265	103	670	495	0	2,533	1,733	3,333	69.3%		2.9
	L. Tatsamenie	57	3	8	69	0	137	0	408	3.8%		0.2
	Crescent	92	0	1	35	0	128	0	310	3.5%		0.1
	Speel	779	12	5	61	0	857	147	1,567	23.4%		1.0
	Total	2,193	118	684	660	0	3,655			100.0%	886	4.1
Total	Kuthai	4,609	983	0	281	6	5,879	5,205	6,553	7.8%		2.3
	L. Trapper	14,363	932	0	2,255	3	17,553	14,423	20,683	23.4%		6.8
	Mainstem	17,452	1,338	7,399	2,021	9	28,219	23,562	32,876	37.6%		11.0
	L. Tatsamenie	1,638	104	180	424	0	2,346	613	4,079	3.1%		0.9
	Crescent	10,505	15	106	1,018	142	11,786	9,724	13,848	15.7%		4.6
	Speel	8,835	123	84	209	1	9,252	5,861	12,643	12.3%		3.6
	Total	57,402	3,495	7,769	6,208	161	75,035				2,570	29.2

[a] Confidence intervals are minimum estimates based on the proportions of age-1.3 fish, age composition, and sample sizes.

Table 13. Estimated contribution of sockeye salmon stocks by age class to the Taku River gill net fishery, 1987.

Statistical Week		Age Groups 1.3	1.2	0.+	2.+	Others	Total	90% C.I.[a] Lower	Upper	Percent	Effort Boat Days	CPUE
27-28	Kuthai	193	64	0	16	5	278	214	342	40.5		11.6
(6/29-7/7)	L. Trapper	105	13	0	23	2	143	67	219	20.8		6.0
	Mainstem	140	25	50	17	3	235	138	332	34.3		9.8
	L. Tatsamenie	20	2	2	6	0	30	0	87	4.4		1.3
	Total	458	104	52	62	10	686				24	28.6
29	Kuthai	85	34	0	13	2	134	90	178	17.1		5.2
(7/13-7/15)	L. Trapper	363	53	0	66	5	487	385	589	62.3		18.7
	Mainstem	113	24	9	13	2	161	71	251	20.6		6.2
	L. Tatsamenie	0	0	0	0	0	0	0	0	0.0		0.0
	Total	561	111	9	92	9	782				26	30.1
30	Kuthai	285	56	0	7	0	348	186	510	7.5		9.7
(7/20-7/23)	L. Trapper	1,141	80	0	136	0	1,357	874	1,840	29.4		37.7
	Mainstem	1,861	191	497	120	0	2,669	2,048	3,290	57.8		74.1
	L. Tatsamenie	191	14	13	29	0	247	0	637	5.3		6.9
	Total	3,478	341	510	292	0	4,621				36	128.4
31	Kuthai	11	2	0	1	0	14	1	27	1.9		0.6
(7/27-7/29)	L. Trapper	102	8	0	12	0	122	52	192	16.2		5.1
	Mainstem	358	39	144	26	5	572	472	672	76.2		23.8
	L. Tatsamenie	31	2	3	7	0	43	0	109	5.7		1.8
	Total	502	51	147	46	5	751				24	31.3
32	Kuthai	48	10	0	2	0	60	2	118	1.5		1.3
(8/3-8/7)	L. Trapper	530	41	0	48	0	619	298	940	15.0		12.9
	Mainstem	1,288	147	1,178	62	0	2,675	2,235	3,115	65.0		55.7
	L. Tatsamenie	530	42	129	63	0	764	433	1,095	18.6		15.9
	Total	2,396	240	1,307	175	0	4,118				48	85.8
33	Kuthai	0	0	0	0	0	0	0	1	0.0		0.0
(8/10-8/12)	L. Trapper	0	0	0	0	0	0	0	0	0.0		0.0
	Mainstem	844	81	498	30	9	1,462	1,304	1,620	92.7		56.2
	L. Tatsamenie	83	6	13	13	0	115	0	248	7.3		4.4
	Total	927	87	511	43	9	1,577				26	60.7

-Continued-

Table 13. (page 2 of 2).

Statistical Week		Age Groups 1.3	1.2	0.+	2.+	Others	Total	90% C.I.[a] Lower	Upper	Percent	Effort Boat Days	CPUE
34-39	Kuthai	0	0	0	0	0	0	0	2	0.0		0.0
(8/17-9/24)	L. Trapper	0	0	0	0	0	0	0	0	0.0		0.0
	Mainstem	639	58	285	37	0	1,019	960	1,078	100.0		10.5
	L. Tatsamenie	0	0	0	0	0	0	0	0	0.0		0.0
	Total	639	58	285	37	0	1,019				97	10.5
Total	Kuthai	622	166	0	39	7	834	644	1,024	6.2		3.0
	L. Trapper	2,241	195	0	285	7	2,728	2,130	3,326	20.1		9.7
	Mainstem	5,243	565	2,661	305	19	8,793	7,996	9,590	64.9		31.3
	L. Tatsamenie	855	66	160	118	0	1,199	663	1,735	8.8		4.3
	Total	8,961	992	2,821	747	33	13,554				281	48.2

[a] Confidence intervals are minimum estimates based on the proportions of age-1.3 fish, age composition, and sample sizes.

Table 14. Estimated contribution of sockeye salmon stocks by age class to the Canyon Island fish wheel catches, 1987.

Statistical Week		Age Groups					
		1.3	1.2	0.+	2.+	Others	Total
24-25	Kuthai	0.829	0.917	0.000	0.550	0.000	0.810
(6/15-6/20)	L. Trapper	0.073	0.029	0.000	0.237	0.000	0.079
	Mainstem	0.081	0.047	0.946	0.143	0.000	0.091
	L. Tatsamenie	0.017	0.007	0.054	0.070	0.000	0.020
26	Kuthai	0.812	0.904	0.000	0.491	0.000	0.803
(6/21-6/27)	L. Trapper	0.000	0.000	0.000	0.000	0.000	0.000
	Mainstem	0.107	0.063	0.829	0.187	0.000	0.115
	L. Tatsamenie	0.081	0.033	0.171	0.322	0.000	0.083
27	Kuthai	0.664	0.839	0.000	0.172	0.000	0.613
(6/28-7/4)	L. Trapper	0.202	0.092	0.000	0.510	0.038	0.220
	Mainstem	0.040	0.027	0.609	0.054	0.962	0.055
	L. Tatsamenie	0.094	0.043	0.391	0.263	0.000	0.113
28	Kuthai	0.279	0.476	0.000	0.240	0.000	0.334
(7/5-7/11)	L. Trapper	0.393	0.241	0.000	0.455	0.000	0.327
	Mainstem	0.283	0.255	0.960	0.200	0.000	0.291
	L. Tatsamenie	0.045	0.028	0.040	0.105	0.000	0.048
29	Kuthai	0.072	0.158	0.000	0.064	0.000	0.094
(7/12-7/18)	L. Trapper	0.524	0.414	0.000	0.506	0.000	0.470
	Mainstem	0.291	0.337	0.911	0.178	0.000	0.320
	L. Tatsamenie	0.113	0.090	0.089	0.252	0.000	0.117
30	Kuthai	0.010	0.045	0.000	0.007	0.000	0.014
(7/19-7/25)	L. Trapper	0.532	0.426	0.000	0.654	0.038	0.436
	Mainstem	0.434	0.510	0.986	0.297	0.962	0.528
	L. Tatsamenie	0.024	0.019	0.014	0.042	0.000	0.023
31	Kuthai	0.010	0.021	0.000	0.004	0.000	0.008
(7/26-8/1)	L. Trapper	0.298	0.226	0.000	0.410	0.015	0.227
	Mainstem	0.643	0.716	0.981	0.493	0.985	0.722
	L. Tatsamenie	0.048	0.037	0.019	0.093	0.000	0.042
32	Kuthai	0.021	0.043	0.000	0.028	0.000	0.019
(8/2-8/8)	L. Trapper	0.291	0.214	0.000	0.384	0.013	0.202
	Mainstem	0.689	0.743	1.000	0.588	0.987	0.780
	L. Tatsamenie	0.000	0.000	0.000	0.000	0.000	0.000
33	Kuthai	0.011	0.022	0.000	0.013	0.000	0.009
(8/9-8/15)	L. Trapper	0.086	0.061	0.000	0.106	0.003	0.053
	Mainstem	0.823	0.859	0.979	0.648	0.997	0.872
	L. Tatsamenie	0.080	0.058	0.021	0.233	0.000	0.067
34-39	Kuthai	0.000	0.000	0.000	0.000	0.000	0.000
(8/16-9/20)	L. Trapper	0.000	0.000	0.000	0.000	0.000	0.000
	Mainstem	0.925	0.947	0.984	0.771	1.000	0.951
	L. Tatsamenie	0.075	0.053	0.016	0.229	0.000	0.049

Table 15. Estimated catches, escapements, total runs, and exploitation rates of Port Snettisham and Taku River sockeye salmon, 1987.[a]

Stock Group	District 111 Catches		Inriver Catches		Total Catch		Escapement	Total Run	District 111 Commercial Exploitation Rate	Total Commercial Exploitation Rate
	Commercial	Test	Commercial	Test	Commercial	Test				
Crescent Lake	11,786	236	0	0	11,786	236	7,839	19,861	0.593	0.593
Speel Lake	9,252	166	0	0	9,252	166	9,353	18,771	0.493	0.493
Snettisham Total	21,038	402	0	0	21,038	402	17,192	38,632	0.545	0.545
L. Trapper Lake	17,553	477	2,728	18	20,281	495	12,007	32,783	0.535	0.619
L. Tatsamenie Lake	2,346	55	1,199	15	3,545	70	2,794	6,409	0.366	0.553
Kuthai Lake	5,879	69	834	2	6,713	71	n/d	n/d	n/d	
Mainstem Taku R.	28,219	427	8,793	202	37,012	629	n/d	n/d	n/d	
Taku Total	53,997	1,028	13,554	237	67,551	1,265	73,339	142,155	0.380	0.475

[a] The stock composition of weekly test fishery catches was assumed to equal the commercial fishery stock composition estimates for the same week.

Table 16. Total run and exploitation rate estimates for Taku River and Port Snettisham sockeye salmon, 1983-1987.[a]

Year	Taku River Total Run	Taku River District 111 Harvest	Taku River Total Commercial Harvest	Snettisham Total Run	Snettisham District 111 Harvest
1983 number [b]		23,892	40,948	37,641	7,735
exploitation rate [b]					0.205
1984 number	192,067	58,653	85,895	35,247	18,676
exploitation rate		0.305	0.447		0.530
1985 number	192,072	73,912	88,156	28,602	14,280
exploitation rate		0.385	0.459		0.499
1986 number	165,809	60,700	75,439	21,351	12,080
exploitation rate		0.366	0.455		0.566
1987 number	142,155	53,997	67,551	38,632	21,038
exploitation rate		0.380	0.475		0.545
Mean exploitation rate[c] (1984-1987)		0.359	0.459		0.535

[a] These numbers do not reflect possible interceptions in purse seine fisheries in northern S.E. Alaska.

[b] Escapement to the Taku River in 1983 was unknown, thus total run and exploitation rates could not be determined.

[c] Average of annual exploitation rates.

Table 17. Likelihood-ratio (G) tests of in- and postseason stock composition estimates for age-1.3 fish in the District 111 gill net harvest of 1987.

Statistical Week		Percent Stock Composition						df	G-Value	p-value
		Kuthai	L.Trapper	Mainstem	L.Tatsamenie	Crescent	Speel			
26	In	0.675	0.000	0.172	0.000	0.033	0.120	5	31.82*	p <.001
(6/21-6/24)	Post	0.623	0.000	0.346	0.013	0.018	0.000			
27	In	0.312	0.144	0.338	0.027	0.050	0.129	5	6.09	p >.250
(6/28-7/1)	Post	0.309	0.226	0.314	0.036	0.010	0.105			
28	In	0.117	0.476	0.041	0.000	0.156	0.210	5	52.62*	p <.001
(7/5-7/8)	Post	0.095	0.367	0.348	0.053	0.082	0.055			
29	In	0.062	0.412	0.319	0.000	0.175	0.032	5	38.73*	p <.001
(7/12-7/14)	Post	0.059	0.640	0.190	0.053	0.012	0.046			
30	In	0.036	0.000	0.270	0.024	0.411	0.259	5	72.98*	p <.001
(7/19-7/22)	Post	0.041	0.183	0.093	0.008	0.340	0.335			
31	In	0.000	0.000	0.533	0.048	0.360	0.059	5	24.17*	p <.001
(7/26-7/31)	Post	0.000	0.089	0.432	0.035	0.347	0.097			
32	In	0.000	0.000	0.559	0.067	0.254	0.120	5	69.99*	p <.001
(8/2-8/6)	Post	0.022	0.177	0.411	0.000	0.169	0.221			
33	In	0.000	0.000	0.654	0.041	0.305	0.000	5	26.02*	p <.001
(8/9-8/12)	Post	0.000	0.172	0.576	0.040	0.212	0.000			
34-40	In	0.000	0.000	0.647	0.006	0.000	0.347	5	4.40	p >.250
(8/17-9/28)	Post	0.000	0.000	0.577	0.026	0.042	0.355			

* significant (p<.001)

Table 18. Likelihood-ratio (G) tests of in-and postseason pooled stock composition estimates for age-1.3 fish in the District 111 gill net harvest of 1987.

Statistical Week		Percent Stock Composition: Taku	Snettisham	dF	G-Value	p-value
26	In	0.847	0.153	1	16.76*	p <.001
(6/21-6/24)	Post	0.982	0.018			
27	In	0.821	0.179	1	1.92	p >.100
(6/28-7/1)	Post	0.885	0.115			
28	In	0.634	0.366	1	15.48*	p <.001
(7/5-7/8)	Post	0.863	0.137			
29	In	0.793	0.207	1	12.30*	p <.001
(7/12-7/14)	Post	0.942	0.058			
30	In	0.330	0.670	1	0.01	p >.900
(7/19-7/22)	Post	0.325	0.675			
31	In	0.581	0.419	1	0.12	p >.500
(7/26-7/31)	Post	0.562	0.438			
32	In	0.626	0.374	1	0.08	p >.750
(8/2-8/6)	Post	0.610	0.390			
33	In	0.695	0.305	1	2.27	p >.100
(8/9-8/12)	Post	0.788	0.212			
34-40	In	0.653	0.347	1	0.31	p >.500
(8/17-9/28)	Post	0.603	0.397			

* significant (p<.001)

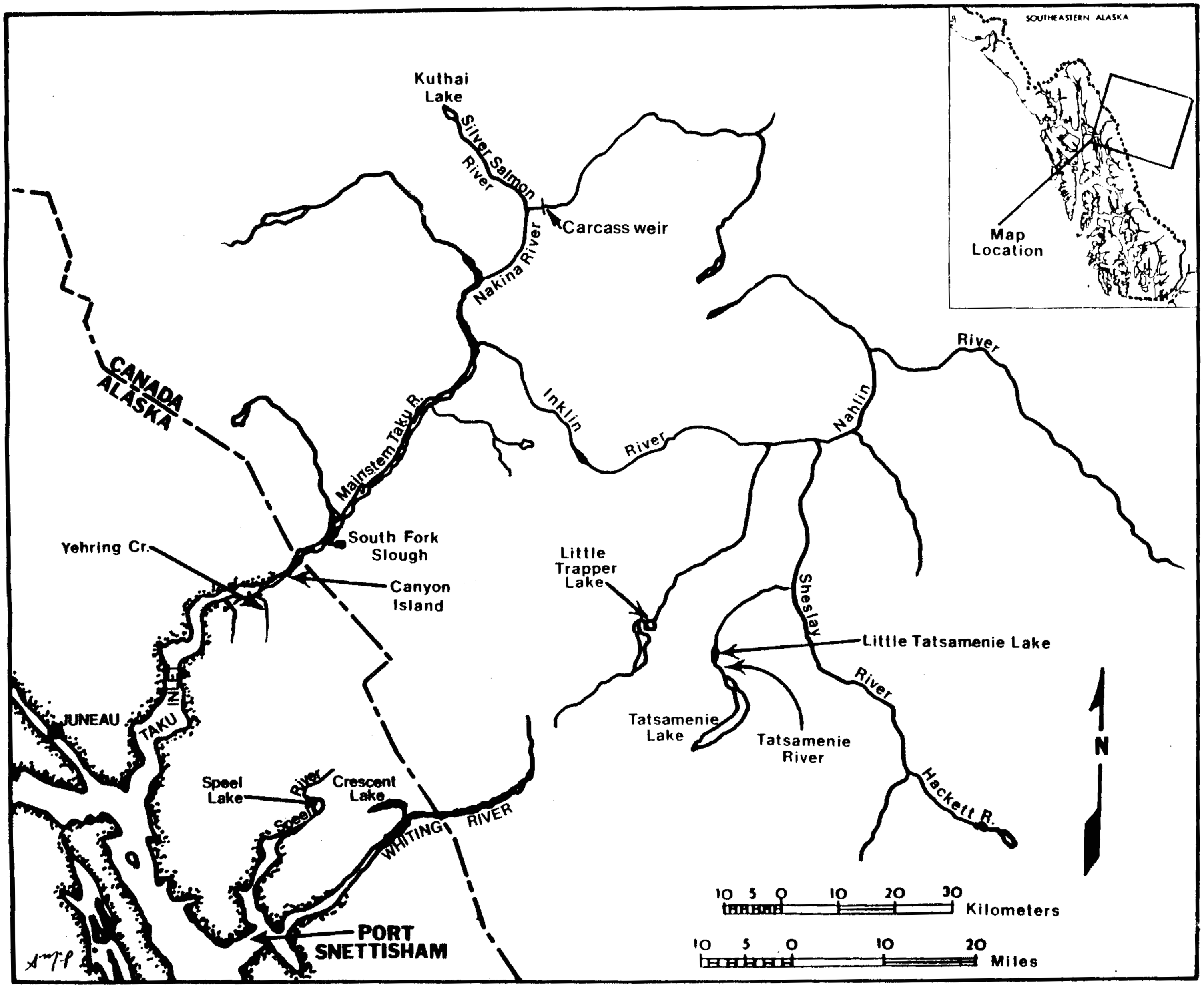

Figure 1. Taku River and Port Snettisham drainages.

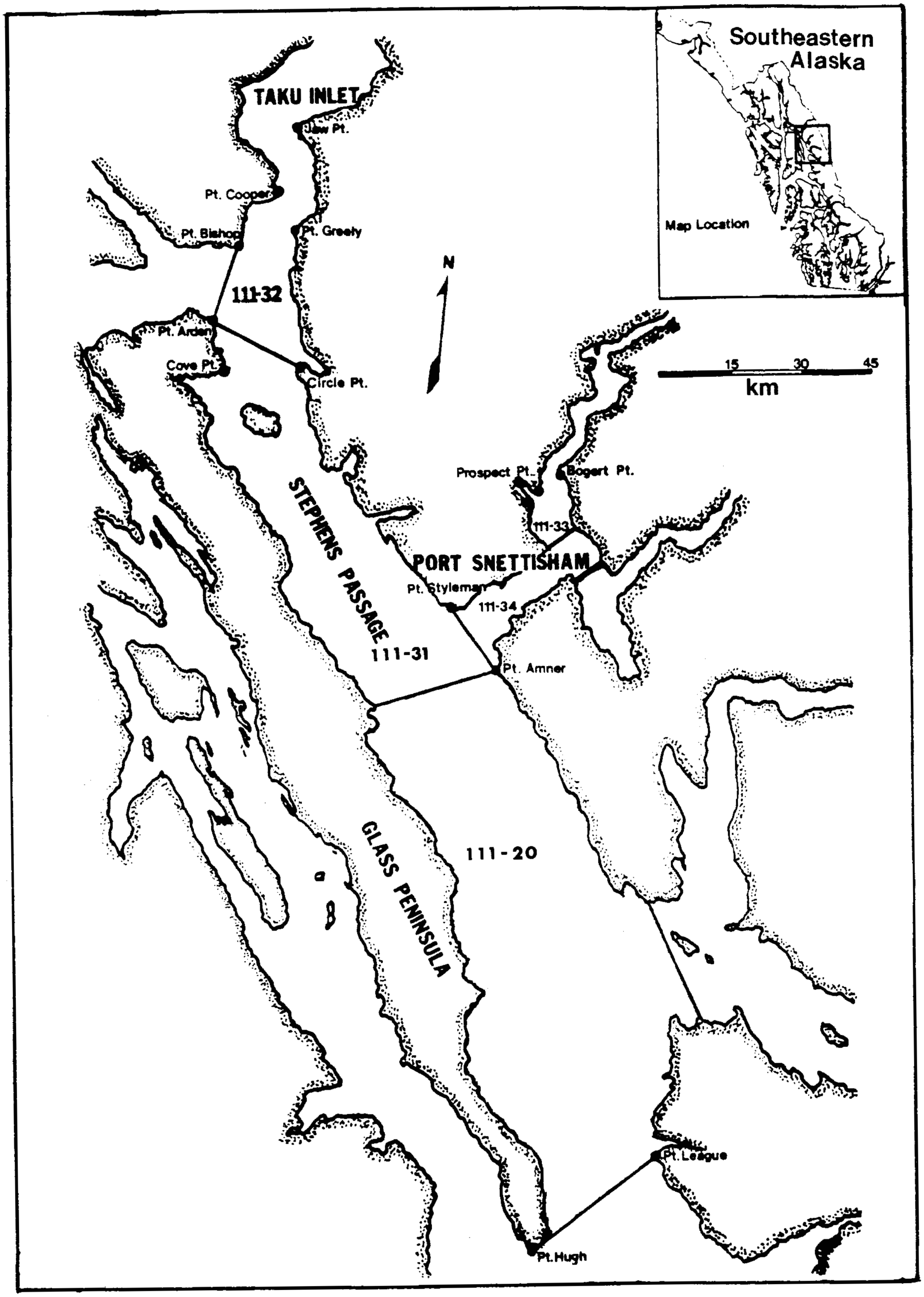

Figure 2. District 111 fishing area showing subdistricts.

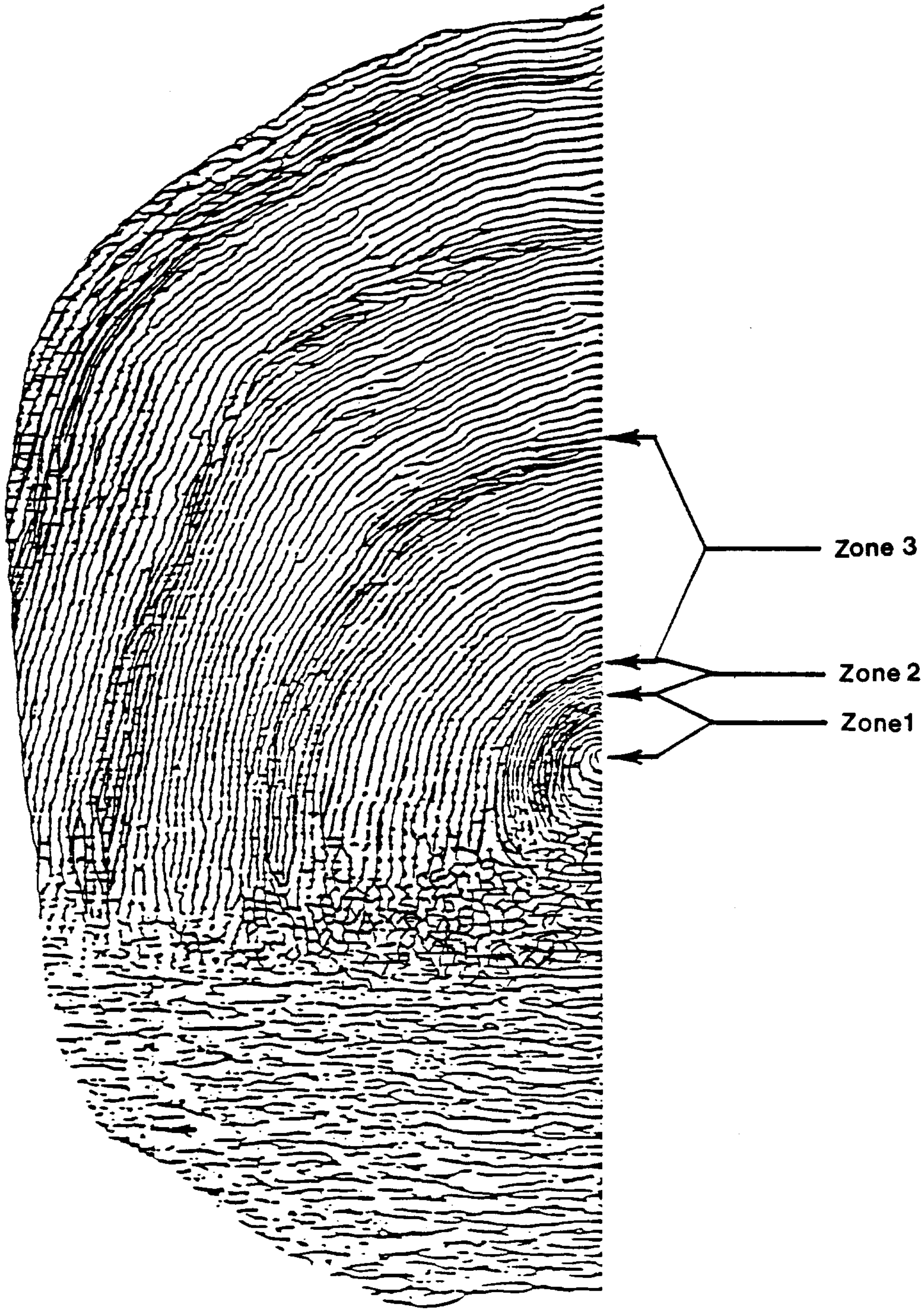

Figure 3. Typical age-1. sockeye salmon scale showing the zones used to measure scale patterns.

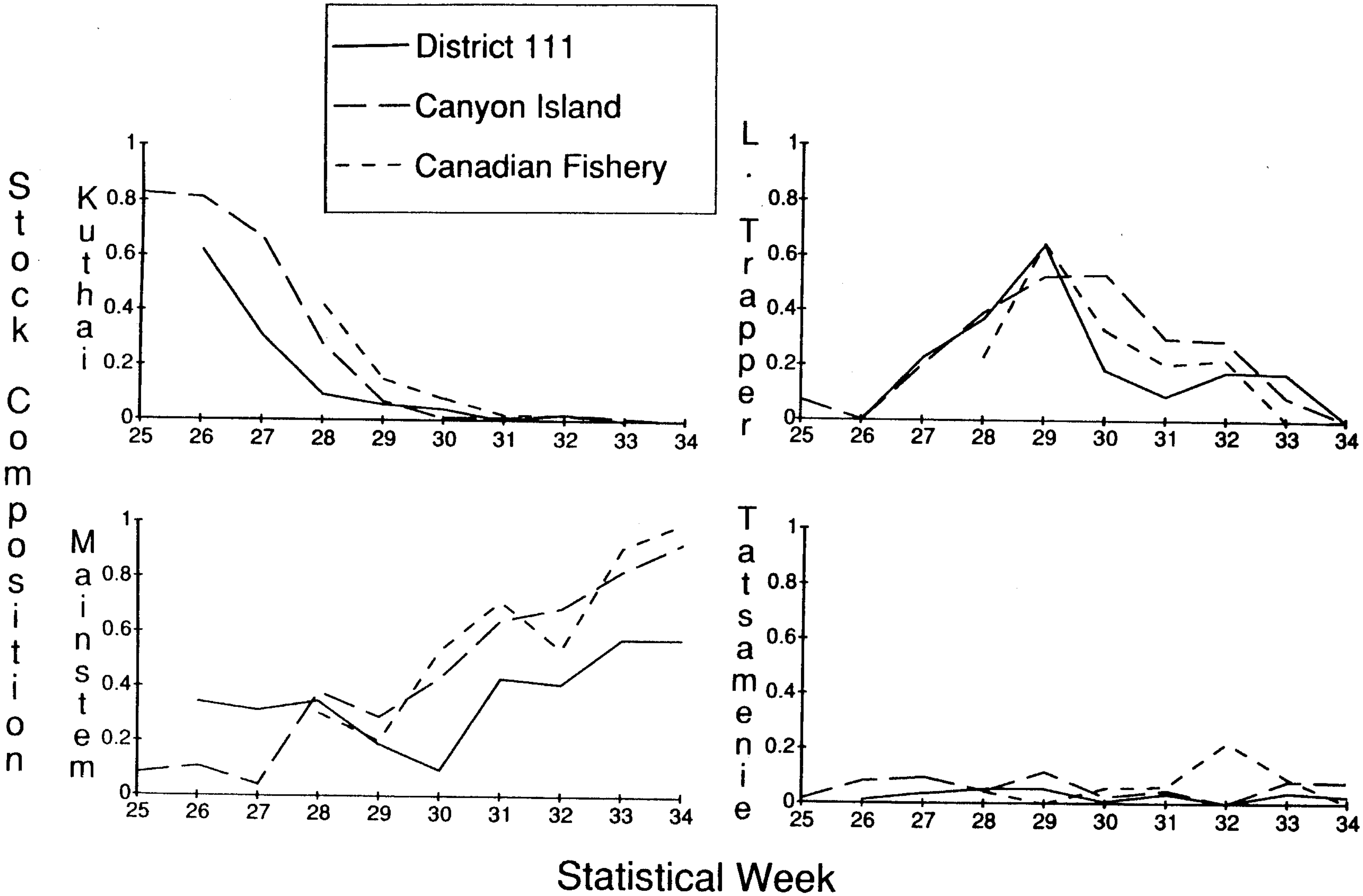

Figure 4. Estimates of the proportional contributions of age-1.3 Taku River stocks to the District 111 fishery, Canyon Island fish wheel catches, and the Canadian Taku River fishery, 1987.

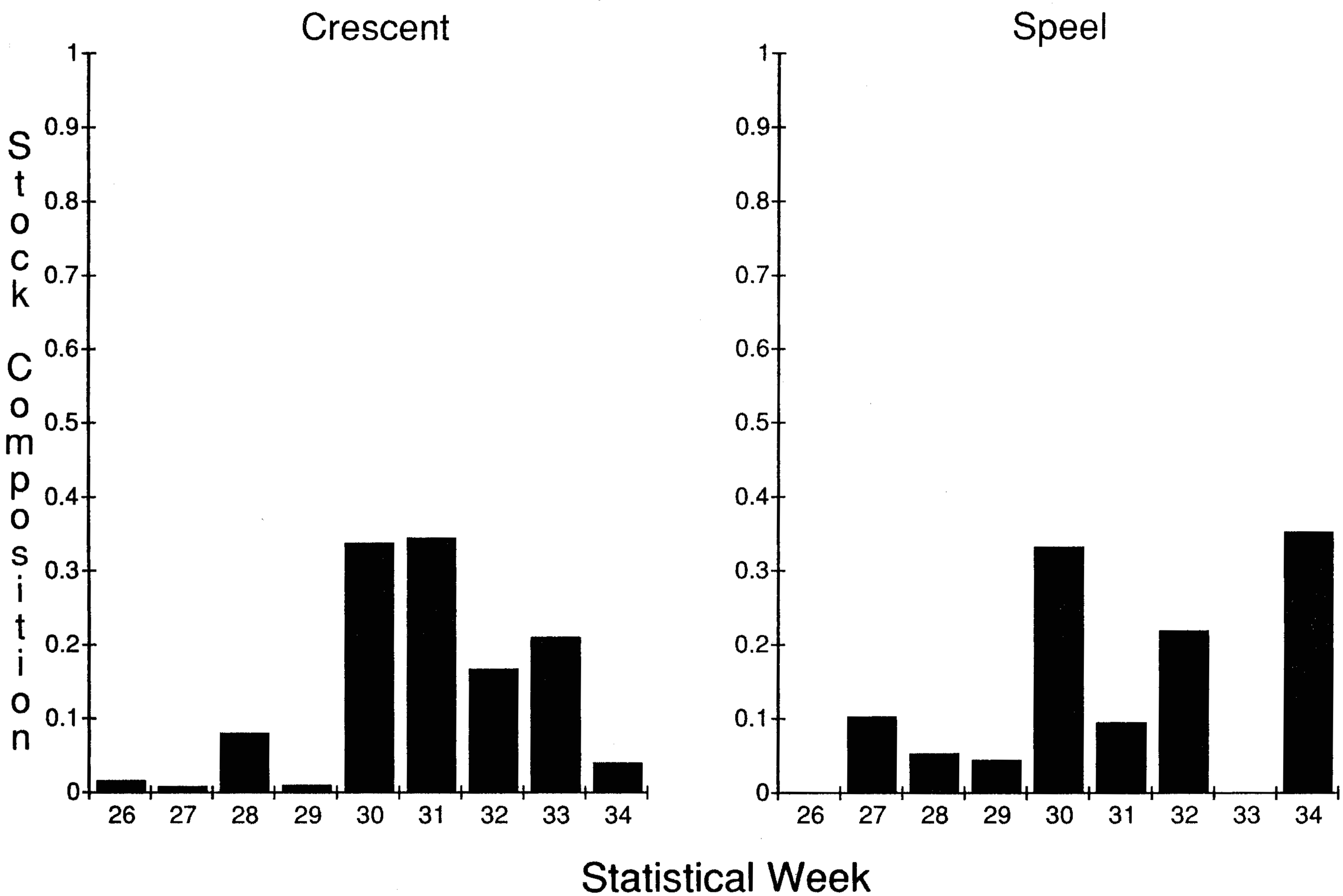

Figure 5. Estimates of the proportional contributions of age-1.3 Snettisham stocks to the District 111 fishery, 1987.

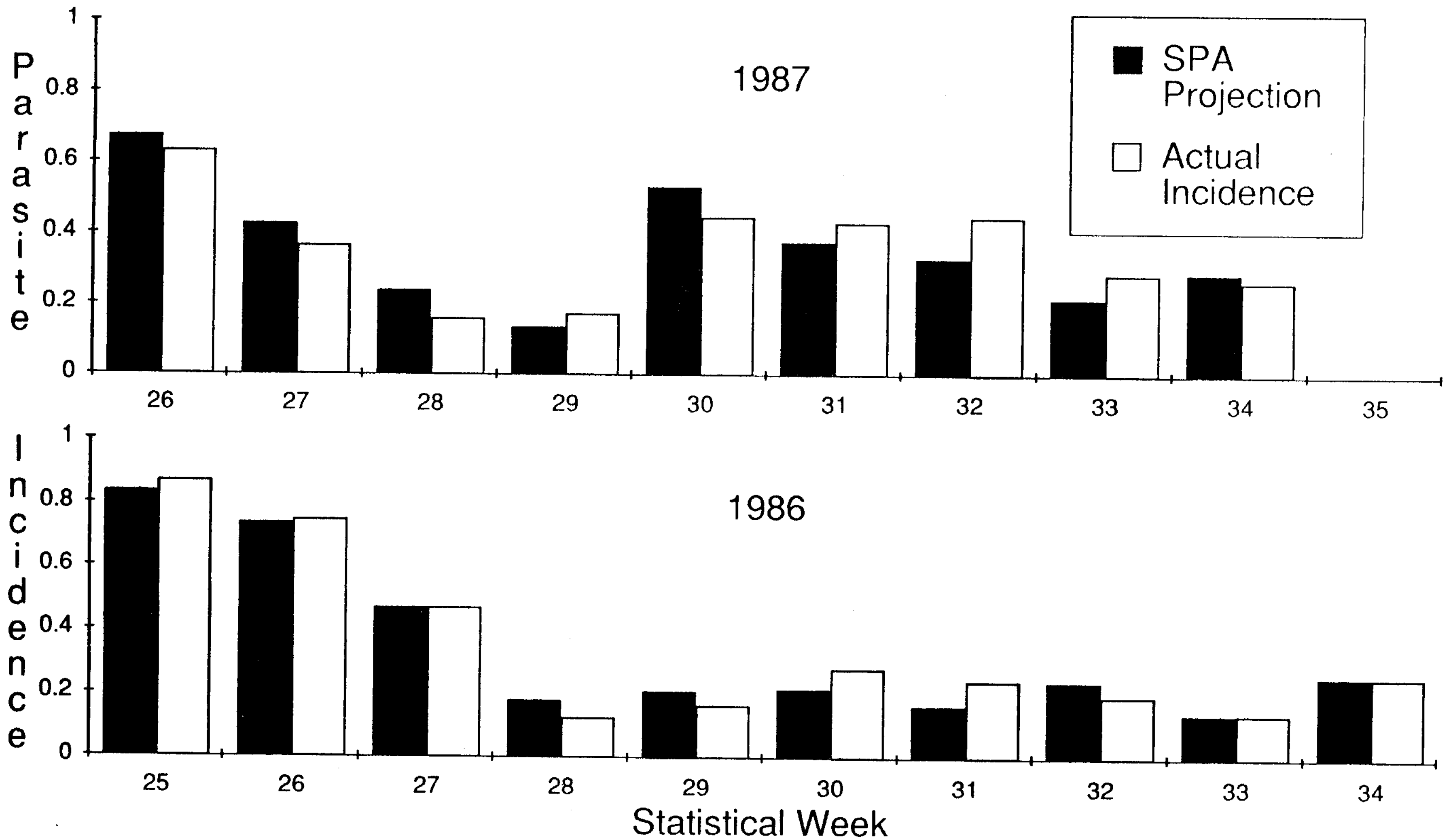

Figure 6. Comparison of actual brain parasite incidence with the incidence that would have occurred given the estimated SPA stock composition in District 111 in 1986 and 1987.

APPENDICES

Appendix A.1. Scale pattern variables screened for linear discriminant function of age-1.3 sockeye salmon, 1987.

Variable No.	Description
	First Freshwater (FW) Annular Zone
1	Number of circuli in the zone
2	Distance across the zone
3	Distance: scale focus (CO) to the second circulus in zone (C2)
4	Distance: C0 to C4
5	Distance: C0 to C6
6	Distance: C0 to C8
7	Distance: C2 to C4
8	Distance: C2 to C6
9	Distance: C2 to C8
10	Distance: C4 to C6
11	Distance: C4 to C8
12	Distance: fourth from the last circulus of zone to end of zone
13	Distance: second from the last circulus of zone to end of zone
14	Distance: C2 to end of zone
15	Distance: C4 to end of zone
16	Relative Distance: (Variable #3)/(Variable #2)
17	Relative Distance: (Variable #4)/(Variable #2)
18	Relative Distance: (Variable #5)/(Variable #2)
19	Relative Distance: (Variable #6)/(Variable #2)
20	Relative Distance: (Variable #7)/(Variable #2)
21	Relative Distance: (Variable #8)/(Variable #2)
22	Relative Distance: (Variable #9)/(Variable #2)
23	Relative Distance: (Variable #10)/(Variable #2)
24	Relative Distance: (Variable #11)/(Variable #2)
25	Relative Distance: (Variable #12)/(Variable #2)
26	Relative Distance: (Variable #13)/(Variable #2)
27	Average Distance between circuli: (Variable #2)/(Variable #1)
28	Number of circuli in the first 3/4 of the zone
29	Maximum distance between two adjacent circuli in the zone
30	Relative Distance: (Variable #29)/(Variable #2)
	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-

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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 B.1. Classification matrices from discriminant function analyses of age-1.3 sockeye salmon scales used in-season to estimate the stock composition of District 111 catches.

Actual Group of Origin	Sample Size	Classified Group of Origin					
		Kuthai	L. Trapper	Mainstem	L. Tatsamenie	Crescent	Speel
Kuthai	90	0.933	0.000	0.011	0.056	0.000	0.000
L. Trapper	200	0.000	0.665	0.175	0.000	0.085	0.075
Mainstem	131	0.023	0.168	0.481	0.053	0.076	0.198
L. Tatsamenie	197	0.025	0.051	0.076	0.807	0.000	0.041
Crescent	100	0.000	0.130	0.040	0.000	0.780	0.050
Speel	100	0.000	0.080	0.140	0.020	0.000	0.760

Mean proportion correctly classified: 0.738

Actual Group of Origin	Sample Size	Classified Group of Origin				
		L. Trapper	Mainstem	L. Tatsamenie	Crescent	Speel
L. Trapper	200	0.665	0.190	0.000	0.095	0.050
Mainstem	131	0.137	0.489	0.076	0.092	0.206
L. Tatsamenie	197	0.046	0.081	0.832	0.000	0.041
Crescent	100	0.170	0.050	0.000	0.750	0.030
Speel	100	0.040	0.160	0.010	0.000	0.790

Mean proportion correctly classified: 0.705

Actual Group of Origin	Sample Size	Classified Group of Origin				
		Kuthai	Mainstem	L. Tatsamenie	Crescent	Speel
Kuthai	90	0.867	0.011	0.122	0.000	0.000
Mainstem	131	0.008	0.550	0.076	0.122	0.244
L. Tatsamenie	197	0.036	0.102	0.797	0.010	0.056
Crescent	100	0.000	0.080	0.000	0.800	0.120
Speel	100	0.000	0.130	0.020	0.000	0.850

Mean proportion correctly classified: 0.773

Actual Group of Origin	Sample Size	Classified Group of Origin				
		Kuthai	L.Trapper	Mainstem	Crescent	Speel
Kuthai	90	0.944	0.000	0.033	0.000	0.022
L.Trapper	200	0.000	0.715	0.155	0.090	0.040
Mainstem	131	0.023	0.183	0.458	0.084	0.252
Crescent	100	0.000	0.150	0.030	0.770	0.050
Speel	100	0.000	0.040	0.180	0.000	0.780

Mean proportion correctly classified: 0.733

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Actual Group of Origin	Sample Size	Classified Group of Origin			
		L.Tatsamenie	Mainstem	Crescent	Speel
L. Tatsamenie	197	0.807	0.112	0.010	0.071
Mainstem	131	0.061	0.603	0.130	0.206
Crescent	100	0.000	0.100	0.760	0.140
Speel	100	0.020	0.180	0.000	0.800

Mean proportion correctly classified: 0.743

Actual Group of Origin	Sample Size	Classified Group of Origin			
		L.Trapper	L.Tatsamenie	Mainstem	Crescent
L.Trapper	200	0.710	0.005	0.185	0.100
L.Tatsamenie	197	0.051	0.832	0.117	0.000
Mainstem	131	0.198	0.122	0.595	0.084
Crescent	100	0.150	0.000	0.070	0.780

Mean proportion correctly classified: 0.729

Actual Group of Origin	Sample Size	Classified Group of Origin			
		Kuthai	Mainstem	Crescent	Speel
Kuthai	90	0.956	0.022	0.000	0.022
Mainstem	131	0.031	0.618	0.115	0.237
Crescent	100	0.000	0.110	0.780	0.110
Speel	100	0.000	0.150	0.020	0.830

Mean proportion correctly classified: 0.796

Actual Group of Origin	Sample Size	Classified Group of Origin			
		Kuthai	L. Tatsamenie	Crescent	Speel
Kuthai	90	0.922	0.078	0.000	0.000
L. Tatsamenie	197	0.025	0.873	0.010	0.091
Crescent	100	0.000	0.000	0.870	0.130
Speel	100	0.020	0.000	0.010	0.970

Mean proportion correctly classified: 0.909

Actual Group of Origin	Sample Size	Classified Group of Origin		
		Mainstem	L. Tatsamenie	Crescent
Mainstem	131	0.794	0.099	0.107
L.Tatsamenie	197	0.122	0.868	0.010
Crescent	100	0.000	0.150	0.850

Mean proportion correctly classified: 0.837

Actual Group of Origin	Sample Size	Classified Group of Origin		
		Mainstem	L. Tatsamenie	Speel
Mainstem	131	0.649	0.115	0.237
L.Tatsamenie	197	0.091	0.843	0.066
Speel	100	0.130	0.020	0.850

Mean proportion correctly classified: 0.780

Appendix B.2. Classification matrices from discriminant function analyses of age-1.3 sockeye salmon scales used postseason to estimate the stock composition of District 111 catches.

Actual Group of Origin	Sample Size	Classified Group of Origin					
		Kuthai	L. Trapper	Mainstem	L. Tatsamenie	Crescent	Speel
Kuthai	63	0.968	0.000	0.000	0.000	0.000	0.032
L. Trapper	200	0.000	0.615	0.150	0.030	0.120	0.085
Mainstem	142	0.000	0.127	0.500	0.099	0.028	0.246
L. Tatsamenie	189	0.011	0.175	0.053	0.614	0.005	0.143
Crescent	99	0.000	0.202	0.040	0.010	0.697	0.051
Speel	100	0.000	0.010	0.270	0.080	0.000	0.640

Mean proportion correctly classified: 0.672

Actual Group of Origin	Sample Size	Classified Group of Origin				
		Kuthai	L.Trapper	Mainstem	Crescent	Speel
Kuthai	63	0.968	0.000	0.016	0.000	0.016
L.Trapper	200	0.000	0.685	0.095	0.120	0.100
Mainstem	142	0.000	0.155	0.556	0.028	0.261
Crescent	99	0.000	0.202	0.030	0.717	0.051
Speel	100	0.000	0.020	0.320	0.000	0.660

Mean proportion correctly classified: 0.717

Actual Group of Origin	Sample Size	Classified Group of Origin			
		Kuthai	Mainstem	L.Tatsamenie	Crescent
Kuthai	63	0.968	0.032	0.000	0.000
Mainstem	142	0.000	0.775	0.176	0.049
L. Tatsamenie	189	0.005	0.169	0.799	0.026
Crescent	99	0.000	0.182	0.020	0.798

Mean proportion correctly classified: 0.835

Actual Group of Origin	Sample Size	Classified Group of Origin			
		L.Trapper	Mainstem	L.Tatsamenie	Crescent
L. Trapper	200	0.670	0.165	0.040	0.125
Mainstem	142	0.155	0.675	0.141	0.028
L. Tatsamenie	189	0.175	0.127	0.693	0.005
Crescent	99	0.182	0.081	0.020	0.717

Mean proportion correctly classified: 0.689

Actual Group of Origin	Sample Size	Classified Group of Origin			
		Mainstem	L.Tatsamenie	Crescent	Speel
Mainstem	142	0.599	0.099	0.560	0.246
L.Tatsamenie	189	0.122	0.672	0.021	0.185
Crescent	99	0.162	0.010	0.768	0.061
Speel	100	0.310	0.800	0.010	0.600

Mean proportion correctly classified: 0.660

Appendix B.3. Classification matrices from discriminant function analyses of age-1.3 sockeye salmon scales used postseason to estimate the stock composition of Canadian Taku River and Canyon Island catches.

Actual Group of Origin	Sample Size	Classified Group of Origin			
		Kuthai	L. Trapper	Mainstem	L. Tatsamenie
Kuthai	63	0.968	0.000	0.032	0.000
L.Trapper	200	0.000	0.760	0.195	0.045
Mainstem	142	0.000	0.155	0.683	0.162
L.Tatsamenie	189	0.005	0.143	0.148	0.704

Mean proportion correctly classified: 0.779

Actual Group of Origin	Sample Size	Classified Group of Origin		
		Kuthai	L.Trapper	Mainstem
Kuthai	63	0.968	0.000	0.032
L.Trapper	200	0.000	0.805	0.195
Mainstem	142	0.000	0.183	0.817

Mean proportion correctly classified: 0.863

Actual Group of Origin	Sample Size	Classified Group of Origin		
		Kuthai	Mainstem	L.Tatsamenie
Kuthai	63	0.968	0.032	0.000
Mainstem	142	0.000	0.796	0.204
L.Tatsamenie	189	0.005	0.175	0.820

Mean proportion correctly classified: 0.861

Actual Group of Origin	Sample Size	Classified Group of Origin	
		Mainstem	L.Tatsamenie
Mainstem	142	0.824	0.176
L.Tatsamenie	189	0.169	0.831

Mean proportion correctly classified: 0.827