PACIFIC SALMON COMMISSION
TRANSBOUNDARY TECHNICAL COMMITTEE REPORT
REPORT TCTR (91)-3
Salmon Management Plan for the Stikine, Taku, and Alsek Rivers, 1991.

June, 1991.

## TABLE OF CONTENTS

LIST OF TABLES ..... iii
LIST OF FIGURES ..... iv
EXECUTIVE SUMMARY ..... v
INTRODUCTION ..... 1
STIKINE RIVER ..... 1
Sockeye Salmon ..... 1
Pre-season Forecast ..... 1
Spawning Escapement Goals ..... 4
Harvest Sharing Objectives ..... 5
Management Procedures ..... 5
United States ..... 5
Canada ..... 7
Summary ..... 8
In-season Data Exchange and Review ..... 8
Stock Assessment Program ..... 8
Catch Statistics ..... 8
Age Composition of Sockeye in Catches ..... 9
Stock Composition of Alaska Catches ..... 9
Stock Composition of the Inriver Canadian Catch ..... 9
Stock Composition and Run Timing Past the Lower Stikine Test Fishery ..... 9
Spawning Escapement Estimates ..... 10
Post-season SPA standards ..... 10
Data Evaluation Procedures ..... 10
Historical Database ..... 10
Stikine Management Model ..... 10
In-season Use ..... 12
Post-season Evaluation ..... 12
Coho Salmon ..... 12
Pre-season Forecast ..... 12
Escapement Goal ..... 13
Harvest Sharing Objectives ..... 13
Stock Assessment Program ..... 13
Management Procedures ..... 13
United States ..... 13
Canada ..... 13

## TABLE OF CONTENTS (cont'd)

Chinook Salmon ..... 13
Pre-season Forecast ..... 13
Escapement Goal ..... 13
Harvest Sharing Objectives ..... 14
Management Procedures ..... 14
United States ..... 14
Canada ..... 14
Stock Assessment Program ..... 14
TAKU RIVER ..... 20
Pre-season Forecasts ..... 20
Escapement Goals ..... 20
Harvest Sharing Objectives ..... 20
Management Procedures ..... 22
United States ..... 22
Canada ..... 24
ALSEK RIVER ..... 26
Pre-season Forecasts ..... 26
Escapement Goals ..... 26
Harvest Sharing Objectives ..... 26
Management Procedures ..... 26
United States ..... 26
Canada ..... 28

## LIST OF TABLES

Table Page

1. Stikine River sockeye run size, 1979 to 1990. . . . . . . . . . . . . . . . . . . . . . . . . . . . 15
2. CPUE for all sockeye salmon and the proportion of Tahltan stock in the catch from the Canadian lower Stikine River commercial fishery16
3. CPUE of all sockeye salmon and the proportion of Stikine River Tahltan and non-Tahltan stocks in the catch from the U.S. District 106-41/42 commercial fishery17
4. Model parameters from the linear regression of run size on cumulative CPUE for the 1991 Stikine Management Model18
5. Evaluation of the Stikine Management Model for the 1990 season. Weekly
forecasts of run size for 1990 are given along with the total allowable catch for
Stikine River sockeye salmon. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 19

## LIST OF FIGURES

Figure Page

1. Location of principal U.S. and Canadian fishing areas where Stikine River salmon stocks are caught. ..... 2
2. The Taku River and principal U.S. and Canadian fishing areas. ..... 21
3. Location of U.S. fishing areas adjacent to the Taku River. ..... 23
4. Location of the principal U.S. and Canadian fishing areas where Alsek River salmon stocks are caught ..... 27

## EXECUTIVE SUMMARY

Management of the transboundary Stikine, Taku, and Alsek rivers to achieve conservation and allocation objectives stipulated by the Pacific Salmon Treaty requires close cooperation between Canada and the United States. This plan has been developed to assure each Party has a clear understanding of objectives and procedures used in managing relevant fisheries.

This report is organized by river system and salmon species. For each species within each drainage, the pre-season forecast, spawning escapement goals, harvest sharing objectives, and management procedures are presented. For salmon stocks of the Stikine River, details of the stock assessment program are also presented.

The pre-season forecast for the Stikine River sockeye salmon run in 1991 is approximately 94,000 fish, which coincidentally is the same as the pre-season forecast for 1990. This is an average level of return from which a total allowable catch of 34,000 fish could be shared by the two Parties. The escapement goal of 60,000 sockeye salmon has not been changed. The in-season predictions of run size during the 1991 season, as determined by the Stikine Management Model, will be based on historical data from 1982 to 1990. The stock assessment program for the river is similar to last year. The 1991 run of chinook salmon to the Stikine River is expected to be average; whereas, a below average coho run is anticipated.

There are no major changes to the management plans for the other species of salmon originating in the Stikine River or for any salmon species originating in the Taku or Alsek river drainages. It is expected that the run size of Taku River sockeye salmon will be average to above average; of chinook and coho salmon, about average; and of chum salmon, below average. A strong pink run to the Taku River is anticipated. Chinook and coho salmon runs to the Alsek River are expected to be average. The early run of Alsek sockeye salmon is expected to be below average; whereas, the late run of sockeye salmon is expected to be average to above average.

## INTRODUCTION

Management of transboundary river salmon to achieve conservation and allocation objectives, as stipulated by the Pacific Salmon Treaty, requires a cooperative approach by Canada and the United States. It is important that both Parties have a clear understanding of the objectives and agree upon procedures to be used in managing the fisheries, including the criteria upon which modifications of fishing patterns will be based. This document is intended to facilitate cooperative management by presenting the 1991 forecasts, summarizing the management goals, and outlining the procedures to be used by the Canadian Department of Fisheries and Oceans (DFO) and the Alaska Department of Fish and Game (ADF\&G) during the conduct of the 1991 fisheries on the Stikine, Taku and Alsek salmon stocks.

## STIKINE RIVER

Sockeye Salmon

## Pre-season Forecast

For 1991, the total run forecast for Stikine River sockeye salmon is approximately 94,000 fish of which roughly $45 \%$ are predicted to be of Tahltan origin. Coincidentally, last year, the pre-season expectation was also 94,000 sockeye; however, only $30 \%$ were expected to be of Tahltan origin. The 1991 prediction is derived by averaging two sibling forecasts for Tahltan sockeye salmon, ( 40,909 sockeye - DFO estimate; 42,815 sockeye - ADF\&G estimate) and adding this to the expected return of approximately 52,000 non-Tahltan sockeye salmon based on non-Tahltan stock-recruitment data. The pre-season forecast of total allowable catch (TAC) is approximately 34,000 sockeye salmon.

Tahltan Forecast: The return of younger age classes from a given brood escapement can be used to forecast the return of subsequent age classes (i.e. older siblings) in the cohort. The total run in a given year may then be forecast by expanding the forecasts of the major age classes returning in that year. DFO and ADF\&G forecasts of the 1991 Tahltan sockeye run were based on two different sibling forecast techniques. Brief descriptions of the two techniques are given below.

The DFO sibling forecast was based on data from 1979 through 1989. Estimates of Tahltan sockeye salmon in the marine and lower Stikine catches for this period were obtained from the Transboundary Technical Committee Report: TCTR(91)-1, Transboundary River Salmon Production, Harvest, and Escapement Estimates, 1989. It was assumed that $90 \%$ of the catches in the upper Stikine commercial and Indian food fisheries were comprised of Tahltan sockeye stock. The age composition of all catches was assumed to be same as that


Figure 1. Location of principal U.S. and Canadian fishing areas where Stikine River salmon stocks are caught.
of Tahltan sockeye salmon sampled at the Tahltan Lake weir. Linear regression analysis indicated a significant correlation between the return of four-year-old Tahltan sockeye salmon and the total return of Tahltan sockeye salmon (all ages) in the next year ( $\mathrm{r}^{2}=0.68$ for data from 1979 to 1989). Based on the equation describing this relationship and a total return estimate of 3,943 age-4 sockeye in 1990, the 1991 forecast for Tahltan sockeye salmon is 40,909 fish.

The ADF\&G sibling forecast was based on data from 1983 through 1989 and used agespecific data from catches of Tahltan fish in the Alaskan District 106 and District 108, the in-river test fishery, and the Canadian commercial fishery in the lower river. For years in which test fishery catches were not sampled, catches in the Alaskan District 106 and 108 test fisheries were assumed to have the same age-specific stock composition as the commercial catches in the same district. The catches in the Canadian commercial and Indian food fisheries in the upper Stikine River were estimated to be $90 \%$ Tahltan fish and were assumed to have the same age composition as the Tahltan escapement. Linear regression was used to predict the total estimated run (catch and escapement, all ages) from the return (catch and escapement) of Tahltan age-1.2 (four-year-old fish) in the previous year ( $\mathrm{r}^{2}=0.91$ ). Using this method, the pre-season forecast for the 1991 Tahltan sockeye run is 42,815 fish.

While Tahltan sockeye smolt out-migration data is not formally being used to predict the 1991 run due to a limited time series of data, it should be noted that the smolt counts that are relevant to the 1991 run are $1,170,136$ in 1988, and 580,574 in 1989. The 1988 smolts would be returning in 1991 as age-1.3 and age- 2.3 adults, and the 1989 smolts, as age- 1.2 and age- 2.2 fish. Although smolt survival has been quite variable, assuming the survival rates of each of the major age classes to be average, the total return in 1991 derived from the smolt data ranges from 46,041 sockeye (ADF\&G prediction) to 51,300 sockeye (DFO prediction). The average of the smolt predictions (i.e. 48,670) is approximately $16 \%$ higher than the average of the sibling forecasts.

Non-Tahltan Forecast: The non-Tahltan forecast for 1991 of 52,206 sockeye salmon is based on stock-recruitment data for the non-Tahltan sockeye salmon for the 1975 to 1985 brood years. Brood year escapements for 1975 to 1978 were estimated by assuming a fixed ratio of Tahltan:non-Tahltan escapements equivalent to the average ratio from 1979 to 1986 (ie. 0.76:1). [Note: Tahltan escapement data have been tabulated since 1959]. Returns from the 1975 to 1985 brood years were reconstructed from annual catch and escapement data as reported in the 1989 catch and escapement report by the Transboundary Technical Committee (TCTR(91)-1), and from age composition data from the lower Stikine commercial fishery. A Ricker stock-recruitment curve fitted to the brood year return data explained $51 \%$ of the variation in adult returns $(r=0.71)$, and was statistically significant at the level of $\alpha=0.05(\mathrm{p}<0.025)$. The 1991 forecast was calculated by applying the stock:recruitment equation to the principal brood year escapements for 1991 (1985-1987) and apportioning the expected returns from each brood year by the average age composition.

## Spawning Escapement Goals

Two sockeye stocks are recognized for the Stikine River: the Tahltan stock which spawns in Tahltan Lake; and, the non-Tahltan stock which is a conglomerate of stocks which spawn elsewhere throughout the drainage. These stocks are considered to be independent. Surpluses or deficits in escapement realized in one stock shall not be used to balance deficits or surpluses in the other.

Spawning escapement goals have been established as ranges which reflect biological data regarding stock productivity, the ability of existing management systems to deliver established goals, the accuracy and precision of estimates of escapement generated by stock assessment programs, and the degree of risk considered acceptable. At present, our best judgement of the escapement goals for these stocks are:

Tahltan Lake Stock.

|  | TARGET = mid-point $=30 \mathrm{k}$ |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Escapement | $0-18 \mathrm{k}$ | $18 \mathrm{k}-20 \mathrm{k}$ | $20 \mathrm{k}-40 \mathrm{k}$ | $40 \mathrm{k}-50 \mathrm{k}$ | $>50 \mathrm{k}$ |
| Mgmt. Category | Red | Yellow | Green | Yellow | Red |

## Non-Tahltan Stocks.

|  | TARGET = mid-point $=30 \mathrm{k}$ |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Escapement | $0-15 \mathrm{k}$ | $15 \mathrm{k}-20 \mathrm{k}$ | $20 \mathrm{k}-40 \mathrm{k}$ | $40 \mathrm{k}-75 \mathrm{k}$ | $>75 \mathrm{k}$ |  |
| Mgmt. Category | Red | Yellow | Green | Yellow | Red |  |

A post-season estimate of escapement that falls within the Green Management Category shall be considered fully acceptable; one that falls within the Yellow Management Category shall be considered acceptable but not desired; and, one that falls within the Red Management Category shall be considered undesirable.

The following databases for the Tahltan Lake stock will be developed and exchanged for use in evaluating escapement goals:

1. total returns from various levels of spawning escapements;
2. smolt production as a function of the number of spawners; and,
3. adult production as a function of the number of smolts.

The following databases for the non-Tahltan stock will be developed and exchanged for use in evaluating escapement goals:

1. total returns from various levels of spawning escapements;
2. inventory and assessment data regarding the historical pattern of distribution, abundance, and timing of spawning fish; and,
3. inventory and assessment data regarding the distribution, abundance, size, and condition factors of rearing juvenile fish.

Methodology for the analysis of the above-named databases is being developed by the Transboundary Technical Committee and will be used in reviewing escapement goals.

## Harvest Sharing Objectives

The harvest and management of Stikine River stocks for the period 1988 to 1992 is governed by Annex IV, Chapter 1, of the Pacific Salmon Treaty as negotiated by the Pacific Salmon Commission in February of 1988. Sharing arrangements for sockeye salmon are:

| Sockeye Total Allowable Catch |  | Canadian Allowable Catch |  |
| :---: | :---: | :---: | :---: |
| From | To | Minimum | Maximum |
| 0 | 0 | 4,000 | 4,000 |
| 1 | 20,000 | 10,000 | 15,000 |
| 20,001 | 60,000 | 15,000 | 20,000 |
| 60,001 | infinity | 20,000 | 30,000 |

Under this annex, the U.S. is allowed to catch the remainder of the total allowable catch (TAC) of sockeye after the Canadian allowable catch is subtracted from the total. However, even when the calculated TAC for the U.S. is low or zero, incidental catches of Stikine sockeye salmon are allowable in District 106. This schedule, which is conditionally in effect until 1992, is tied to a commitment by the Parties to undertake a cooperative sockeye enhancement program commencing in 1989; an obligation which is currently being met.

## Management Procedures

United States. The fishery in Section 6-A (Sumner Strait, Figure 1) will open on the third Sunday in June (June 16, statistical week 25). Returning Stikine sockeye salmon are a primary management concern during the first four weeks of the fishery. After that time, other sockeye stocks and salmon species greatly overshadow Stikine sockeye salmon in the catch. District 108 is generally managed through mid-July with Stikine sockeye salmon as
the primary management consideration. Subsequent openings in Districts 106 and 108, after mid-July, will be based upon run sizes determined from the Stikine Management Model plus other jointly agreed to measurements of abundance. Initial openings in District 108 will be restricted to the outer areas of the district in order to minimize the interception of adult chinook salmon. Chinook salmon catches will also be a management concern in District 106 throughout the season and, if large numbers of small feeder chinook are caught, night closures will be instituted.

Announcements for fishery openings throughout Southeast Alaska are made on Thursday afternoons for gillnet fisheries, which begin the following Sunday. The U.S. fishery has historically fished these districts for one to three days per week with occasional closures or longer fishing periods during extremes in stock abundance. If weekly catch-per-unit-effort (CPUE) is above average, extensions in fishing time could occur. Weekly fishing time is regulated on gross evaluations of run strength. Achieving the desired escapement goal into the Stikine River and into major Alaskan sockeye systems is the primary objective. The secondary objective is achieving the harvest sharing arrangement in effect. Fishing gear used in Districts 106 and 108 is similar; common sockeye net sizes are between $51 / 8$ and $51 / 2$ inches (130-140 mm) stretched mesh, 60 meshes deep and 300 fathoms ( 549 m ) long.

Management responses that will be used to reduce the sockeye harvest would begin with restrictions in fishing time in District 108. Next, closures of that district would be used followed by restrictions in fishing time in Sumner Strait. Finally, the most complete restriction would be the additional closure of Sumner Strait. The management responses for more liberal fisheries would start with increases in fishing time in District 108 and would extend to increases in time in District 106. When both districts are open, the fishing times in each will coincide, if possible.

A number of domestic considerations are involved in the District 106 and 108 fisheries. In District 108, chum salmon returns into Frederick Sound are a management consideration beginning the end of June. Chum salmon run strength assessments are based upon CPUE in test fishery catches. Pink salmon are occasionally a consideration in District 108 beginning in July. Pink salmon run strength assessments are based upon escapement surveys and CPUE in the test fisheries. Beginning in mid-June and occasionally extending to early August, sockeye runs in U.S. systems are a management consideration. The assessments of the strength of these runs are based upon commercial and test fishery CPUE, weir counts, and scale pattern analysis to determine stock composition. Beginning in mid-July pink salmon run strength may be a management consideration in the District 106 fishery. Assessment of pink run strength is based upon the predicted return, CPUE, and total catches in the commercial and test fisheries. Availability of pink and chum salmon in District 106 and District 108 is expected to be slightly below average in 1991.

Troll fishery regulations for 1991 are similar to those in effect in 1989 and 1990. The Alaska Board of Fisheries has set a catch limit of 40,000 non-Alaska hatchery-origin chinook salmon for the month of June. Experimental fisheries will occur two days per week in confined
areas close to the hatchery release sites. Inside waters will be open June 5-7. A second opening will occur in late June if the catch during the first opening does not exceed 25,000 non-Alaskan hatchery origin chinook salmon, and if the projected total catch for June falls below 40,000 chinook (non-Alaskan hatchery-origin). This plan will be modified, if necessary, to meet any restrictions that may be imposed on the June fishery by re-negotiation of the Treaty Annex.

Canada. The Canadian lower Stikine River commercial fishery (Figure 1) will be managed on a weekly basis with management actions driven by results of stock, catch and escapement projections derived from the Stikine Management Model. Weekly inputs to the model will include: stock identification results from catches in Alaskan Districts 106 and 108 and in the Canadian lower river gillnet fishery; CPUE data from targeting fisheries; catch data; and escapement requirements. Consideration for Tahltan sockeye stock management objectives should persist from the fishery opening June 24 to the end of July. Thereafter, the management attention will be focused primarily on non-Tahltan stock objectives. Actual time frames of responses to specific stock compositions will be fine-tuned in-season according to the weekly results of the stock identification program.

The achievement of escapement objectives is the foremost priority in management considerations. Inriver allocation priority will be to fulfill the requirements of the traditional Indian food fishery located near Telegraph Creek. The commercial fisheries, therefore, will be managed to accommodate these fundamental priorities. The area of most intense management will be within the lower Stikine commercial fishery.

Fishing time in the lower Stikine fishery will depend upon stock assessment and international and domestic catch allocation considerations. Normal fishing periods of one to two days per week will be adjusted accordingly. Traditional gear limitations of one net per fisherman with a maximum length of 135 meters will be in effect. Fishing boundaries will remain unchanged from those established in previous years, i.e. from the border upstream to boundary markers located near the Stikine-Porcupine confluence, and in the Iskut River to a marker located approximately 2 km . upstream from the mouth. In the upper Stikine commercial fishery, one day of fishing will be permitted each week. As in past years, weekly fishing times in the upper Stikine Indian food fishery will not normally be restricted.

Restrictive management responses that could be used to reduce the sockeye harvest in the lower Stikine commercial fishery, in order of implementation, include: reducing fishing time, the major tool used in the regulation of the fishery; and, reducing the fishing area by relocating boundaries to protect isolated spawning populations. In the upper Stikine Indian food fishery, reductions in fishing time would be considered if no other adjustments could be made in the lower and upper river commercial fisheries. Conservation measures for the protection of chinook salmon in the lower river commercial fishery include a maximum mesh size of less than 146 mm ( 5.75 in .) through mid-July.

In the event that a more liberal management regime is justified, extensions to fishing time
in the lower Stikine fishery for up to 24 hours would be granted. Additional fishing time beyond this would be dependent on stock escapement and catch considerations.

Summary. Attainment of escapement goals for the Tahltan and non-Tahltan portions of the run is the primary objective of Stikine sockeye management. Harvest sharing will be based upon the TAC projections derived from the model. The TAC estimates will likely change from week to week as the Stikine Management Model forecasts a new total run size from the cumulative CPUE each week. Variations in the TAC estimate will likely be larger early in the season, when CPUE is high, than later in the season. Management actions will reflect these week to week changes in the TAC estimates. Fishery managers from both countries will keep in weekly contact in order to evaluate the output from the Stikine Management Model and the outcome of their respective management actions. If the model projection moves the TAC into a different harvest range for the following week, and the change is due to a difference of 2,000 or less sockeye salmon, managers may decide to wait for two similar consecutive weekly results before altering fishing time.

## In-season Data Exchange and Review

Canada and the U.S. will conduct data exchanges by telephone on Wednesday afternoon or Thursday morning of each week during the fishing season. At that time, current catch statistics and stock assessment data will be updated, exchanged, and reviewed. Management plans for the next week for each country will be discussed at this time. It is anticipated that additional communications will be required each week. Weekly decision deadlines will be: a) for Districts 106 and 108: 11:00 a.m., Thursday, Alaska Daylight Time; and, b) for the Canadian Stikine fishery: 10:00 a.m., Friday, Pacific Daylight Time. A final weekly summary of the fisheries will be conducted Friday afternoon through a conference call between management offices of DFO and ADF\&G.

## Stock Assessment Program

This section summarizes agreements regarding the data which will be collected by each National Section and, when appropriate, procedures that will be used for analysis.

Catch Statistics. The U.S. shall report catches and effort in the following strata for each statistical week:

1. Subdistricts 106-41\&42 (Sumner Strait);
2. Subdistrict 106-30 (Clarence Strait);
3. Subdistricts 108-10-to-40 (Stikine - Wrangell side);
4. Subdistricts 108-50\&60 (Stikine - Frederick Sound side); and,
5. the test fishery conducted in District 108.

Canada shall report catch and effort statistics in the following strata for each statistical week:

1. the lower river commercial fishery;
2. the upper river commercial fishery;
3. the upper river Indian food fishery; and,
4. the lower Stikine River test fishery conducted near the international border.

Age Composition of Sockeye in Catches. Scales will be collected and used to age fish. Associated fish length and sex composition data will also be collected. The U.S. shall provide scale samples from Subdistricts 106-41\&42, Subdistrict 106-30 and District 108 for each fishing week. Canada shall provide scale samples, matched with length and egg diameter data, collected from the lower river commercial fishery each week. Scale samples will not be collected from the upper river commercial and subsistence fisheries. Instead, samples collected at the Tahltan Lake weir will be used to characterize the age composition of these upper river catches. Sockeye salmon caught in the lower Stikine test fishery will be sampled for scales and for egg diameter, sex, and length data. Scale impressions will be available to ADF\&G.

Stock Composition of Alaska Catches. During the fishing season, scale pattern analysis (SPA) will be used to estimate the contribution of Tahltan and non-Tahltan stocks to the catches made each week in each subsection of District 106 (Clarence Strait and Sumner Strait), and District 108. The desired sample size from each of these strata is 700 fish per week. It is recognized that small catches in District 108, similar to previous years, may preclude temporal stratification at the desired level. A test fishery will operate in Frederick Sound during June and July. When a commercial fishery does not operate, stock composition estimates will be made using samples collected from the test fishery. In District 106, when a commercial fishery does not operate, a test fishery will be instituted for scale sample collection and abundance estimation. Post-seasonally, the estimates of stock composition will be updated based on revised scale pattern standards.

Stock Composition of the Inriver Canadian Catch. Egg diameter data will be used to estimate the Tahltan versus non-Tahltan contribution to the catches during the fishing season. This will also be the data used post-seasonally. The desired sample size is 350 sockeye taken randomly from the catch each week. Scales will be taken and sex determined for all fish in the sample and egg diameters will be measured from 100 females in the sample. It is necessary to match the scale and egg data by fish to develop post-season stock specific age composition estimates, and possibly for the development of post-season scale pattern standards.

Stock Composition and Run Timing Past the Lower Stikine Test Fishery. The proportion of Tahltan and non-Tahltan fish in test net catches will be determined in-season based on egg diameter data. Canada shall sample all fish for scales and all females for egg diameter (data to be matched with scale samples). The post-season estimate may be based on the egg diameter data, or, scale pattern analyses may be used to estimate age specific stock
composition of both males and females if biometric review indicates that this method would increase accuracy or precision of estimates.

Spawning Escapement Estimates. An adult enumeration weir will be used to determine the Tahltan sockeye escapement. The age composition will be estimated from scale samples. Approximately 800 fish will be sampled during the season for scales, length, and sex. The non-Tahltan escapement will be estimated using migratory timing information obtained from catch-per-unit-effort (CPUE) data from the drift test fishery located near the international border combined with weekly stock compositions estimated from the combined drift and set net test fishery catches.

Post-season SPA standards. Scale pattern standards for Tahltan and non-Tahltan sockeye stocks will be made from scale samples collected inriver. For the Tahltan stock, samples will be taken from both male and female sockeye from the Tahltan weir, and from female sockeye caught in the lower river fisheries having small-diameter eggs. For the non-Tahltan stock, samples will be taken from females caught in the lower river fisheries having largediameter eggs. Standards for classifying marine catches will therefore be developed from scale samples collected from the Tahltan weir and from both the commercial and test fishery catches in Canada.

Since the weekly proportion of Tahltan to non-Tahltan sockeye salmon in the test fishery is used post-seasonally to determine both the proportion of these two stocks in the entire run, and, the mainstem escapement, it is important to get the best estimate possible. There are two options on how to classify fish in the test fishery catches, post-seasonally:

Option 1: egg diameters would be used to determine stock proportions in the test fishery catches for both in-season and post-season analyses;

Option 2: SPA, using standards developed from the weir and the inriver commercial catch, would be used to develop post-season estimates of stock proportions.

## Data Evaluation Procedures

Historical Database. Although Canadian commercial fishing began in the Stikine River in 1975, methodology for estimating run size was not well standardized until 1982. Therefore, estimates of run size after this time are considered to be better than those made prior to 1982. The historical database from 1982 to 1990 used as input to the Stikine Management Model for 1991 is presented in Tables 1 to 3. The 1991 run size estimate by the model at the end of the fishing season will be updated in the fall of 1991 using post-season stock composition data for use in the database in future years.

Stikine Management Model. A model based on the linear relationship between CPUE and run size has been constructed and updated to make weekly in-season predictions of the total
run and the total allowable catch (TAC) during the 1991 season. A description of the original model is given in the Transboundary Technical Committee Report: TCTR (88)-2, Salmon Management Plan for the Transboundary Rivers, 1988. The purpose of the model is to aid managers in making weekly harvest decisions to meet U.S./Canada treaty obligations for harvest sharing and conservation of Stikine River sockeye salmon.

The model for 1991 is based on nine years of historical CPUE data from District 106 and eight years from the Canadian commercial fishery in the lower river. (There was no commercial fishing inriver in 1984.) A FORTRAN program has been written to determine the coefficients of the linear model of run size regressed on cumulative CPUE for each week of the fisheries beginning in week 25 for the District 106 fishery, and week 26 for the lower river fishery. The parameters from the linear regressions are presented in Table 4. In the past, two sets of CPUE data have been used to predict the total run. These included:

1. the District 106 cumulative CPUE which was used to predict the total run of Stikine River sockeye; and,
2. the cumulative CPUE from the Canadian lower river commercial fishery which was used to predict the inriver Stikine River sockeye run. The total run was then determined as the inriver run plus the catch of Stikine River sockeye salmon in District 106, which was estimated as $10 \%$ of the total run (i.e. inriver estimate/0.9), plus the projected Stikine River sockeye catch in District 108.

The 1991 inseason model predictions will be based on the second method as described above. The reason for this is that weekly regressions of CPUE on total run using the in-river data usually have higher coefficients of correlation compared to those based on the District 106 CPUE data for corresponding weeks (Table 4). Predictions from the District 106 data will continue to be made to verify inseason estimates and provide post-season comparisons.

The TAC of Stikine sockeye salmon for the 1991 season will be determined each week from run size estimates according to the following schedule:

1. Week 25 and 26 (6/16-6/29): the pre-season forecast of run size will be used.
2. Week 27 and after (7/7-end of season): an estimate of run size will be determined each week from the cumulative CPUE of sockeye salmon in the lower river commercial fishery.

Separate projections of run size will be made for the Tahltan stock and for the entire Stikine sockeye run. This information will be used post-seasonally to help evaluate the performance of the model.

The estimates of TAC made each week after statistical week 26 will be based on CPUE data
from the lower Stikine commercial fishery. In the event that the commercial fishery is closed for a given week, the CPUE data from the lower Stikine test fishery will be used. In this case, the average test fishery CPUE from Monday through Wednesday will be used.

The part of the model which determines total and weekly TAC levels for the U.S. and Canadian fisheries has been written on a Lotus worksheet for use by managers in-season. This part of the model uses the coefficients from the linear regression model, the established escapement goals, and Annex provisions of harvest sharing to determine the total TAC for each country. Weekly estimates of TAC and effort are provided as guidelines for the managers and are derived from the 1982-1990 average run timing of the stocks and the corresponding average CPUE levels of each fishery.

In-season Use. For 1991, the model predictions will set the TAC levels; however, managers may use additional information on which to make decisions on the openings of their respective fisheries. They will evaluate the output of the model and look for discrepancies with other information they may have on run strength. The information and evaluation will be used to improve the model for the next year.

Post-season Evaluation. After the fishing season is over, the Transboundary Technical Committee will evaluate how well the model performed in predicting the entire run, where discrepancies occurred, and what might have caused them. The committee will also determine whether escapement goals were met according to the Spawning Escapement Goals section of this report. This information is presented in the annual catch and escapement reports prepared by the committee. For 1990, this evaluation may be found in: Preliminary Transboundary River Salmon Production, Harvest, and Escapement Estimates, 1990, Transboundary Technical Committee, November $1990^{1}$. The table summarizing the output of the Stikine Management Model during the 1990 fishing season is presented here in Table 5. The in-season estimates of marine catch of Stikine origin sockeye were quite high due to in-season problems of distinguishing Stikine and Alaskan stocks. This was corrected post-season with the use of current-year standards for stock identification.

Coho Salmon

## Pre-season Forecast

The lack of information on the escapement or smolt production precludes specific numerical forecasts. A qualitative prediction of the 1991 run is that it will be below average based on the poor catch in the coho test fishery in the two principal brood years.
${ }^{1}$ This report will be finalized in the winter of 1991/92 and published in the PSC series.

## Escapement Goal

The interim escapement goal for Stikine River coho salmon is 30,000 to 50,000 .

## Harvest Sharing Objectives

Under Annex IV, Canada is allowed a maximum harvest of Stikine coho of 4,000 pieces.

## Stock Assessment Program

Each country shall:

1. report catch statistics for the same strata as sockeye salmon are reported;
2. sample its fisheries for coded-wire-tags; and,
3. conduct escapement programs as resources permit.

## Management Procedures

United States. If there is a conservation concern, the District 108 fishery will be restricted.
Canada. If there is a conservation concern, the Canadian fishery will be restricted. The Canadian harvest allocation of 4,000 coho, as specified in the Annex IV of the Pacific Salmon Treaty, will be the basic management guide in the inriver fishery.

## Chinook Salmon

## Pre-season Forecast

The escapement through the Little Tahltan chinook weir was below average in 1985 and 1986, the two principal brood years of the 1991 return. Assuming a return per female spawner of $6: 1$, the total return is expected to be about average in 1991. However, it should be noted that uncertainty over the historical total stock size, due to a lack of marine harvest data and total inriver spawning estimates, makes it difficult to relate the expected return with previous years.

## Escapement Goal

The interim escapement goal for Stikine River chinook salmon is 19,800 to 25,000 .

## Harvest Sharing Objectives

Under Annex IV, Canada is allowed to harvest Stikine chinook salmon as an incidental harvest in the directed fishery for sockeye and coho salmon. Both Parties are to take appropriate management actions to ensure that escapement goals for chinook salmon bound for the Canadian portions of the Stikine River are achieved by 1995.

## Management Procedures

United States. Initial openings in District 108 will be restricted to the outer areas of the district in order to minimize the interception of adult chinook salmon. Chinook salmon catches will also be a management concern in District 106 throughout the season and, if large numbers of small feeder chinook are caught, night closures will be instituted.

Canada. Chinook will be harvested in the commercial fisheries incidentally during the early sockeye fishery. Mesh size restrictions (maximum 146 mm ) will be in effect through mid-July to conserve chinook salmon.

## Stock Assessment Program

Each country shall:

1. report catch statistics for the same strata as sockeye salmon are reported;
2. sample its fisheries for coded-wire-tags; and,
3. conduct escapement programs as resources permit.

Table 1. Stikine River sockeye run size, 1979 to 1990.

| Year | Inriver run size estimates |  |  | MarineCatch $^{\text {a/ }}$ | Total Run | Escapement |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Canada | U.S. | Average |  |  |  |
| All Stikine Sockeye |  |  |  |  |  |  |
| 1979 |  | 40,353 | 40,353 | 8,299 | 48,652 | 26,819 |
| 1980 |  | 62,743 | 62,743 | 23,206 | 85,949 | 41,824 |
| 1981 |  | 140,029 | 140,029 | 27,538 | 167,567 | 112,405 |
| 1982 |  | 68,761 | 68,761 | 43,329 | 112,090 | 48,221 |
| 1983 | 77,260 | 66,838 | 71,683 | 5,810 | 77,493 | 50,563 |
| 1984 | 95,454 | 59,168 | 76,211 | 7,928 | 84,139 | 70,884 |
| 1985 | 237,261 | 138,498 | 184,747 | 29,747 | 214,494 | 157,943 |
| 1986 |  |  | 69,036 | 6,420 | 75,456 | 51,190 |
| 1987 |  |  | 39,264 | 4,077 | 43,342 | 27,981 |
| 1988 |  |  | 41,915 | 3,181 | 45,096 | 25,377 |
| 1989 |  |  | 75,054 | 15,335 | 90,389 | 53,415 |
| Averages |  |  |  |  |  |  |
| 1979-1989 |  |  | 79,072 | 15,897 | 94,970 | 60,602 |
| 1980-1989 |  |  | 82,944 | 16,657 | 99,601 | 63,980 |
| 1990 |  |  | 69,605 | 9,858 | 79,463 | 49,640 |


| 1979 | 17,472 | 5,076 | 22,548 | 10,211 |
| :---: | :---: | :---: | :---: | :---: |
| 1980 | 19,137 | 11,239 | 30,376 | 11,018 |
| 1981 | 66,514 | 16,189 | 82,703 | 50,790 |
| 1982 | 42,493 | 24,785 | 67,278 | 28,257 |
| 1983 | 32,684 | 5,104 | 37,788 | 21,256 |
| 1984 | 37,571 | 3,251 | 40,822 | 32,777 |
| 1985 | 86,008 | 25,197 | 111,205 | 67,326 |
| 1986 | 31,015 | 2,757 | 33,771 | 20,280 |
| 1987 | 13,413 | 2,255 | 15,668 | 6,958 |
| 1988 | 7,222 | 2,129 | 9,351 | 2,536 |
| 1989 | 14,111 | 1,556 | 15,667 | 8,316 |
| Averages |  |  |  |  |
| 1979-1989 | 33,422 | 9,049 | 42,471 | 23,611 |
| 1980-1989 | 35,017 | 9,446 | 44,463 | 24,951 |
| 1990 | 23,982 | 2,307 | 26,289 | 14,927 |

a/ The marine catch includes test fishery catches.

Table 2. CPUE for all sockeye salmon and the proportion of Tahltan stock in the catch from the Canadian lower Stikine River commercial fishery from 1982 to 1990. For periods when the fishery was closed, values were filled in with averaging and interpolation techniques (these values are underlined in the table).


Table 3. CPUE of all sockeye salmon and the proportion of Stikine River Tahltan and non-Tahltan stocks in the catch from the U.S. District 106-41/42 commercial fishery from 1982 to 1990 . For periods when the fishery was closed, values were estimated using averaging and interpolation techniques (these values are underlined in the table).

CPUE of all Sockeye Salmon in Catch

| Week | 1990 | 1989 | 1988 | 1987 | 1986 | 1985 | 1984 | 1983 | 1982 |
| ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: |
| 25 | 29.2 | 46.8 | 16.5 | 19.3 | 14.1 | 91.0 | 45.3 | 38.2 | 101.9 |
| 26 | 33.6 | 51.9 | 22.9 | 29.1 | 16.9 | 126.9 | 69.6 | 57.7 | 119.1 |
| 27 | 78.2 | 66.1 | 58.7 | 52.2 | 63.0 | 162.9 | 89.4 | 38.6 | 124.9 |
| 28 | 84.5 | 147.1 | 66.8 | 103.9 | 75.5 | 117.4 | 80.9 | 65.9 | 156.9 |
| 29 | 116.1 | 109.4 | 103.6 | 83.9 | $\underline{88.0}$ | 113.3 | 79.7 | 76.1 | 160.5 |
| 30 | 176.9 | 89.4 | 87.6 | 155.9 | 100.6 | 108.7 | 148.3 | 69.9 | 164.1 |
| 31 | 78.4 | 93.4 | 59.3 | 106.6 | 105.8 | 189.1 | 53.0 | 44.4 | 137.3 |
| 32 | 45.1 | 36.2 | 92.2 | 115.4 | 82.1 | 69.0 | 45.6 | 40.5 | 95.2 |
| 33 | 30.6 | 33.5 | 67.7 | 88.3 | 60.1 | 100.5 | 14.9 | 18.2 | 53.1 |
| 34 | 12.6 | 7.7 | 20.5 | 45.9 | 28.8 | 37.8 | 5.4 | 6.2 | 11.1 |
| 35 | 4.2 | 2.9 | 11.0 | 3.4 | 8.9 | 5.9 | 1.1 | 5.7 | 4.4 |



Proportion Tahltan Stock in Catch

| Week | 1990 | 1989 | 1988 | 1987 | 1986 | 1985 | 1984 | 1983 | 1982 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 25 | 0.02 | 0.03 | 0.04 | 0.04 | 0.00 | 0.10 | 0.07 | 0.04 | 0.01 |
| 26 | 0.03 | 0.09 | 0.09 | 0.01 | 0.02 | 0.11 | 0.08 | 0.10 | 0.15 |
| 27 | 0.03 | 0.03 | 0.07 | 0.01 | 0.09 | 0.35 | 0.11 | 0.19 | 0.11 |
| 28 | 0.01 | 0.00 | 0.05 | 0.05 | 0.11 | 0.24 | 0.11 | 0.12 | 0.19 |
| 29 | 0.01 | 0.00 | 0.01 | 0.01 | 0.06 | 0.13 | 0.02 | 0.08 | 0.17 |
| 30 | 0.00 | 0.00 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.13 | 0.06 |
| 31 | 0.00 | 0.00 | 0.00 | 0.00 | 0.04 | 0.00 | 0.00 | 0.02 | 0.08 |
| 32 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.09 | 0.00 |
| 33 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.05 | 0.00 |
| 34 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.05 | 0.00 |
| 35 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.03 | 0.00 |
| $=========================================================$ |  |  |  |  |  |  |  |  |  |



| Proportion Non-Tahltan Stock in Catch |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Week | 1990 | 1989 | 1988 | 1987 | 1986 | 1985 | 1984 | 1983 | 1982 |
| 25 | 0.06 | 0.06 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 |
| 26 | 0.02 | 0.10 | 0.00 | 0.00 | 0.00 | 0.03 | 0.05 | 0.02 | 0.03 |
| 27 | 0.02 | 0.16 | 0.00 | 0.00 | 0.03 | 0.01 | 0.04 | 0.01 | 0.02 |
| 28 | 0.02 | 0.05 | 0.00 | 0.00 | 0.02 | 0.01 | 0.01 | 0.01 | 0.08 |
| 29 | 0.01 | 0.01 | 0.00 | 0.00 | 0.04 | 0.01 | 0.13 | 0.06 | 0.09 |
| 30 | 0.01 | 0.00 | 0.00 | 0.02 | 0.01 | 0.03 | 0.02 | 0.01 | 0.17 |
| 31 | 0.04 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.03 | 0.00 | 0.09 |
| 32 | 0.05 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.02 | 0.03 | 0.00 |
| 33 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.02 | 0.04 | 0.03 | 0.00 |
| 34 | 0.02 | 0.01 | 0.00 | 0.00 | 0.00 | 0.04 | 0.04 | 0.00 | 0.00 |
| 35 | 0.02 | 0.01 | 0.00 | 0.00 | 0.00 | 0.05 | 0.04 | 0.02 | 0.00 |

Table 4. Model parameters from the linear regression of run size on cumulative CPUE for the 1991 Stikine Management Model. (Due to rounding, the run fraction column may not total 1.0).

Canadian lower river commercial fishery catch of sockeye salmon

| HEEK | $R^{2}$ | RUN $F$. | INTERCEPT | SLOPE | SD(R.F) | SD(INT) | SD(SLOPE) AVG.CPUE |  |
| :---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: |
| 26 | .93 | .03 | 41685.46 | 2034.19 | .026 | 5951.22 | 222.04 | 17.61 |
| 27 | .86 | .09 | 18810.30 | 1032.37 | .063 | 11446.25 | 166.95 | 39.25 |
| 28 | .88 | .12 | 2777.10 | 670.49 | .066 | 12596.02 | 99.65 | 54.60 |
| 29 | .93 | .18 | 8036.11 | 336.97 | .055 | 8944.12 | 37.35 | 94.71 |
| 30 | .89 | .18 | 337.85 | 265.40 | .048 | 12590.35 | 38.42 | 84.60 |
| 31 | .86 | .13 | -3600.31 | 228.17 | .043 | 15008.61 | 37.98 | 64.70 |
| 32 | .81 | .14 | -11886.18 | 214.19 | .058 | 19367.21 | 42.67 | 61.88 |
| 33 | .80 | .07 | -12958.22 | 200.81 | .029 | 20110.80 | 41.15 | 33.15 |
| 34 | .78 | .04 | -14199.55 | 196.44 | .017 | 21390.44 | 42.39 | 16.34 |
| 35 | .77 | .02 | -14398.93 | 193.32 | .008 | 22004.03 | 42.87 | 8.57 |

Canadian lower river commercial fishery catch of Tahltan sockeye salmon

| WEEK | $\mathrm{R}^{2}$ | RUN F. | INTERCEPT | SLOPE | SD(R.F) | SD(INT) | SD(SLOPE) | AVG.CPUE |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 26 | . 79 | . 07 | 14381.22 | 1162.82 | . 067 | 5646.21 | 244.85 | 14.45 |
| 27 | . 85 | .19 | 2731.12 | 621.84 | . 095 | 6224.52 | 108.31 | 31.30 |
| 28 | . 92 | . 23 | -4536.71 | 401.17 | . 093 | 4921.57 | 46.70 | 43.28 |
| 29 | . 90 | . 27 | 2091.76 | 202.48 | . 103 | 5050.11 | 27.91 | 54.62 |
| 30 | . 89 | . 14 | 1244.36 | 176.94 | . 060 | 5413.51 | 25.72 | 25.53 |
| 31 | . 88 | . 05 | 1504.08 | 165.08 | . 032 | 5509.76 | 24.58 | 10.58 |
| 32 | . 88 | . 03 | 1460.70 | 160.58 | . 013 | 5491.21 | 23.81 | 5.31 |
| 33 | . 88 | . 01 | 1710.46 | 156.67 | . 011 | 5484.10 | 23.33 | 3.03 |
| 34 | . 88 | . 00 | 1725.06 | 155.61 | . 006 | 5511.08 | 23.30 | 1.18 |
| 35 | . 88 | . 00 | 1785.36 | 154.97 | . 002 | 5500.50 | 23.19 | . 39 |

District $106-41$ fishery catch of Stikine River sockeye salmon

| WEEK | $\mathrm{R}^{2}$ | RUN F. | INTERCEPT | SLOPE | SD(R.F) | SD(INT) | SD(SLOPE) | AVG.CPUE |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 25 | . 83 | . 06 | 46763.91 | 16437.99 | . 046 | 10507.36 | 2764.35 | 2.71 |
| 26 | . 73 | . 13 | 45457.75 | 4450.65 | . 091 | 14154.14 | 1024.62 | 7.60 |
| 27 | . 95 | . 21 | 47094.15 | 1893.17 | . 117 | 5687.39 | 167.44 | 13.06 |
| 28 | . 86 | . 25 | 45179.00 | 1269.53 | . 101 | 9843.83 | 195.14 | 12.99 |
| 29 | . 72 | . 14 | 48756.74 | 914.51 | . 090 | 13871.29 | 215.44 | 10.20 |
| 30 | . 57 | . 10 | 54441.43 | 693.44 | . 104 | 16887.69 | 226.35 | 6.64 |
| 31 | . 50 | . 06 | 57737.95 | 589.65 | . 064 | 18106.05 | 224.02 | 3.77 |
| 32 | . 50 | . 03 | 56974.63 | 592.65 | . 045 | 18350.00 | 225.79 | 1.00 |
| 33 | . 50 | . 01 | 56477.70 | 595.48 | . 011 | 18302.25 | 223.90 | . 56 |
| 34 | . 51 | . 00 | 56211.43 | 597.39 | . 004 | 18186.79 | 221.61 | . 26 |
| 35 | . 51 | . 00 | 56142.14 | 597.75 | . 002 | 18173.09 | 221.23 | . 08 |

District 106-41 fishery catch of Tahltan sockeye salmon

| HEEK | $\mathrm{R}^{2}$ | RUN F. | [NTERCEPT | SLOPE | SD (R = F) | SD(INT) | SD(SLOPE) | AVG.CPUE |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 25 | . 65 | . 07 | 23594.36 | 8891.28 | . 059 | 8387.41 | 2471.19 | 2.04 |
| 26 | . 75 | . 17 | 16039.42 | 3356.95 | . 162 | 7971.06 | 733.14 | 5.62 |
| 27 | . 85 | . 26 | 19315.55 | 1184.38 | . 127 | 5595.02 | 186.20 | 11.28 |
| 28 | . 87 | . 27 | 16701.10 | 856.90 | . 157 | 5524.61 | 126.32 | 10.29 |
| 29 | . 85 | . 12 | 16809.33 | 700.13 | . 080 | 5958.58 | 112.27 | 6.39 |
| 30 | . 82 | . 06 | 16478.08 | 665.86 | . 075 | 6569.94 | 118.09 | 2.33 |
| 31 | . 79 | . 03 | 16866.50 | 626.91 | . 059 | 7082.56 | 121.88 | 1.74 |
| 32 | . 79 | . 00 | 16648.19 | 625.88 | . 028 | 7158.37 | 122.58 | . 41 |
| 33 | . 79 | . 00 | 16543.40 | 625.87 | . 010 | 7184.67 | 122.82 | . 17 |
| 34 | . 79 | . 00 | 16527.32 | 625.72 | . 002 | 7192.40 | 122.89 | . 04 |
| 35 | . 79 | . 00 | 16517.91 | 625.63 | . 001 | 7197.05 | 122.94 | . 02 |

Table 5. Evaluation of the Stikine Management Model for the 1990 season. Weekly forecasts of run size for 1990 are given along with the total allowable catch for Stikine River sockeye salmon.

Model runs generated in U.S. management office in Petersburg

| Week | Start Date | Forecasts |  | U.S. Fishing Regime |  |  | Canada TAC | Cumulative Catch |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | Run Size | TAC | 6 | 8 | TAC |  | U.S. | Canada |
| 25 | 17-Jun | 94,000 | 34,000 | I | D - | 14,000 | 20,000 | 2,688 | 0 |
| 26 | 24 -Jun | 94,000 | 34,000 | I | D | 14,000 | 20,000 | 6,808 | 285 |
| 27 | 01-Jul | 140,690 | 80,690 | I | D | 50,690 | 30,000 | 11,614 | 1,580 |
| 28 | 08-Jul | 95,671 | 35,671 | I | D | 15,671 | 20,000 | 19,215 | 2,560 |
| 29 | 15-Jul | 106,106 | 46,106 | 1 | D | 26,106 | 20,000 | 35,241 | - 9,223 |
| 30 | 22-Jul | 110,962 | 50,962 | I | D | 30,962 | 20,000 | 28,904 | 10,445 |
| 31 | 29-Jul | 105,128 | 45,128 | 1 | D | 25,128 | 20,000 | 35,273 | 13,104 |
| 32 | 05-Aug | 104,970 | 44,970 | I | D | 24,970 | 20,000 | 38,332 | 16,827 |
| post-sea estima | son te | 79,463 | 19,463 |  |  |  |  | 9,420 | 18,024 |

Model runs generated in Canadian management office in Whitehorse

| Week | Start <br> Date | Forecasts |  | U.S. Fishing Regime |  |  | Canada TAC | Cumulative Catch |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | Run Size | TAC | 6 | 8 | TAC |  | U.S. | Canada |
| 25 | 17-Jun | 94,000 | 34,000 | I | D + | 14,000 | 20,000 | 2,781 | 0 |
| 26 | 24-Jun | 94,000 | 34,000 | I | D | 14,000 | 20,000 | 6,808 | 285 |
| 27 | 01-Jul | 140,690 | 80,690 | I | D | 50,960 | 30,000 | 12,571 | 1,580 |
| 28 | 08-Jul | 95,671 | 35,671 | 1 | D | 15,671 | 20,000 | 19,127 | 4,298 |
| 29 | 15-Jul | 125,048 | 65,048 | 1 | D | 35,048 | 30,000 | 35,103 | $=9,606$ |
| 30 | 22-Jul | 111,381 | 51,381 | 1 | D | 31,381 | 20,000 | 35,103 | 12,285 |
| 31 | 29-Jul | 105,635 | 45,635 | 1 | 1 | 25,635 | 20,000 | 45,091 | 13,837 |
| 32 | 05-Aug | 105,841 | 45,841 | 1 | 1 | 25,841 | 20,000 | 48,574 | - 16,704 |
| 33 | 12-Aug | 102,707 | 42,707 | 1 | 1 | 22,707 | 20,000 | 38,268 | $=17,150$ |
| 34 | 19-Aug | 98,827 | 38,827 | 1 | 1 | 18,827 | 20,000 | 38,268 | 17,646 |
| 35 | 26-Aug | 97,770 | 37,770 | 1 | 1 | 17,770 | 20,000 | 57,881 | = 17,848 |
| 36 | 02-Sep | 108,848 | 48,848 | 1 | 1 | 28,848 | 20,000 | 57,881 | 17,848 |
| post-sea estima | on | 79,463 | 19,463 |  |  |  |  | 9,420 | 18,024 |



+ I indicates indirect fishery allowed; D indicates directed fishery allowed.
- Cumulative U.S. catch decrease due to use of different analytical techniques to minimize the misclassification problem.
- Where U.S. cumulative catch is the same in succeeding weeks, this indicates that catch data was not available in the succeeding week when the model was run.


## TAKU RIVER

## Pre-season Forecasts

The sockeye run size is expected to be average to above average in 1991. The chinook and coho runs are expected to be average; whereas, the chum run will likely be below average. The pink salmon run is expected to be strong but average for odd numbered years; the oddyear cycle is the dominant cycle of Taku pink salmon.

## Escapement Goals

Interim escapement goals set by the Transboundary Technical Committee for salmon spawning in Canadian portions of the Taku River are:

| Species | Interim Escapement Goal Ranges |  |
| :---: | :---: | :---: |
|  | From | To |
| Sockeye | 71,000 | 80,000 |
|  | 27,500 | 35,000 |
| Chinook | 25,600 | 30,000 |
| Pink | 150,000 | 250,000 |
| Chum | 50,000 | 80,000 |

## Harvest Sharing Objectives

Annex IV of the Pacific Salmon Treaty provides for the following harvest sharing arrangements for salmon originating in Canadian portions of the Taku River:

| Species | Canadian Share | United States Share |
| :---: | :---: | :---: |
| Sockeye | $18 \%$ of TAC | $82 \%$ of TAC |
| Coho | 3,000 |  |
| Chinook, Pink, Chum | Incidental Harvest |  |

Both Parties agree to take appropriate management actions to ensure that the escapement goals for chinook salmon bound for Canadian portions of the Taku River are achieved by 1995.


Figure 2. The Taku River and principal U.S. and Canadian fishing areas.

Collateral United States management goals for the District 111 fishery:

1. Provide for an orderly fishery while harvesting those fish in excess of spawning escapement needs and harvest sharing obligations;
2. Promote the harvest and processing of good quality fish within the constraints dictated by run size;
3. Manage, in conjunction with other drift gillnet fisheries in the region, to minimize chinook catches in District 111 and to keep the all-district catch below 7,600 chinook salmon (exclusive of new Alaska hatchery produced fish);
4. Minimize, to the extent practical, the incidental harvest of chinook salmon; and,
5. Provide for sufficient salmon spawning escapements to the Port Snettisham and Stephens Passage stocks.

## Management Procedures

The management coordination between U.S. and Canadian fishery managers will involve weekly conferences between designated managers or alternates.

United States. Section 11-B (Stephens Passage, Figures 2 and 3) will initially open for a 72hour period on the third Sunday of June (June 16, statistical week 25). The strength of the sockeye salmon run will be evaluated using CPUE analysis and weekly escapement estimates derived from the Taku River fish wheel mark-recapture project. Scale pattern analysis will be used to estimate the contributions of Taku River and Port Snettisham sockeye salmon to the District 111 catch.

Protection of Port Snettisham sockeye salmon will be attempted again this year in order to rebuild these stocks to historical levels. Port Snettisham will be closed inside a line from Point Amner to Point Styleman through approximately August 17. To minimize the harvest of mature chinook salmon, Taku Inlet will be closed north of the latitude of Jaw Point during the initial fishing weeks (Figure 3). In addition, night closures will be imposed if catches of juvenile chinook salmon (feeders) are above average levels. Based on catch rates in previous years, night closures could be expected through the end of July.

Harvestable returns of summer run hatchery chum salmon are expected to return in 1991 from fry outplants to the Limestone Inlet area of Stephens Passage. Additional fishing time is expected in Stephens Passage to harvest these fish. A six inch ( 152 mm ) minimum mesh size restriction will be employed to minimize the catch of sockeye salmon during these openings.

Although the Taku River pink salmon run is expected to be very strong this year, additional fishing time will not be allowed within Taku Inlet to target this species. Based on gillnet studies conducted by the Alaska Department of Fish and Game, it would not be possible to target on pink salmon without also harvesting substantial numbers of sockeye salmon. Additional fishing time may be warranted to harvest pink salmon returns to streams in


Figure 3. Location of U.S. fishing areas adjacent to the Taku River.

District 111 in lower Stephens Passage and Seymour Canal, and the northern portions of District 110 (Figure 3).

Beginning in mid-August, management emphasis will switch to fall chum and coho salmon. Fishing time and area will then be dependent upon the developing run strengths of the wild stocks of fall chum and coho salmon. Management will be based on evaluation of catch, CPUE, and fishing effort. The coho salmon catches and escapement estimates developed by the Taku River mark-recapture project will also be considered.

In 1989, the Alaska Board of Fisheries directed that an extension of the purse seine fishing area in northern Chatham Strait (Sub-District 112-16) be allowed during the month of July. The area encompasses waters along the western shore of Admiralty Island north of Point Marsden (Figure 3). Short fishery openings to target pink salmon will be allowed in early to mid- July if large numbers of this species are available for harvest. Sockeye salmon bound for Lynn Canal, Taku River, Port Snettisham, and numerous Alaskan island systems are believed to be present in this area. To limit the incidental harvest of sockeye salmon in the July fishery, a cap of 15,000 sockeye salmon will be in place.

The chinook sport fishing season will be open in the marine waters near Juneau throughout the year. However, Taku Inlet, north of a line from Point Bishop to Dorothy Creek, will be closed to sport fishing from April 16 through June 14 to protect returning Taku River chinook salmon. The daily bag and possession limits are two chinook salmon per person. These are the same sport fishery restrictions as in 1990.

A personal use fishery in U.S. portions of the Taku River was established by the Alaska Board of Fisheries in 1989 and will operate during the month of July in 1991. A seasonal bag limit of five sockeye salmon per person or ten sockeye salmon per household will be allowed to be taken using set gillnets.

Canada. The Canadian fishery will open Monday, June 17 for an initial 48 hour period to target early sockeye returns. A maximum mesh size restriction of 146 mm ( 5.75 inches) will be in effect through mid-July to conserve chinook salmon during the early season sockeye fishery.

Canadian sockeye management decisions for the Taku River fishery (Figure 2) will be based on weekly projections of total run size and total allowable catch (TAC). The weekly projection of the seasonal TAC will be made using the following calculations:

$$
T A C=\frac{E_{w}+C C_{w}+\left(A C_{w-1}\right)}{P R T_{w}}-E g
$$

Where: $\boldsymbol{T A C}=$ projected total allowable catch for season;

| $\boldsymbol{E}_{\boldsymbol{w}}$ | $=$ total escapement to date, i.e., to week $\boldsymbol{w} ;$ |
| :--- | :--- |
| $\boldsymbol{C} \boldsymbol{C}_{\boldsymbol{w}}$ | $=$ total Canadian catch to date, i.e., to week $\boldsymbol{w} ;$ |

$A C_{w-1}=$ estimated cumulative Alaskan catch of Taku sockeye to the preceding week $\boldsymbol{w}-1$ (preceding week used to allow for migration time). Catches in Districts 111 and 112 will be considered for inclusion in this estimate.
$\boldsymbol{P R} \boldsymbol{T}_{\boldsymbol{w}}=\quad$ estimated proportion of run through to week $\boldsymbol{w}$ determined from the average inriver run timing based on CPUE data from the Canadian fishery. (Run timing estimates will be adjusted inseason according to in-season CPUE data relative to historic data in both U.S. and Canadian fisheries); and,
Eg $\quad=\quad$ system-wide escapement goal (A value of 75,000 will be used reflecting the midpoint in the interim range of 71,000 to 80,000 ).

Weekly TAC projections for sockeye salmon will be used to develop the total Canadian guideline harvest by applying the $18 \%$ allocation specified in Annex IV of the Treaty. Run timing will be used to apportion the projected total season catch into weekly harvest guidelines.

The Canadian fishery will be monitored daily by a resident DFO Fisheries Officer and/or Guardian who will collect catch and tag recovery information. Catch information will be relayed to the DFO office in Whitehorse, collated, and exchanged with a designated ADF\&G contact person during weekly telephone contacts. Tag recovery information will be forwarded to the DFO/ADF\&G tagging crew located at Canyon Island, Alaska.

Weekly and cumulative sockeye population and escapement estimates will be developed from catch and tag recovery information using both the Schaefer and Stratified Petersen algorithms. Examination of these factors will be used to determine if the Canadian sockeye catch is on target; adjustments will be made to weekly fishing time to compensate for deficit/surplus situations.

## ALSEK RIVER

## Pre-season Forecasts

Run sizes of chinook and coho to the Alsek River in 1991 are expected to be average. The early-run sockeye run is expected to be below average, whereas, the late run is anticipated to be average to above average.

## Escapement Goals

Interim escapement goals set by the Transboundary Technical Committee for salmon spawning in the Canadian portion of the Alsek River are:

| Species | Interim Escapement Goal Ranges |  |
| :---: | :---: | :---: |
|  | From | To |
| Sockeye | 33,000 | 58,000 |
| Coho | 5,400 | 25,000 |
| Chinook | 7,200 | 12,500 |

## Harvest Sharing Objectives

Annex IV of Pacific Salmon Treaty requires that the Parties take the necessary management actions to rebuild chinook and early sockeye salmon stocks.

## Management Procedures

United States. As in 1990, the initial opening for the Alsek River fishery (Dry Bay, Figure 4) for the 1991 season will be for twenty-four hours on the third Monday in June (June 17), a delay of two weeks relative to fishery openings prior to 1982 and one week later than in 1989. This conservative management approach is designed to reduce harvest rates on the expected weak runs of chinook and early sockeye salmon. An extension of fishing time may be allowed if sockeye salmon run strength is sufficient and the harvest of chinook salmon can be kept low. The duration of fishing periods during the remainder of the sockeye salmon season will be based on evaluation of sockeye salmon catches and effort levels. Gillnets will be restricted to a maximum mesh size of six inches ( 152 mm ) through July 1 to minimize incidental chinook salmon harvests.


Figure 4. Location of the principal U.S. and Canadian fishing areas where Alsek River salmon stocks are caught.

After the first several weeks of the fishing season, U.S. managers will use two in-season sockeye salmon abundance models to predict the total catch and the escapement through the Klukshu River weir. A model that employs a simple linear regression between harvest rate and effort together with historical migratory timing data has been used since 1984. This model had annually produced accurate predictions as early as the third week of the season until 1989, when the predictions were poor. The model was updated in 1990 and a new model which employs two multiple regressions, one to predict the total run and one to predict the total catch, was developed for use. Predictions from both models were highly accurate in 1990; the two models will be run throughout the 1991 season to assess which is better for use in subsequent years.

The Alsek River sockeye salmon run in the lower river is nearly over by early to mid-August. Management emphasis will then be switched to coho salmon. Fishing time during the coho salmon fishery will be based on a comparison of current year fishery performance with historical performance.

The Alsek River surf fishing area will likely be open during the same time period as the inriver fishery. The surf fishery areas include the shoreline, $3 / 4$ of a mile ( 1.2 km ) in each direction from the river mouth to the outermost bar where the surf breaks.

Canada. Management of both the sport and Indian food fisheries in the Alsek River (Figure 4) will be similar to that of the last several years with conservation measures in place to protect chinook and early-run sockeye salmon.

Final plans for the Indian food fishery will be made after discussions between the Department of Fisheries and Oceans and the Champagne/Aishihik Indian Band, the primary user of the resource. The fishing pattern in recent years has involved a closure early in the season followed by a period during which the fishery opened for only one day per week. Thereafter, the fishery has been permitted to operate for longer fishing periods. The escapement of sockeye salmon through the Klukshu weir serves as an in-season indicator of stock strength and adjustments to the fishery may be made on the basis of weir counts.

