

PNPIC Technical Report TR 86-2

1984 - 1985 Salmon Spawner Survey Report
for Coho and Chum Salmon of Hood Canal
and Strait of Juan de Fuca

Cynthia Young

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Point No Point Treaty Council
7850 N.E. Little Boston Road
Kingston, Washington 98346

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Introduction

Spawner surveys were conducted during the 1984-1985 season for the second consecutive year on Hood Canal and Strait of Juan de Fuca tributaries in the Point No Point Treaty area (Figure 1). The program this year was designed to address specific questions about spawner activity. Objectives were established based on knowledge acquired during the previous year's (1983-1984) surveys regarding spawner distribution, run timing, spawner abundance, and stream accessibility to surveyors (Young, 1986). Tribal concerns and needs of the Point No Point Treaty Council (PNPTC) fisheries management program also were considered. These objectives focused on selected salmon species, river systems and management issues and were prioritized and undertaken according to time and manpower availability. Survey schedules were coordinated with the Washington Department of Fisheries (WDF). Effort was concentrated primarily on early, normal and late-normal naturally produced chum salmon and to a lesser extent naturally produced coho and chinook salmon in selected streams. The spawner survey program was not planned or used to monitor escapement for inseason harvest management except for coho salmon on the Dungeness River.

Survey Program Objectives by Species and Area

Chinook Salmon

Chinook salmon surveys were performed only on the South Fork Skokomish River for two purposes: 1) to determine if the range of spawning habitat extended farther upstream from the area surveyed by the WDF and 2) to attempt an evaluation of the tribal juvenile planting program in two tributaries, Brown and LeBar creeks, where adult returns were expected from plants made in previous years.

Coho Salmon

Hood Canal

We conducted surveys to learn more about spawner distribution and run timing, and estimate the abundance of coho salmon in the North Fork Skokomish River. This location was chosen because we observed a substantial run of coho salmon in the North Fork Skokomish River in 1983-1984 (Young, 1986) and because this river is not currently included in the WDF coho salmon index area surveys of the Skokomish River system.

Strait of Juan de Fuca

Coho salmon spawner surveys were performed on Sadie Creek (tributary to the East Twin River) and on the Pysht River system to gain additional information on spawner distribution, run timing and escapement. Sadie Creek, a western Strait stream with good access for surveying, was included because of its potential as an index stream. Until 1983, little was known about salmon distribution or the condition of spawning grounds in the Pysht River. Intensive spawner surveys were conducted in 1983 for the first time when the PNPTC developed spawner index areas and performed weekly surveys (Young, 1986). This year's surveys were intended to build upon and extend the information gathered in 1983.

Two additional objectives were: 1) to monitor coho spawner distribution in an attempt to insure escapement to upstream areas prior to fishery openings on the Dungeness River and 2) to check for returning spawners from juvenile coho outplants returning this season (brood 1981) to selected tributaries of the Strait.

Early Chum Salmon

We surveyed early chum salmon runs to obtain run timing and escapement estimates because coverage was inadequate during the 1983 surveys and these runs were not included by the WDF in its weekly surveys this year. We also surveyed the Lyre and Dungeness rivers, and Deep and Salt creeks to determine for the first time, whether early chum salmon runs existed in these streams.

Normal Chum Salmon

Hood Canal

The purpose of our surveys of normal-timed chum salmon spawners of Hood Canal was to investigate run timing and abundance. For the Skokomish River, in addition to run timing and abundance, we wanted to determine the distribution of chum spawners. We also had a particular interest in the occurrence of late-normal runs in the North Fork Skokomish River, Hamma Hamma River, Dosewallips River and Fulton Creek. Finally, we attempted to evaluate the effectiveness of the egg box incubation program based on numbers of returning spawners.

Strait of Juan de Fuca

Spawner distribution, run timing and abundance of normal chum salmon were investigated on the Lyre, West Twin and Pysht rivers. We decided to survey these streams because data

gathered last year were found to be inadequate. Also this year the WDF did not plan to include the Lyre River in its weekly survey schedule and was planning to survey the West Twin River only once during the season and we felt that more thorough coverage was necessary.

Chum Salmon Sex ratios

The sex ratio of chum salmon returning to the surveyed streams was determined again this year to supplement data collected during the 1983-1984 survey season.

Methods

Field Data Collection

Training of six tribal members, who were used as field surveyors began September 17, 1984 and continued in the field during actual surveys. The last survey of the season was performed on February 8, 1985. Each team of two surveyors consisted of a technician and a trainee who worked both in pairs and separately. The technician was responsible for data recording and overseeing the trainee. A field supervisor managed and coordinated the survey teams. The surveyors generally covered between 2 and 4 streams per day and 1.0 to 4.0 miles per stream depending on travel distances and length of surveys. Boat surveys were rare but were used in cases where the river was too deep, inaccessible by foot (i.e. brush on banks) or too wide such as in Richert Springs and Hunter Creek. Surveys were performed on the same streams every 7 days when water conditions permitted. Survey methods, data collected and equipment used were identical to that described in Young (1986).

Chinook Salmon

Chinook spawner surveys on the South Fork Skokomish River spanned a three week period (September 25 to October 19) to coincide with the run peak. We surveyed four times near the run peak because we were assessing spawner distribution in the river and our chances of observing spawners were greatest at that time. The survey locations were chosen for their accessibility to the river. Those locations were between the river miles of 2.0 and 3.2, 5.5 and 6.0, 10.2 and 13.0, 17.9 and 19.2, and 21.4 and 22.1. The WDF index area was between river miles 0.0 and 2.2. Brown and LeBar creeks both were surveyed once (October 9) from the mouth to approximately river mile 1.0; we assumed this area included all or a major portion of each stream's anadromous zone because a series of cascades and boulder substrate were present at the upper end of our survey area.

Coho Salmon

Sadie Creek and the Pysht River system, including the mainstem, South Fork Pysht River, Green Creek, unnamed (stream no. 190121) and Needham Creek, were surveyed weekly for coho spawners throughout the spawning season. The Pysht River system was surveyed in cooperation with the WDF. The Dungeness River was surveyed five times for coho spawner distribution at key pools and index areas established last season, again to coincide with the run peak. The following Strait streams were surveyed during the run peak from one to three times: Colville Creek, Field Creek, Susie Creek, East Twin River and Little Hoko River. The intent was to check for returning spawners from 1981 brood juvenile plants. We were also interested in returns from plants in Sadie Creek, the Pysht and South Fork Pysht rivers, and Green Creek; these streams were covered under the aforementioned weekly surveys. Coho were also counted and recorded in streams when they were observed during chum surveys.

Early Chum Salmon

Streams surveyed for early chum salmon in Hood Canal were Big Mission Creek and Union, Tahuya, Dewatto, and Little Quilcene rivers. Snow, Salmon and Jimmycomelately creeks, which drain into the eastern Strait of Juan de Fuca were also surveyed. The Strait streams including Dungeness River, Salt Creek, Deep Creek, and Lyre River, were surveyed by the PNPTC two to three times near the estimated run peak for early chum salmon.

Normal Chum Salmon

We continued counting chum salmon on those east side Hood Canal streams (and also the Little Quilcene River) that were surveyed for early timing chum while the WDF surveyed streams on the west side. The PNPTC also began surveying the west side of Hood Canal streams after the WDF had stopped but only where late-normal timing chum salmon were still present. Our surveys of tributaries to the Strait included the Lyre, West Twin and Pysht rivers. We closely coordinated surveys of those Strait streams with the WDF to avoid duplication and insure adequate coverage.

Adult chum salmon returns were monitored in the following southern Hood Canal egg box streams: Anderson Creek, Caldervin Creek, Stimson Creek, Tahuya River and Union River. These streams were surveyed two to three times near the suspected run peak for four and five year old chum salmon expected to return in 1984.

Chum salmon sex ratios

Chum salmon carcasses (of both early and normal timing) were counted and recorded according to sex during the spawner surveys. The weekly counts were summed by stream and the female to male ratio was derived for each. (These counts were based on cumulative totals and they probably contained some multiple counts of the same fish.)

Data Handling

The field data were transferred daily to PNPTC forms and WDF data cards. All data were sent to the WDF for entry in the computer after examination for accuracy. Spawner survey data for the Point No Point Treaty area were compiled by the WDF along with data of the WDF and U.S. Fish and Wildlife Service. A copy of these data was obtained from the WDF, stored on a microcomputer disk and corrected for errors. Tables of PNPTC data were generated from the disk. We edited data for the specific use of developing spawner curves as follows: (1) Streams on which no fish were seen were deleted as were those of no interest to the present study; (2) adjacent reach counts made on the same day were added together to form a single data point; (3) counts were adjusted according to percent visibility recorded during the field survey (if visibility was below 25%, the data were omitted); and (4) zero counts were added at the beginning and end of run data if not already present. Furthermore, data obtained from survey reaches that were not adjacent but on the same stream were kept separate and treated individually. Finally, early and normal chum runs were separated at low counts or zero counts in October.

Generally, the criteria for data use were the same as described by Young (1986) for the 1983-1984 season; however, a different approach was applied in generating 1984-1985 spawner curves. Instead of using curves derived by the Schnute and Sibert (1983) method as was done for 1983-1984 data, we plotted the respective counts of live and dead salmon for each stream by connecting the individual counts with straight lines. We decided to use this approach primarily because of its convenience but also straight line plotting has the advantage, over Schnute and Sibert curve development, of fitting any configuration of spawner counts. Run timing, survey life and escapement were estimated using the straight line spawner curves.

Run Timing

The 10, 30, 50, 70, and 90 percent completion dates of the run were calculated from each live spawner curve for each species and stream. Run timing was determined in this manner

for all salmon runs surveyed weekly by the PNPTC as well as some runs pertinent to this study surveyed by the WDF. Streams surveyed by the WDF for which we estimated run timing for coho salmon included the Skokomish River tributaries, Swift, Kirkland, unnamed (stream no. 160015) and Fir creeks and also the Strait tributaries, Deep Creek and South Fork Pysht River. Early chum salmon streams surveyed by the WDF for which run timing was calculated were Lilliwaup Creek and Hamma Hamma, Duckabush, and Dosewallips rivers. Those surveyed for normal timed chum salmon by the WDF for which run timing was estimated included Kirkland, unnamed (stream no. 160015) and Deep creeks. The WDF counts were also used to fill gaps in area or time in our data; for example, the index areas surveyed by the WDF upstream of our survey areas on Big Mission Creek and the Union River.

Escapement Estimation

Escapement estimates were made on a stream by stream basis for those streams surveyed by the PNPTC. The WDF data were used exclusively for coho and chum salmon of the same Skokomish River tributaries and streams on the Strait listed above in the run timing methodology section. Escapements were estimated using the area under the curve methodology described in Young (1986). Areas under the curve were calculated from the previously described spawner (or run timing) curves. Escapement was estimated from the equation:

$$\text{Escapement} = \frac{\text{Area under the curve}}{\text{Survey life}}$$

Survey life is defined as the number of days that the average spawner could be counted as a live fish in the survey reach and was calculated as the difference between the median dates of live and dead salmon derived from the respective spawner curves.

Results and Discussion

Chinook Salmon

All of our chinook spawner surveys were upstream of the WDF index area (between river miles 0.0 and 2.2) on the South Fork Skokomish River. We observed only one chinook salmon between river miles 2.2 and 3.2 and no chinook salmon above river mile 3.2. The river is inaccessible to foot surveyors and difficult if not dangerous to float or snorkel within sections where it is contained in canyons from approximately river miles 3.2 to 5.5. Thus we were not able to determine conclusively whether or not chinook spawners were present within this reach this year. It is possible that fall chinook

passage was blocked by low water conditions in the canyons at the time fall chinook were in the river. We found good spawning habitat in the sections of the South Fork we surveyed above river mile 3.2, especially between river miles 10.2 and 13.0 and between 17.9 and 22.1.

Cedar, Pine and Church creeks which drain into the South Fork between river miles 17.2 and 22.1, had unsuitable substrate (primarily large boulders) for spawning and became steep approximately three-tenths of a river mile above their mouths. We observed no chinook in these streams.

No chinook salmon were seen in Brown and Lebar creeks in which we were expecting returns from fry plants. These streams drain into the South Fork Skokomish river at river mile 12.8 and 13.5, respectively. Perhaps the planted juvenile salmon returned as adults to lower spawning areas of the river but were unable to pass through the river canyons to reach these streams.

Coho Salmon

Spawner Distribution

Hood Canal

Coho spawning in the North Fork Skokomish River within our index area (river mile 9.0 at the confluence with the mainstem, to 13.4) was concentrated approximately between river miles 10.5 to 13.2, though coho were observed throughout the reach. Additionally, coho were seen in large numbers early in the season in a large pool at the mouth of the North Fork. The extent to which the coho may be distributed upstream of river mile 13.4 is not clearly understood. Some adult coho (peak count, 54) were seen between river miles 13.4 and 15.6 during our 1983-1984 surveys. Members of the PNPTC staff have noted in previous years the presence of juvenile coho only as far upstream as river mile 15.6 in surveys that extended to river mile 17.2. Falls at river mile 15.6 appear to be impassable to adults at low water levels.

Strait of Juan de Fuca

Coho spawning was observed between river miles 1.6 and 2.1 in Sadie Creek. (Sadie Creek enters the East Twin River at river mile 1.8.) Spawning habitat was unsuitable below river mile 1.6 because substrate consists of large boulders. Thick brush prevented surveys beyond river mile 2.1 but it is possible that coho spawners migrated beyond that point.

Spawner surveys in the Pysht River were conducted consistently from river mile 5.1 to 11.9 in a joint effort with the WDF. Downstream of river mile 5.1 the river is deep and too silty for reliable surveys. Upstream of river mile 11.9 the river was difficult for surveyors to access and substrate

consisted largely of bedrock. The majority of coho spawning activity appeared to take place between river miles 9.3 and 11.8. An upper range limit at river mile 11.8 would be the same as that indicated by the Washington Department of Game for steelhead trout. A single survey between river miles 11.9 and 13.3, however, did record one coho spawner at river mile 12.5. No coho were seen during a one mile survey of an unnamed tributary (stream no. 190125) which enters the Pysht River at river mile 13.3.

The few coho counted in the South Fork Pysht River, within our chum salmon survey area between river miles 0.0 and 3.8, appeared to be in transit. Very few coho salmon (peak count of 9) were counted on the spawning grounds of the South Fork by the WDF within their index area (river mile 5.7 to 7.6).

Coho salmon spawned upstream of chum salmon (above river mile 0.3) and up to river mile 2.4 in Green Creek. There appeared to be an impassable log jam at that point. Coho salmon in Needham Creek were observed this year to have returned as far upstream as river mile 1.8 where a log jam and falls appeared to block passage.

Few coho were seen during our chum salmon surveys in the West Twin River (peak count of 6) within river miles 0.0 and 1.8. The WDF performed one exploratory survey that extended from the mouth to river mile 4.4 on the West Twin River but no coho were counted. The first in a series of impassable blocks (log jams and falls) was discovered beginning at river mile 2.3. The most suitable substrate for spawning was found by the WDF to be between river mile 1.0 and 1.8.

Run Timing

Table 1 lists the percentage breakdown of each coho run over time based on constructed spawner curves. Appendix 1 contains the data used to form the spawner curves for each stream.

The coho run in the North Fork Skokomish River showed a later run timing of ten days at the median (50%) run completion date (December 14) this year compared to that of the previous 1983-1984 season (December 4) (Young, 1986). The coho run on the Skokomish River system had a range of median dates of run completion from December 13 to December 20 (excluding Richert Springs because coho appeared to be holding temporarily). The median dates of the coho runs in the Pysht River system ranged from November 15 to December 16. The median completion date for coho salmon in Sadie Creek (November 25) was early in relation to other Strait streams except it was similar in run timing to the mainstem Pysht River and the South Fork Pysht River (Table 1).

Escapement Estimates

Table 2 describes the escapement estimates by stream system and Appendix 2 gives calculated areas under the curves for each system. The escapement estimates of coho include jack salmon.

A total of 739 coho salmon were estimated to have returned to the North Fork Skokomish River this year; that is 60% of our total escapement estimate for the entire system. Direct comparison with a WDF estimate is not possible because the WDF did not derive a North Fork estimate separate from the remainder of the Skokomish river system. The North Fork Skokomish River appears to be an important spawning area and the WDF may wish to consider adding it to their index surveys.

Our coho salmon escapement estimate of the Skokomish River (1,205) was approximately 7,500 less than what the WDF estimated for this 1984-1985 season (8,800). One possible cause of the large discrepancy in estimates is the use of different approaches to deriving an escapement estimate. The WDF's initial escapement estimates are directed to large drainage areas (i.e., Hood Canal) rather than specific streams, in contrast to our method of first estimating escapement for each individual stream. Thus the WDF arrived at its escapement estimate for the Skokomish River indirectly. A percentage of the total Hood Canal escapement estimate was assigned to the Skokomish River in proportion to the escapement goal of the river, relative to the total escapement goal of Hood Canal. (See comparative discussion of escapement estimation methodologies in Young, 1986.)

Sadie Creek was estimated to have 78 coho salmon escape to it this year. Direct comparison of our estimate with that of the WDF is again not possible because the WDF did not derive separate escapement estimates for tributaries to the Strait. We estimated a total of 153 coho to have returned to the Pysht River, South Fork and Green Creek in comparison to a total of 10 calculated for the previous year.

Three thousand coho salmon were estimated to have returned to outer Strait streams (west of the Elwha River) by the WDF. Our estimate of escapement for this area was 380 coho salmon and was based on data from most of the major tributaries to the western Strait, including the East Twin and West Twin rivers, Deep Creek and the Pysht River, but not the Hoko River. Recognizing that our estimate was not inclusive of every western Strait tributary, the fact that it was less than one-seventh of the estimate made by the WDF is notable. The WDF used the data from only the following streams to project total escapement for all outer Strait streams: Salt Creek and a tributary (unnamed stream no. 190014), South Fork Pysht River and Hoko River. The WDF arrived at their estimate by using the mean from the results of three separate methods of escapement estimation: cumulative new redd counts, peak counts and area

under the curve values (Flint pers. comm.). This approach is in contrast to our single method (area under the curve) applied to individual streams of the outer Strait from which adequate survey data were collected by both agencies. Our total estimate was the sum of estimates for the surveyed streams. The variation between our and the WDF estimates probably is largely due to these methodological differences.

Surveys performed on the Dungeness River to monitor coho distribution provided the assurance that the majority of coho had escaped upstream and consequently the river was opened to subsistence fishing on October 17.

Table 3 lists our estimates of survey life values for coho salmon. The North Fork Skokomish River coho survey life value of 40.2 days was within two days of that calculated for the previous (1983-1984) season (38.2 days). (This was the only stream for which comparison between years could be made.) Coho survey life values ranged between 4.4 to 40.2 days compared with 9.4 to 38.2 days calculated for the previous season. The average survey life value this 1984-1985 season was 19.5 days (derived from fewer runs than the previous year) and compares to 21.3 calculated for the 1983-1984 season.

Juvenile Plants

Little evidence was found of adult returns from the 1981 coho fry outplants in tributaries to the Strait. Although only one to three surveys were performed on most of these streams, the surveys were conducted at or near the assumed peak of each run when evidence of returning spawners should have been strongest. No salmon were seen on Susie Creek (31,000 fry planted) and only two were counted on Field Creek (18,700 fry planted) during our surveys. Susie Creek may have had an impassable log jam at river mile 0.3 and Field Creek may have been difficult for returning coho to access because of log jams near the mouth. A peak count of only eight coho salmon was made for the Little Hoko River (9,700 fry planted) and surveys (between river miles 0.0 and 3.9) revealed no apparent barriers to fish passage. A log jam at river mile 0.9 on Colville Creek (21,000 fry planted) may have been a barrier to the 10 salmon counted downstream of the log jam at approximately the run peak. The East Twin River (89,500 fry planted) had an estimated escapement of 42 coho salmon. The WDF found that coho passage is prevented by log jams and falls beyond river mile 3.1 on the East Twin River. The estimated escapement to Sadie Creek (49,700 fry planted) was 73 coho. The Pysht River (122,300 fry planted) and two tributaries, the South Fork Pysht River (40,500 fry planted) and Green Creek (4,800 fry planted), had a combined escapement estimate of 153 coho (Table 2).

It cannot be established conclusively if the 1981 brood coho outplants were successful or not, but the low number of observed spawners, especially in Susie Creek, Field Creek, Little Hoko River and Colville Creek suggest that plants in

those streams have not resulted in increased adult returns, at least for this year. The reason or reasons adult returns appeared poor are not clear. Juvenile survival in the streams may have been low or substantial numbers of coho may have been intercepted in the sport and troll fisheries. The relatively large return to Sadie Creek with its limited spawning area, suggests that planted coho may have returned to that creek.

Early Chum Salmon

Spawner Distribution

No early chum salmon were observed in Salt Creek, Deep Creek, or the Lyre River. Very few were seen in the Dungeness River (peak count 7, on October 3). The early chum salmon runs may not exist in the three streams where no spawners were observed or possibly, the run timing was earlier than we anticipated and our surveys, from October 3 through November 6, missed the runs.

Run timing

Table 4 lists the dates at 10, 30, 50, 70 and 90 percent run completion determined from the spawner curves for each stream. Appendix 3 contains the data used to form the spawner curves.

The Union River exhibited the earliest median date of run completion (September 20) followed by the Little Quilcene River (September 23), the Dosewallips River (September 28) and the Hamma Hamma River (September 29). The latest median run completion date was for Big Mission Creek on October 10. Timing was not found to be consistently earlier in northern Hood Canal tributaries relative to tributaries farther south nor were Strait tributary runs earlier than those in Hood Canal.

Direct comparisons of run timing between 1983 and this season were only possible for the Tahuya, Hamma Hamma and Duckabush rivers. The Tahuya and Hamma Hamma rivers' early chum salmon run timing this year closely paralleled that of 1983 with a difference in the median run completion dates of only two and three days (October 2 versus October 4 for the Tahuya River and September 29 versus September 26 for the Hamma Hamma River). The Duckabush River's early chum run timing this year was over one week later at the median run completion date compared to 1983 (October 4 versus September 25). However, no surveys were performed in the Duckabush River between September 7 and September 25 in 1984, and this may account for the estimated difference. If the peak of the run had been reached during this gap in surveys, the resulting run timing curve would have been less skewed towards the latter part of the run and the run timing calculation would have resulted in an earlier median date.

Escapement Estimates

Table 5 contains the escapement estimates calculated for early chum salmon and Appendix 4 lists area under the curve values for each stream from which escapement estimates were made.

The largest escapements estimated this season were in Salmon Creek, (538 salmon) followed by Jimmycomelately Creek (401) and then Snow Creek (316), all tributaries to the eastern Strait. The Tahuya River (245) and Union River (174), both in southern Hood Canal, were next largest in abundance. In 1983-1984, Salmon and Jimmycomelately creeks also yielded the largest and second largest estimates, respectively. The estimates for individual streams were generally higher this year in comparison to 1983, except for Salmon Creek (538 compared to 680) and the Little Quilcene River (126 compared to 149). The Union River estimate was nearly identical (174 compared to 175).

We estimated an early chum salmon return of 472 fish to all marine area 12D tributaries, which is nearly half that estimated by the WDF (905). Estimates of the total return to Strait streams were closer in value; however, our estimate was still lower (1,255 for PNPTC and 1,554 for WDF). One possible explanation for the difference in the escapement estimates for Strait tributaries is our use of survey life values (Table 5) that are greater than the standard value of 10 days used by the WDF. (See Ames (1984) for a discussion of WDF survey life values.) This explanation, however, does not apply to marine Area 12D tributaries because our survey life values for these streams were all less than 10 days. Perhaps the use of different methods employed in fitting curves to the data points is responsible for the difference (See Young, 1986).

Table 6 lists survey life estimates. Early chum salmon on the Tahuya River have a calculated survey life value difference of only one day between this 1984-1985 season and the previous season (6.3 days versus 5.1 days). This is the only stream where a comparison could be made. Survey life values ranged from 4.2 days for Big Mission Creek to 16.5 days for Jimmycomelately Creek, averaging 11.8 days.

Normal chum salmon

Spawner distribution

Hood Canal

Normal chum salmon were found on spawning grounds in five tributaries to the Skokomish River. Listed in order of high to low abundance of chum salmon, the streams were: The North Fork (chum salmon spawning concentrated approximately between river miles 10.2 and 12.9), Richert Springs (concentrated from river

mile 0.3 to the source of the springs at river mile 0.5), Vance Creek, Kirkland Creek and Hunter Creek. Distribution within the latter three streams was not determined conclusively.

Strait of Juan de Fuca

Chum salmon returned to spawn in the lower mile of the Lyre River and spawned between river mile 0.1 and 1.8 in the West Twin River. As mentioned earlier in the coho salmon section, spawner surveys were conducted consistently from river mile 5.1 to 11.9 in the Pysht River in a joint effort with the WDF. Chum spawning was found to be concentrated between river miles 5.1 and 11.0. Chum were few in number (peak count, 10) in the South Fork Pysht River and none were seen upstream of river mile 1.9. Chum were observed spawning only in the lower 0.3 mile of Green Creek.

Run Timing

Table 7 shows percentages of run completion of normal chum salmon by stream. The median run timing date for the North Fork Skokomish River (December 16), Duckabush River (December 12) and Caldervin Creek (December 4) closely matched the median run timing dates of the same streams in 1983 (December 17, December 13 and December 5, respectively). This season's median run completion dates on the Dewatto (December 9), Hamma Hamma (December 28) and Lyre rivers (December 11) were within three days of the values calculated for last season (December 6, December 25 and December 8, respectively). The median run completion date of the chum salmon run in the Union River (November 23), and Pysht River (November 25), however, were more than three weeks earlier compared to 1983 (December 17 and December 25, respectively). The timing differences between years for the Pysht and the Union rivers may have been caused by the fact that in 1983 normal chum run timing curves were constructed lacking approximately one month of survey data. The Schnute and Sibert model used to construct the 1983 curves (See Young, 1986), in order to compensate for the missing data, may have estimated a peak count that was later than actually occurred.

The median run completion dates of live counts for normal chum runs spanned a 48 day period from November 10 for Little Mission Creek to December 28 for the Hamma Hamma River. In 1983 the span was 28 days, ranging from November 27 for Stimson Creek to December 25 for the Hamma Hamma and Pysht Rivers. No consistent overall pattern of earlier or later run timing as indicated by the median run completion dates was observed this year in comparison to 1983.

The North Fork Skokomish, Hamma Hamma, and Dosewallips rivers and Fulton Creek were surveyed for late-normal chum salmon. No salmon were seen in the latter two streams beyond

January 15. Chum salmon were last seen on January 21, in the North Fork Skokomish River and were present in late January in the Hamma Hamma River in numbers higher than those counted during earlier surveys. Live salmon were counted in the Hamma Hamma River until February 8 when surveys ended. The WDF surveyed Eagle and Jorsted creeks, two other streams with suspected runs of late-normal chum salmon. The WDF surveys ended on December 17 and we did not continue surveying these streams after the WDF stopped. The count on Jorsted Creek that day was higher than for any preceding day and for Eagle Creek it was not significantly lower in relation to any preceding day (from 1985 WDF salmon spawning ground data). Data gathered this year were not complete enough to clearly indicate a late-normal chum run that was separate and distinct from normal chum in any of the surveyed streams. Late salmon were present in some streams but if clear breaks in entry between the two "stocks" were present, they were not discernable from this year's survey data.

Escapement Estimates

Table 8 contains escapement estimates for normal chum salmon and Appendix 6 the area under the curve values used to make these estimates. The largest escapement estimate this year was for the Pysht River (2,108), followed by the North Fork Skokomish River (1,360), and the Dewatto River (1,189). The escapement estimates calculated for this season were larger than those calculated for the 1983-1984 season except for Vance and Kirkland creeks (combined total; 283 versus 509) and the Tahuya River (485 versus 726). In particular, the Dewatto River in combination with one of its tributaries (unnamed stream no. 150421) and Anderson Creek yielded about twice as many estimated spawners compared to 1983-1984 (969 versus 529 and 810 versus 385, respectively). The Lyre River had an estimated return of 285 that was almost six times as great as that of 1983-1984 (50) and the Pysht River had about three times as many estimated spawners this year as in last year (2,081 versus 773). The escapement estimates for the North Fork Skokomish and Union rivers on the other hand were very close to those calculated for last season (661 versus 631 and 679 versus 621, respectively).

Our escapement estimates for Area 12D tributaries (2,519), the Skokomish River (1,360) and tributaries to the Strait (2,832) were substantially lower than those of the WDF (5,331, 3,901 and 6,622, respectively). These differences may be the result of our use of survey life values that were almost always larger than the standard value of 10 days used by the WDF (Table 8).

Table 9 lists the survey life values calculated for normal chum salmon. This 1984-1985 season's survey life estimates when compared with those of last season on Caldervin Creek, Stimson Creek, Little Mission Creek, and the Lyre River

were at most, only three days apart. The North Fork Skokomish River normal chum survey life this season was nearly identical with that of 1983-1984. Streams that showed the greatest difference were the Dewatto River (19 days longer this year than last), Tahuya River (16 days longer this year), Union River (14 days longer this year) and Anderson Creek (15 days shorter this year). Normal chum survey life values this season ranged from 1.8 days for the South Fork Pysht River to 35.1 days for Vance Creek. The survey life values for 1983-1984 spanned from 6.5 to 31.6 days. The average value for this season of 16.4 days was lower than the 1983-1984 average of 19.5 days, and higher than this season's average of 11.8 days for early chum.

Juvenile Plants in Hood Canal Tributaries

Generally, a good return was evident for the 1984-1985 season in egg box streams. Stimson creek had an estimated escapement of 252 chum salmon and Anderson Creek had an estimated return of 821 salmon. The survey on the Tahuya River from the egg boxes at the head of the river to 0.7 of a river mile downstream revealed only adult coho salmon; however, that location is at approximately river mile 20 and it is doubtful that chum salmon would return that far upstream.

It is generally difficult to ascertain if the observed returning chum originated from egg boxes. It would be possible to do so if the run timing of egg box salmon (Hoodsport hatchery stock) were different enough to distinguish that stock from natural salmon stocks, or if numbers returning differed substantially between years of expected egg box returns and years of no expected egg box returns.

Egg box streams on the whole did not appear to exhibit the early run timing that would be expected for Hoodsport hatchery stock or a run timing that was similar between the eggbox streams. Run timing of egg box salmon on the Tahuya and Union rivers and possibly Anderson Creek, may have been obscured by the overlapping runs of two or more distinct natural stocks that enter these rivers.

Twanoh Creek had no egg box chum returning this year, yet we surveyed it and the return was good relative to the size of the stream (estimated escapement, 313). Other streams without egg boxes yielded large returns too, such as the North Fork Skokomish River.

Generally, we could not perceive apparent differences in returns between streams with and without egg boxes. The exception was Courtney Creek (a tributary to the Union river), an egg box stream that did have a large return which appeared out of proportion to stream size (peak count of 64). This relatively large return gave strong indication of a successful planting program on this stream.

Chum Salmon Sex Ratios

The tributaries to the western Strait showed more males than females with a female to male ratio of 1:1.2. More females than males were seen in tributaries of the eastern Strait and Hood Canal. Eastern Strait tributaries had the largest difference at a 1.4:1 female to male ratio. The ratio for Hood Canal tributaries was 1.1:1. The latter ratio is smaller than the 1.4:1 calculated for last season only for Hood Canal.

More females than males may be counted because they die in quiet water near their redds where our surveys take place. Males are often washed downstream or into deep pools and are less likely to be counted (Eames, et. al., 1981). The intercepting net fishery may also be responsible for the uneven sex ratios observed in fresh water assuming a 1:1 sex ratio at sea. Males may be more easily snagged by the nets due to their deformed toothy jaw (Young, 1986).

Summary

This year the spawner survey program was designed to answer specific questions regarding chinook, coho and especially chum salmon spawner activity in selected tributary streams of Hood Canal and the Strait of Juan de Fuca. Planning direction was provided by the tribes, staff biologists and from knowledge acquired from past surveys. Our effort focused on obtaining run timing, abundance and spawner distribution information. Surveys were coordinated with the WDF to avoid duplicating effort and to maximize the effectiveness of data collection.

The field surveys and data handling were performed identically to the 1983-1984 season with one exception; all spawner curves were formed by connecting data points with straight lines as opposed to developing Schnute and Sibert (1983) derived curves. Thus the problems associated with our methodology were the same as encountered in 1983-1984 (Young, 1986).

Interest in chinook salmon was confined to the South Fork Skokomish River and two tributaries to determine spawner distribution in that river and obtain information regarding the effects of the tribal juvenile planting program. No chinook salmon were seen above river mile 3.2 or in the two planted tributaries. It is suspected that fall chinook were unable to negotiate the constricted flows and drops beyond river mile 3.2.

Coho salmon surveys were concentrated mainly on the North fork Skokomish River, Sadie Creek and the Pysht River. Management concerns on the Dungeness River and interest in juvenile outplant production on tributaries to the Strait required a lesser survey effort.

Surveys of the North fork Skokomish River revealed a substantial run of coho salmon but the run was relatively poor on the Pysht River. Sadie Creek supported a run of coho salmon, that may have been a return from juvenile plants. Other major Strait systems revealed very low numbers of coho salmon. Planted streams were largely devoid of coho except for Sadie Creek, the Pysht River and Green Creek, possibly due to sport and troll fishery harvests or poor juvenile survival. Run timing for individual Strait streams was mostly dissimilar between this and the previous season where comparisons could be made. Our Dungeness River surveys allowed us to determine when sufficient numbers of coho spawners had passed upstream so that a tribal subsistence fishery could begin in the lower river. Our escapement estimates for the Skokomish River system and the Strait were considerably smaller than that of the WDF, probably due to major methodological differences in making estimates.

Surveys for chum salmon included all runs in selected tributaries from early to late-normal. Early chum salmon surveys were concentrated on tributaries of east Hood Canal and the eastern Strait, but we also surveyed with less effort to ascertain early chum salmon presence in tributaries to the western Strait. Normal chum surveys were directed to assess spawner distribution, run timing and abundance on the Skokomish river and major Strait tributaries; determine if the Hood Canal egg box streams were producing a run of returning adults; and look for quantitative evidence of late-normal chum in tributaries of western and southern Hood Canal.

Early chum salmon were more abundant in eastern Strait tributaries than in Hood Canal as was also found to be true in the previous season. Run timing was not found to be earlier in northern Hood Canal in comparison to southern Hood Canal nor was run timing of the tributaries to the Strait earlier than those of Hood Canal. Escapement estimates were generally higher than last season. Our estimates also were generally smaller than the WDF estimates especially for marine area 12D tributaries. Only a few chum salmon with early-normal run timing were observed in the Dungeness River and none were seen in Salt Creek, Deep Creek and the Lyre River.

Normal chum salmon were found in areas where occurrence and distribution were not previously known on the Skokomish River system, the West Twin, Lyre and Pysht rivers. Late-normal chum salmon were found in good numbers in the North Fork Skokomish River and the Hama Hama River. The run timing of most of the runs this season closely paralleled that of the previous season. The largest escapement estimate was made for the Pysht River followed by the North Fork Skokomish River. These estimates were higher than for the previous season as were estimates for most of the streams surveyed. Generally, our estimates were substantially lower than those of the WDF where comparisons could be made. Observed chum salmon sex ratios this year confirmed conclusions drawn for the previous season;

that is, more females than males were returning to spawn.

No clear indication of adult returns from the egg box program could be derived from surveys on the Hood Canal egg box streams except in Courtney Creek where a larger than capacity escapement did occur. A substantial number of chum salmon did return to Twanoh Creek, where we were not expecting returns, and were possibly progeny from former outplants under the egg box program.

References

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- 2) Eames, M., T. Quinn, K. Reidinger, and D. Haring. 1981. Northern Puget Sound 1976 adult coho and chum tagging studies. Wash. Dept. of Fish. Tech. Report No. 64. 217 p.
- 3) Schnute, J., and J. Sibert. 1983. The Salmon terminal fishery: A practical comprehensive timing model. Can. J. Fish. Aquat. Sci. 40: 835-853.
- 4) Young, C. 1986. 1983-1984 Spawner survey report for chum and coho salmon of Hood Canal and Strait of Juan de Fuca. Point No Point Treaty Council: Tech. Report No. 86-01. 89 p.

Tables

Table 1. Coho salmon run timing by stream.

STREAM NAME	WRIA AND STREAM NO.	10%	30%	50%	70%	90%
<u>HOOD CANAL</u>						
N.F. Skok.	160001	11/15	12/5	12/14	12/23	1/9
Richert Spr.	160010	11/8	11/12	11/15	11/27	12/7
Swift	160012	11/10	12/14	12/18	12/21	1/1
Vance	160013	11/11	12/6	12/13	12/23	1/11
Kirkland	160014	12/10	12/15	12/18	12/22	12/30
Unnamed	160015	12/10	12/16	12/20	12/24	12/29
Fir	160016	11/10	12/14	12/17	12/22	1/2
<u>STRAIT OF JUAN DE FUCA</u>						
East Twin*	190082	12/13	12/16	12/19	12/23	1/2
Sadie*	190083	11/8	11/15	11/25	12/4	12/13
West Twin	190093	12/6	12/14	12/21	12/29	1/5
Deep	190103	12/6	12/12	12/16	12/20	12/28
Pysht*	190113	10/15	11/2	11/18	12/8	12/24
S.F. Pysht*	190115	11/9	11/17	11/26	12/5	12/25
Green*	190120	11/8	11/27	12/7	12/14	12/24
Unnamed	190121	12/2	12/8	12/16	12/24	12/29
Needham	190122	11/27	12/5	12/13	12/22	12/30

* Coho salmon outplanted streams.

Table 2. Coho salmon escapement estimates by stream.

<u>STREAM NAME</u>	<u>TRIB TO MARINE AREA</u>	<u>WRIA AND STREAM NO.</u>	<u>ESCAPEMENT ESTIMATE</u>
<u>HOOD CANAL</u>			
N.F. Skokomish	12C	160001	739
Hunter		160007	8
Richert Springs		160010	125
Swift		160012	24
Vance		160013	119
Kirkland		160014	90
Unnamed		160015	81
Fir		160016	19
<u>STRAIT OF JUAN DE FUCA</u>			
East Twin*	5	190082	42
Sadie*		190083	73
West Twin	5	190093	11
Deep	5	190103	17
Pysht*	5	190113	80
S.F. Pysht*		190115	21
Green*		190120	52
Unnamed		190121	29
Needham		190122	55

* Coho salmon outplanted streams.

Table 3. Coho salmon survey life estimates.

STREAM NAME	WRIA AND STREAM NO.	MEDIAN DAY*		SURVEY LIFE
		LIVE	DEAD	
<u>HOOD CANAL</u>				
N.F. Skokomish	160001	348.3 (12/14)	388.5 (1/24)	40.2
Richert Springs	160010	318.6 (11/15)	NO DEAD	-----
Swift	160012	352.2 (12/18)	368.3 (1/3)	16.1
Vance	160013	346.7 (12/13)	377.4 (1/12)	30.7
Kirkland	160014	352.4 (12/18)	369.7 (1/5)	17.3
Unnamed	160015	354.1 (12/20)	359.2 (12/25)	5.1
Fir	160016	351.4 (12/17)	362.4 (12/28)	11.3
<u>STRAIT OF JUAN DE FUCA</u>				
East Twin	190082	352.8 (12/19)	342.5 (12/9)	(-)
Sadie	190083	328.6 (11/25)	333.0 (11/29)	4.4
West Twin	190093	354.9 (12/21)	372.9 (1/8)	18.0
Deep	190103	350.2 (12/16)	361.5 (12/28)	11.3
Pysht	190113	322.4 (11/18)	358.5 (12/25)	36.1
S.F. Pysht	190115	330.1 (11/26)	358.3 (12/24)	28.2
Green	190120	341.2 (12/7)	361.1 (12/27)	19.9
Unnamed	190121	350.1 (12/16)	364.8 (12/31)	14.7
Needham	190122	346.8 (12/13)	366.0 (1/1)	19.2

* Median day is expressed as an annual day number falling between day 1 and day 365 except when that day falls in the following year - then the day number progresses beyond 365.

Table 4. Early chum salmon run timing by stream

<u>STREAM NAME</u>	<u>WRIA AND STREAM NO.</u>	<u>10%</u>	<u>30%</u>	<u>50%</u>	<u>70%</u>	<u>90%</u>
<u>HOOD CANAL</u>						
Dewatto	150420	9/20	9/25	10/4	10/9	10/13
Tahuya*	150446	9/21	9/28	10/2	10/6	10/11
B. Mission	150495	10/2	10/8	10/10	10/12	10/15
Union*	150503	9/10	9/15	9/20	9/24	10/1
Lilliwaup	160230	9/26	9/29	10/3	10/7	10/12
Hamma Hamma	160251	9/17	9/25	9/29	10/3	10/9
Duckabush	160351	9/25	9/30	10/4	10/9	10/18
Dosewallips	160442	9/14	9/22	9/28	10/3	10/8
L. Quilcene	170076	9/13	9/18	9/23	9/28	10/9
<u>STRAIT OF JUAN DE FUCA</u>						
Snow	170219	9/26	10/3	10/8	10/14	10/22
Salmon	170245	9/21	9/27	10/3	10/11	10/24
Jimmycome- lately	170285	9/15	9/22	10/1	10/11	10/25

* Egg box streams

Table 5. Early chum salmon escapement estimates by stream.

<u>STREAM NAME</u>	<u>TRIB TO MARINE AREA</u>	<u>WRIA AND STREAM NO.</u>	<u>ESCAPEMENT ESTIMATE</u>
<u>HOOD CANAL</u>			
Dewatto	12C	150420	45
Tahuya*	12D	150446	245
Big Mission	12D	150495	53
Union*	12D	150503	174
Little Quilcene	12A	170076	126
<u>STRAIT OF JUAN DE FUCA</u>			
Snow	6B	170219	316
Salmon	6B	170245	538
Jimmycomelately	6B	170285	401

* Egg box streams

Table 6. Early chum salmon survey life estimates.

STREAM NAME	WRIA AND STREAM NO.	MEDIAN DAY*		SURVEY LIFE
		LIVE	DEAD	
<u>HOOD CANAL</u>				
Dewatto	150420	277.4 (10/4)	276.7 (10.5)	(-)
Tahuya	150446	275.0 (10/2)	281.3 (10/8)	6.3
Big Mission	150495	283.0 (10/10)	287.2 (10/14)	4.2
Union	150503	263.2 (9/20)	272.7 (9/30)	9.5
L. Quilcene	170076	266.2 (9/23)	281.7 (10/9)	15.5
<u>STRAIT OF JUAN DE FUCA</u>				
Snow	170219	281.2 (10/8)	295.4 (10/22)	14.2
Salmon	170245	276.0 (10/3)	292.1 (10/19)	16.1
Jimmycome- lately	170285	274.1 (10/1)	290.6 (10/18)	16.5

* Median day is expressed as an annual day number falling between day 1 and day 365 except when that day falls in the following year - then the day number progresses beyond 365.

Table 7. Normal chum salmon run timing by stream.

STREAM NAME	WRIA AND STREAM NO.	10%	30%	50%	70%	90%
<u>HOOD CANAL</u>						
Twanch*	140134	11/18	11/25	11/30	12/6	12/19
Anderson*	150412	11/19	11/28	12/5	12/14	12/23
Dewatto	150420	11/11	11/26	12/9	12/20	12/31
Caldervin*	150445	11/23	11/29	12/4	12/10	12/18
Tahuya*	150446	11/6	11/19	12/1	12/11	12/25
Stimson*	150488	11/7	11/13	11/18	11/22	11/29
L. Mission	150493	10/30	11/5	11/10	11/15	11/26
B. Mission ₁	150495	10/30	11/6	11/15	11/21	12/5
B. Mission ₂	150495	11/17	11/20	11/23	11/26	12/1
Union ₁ *	150503	11/6	11/17	11/23	12/2	12/17
Union ₂	150503	11/5	11/12	11/20	11/28	12/6
N.F. Skok.	160001	11/30	12/10	12/17	12/24	1/1
Richert Spr.	160010	11/29	12/11	12/20	12/26	1/2
Vance	160013	11/11	11/23	12/2	12/10	12/23
Kirkland	160014	12/2	12/7	12/11	12/15	12/22
Unnamed	160015	11/22	12/2	12/6	12/10	12/14
Eagle	160243	11/15	11/26	12/8	12/17	12/28
Jorsted	160248	12/1	12/7	12/11	12/14	12/16
Hamma Hamma	160251	11/27	12/14	12/28	1/11	1/25
Duckabush	160351	11/22	12/6	12/12	12/22	1/1
Dosewallips	160442	12/8	12/11	12/13	12/18	12/31

Table 7. (Continued)

STREAM NAME	WRIA AND STREAM NO.	10%	30%	50%	70%	90%
L. Quilcene	170076	12/17	12/16	12/22	12/26	12/29
<u>STRAIT OF JUAN DE FUCA</u>						
Lyre	190031	11/26	12/5	12/11	12/17	12/26
West Twin	190093	12/5	12/7	12/8	12/10	12/13
Deep	190103	11/18	11/23	11/27	12/2	12/13
Pysht	190113	11/18	11/21	11/25	11/29	12/6
S.F. Pysht	190115	11/26	11/30	12/3	12/5	12/9
Green	190120	10/28	11/6	11/12	11/18	11/27
Needham	190122	11/13	11/19	11/21	11/24	11/28

* Egg box streams

Big Mission₁: River Miles: 0.0-2.1

Big Mission₂: River Miles: 3.2-5.1

Union₁: River Miles: 0.3 - 3.0

Union₂: River Miles: 5.3 - 6.0

Table 8. Normal chum salmon escapement estimates by stream.

STREAM NAME	TRIB TO MARINE AREA	WRIA AND STREAM NO.	ESCAPEMENT ESTIMATE
<u>HOOD CANAL</u>			
Twanoh*	12D	140134	313
Anderson*	12B	150412	731
Unnamed		150413	48
Unnamed		150414	31
Unnamed		150415	11
Dewatto	12C	150420	539
Unnamed		150421	430
Unnamed		150424	220
Caldervin*	12D	150445	126
Tahuya	12D	150446	485
Unnamed		150447	20
Unnamed		150461	7
Stimson*	12D	150488	252
Little Mission	12D	150493	602
Big Mission _{1,2}	12D	150495	970
Unnamed		150498	57
Union* _{1,2}	12D	150503	679
Courtney ₂		150505	49
N. F. Skokomish	12C	160001	661
Hunter		160007	81
Richert Springs		160010	307
Swift		160012	1
Vance		160013	195
Kirkland		160014	88
Unnamed		160015	16
Little Quilcene	12A	170076	148
<u>STRAIT OF JUAN DE FUCA</u>			
Lyre	5	190031	285
Susie		190034	1

Table 8. Continued.

STREAM NAME	TRIB TO MARINE AREA	WRIA AND STREAM NO.	ESCAPEMENT ESTIMATE
East Twin	5	190082	21
West Twin	5	190093	46
Deep	5	190103	392
Pysht	5	190113	2021
S.F. Pysht		190115	10
Green		190120	60
Unnamed		190121	2
Needham		190122	15

* Egg box systems

Table 9. Normal chum salmon survey life estimates.

STREAM NAME	WRIA AND STREAM NO.	MEDIAN DAY*		SURVEY LIFE
		LIVE	DEAD	
<u>HOOD CANAL</u>				
Twanch	140134	334.4 (11/30)	350.6 (12/17)	16.2
Anderson	150412	339.4 (12/5)	354.6 (12/21)	15.2
Dewatto	150420	343.3 (12/9)	369.5 (1/5)	25.7
Caldervin	150445	338.4 (12/4)	352.6 (12/19)	14.2
Tahuya	150446	335.3 (12/1)	363.7 (12/30)	28.4
Stimson	150488	321.6 (11/18)	335.1 (12/1)	13.5
L. Mission	150493	314.0 (11/10)	328.2 (11/24)	14.2
B. Mission ₁	150495	318.6 (11/15)	337.7 (12/4)	19.1
B. Mission ₂	150495	326.9 (11/23)	338.0 (12/4)	11.1
Unnamed	150498	320.1 (11/16)	338.8 (12/5)	18.7
Union ₁	150503	327.3 (11/23)	351.6 (12/18)	24.3
Union ₂	150503	323.9 (11/20)	347.5 (12/14)	23.6
Courtney	150505	319.2 (11/15)	335.3 (12/1)	16.1
N.F. Skokomish	160001	350.9 (12/17)	377.5 (1/13)	26.6
Richert Springs	160010	354.1 (12/20)	368.3 (1/3)	14.2
Vance	160013	336.1 (12/2)	371.2 (1/6)	35.1
Kirkland	160014	345.2 (12/11)	351.7 (12/18)	6.5
Unnamed	160015	340.1 (12/6)	344.9 (12/11)	4.8
L. Qulicene	170076	355.9 (12/22)	314.2 (11/10)	(-)
<u>STRAIT OF JUAN DE FUCA</u>				
Lyre	190031	345.1 (12/11)	365.0 (12/31)	19.9
West Twin	190093	342.0 (12/8)	342.0 (12/8)	0
Deep	190103	330.7 (11/27)	345.6 (12/12)	14.9
Pysht	190113	328.5 (11/25)	342.6 (12/9)	14.1

Table 9. Continued.

STREAM NAME	WRIA AND STREAM NO.	MEDIAN DAY*		SURVEY LIFE
		LIVE	DEAD	
S.F. Pysht	190115	336.8 (12/3)	338.6 (12/5)	1.8
Green	190120	315.9 (11/12)	330.4 (11/26)	14.50
Needham	190122	325.2 (11/21)	NO DEAD	

B. Mission₁: River miles 0.0-2.1

B. Mission₂: River miles 3.2-5.1

Union₁: River miles 0.3-3.0

Union₂: River miles 5.3-6.0

* Median day is expressed as an annual day number falling between day 1 and day 365 except when that day falls in the following year - then the day number progresses beyond 365.

APPENDICES

Appendix 1. Data used to form spawner curves by stream for coho salmon.

STREAM NAME	WRIA, STREAM NO. & RIVER MILES (RM)	DATE	%SEEN	LIVE	DEAD	COMMENTS
<u>HOOD CANAL</u>						
N.F. Skok.	160001 RM 9.0-13.4	10/1	99	0	0	
		10/23	90	61	0	
		11/5	50	64	0	
		11/19	75	34	0	
		11/26	85	337	0	
		12/3	80	409	5	
		12/10	90	588	5	
		12/17	90	618	12	
		12/26	90	512	25	
		1/2	90	277	34	
		1/7	90	106	0	
		1/15	90	69	9	
		1/21	95	133	168	
		1/28	90	112	120	
		2/4	90	54	73	
		2/11	99	0	0	
Richert Springs	160010 RM 0.0-0.5	10/30	99	0	0	
		11/6	75	12	0	
		11/13	80	100	0	
		11/14	90	35	0	
		11/19	75	4	0	
		11/26	90	30	0	
		12/3	80	20	0	
		12/10	85	17	0	
		12/17	80	0	0	
Swift	160012 RM 0.0-0.3	10/31	99	0	0	
		11/7*	95	6	0	
		11/15*	95	0	0	
		11/27*	75	1	1	
		12/7*	95	2	1	
		12/17*	95	15	4	
		12/18	90	29	5	
		12/26*	95	3	0	
		1/3*	90	3	4	
		1/10	95	3	10	0.0-0.4
1/17	99	0	0			

Appendix 1. (Continued)

STREAM NAME	WRIA, STREAM NO. & RIVER MILES (RM)	DATE	%SEEN	LIVE	DEAD	COMMENTS
Vance	160013 RM 0.0-1.7	10/17	99	0	0	
		10/24	90	7	0	
		12/6*	80	19	0	
		12/13	75	95	0	
		12/18	80	11	1	
		1/2	75	27	2	
		1/7	90	23	0	
		1/15	90	19	5	
		1/21	95	10	2	
		1/29	99	0	0	
Kirkland	160014 RM 0.0-0.6	11/6	99	0	0	
		11/7*	90	0	1	
		11/15*	95	2	0	
		11/27*	65	1	0	
		12/7*	90	6	0	
		12/17*	90	71	11	
		12/18	90	70	7	0.0-0.3
		12/26*	90	26	30	
		1/3*	95	11	42	
		1/10	95	2	74	0.0-0.3
1/17*	99	0	0			
Unnamed	160015 RM 0.0-0.9	11/15*	95	0	0	
		11/27*	80	0	1	
		12/7*	90	4	0	
		12/17*	90	18	2	
		12/26*	90	18	17	
		1/3*	95	1	0	
		1/10*	95	0	3	0.0-0.6
		1/11	99	0	0	
Fir	160016 RM 0.0-0.3	10/31	99	0	0	
		11/7*	90	3	0	
		11/15*	90	1	1	
		11/27*	65	0	0	
		12/7*	50	0	0	
		12/17*	85	11	0	
		12/26*	90	3	3	
		1/3*	95	2	2	
		1/10*	85	1	0	
		1/17	99	0	0	

Appendix 1. (Continued)

STREAM NAME	WRIA, STREAM NO. & RIVER MILES (RM)	DATE	%SEEN	LIVE	DEAD	COMMENTS
<u>STRAIT OF JUAN DE FUCA</u>						
Lyre	190031 RM 1.1-2.6	10/12	99	0	0	
		10/19	65	6	0	
		10/26	45	0	0	0.0-2.6
		11/9	40	0	0	
		11/16	60	2	0	
		12/5	60	12	0	0.0-2.6
		12/28	70	0	1	
E. Twin	190082 RM 1.8-3.1	10/31	55	0	0	0.2-2.5
		12/13	70	29	2	0.0-3.1
		12/28	80	5	0	
		1/4	90	5	1	
		1/8	90	4	1	
		1/15	99	0	0	
Sadie	190083 RM 1.2-2.2	10/25	35	0	0	1.4-1.6
		10/31	80	0	0	0.0-1.6
		11/9	80	31	0	
		11/16	80	23	1	0.0-2.2
		12/6	90	24	1	
		12/12	80	29	1	1.2-2.4
		12/19	90	1	0	1.2-2.7
		12/28	75	0	0	1.6-2.2
		1/4	90	3	0	1.6-2.2
		1/8	95	0	0	1.6-2.2
W. Twin	190093 RM varies	11/29	99	0	0	
		12/6	85	5	0	0.0-1.0
		1/3	90	5	0	1.0-1.8
		1/10	75	3	3	0.0-1.8
Deep	190103 RM 0.2-1.8	11/26*	75	0	0	
		12/3*	75	2	0	
		12/10*	75	5	0	
		12/17*	75	9	0	
		12/24*	80	3	2	
		1/2*	80	3	3	

Appendix 1. (Continued)

STREAM NAME	WRIA, STREAM NO. & RIVER MILES (RM)	DATE	%SEEN	LIVE	DEAD	COMMENTS
Pysht	190113 RM 5.1-11.0	10/5	70	0	0	3.5-1.0
		10/16/17	65	42	0	
		10/22	85	5	0	
		10/23	85	0	0	10.0-15.3
		10/29	50	22	0	3.5-11.9
		11/14	25	9	0	5.1-11.5
		11/19/20	75	3	0	5.1-11.6
		11/26/27	85	16	0	6.0-13.3
		12/3/4	80	43	2	6.0-11.9
		12/10/11	75	32	6	7.4-11.9
		12/18	75	23	5	7.4-11.9
		12/26/28	90	33	10	7.4-12.3
		1/3	85	7	11	7.4-11.9
		1/7	90	1	1	11.0-11.9
		1/11	85	0	0	11.9-13.3
S.F. Pysht	190115 5.7-7.6	10/30	35	0	0	0.0-1.9
		11/13*	35	4	0	
		11/19*	75	8	0	
		11/20	85	1	1	1.9-3.8
		11/26*	75	11	0	
		12/3*	75	5	0	
		12/4	80	3	0	0.0-1.9
		12/7	60	0	0	1.9-3.8
		12/10*	75	5	0	
		12/11	65	0	2	0.0-1.9
		12/17*	75	5	1	
		12/24*	80	4	2	
		1/2*	80	2	2	
		1/9	99	0	0	
Green	190120 RM 0.0-2.4	10/22	70	0	0	0.0-1.0
		10/29	70	4	2	0.0-1.0
		11/13	45	7	0	0.0-2.0
		11/19	40	0	0	0.0-2.0
		11/26	75	16	0	0.0-2.2
		12/3	75	12	1	
		12/10	70	22	0	
		12/17	60	15	0	
		12/27	90	10	10	
		1/2	80	1	1	
		1/7	90	3	7	
		1/15	50	0	0	

Appendix 1. (Continued)

STREAM NAME	WRIA, STREAM NO. & RIVER MILES (RM)	DATE	%SEEN	LIVE	DEAD	COMMENTS
Unnamed	190121 RM 0.0-1.0	11/26	99	0	0	
		12/3	80	12	0	
		12/10	70	9	0	
		12/17	60	5	0	
		12/26	50	9	2	
		1/2	80	2	3	
		1/7	80	0	1	
		1/15	65	1	0	
		1/22	99	0	0	
		Needham	190122 RM 0.0-1.5	10/30	65	0
11/14	80			4	0	0.0-1.5
11/20	75			0	0	0.0-1.5
12/4	80			27	0	
12/11	90			21	2	
12/27	90			23	5	
1/7	90			4	8	
1/15	80			0	2	
1/23	99			0	0	

* WDF data

Appendix 2. "Area under the curve" (A.U.C.) estimates for coho salmon.

<u>STREAM NAME</u>	<u>WRIA AND STREAM NO.</u>	<u>A.U.C. ESTIMATES</u>
<u>HOOD CANAL</u>		
N.F. Skokomish	160001	29,711.93
Richert Springs	160010	1309.00
Swift	160012	385.98
Vance	160013	2329.67
Kirkland	160014	1221.22
Unnamed	160015	412.34
Fir	160016	211.41
<u>STRAIT OF JUAN DE FUCA</u>		
Lyre	190031	527.95
East Twin	190082	1325.18
Sadie	190083	1307.64
West Twin	190093	214.16
Deep	190103	196.21
Pysht	190113	2876.36
S.F. Pysht	190115	401.90
Green	190120	1037.45
Unnamed	190121	432.21
Needham	190122	1062.43

Appendix 3. Data used to form spawner curves by stream for early chum salmon.

STREAM NAME	WRIA, STREAM NO. & RIVER MILES (RM)	DATE	%SEEN	LIVE	DEAD	COMMENTS
<u>HOOD CANAL</u>						
Dewatto	150420 RM 0.0-1.8	9/14	95	0	0	0.0-0.5
		9/20*	90	19	1	
		9/26	95	13	2	
		10/3*	90	8	10	
		10/10*	40	14	0	
		10/14	85	5	2	
		10/23*	90	1	1	
		10/29	90	2	3	0.0-0.9
		10/30*	70	0	1	
		Tahuya	150446 RM Variable	9/4	99	0
9/11*	95			5	0	0.2-2.3
9/14	95			2	0	0.2-1.5
9/20*	90			26	0	0.0-1.0
9/26*	90			33	1	0.0-1.0
9/28	90			72	3	0.3-2.5
10/5*	90			81	20	0.1-2.3
10/8	90			40	35	0.0-3.7
10/10	35			25	11	0.3-3.7
10/11*	75			33	19	0.1-2.3
10/15	95			10	19	0.0-3.7
10/16*	80			8	23	0.0-2.3
10/19	99			0	0	
Big Mission	150495 RM 0.0-2.1	9/19	99	0	0	
		9/26*	99	3	0	0.0-1.6
		10/1	95	1	3	
		10/3*	99	3	0	0.0-1.6
		10/9	90	17	2	
		10/11*	99	21	1	0.0-1.6
		10/16	95	9	11	
		10/19	99	0	0	
Union	150503 0.3-3.0	9/4	99	0	0	
		9/11*	95	54	8	0.3-1.8
		9/19*	90	50	29	0.3-1.8
		9/21	95	96	73	0.0-3.0
		9/28*	85	18	64	0.3-2.3
		10/1	75	23	142	
		10/5*	85	2	33	0.3-2.3
		10/9	75	4	53	
		10/11*	40	6	16	0.3-2.3
		10/16	75	1	23	
		10/20	99	0	0	

Appendix 3. (Continued).

<u>STREAM NAME</u>	<u>WRIA, STREAM NO. & RIVER MILES (RM)</u>	<u>DATE</u>	<u>%SEEN</u>	<u>LIVE</u>	<u>DEAD</u>	<u>COMMENTS</u>
L. Quilcene	170076 RM 0.0-1.8	9/1	99	0	0	
		9/7	95	6	0	0.2-0.8
		9/18	95	53	7	0.0-0.8
		9/24*	99	47	20	
		9/25	95	70	26	0.0-1.0
		10/2*	99	9	62	
		10/3*	80	13	71	
		10/8*	99	18	69	
		10/11	85	5	52	
		10/15*	90	1	49	
		10/17	90	13	41	0.0-0.8
		10/22*	99	0	46	
		10/25	90	11	35	0.0-0.8
		10/29*	99	0	14	
11/5	99	0	0			
<u>STRAIT OF JUAN DE FUCA</u>						
Snow	170219 RM 0.0-1.5	9/10	99	0	0	
		9/17	90	11	0	0.1-1.5
		9/24	70	47	0	0.0-0.8
		10/2	65	105	18	
		10/10	60	98	133	
		10/18	95	105	68	
		10/24	85	57	82	
		10/31	90	11	68	
		11/7	55	0	17	
		11/15	99	0	0	
Salmon	17245 RM 0.0-1.5	9/10	90	0	0	
		9/17	90	73	6	0.1-1.5
		9/24	95	294	43	0.1-1.5
		10/2	95	277	214	
		10/10	75	134	375	
		10/18	95	113	405	
		10/24	90	114	412	
		10/31	90	43	468	
		11/7	60	1	47	
		11/14	75	1	11	
11/21	99	0	0			

Appendix 3. (Continued).

STREAM NAME	WRIA, STREAM NO. & RIVER MILES (RM)	DATE	%SEEN	LIVE	DEAD	COMMENTS
Jimmycome- lately	170285 0.0-0.7	9/5	80	0	0	0.0-0.2
		9/10	95	33	1	
		9/17	95	112	16	
		9/24	95	8	98	
		10/2	95	77	236	
		10/10	75	59	264	
		10/18	95	40	351	
		10/24	90	43	298	
		10/31	90	32	365	
		11/7	50	2	49	
		11/14	75	0	12	
		11/21	99	0	0	

* WDF data

Appendix 4. "Area under the curve" (A.U.C.) estimates for early chum salmon.

<u>STREAM NAME</u>	<u>WRIA AND STREAM NO.</u>	<u>A.U.C. ESTIMATES</u>
<u>HOOD CANAL</u>		
Dewatto	150420	524.68
Tahuya	150446	1540.36
Big Mission	150495	221.68
Union	150503	1455.96
Little Quilcene	170076	1263.89
<u>STRAIT OF JUAN DE FUCA</u>		
Snow	170219	4483.22
Salmon	170245	8662.21
<u>Jimmycomelately</u>	170285	3825.20

Appendix 5. Data used to form spawner curves by stream for normal chum salmon.

STREAM NAME	WRIA, STREAM NO. & RIVER MILES (RM)	DATE	% SEEN	LIVE	DEAD	COMMENTS
<u>HOOD CANAL</u>						
Twanoh	140134 RM 0.0-0.3	11/7*	99	0	0	
		11/8*	95	12	1	
		11/14*	99	37	19	
		11/19*	99	47	32	
		11/21	90	88	41	0.0-.5
		11/27	80	86	60	0.0-.5
		11/28*	85	118	27	
		12/4	90	92	85	0.0-.5
		12/6*	99	126	97	
		12/12*	99	0	203	
		12/17*	99	51	177	
		1/2*	99	0	122	
		1/9	99	0	0	
		Anderson	150412 RM 0.0-1.1	10/3*	99	0
10/10*	99			1	0	0.0-.0
10/16*	99			0	0	
10/23*	99			0	0	
10/30*	99			1	0	
11/6*	80			4	0	
11/15*	90			51	1	
11/21	85			162	5	
12/5*	90			176	34	
12/6	85			77	11	0.1-1.1
12/13*	90			211	72	
12/26*	95			88	86	
1/2*	95			21	62	
1/9	99			0	0	
Dewatto	150420 RM 0.0-1.8	10/3*	70	0	1	
		11/5	60	77	3	
		11/15*	50	59	0	
		11/19	45	50	2	
		11/26	65	153	20	
		12/3	50	53	24	
		12/10	80	162	47	
		12/19	90	179	30	
		12/27	90	202	106	
		1/3	90	95	75	
		1/8	90	33	88	
		1/16	90	14	110	0.0-0.9
		1/22	90	3	113	
		1/29	99	0	0	

Appendix 5. (Continued).

STREAM NAME	WRIA, STREAM NO. & RIVER MILES (RM)	DATE	%SEEN	LIVE	DEAD	COMMENTS
Caldervin	150445 RM 0.0-0.7	11/15*	99	0	0	0.0-0.3
		11/21	90	31	1	
		11/27	30	18	2	
		12/4	90	68	12	
		12/5*	99	69	15	0.0-0.3
		12/13*	99	48	47	0.0-0.3
		12/26*	99	6	57	0.0-0.3
		1/2	99	0	0	
Tahuya	150446 RM 0.0-3.7	10/19	99	0	0	
		10/22	90	15	18	0.2-3.7
		10/29	90	49	7	
		11/5	40	81	9	
		11/19	40	81	0	
		12/10	80	245	62	
		12/19	80	133	52	
		12/27	90	112	53	
		1/3	75	53	48	
		1/8	80	33	127	
		1/16	90	0	106	
		1/23	99	0	0	
		Stimson	150488 RM 0.0-1.1	10/30	99	0
11/6*	99			71	3	0.0-0.6
11/15*	99			158	11	0.0-0.6
11/21	90			137	54	
11/27	30			24	36	
12/4	90			32	36	
12/5*	99			13	40	0.0-0.6
12/13*	99			0	48	0.0-0.6
12/21	99			0	0	
L. Mission	150493 RM varies	10/11*	99	0	0	0.0-0.3
		10/16*	99	1	0	0.0-0.8
		10/23*	99	14	1	0.0-0.8
		10/30*	99	196	6	0.0-0.8
		11/5*	99	363	25	0.0-0.8
		11/13	75	256	85	0.0-1.0
		11/15*	99	250	114	0.0-0.8
		11/20	75	122	154	0.0-1.2
		11/21*	99	129	206	0.0-0.8
		12/4	65	29	31	0.0-1.0
		12/11	85	27	31	0.0-1.0
		12/13*	99	1	75	0.0-0.8
		12/21	90	0	26	0.0-1.1
12/28	90	1	39	0.0-1.1		
1/4	90	0	23	0.0-1.1		
1/11	99	0	0			

Appendix 5. (Continued)

STREAM NAME	WRIA, STREAM NO. & RIVER MILES (RM)	DATE	%SEEN	LIVE	DEAD	COMMENTS
Big Mission ₁	150495 RM 0.0-2.1	10/19	99	0	0	
		10/23	90	85	8	
		10/30	90	208	240	
		11/5*	90	518	65	
		11/6	55	120	20	
		11/13	60	252	70	
		11/15*	85	362	103	
		11/20	60	253	186	
		11/21*	75	264	199	
		12/4	65	51	48	
		12/5*	90	143	110	
		12/11	80	94	150	
		12/13*	90	74	239	
		12/21	90	7	16	
		12/28	90	5	125	
		1/2*	99	1	1	
		1/4	90	3	47	
1/9	90	0	29			
1/16	99	0	0			
Big Mission ₂	150495 RM 3.2-5.1	11/13	99	0	0	
		11/20*	85	17	1	
		12/4*	90	3	0	
		12/11*	85	0	3	
Unnamed	150498 RM 0.0-0.8	11/5*	95	0	0	
		11/13*	85	36	0	
		11/20*	90	16	0	
		12/11*	90	0	2	
Union ₁	150503 RM 0.3-3.0	10/20	99	0	0	
		10/23	85	9	13	
		10/30	70	53	6	
		11/6	60	45	2	
		11/13	60	95	1	
		11/15*	80	142	36	0.3-1.8
		11/20	60	179	42	
		12/4	60	65	39	
		12/7*	80	117	108	0.3-1.8
		12/11	75	60	27	
		12/13*	85	87	109	0.3-1.8
		12/21	90	46	96	
		12/28	90	28	96	
1/4	90	14	54	0.3-1.8		
1/9	90	5	60	0.3-1.8		
1/16	99	0	0			

Appendix 5. (Continued)

STREAM NAME	WRIA, STREAM NO. & RIVER MILES (RM)	DATE	%SEEN	LIVE	DEAD	COMMENTS
Union ₂	150503 RM 5.3-6.0	10/29	99	0	0	
		11/5*	95	49	0	
		11/13*	85	30	2	
		11/20*	85	37	8	
		12/4*	85	32	11	
		12/11*	95	10	36	
		12/19*	90	1	11	
		12/28*	90	0	25	
		1/4*	85	1	9	
		1/11	99	0	0	
		Courtney	150505 RM 0.0-0.8	10/29	99	0
11/5*	95			3	0	
11/13*	90			33	0	
11/20*	90			18	3	
11/29*	65			3	3	
12/4*	90			0	4	
12/11*	95			0	3	
12/18	99			0	0	
N. F. Skok.	160001 RM 9.0-13.4			10/16	99	0
		10/23	90	7	0	
		11/5	50	8	0	9.0-10.0
		11/19	75	5	0	
		11/26	85	140	5	
		12/3	80	210	10	
		12/10	90	452	54	
		12/17	90	506	100	
		12/26	90	434	207	
		1/2	90	216	313	
		1/7	90	76	365	
		1/15	90	35	382	
		1/21	95	13	385	
		1/28	90	0	491	
2/3	99	0	0			
Richert Springs	160010 RM 0.0-0.5	11/6	75	0	0	
		11/13	80	19	0	
		11/14	90	16	0	
		11/19	75	9	0	
		11/26	90	32	0	
		12/3	80	30	0	
		12/7	85	50	23	
		12/10	85	126	55	
		12/17	80	60	29	
12/26	90	163	169			

Appendix 5. (Continued).

STREAM NAME	WRIA, STREAM NO. & RIVER MILES (RM)	DATE	%SEEN	LIVE	DEAD	COMMENTS
Richert Springs Cont.		1/2	85	56	136	
		1/7	80	26	161	
		1/15	90	9	92	
		1/22	90	0	101	
		1/29	99	0	0	
Vance	160013 RM 0.0-1.7	10/24	90	0	0	
		12/6*	80	154	17	
		12/13	80	118	33	
		12/18	75	50	8	
		1/2	90	39	50	
		1/7	90	8	79	
		1/15	90	0	106	0.0-3.6
		1/21	95	0	72	
		1/23	99	0	0	
Kirkland	160014 RM 0.0-0.6	11/14	90	0	0	0.0-0.3
		11/27*	65	1	7	
		12/7*	90	26	24	
		12/17*	90	27	24	
		12/18	90	9	29	0.0-0.3
		1/3*	95	1	5	
		1/10*	85	0	23	0.0-0.4
		1/17	99	0	0	
Unnamed	160015 RM 0.0-0.9	11/15*	95	1	0	
		11/27*	80	1	0	
		12/7*	90	4	2	
		12/17*	90	2	3	
		12/18	90	0	1	0.0-0.5
Hamma Hamma	160251 RM 0.0-2.3	11/5	99	0	0	
		12/6*	80	106	5	0.0-1.0
		1/23	90	138	372	
		1/28	90	113	434	
		2/4	90	20	495	0.3-1.1
		2/8	85	3	0	0.3-1.1
		2/11	99	0	0	
Little Quilcene	170076 RM 0.0-1.8	10/29*	99	0	0	
		11/1	90	6	28	0.0-0.8
		12/4*	60	0	0	
		12/11*	85	31	0	
		12/19*	80	37	0	
		12/27*	90	86	3	
		1/3	99	0	0	

Appendix 5. (Continued)

STREAM NAME	WRIA, STREAM NO. & RIVER MILES (RM)	DATE	%SEEN	LIVE	DEAD	COMMENTS
<u>STRAIT OF JUAN DE FUCA</u>						
Lyre	190031 RM 0.0-2.6	10/26	45	0	0	
		11/16	20	2	0	0.0-1.1
		12/5	60	93	35	
		12/12	70	166	71	
		12/19	75	104	19	
		12/28	70	31	103	
		1/4	80	27	61	
		1/8	90	17	52	
		1/16	75	3	15	
		1/23	99	0	0	
		West Twin	190093 RM 0.1-1.8	12/3	85	0
12/6	85			36	4	0.0-1.0
12/13	80			10	2	0.0-1.0
12/13	80			0	0	
12/28	95			2	0	0.0-1.0
1/3	90			0	0	
Deep	190103 RM 0.2-2.0	11/13*	25	0	0	
		11/19*	75	203	1	
		11/26*	75	206	23	
		12/3*	75	110	54	
		12/10*	75	65	72	
		12/17*	75	33	54	
		12/24*	80	13	31	
		1/2*	80	8	18	
		1/9	99	0	0	
Pysht	190113 RM 5.1-11.0	10/13	50	0	0	3.5-10.0
		10/16	65	1	0	5.1-7.2
		10/29	80	3	0	9.2-11.0
		10/30	35	4	0	5.1-7.2
		11/14	25	0	0	7.4-11.0
		11/19/20	75	1433	74	
		11/26/27	75	1042	453	
		12/3/4	75	457	714	
		12/10/11	75	116	751	
		12/18	75	51	404	
		12/26	80	24	220	7.4-11.0
		1/3	80	8	103	7.4-11.0
		1/10	99	0	0	

Appendix 5. (Continued)

STREAM NAME	WRIA, STREAM NO. & RIVER MILES (RM)	DATE	%SEEN	LIVE	DEAD	COMMENTS
S.F. Pysht	190115 RM 0.0-1.9	11/20	85	0	0	1.9-3.8
		12/4	80	7	3	
		12/11	65	1	2	
		12/18	99	0	0	
Green	190120 RM 0.0-1.0	10/16	85	0	0	0.2-2.0 0.0-2.2 0.0-2.4
		11/13	45	15	0	
		11/19	40	9	2	
		11/26	75	11	6	
		12/3	75	5	2	
		12/10	75	0	1	
Needham	190122 RM 0.0-1.5	10/30	65	0	0	0.0-1.8
		11/14	80	2	0	
		11/20	75	11	0	
		12/4	80	0	0	

* WDF data

Appendix 6. "Area under the curve" (A.U.C.) estimates for normal chum salmon.

<u>STREAM NAME</u>	<u>WRIA AND STREAM NO.</u>	<u>A.U.C. ESTIMATES</u>
<u>HOOD CANAL</u>		
Twanoh	140134	3128.06
Anderson	150412	7639.04
Dewatto	150420	10,849.58
Caldervin	150445	1782.22
Tahuya	150446	13,766.78
Stimson	150488	3405.35
Little Mission	150493	8551.14
Big Mission ₁	150495	1411.75
Big Mission ₂	150495	245.00
Unnamed	150498	566.54
Union ₁	150503	8188.11
Union ₂	150503	1600.53
Courtney	150505	490.99
N.F. Skokomish	160001	17,575.39
Richert Springs	160010	4352.96
Vance	160013	6855.28
Kirkland	160014	568.69
Unnamed	160015	76.73
Little Quilcene	170076	1480.20
<u>STRAIT OF JUAN DE FUCA</u>		
Lyre	190031	5667.58
West Twin	190093	277.62
Deep	190103	5833.33

Appendix 6. Continued.

<u>STREAM NAME</u>	<u>WRIA AND STREAM NO.</u>	<u>A.U.C. ESTIMATES</u>
Pysht	190113	28,491.65
S.F. Pysht	190115	102.64
Green	190120	862.25
Needham	190122	172.92

B. Mission₁: 0.3-3.0
B. Mission₂: 3.2-5.1

Union₁: 0.3-3.0
Union₂: 5.3-6.0