PNPTC 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

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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.

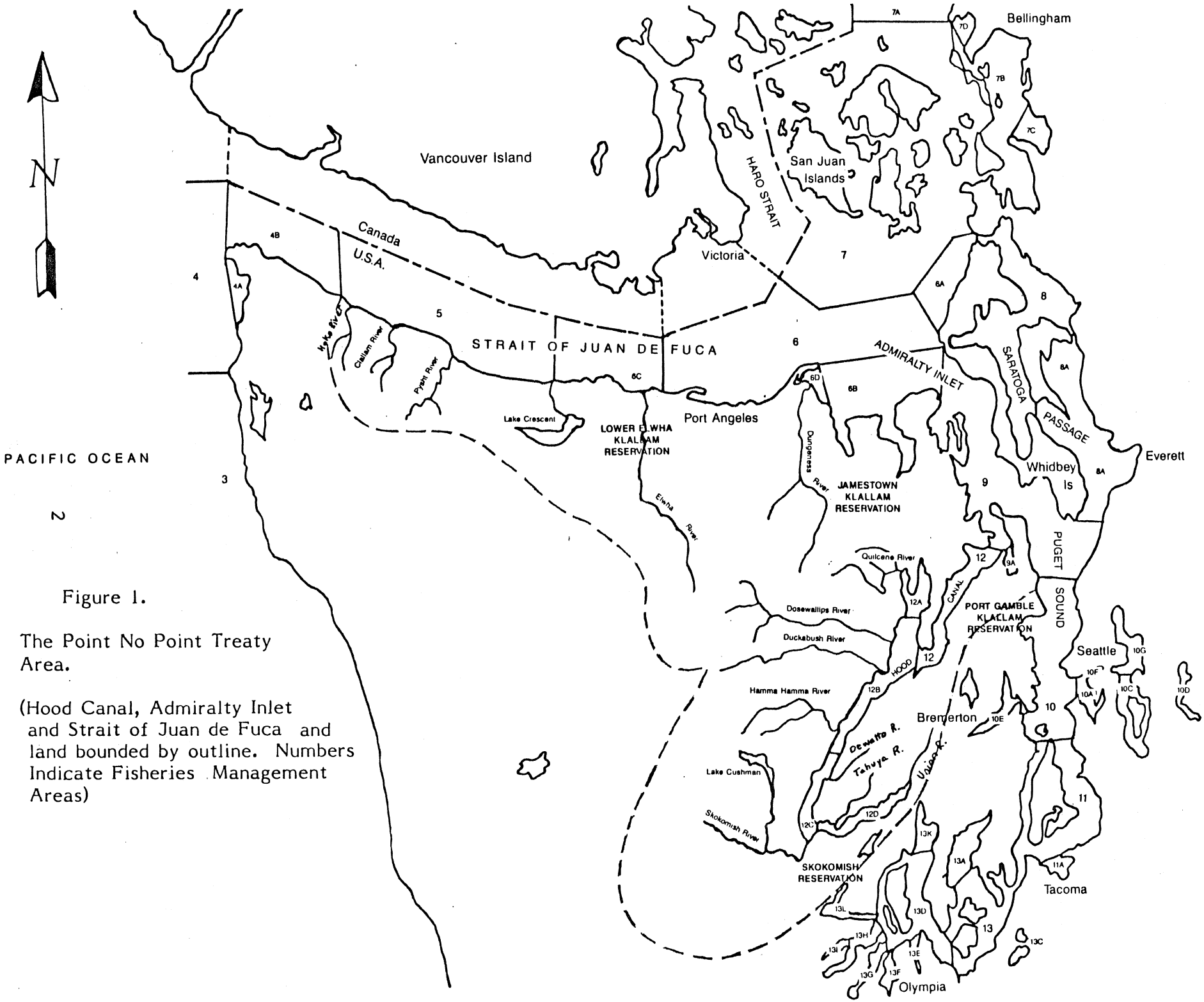

Figure 1.

The Point No Point Treaty Area.

(Hood Canal, Admiralty Inlet and Strait of Juan de Fuca and land bounded by outline. Numbers Indicate Fisheries Management Areas)

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 timimg and abundance, we wanted to determine the distribution of chum spawners. We also had a particular interest in the occurance 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 nessasary.

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 streams'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 cummulative 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, unnnamed (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