PNPTC Technical Report TR 86-1

1983-1984 Salmon Spawner Survey Report for Chum and Coho Salmon of Hood Canal and Strait of Juan de Fuca

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Submitted as part of the Final Report for
Contract # PL 93-638 POOC14207642
(Jobs Bill, FY 83-FY 84)

Sponsored by

U.S. Department of the Interior
Bureau of Indian Affairs

February, 1986

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Introduction

The Point No Point Treaty Council (PNPTC) was awarded a Federal Jobs Bill Contract in 1983 under which spawner surveys were conducted on Hood Canal and Strait of Juan de Fuca (Strait) tributaries in the treaty area during the 1983-1984 season. Survey planning was coordinated with the Washington Department of Fisheries (WDF) to insure maximum coverage of spawning areas and increase the data available for evaluating the escapement of naturally produced chum and coho salmon. The WDF currently surveys over 32 chum salmon and 30 coho salmon index areas and numerous supplemental areas in watersheds of Hood Canal and the Strait. The Washington Department of Game also performs surveys of salmon on two Strait tributaries, Snow Creek and Salmon Creek.

The PNPTC spawner survey program was designed to provide information on chum and coho salmon run timing, spawning distribution and magnitude of escapement to the spawning grounds. It was also expected that insight would be gained regarding survey techniques, potential new spawning ground index areas, and other general information useful for planning future spawner surveys. Anticipated side benefits included the possibility of confirming salmon utilization of areas potentially affected by hydroelectric proposals, identifying previously unrecognized habitat problems (e.g. blocks to fish passage) on the surveyed streams and evaluation of juvenile planting programs. The PNPTC spawner survey program was not planned nor used to monitor escapement for in-season harvest management.

Methods

Field Survey Design

Salmon spawner surveys were conducted on river systems within the Point No Point Treaty Area. This area includes systems which drain into Hood Canal, the west side of Admiralty Inlet and the Strait of Juan de Fuca west to, and including the Hoko River (Figure 1). Effort was concentrated on coho and chum salmon; however, chinook salmon, pink salmon and steelhead trout were counted and recorded when observed. An attempt was made to gain knowledge of species distribution, abundance and run timing by covering a large number of streams over a broad area. Accessibility to the stream and presence of a terminal area such as at impassable falls (insuring a total spawning count) were considered in selecting specific streams. We tried to survey all areas accessible to chum on a given stream but for coho we

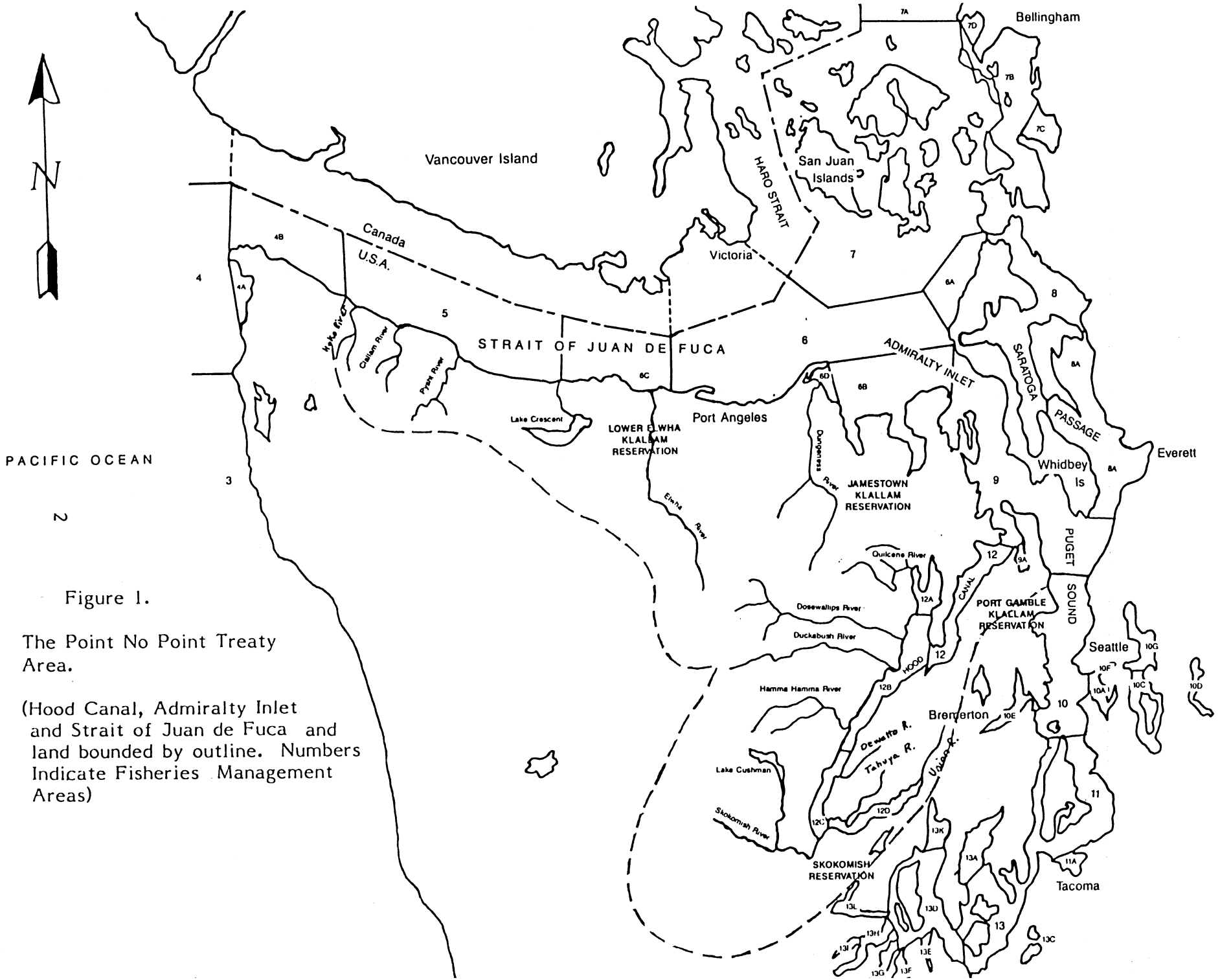

Figure 1.

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)

attempted to cover spawning areas and avoid transport areas wherever possible. Many streams surveyed in the past by the PNPTC in which salmon were known to occur were chosen. We decided to survey rivers and tributaries which were not surveyed or surveyed infrequently by the WDF and we duplicated surveys on 15 WDF index areas to compare counts. We also surveyed upstream and downstream of 15 WDF index areas (including some but not all of the same areas we duplicated) in an attempt to evaluate the effectiveness of these stream reaches as indexes.

Field Data Collection

Ten tribal members (2 each from the Port Gamble, Jamestown and Elwha tribes and 4 from the Skokomish Tribe) were hired to survey in areas closest to the respective tribal areas. Training of the ten surveyors began on Sept. 12, 1983. Surveys began on Sept. 19, 1983 and ended on Feb. 14, 1984; however, some surveys were begun earlier by permanent PNPTC fisheries staff. Foot and boat surveys were done by teams of two surveyors, consisting of a technician and a trainee. The surveyors worked either in pairs or 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 4 and 9 streams per day and .5 to 2 miles per stream depending on travel distances and the length of surveys. Boat surveys were rare but were used in those cases where the river was too deep to walk instream, inaccessible by foot (i.e., canyon) or too wide to view the opposite side, such as the Skokomish and Elwha rivers. Surveys were repeated every 7 days when water conditions permitted. Polaroid glasses were worn to provide better visibility and tally counters were used to record both live and dead fish. Care was taken to look for salmon under debris, undercut banks, overhanging vegetation and in deep pools. The following data were recorded in field books: counts of live and dead salmon, number of redds, river miles of observed spawning, sex of dead chum salmon, percent visibility and general comments concerning the weather, stream conditions, and habitat problems including the presence of fish passage barriers. Spawning areas were identified by the presence of redds and observation of spawning activity such as pairing, digging redds and aggressive behavior.

The field data were transferred daily to PNPTC forms and WDF data cards. The latter were forwarded to the WDF. The field supervisor was responsible for examining the data for accuracy and submitting it to a keypuncher for computer entry. Tables of the data were generated with the computer by stream and species.

Preliminary Data Assessment

Run timing, survey life and escapement were estimated from the survey data. Initially, the observed counts of live and dead coho and chum salmon were plotted versus time and polynomial curves were fitted using the University of Washington's Simplot Graphics Software (Academic Computer Center, 1982). These curves were used to inspect the data for outliers, check for completeness of run coverage and compare counts of live and dead salmon for consistency. This preliminary assessment served as the basis for further analysis described in the following sections.

Only data that met the following criteria were used in forming polynomial curves: 1) surveys spanned most or all of the freshwater run (i.e., zero counts at beginning and end) and 2) fish were counted on at least four consecutive surveys on the same reach. Separate curves were constructed for the early and normal compoments of the chum run. The criterion for separating early and normal chum runs was the occurrence of a low or zero count in October. Mainstem counts were added to tributary counts and tributary counts were added to other tributary counts of the same system and combined on one curve if they met these requirements: 1) Too few fish were counted to form a curve for a given creek (i.e., less than 4 counts or less than 10 fish total), 2) surveys on the combined streams were done on the same day or no more than one day apart, 3) peak counts of the streams occurred on or near the same day, and 4) the reaches surveyed were within 4 miles of each other. The WDF data were used to fill gaps in our survey data and to better define our spawner curves. The WDF data was used exclusively if the WDF surveys extended over a larger area or longer period of time than did ours.

Live counts were expanded based on estimated percent visibility. Counts with visibilities of less than 25 percent were discarded except on Stimson Creek, Dewatto River, Hunter Creek, Hamma Hamma Slough, Duckabush River, Dosewallips River, Tarboo Creek, Chimacum Creek, Dungeness River and Green Creek, where a shortage of data required lower visibility counts be used. New polynomial curves were subsequently developed with the observed values expanded for visibility and compared with the original unadjusted curves. We found visibility expansions did not change the form of the live spawner curves in most cases and thus decided to use adjusted curves because we believe they better represented actual numbers of salmon present. These decisions on visibility adjustments and the above described criteria for using and combining data to generate polynomial curves were also applied to the development of spawner curves described below.

Run Timing

The run timing of each species in each stream (where adequate data had been collected) was modeled by applying the four parameter equation developed by Schnute and Sibert (1983). The curve described by this method is responsive to data trends and can assume a variety of unimodal forms (including asymmetric and kurtotic curves). Parameters of the equation were estimated using the BMDP Derivative-Free Nonlinear Regression Program (Ralston, 1979). The 10, 30, 50, 70 and 90 percent complete days of the run were calculated from each curve (i.e., stream) for each species using the exact solution derived by Schnute and Sibert. Criteria for using the Schnute and Sibert method were the same as for generating the polynomial curves but also included the requirements of a unimodal distribution of spawner counts and a scheduled weekly survey frequency. Run timing calculations were not made for those streams where Schnute and Sibert curves were not developed.

Spawner Survey Life

On a given stream separate median dates indicating 50 percent run completion were determined from the Schnute and Sibert timing curves of live and dead salmon. The difference in number of days between the two median dates was then taken as an estimate of spawner survey life for the given stream. Survey life in this case is defined as the number of days that the average salmon can be counted on the spawning grounds as a live fish in the area surveyed. It is not always equal to the total fresh water life (stream life); for example, a salmon may remain for several weeks in the mainstem of a large river prior to moving to smaller tributaries where it is surveyed. In some cases with respect to coho, there were too few or no dead salmon observed in relation to live, precluding an estimate of survey life. Survey life was estimated to facilitate escapement estimates as described below.

Escapement

Escapement estimates were made on a stream by stream basis except as otherwise noted below. Data from the WDF surveys on streams in the Point No Point treaty area were used in addition to the PNPTC data. It was assumed that unsurveyed streams contributed very little to escapement and, therefore, no attempt was made to estimate escapement for those streams.

Escapements were estimated using the "area under the curve" methodology. The area under the curve is calculated as that area under the curve that results from plotting number of fish versus day of count (i.e., run timing curve). Estimates of the