



**The Snake River, Eldorado River
and Pilgrim River Salmon
Escapement Enumeration and
Sampling Project Summary
Report, 2002**

**Kawerak Inc.
P.O. Box 948
Nome, Alaska 99762**

To

**The Alaska Department of Fish and Game
Commercial Fisheries Division, AYK Region
333 Raspberry Road
Anchorage, Alaska 99518-1599**

Authors: **Spencer Waitman.** Fisheries Biologist for Kawerak Inc., Division of Natural Resources, Fisheries Department to January 2003
Karen Dunmall. Fisheries Biologist for Kawerak Inc., Division of Natural Resources, Fisheries Department

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Project Sponsorship

Kawerak Inc. operated these projects in cooperation with the Alaska Department of Fish and Game, Commercial Fisheries Division in Nome, Alaska.

Funding for these projects was provided by the Bering Sea Fishermen's Association, the Norton Sound Economic Development Corporation (NSEDC) and the Norton Sound Sustainable Salmon Initiative.

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Abstract:

Kawerak Inc. operated salmon escapement enumeration and sampling projects on the Snake, Eldorado and Pilgrim Rivers in the 2002 season. These projects provide salmon escapement and biological (age, sex, and length) data to the Alaska Department of Fish and Game for the in season management of subsistence and sport fisheries in the Nome Sub district and Port Clarence District management areas. Although Kawerak Inc. has operated these projects in the past, the 2002 season represents the longest duration and has the most consistent data of all previous years.

Within the Nome Sub district, salmon escapement remains depressed as it appears that the chum and coho returns continue to be poor or in decline. Escapement on the Snake River was counted from June 28 to September 16, 2002 at 9 chinook (*Oncorhynchus tshawytscha*), 2,776 chum (*O. keta*), 4,103 pink (*O. gorbuscha*), 409 coho (*O. kisutch*) and 8 sockeye (*O. nerka*) salmon. In addition, 442 coho were counted by aerial survey below the weir site on September 18, 2002, which was after the weir was removed. Although these fish were not added to the total count, they should not be overlooked when evaluating the total season run strength for the species. A larger number of female chum (N=1,642) than male chum (N=1,134) and a similar number of female coho (N=183) and male coho (N=226) were estimated in the Snake River during the 2002 season.

Escapement on the Eldorado River, which is East of Cape Nome, was counted from June 24 to September 10, 2002 at 26 chinook, 10,243 chum, 119,105 pink, 623 coho and 10 sockeye salmon. Although other salmon species appear to be in decline, the even year pink salmon returns to the Eldorado River remained relatively strong in 2002. The total number of male and female chum estimated in the Eldorado River was 5024 male and 5219 female. A larger number of female than male chum were estimated in the river during June 25-July 12, whereas the opposite occurred during July 13-July 31, and the sex ratio was similar from August 1-September 3. A similar number of male (N=327) and female (N=296) coho were estimated in the Eldorado River in the 2002 season.

Salmon escapement to the Pilgrim River in the Port Clarence District was conducted at a new site for the 2002 season. This site is approximately 6.5 river miles downstream of the Kougarok Highway Bridge, and is below most of the significant spawning reaches used by chum, chinook, pink and coho salmon. Escapement on the Pilgrim River was counted from July 4 to September 4, 2002 at 150 chinook, 5,590 chum, 3,882 pink, 246 coho and 3,888 sockeye salmon. A larger number of male chum (N=3,299) than female chum (N=2,291) were estimated in the Pilgrim River in the 2002 season.

These escapement data allowed the Alaska Department of Fish and Game to continue to manage for subsistence harvest under a Tier II permitting system, with 40 permits issued in the 2002 season, while the Nome Sub district remained closed to commercial fishing.

Scale samples were collected from chum and coho salmon at Snake and Eldorado Rivers, and from chum and sockeye at Pilgrim River. At the Snake, Eldorado and Pilgrim

Rivers, the most abundant age class for chum was 0.3, from brood year 1998. Of the 2776 chum counted at the Snake River site, 64%, representing an estimated 1777 chum, were found to be age 0.3. Of the 10,243 chum counted at the Eldorado River site, 88.3%, representing an estimated 8991 chum, were found to be age 0.3. Of the 5590 chum counted at the Pilgrim River site, 80.5%, representing an estimated 4327 chum, were found to be age 0.3. Age data was not determined for sockeye.

At the Snake and Eldorado Rivers, the most abundant age class for coho was age 2.1, from brood year 1997. Of the 409 coho counted at the Snake River site, 87.5%, representing an estimated 358 coho, were found to be age 2.1. Of the 623 coho counted at the Eldorado River site, 85.2%, representing an estimated 531 coho, were found to be age 2.1.

At all of the Snake, Eldorado and Pilgrim Rivers, male salmon were generally longer than female salmon of each species, and older salmon (from earlier brood years) were generally larger than younger salmon (from later brood years) of each species.

Snake River Salmon Escapement and Sampling Project

Objectives

The 2002 season represents the eighth consecutive year that Kawerak Inc. has operated a salmon enumeration and sampling project on the Snake River. The objectives for the 2002 season remain threefold:

- 1) To obtain daily and seasonal information regarding the run timing and magnitude of chinook salmon (*Oncorhynchus tshawytscha*), chum salmon (*O. keta*), pink salmon (*O. gorbuscha*), coho salmon (*O. kisutch*) and sockeye salmon (*O. nerka*) escapement to the Snake River.
- 2) To obtain the age, sex and length composition of the chum salmon and coho salmon escapement to the Snake River.
- 3) To monitor environmental conditions for stream temperature and stream stage height at 0800 and 2000 hours daily.

Methods

The Snake River project began on June 30, 2002 at a site (Section 18, T11S, R34W, KRM) located approximately 5 miles upstream from the mouth of the Snake River, Stream No. 333-10-11200 (Figure 1). A tent camp, which was constructed on the bluff adjacent to the river, housed a crew of 2-3 fisheries technicians until September 16, 2002, when the project was terminated by ADF&G Area Managers due to lack of fish.

Salmon enumeration was conducted from June 30 to July 18, 2002 using a counting tower and partial diversion weir. A 15 foot high scaffold counting tower, 60 foot long diversion weir and 30 foot long by 4 foot wide white vinyl substrate panel was installed in the river to conduct salmon escapement enumeration. The diversion weir directed migrating fish over the substrate panel (called “flash panel”) for greater ease and accuracy of visual enumeration. A fisheries technician stood on the counting tower from the top of each hour until 20 minutes past the hour, which was timed using a digital stopwatch, and visually counted the salmon passing over the substrate panel. Fish were identified to species and tallied on a 12 key tallywacker. Downstream migrants were subtracted from upstream migrants unless those fish were in a dead or dying condition. Polarized sunglasses were used to enhance vision during the day and an array of 120 volt floodlights was used during periods of low light. Counting continued uninterrupted 24 hours a day and 7 days a week for the duration of the project.

Data from the tallywacker was transcribed into a waterproof data booklet before coming off of the tower and this data again transcribed onto daily escapement data sheets located in a data binder. The twenty minute count was expanded by a factor of three to obtain total hourly estimated escapement. The total estimated daily escapement was communicated daily via cell phone to ADF&G Area Managers. If a counting period was missed due to turbid water, high water or other circumstances, the missed period was

estimated by obtaining the interpolated mean for the counts of the previous and following days for that same time period.

On July 18, 2002 the counting tower was abandoned and the picket weir was extended to span the entire river from bank to bank. A fyke trap, live box and boat gate were also installed at this time. The boat gate was constructed of welded weir panels and measured 12 feet wide by 8 feet high. The boat gate replaced a section of weir and could be swung out of the way to pass boats upstream if need be. Sandbags ensured the boat gate remained fish tight at all times. Total weir counts were conducted from the period of July 18 until the end of the project on September 16, 2002. The decision to convert from tower counts to total weir counts was made by the Kawerak Fisheries Biologist to make biological (age, sex and length) samples more easily attainable, to reduce staffing needs at the site and to make counting more accurate by eliminating the sample error associated with both species identification and enumeration inherent with counting towers. It should be noted that during years with very low salmon returns, counting towers are very monotonous to operate and this monotony can contribute to increased fatigue and reduced morale of the counting crews which may result in errors and therefore less than reliable data.

The weir was staffed by two Kawerak Fisheries Technicians. The technicians checked the weir during periods of normal peak diurnal salmon migration periods, which tended to occur from approximately 2200 hours until dawn, and passed fish either upstream by removing two to four weir pickets or into the live box for biological sampling as pressure by the fish determined was appropriate. Fish were identified to species as they passed upstream or into the live box, tallied and the data recorded in the waterproof data booklet. This data was transcribed at the end of the period onto the data sheets. The time of day for this period was also noted.

Age, Sex, Length (ASL) sampling was conducted based on a pulse sampling design (Molyneaux and DuBois 1999). The sample size goal for each pulse was 160 chum salmon, 160 sockeye salmon and 160 coho salmon. This sample size was selected so that simultaneous 95% confidence interval estimates of age composition proportions would be no wider than 0.20 (Bromaghin 1993). Recommended sample size was increased an additional 8 to 9% to account for unusable scales. Each pulse sample was used to estimate the ASL composition of the run for a given temporal stratum. A weighted mean, with fish passage during each defined stratum as the weight, was used to estimate age composition of the total season passage. The sex of each fish was determined from external characteristics.

Scales were collected from the left side of the fish approximately two rows above the lateral line in the area crossed by a diagonal from the posterior insertion of the dorsal fin to the anterior insertion of the anal fin (INPFC 1963). Scales were mounted on gum cards and impressions were made on cellulose acetate cards with a heated hydraulic press (Clutter and Whitesel 1956). Salmon were measured to the nearest one-half centimeter from the middle of the eye to the fork of the tail. After sampling, the adipose fin was cut

to mark that the fish has been sampled and if it was recaptured it would not be sampled again. The number of recaptured fish was also recorded.

Ages for salmon are determined by examining scale characteristics (Mosher 1968). European notation (e.g., 2.2; Koo 1962) was used to record ages: numerals preceding the decimal refer to number of freshwater annuli and numerals following the decimal refer to number of marine annuli. Total age from time of egg deposition or brood year is the sum of these numbers plus one.

Age, sex and length samples were obtained by beach seine during the period of tower counts or from the trap and live box during the period of total weir counts. Chum and coho were sampled for age, sex and length. Pink, chinook, and sockeye salmon were not sampled. All data was collected in a waterproof data booklet and then later transcribed onto the appropriate data sheets.

Environmental observations for stream temperature and stage height were taken daily at 0800 and 2000 hours. Stream temperature was recorded to the nearest degree Celsius using a mercury-in-glass thermometer. Stage height was taken by reading the staff gage to the nearest 100th of a foot.

Escapement and ASL data was examined for errors by recalculating the daily escapement data at the end of the season. Any errors found were investigated by referring back to the field notebooks if need be. Corrected data was entered into an Excel spreadsheet for analysis and archival.

Results

The total number of fish counted by species from June 30 to September 16, 2002 at Snake River is as follows: 9 chinook, 2,776 chum, 4,103 pink, 409 coho, and 8 sockeye salmon and 140 Dolly Varden (Table 1, Figure 2). Approximately 63.0% of the total cumulative salmon escapement was counted using tower count methods and the remaining 37.0% of the escapement was determined from total weir counts. Historical total cumulative escapement is shown in Table 2.

Although the Snake River salmon escapement project was terminated on September 16, an aerial survey conducted by ADF&G on September 18, 2002 showed an estimated 442 additional coho below the weir site. This estimated remainder was 108.1% of the weir counts. These fish were holding anywhere from 200 yards to a mile below the weir site and did not move even after the weir was removed. It is assumed that these fish moved up into spawning reaches after the rain events that occurred in late September. However, these fish were not added onto the total estimated escapement for the season because they were not observed moving past the counting apparatus.

Age, sex and length (ASL) samples were collected from chum and coho salmon. A total of 475 usable ASL samples were taken from chum salmon in two defined strata. It was determined that 1.3% of the chum return was age 0.2, 64% was age 0.3, 33.5% was age

0.4 and 1.3% was age 0.5 (Table 3). Female chum represented 59.2% of the return and the remaining 40.8% were male (Table 3). A total of 192 usable ASL samples were taken from coho salmon at the Snake River site. The majority of coho sampled (87.5%) were age 2.1, 9.9% were age 3.1 and 2.6% were age 1.1 (Table 4). Female coho represented 44.8% of the return and the remaining 55.2% were male coho (Table 4). A larger number of female chum (N=1,642) than male chum (N=1,134) and a similar number of female coho (N=183) and male coho (N=226) were estimated in the Snake River during the 2002 season (Table 3, Table 4). Generally, both chum and coho salmon increased in fork length with increasing age, and the males were generally larger than the female of each species (Table 3, Table 4).

ADF&G staff conducted aerial surveys on July 19, August 19, August 28 and September 18, 2002. Aerial survey data is available in Appendix 1.

Environmental conditions were monitored on the Snake River for stream temperature and stage height. Water temperature generally increased from June 30 to July 19, when it attained a temperature of 20°C, and then subsequently decreased to a minimum of 4°C on each of September 9 and September 16, 2002 (Table 5, Figure 3). Stream height (stage) remained relatively constant, with a slight decreasing trend, from July 1 to September 2, when it sharply increased, and subsequently continued to decrease to the end of the project (Table 5, Figure 4).

Discussion

The 2002 season represents the eighth consecutive year that Kawerak has operated this project on the Snake River. As this project started on June 30 and ended on September 16, the 2002 season is also the longest duration that the Snake River project has been operated in its history. As well, this is only the second year this project has operated through the entirety of the coho run. Therefore, although it does appear that the coho run was extremely poor this year, any trends in coho populations are difficult to establish at this time.

The merit of converting this project from a tower to a weir is evident. It is intended that the towers be permanently decommissioned and that total weir counts be conducted from this point forward. However, the weirs currently used by Kawerak Inc. have exceeded their useful lifespan and must be replaced. The use of galvanized pickets may be leaching the zinc coating into solution creating an unacceptable toxic discharge from this equipment into the river. It is strongly advisable that all galvanized materials be removed from use and replaced with non-toxic alternatives such as aluminum. Funding will be sought to construct new Rackmaster® style weirs in 2003.

In addition, it is evident that more effort needs to be made to ensure fish habitat is protected. During informal surveys of the Snake River drainage, it was found that roads were built not only in the river floodplain, but were constructed so they followed the course of shallow spawning tributaries. A frequently used access road that followed the course of Boulder Creek was found to cross the creek repeatedly and followed the stream

for long sections, forcing vehicles to drive down sections of spawning habitat where spawning coho were found. In addition, more effort needs to be made to identify and mitigate other potential obstructions and threats to fish habitat such as perched culverts, mining effluents and diversion of instream flow.

Eldorado River Salmon Escapement and Sampling Project

Objectives

The 2002 season represents the seventh consecutive year that Kawerak Inc. has operated a salmon enumeration and sampling project on the Eldorado River. The objectives for the 2002 season remain threefold:

- 1) To obtain daily and seasonal information regarding the run timing and magnitude of chinook salmon (*Oncorhynchus tshawytscha*), chum salmon (*O. keta*), pink salmon (*O. gorbuscha*), coho salmon (*O. kisutch*) and sockeye salmon (*O. nerka*) escapement to the Eldorado River.
- 2) To obtain the age, sex and length composition of the chum salmon and coho salmon escapement to the Eldorado River.
- 3) To monitor environmental conditions for stream temperature and stream stage height at 0800 and 2000 hours daily.

Methods

The Eldorado River project began on June 24, 2002 at a site (Section 35, T11S, R33W, KRM) (Stream No. 333-10-1150-2030) located approximately 15 miles upstream from the Safety Sound Bridge (Figure 5). A tent camp, which was constructed on the bluff adjacent to the river, housed the crew of 2-3 fisheries technicians until September 10, 2002, when the project was terminated by ADF&G Area Managers due to lack of fish.

Salmon enumeration was conducted from June 24 to August 14, 2002 using a counting tower and partial diversion weir. A 15 foot high scaffold counting tower, 60 foot long diversion weir and 30 foot long by 4 foot wide white vinyl substrate panel was installed in the river to conduct salmon escapement enumeration. The diversion weir directed migrating fish over the substrate panel (called "flash panel") for greater ease and accuracy of visual enumeration. A fisheries technician stood on the counting tower from the top of each hour until 20 minutes past the hour, which was timed using a digital stopwatch, and visually counted the salmon passing over the substrate panel. Fish were identified to species and tallied on a 12 key tallywacker. Downstream migrants were subtracted from upstream migrants unless those fish were in a dead or dying condition. Polarized sunglasses were used to enhance vision during the day and an array of 120 volt floodlights was used during periods of low light. Counting continued uninterrupted 24 hours a day and 7 days a week for the duration of the project. Data from the tallywacker was transcribed into a waterproof data booklet before coming off of the tower and this data again transcribed onto daily escapement data sheets located in a data binder. The twenty minute count was expanded by a factor of three to obtain total hourly estimated escapement. The total estimated daily escapement was communicated daily via VHF radio to ADF&G Area Managers. If a counting period was missed due to turbid water, high water or other circumstances, the missed period was estimated by obtaining the interpolated mean for the counts of the previous and following days for that same time period.

On August 15, 2002 the counting tower was abandoned and the picket weir was extended to span the entire river from bank to bank. A fyke trap, live box and boat gate were also installed at this time. The boat gate was constructed of welded weir panels and measured 12 feet wide by 8 feet high. The boat gate replaced a section of weir and could be swung out of the way to pass boats upstream if need be. Sandbags ensured the boat gate remained fish tight at all times. Total weir counts were conducted from the period of August 15 until the end of the project on September 10, 2002. The decision to convert from tower counts to total weir counts was made by the Kawerak Fisheries Biologist to make biological (age, sex and length) samples more easily attainable, to reduce staffing needs at the site and to make counting more accurate by eliminating the sample error associated with both species identification and enumeration inherent with counting towers. It should be noted that during years with very low salmon returns, counting towers are very monotonous to operate and this monotony can contribute to increased fatigue and reduced morale of the counting crews which may result in errors and therefore less than reliable data.

The weir was staffed by two Kawerak Fisheries Technicians. The technicians checked the weir during periods of normal peak diurnal salmon migration periods, which tended to occur from approximately 2200 hours until dawn, and passed fish either upstream by removing two to four weir pickets or into the live box for biological sampling as pressure by the fish determined was appropriate. Fish were identified to species as they passed upstream or into the live box, tallied and the data recorded in the waterproof data booklet. This data was transcribed at the end of the period onto the data sheets. The time of day for this period was also noted.

Escapement sampling was conducted based on a pulse sampling design (Molyneaux and DuBois 1999). The sample size goal for each pulse was 160 chum salmon and 160 coho salmon. This sample size was selected so that simultaneous 95% confidence interval estimates of age composition proportions would be no wider than 0.20 (Bromaghin 1993). Recommended sample size was increased an additional 8 to 9% to account for unusable scales. Each pulse sample was used to estimate the ASL composition of the run for a given temporal stratum. A weighted mean, with fish passage during each defined stratum as the weight, was used to estimate age composition of the total season passage. The sex of each fish was determined from external characteristics.

Scales were collected from the left side of the fish approximately two rows above the lateral line in the area crossed by a diagonal from the posterior insertion of the dorsal fin to the anterior insertion of the anal fin (INPFC 1963). Scales were mounted on gum cards and impressions made on cellulose acetate cards with a heated hydraulic press (Clutter and Whitesel 1956). Salmon were measured to the nearest one-half centimeter from the middle of the eye to the fork of the tail. After sampling the adipose fin was cut to mark that the fish has been sampled and if it was recaptured it would not be sampled again. The number of recaptured fish was also recorded.

Ages for salmon were determined by examining scale characteristics (Mosher 1968). European notation (e.g., 2.2; Koo 1962) was used to record ages: numerals preceding the decimal refer to number of freshwater annuli and numerals following the decimal refer to number of marine annuli. Total age from time of egg deposition or brood year is the sum of these numbers plus one.

Age, sex and length (ASL) samples were obtained by beach seine during the period of tower counts or from the trap and live box during the period of total weir counts. Chum and coho were sampled for age, sex and length. Pink, chinook, and sockeye salmon were not sampled. Because of the low return of coho this year (N=540), over 69.6% of the return was sampled for ASL. All data was collected in a waterproof data field booklet and then later transcribed onto the appropriate data sheets.

Escapement and ASL data was examined for errors by recalculating the daily escapement data at the end of the season. Any errors found were investigated by referring back to the rite in the rain field notebooks if need be. Corrected data was entered into an Excel spreadsheet for analysis and archival.

Environmental observations for stream temperature and stage height were taken daily at 0800 and 2000 hours. Stream temperature was recorded to the nearest degree Celsius using a mercury in glass thermometer. Stage height was taken by reading the staff gage to the nearest 100th of a foot.

Results

The total number of fish counted by species from June 24 to September 10, 2002 at Eldorado River is as follows: 26 chinook, 10,243 chum, 119,105 pink, 623 coho, and 10 sockeye salmon and 337 Dolly Varden (Table 6, Figure 6). Approximately 99.59% of the total cumulative salmon escapement was counted using tower count methods and the remaining 0.41% of the escapement was determined from total weir counts. Historical cumulative escapement is shown in Table 7.

Age, sex and length (ASL) samples were attained from chum and coho salmon. A total of 367 usable ASL samples were taken from chum salmon in three defined strata. It was determined that 1.6% of the chum return was age 0.2, 88% was age 0.3, 6.5% was age 0.4 and 3.5% was age 0.5 (Table 8). Female chum salmon represented 51.0% of the return and the remaining 49.0% was male (Table 8). A total of 85.2% of the coho return was age 2.1, 13.1% was age 3.1 and 1.6% was age 1.1 (Table 9). Female coho salmon represented 47.5% of the total estimated coho run, while males represented 52.5% (Table 9). The total number of male and female chum estimated in the Eldorado River was 5024 male and 5219 female (Table 8, Table 9). A larger number of female than male chum were estimated in the river during June 25-July 12, whereas the opposite occurred during July 13-July 31, and the sex ratio was similar from August 1-September 3. A similar number of male (N=327) and female (N=296) coho were estimated in the Eldorado River in the 2002 season.

Aerial surveys were conducted by ADF&G staff on August 19 and September 18, 2002. The aerial survey data are included in Appendix 1.

Environmental conditions were monitored on the Eldorado River for stream temperature and stage height. Water temperature fluctuated with time of day, as the temperature readings at 2000 hours were always higher than those taken at 0800 hours. Water temperatures remained relatively constant until August 25-26, when the water temperature began to decrease, and ended at 2°C on September 10 (Table 10, Figure 7). Stream height (stage) remained relatively constant until September 2, when it sharply increased, and subsequently continued to decrease to the end of the project (Table 10, Figure 8).

Discussion

The 2002 season represents the seventh consecutive season that Kawerak has operated this project on the Eldorado River, and its start date of June 24 is the earliest that the project has ever begun. This is only the second year this project has operated through the entirety of the coho run. Therefore, although it does appear that the coho run was extremely poor this year, any trends in coho populations are difficult to establish at this time. Although other salmon species appear to be in decline, the even year pink salmon returns to the Eldorado River remained relatively strong in 2002.

The project ran smoothly for the most part this year. However, on September 4, 2002 a high water event occurred which prompted the crew to pull approximately 60% of the weir pickets to reduce stress on the weir. The pickets were removed from the period of September 4, 2002 at 1700 hours to September 5, 2002 at 1300 hours for a total of 20 hours. An unknown quantity of fish may have passed upstream, although anecdotal comments by the crew stated that no fish were seen to be holding below or passing by the site during this event. An attempt was made to interpolate the missing data, but data entries were missing on the hourly count data sheets for those dates needed. Only the total daily escapement data was available. It is clear that the intensity of this storm event caused the already fatigued crew to grow despondent. The inadequacy of the tents and heaters to combat the cold and wet conditions posed a real risk to employee safety and as a result data loss occurred.

The merit of converting this project from a tower to a weir is evident. It is intended that the towers be permanently decommissioned and that total weir counts be conducted from this point forward. However, the weirs currently used by Kawerak have exceeded their useful lifespan and must be replaced. The use of galvanized pickets may be leaching the zinc coating into solution creating an unacceptable toxic discharge from this equipment into the river. It is strongly advisable that all galvanized materials be removed from use and replaced with non-toxic alternatives such as aluminum. Funding will be sought to construct new Rackmaster® style weirs in 2003.

It is also suggested to pursue replacing the inadequate canvas weatherport tents with a small cabin. Protection from bears and an inhospitable climate is a paramount concern for employee safety and morale, which in turn appears to have a direct effect on data quality.

Pilgrim River Salmon Escapement and Sampling Project

Objectives

The 2002 season represents the fourth year that Kawerak Inc. has operated a salmon enumeration and sampling project on the Pilgrim River, although this is the first season at the present site. The objectives for the 2002 season remain threefold:

- 1) To obtain daily and seasonal information regarding the run timing and magnitude of chinook salmon (*Oncorhynchus tshawytscha*), chum salmon (*O. keta*), pink salmon (*O. gorbuscha*), coho salmon (*O. kisutch*) and sockeye salmon (*O. nerka*) escapement to the Pilgrim River.
- 2) To obtain the age, sex and length composition of the chum salmon, coho salmon, and sockeye salmon escapement to the Pilgrim River.
- 3) To monitor environmental conditions for stream temperature and stream stage height at 0800 and 2000 hours daily.

Methods

The Pilgrim River project began on July 4, 2002 at a site (Section 27, T4S, R30W, KRM)(Stream No. 333-10-1150-2030) located approximately 6.5 miles downstream of the Kougarak Highway Bridge (Figure 9). A tent camp, which was constructed on the bluff adjacent to the river, housed the crew of 3 fisheries technicians until September 4, 2002. Although this is the fourth year Kawerak has operated this project, 2002 is the first season from the present site. The present project site was selected by an ADF&G weir sites investigation to be suitable for the installation of a resistance board weir (Menard, 2001). A resistance board weir is scheduled for installation at this site in 2003. This site proved in 2002 to be below the majority of critical spawning habitat used by all species of salmon.

Salmon enumeration was conducted from July 4 to September 4, 2002 using 2 counting towers due to the width of the river (220ft). A 15 foot high scaffold counting tower was installed on each bank and a 220 foot long by 8 foot wide white vinyl substrate panel was installed in the river to conduct salmon escapement enumeration. The river was functionally divided into two equal 110 foot long sections by a buoy anchored in the middle of the river. A fisheries technician stood in each counting tower for 10 minutes, which was timed using a digital stopwatch, and visually counted the salmon passing over the substrate panel for a total sampling period of 20 minutes. Counting would begin from side A, on the left bank (as you are facing downstream) at the top of the hour and continue for a 10-minute sample period. After the Side A sample was completed, the technician would cross the river and position themselves on the tower at side B. Counting would commence at 15 minutes after the hour for a 10-minute sample period. Fish were identified to species and tallied on a 12 key tallywacker. Downstream migrants were subtracted from upstream migrants unless those fish were in a dead or dying condition. Polarized sunglasses were used to enhance vision during the day and an array of 120 volt

floodlights was used during periods of low light. Counting continued uninterrupted 24 hours a day and 7 days a week for the duration of the project.

Data from the tallywacker was transcribed into a waterproof data booklet before coming off of the tower and this data again transcribed onto daily escapement data sheets located in a data binder. Each 10-minute count was expanded by a factor of six to obtain total hourly estimated escapement for each side and this data again transcribed onto daily escapement data sheets located in a data binder. The expanded counts for side A and side B were summed and the total hourly and daily escapement was transcribed onto the appropriate data sheets. The total daily escapement was communicated daily via satellite phone to ADF&G Area Managers. Escapement and ASL data was examined for errors by recalculating the daily escapement data at the end of the season. Any errors found were investigated by referring back to the waterproof field notebooks if need be. If a counting period was missed due to turbid water, high water or other circumstances, the missed period was estimated by obtaining the interpolated mean for the counts of the previous and following days for that same time period.

Escapement sampling was conducted based on a pulse sampling design (Molyneaux and DuBois 1999). The sample size goal for each pulse was 160 chum salmon, 160 sockeye salmon and 160 coho salmon. This sample size was selected so that simultaneous 95% confidence interval estimates of age composition proportions would be no wider than 0.20 (Bromaghin 1993). Recommended sample size was increased an additional 8 to 9% to account for unusable scales. Each pulse sample was used to estimate the ASL composition of the run for a given temporal stratum. A weighted mean, with fish passage during each defined stratum as the weight, was used to estimate age composition of the total season passage. The sex of each fish was determined from external characteristics.

Scales were collected from the left side of the fish approximately two rows above the lateral line in the area crossed by a diagonal from the posterior insertion of the dorsal fin to the anterior insertion of the anal fin (INPFC 1963). Scales were mounted on gum cards and impressions made on cellulose acetate cards with a heated hydraulic press (Clutter and Whitesel 1956). Salmon were measured to the nearest one-half centimeter from the middle of the eye to the fork of the tail. After sampling the adipose fin was cut to mark that the fish has been sampled and if recaptured it will not be sampled again. The number of recaptured fish was also recorded.

Ages for salmon are determined by examining scale characteristics (Mosher 1968). European notation (e.g., 2.2; Koo 1962) was used to record ages: numerals preceding the decimal refer to number of freshwater annuli and numerals following the decimal refer to number of marine annuli. Total age from time of egg deposition or brood year is the sum of these numbers plus one.

Chum salmon were sampled for age, sex and length. Sockeye salmon were sampled in spawning areas at Salmon Lake during a single sample period on August 20, 2002 by ADF&G and Kawerak staff. Although the intent was to sample the sockeye for age, sex and length, ADF&G staff later determined that all age samples were not readable.

Therefore, sockeye were only sampled for sex and length. Pink, chinook and coho salmon were not sampled. Although it was originally intended to sample coho salmon, but the low escapement this year (N=246) made the collection of coho samples unfeasible.

Environmental observations for stream temperature and stage height were taken daily at 0800 and 2000 hours. Stream temperature was recorded to the nearest degree Celsius using a mercury-in-glass thermometer. Stage height was taken by reading the staff gage to the nearest 100th of a foot.

Results

The total number of fish counted by species from July 4 to September 4, 2002 at Pilgrim River is as follows: 150 chinook, 5,590 chum, 3,882 pink, 246 coho, and 3,888 sockeye salmon and 0 Dolly Varden (Table 11, Figure 10). Historical total cumulative escapement is shown in Table 12.

A total of 471 usable age, sex and length (ASL) samples were attained from chum salmon in two defined strata (Table 13). It was determined that 0.2% of the return was age 0.2, 80.5% was age 0.3, 14.0% was age 0.4 and 5.3% was age 0.5. 41.0% of the return was female and the remaining 59.0% was male. A larger number of male chum (N=3,299) than female chum (N=2,291) were estimated in the Pilgrim River in the 2002 season (Table 13).

An aerial survey of the Pilgrim River was conducted by ADF&G staff on July 24, 2002. In addition, aerial surveys of Salmon Lake, which is the source headwaters for Pilgrim River, were conducted on July 19, July 24, August 7, August 23 and August 24, 2002 (Appendix 1).

Environmental conditions were monitored on the Pilgrim River for stream temperature and stage height. Water temperature generally increased from July 4 to July 24, when it attained a temperature of 19°C, and then subsequently decreased to a minimum of 8°C on September 4, 2002 (Table 14, Figure 11). Stream height (stage) increased from July 4 to July 9, 2002, when the river reached its maximum depth, and then subsequently decreased to September 4, 2002 (Table 14, Figure 12).

Discussion

The 2002 season represents the fourth year this project has been operated on the Pilgrim River, however it is the third time the project has had a new site. The site used in 1997 and 1999 was approximately 5 miles below the 2002 site, while the site in 2000 was approximately 11 miles upstream of the 2002 site. Therefore, comparison of data between years on the Pilgrim River is not possible because of differences in site, which translate to differences in run due to location of spawning grounds. As well, comparison is not possible due to differences in project duration (1999 season was ended early), and species identification difficulties (specifically in 1997). It is evident that consistency of data is

needed in order to acquire any substantive information regarding the stock status and trends of salmon to this system. Therefore, the installation of a resistance-board weir in 2003 will be a much better tool for determining the stock status and trends for all species of salmon in this system, particularly sockeye salmon.

The Pilgrim River, and its source headwaters at Salmon Lake, continues to be a major producer of sockeye salmon to the Port Clarence District. Enhancement efforts in Salmon Lake include lake fertilization and resulting limnology and smolt outmigration sampling by ADF&G. The goal of the lake enrichment program is to increase zooplankton biomass without negatively altering the species composition or changing the lake's oligotrophic state. This, in turn, should lead to a higher quality rearing habitat for planktivorous juvenile sockeye, and ultimately result in an increase in smolt and adult production (Todd and Kyle. 1997). However, difficulty in obtaining tow net samples of juvenile sockeye rearing in the lake has hampered efforts to apportion bioacoustic surveys of the lake. Concerns that the trophic structure of the lake may be altered to favor planktivorous resident fish other than sockeye salmon juveniles by the addition of liquid fertilizer, has prompted ADF&G to discontinue enhancement efforts in 2002 until evaluation of the rearing population of juvenile sockeye salmon in the lake has been completed. However, limnology and smolt outmigration continue to be monitored. This Pilgrim River escapement project contributes valuable information on adult sockeye returns to this system and therefore helps to evaluate the enhancement efforts in the lake.

The project this year was a success. Although the low abundance of coho salmon made ASL sampling not feasible, we achieved the majority of our goals this year. This was considered an extreme low water year. With only 2.77 inches of rain (from Onset® datalogging tipping bucket rain gauge) reported from the period of June 11, 2002 to September 18, 2002, the river was at base flow for most of the summer. The low water restricted boat traffic and made installing the camp challenging. If this trend continues, the challenging low water may be more than a nuisance when attempting to transport weir materials to the site in 2003.

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