

**2017 In-season Escapement Estimates of Fraser River Salmon at Qualark
Dual-frequency Identification Sonar (DIDSON) Site with Test Fishing Results
and Species Apportionment**

2017 Project Report to Southern Boundary Restoration and Enhancement Fund

by

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ABSTRACT

The Qualark DIDSON project produces in-season estimates of total daily salmon escapement in the Fraser River near Yale, BC. These estimates combine acoustic counts of salmon with species composition information derived from a drifted gill net test fishing program conducted at the acoustic site. Although estimates of daily escapement can be produced for all five species of Pacific salmon, the focus of the Qualark program is on Sockeye Salmon. These in-season escapement estimates can be used in conjunction with hydroacoustic estimates from Pacific Salmon Commissions Mission site and test fisheries to manage fisheries on Fraser River salmon stocks. The total salmon escapement passing Qualark in 2017 was estimated to be $2,716,133 \pm 122,765$, consisting of, 1,321,858 Sockeye, 268,502 Chinook including 92,829 jacks, 1,095,716 Pink, 29,412 Coho and 645 Chum Salmon.

Additional testing and research was conducted using ARIS 1800, a second generation version of acoustic imaging technology. The ARIS system was used to examine potential passage occurring 10 m beyond the normal range of DIDSON coverage. Over the past 2 years a very small fraction of both the daily and total salmon migration occurred beyond 20 m distance from the transducer on either side of the Fraser River at Qualark. Migration occurring beyond 20 m on either bank of the Fraser at Qualark, has not contributed a significant source of bias to annual estimation. ARIS was also used to evaluate the vertical distribution of fish, potential DIDSON blind zones near the bottom and at the surface and provide a check on the calculated file expansion error. The processing of the 2017 ARIS data is ongoing and results are pending.

INTRODUCTION

The Qualark acoustic salmon counting site was initially developed using split-beam hydroacoustic technology between 1993 and 1998 and employed a drifted gillnet test fishing program to apportion the daily acoustic estimate by species (Enzenhofer and Cronkite, 1998). The Applied Technologies Section of the Department of Fisheries and Oceans (DFO) re-activated the Qualark site on the mainstem of the Fraser River in 2008 using multi-beam acoustic technology (DIDSON) to monitor the abundance of adult Pacific Salmon (*Oncorhynchus* spp.) migrating upstream en route to terminal spawning areas in the middle and upper portions of the Fraser River watershed (Enzenhofer et al., 2010). A test fishery was implemented to collect daily biological and species composition data to apportion the acoustic estimates. Since 2010 the site has been transitioned from a research to an operational project operated by DFO's Fraser Stock Assessment Program. All six Pacific salmon species (Sockeye Salmon (*O. nerka*), Pink Salmon (*O. gorbuscha*), Chinook Salmon (*O. tshawytscha*), Coho Salmon (*O. kisutch*), Chum Salmon (*O. keta*)) and Steelhead Trout (*O. mykiss*) return to spawn in the Fraser River and pass the Qualark site. In even numbered years (e.g., 2016) Sockeye Salmon are numerically dominant in the Fraser River while Pink Salmon are often more abundant than Sockeye Salmon in odd numbered years (e.g., 2017).

The Pacific Salmon Commission (PSC) estimates daily escapement of Fraser River Sockeye Salmon at Mission, BC using acoustics in support of in-season management of Sockeye fisheries. The Mission site is strategically located to provide key information that meets multiple obligations under the Pacific Salmon Treaty. Reliable estimates of Sockeye Salmon escapement in the Fraser River are a prerequisite to achieving spawning escapement goals and harvest allocations. The Mission site poses technical challenges for the acoustic enumeration of salmon that contribute to the concerns among managers and other clients about the reliability of the Mission estimate (Enzenhofer et al, 2010).

In contrast to Mission site characteristics at Qualark are closer to the ideal for reliably detecting and tracking salmon using acoustics, as they move upstream (see Enzenhofer et al., 2010).

Project Goals

The 2017 program at Qualark was jointly funded by DFO and the PSC's Southern Boundary Restoration and Enhancement Fund. It was the 10th year of paired operation with Mission.

The goals of this project are to:

1. Produce reliable and timely estimates of gross in-season salmon escapement in the Fraser River using three study design elements that are complementary to work conducted by PSC staff at Mission:

- Operation of the Qualark DIDSON hydroacoustic enumeration systems in a manner consistent with practices developed from 2008 to 2010 (Enzenhofer et al., 2010);
 - Implementation of the Qualark test fishery consistent with procedures developed during the period 2008 to 2010;
 - Operation of an ARIS acoustic system to evaluate potential sources of estimate bias in the DIDSON data collection systems deployed at Qualark.
2. Provide validation of Sockeye Salmon escapement estimates produced at Mission with the goal of providing managers with the best possible in-season escapement estimates to utilize for effective management of fisheries; and
 3. Provide data that can be used to develop analytical methods to either modify or combine estimates from the Mission and Qualark hydroacoustic sites to provide a more robust estimate of salmon escapement into the Fraser River based on multiple years of data from 2008 to 2017 when both sites were operating.

This report documents hydroacoustic estimates of daily salmon escapement at Qualark in 2017, including daily test fishing catch and species apportionment data.

METHODS

Study Area

The Qualark hydroacoustic facility operates in the Fraser River 15 km north of Hope, British Columbia, Canada and is 95 km upstream of Mission, BC where the PSC operates their acoustic estimation site for enumerating Fraser River salmon. The Qualark site is situated below many, but not all of the major Sockeye Salmon spawning areas in the Fraser River watershed (Figure 1). There are a number of Sockeye Salmon stocks that spawn in Fraser tributaries below the Qualark site including: Upper Pitt, Chilliwack, Harrison and Birkenhead rivers; Big Silver, Weaver Creek and spawning channel; Cultus and Chilliwack lakes; and, at Widgeon Slough. Total Fraser Sockeye Salmon escapement in the Fraser River requires enumeration at these locations in addition to Qualark. Pink Salmon spawn primarily in the Fraser mainstem, and the Harrison, Chilliwack and Coquihalla rivers which are tributary to the lower Fraser River below Qualark. The proportion of the total Fraser Pink Salmon escapement that migrates past Qualark to spawn in the middle and upper Fraser River mainstem and its tributaries varies annually.

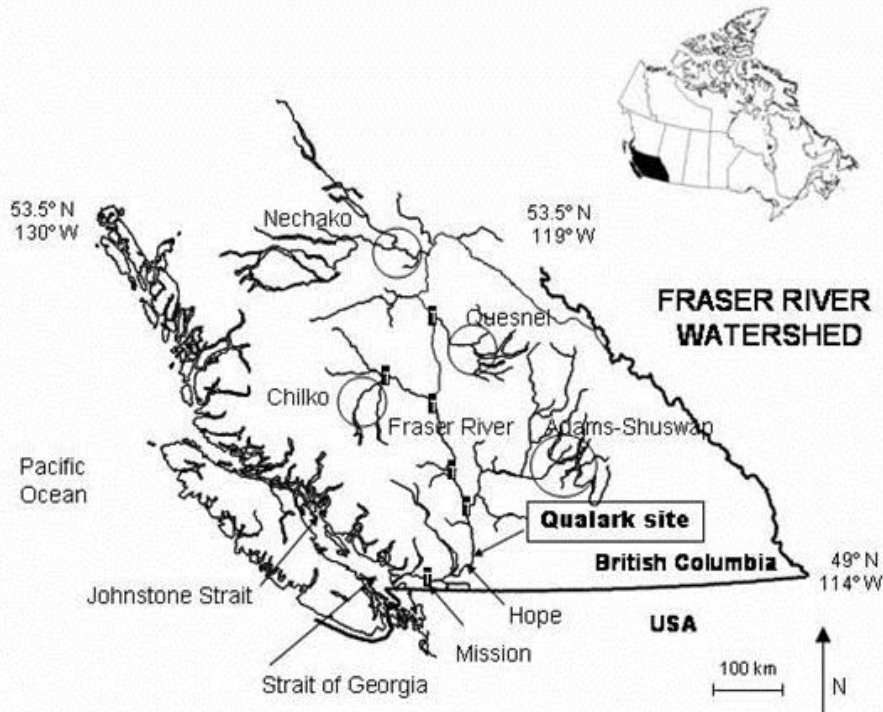


Figure 1. Map showing the Fraser River watershed and location of the Qualark hydroacoustic site near Hope, BC. Some of the major spawning areas including the Nechako, Quesnel, Chilko, and Adams-Shuswap Lake systems are circled.

The Qualark site was originally chosen as an experimental site because it possessed a number of favorable characteristics (Enzenhofer and Cronkite, 2000). It was on a straight stretch of river with laminar flow, water velocity was high, flows were not tidally-influenced, and substrate and bank configurations were planar and free of obstructions (scalping, benches, and large boulders) that might impair acoustic fish detection or introduce noise to the acoustic system. There was also minimal human activity to alter fish behaviour. These characteristics ensure that fish actively migrate through this area rather than holding or milling, which is a key factor to the success of a riverine acoustic site. The relatively high water velocities and consistent bank slopes combined with the energy conserving migration behaviour of salmon, result in most salmon, including Sockeye Salmon, migrating past the Qualark site within 20 m of either shore regardless of Fraser River discharge and water level. Consequently, it is not necessary to continuously ensound the middle of the river, although periodic checks to confirm the absence of fish escapement are necessary and prudent.

The Fraser River is 150 m wide at the Qualark site with discharge ranging from 10,000 $\text{m}^3\cdot\text{s}^{-1}$ during spring freshet to 700 $\text{m}^3\cdot\text{s}^{-1}$ during the low water period in winter (Environment Canada, 2017). The river banks have a natural slope of 21° (right-bank) and 20° (left-bank) with

the surface layer comprised of 30-50 cm diameter rock and some large boulders (Figure 2). Left-bank (LB) and right-bank (RB) are referenced relative to an observer facing downstream. Water velocities at the site range from $1.0 \text{ m}\cdot\text{s}^{-1}$ near shore to $3\text{-}4 \text{ m}\cdot\text{s}^{-1}$ in the middle of the river. Flow patterns vary from bank to bank, but in general fine materials are scoured along the right-bank and sand is deposited along the left-bank.

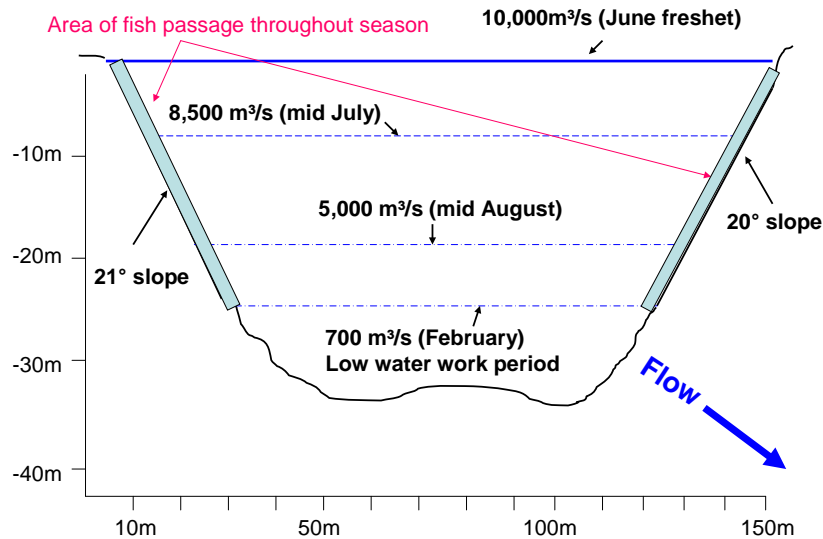


Figure 2. Fraser River cross section at the Qualark hydroacoustics site showing average discharge rates throughout the salmon migration period. Note that the vertical and horizontal scales differ. River flow is toward the viewer.

The RB is accessible by road and heavy equipment was used to mechanically re-profile the bank for acoustic work during the low water period in early 2008. The LB site which is approximately 150 m downstream of the RB site is only accessible by boat. Equipment and supplies were moved to the LB by boat and the refurbishment of the acoustic ramp and reinstallation of in-river equipment was done manually during the low water period in February of 2008. Refurbishment of the banks included removing large substrate, leveling the slope, adding sand bags and the track mounted fish deflection weir. Additional bank work was conducted over the winter of 2017 to restore the acoustic ramp and track mounted weir on the right bank back to original conditions achieved in 2008. This work involved the placement of new gravel to restore the ramp to a uniform grade and the relining it with newly filled sandbags to provide a flat non-reflective acoustic surface.

Equipment

Acoustic data were collected with two standard DIDSON imaging systems (one on each bank). The standard DIDSON imaging systems have high frequency (1.8 MHz) and low frequency modes (1.1MHz) and their output consists of images created by multiple sound beams focused through a moveable lens giving a field of view that is 14° vertical and 29° horizontal

(Belcher et al., 2001; Sound Metrics 2007). The RB has hydroelectric lines to the site while the LB power source was a Power Pac (Enzenhofer et al., 2007) that was charged by a combination of a solar panel and a battery charger powered by a generator. The DIDSON systems are affixed to a track-mounted 6 m long fish deflection weir that can be adjusted in response to changes in river water levels with a remotely controlled winch (Enzenhofer et al., 2010). The DIDSON systems were mounted on an adjustable pole mount that facilitates adjustments to depth, bearing, tilt and roll (Enzenhofer and Cronkite, 2005).

DIDSON Configuration

The DIDSON system bearing was set so that the beam aim was perpendicular to the river flow with the upstream end of the weir barely visible on the edge of the image. The tilt on RB was set at -17° relative to the surface while LB was -14° . A -35° roll was adopted on both banks. This configuration was fixed throughout the program, although minor adjustments were made to the bearing and tilt as the season progressed. The aiming configuration was verified with a target suspended in the ensonified region to ensure that there were no blind zones near the surface or bottom through which fish could pass undetected and is consistent with protocols outlined by Holmes et al. (2006).

Sampling Design

Based on split-beam sonar work at the Qualark site in the 1990s (Enzenhofer and Cronkite, 2000) and previous years DIDSON assessments, the majority of fish migration was expected to occur within a range of 5 m from the end of the deflection weir and the remainder were expected within the next 10 m. During times where set gill nets are deployed in the area during First Nations fisheries, fish migration can occur slightly further offshore. We used a systematic range stratified sampling design on each bank that utilized one aiming configuration of the DIDSON to sample between 4.17 m to 29.17 m in range, divided into three range bin files each hour (Enzenhofer et al., 2010; Figure 3). Data were collected for a total of 50 minutes out of each hour. On each bank three files were recorded hourly consisting of:

- 20 minute 5 m window length (4.17 m to 9.17 m) at high frequency mode (1.8 MHz utilizing 96 beams) producing the best available image resolution for counting the majority of fish escapement (Bin 1);
- 20 minute 10 m window length (9.17 m to 19.17 m) at low frequency mode (1.1 MHz utilizing 48 beams) (Bin 2); and
- 10 minute 10 m window length (19.17 m to 29.17 m) at low frequency mode (Long-Range Bin 3).

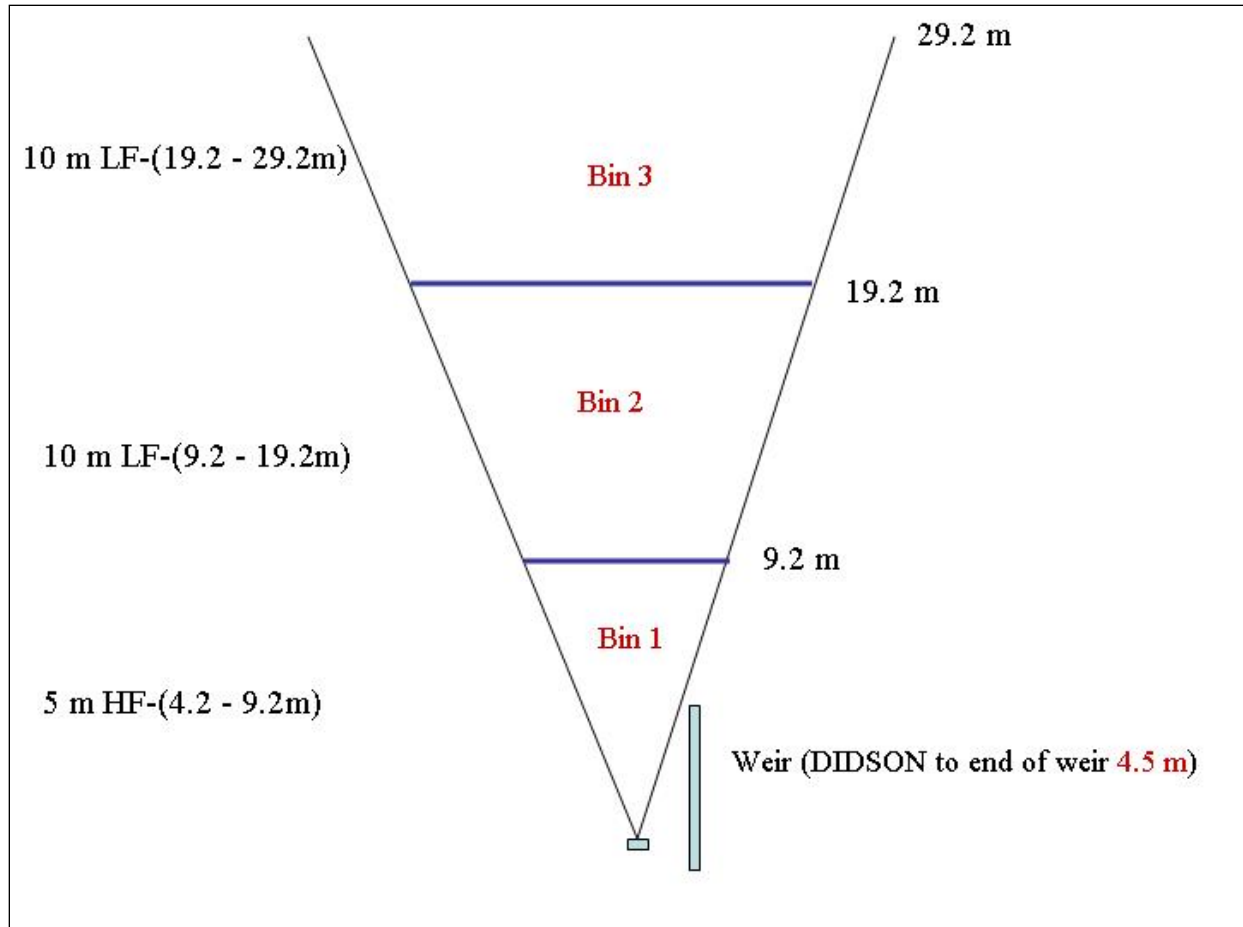


Figure 3. Plan view of the sampling strategy showing one aim configuration of the DIDSON and three range bins to sample 29.17 m range at the Qualark hydroacoustics site. Bin 1 is shown using a 5 m window length at high frequency (HF) starting at 4.17 m from the DIDSON. Bin 2 is shown with a 10 m window length in low frequency (LF) mode, from 9.17 m to 19.17 m from the DIDSON. Bin 3 is a 10 m window length in low frequency mode covering a range between 19.17 m to 29.17 m.

Data Processing Procedures

The DIDSON data files were saved directly onto laptop computer hard drives and subsequently backed up onto an external hard drive. The data was transferred from the DIDSON computers to a processing computer where the files were manually counted by site personnel applying pre-determined counting criteria to estimate net upstream flux (Enzenhofer et al., 2010). The upstream flux of migrating salmon is calculated as the upstream count minus the downstream count (Xie et al., 2002). Counting criteria addressed the potential for double counting of fish which may move out of or into an adjoining range bin (Figure 4 and 5). The expansion of 20 minute counts to hourly counts has been shown to be representative of the hourly flux (Lilja et al, 2008). In this same way the movement of fish in and out of the end of a range bin in a 20 minute file can be assumed to be representative of the behaviour during the whole hour. A minimum fish size limit was set at 35 cm (measured using the measurement tool on the DIDSON program) to remove smaller native species from the escapement estimate.

Identifiable non-salmon species (e.g. sturgeon) were not included in the counts. Test fishing over the past 10 years at Qualark indicate negligible numbers of non-salmon sized targets present at this site. Counting procedures relating to playback speed and file viewing settings (use of background subtraction, threshold and intensity settings) were utilized to ensure consistency between different counters. Counting of files with counts in excess of 1,500 fish in the first 10 minutes was terminated at the 10 minute mark. Net upstream flux for each range bin was expanded to the hour and summed to represent total daily salmon escapement.

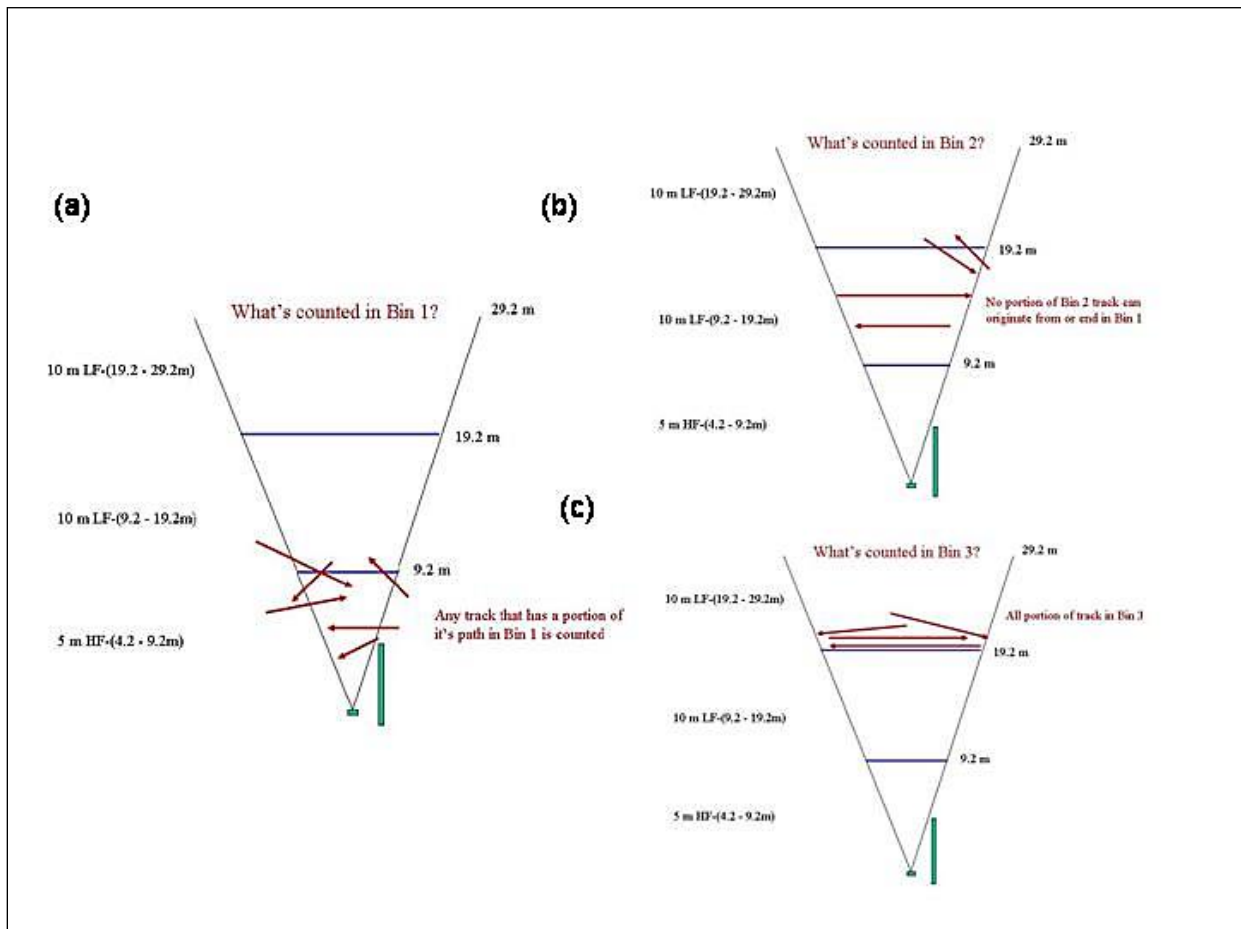


Figure 4. Counting criteria for manual counts of range bins to avoid double counting fish passing through more than one range bin. (a) Any portion of a fish trajectory is included in the Bin 1 count, (b) fish included in Bin 2 counts cannot have any portion of its track in Bin 1, and (c) fish included in the Bin 3 count must have entire portion of track in Bin 3.

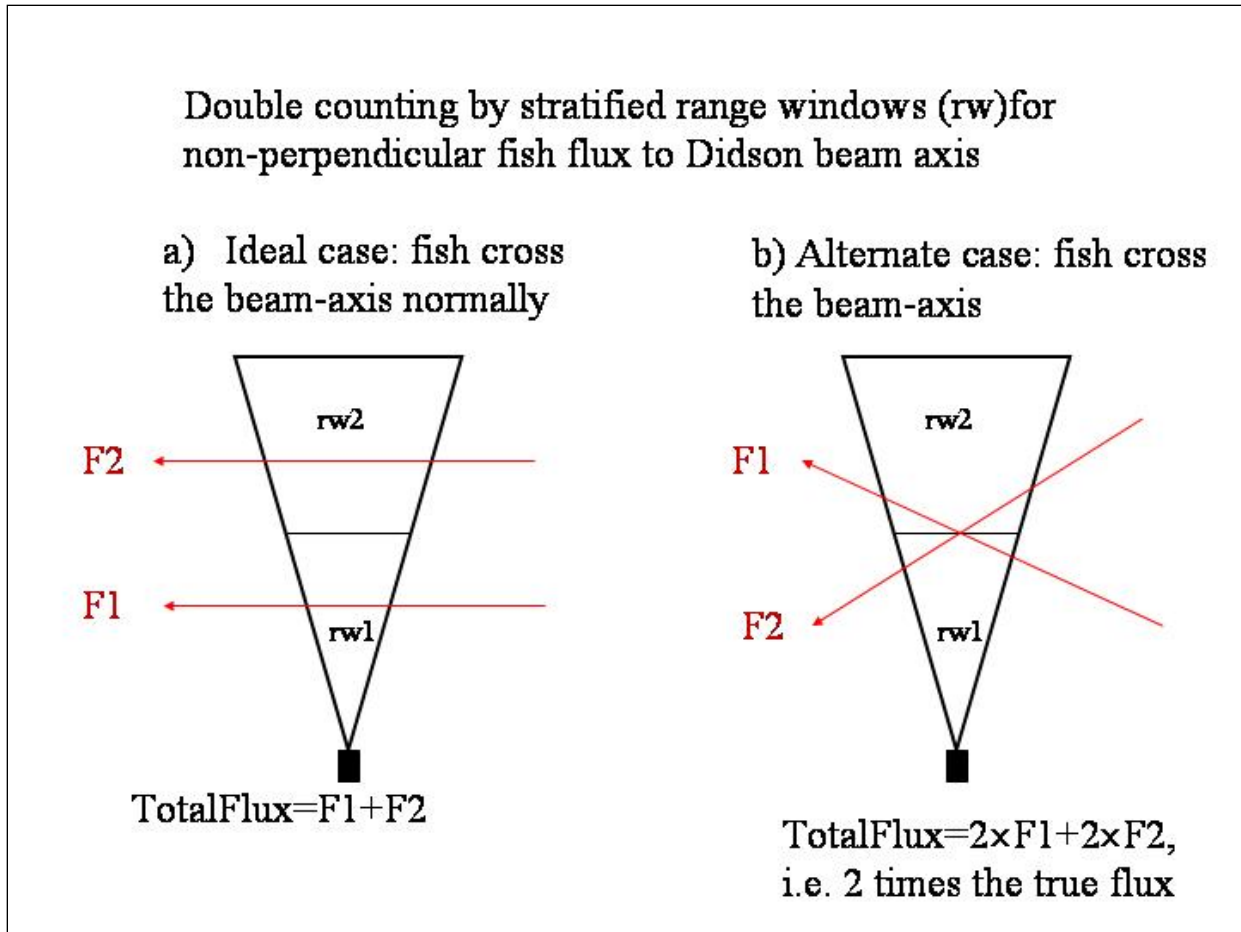


Figure 5. Illustration of fish escapement moving through a fixed location DIDSON imaging sonar configured with one aim and two range windows (rw1 & rw2). a) Two fish tracks (F1 & F2) each passing through only one range window resulting in a correct flux estimate of two, and b) Two fish tracks (F1 & F2) crossing through both range windows potentially resulting in an incorrect double count of four if the counting criteria protocols in Figure 4 are not applied.

Test Fishing

Test fishing consisted of 6 gill net drifts per day, seven days per week, one 3-drift set in the morning and one 3-drift set in the evening. Each set of 3 drifts was made close to shore along the right bank and directed at capturing salmon. The morning drift series was conducted from 07:00-08:00 and the evening drift series was conducted from 19:00-20:00. The shortening of day length later in the season may result in evening drifts being moved to an earlier start time (18:00-19:00). Two additional drifts per week, spaced out over the week, were made beyond 25 m from the right bank using the 5¼ inch mesh net to test for presence/absence of migrating salmon in the offshore regions. The mesh sizes used for the drifts included 4, 4¾, 5¼, 5¾, 6¾ and 8 inch (stretched mesh, 70 mesh hang, and 30 m length). The morning drifts began on the first day using the 4, 5¼, and 6¾ inch meshes in sequence, and the evening drifts began using the 4¾, 5¾ and 8 inch meshes in sequence. On the second day the morning and evening sequences were reversed and on each subsequent day the pattern of drifts was alternated to allow some randomisation of the sampling. Each drift was approximately 4-6 minutes in duration and began

150 m upstream of the acoustic system and terminated approximately 500 m downstream of the Qualark site.

The date, drift number, mesh size, start and end times were recorded, along with the number of each species of salmon caught in each drift. The number of each species caught in a drift was recorded as retained or released. Fish that were identified by species but escaped were included with the released fish. All Sockeye and Chinook salmon caught were retained; Coho Salmon and Steelhead Trout were released whenever possible but were retained if dead or mortally wounded. Chinook and Coho Salmon were assessed for adipose condition (present/absent). Comments were recorded relating to the success of the drift and any miscellaneous by-catch. Catch from different drifts was kept in separate labelled totes. Test fishing counts by species and drift were verified when the fish were sampled. The test fishing data was compiled daily (for the previous day) and entered into a MS-Excel spreadsheet database. The daily species proportion was determined from the test fishery data and applied to the total upstream flux to estimate daily escapement by species.

Sampling

Sex, post-orbital fork (POF) length (cm), weight (kgs), scale samples and DNA samples (adipose fin punch) from up to 50 Sockeye Salmon per day were taken. All additional Sockeye Salmon were sampled for sex, POF length and weight (kgs). Chinook Salmon were sampled for sex, fork length (FL), weight (kgs) and scales (5 per fish) and were assessed for adipose condition (present/absent). Heads were retained for all fish with clipped adipose fins. Coho Salmon were assessed and sampled in a similar fashion to Chinook Salmon. Up to 50 Pink Salmon per day were sampled for sex, post-orbital hypural (POH) length (cm) and weight (kgs).

Precision

There are two sources of error that affect the precision of the hydroacoustic estimate of total salmon passage. The first source is observer error related to the difference in counts of the same file by different personnel. In order to assess the precision between counters a random number generator was used to select 48 files (8 from each of the 6 range bins) daily to recount. Recounts were conducted by experienced staff. The precision was assessed by calculating the coefficient of variation (CV) and average percent error (APE) between the initial counts and recounted files (Enzenhofer et al., 2010).

$$CV = \sqrt{\frac{\sum_{i=1}^R (X_{ij} - \bar{X}_j)^2}{\bar{X}_j^2}} \times 100$$

$$APE = \frac{1}{N} \sum_{j=1}^N \left[\frac{1}{R} \sum_{i=1}^R \frac{|X_{ij} - \bar{X}_j|}{\bar{X}_j} \right] \times 100$$

where N is the number of events counted by R observers, X_{ij} is the i^{th} count of the j^{th} event and \bar{X}_j is the average count of the j^{th} event.

CV was used to identify discrepancies between counters on a day to day basis. The discrepancies can help identify personnel that require further training or if there was an error in which files were counted. For example, files from an incorrect date are occasionally erroneously selected from the file directory and counted. APE was used to determine the precision of the entire dataset. Counter precision of files with low abundance presents a problem as the difference of one or two fish between counts can lead to a large and highly variable APE. A weighted mean of the APE from all files that were recounted was used to estimate counter precision for the season. The files with low abundance that make up a minute portion of the sample do not disproportionately weight the precision estimate when using this method.

The second source of error in the precision of the hydroacoustic estimate is temporal error relating to the expansion of the 10 or 20 minute files to represent hourly escapement. No full hour files were collected at Qualark and thus no actual observed estimates of the file expansion error are possible. However, variance of the expanded population estimate for each of the 6 bins was calculated using the following variance estimator (Cochran, 1977).

$$v(\text{Bin}_Z) = \frac{N^2 s_Z^2}{n_Z} (1 - f)$$

Where N is the total number of 1 hour sample periods, s_Z^2 is the sample variance of the different bins, n_Z is the total time sampled in hours and f is the sample fraction (n_Z/N).

The sample variance was calculated for each of the bins using successive differences between stratified periods of time in this case the variation between the expanded counts over 5 hour periods (Reynolds et al., 2007; Lilja et al., 2008).

$$s_Z^2 = \sum_{i=5}^N \frac{(\text{Bin}_{Zi}/2 - \text{Bin}_{Zi-1} + \text{Bin}_{Zi-2} - \text{Bin}_{Zi-3} + \text{Bin}_{Zi-4}/2)^2}{3.5(N - 4)}$$

Where Bin_{Zi} is the expanded upstream count from bin Z on the i th hour.

This method has been shown to overestimate sample variance (Reynolds et al., 2007). The variance estimates and subsequent calculations of standard deviation and confidence intervals should be positively biased and thus conservative estimates. The variance in the total salmon passage estimate is determined by summing the components of observer variance and the temporal variance for the 6 different data bins. (Eggers et al., 1995).

In-season Reporting

An estimate of salmon escapement by species was calculated on a daily basis for the previous day's data. Escapement was reported on a bi-weekly basis to the Fraser Panel and technical data users in DFO and PSC. Test fishing catch was sent to PSC on a daily basis and a detailed test fishing report was distributed monthly.

Additional Research

We were able to access an additional acoustic imaging system from DFO during summer 2017. ARIS 1800 has been developed as a replacement for the DIDSON acoustic imaging systems we currently use at Qualark but which are becoming obsolete. ARIS 1800 is similar to the standard DIDSON imaging system. It has high frequency (1.8 MHz) and low frequency (1.1MHz) modes and output consists of images created by multiple sound beams focused through a moveable lens giving a field of view that is 14° vertical and 28° horizontal (Sound Metrics, 2014). This equipment access gave us the opportunity to further evaluate the technical capabilities of the new ARIS acoustic imaging system. The ARIS monitoring conducted was opportunistic and incremental to the standard Qualark DIDSON procedures which were not modified in any way to accommodate ARIS deployment. We used the ARIS equipment to monitor salmon migration occurring in two areas of possible concern identified by Pacific Salmon Commission staff in spring/summer 2015 (M. Lapointe, pers. comm.):

- First, we used ARIS to ensonify the RB water column beyond the current 29.17 m range using DIDSON. ARIS permitted us to evaluate fish passage occurring between 29 m and 40 m, extending coverage by 40% of the current range. While salmon migration has been shown to be highly shore oriented at Qualark during 14 years of monitoring concerns persist that migration may periodically occur outside the standard ensonified zone. ARIS has given us the opportunity to assess these distances at Qualark with acoustic imaging.
- Second, we simultaneously ensonified RB DIDSONs Bin 1 (4.17-9.17m) using ARIS in -90° roll aspect as an incremental add-on to DIDSON monitoring. In doing so we attempted to evaluate the vertical distribution of salmon and concerns that the DIDSON beam dimensions in -35° roll aspect created a possible acoustic blind zone near the bottom approximately 8-9m from the DIDSON lens.

The ARIS was affixed to the track-mounted fish deflection weir next to the RB DIDSON using a pole mount with an ARIS mounting plate. The ARIS was aimed using similar methods employed with the DIDSON, except the ARIS was set at a 0° or -90° roll instead of the -35° roll employed under normal Qualark operating procedures with the DIDSON.

While using ARIS to periodically evaluate fish passage occurring 10 m beyond the normal DIDSON range of 29 m roll was set at 0°, while tilt was set at -17°. Minor alterations were made the aim throughout the period of long range data collection. Files were recorded using a range bin of 25-40 m and duration of 20 minutes. ARIS software imparts limitations to user specified range bins preventing a starting range of 29.17 m which would align exactly with

DIDSON. These files were collected hourly in LF during the HF DIDSON file collection in order to reduce crosstalk interference between the systems. The ARIS files were counted by experienced staff; fish observed within the normal DIDSON range of 29.17 m (25-29.17m in the ARIS file) were not counted. Counting procedures used for processing DIDSON files were applied in processing the ARIS files. Sturgeon were easily recognizable and removed from the counts. A minimum size limit of 35 cm was used to remove smaller fish from the ARIS counts. This is equivalent to the 30 cm minimum size cut off used when processing DIDSON images collected using a -35° roll because the use of roll makes fish appear 18% smaller than they actually are. Increasing the ARIS image minimum size cut off by 18% ensures the size exclusions are equivalent for data collected by each imaging system.

ARIS was also deployed to evaluate the vertical distribution of salmon targets in RB Bin 1. Simultaneous collection of ARIS files using the same aim and range as the DIDSON Bin 1 (-35° roll; 4.17-9.17 m), with the exception that the ARIS data was collected using a -90° roll with -13° tilt, provided full water column coverage by both systems. Files were collected hourly in HF mode for both systems with no crosstalk interference being observed. Files were counted by experienced staff assessing direction of migration and ability to discriminate individual fish recorded and their vertical position in the water column for the ARIS data.

The file expansion error is calculated based on a variance estimator that compares the variance between hourly counts not on actual data. In 2017, additional ARIS files were recorded to provide data to calculate and check file expansion error estimates. On several occasions throughout the season, the ARIS was set up to record files with the same aim and orientation as the DIDSON Bin1. The whole day was recorded with three 20 minute files collected for each hour. These files will be counted using the same procedures as used in processing the DIDSON files. These counts can be used to determine the variance between three counts in each hour.

RESULTS

Environmental Conditions

Fraser River discharge levels measured at Hope, BC in 2017 were consistently below average values for the date over the duration of the study period (Fisheries and Oceans Canada, 2017). With the exception of a brief increase in mid-September due to rain, Fraser River discharge decreased steadily from July through September. Discharge decreased from 6,000 m^3s^{-1} from the beginning of July to less than 1,500 m^3s^{-1} in the third week of September (Figure 6). Discharge during acoustic equipment installation was just over 6,000 m^3s^{-1} . This level prevented the installation of the left bank system for a week until the discharge had decreased to approximately 5,500 m^3s^{-1} .

Fraser River water temperature measured at Hope, BC was 1-2 °C above average on a daily basis during the 2017 study. The water temperature varied from 15.5 °C during the first week of July to 20.0 °C at peak in mid-August to 14.0 °C during the third week of September (Figure 6). Daily water temperature remained above 18 °C from the beginning of August until

early September, and was above 19 °C for a week in mid-August. Temperatures above 18°C can result in decreased swimming performance and above 19°C can result in early signs of physiological stress in Pacific salmon (Fisheries and Oceans Canada, 2017).

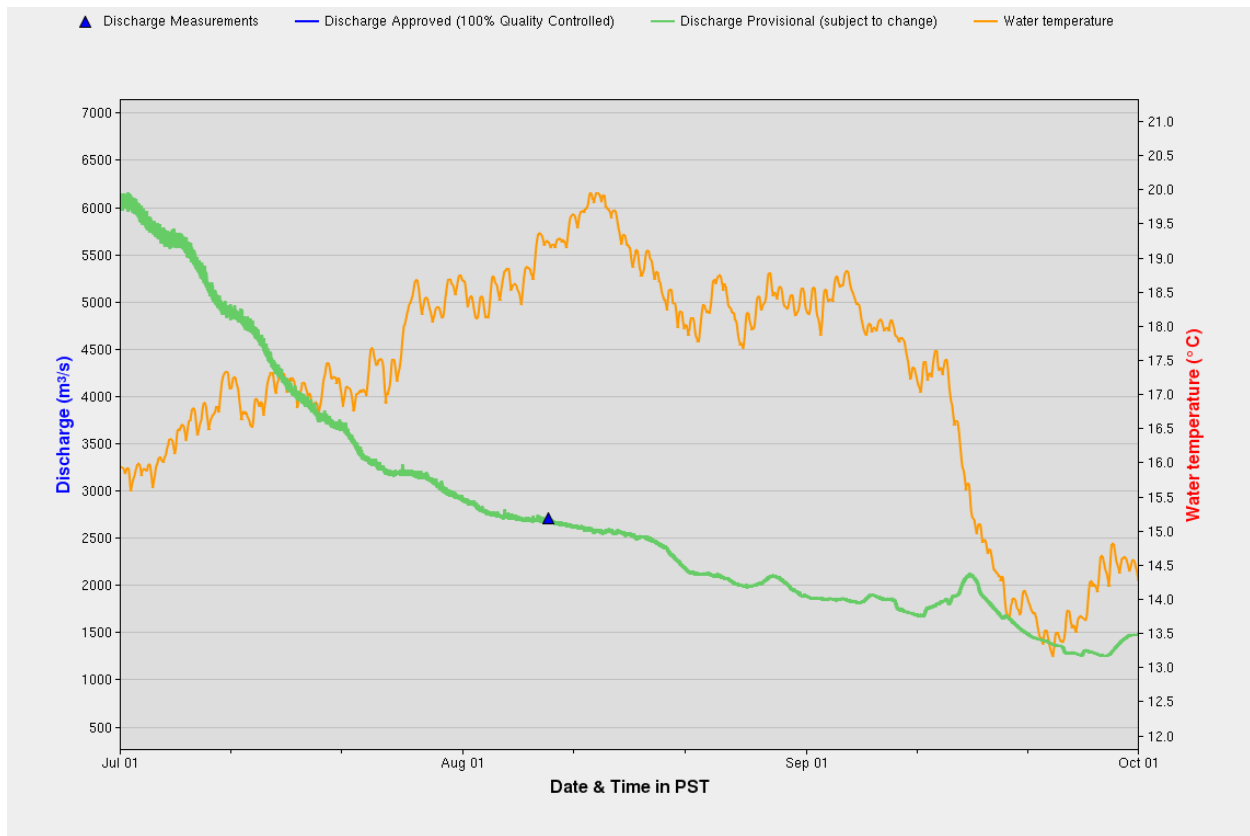


Figure 6. Discharge and water temperature for the Fraser River at Hope (Station # 08MF005) during the 2017 period of operation at the Qualark hydroacoustics site. (Environment Canada, 2017).

Total Salmon Escapement Estimate

Operation of the RB DIDSON system was initiated at 15:15 on 1 July 2017. High water levels early in the season prevented the installation of the LB DIDSON. Operation of the LB DIDSON system was initiated at 13:16 on 8 July 2017. RB counts were used to estimate LB escapement during the period while only the RB DIDSON was operational. The DIDSON systems were shut down on 24 September 2017 (RB at 12:10 and LB at 12:11). The total salmon escapement estimate was 2,716,133 (Figure 7; Appendix 1) with escapement on RB of 1,268,890 salmon, representing 47 % of the total estimate and escapement on LB of 1,447,244 comprising the remaining 53 % of the total escapement estimate. Maximum daily salmon escapement was observed on 30 August 2017 at approximately 91,000 fish (Figure 8).

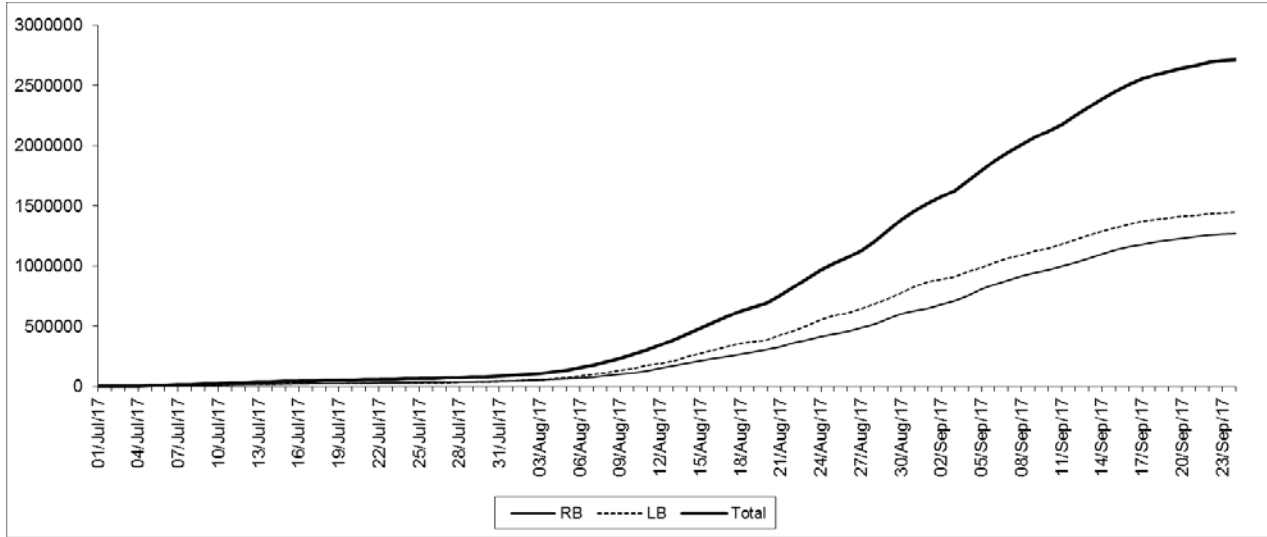


Figure 7. Cumulative daily counts of total salmon escapement derived from DIDSON assessment at Qualark, 2017, including daily cumulative counts by bank.

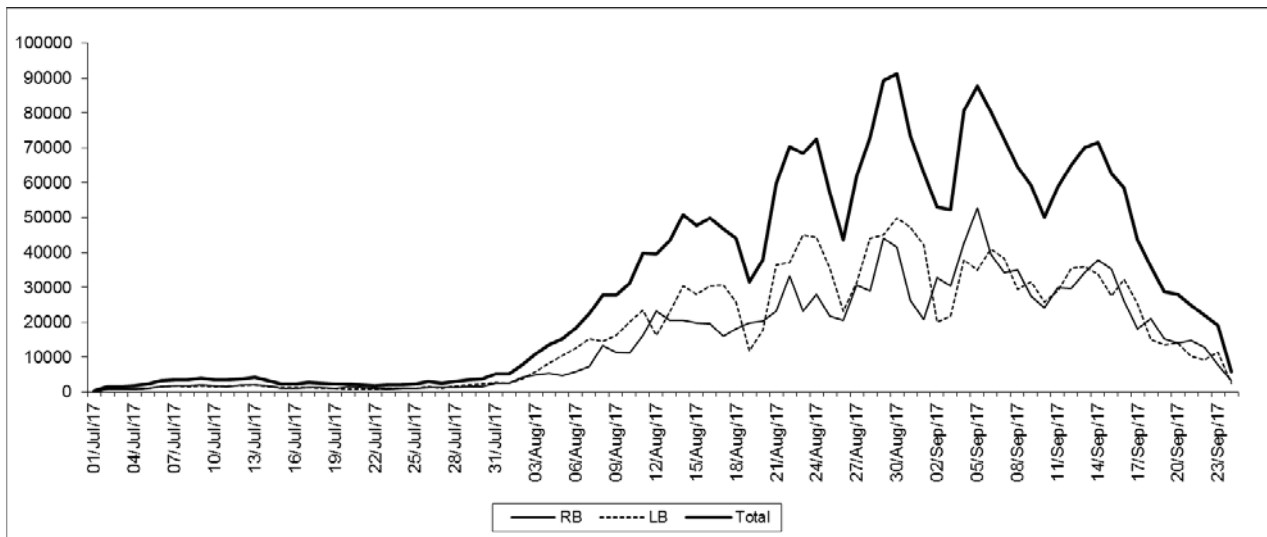


Figure 8. Expanded daily upstream counts of salmon escapement derived from DIDSON assessment at Qualark, 2017, including daily escapement by bank.

Migration Behavior

Salmon migration past the Qualark site is highly shore oriented a result of the rivers flow pattern which is lowest on shore and highest mid channel. In 2017 approximately 92% of all migration occurred in Bin 1 within 5 m of the end of the fish deflection weirs, which is within 9.2 m of shore (Table 1). Less than 1% of the total migration occurred in Bin 3, 19-29 m offshore. This is consistent with migration distribution patterns observed since 2008, and despite the seasonally low flows observed there was no tendency for salmon to migrate further offshore in 2017. During periods of First Nation set gill net fisheries in the river downstream of Qualark

the proportion of migration occurring beyond Bin 1 (the first 5 m) increased to 13.8% on RB and 13.6% on LB. This contrasts with 6.1% and 4.6% on RB and LB respectively, during periods when fisheries were not occurring. This migration shift slightly farther offshore (2-5 m) in response to fishing activity has been observed consistently since 2008. Once fishing pressure is removed salmon immediately respond by shifting their migration back onshore. Figure 9 illustrates the difference in the proportion of migration occurring offshore (9.17-29.17m; in Bins 2 & 3) during First Nation set gill net openings in the area adjacent to the Qualark site. No major holding or milling behavior was observed at Qualark in 2017.

Table 1. Escapement estimates recorded in the 4.17-9.17 m HF range bin compared to the two LF range bins from 9.17-29.17 m at Qualark, 2017. Escapement is divided by bank, period of time and fishing activities.

Period	Bank	Escapement	Bin 1 (4.17–9.17m)	Bin 2 (9.17–19.17m)	Bin 3 (19.17–29.17m)
Jul 1-Sep 24	Both	2,716,133	91.9%	7.4%	0.7%
Jul 1-Sep 24	Right	1,268,890	91.2%	8.3%	0.5%
Jul 1-Sep 24	Left	1,447,244	92.5%	6.6%	0.9%
No nets	Right	829,976	93.9%	5.8%	0.3%
No nets	Left	987,397	95.4%	4.2%	0.4%
Nets in	Right	438,914	86.2%	12.9%	0.9%
Nets in	Left	459,847	86.4%	11.8%	1.8%

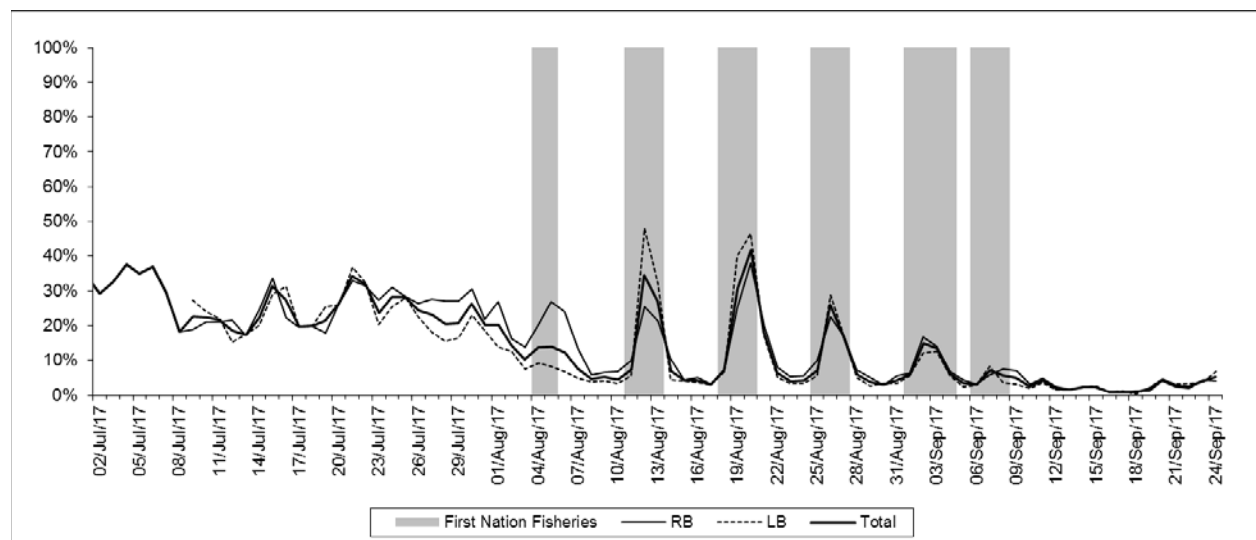


Figure 9. The proportion of daily escapement occurring beyond the first 5 m HF range bin from 9.17 to 29.17 m from the DIDSON at Qualark, 2017. First nation set gill net openings are identified.

Species Composition

The test fishing program commenced on the morning of 2 July 2017, the day following the hydroacoustic program launch. Species composition from 2 July 2017 was applied to the first partial day of the hydroacoustic data. The test fishing program terminated after the morning drift sequence on 24 September 2017, with the hydroacoustic program ending the same day. Sockeye

Salmon were the most abundant species captured during July and August (Figure 10; Appendix 1). A relatively high proportion of Chinook Salmon were observed during July with low proportions observed during August and September (Figure 11). Pink salmon were the most abundant species captured during September (Figure 12). Coho Salmon were observed starting in the second week of September through to the end of the project (Figure 13). Chum Salmon were observed in mid-September (Appendix 1). Coho and Chum Salmon comprised only a very small component of daily migration. Appendix 2 contains details of test fishery catch by set.

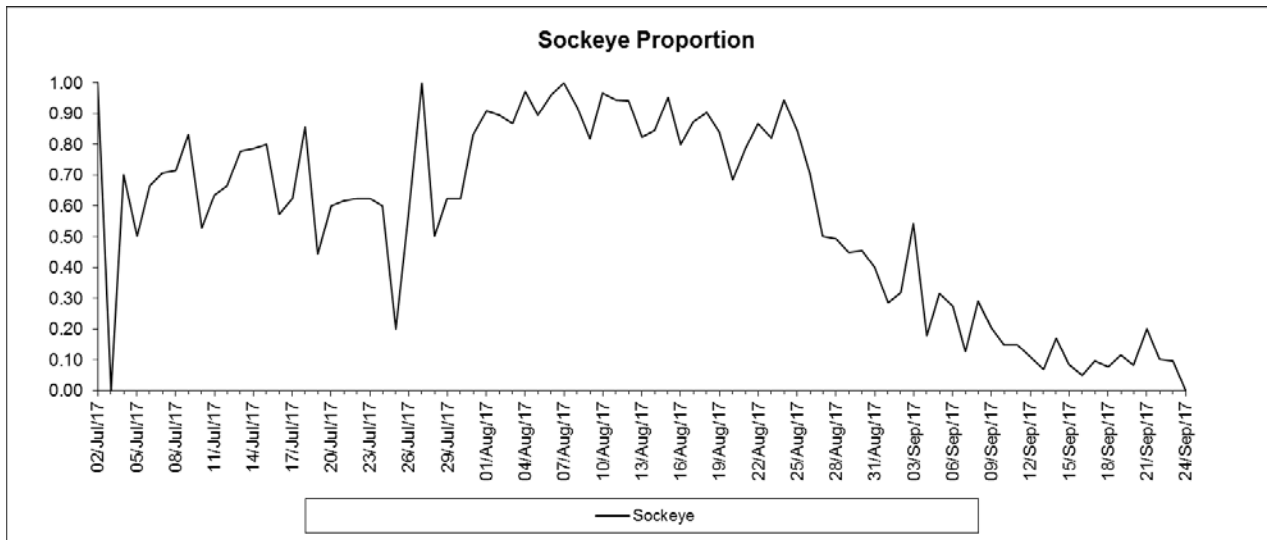


Figure 10. Daily Sockeye Salmon proportion derived from the test fishery at Qualark, 2017.

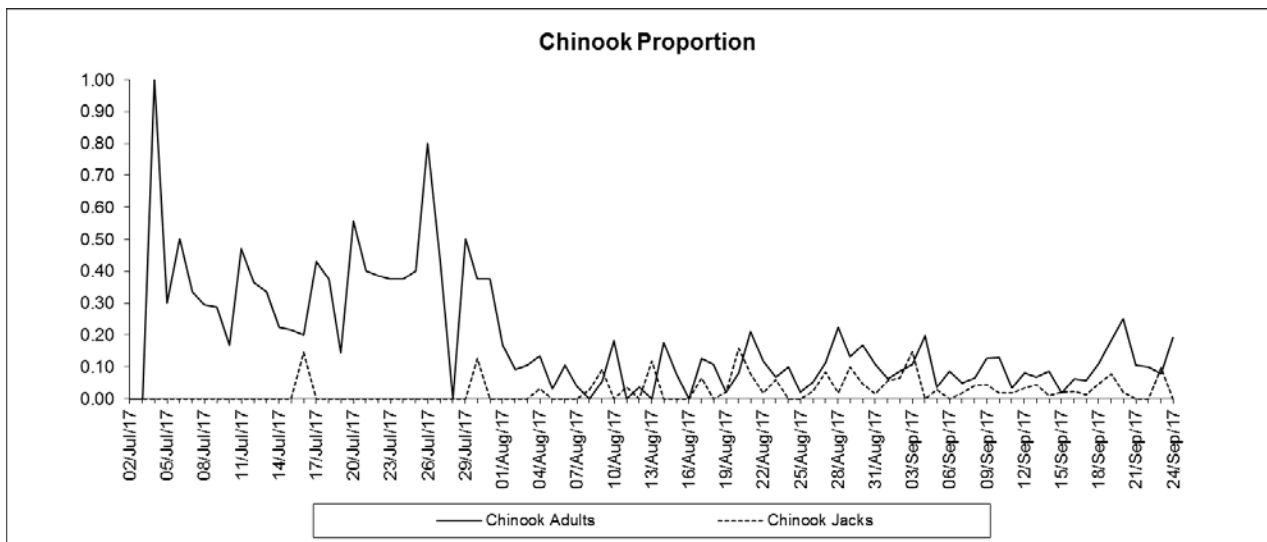


Figure 11. Daily Chinook Salmon proportion derived from the test fishery at Qualark, 2017.

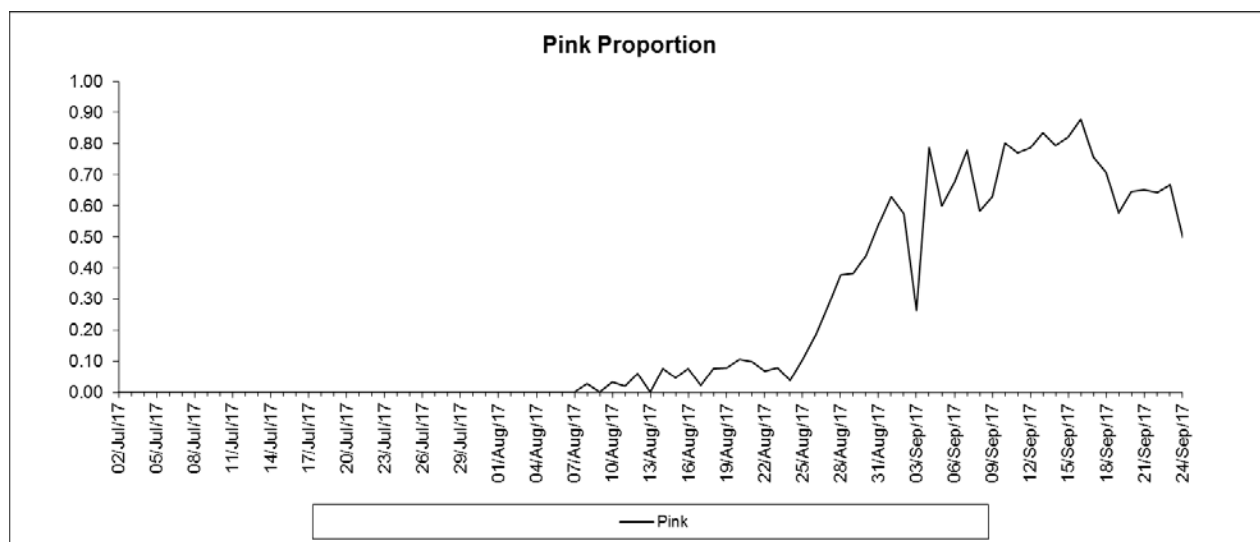


Figure 12. Daily Pink Salmon proportion derived from the test fishery at Qualark, 2017.

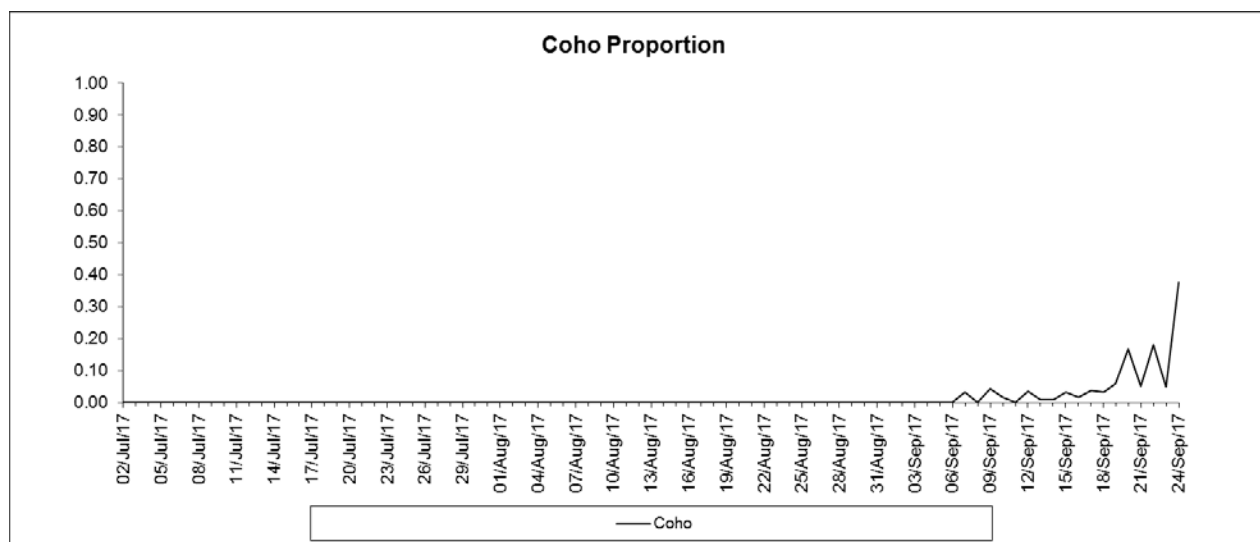


Figure 13. Daily Coho Salmon proportion derived from the test fishery at Qualark, 2017.

Escapement by Species

Sockeye Salmon comprised 49% (1,321,858) of the total salmon escapement at Qualark in 2017 (Figure 14; Appendix 1). Sockeye Salmon were present daily throughout the majority of test fishery operation, comprising on average 65% of daily migration in July, 80% in August and 20% in September (Figure 10).

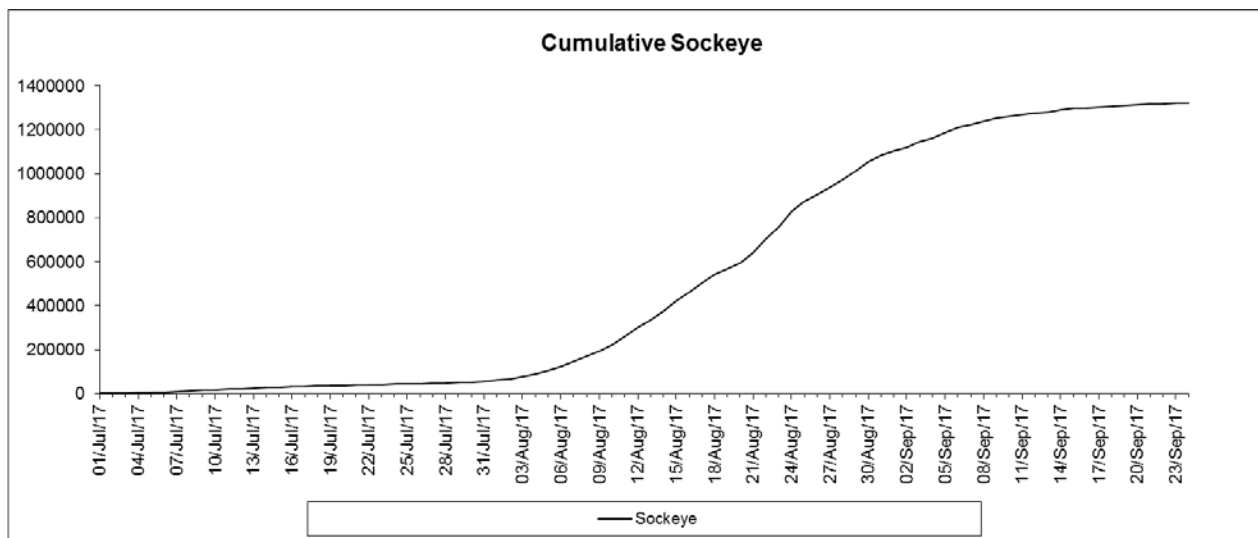


Figure 14. Cumulative daily Sockeye Salmon escapement apportioned by species based on test fishing catch at Qualark, 2017.

In general, Sockeye abundance was much lower than expected throughout the season. The daily abundance of Sockeye Salmon started increasing at the end of July (Figure 15; Appendix 1). Daily passage estimates for Sockeye Salmon ranged from 0 early in July, to a peak of 68,411 on 24 August 2017. Multiple peaks and troughs were observed throughout the season.

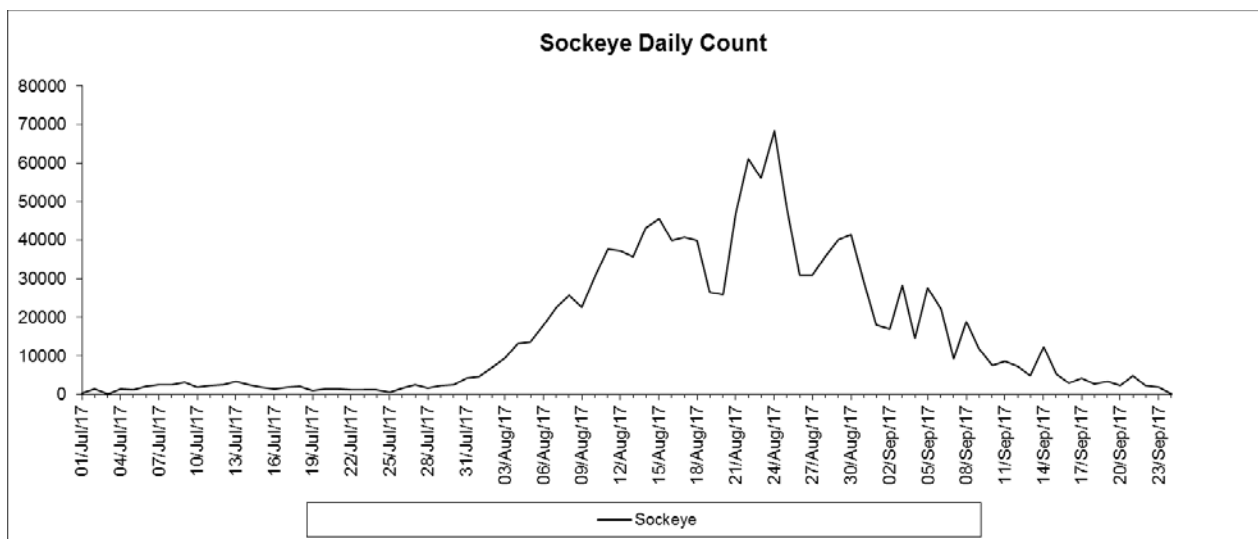


Figure 15. Daily escapement estimates of Sockeye Salmon in the Fraser River at Qualark, 2017.

Chinook Salmon comprised 10% (268,502) of total salmon passage at Qualark in 2017 including an estimated 175,675 adults and 92,827 jacks (Figure 16; Appendix 1). Chinook Salmon were present daily throughout the majority of test fishery operation, comprising on average 35% of daily migration in July and 10% in August and September (Figure 11).

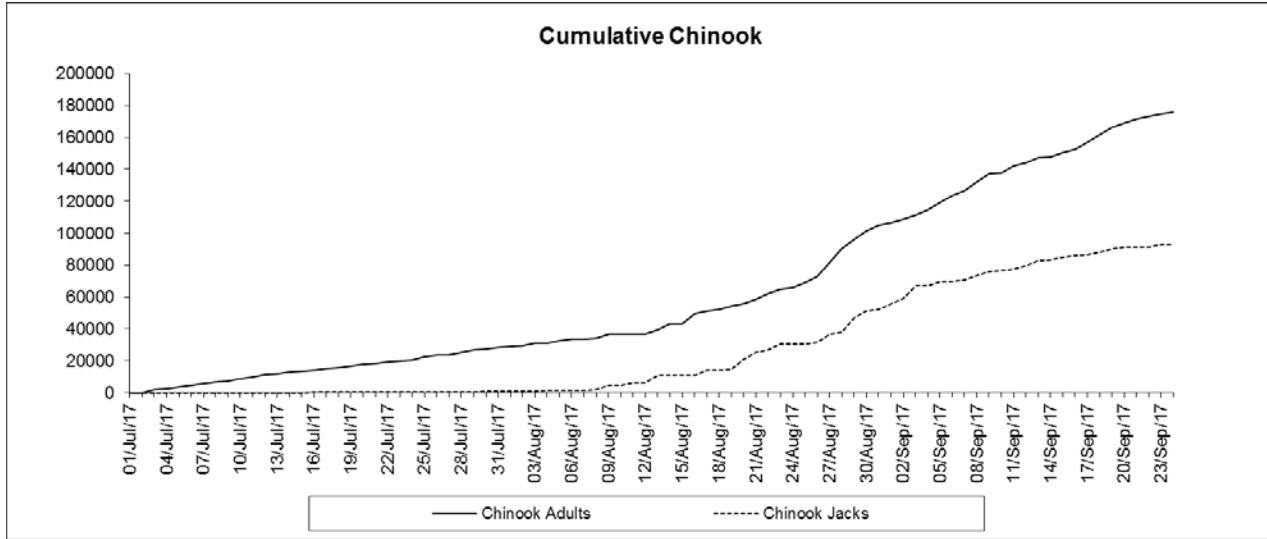


Figure 16. Cumulative daily Chinook Salmon escapement apportioned by species based on test fishing catch at Qualark, 2017.

The daily Chinook Salmon estimate remained very low and relatively stable until mid-August when escapement increased (Figure 17). Daily passage estimates for Chinook Salmon ranged from a low of 0 to a peak of 14,870 on 29 August 2017. There was a relatively high abundance of jack Chinook observed from mid-August to the end of the project on 24 September 2017.

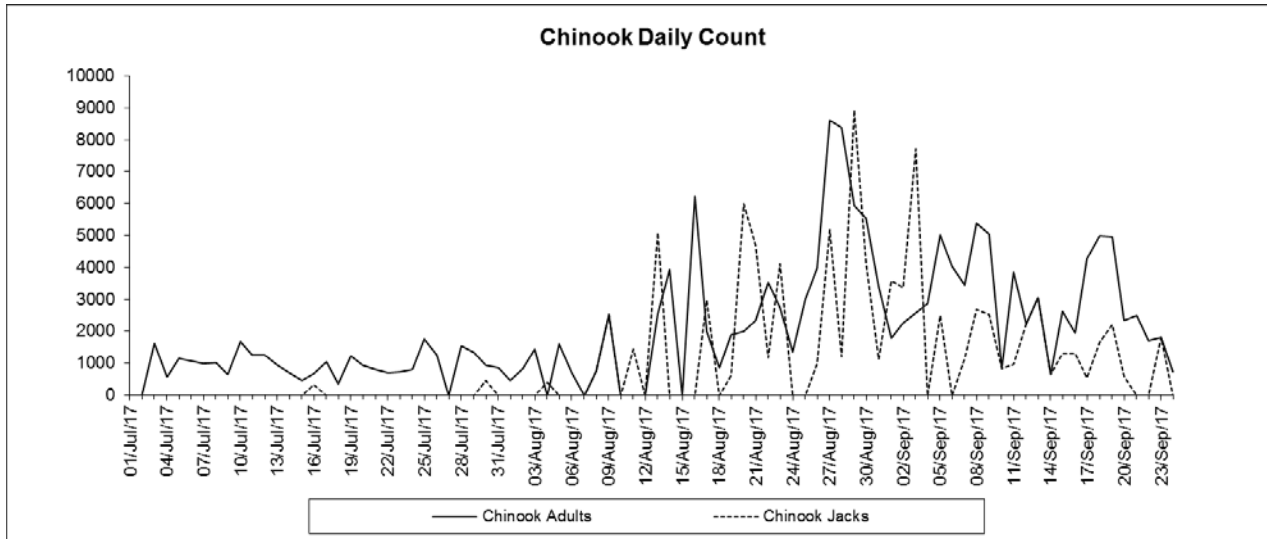


Figure 17. Daily escapement estimates of Chinook Salmon in the Fraser River at Qualark, 2017.

Pink Salmon comprised 40% (1,095,716) of total salmon passage at Qualark in 2017 (Figure 18; Appendix 1). Pink Salmon were present in the test fishery starting on 8 August 2017, comprising approximately 5% of daily migration in the last three weeks of August and 65% in September (Figure 12).

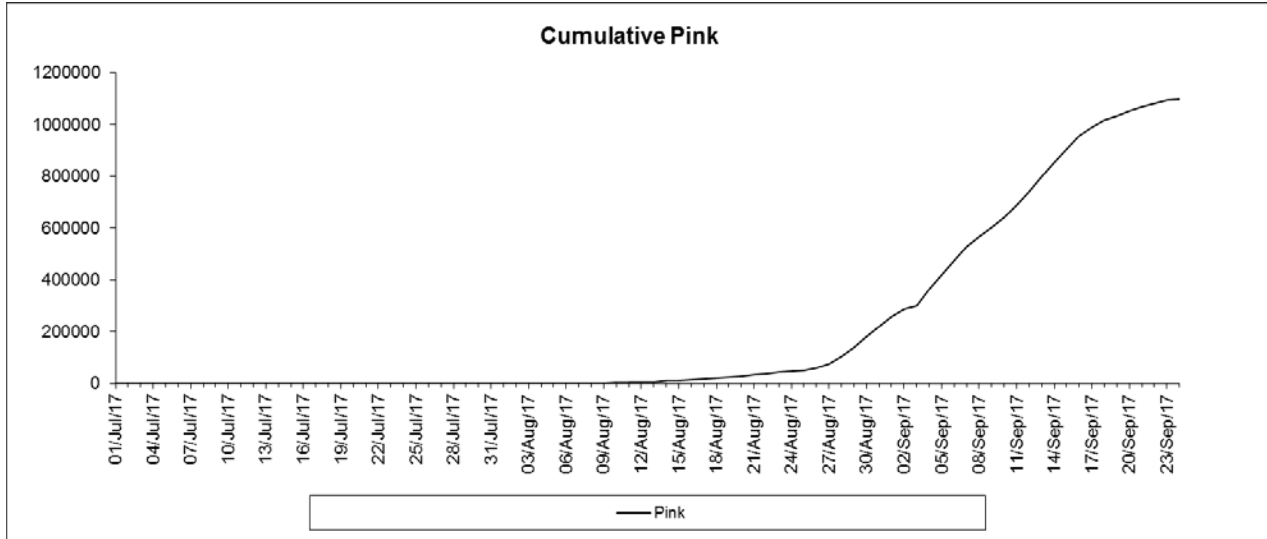


Figure 18. Cumulative daily Pink Salmon escapement apportioned by species based on test fishing catch at Qualark, 2017.

The daily Pink Salmon estimate remained low and relatively stable until the end of August when escapement increased (Figure 19). Daily passage estimates for Pink Salmon ranged from a low of 0 to a peak of 63,318 on 4 September 2017.

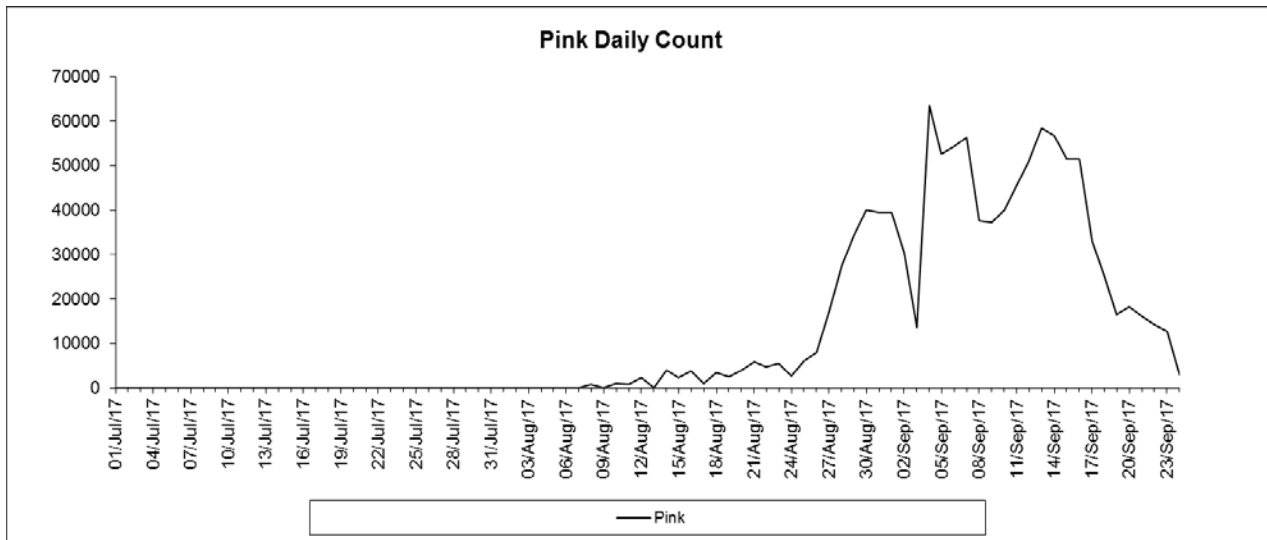


Figure 19. Daily escapement estimates of Pink Salmon in the Fraser River at Qualark, 2017.

Coho Salmon comprised 1% (29,412) of total salmon passage at Qualark in 2017 (Figure 20; Appendix 1). However a total of 48 Coho were caught in the last three weeks of the project. This was a larger than average catch for the season. Coho Salmon were present in the test fishery starting on 7 September 2017. Coho were caught daily throughout the majority of final three weeks of test fishery operation, comprising approximately 5% of daily migration from 7 September 2017 to 24 September 2017 (Figure 13).

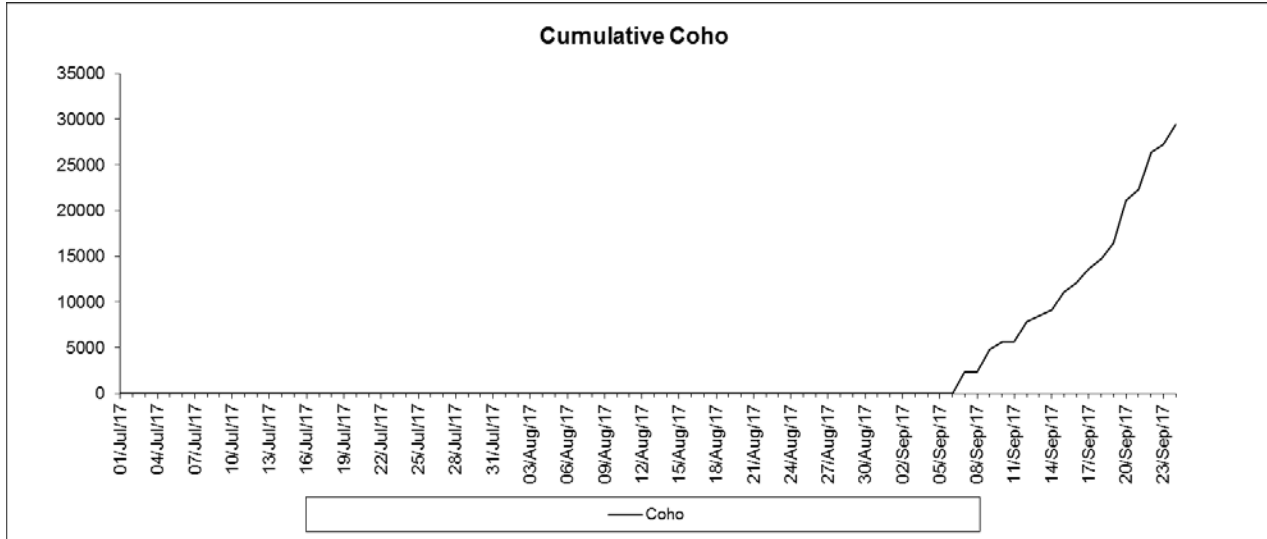


Figure 20. Cumulative daily Coho Salmon escapement apportioned by species based on test fishing catch at Qualark, 2017.

The daily Coho Salmon estimate fluctuated but showed an increasing trend from 7 September 2017 until the end of the project (Figure 21). Daily passage estimates for Coho Salmon ranged from a low of 0 to a peak of 4,678 on 20 September 2017.

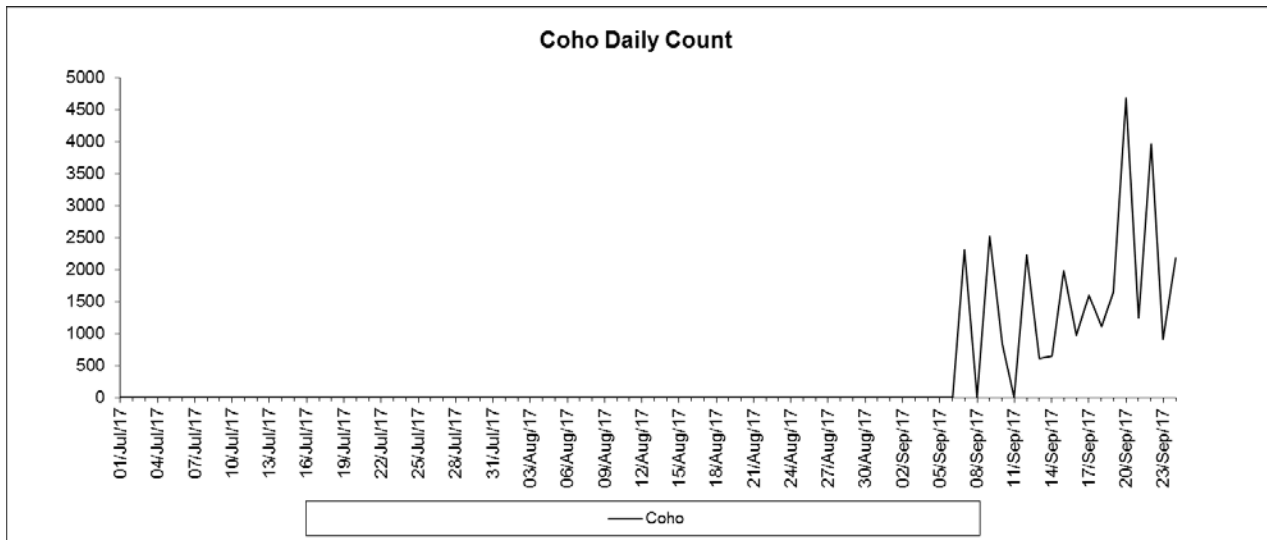


Figure 21. Daily escapement estimates of Chinook Salmon in the Fraser River at Qualark, 2017.

Chum Salmon comprised a very minor proportion (645) of the 2017 Qualark estimate (Appendix 1). Only one Chum Salmon was caught in the test fishery in 2017.

Precision

The variance estimates related to the temporal expansion procedures are documented in Table 2 for each of the 6 different range bins estimated at Qualark.

Table 2. Total number of files counted (N), total time counted in hours (n), unsampled fraction ($1-f$), sample variance (s^2) and variance related to temporal expansion in each of the 6 different bins at Qualark, 2017.

	RB Bin 1	RB Bin 2	RB Bin 3	LB Bin 1	LB Bin 2	LB Bin 3	Total
N	2033	2033	2033	2033	2033	2033	
n	677.7	677.7	338.8	677.7	677.7	338.8	
$1 - f$	0.67	0.67	0.83	0.67	0.67	0.83	
s^2	162994	2578	46	124957	2203	178	
$v(Bin_z)$	662734584	10480681	466327	508076606	8955515	1810119	1191437760

The number of files recounted two or more times by different staff were 2,821. The escapement in the recounted files accounted for approximately 30% of the total estimated escapement. The total weighted APE associated with observer precision was 1.9% (Table 3). The 95% confidence interval on total salmon passage was calculated to be $\pm 122,765$ salmon.

Table 3. Observer, temporal and total error, standard deviation and variance at Qualark 2017, including calculated 95% confidence intervals on the total salmon escapement estimate.

	Observer	Temporal	Total
Error	0.019	0.013	0.023
SD	52,266	34,517	62,635
Variance	2,731,756,692	1,191,437,760	3,923,194,452
Total Population			2,716,133
$\pm 95\%$ CI			122,765
Lower 95% CI			2,593,368
Upper 95% CI			2,838,899
Percent Relative Error			4.52%

Additional Research

From 20 July 2017 to 22 September 2017, 794 long range ARIS (25-40m) files, 392 -90 degree files and 923 file expansion files were recorded (Figure 22).

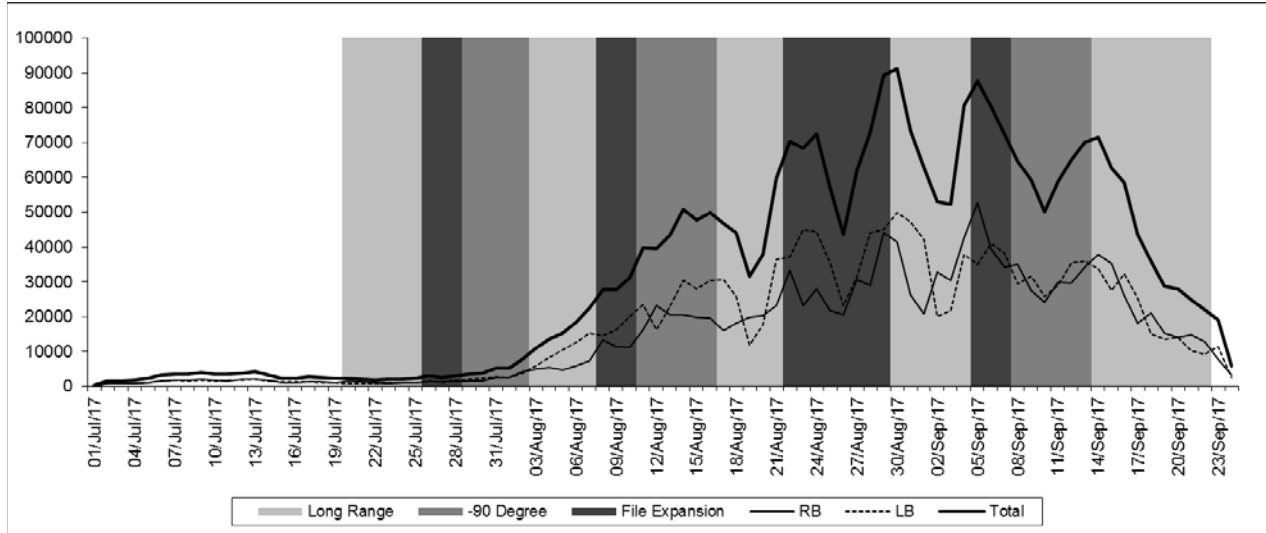


Figure 22. Daily salmon escapement and periods of data collection of long range (25-40m), -90° rolled and file expansion ARIS files at Qualark, 2017.

The processing of the 2017 ARIS data is in progress and results are pending.

DISCUSSION

The DIDSON hydroacoustic program at Qualark produces daily in-season estimates of salmon escapement in the Fraser River near Hope, BC. Daily escapement estimates at Qualark can be produced regardless of discharge and procedures do not change throughout the duration of the project. In 2017, the total escapement was estimated as $2,716,133 \pm 122,765$ salmon. The lower 95% confidence interval was 2,593,368 salmon; the upper 95% confidence interval was 2,838,899 salmon.

Hydroacoustic coverage of the area that salmon migrate within is complete at Qualark. The bottom of the ensonified area has been modified resulting in an acoustically non-reflective planar profile. There are no shelves or scalloped areas that create acoustic shadowing that could potentially obscure salmon escapement. The -35° roll angle is utilized to maximize vertical coverage of the water column. The results of testing estimated vertical water column sampling coverage on RB to be from the substrate to 38 cm below the surface, on LB coverage is to within 29 cm from the surface. These measurements were collected from the weir approximately 4 m from the DIDSON. Beam spread beyond this point will further increase coverage as distance from the DIDSON increases. On-site testing has shown that salmon rarely migrate this close to the surface. Migration occurs primarily within 5 meters of the end of the fish deflection weir due to fast, strong flow in mid-river and slower seams of water along the banks. The absence of migration beyond the area of coverage is further supported by the very minimal escapement (<1%) observed in the 19.17-29.17 m range bin (Bin3) and lack of catch in the bi-weekly offshore drifts.

The bank-oriented migratory behavior allows for the collection of high quality 5 m HF DIDSON files that contain the vast majority of the salmon migration, 92% in 2017. The directed upstream migratory behavior combined with the high image quality maximizes the accuracy and precision of the counts. Counting protocols address potential biases associated with fish crossing between range bins. Minimum length requirements remove smaller native fish from the counts.

No major holding or milling behaviors were observed in 2017, and there was no marked migration observed beyond Bin1, except during periods when First Nation Fisheries were occurring. In previous years, First Nations set gill net fisheries occurring near the site have consistently elicited a similar response from migrating salmon, regardless of discharge level. In 2017, 47% of passage was on RB and 53% was on LB. In previous years, the proportion by bank, though variable on a day to day basis, was also close to 50% on each bank overall.

The total daily salmon escapement is proportioned by species based on the direct proportion of each caught in the daily test fishery. The emphasis from a management perspective is on Sockeye Salmon. The total salmon escapement estimate at Qualark in 2017 was 2,716,133, consisting of, 1,321,858 Sockeye, 268,502 Chinook including 92,829 jacks, 1,095,716 Pink, 29,412 Coho and 645 Chum. Despite the high quality of the acoustically derived total salmon escapement estimate and the test fishing being conducted at the location of hydroacoustic site, the representativeness of species proportioning may introduce uncertainty due to small sample sizes in test fishing catch relative to total passage. In addition, the species apportioning procedures applied assume constant catchability through time and by species, if catchability varies, then application of direct proportional expansion may introduce species composition bias. We are investigating methods to account for differences in species specific vulnerability to the fishing gear to improve the species estimates and reduce sampling induced bias effects. This work is ongoing and will be reported on in the future.

Utility of the next generation ARIS was assessed as it will soon be replacing DIDSON which is no longer manufactured. There were a number of challenges encountered with the ARIS. The manufacturer confirmed the advanced timer recording was not yet functional, making set-up of the standard Qualark recording regime nearly impossible. The basic recording function does not allow flexibility in start times for 20 minute files. It only allows for start times of 0 minutes, 20 minutes and 40 minutes of each hour. The standard Qualark file start times on RB are 0 minutes, 15 minutes, 36 minutes of each hour. In order to get a 20 minute file with a start time of 15 minutes past the hour it was necessary to offset the ARIS computer clock by 5 minutes. Additionally there were problems with air being trapped inside the unit causing poor image quality. The image quality was not good throughout the experimentation: we noted excessive arcing on salmon targets; poor bottom image; and numerous technical “glitches” when the system shutdown for no apparent reason. The file size from ARIS is much larger than DIDSON requiring much more data storage capacity. Lastly, the ARIS Fish program used to view recorded files requires additional development to improve user friendliness. The advantages of the ARIS are the increased flexibility in start ranges and bin size. Additionally the LF ARIS files can be recorded with 96 beams instead of 48 beams with the DIDSON so theoretically longer range and larger bins should have better image quality. Overall the image quality was poorer than that of the aging DIDSON systems and numerous other problems with the software functionality made use of the ARIS difficult.

Despite these challenges, we were able to explore, in a limited manner, whether salmon passage was occurring beyond the normal DIDSON coverage 29.17m, in 2017 using ARIS. Flow is fast in the middle of the river relative to the banks which have seams of slower flow within the ensonified area. Salmon exhibit high fidelity to moving through the near shore area with slower flow due to reduced energetic requirements. This behavior is readily apparent within the DIDSON's range stratified files. Approximately 92% of all the salmon migration was observed in Bin1 (4.17-9.17m). The remaining 8% moved in Bin2 (9.17-19.17m), with less than 1% of total migration occurring in Bin 3 (19.17-29.17m) this year. External stimuli (Qualark drift gill net test fishery and First Nation set net fisheries) repeatedly cause a higher proportion of salmon to shift their migration offshore at Qualark. This shift is no greater than 3-5 m beyond normal distribution and sees temporally limited elevation in Bin2 counts. There is no evidence that salmon move off beyond the 30m ensonified area during these periods. Very low proportions move out as far as Bin3. In all cases as soon as external stimuli are removed the fish immediately respond by resuming their highly on-shore oriented behavior. Migration occurring beyond the regularly ensonified zone has been assessed using bi-weekly offshore gillnet drifts since 2008. A 30 m gillnet is drifted just beyond the outboard edge of the ensonified area, sweeping a range of 30-60 m offshore to evaluate salmon presence there. Over the 10 year period of operation there have been a total of four salmon caught in these offshore drifts. Additionally, DFO's Applied Technologies group transected the river during the initial set up of the operation in the late 90's to determine if there was passage in the middle of the river. They used splitbeam hydroacoustic distribution plots to show that salmon migration was highly shore oriented: minimal or no passage was seen outside the normally ensonified area (30 m).

Additional work is ongoing to assess and evaluate additional ARIS data collected in 2017 evaluating target distribution in RB Bin 1. Results will be reported elsewhere.

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APPENDICES

Appendix 1. Daily total and cumulative salmon escapement by bank, daily catch, daily species proportions and daily and cumulative escapement by species from Qualark hydroacoustic and test fishing programs in 2017.

Date	Total Expanded Daily Count			Cumulative Daily Count			Daily Catch							Species Proportion							Daily Species Count							Cumulative Species Count						
	RB	LB	Total	RB	LB	Total	Sockeye	Chinook	Chinook Jacks	Coho	Pink	Chum	Total	Sockeye	Chinook Adults	Chinook Jacks	Coho	Pink	Chum	Sockeye	Chinook Adults	Chinook Jacks	Coho	Pink	Chum	Sockeye	Chinook Adults	Chinook Jacks	Coho	Pink	Chum			
1-Jul-17	174	174	348	174	174	348	1	0	0	0	0	0	1	1.00	0.00	0.00	0.00	0.00	0.00	348	0	0	0	0	0	348	0	0	0	0	0			
2-Jul-17	738	738	1476	912	912	1824	0	1	0	0	0	0	1	1.00	0.00	0.00	0.00	0.00	0.00	1476	0	0	0	0	0	1824	0	0	0	0	0			
3-Jul-17	810	810	1620	1722	1722	3444	7	3	0	0	0	0	10	0.00	1.00	0.00	0.00	0.00	0.00	0	1620	0	0	0	0	1824	1620	0	0	0	0			
4-Jul-17	957	957	1914	2679	2679	5358	4	4	0	0	0	0	8	0.70	0.30	0.00	0.00	0.00	0.00	1340	574	0	0	0	0	3164	2194	0	0	0	0			
5-Jul-17	1143	1143	2286	3822	3822	7644	6	3	0	0	0	0	9	0.50	0.50	0.00	0.00	0.00	0.00	1143	1143	0	0	0	0	4307	3337	0	0	0	0			
6-Jul-17	1587	1593	3180	5409	5415	10824	12	5	0	0	0	0	17	0.67	0.33	0.00	0.00	0.00	0.00	2120	1060	0	0	0	0	6427	4397	0	0	0	0			
7-Jul-17	1686	1686	3372	7095	7101	14196	10	4	0	0	0	0	14	0.71	0.29	0.00	0.00	0.00	0.00	2380	992	0	0	0	0	8807	5389	0	0	0	0			
8-Jul-17	1863	1662	3525	8958	8763	17721	15	3	0	0	0	0	18	0.71	0.29	0.00	0.00	0.00	0.00	2518	1007	0	0	0	0	11325	6396	0	0	0	0			
9-Jul-17	2127	1746	3873	11085	10509	21594	9	8	0	0	0	0	17	0.83	0.17	0.00	0.00	0.00	0.00	3228	646	0	0	0	0	14552	7042	0	0	0	0			
10-Jul-17	1913	1647	3560	12998	12156	25154	7	4	0	0	0	0	11	0.53	0.47	0.00	0.00	0.00	0.00	1884	1675	0	0	0	0	16437	8717	0	0	0	0			
11-Jul-17	1599	1824	3423	14597	13980	28577	5	3	0	0	0	0	8	0.64	0.36	0.00	0.00	0.00	0.00	2178	1245	0	0	0	0	18615	9961	0	0	0	0			
12-Jul-17	2046	1740	3786	16643	15720	32363	7	2	0	0	0	0	9	0.67	0.33	0.00	0.00	0.00	0.00	2524	1262	0	0	0	0	21139	11223	0	0	0	0			
13-Jul-17	2123	2064	4187	18765	17784	36549	11	3	0	0	0	0	14	0.78	0.22	0.00	0.00	0.00	0.00	3256	930	0	0	0	0	24395	12154	0	0	0	0			
14-Jul-17	1691	1556	3247	20456	19340	39796	4	1	0	0	0	0	5	0.79	0.21	0.00	0.00	0.00	0.00	2551	696	0	0	0	0	26946	12849	0	0	0	0			
15-Jul-17	1131	1203	2334	21587	20543	42130	4	2	1	0	0	0	7	0.80	0.20	0.00	0.00	0.00	0.00	1867	467	0	0	0	0	28813	13316	0	0	0	0			
16-Jul-17	1017	1338	2355	22604	21881	44485	5	3	0	0	0	0	8	0.57	0.29	0.14	0.00	0.00	0.00	1346	673	336	0	0	0	30159	13989	336	0	0	0			
17-Jul-17	1418	1347	2765	24022	23228	47249	8	5	0	0	0	0	13	0.63	0.38	0.00	0.00	0.00	0.00	1728	1037	0	0	0	0	31887	15026	336	0	0	0			
18-Jul-17	1428	981	2409	25450	24209	49658	4	5	0	0	0	0	9	0.86	0.14	0.00	0.00	0.00	0.00	2065	344	0	0	0	0	33952	15370	336	0	0	0			
19-Jul-17	1149	1077	2226	26599	25286	51884	6	4	0	0	0	0	10	0.44	0.56	0.00	0.00	0.00	0.00	989	1237	0	0	0	0	34941	16607	336	0	0	0			
20-Jul-17	1558	789	2347	28156	26075	54231	8	5	0	0	0	0	13	0.60	0.40	0.00	0.00	0.00	0.00	1408	939	0	0	0	0	36349	17545	336	0	0	0			
21-Jul-17	1287	783	2070	29443	26858	56301	2	0	0	0	0	0	2	0.62	0.38	0.00	0.00	0.00	0.00	1274	796	0	0	0	0	37623	18341	336	0	0	0			
22-Jul-17	1152	732	1884	30595	27590	58185	5	3	0	0	0	0	8	0.63	0.38	0.00	0.00	0.00	0.00	1178	707	0	0	0	0	38800	19048	336	0	0	0			
23-Jul-17	876	1059	1935	31471	28649	60120	5	3	0	0	0	0	8	0.63	0.38	0.00	0.00	0.00	0.00	1209	726	0	0	0	0	40010	19773	336	0	0	0			
24-Jul-17	1023	978	2001	32494	29627	62121	3	2	0	0	0	0	5	0.60	0.40	0.00	0.00	0.00	0.00	1201	800	0	0	0	0	41210	20574	336	0	0	0			
25-Jul-17	1146	1065	2211	33640	30692	64332	1	4	0	0	0	0	5	0.20	0.80	0.00	0.00	0.00	0.00	442	1769	0	0	0	0	41652	22343	336	0	0	0			
26-Jul-17	1295	1632	2927	34935	32324	67258	4	3	0	0	0	0	7	0.57	0.43	0.00	0.00	0.00	0.00	1672	1254	0	0	0	0	43325	23597	336	0	0	0			
27-Jul-17	1362	1170	2532	36297	33494	69790	2	0	0	0	0	0	2	1.00	0.00	0.00	0.00	0.00	0.00	2532	0	0	0	0	0	45857	23597	336	0	0	0			
28-Jul-17	1320	1785	3105	37617	35279	72895	4	4	0	0	0	0	8	0.50	0.50	0.00	0.00	0.00	0.00	1553	1553	0	0	0	0	47409	25149	336	0	0	0			
29-Jul-17	1443	2088	3531	39060	37367	76426	5	3	0	0	0	0	8	0.63	0.38	0.00	0.00	0.00	0.00	2207	1324	0	0	0	0	49616	26473	336	0	0	0			
30-Jul-17	1596	2199	3795	40656	39566	80221	10	4	2	0	0	0	16	0.63	0.25	0.13	0.00	0.00	0.00	2372	949	474	0	0	0	51988	27422	811	0	0	0			
31-Jul-17	2424	2733	5157	43080	42299	85378	10	2	0	0	0	0	12	0.83	0.17	0.00	0.00	0.00	0.00	4298	860	0	0	0	0	56285	28282	811	0	0	0			
1-Aug-17	2517	2580	5097	45597	44879	90475	10	1	0	0	0	0	11	0.91	0.09	0.00	0.00	0.00	0.00	4634	463	0	0	0	0	60919	28745	811	0	0	0			
2-Aug-17	4119	3678	7797	49716	48557	98272	17	2	0	0	0	0	19	0.89	0.11	0.00	0.00	0.00	0.00	6976	821	0	0	0	0	67895	29566	811	0	0	0			
3-Aug-17	4866	5979	10845	54582	54536	109117	13	2	0	0	0	0	15	0.87	0.13	0.00	0.00	0.00	0.00	9399	1446	0	0	0	0	77294	31012	811	0	0	0			
4-Aug-17	5388	8286	13674	59970	62822	122791	33	0	1	0	0	0	34	0.97	0.00	0.03	0.00	0.00	0.00	13272	0	402	0	0	0	90566	31012	1213	0	0	0			
5-Aug-17	4746	10542	15288	64716	73364	138079	17	2	0	0	0	0	19	0.89	0.11	0.00	0.00	0.00	0.00	13679	1609	0	0	0	0	104245	32621	1213	0	0	0			
6-Aug-17	5853	12642	18495	70569	86006	156574	25	1	0	0	0	0	26	0.96	0.04	0.00	0.00	0.00	0.00	17784	711	0	0	0	0	122029	33332	1213	0	0	0			
7-Aug-17	7230	15312	22542	77799	101318	179116	30	0	0	0	0	0	30	1.00	0.00	0.00	0.00	0.00	0.00	22542	0	0	0	0	0	144571	33332	1213	0	0	0			
8-Aug-17	13307	14517	27824	91105	115835	206940	34	1	1	0	1	0	37	0.92	0.03	0.03	0.00	0.03	0.00	25568	752	752	0	752	0	170138	34084	1965	0	752	0			
9-Aug-17	11400	16290	27690	102505	132125	234630	18	2	2	0	0	0	22	0.82	0.09	0.09	0.00	0.00	0.00	22655	2517	2517	0	0	0	192794	36602	4482	0	752	0			
10-Aug-17	11193	20040	31233	113698	152165	265863	29	0	0	0	1	0	30	0.97	0.00	0.00	0.00	0.03	0.00	30192	0	0	0	1041	0	222985	36602	4482	0	1793	0			
11-Aug-17	16314	23517	39831	130012	175682	305694	52	0	2	0	1	0	55	0.95	0.00	0.04	0.00	0.02	0.00	37658	0	1448	0	724	0	260644	36602	5931	0	2517	0			
12-Aug-17	23220	16254	39474	153232	191936	345168	16	0	0	0	1	0	17	0.94	0.00	0.00	0.00	0.06	0.00	37152	0	0	0	2322	0	297796	36602	5931	0	4839	0			
13-Aug-17	20502	22866	43368	173734	214802	388536	14	1	2	0	0	0	17	0.82	0.06	0.12	0.00	0.00	0.00	35715	2551	5102	0	0	0	333511	39153	11033	0	4839	0			
14-Aug-17	20601	30339	50940	194335	245141	439476	33	3	0	0	3	0	39	0.85	0.08	0.00	0.00	0.08	0.00	43103	3918	0	0	3918	0	376614	43071	11033	0	8758	0			
15-Aug-17	19716	28017	47733	214051	273158	487209	41	0	0	0	2	0	43	0.95	0.00	0.00	0.00	0.05	0.00	45513	0	0	0	2220	0									

Appendix 1 cont.

Date	Total Expanded Daily Count			Cumulative Daily Count			Daily Catch							Species Proportion							Daily Species Count							Cumulative Species Count						
	RB	LB	Total	RB	LB	Total	Bookeye	Chinook	Chinook Jacks	Coho	Pink	Chum	Total	Bookeye	Chinook Adults	Chinook Jacks	Coho	Pink	Chum	Bookeye	Chinook Adults	Chinook Jacks	Coho	Pink	Chum	Bookeye	Chinook Adults	Chinook Jacks	Coho	Pink	Chum			
17-Aug-17	16052	30756	46808	249631	334238	583869	41	2	0	0	1	0	47	0.87	0.04	0.06	0.00	0.02	0.00	40832	1992	2988	0	996	0	502841	51295	14020	0	15713	0			
18-Aug-17	18210	25836	44046	267841	360074	627915	47	1	0	0	4	0	52	0.90	0.02	0.00	0.00	0.08	0.00	39811	847	0	0	3388	0	542652	52142	14020	0	19101	0			
19-Aug-17	19711	11923	31634	287552	371996	659548	42	3	1	0	4	0	50	0.84	0.06	0.02	0.00	0.08	0.00	26572	1898	633	0	2531	0	569224	54040	14653	0	21632	0			
20-Aug-17	20223	17733	37956	307775	389729	697504	26	2	6	0	4	0	38	0.68	0.05	0.16	0.00	0.11	0.00	25970	1998	5993	0	3995	0	595194	56037	20646	0	25627	0			
21-Aug-17	23298	36498	59796	331073	426227	757300	40	2	4	0	5	0	51	0.78	0.04	0.08	0.00	0.10	0.00	46899	2345	4690	0	5862	0	642093	58382	25336	0	31489	0			
22-Aug-17	33327	37056	70383	364400	463283	827683	52	3	1	0	4	0	60	0.87	0.05	0.02	0.00	0.07	0.00	60999	3519	1173	0	4692	0	703091	61901	26509	0	36182	0			
23-Aug-17	23232	45174	68406	387632	508457	896089	41	2	3	0	4	0	50	0.82	0.04	0.06	0.00	0.08	0.00	56093	2736	4104	0	5472	0	759184	64638	30613	0	41654	0			
24-Aug-17	28071	44445	72516	415703	552902	968605	50	1	0	0	2	0	53	0.94	0.02	0.00	0.00	0.04	0.00	68411	1368	0	0	2736	0	827596	66006	30613	0	44390	0			
25-Aug-17	21649	35394	57043	437352	588296	1025649	32	2	0	0	4	0	38	0.84	0.05	0.00	0.00	0.11	0.00	48036	3002	0	0	6005	0	875632	69008	30613	0	50395	0			
26-Aug-17	20559	23178	43737	457911	611474	1069386	31	4	1	0	8	0	44	0.70	0.09	0.02	0.00	0.18	0.00	30815	3976	994	0	7952	0	906447	72984	31608	0	58347	0			
27-Aug-17	30603	31323	61926	488514	642797	1131312	18	5	3	0	10	0	36	0.50	0.14	0.08	0.00	0.28	0.00	30963	8601	5161	0	17202	0	937410	81585	36768	0	75549	0			
28-Aug-17	28872	44091	72963	517386	686888	1204275	30	7	1	0	23	0	61	0.49	0.11	0.02	0.00	0.38	0.00	35883	8373	1196	0	27511	0	973293	89958	37964	0	103059	0			
29-Aug-17	44181	45039	89220	561567	731927	1293495	27	4	6	0	23	0	60	0.45	0.07	0.10	0.00	0.38	0.00	40149	5948	8922	0	34201	0	1013442	95906	46886	0	137260	0			
30-Aug-17	41361	49854	91215	602928	781781	1384710	30	4	3	0	29	0	66	0.45	0.06	0.05	0.00	0.44	0.00	41461	5528	4146	0	40079	0	1054903	101434	51032	0	177340	0			
31-Aug-17	26331	47130	73461	629259	828911	1458171	26	3	1	0	35	0	65	0.40	0.05	0.02	0.00	0.54	0.00	29384	3391	1130	0	39556	0	1084288	104825	52162	0	216896	0			
1-Sep-17	20775	42108	62883	650034	871019	1521054	20	2	4	0	44	0	70	0.29	0.03	0.06	0.00	0.63	0.00	17967	1797	3593	0	39526	0	1102254	106621	55756	0	256422	0			
2-Sep-17	32823	20094	52917	682857	891113	1573971	15	2	3	0	27	0	47	0.32	0.04	0.06	0.00	0.57	0.00	16888	2252	3378	0	30399	0	1119143	108873	59133	0	286821	0			
3-Sep-17	30477	21759	52236	713334	912872	1626207	33	3	9	0	16	0	61	0.54	0.05	0.15	0.00	0.26	0.00	28259	2569	7707	0	13701	0	1147402	111442	66840	0	300523	0			
4-Sep-17	42672	37914	80586	756006	950786	1706793	5	1	0	0	22	0	28	0.18	0.04	0.00	0.00	0.79	0.00	14390	2878	0	0	63318	0	1161792	114320	66840	0	363840	0			
5-Sep-17	52663	34992	87655	808669	985778	1794448	11	2	1	0	21	0	35	0.31	0.06	0.03	0.00	0.60	0.00	27549	5009	2504	0	52593	0	1189341	119329	69345	0	416433	0			
6-Sep-17	39534	40884	80418	848203	1026662	1874866	11	2	0	0	27	0	40	0.28	0.05	0.00	0.00	0.68	0.00	22115	4021	0	0	54282	0	1211456	123350	69345	0	470715	0			
7-Sep-17	34314	38241	72555	882517	1064903	1947421	8	3	1	2	49	0	63	0.13	0.05	0.02	0.03	0.78	0.00	9213	3455	1152	2303	56432	0	1220669	126805	70496	2303	527147	0			
8-Sep-17	35046	29454	64500	917563	1094357	2011921	7	2	1	0	14	0	24	0.29	0.08	0.04	0.00	0.58	0.00	18813	5375	2688	0	37625	0	1239482	132180	73184	2303	564772	0			
9-Sep-17	27465	31701	59166	945028	1126058	2071087	19	8	4	4	59	0	94	0.20	0.09	0.04	0.04	0.63	0.00	11959	5035	2518	2518	37136	0	1251441	137215	75702	4821	601908	0			
10-Sep-17	24078	25938	50016	969106	1151996	2121103	18	2	2	2	97	0	121	0.15	0.02	0.02	0.02	0.80	0.00	7440	827	827	827	40095	0	1258881	138042	76528	5648	642004	0			
11-Sep-17	29955	28896	58851	999061	1180892	2179954	9	4	1	0	47	0	61	0.15	0.07	0.02	0.00	0.77	0.00	8683	3859	965	0	45344	0	1267564	141901	77493	5648	687348	0			
12-Sep-17	29562	35457	65019	1028623	1216349	2244973	13	4	4	4	92	0	117	0.11	0.03	0.03	0.03	0.79	0.00	7224	2223	2223	2223	51126	0	1274788	144124	79716	7871	738474	0			
13-Sep-17	34163	35877	70040	1062786	1252226	2315012	8	5	5	1	96	0	115	0.07	0.04	0.04	0.01	0.83	0.00	4872	3045	3045	609	58468	0	1279661	147169	82761	8480	796942	0			
14-Sep-17	37740	33873	71613	1100526	1286099	2386625	19	1	1	1	88	1	111	0.17	0.01	0.01	0.01	0.79	0.01	12258	645	645	645	56774	645	1291919	147814	83406	9125	853716	645			
15-Sep-17	35133	27561	62694	1135659	1313660	2449319	8	4	2	3	78	0	95	0.08	0.04	0.02	0.03	0.82	0.00	5279	2640	1320	1980	51475	0	1297198	150454	84726	11105	905191	645			
16-Sep-17	26187	32418	58605	1161846	1346078	2507924	9	6	4	3	158	0	180	0.05	0.03	0.02	0.02	0.88	0.00	2930	1954	1302	977	51442	0	1300128	152408	86029	12081	956633	645			
17-Sep-17	18219	25446	43665	1180065	1371524	2551589	8	8	1	3	62	0	82	0.10	0.10	0.01	0.04	0.76	0.00	4260	4260	533	1598	33015	0	1304388	156668	86561	13679	989648	645			
18-Sep-17	21063	14907	35970	1201128	1386431	2587559	5	9	3	2	46	0	65	0.08	0.14	0.05	0.03	0.71	0.00	2767	4980	1660	1107	25456	0	1307155	161648	88221	14786	1015104	645			
19-Sep-17	15153	13488	28641	1216281	1399919	2616200	6	9	4	3	30	0	52	0.12	0.17	0.08	0.06	0.58	0.00	3305	4957	2203	1652	16524	0	1310460	166605	90424	16438	1031628	645			
20-Sep-17	14115	13950	28065	1230396	1413869	2644265	4	4	1	8	31	0	48	0.08	0.08	0.02	0.17	0.65	0.00	2339	2339	585	4678	18125	0	1312799	168944	91009	21116	1049753	645			
21-Sep-17	14698	10181	24879	1245094	1424051	2669144	4	2	0	1	13	0	20	0.20	0.10	0.00	0.05	0.65	0.00	4976	2488	0	1244	16171	0	1317775	171432	91009	22359	1065924	645			
22-Sep-17	12795	9300	22095	1257889	1433351	2691239	4	3	0	7	25	0	39	0.10	0.08	0.00	0.18	0.64	0.00	2266	1700	0	3966	14163	0	1320041	173131	91009	26325	1080088	645			
23-Sep-17	7719	11367	19086	1265608	1444718	2710325	2	2	2	1	14	0	21	0.10	0.10	0.10	0.05	0.67	0.00	1818	1818	1818	909	12724	0	1321858	174949	92827	27234	1092812	645			
24-Sep-17	3282	2526	5808	1268890	1447244	2716133	0	1	0	3	4	0	8	0.00	0.13	0.00	0.38	0.50	0.00	0	726	0	2178	2904	0	1321858	175675	92827	29412	1095716	645			

Appendix 2. Catch by drift from the 2017 Qualark drift gill net test fishing program including drift number, location, start and end times, duration, mesh size and comments.

Date	Drift	Location	Time				Mesh Size	Caught							Comments
			Start	End	Duration	Sockeye		Chinook	Chin. Jacks	Pink	Coho	Chum	Total		
02/07/17	1	near	08:12	08:15	03:00	4.00	1	0	0	0	0	0	0	1	Good drift. Late start.
02/07/17	2	near	08:21	08:25	04:00	5.25	0	0	0	0	0	0	0	0	Good drift. No fish.
02/07/17	3	near	08:42	08:47	05:00	6.75	0	0	0	0	0	0	0	0	Good drift. One fish hit net but released species unknown.
02/07/17	4	near	19:10	19:14	04:00	4.75	0	0	0	0	0	0	0	0	Good drift.
02/07/17	5	near	19:25	19:30	05:00	5.75	0	0	0	0	0	0	0	0	Good drift.
02/07/17	6	near	19:40	19:45	05:00	8.00	0	0	0	0	0	0	0	0	Good drift. One fish hit net but released species unknown.
03/07/17	1	near	07:00	07:05	05:00	4.75	0	0	0	0	0	0	0	0	Good drift.
03/07/17	2	near	07:22	07:27	05:00	5.75	0	0	0	0	0	0	0	0	Good drift. No fish.
03/07/17	3	near	07:42	07:47	05:00	8.00	0	1	0	0	0	0	0	1	Good drift. One Chinook. No night drifts conducted.
04/07/17	1	near	07:00	07:05	05:00	4.00	5	3	0	0	0	0	0	8	Good drift. Fish caught throughout net.
04/07/17	2	near	07:26	07:31	05:00	5.25	1	0	0	0	0	0	0	1	Good drift.
04/07/17	3	near	07:42	07:48	06:00	6.75	1	0	0	0	0	0	0	1	Good drift.
04/07/17	4	near	19:00	19:05	05:00	4.75	0	0	0	0	0	0	0	0	Good drift.
04/07/17	5	near	19:22	19:26	04:00	5.75	0	0	0	0	0	0	0	0	Good drift.
04/07/17	6	near	19:40	19:45	05:00	8.00	0	0	0	0	0	0	0	0	Good drift. One fish hit net but released species unknown.
05/07/17	1	near	07:00	07:06	06:00	4.75	3	3	0	0	0	0	0	6	Good drift. Drift slow so made it a longer drift.
05/07/17	2	near	07:22	07:27	05:00	5.75	0	0	0	0	0	0	0	0	Good drift.
05/07/17	3	near	07:38	07:43	05:00	8.00	1	0	0	0	0	0	0	1	Good drift. One sockeye fell off net.
05/07/17	4	near	19:08	19:13	05:00	4.00	0	0	0	0	0	0	0	0	Good drift.
05/07/17	5	near	19:21	19:26	05:00	5.25	0	0	0	0	0	0	0	0	Good drift.
05/07/17	6	near	19:45	19:50	05:00	6.75	0	1	0	0	0	0	0	1	Good drift. One Chinook. No night drifts conducted.
06/07/17	1	near	07:00	07:05	05:00	4.00	1	3	0	0	0	0	0	4	Good drift, one Shad retained.
06/07/17	2	near	07:22	07:26	04:00	5.25	0	0	0	0	0	0	0	0	Good drift.
06/07/17	3	near	07:38	07:43	05:00	6.75	0	0	0	0	0	0	0	0	Good drift.
06/07/17	7	far	07:50	07:52	02:00	5.25	0	0	0	0	0	0	0	0	Good drift.
06/07/17	4	near	19:00	19:05	05:00	4.75	3	0	0	0	0	0	0	3	Good drift.
06/07/17	5	near	19:23	19:28	05:00	5.75	2	0	0	0	0	0	0	2	Good drift.
06/07/17	6	near	19:44	19:50	06:00	8.00	0	0	0	0	0	0	0	0	Good drift.
07/07/17	1	near	07:00	07:05	05:00	4.75	4	1	0	0	0	0	0	5	Good drift, one Chinook fell off at boat.
07/07/17	2	near	07:23	07:29	06:00	5.75	2	2	0	0	0	0	0	4	Good drift, one Sockeye fell off net.
07/07/17	3	near	07:40	07:45	05:00	8.00	0	0	0	0	0	0	0	0	Good drift.
07/07/17	4	near	19:05	19:10	05:00	4.00	2	1	0	0	0	0	0	3	Good drift, net drifted tight. All fish fell off.
07/07/17	5	near	19:23	19:29	06:00	5.25	4	1	0	0	0	0	0	5	Good drift.
07/07/17	6	near	19:43	19:48	05:00	6.75	0	0	0	0	0	0	0	0	Good drift.
08/07/17	1	near	07:00	07:05	05:00	4.00	2	0	0	0	0	0	0	2	Good drift.
08/07/17	2	near	07:22	07:28	06:00	5.25	4	0	0	0	0	0	0	4	Good drift, spotted beaver at end of drift.
08/07/17	3	near	07:44	07:49	05:00	6.75	2	2	0	0	0	0	0	4	Good drift.
08/07/17	4	near	19:03	19:09	06:00	4.75	0	1	0	0	0	0	0	1	Longer drift, net drifted in but fixed self.
08/07/17	5	near	19:27	19:33	06:00	5.75	2	1	0	0	0	0	0	3	Good drift.
08/07/17	6	near	19:45	19:50	05:00	8.00	0	0	0	0	0	0	0	0	Good drift.
09/07/17	1	near	07:00	07:05	05:00	4.75	8	0	0	0	0	0	0	8	Good drift. A couple wounded fish.
09/07/17	2	near	07:23	07:28	05:00	5.75	2	1	0	0	0	0	0	3	Good drift.
09/07/17	3	near	07:45	07:50	05:00	8.00	0	1	0	0	0	0	0	1	Good drift. One badly wounded Chinook.

Appendix 2 cont.

Date	Drift	Location	Time			Mesh Size	Caught							Comments	
			Start	End	Duration		Sockeye	Chinook	Chin. Jacks	Pink	Coho	Chum	Total		
17/07/17	7	far	07:52	07:55	03:00	5.25	0	0	0	0	0	0	0	0	Good drift. 25m offshore.
17/07/17	4	near	19:00	19:06	06:00	4.00	0	2	0	0	0	0	0	2	Good drift.
17/07/17	5	near	19:25	19:30	05:00	5.25	1	0	0	0	0	0	0	1	Good drift.
17/07/17	6	near	19:42	19:47	05:00	6.75	2	1	0	0	0	0	0	3	Good drift. Fish caught throughout net.
18/07/17	1	near	07:00	07:05	05:00	4.00	5	0	0	0	0	0	0	5	Good drift. One sockeye fell off pulling net in.
18/07/17	2	near	07:24	07:29	05:00	5.25	3	0	0	0	0	0	0	3	Good drift.
18/07/17	3	near	07:44	07:49	05:00	6.75	0	0	0	0	0	0	0	0	Good drift.
18/07/17	4	near	19:02	19:08	06:00	4.75	3	0	0	0	0	0	0	3	Good drift.
18/07/17	5	near	19:23	19:28	05:00	5.75	1	0	0	0	0	0	0	1	Good drift.
18/07/17	6	near	19:48	19:53	05:00	8.00	0	2	0	0	0	0	0	2	Good drift.
19/07/17	1	near	07:00	07:03	03:00	4.75	0	1	0	0	0	0	0	1	Bad drift. Net drifted into shore.
19/07/17	2	near	07:18	07:23	05:00	5.75	0	1	0	0	0	0	0	1	Good drift. Chinook has hook wound on mouth.
19/07/17	3	near	07:40	07:45	05:00	8.00	0	1	0	0	0	0	0	1	Good drift.
19/07/17	4	near	19:00	19:05	05:00	4.00	3	2	0	0	0	0	0	5	Good drift. One Chinook went through the net.
19/07/17	5	near	19:22	19:27	05:00	5.25	1	0	0	0	0	0	0	1	Good drift.
19/07/17	6	near	19:42	19:46	04:00	6.75	0	0	0	0	0	0	0	0	Good drift.
20/07/17	1	near	07:00	07:05	05:00	4.00	2	0	0	0	0	0	0	2	Good drift.
20/07/17	2	near	07:18	07:23	05:00	5.25	2	2	0	0	0	0	0	4	Good drift.
20/07/17	3	near	07:40	07:44	04:00	6.75	1	0	0	0	0	0	0	1	Incomplete drift. Net drifted into shore.
20/07/17	7	far	07:52	07:55	03:00	5.25	0	0	0	0	0	0	0	0	Good drift. 30m offshore.
20/07/17	4	near	19:00	19:05	05:00	4.75	1	0	0	0	0	0	0	1	Good drift.
20/07/17	5	near	19:22	19:27	05:00	5.75	0	2	0	0	0	0	0	2	Good drift.
20/07/17	6	near	19:45	19:50	05:00	8.00	0	0	0	0	0	0	0	0	Good drift.
21/07/17	1	near	07:02	07:07	05:00	4.75	5	0	0	0	0	0	0	5	Good drift, fish caught throughout net.
21/07/17	2	near	07:23	07:28	05:00	5.75	0	0	0	0	0	0	0	0	Good drift.
21/07/17	3	near	07:43	07:48	05:00	8.00	0	0	0	0	0	0	0	0	Good drift, one six foot sturgeon released.
21/07/17	4	near	19:00	19:05	05:00	4.00	1	1	0	0	0	0	0	2	Good drift, one Chinook hit fell off, lost one sockeye.
21/07/17	5	near	19:24	19:29	05:00	5.25	2	3	0	0	0	0	0	5	Good drift.
21/07/17	6	near	19:42	19:47	05:00	6.75	0	1	0	0	0	0	0	1	Good drift.
22/07/17	1	near	06:01	06:06	05:00	4.00	2	0	0	0	0	0	0	2	Good drift, rainy day.
22/07/17	2	near	06:20	06:25	05:00	5.25	0	2	0	0	0	0	0	2	Good drift.
22/07/17	3	near	06:40	06:45	05:00	6.75	2	1	0	0	0	0	0	3	Good drift.
22/07/17	4	near	19:03	19:08	05:00	4.75	1	0	0	0	0	0	0	1	Good drift.
22/07/17	5	near	19:23	19:28	05:00	5.75	0	0	0	0	0	0	0	0	Good drift.
22/07/17	6	near	19:44	19:50	06:00	8.00	0	0	0	0	0	0	0	0	Good drift.
23/07/17	1	near	06:01	06:06	05:00	4.75	2	1	0	0	0	0	0	3	Good drift. One American Shad retained.
23/07/17	2	near	06:25	06:31	06:00	5.75	2	1	0	0	0	0	0	3	Good drift.
23/07/17	3	near	06:46	06:51	05:00	8.00	0	1	0	0	0	0	0	1	Good drift.
23/07/17	4	near	19:00	19:05	05:00	4.00	1	0	0	0	0	0	0	1	Good drift.
23/07/17	5	near	19:22	19:25	03:00	5.25	0	0	0	0	0	0	0	0	Incomplete drift. Net hung up past weir.
23/07/17	6	near	19:42	19:47	05:00	6.75	0	0	0	0	0	0	0	0	Good drift. One ten foot sturgeon released after a fight.
24/07/17	1	near	07:01	07:06	05:00	4.00	0	0	0	0	0	0	0	0	Good drift.
24/07/17	2	near	07:21	07:26	05:00	5.25	1	0	0	0	0	0	0	1	Good drift.
24/07/17	3	near	07:40	07:45	05:00	6.75	0	0	0	0	0	0	0	0	Good drift.
24/07/17	7	far	07:52	07:55	03:00	5.25	0	0	0	0	0	0	0	0	Good drift. 25m offshore.
24/07/17	4	near	19:03	19:08	05:00	4.75	1	0	0	0	0	0	0	1	Good drift.
24/07/17	5	near	19:21	19:26	05:00	5.75	1	2	0	0	0	0	0	3	Good drift. Dead Chinook washed up at beach at landing site.
24/07/17	6	near	19:40	19:44	04:00	8.00	0	0	0	0	0	0	0	0	Good drift.
25/07/17	1	near	07:01	07:06	05:00	4.75	0	0	0	0	0	0	0	0	Good drift.
25/07/17	2	near	07:23	07:28	05:00	5.75	0	1	0	0	0	0	0	1	Good drift.

Appendix 2 cont.

Date	Drift	Location	Time			Mesh Size	Caught							Total	Comments
			Start	End	Duration		Sockeye	Chinook	Chin. Jacks	Pink	Coho	Chum			
10/08/17	3	near	07:39	07:44	05:00	8.00	5	0	0	0	0	0	0	5	Good drift.
10/08/17	7	far	07:52	07:55	03:00	5.25	0	0	0	0	0	0	0	0	Good drift. 30m offshore.
10/08/17	4	near	19:00	19:02	02:00	4.00	3	0	0	0	0	0	0	3	Incomplete drift hung up at weir.
10/08/17	5	near	19:22	19:27	05:00	5.25	2	0	0	0	0	0	0	2	Good drift.
10/08/17	6	near	19:40	19:45	05:00	6.75	0	0	0	0	0	0	0	0	Net hit bottom 3/4 way through drift, lead line torn but finished drift.
11/08/17	1	near	07:00	07:05	05:00	4.00	15	0	2	0	0	0	0	17	Good drift.
11/08/17	2	near	07:22	07:25	03:00	5.25	0	0	0	0	0	0	0	0	Incomplete drift. Hung up past weir, net trashed.
11/08/17	3	near	07:45	07:48	03:00	6.75	3	0	0	0	0	0	0	3	Incomplete drift. Hung up past weir, net trashed.
11/08/17	4	near	19:00	19:05	05:00	4.75	28	0	0	0	0	0	0	28	Good drift. Fish caught throughout net.
11/08/17	5	near	19:22	19:27	05:00	5.75	0	0	0	0	0	0	0	0	Good drift.
11/08/17	6	near	19:42	19:47	05:00	8.00	6	0	0	1	0	0	0	7	Good drift. 1 Pink.
12/08/17	1	near	07:00	07:03	03:00	4.75	4	0	0	0	0	0	0	4	Incomplete Drift. Net drifted into shore halfway through.
12/08/17	2	near	07:22	07:27	05:00	5.75	0	0	0	0	0	0	0	0	Good drift. Possible sturgeon.
12/08/17	3	near	07:43	07:46	03:00	8.00	0	0	0	0	0	0	0	0	Incomplete drift. Hung up in same spot past weir.
12/08/17	4	near	19:00	19:05	05:00	4.00	9	0	0	0	0	0	0	9	Good drift.
12/08/17	5	near	19:23	19:28	05:00	5.25	3	0	0	1	0	0	0	4	Good drift.
12/08/17	6	near	19:43	19:47	04:00	6.75	0	0	0	0	0	0	0	0	Good drift.
13/08/17	1	near	07:00	07:05	05:00	4.00	6	0	2	0	0	0	0	8	Good drift.
13/08/17	2	near	07:22	07:27	05:00	5.25	1	0	0	0	0	0	0	1	Good drift.
13/08/17	3	near	07:40	07:45	05:00	6.75	1	0	0	0	0	0	0	1	Good drift.
13/08/17	4	near	19:02	19:07	05:00	4.75	1	0	0	0	0	0	0	1	Good drift.
13/08/17	5	near	19:23	19:28	05:00	5.75	5	1	0	0	0	0	0	6	Good drift.
13/08/17	6	near	19:43	19:48	05:00	8.00	0	0	0	0	0	0	0	0	Good drift.
14/08/17	1	near	07:01	07:06	05:00	4.75	13	0	0	2	0	0	0	15	Good drift. 2 Pinks.
14/08/17	2	near	07:22	07:27	05:00	5.75	0	1	0	1	0	0	0	2	Good drift. One Pink.
14/08/17	3	near	07:42	07:47	05:00	8.00	0	1	0	0	0	0	0	1	Good drift.
14/08/17	7	far	07:53	07:56	03:00	5.25	0	0	0	0	0	0	0	0	Good drift. 25m offshore.
14/08/17	4	near	19:00	19:05	05:00	4.00	15	0	0	0	0	0	0	15	Good drift. Fish caught throughout net.
14/08/17	5	near	19:22	19:27	05:00	5.25	1	0	0	0	0	0	0	1	Good drift.
14/08/17	6	near	19:43	19:48	05:00	6.75	4	1	0	0	0	0	0	5	Good drift.
15/08/17	1	near	07:00	07:05	05:00	4.00	27	0	0	0	0	0	0	27	Good drift. Fish all throughout net.
15/08/17	2	near	07:23	07:28	05:00	5.25	2	0	0	0	0	0	0	2	Good drift. Two sockeye fell off the net.
15/08/17	3	near	07:45	07:50	05:00	6.75	6	0	0	2	0	0	0	8	Good drift.
15/08/17	4	near	19:00	19:02	02:00	4.75	4	0	0	0	0	0	0	4	Incomplete drift. Hung up at the weir. One wounded sockeye.
15/08/17	5	near	19:23	19:28	05:00	5.75	1	0	0	0	0	0	0	1	Good drift.
15/08/17	6	near	19:44	19:49	05:00	8.00	1	0	0	0	0	0	0	1	Good drift.
16/08/17	1	near	07:00	07:05	05:00	4.75	21	0	0	2	0	0	0	23	Good drift. Fish caught throughout net.
16/08/17	2	near	07:22	07:28	06:00	5.75	0	1	0	0	0	0	0	1	Good drift.
16/08/17	3	near	07:44	07:49	05:00	8.00	6	1	0	0	0	0	0	7	Good drift.
16/08/17	4	near	19:00	19:05	05:00	4.00	5	0	0	0	0	0	0	5	OK drift. Net hit bottom, broke lead line.
16/08/17	5	near	19:22	19:27	05:00	5.25	0	0	0	0	0	0	0	0	Good drift.
16/08/17	6	near	19:44	19:50	06:00	6.75	0	3	0	1	0	0	0	4	Good drift.
17/08/17	1	near			00:00	4.00	11	0	3	0	0	0	0	14	Good drift.
17/08/17	2	near	07:24	07:29	05:00	5.25	1	0	0	1	0	0	0	2	Good drift. Wounded sockeye.
17/08/17	3	near	07:43	07:46	03:00	6.75	1	0	0	0	0	0	0	1	Incomplete drift. Hung up past weir.
17/08/17	7	far	07:52	07:55	03:00	5.25	0	0	0	0	0	0	0	0	Good drift. 30m offshore.
17/08/17	4	near	19:00	19:05	05:00	4.75	20	1	0	0	0	0	0	21	Good drift. Fish all over net.
17/08/17	5	near	19:22	19:27	05:00	5.75	1	0	0	0	0	0	0	1	Good drift.
17/08/17	6	near	19:43	19:48	05:00	8.00	7	1	0	0	0	0	0	8	Good drift, 1 radio tagged sockeye.
18/08/17	1	near	07:00	07:05	05:00	4.75	12	1	0	0	0	0	0	13	Good drift, one Chinook fell off at boat.

Appendix 2 cont.

Date	Drift	Location	Time			Mesh Size	Caught							Comments	
			Start	End	Duration		Sockeye	Chinook	Chin. Jacks	Pink	Coho	Chum	Total		
18/08/17	2	near	07:24	07:29	05:00	5.75	0	0	0	0	0	0	0	0	Good drift.
18/08/17	3	near	07:45	07:51	06:00	8.00	9	0	0	0	0	0	0	9	Good drift.
18/08/17	4	near	19:00	19:05	05:00	4.00	20	0	0	0	0	0	0	20	Good drift.
18/08/17	5	near	19:22	19:27	05:00	5.25	3	0	0	3	0	0	0	6	Good drift.
18/08/17	6	near	19:42	19:47	05:00	6.75	3	0	0	1	0	0	0	4	Good drift.
19/08/17	1	near	07:00	07:05	05:00	4.00	25	0	1	1	0	0	0	27	Good drift, fish caught throughout net. One jack sockeye.
19/08/17	2	near	07:26	07:31	05:00	5.25	0	2	0	0	0	0	0	2	Good drift.
19/08/17	3	near	07:43	07:48	05:00	6.75	0	0	0	1	0	0	0	1	Good drift.
19/08/17	4	near	19:01	19:06	05:00	4.75	17	1	0	0	0	0	0	18	Good drift.
19/08/17	5	near	19:23	19:28	05:00	5.75	0	0	0	2	0	0	0	2	Incomplete drift, hung up past weir.
19/08/17	6	near	19:40	19:46	06:00	8.00	0	0	0	0	0	0	0	0	Good drift.
20/08/17	1	near	07:00	07:06	06:00	4.75	11	0	0	2	0	0	0	13	Good drift.
20/08/17	2	near	07:23	07:28	05:00	5.75	1	1	0	0	0	0	0	2	Good drift.
20/08/17	3	near	07:45	07:48	03:00	8.00	0	0	0	0	0	0	0	0	Incomplete drift, hung up at weir.
20/08/17	4	near	19:00	19:05	05:00	4.00	14	1	6	2	0	0	0	23	Good drift, fish caught throughout net.
20/08/17	5	near	19:23	19:28	05:00	5.25	0	0	0	0	0	0	0	0	Net hit bottom half way through drift. Net recovered, broke lead line.
20/08/17	6	near	19:45	19:50	05:00	6.75	0	0	0	0	0	0	0	0	Good drift.
21/08/17	1	near	07:00	07:05	05:00	4.00	22	0	4	3	0	0	0	29	Good drift, lots of jack Chinook lately.
21/08/17	2	near	07:23	07:28	05:00	5.25	1	0	0	1	0	0	0	2	Net hit bottom, broke lead line and picked up sticks from bottom.
21/08/17	3	near	07:42	07:47	05:00	6.75	0	1	0	1	0	0	0	2	Good drift, one Chinook released.
21/08/17	7	far	07:55	07:58	03:00	5.25	0	0	0	0	0	0	0	0	Good drift.
21/08/17	4	near	19:00	19:05	05:00	4.75	9	0	0	0	0	0	0	9	Good drift.
21/08/17	5	near	19:24	19:27	03:00	5.75	0	0	0	0	0	0	0	0	Incomplete drift, hung up past weir. Picked up another stick from bottom.
21/08/17	6	near	19:45	19:50	05:00	8.00	8	1	0	0	0	0	0	9	Good drift.
22/08/17	1	near	07:02	07:08	06:00	4.75	20	2	0	3	0	0	0	25	Good drift.
22/08/17	2	near	07:22	07:27	05:00	5.75	3	0	0	0	0	0	0	3	Good drift.
22/08/17	3	near	07:45	07:50	05:00	8.00	2	1	0	0	0	0	0	3	Good drift, one Chinook released.
22/08/17	4	near	19:00	19:06	06:00	4.00	27	0	1	1	0	0	0	29	Good drift.
22/08/17	5	near	19:25	19:27	02:00	5.25	0	0	0	0	0	0	0	0	Incomplete drift, net hung up bad in usual spot past weir, net trashed.
22/08/17	6	near	19:45	19:50	05:00	6.75	0	0	0	0	0	0	0	0	Good drift.
23/08/17	1	near	07:00	07:05	05:00	4.00	34	1	3	1	0	0	0	39	Good drift.
23/08/17	2	near	07:26	07:32	06:00	5.25	0	1	0	1	0	0	0	2	Good drift.
23/08/17	3	near	07:44	07:49	05:00	6.75	1	0	0	2	0	0	0	3	Good drift.
23/08/17	4	near	19:00	19:02	02:00	4.75	4	0	0	0	0	0	0	4	Incomplete drift, net hung up but recovered without breaking net.
23/08/17	5	near	19:23	19:28	05:00	5.75	0	0	0	0	0	0	0	0	Good drift.
23/08/17	6	near	19:45	19:50	05:00	8.00	2	0	0	0	0	0	0	2	Good drift.
24/08/17	1	near	07:00	07:06	06:00	4.75	21	0	0	1	0	0	0	22	Good drift.
24/08/17	2	near	07:24	07:29	05:00	5.75	1	0	0	0	0	0	0	1	Good drift.
24/08/17	3	near	07:42	07:49	07:00	8.00	7	1	0	1	0	0	0	9	Good drift.
24/08/17	7	far	07:53	07:56	03:00	5.25	0	0	0	0	0	0	0	0	Good drift.
24/08/17	4	near	19:00	19:02	02:00	4.00	8	0	0	0	0	0	0	8	Incomplete, hung up at weir, picked up more sticks.
24/08/17	5	near	19:21	19:27	06:00	5.25	13	0	0	0	0	0	0	13	Good drift.
24/08/17	6	near	19:42	19:47	05:00	6.75	0	0	0	0	0	0	0	0	Good drift, one sturgeon released.
25/08/17	1	near	07:00	07:06	06:00	4.00	18	2	0	0	0	0	0	20	Good drift.
25/08/17	2	near	07:23	07:29	06:00	5.25	0	0	0	0	0	0	0	0	OK drift. Net hit bottom, broke lead line.
25/08/17	3	near	07:43	07:46	03:00	6.75	3	0	0	0	0	0	0	3	Incomplete drift. Hung up past weir, net trashed.
25/08/17	4	near	19:00	19:03	03:00	4.75	5	0	0	0	0	0	0	5	Incomplete drift. Hung up in the usual spot, net broke in one spot.
25/08/17	5	near	19:23	19:29	06:00	5.75	6	0	0	4	0	0	0	10	Good drift.
25/08/17	6	near	19:45	19:50	05:00	8.00	0	0	0	0	0	0	0	0	Net hit bottom. Broke lead line multiple times.
26/08/17	1	near	07:00	07:06	06:00	4.75	24	1	0	4	0	0	0	29	Good drift. Fish all throughout.

Appendix 2 cont.

Date	Drift	Location	Time			Mesh Size	Caught							Total	Comments
			Start	End	Duration		Sockeye	Chinook	Chin. Jacks	Pink	Coho	Chum			
26/08/17	2	near	07:22	07:27	05:00	5.75	0	0	0	2	0	0	2	Good drift. 2 pinks.	
26/08/17	3	near	07:45	07:49	04:00	8.00	0	0	0	0	0	0	0	Net hit bottom, picked up a stick.	
26/08/17	4	near	19:00	19:04	04:00	4.00	3	0	1	0	0	0	4	Net hit bottom 3/4 through drift, broke lead line.	
26/08/17	5	near	19:24	19:29	05:00	5.25	4	2	0	2	0	0	8	Good drift.	
26/08/17	6	near	19:45	19:50	05:00	6.75	0	1	0	0	0	0	1	Good drift.	
27/08/17	1	near	07:00	07:06	06:00	4.00	15	0	2	1	0	0	18	Good drift.	
27/08/17	2	near	07:25	07:30	05:00	5.25	1	1	1	8	0	0	11	Good drift. Fish caught all throughout.	
27/08/17	3	near	07:45	07:50	05:00	6.75	2	2	0	0	0	0	4	Good drift.	
27/08/17	4	near	19:00	19:05	05:00	4.75	0	2	0	1	0	0	3	Good drift.	
27/08/17	5	near	19:23	19:28	05:00	5.75	0	0	0	0	0	0	0	Good drift.	
27/08/17	6	near	19:45	19:47	02:00	8.00	0	0	0	0	0	0	0	Incomplete drift. Hung up at weir.	
28/08/17	1	near	07:02	07:07	05:00	4.75	22	4	0	2	0	0	28	Good drift.	
28/08/17	2	near	07:24	07:30	06:00	5.75	0	0	0	1	0	0	1	Good drift.	
28/08/17	3	near	07:45	07:50	05:00	8.00	1	3	0	3	0	0	7	Good drift.	
28/08/17	7	far	07:56	07:59	03:00	5.25	0	0	0	0	0	0	0	Good drift. 30m offshore.	
28/08/17	4	near	19:00	19:04	04:00	4.00	2	0	1	0	0	0	3	Net stalled halfway through drift then hit bottom.	
28/08/17	5	near	19:24	19:30	06:00	5.25	5	0	0	14	0	0	19	Good drift.	
28/08/17	6	near	19:46	19:51	05:00	6.75	0	0	0	3	0	0	3	Good drift.	
29/08/17	1	near	07:02	07:07	05:00	4.00	13	0	6	1	0	0	20	Good drift. Fish all throughout.	
29/08/17	2	near	07:29	07:35	06:00	5.25	2	2	0	10	0	0	14	Good drift.	
29/08/17	3	near	07:42	07:46	04:00	6.75	0	0	0	0	0	0	0	Net stalled 3/4 way through drift.	
29/08/17	4	near	19:02	19:07	05:00	4.75	11	2	0	6	0	0	19	Good drift.	
29/08/17	5	near	19:25	19:30	05:00	5.75	0	0	0	4	0	0	4	Good drift.	
29/08/17	6	near	19:45	19:50	05:00	8.00	1	0	0	2	0	0	3	Drift OK. Net touched bottom but recovered.	
30/08/17	1	near	07:01	07:06	05:00	4.75	23	2	0	10	0	0	35	Good drift. Fish throughout net.	
30/08/17	2	near	07:26	07:31	05:00	5.75	0	0	0	5	0	0	5	Good drift.	
30/08/17	3	near	07:46	07:51	05:00	8.00	2	0	0	4	0	0	6	Good drift.	
30/08/17	4	near	19:00	19:05	05:00	4.00	5	0	3	4	0	0	12	Good drift.	
30/08/17	5	near	19:22	19:28	06:00	5.25	0	2	0	6	0	0	8	Good drift.	
30/08/17	6	near	19:45	19:48	03:00	6.75	0	0	0	0	0	0	0	Incomplete drift. Hung up past weir unable to recover.	
31/08/17	1	near	07:00	07:05	05:00	4.00	18	0	1	3	0	0	22	Good drift. Net touched bottom but recovered.	
31/08/17	2	near	07:24	07:29	05:00	5.25	3	1	0	9	0	0	13	Good drift.	
31/08/17	3	near	07:44	07:50	06:00	6.75	0	1	0	6	0	0	7	Good drift.	
31/08/17	7	far	07:55	07:58	03:00	5.25	0	0	0	0	0	0	0	Good drift. 25m offshore.	
31/08/17	4	near	19:00	19:05	05:00	4.75	5	0	0	2	0	0	7	Good drift.	
31/08/17	5	near	19:25	19:30	05:00	5.75	0	0	0	13	0	0	13	Good drift.	
31/08/17	6	near	19:43	19:48	05:00	8.00	0	1	0	2	0	0	3	Good drift.	
01/09/17	1	near	07:02	07:08	06:00	4.75	10	1	0	13	0	0	24	Good drift.	
01/09/17	2	near	07:23	07:29	06:00	5.75	0	0	0	8	0	0	8	Good drift.	
01/09/17	3	near	07:45	07:51	06:00	8.00	1	1	0	5	0	0	7	Good drift.	
01/09/17	4	near	19:02	19:07	05:00	4.00	8	0	3	4	0	0	15	Good drift.	
01/09/17	5	near	19:25	19:30	05:00	5.25	1	0	0	7	0	0	8	Good drift.	
01/09/17	6	near	19:42	19:47	05:00	6.75	0	0	1	7	0	0	8	Good drift.	
02/09/17	1	near	07:02	07:07	05:00	4.00	9	0	3	2	0	0	14	Good drift.	
02/09/17	2	near	07:24	07:29	05:00	5.25	3	2	0	10	0	0	15	Good drift.	
02/09/17	3	near	07:54	07:59	05:00	6.75	0	0	0	4	0	0	4	Good drift.	
02/09/17	4	near	18:05	18:11	06:00	4.75	3	0	0	0	0	0	3	Good drift, one huge sturgeon released itself. Began at 6pm.	
02/09/17	5	near	18:21	18:26	05:00	5.75	0	0	0	9	0	0	9	Good drift.	
02/09/17	6	near	18:44	18:48	04:00	8.00	0	0	0	2	0	0	2	Incomplete drift, hung up in same spot.	
03/09/17	1	near	07:00	07:05	05:00	4.75	16	1	5	1	0	0	23	Good drift, fish caught all throughout net.	

Appendix 2 cont.

Date	Drift	Location	Time			Mesh Size	Caught							Total	Comments
			Start	End	Duration		Sockeye	Chinook	Chin. Jacks	Pink	Coho	Chum			
03/09/17	2	near	07:25	07:31	06:00	5.75	4	2	0	2	0	0	8	Good drift.	
03/09/17	3	near	07:45	07:50	05:00	8.00	0	0	0	0	0	0	0	Good drift.	
03/09/17	4	near	18:01	18:06	05:00	4.00	10	0	4	4	0	0	18	Good drift.	
03/09/17	5	near	18:29	18:35	06:00	5.25	1	0	0	8	0	0	9	Good drift.	
03/09/17	6	near	18:45	18:50	05:00	6.75	2	0	0	1	0	0	3	Good drift.	
04/09/17	1	near	07:02	07:08	06:00	4.00	4	1	0	4	0	0	9	Good drift.	
04/09/17	2	near	07:22	07:27	05:00	5.25	1	0	0	6	0	0	7	Good drift.	
04/09/17	3	near	07:44	07:49	05:00	6.75	0	0	0	3	0	0	3	Good drift.	
04/09/17	7	far	07:54	07:56	02:00	5.25	0	0	0	0	0	0	0	Good drift. 25m offshore.	
04/09/17	4	near	18:02	18:07	05:00	4.75	0	0	0	1	0	0	1	Good drift.	
04/09/17	5	near	18:25	18:30	05:00	5.75	0	0	0	2	0	0	2	Good drift.	
04/09/17	6	near	18:45	18:50	05:00	8.00	0	0	0	6	0	0	6	Good drift. All pinks.	
05/09/17	1	near	07:03	07:09	06:00	4.75	3	1	0	2	0	0	6	Good drift.	
05/09/17	2	near	07:24	07:30	06:00	5.75	2	1	0	6	0	0	9	Good drift.	
05/09/17	3	near	07:44	07:50	06:00	8.00	1	0	0	3	0	0	4	Good drift.	
05/09/17	4	near	18:02	18:07	05:00	4.00	2	0	1	0	0	0	3	Good drift.	
05/09/17	5	near	18:22	18:28	06:00	5.25	1	0	0	10	0	0	11	Good drift. One wounded sockeye.	
05/09/17	6	near	18:45	18:50	05:00	6.75	2	0	0	0	0	0	2	Good drift. One 5-6 ft sturgeon released.	
06/09/17	1	near	07:03	07:10	07:00	4.00	2	0	0	5	0	0	7	Good drift. Picked up 2 big rocks off the bottom.	
06/09/17	2	near	07:25	07:31	06:00	5.25	6	2	0	9	0	0	17	Good drift.	
06/09/17	3	near			00:00	6.75	0	0	0	6	0	0	6	Good drift.	
06/09/17	4	near	18:03	18:08	05:00	4.75	3	0	0	7	0	0	10	Good drift.	
06/09/17	5	near	18:24	18:29	05:00	5.75	0	0	0	0	0	0	0	Good drift.	
06/09/17	6	near	18:48	18:52	04:00	8.00	0	0	0	0	0	0	0	Incomplete drift. Net stalled.	
07/09/17	1	near	08:02	08:08	06:00	4.75	4	0	0	10	0	0	14	Good drift.	
07/09/17	2	near	08:19	08:24	05:00	5.75	0	0	0	5	0	0	5	Good drift.	
07/09/17	3	near	08:40	08:45	05:00	8.00	0	0	0	5	0	0	5	Good drift.	
07/09/17	7	far	08:58	09:01	03:00	5.25	0	0	0	1	0	0	1	Good drift. 25 m offshore. One Pink caught 100 ft from shore.	
07/09/17	4	near	18:02	18:07	05:00	4.00	3	1	0	4	2	0	10	Good drift. 2 Coho unable to revive.	
07/09/17	5	near	18:24	18:29	05:00	5.25	1	0	0	21	0	0	22	Good drift. Lots of Pinks.	
07/09/17	6	near	18:44	18:50	06:00	6.75	0	2	1	3	0	0	6	Good drift.	
08/09/17	1	near	08:03	08:08	05:00	4.00	5	0	1	2	0	0	8	Good drift.	
08/09/17	2	near	08:24	08:29	05:00	5.25	0	0	0	6	0	0	6	Good drift. Net bumped bottom but recovered.	
08/09/17	3	near	08:48	08:52	04:00	6.75	0	0	0	2	0	0	2	Incomplete drift. Hung up past weir.	
08/09/17	4	near	18:02	18:05	03:00	4.75	1	0	0	0	0	0	1	Incomplete drift. Net hit bottom unable to recover.	
08/09/17	5	near	18:23	18:28	05:00	5.75	1	2	0	2	0	0	5	Good drift.	
08/09/17	6	near	18:44	18:49	05:00	8.00	0	0	0	2	0	0	2	Good drift.	
09/09/17	1	near	07:02	07:08	06:00	4.75	12	2	0	22	1	0	37	Good drift.	
09/09/17	2	near	07:22	07:28	06:00	5.75	1	0	0	6	0	0	7	Good drift.	
09/09/17	3	near	07:46	07:52	06:00	8.00	0	1	0	8	0	0	9	Good drift.	
09/09/17	4	near	18:02	18:08	06:00	4.00	6	1	4	10	3	0	24	Good drift. 2 coho (one small).	
09/09/17	5	near	18:25	18:30	05:00	5.25	0	3	0	10	0	0	13	Good drift.	
09/09/17	6	near	18:45	18:52	07:00	6.75	0	1	0	3	0	0	4	Good drift.	
10/09/17	1	near	07:03	07:08	05:00	4.00	13	0	2	12	0	0	27	Good drift.	
10/09/17	2	near	07:25	07:31	06:00	5.25	0	1	0	41	2	0	44	Good drift.	
10/09/17	3	near	07:44	07:50	06:00	6.75	0	0	0	23	0	0	23	Good drift. Released all Pinks.	
10/09/17	4	near	18:02	18:08	06:00	4.75	5	0	0	12	0	0	17	Good drift. Pinks released.	
10/09/17	5	near	18:24	18:30	06:00	5.75	0	1	0	8	0	0	9	Good drift. Pinks released.	
10/09/17	6	near	18:45	18:50	05:00	8.00	0	0	0	1	0	0	1	Net hit bottom, broke lead line.	
11/09/17	1	near	07:02	07:05	03:00	4.75	1	0	0	1	0	0	2	Incomplete drift. Hung up at weir net trashed.	

Appendix 2 cont.

Date	Drift	Location	Time			Mesh Size	Caught							Comments
			Start	End	Duration		Sockeye	Chinook	Chin. Jacks	Pink	Coho	Chum	Total	
11/09/17	2	near	07:19	07:24	05:00	5.75	1	2	0	12	0	0	15	Good drift.
11/09/17	3	near	07:44	07:50	06:00	8.00	0	1	0	10	0	0	11	Good drift.
11/09/17	7	far	07:58	08:02	04:00	5.25	0	0	0	0	0	0	0	Good drift. 30m offshore.
11/09/17	4	near	18:02	18:08	06:00	4.00	5	0	1	5	0	0	11	Good drift.
11/09/17	5	near	18:24	18:30	06:00	5.25	1	0	0	13	0	0	14	Good drift. Fish caught all throughout.
11/09/17	6	near	18:46	18:51	05:00	6.75	1	1	0	6	0	0	8	Good drift.
12/09/17	1	near	07:02	07:08	06:00	4.00	6	2	4	13	4	0	29	Good drift. All fish dead.
12/09/17	2	near	07:23	07:28	05:00	5.25	1	0	0	29	0	0	30	Good drift.
12/09/17	3	near	07:43	07:49	06:00	6.75	0	0	0	16	0	0	16	Good drift.
12/09/17	4	near	18:02	18:07	05:00	4.75	6	0	0	14	0	0	20	Good drift. All pinks released.
12/09/17	5	near	18:24	18:30	06:00	5.75	0	0	0	12	0	0	12	Good drift. All pinks released.
12/09/17	6	near			00:00	8.00	0	2	0	8	0	0	10	Good drift.
13/09/17	1	near	07:01	07:07	06:00	4.75	7	5	2	37	0	0	51	Good drift. Fish everywhere.
13/09/17	2	near	07:22	07:28	06:00	5.75	0	0	0	28	0	0	28	Good drift. 13 Pinks retained, 15 Pinks released.
13/09/17	3	near	07:46	07:51	05:00	8.00	0	0	0	13	0	0	13	Good drift. Thirteen pinks released.
13/09/17	4	near	18:00	18:06	06:00	4.00	1	0	3	8	1	0	13	Good drift. Coho dead. Pinks released.
13/09/17	5	near	18:24	18:29	05:00	5.25	0	0	0	6	0	0	6	Good drift.
13/09/17	6	near	18:45	18:52	07:00	6.75	0	0	0	4	0	0	4	Good drift. 4 pinks released. Massive 10 ft sturgeon fought and released.
14/09/17	1	near	07:00	07:06	06:00	4.00	10	0	1	11	0	0	22	Good drift.
14/09/17	2	near	07:20	07:26	06:00	5.25	4	0	0	31	1	0	36	Good drift.
14/09/17	3	near			00:00	6.75	1	0	0	14	0	1	16	Good drift. One chum dead. 6 pinks released.
14/09/17	7	far			00:00	5.25	0	0	0	0	0	0	0	Good drift. 30m offshore.
14/09/17	4	near	18:00	18:05	05:00	4.75	2	0	0	10	0	0	12	Good drift. All pinks released.
14/09/17	5	near	18:21	18:26	05:00	5.75	1	0	0	8	0	0	9	Good drift. 8 pinks released.
14/09/17	6	near	18:44	18:50	06:00	8.00	1	1	0	14	0	0	16	Good drift.
15/09/17	1	near	07:00	07:04	04:00	4.75	2	0	0	1	0	0	3	Net hit bottom, then stalled.
15/09/17	2	near	07:21	07:27	06:00	5.75	1	1	1	21	1	0	25	Good drift.
15/09/17	3	near	07:44	07:50	06:00	8.00	0	1	0	15	1	0	17	Good drift, one Coho unable to revive.
15/09/17	4	near	18:02	18:08	06:00	4.00	5	1	1	10	0	0	17	
15/09/17	5	near	18:23	18:29	06:00	5.25	0	0	0	13	0	0	13	Good drift.
15/09/17	6	near	18:44	18:50	06:00	6.75	0	1	0	18	1	0	20	Good drift, one Coho unable to revive.
16/09/17	1	near	07:01	07:06	05:00	4.00	6	2	3	18	2	0	31	Good drift.
16/09/17	2	near	07:22	07:28	06:00	5.25	1	2	0	40	0	0	43	Good drift.
16/09/17	3	near	07:46	07:51	05:00	6.75	0	0	0	28	0	0	28	Good drift.
16/09/17	4	near	18:00	18:06	06:00	4.75	2	1	1	30	1	0	35	Good drift, all pinks released.
16/09/17	5	near	18:24	18:30	06:00	5.75	0	0	0	24	0	0	24	Good drift.
16/09/17	6	near	18:46	18:52	06:00	8.00	0	1	0	18	0	0	19	Good drift.
17/09/17	1	near	07:00	07:05	05:00	4.75	5	4	0	22	3	0	34	Good drift, fish caught throughout net.
17/09/17	2	near	07:24	07:29	05:00	5.75	0	3	0	23	0	0	26	Good drift.
17/09/17	3	near	07:38	07:42	04:00	8.00	0	0	0	11	0	0	11	Good drift.
17/09/17	4	near	18:00	18:05	05:00	4.00	3	1	1	1	0	0	6	Good drift, one pink released. One sturgeon hit net but released itself.
17/09/17	5	near	18:21	18:24	03:00	5.25	0	0	0	3	0	0	3	Incomplete drift, hung up past weir, net trashed.
17/09/17	6	near	18:40	18:44	04:00	6.75	0	0	0	2	0	0	2	Incomplete drift, hung up past weir in different spot.
18/09/17	1	near	07:00	07:05	05:00	4.00	2	0	2	4	2	0	10	Good drift. Unable to revive Coho.
18/09/17	2	near	07:22	07:27	05:00	5.25	2	1	0	23	0	0	26	Good drift.
18/09/17	3	near	07:40	07:45	05:00	6.75	0	4	0	11	0	0	15	Good drift.
18/09/17	7	far	07:53	07:56	03:00	5.25	0	0	0	0	0	0	0	Good drift. 30m offshore.
18/09/17	4	near	18:00	18:05	05:00	4.75	1	4	1	3	0	0	9	Good drift.
18/09/17	5	near	18:22	18:28	06:00	5.75	0	0	0	3	0	0	3	Good drift.
18/09/17	6	near	18:44	18:50	06:00	8.00	0	0	0	2	0	0	2	Good drift.

Appendix 2 cont.

Date	Time			Mesh Size	Caught								Comments	
	Drift	Location	Start		End	Duration	Sockeye	Chinook	Chin. Jacks	Pink	Coho	Chum		Total
19/09/17	1	near	07:01	07:06	05:00	4.75	4	2	0	8	1	0	15	Good drift.
19/09/17	2	near	07:24	07:30	06:00	5.75	1	0	0	3	1	0	5	Good drift.
19/09/17	3	near	07:42	07:48	06:00	8.00	0	1	0	0	0	0	1	Good drift.
19/09/17	4	near	18:02	18:07	05:00	4.00	1	2	4	5	0	0	12	Good drift.
19/09/17	5	near	18:24	18:30	06:00	5.25	0	2	0	12	1	0	15	Good drift. Coho bleeding badly.
19/09/17	6	near	18:46	18:51	05:00	6.75	0	2	0	2	0	0	4	Good drift. Nice big Chinook.
20/09/17	1	near	07:02	07:08	06:00	4.00	2	0	1	1	1	0	5	Good drift. Unable to revive Coho.
20/09/17	2	near	07:25	07:31	06:00	5.25	1	1	0	14	3	0	19	Good drift. Unable to revive Coho.
20/09/17	3	near	07:46	07:49	03:00	6.75	0	1	0	1	0	0	2	Net stalled halfway through drift.
20/09/17	4	near	18:00	18:05	05:00	4.75	1	0	0	12	4	0	17	Good drift. Unable to revive Coho.
20/09/17	5	near	18:24	18:29	05:00	5.75	0	2	0	2	0	0	4	Good drift.
20/09/17	6	near	18:44	18:50	06:00	8.00	0	0	0	1	0	0	1	Net hit bottom then stalled. Broke lead line in several places.
21/09/17	1	near	07:01	07:06	05:00	4.75	1	0	0	1	1	0	3	Good drift. Coho released.
21/09/17	2	near	07:24	07:30	06:00	5.75	1	0	0	2	0	0	3	Good drift.
21/09/17	3	near	07:42	07:47	05:00	8.00	0	1	0	6	0	0	7	Good drift.
21/09/17	7	far	07:52	07:56	04:00	5.25	0	0	0	0	0	0	0	Good drift. 30m offshore.
21/09/17	4	near	18:01	18:06	05:00	4.00	2	0	0	1	0	0	3	Good drift.
21/09/17	5	near	18:23	18:29	06:00	5.25	0	0	0	2	0	0	2	Good drift.
21/09/17	6	near	18:42	18:48	06:00	6.75	0	1	0	1	0	0	2	Good drift.
22/09/17	1	near	07:02	07:07	05:00	4.00	2	0	0	4	3	0	9	Good drift. 2 Coho released. 1 dead.
22/09/17	2	near	07:24	07:30	06:00	5.25	0	1	0	8	2	0	11	Good drift. 2 Coho revived and released.
22/09/17	3	near	07:45	07:51	06:00	6.75	0	2	0	3	0	0	5	Good drift.
22/09/17	4	near	18:02	18:07	05:00	4.75	2	0	0	4	2	0	8	Good drift. Coho tangled in net unable to revive.
22/09/17	5	near	18:24	18:30	06:00	5.75	0	0	0	6	0	0	6	Good drift.
22/09/17	6	near	18:42	18:49	07:00	8.00	0	0	0	0	0	0	0	Good drift.
23/09/17	1	near	07:00	07:05	05:00	4.75	1	2	1	4	0	0	8	Good drift.
23/09/17	2	near	07:19	07:25	06:00	5.75	1	0	0	2	0	0	3	Good drift.
23/09/17	3	near	07:40	07:45	05:00	8.00	0	0	0	3	0	0	3	Good drift.
23/09/17	4	near	17:30	17:35	05:00	4.00	0	0	1	0	0	0	1	Good drift. Drifts started at 5:30 as its too dark to finish at 7:00.
23/09/17	5	near	17:47	17:52	05:00	5.25	0	0	0	4	1	0	5	Good drift. One Coho unable to revive.
23/09/17	6	near	18:04	18:10	06:00	6.75	0	0	0	1	0	0	1	Good drift.
24/09/17	1	near	07:04	07:07	03:00	4.00	0	0	0	1	0	0	1	Incomplete drift. Hung up past weir.
24/09/17	2	near	07:20	07:26	06:00	5.25	0	1	0	2	3	0	6	Good drift. One chinook fell off.
24/09/17	3	near	07:45	07:50	05:00	6.75	0	0	0	1	0	0	1	Good drift.