<u>CURRENT SEASON:</u>

**Objectives**: Estimate variance of the total fish passage caused by temporal expansion from 10/15/20/30 minute counts into hourly estimates. Provide confidence intervals for escapement estimates. Objectives accomplished using the method of successive difference applied to subsampled video data.

**References:**

Cronkite, G. M. W., Enzenhofer, H. J., Ridley, T., Holmes, J., Lilja, J.
   and Benner, K. 2006. Use of high-frequency imaging sonar to estimate
   adult sockeye salmon escapement in the Horsefly River, British Columbia.
   Canadian Technical Report of Fisheries and Aquatic Sciences 2647,
   Fisheries and Oceans Canada. URL www.dfo-mpo.gc.ca/libraries-
   bibliotheques/tech-eng.htm

Lilja, J., Ridley, T., Cronkite, G. M. W., Enzenhofer, H. J. and Holmes,
   J. A. 2008. Optimizing sampling effort within a systematic design for
   estimating abundant escapement of sockeye salmon (Oncorhynchus nerka) in
   their natal river. Fisheries Research 90(1-3): 118-127. doi:10.1016/
   j.fishres.2007.10.002

**Methods:**

Used method outlined in Cronkite et al. 2006 and Lilja et al. 2008. The variance of the total fish passage estimate caused by temporal expansion from 10-min or 20-min counts into hourly estimates was calculated using the following variance estimator:

$$Var(\hat{Y}) = N^2\left(\frac{1-f}{n}\right)\sum_{i=2}^{N}\frac{(y_i - y_{i-1})^2}{2(N-1)} \tag{4}$$

where $y_i$ is the estimated number of fish passing the sampling site during hour i, N is the total number of one-hour sample periods, n is the total sampled time in hours, and f is the sample fraction (n/N).

The standard deviation (in number of fish) calculated as the square root of sum of variance(s), and 95% confidence intervals were calculated assuming a normal distribution (multiplying the standard deviation by ± 1.96). Note: Assumes no observer error.

**Results from 2017 season:**

**Sproat**: The absolute percent error of abundance estimates over the 2017 season caused by expansion of subsampled counts to hourly counts was estimated to be 1.1 % (+/- 1514 fish) for adult sockeye and 0.9% (+/- 1298 fish) for sockeye jacks.

**Stamp**: The absolute percent error of abundance estimates over the 2017 season caused by expansion of subsampled counts to hourly counts was estimated to be 1.7 % (+/- 2002 fish) for adult sockeye and 1.8% (+/- 404 fish) for sockeye jacks.
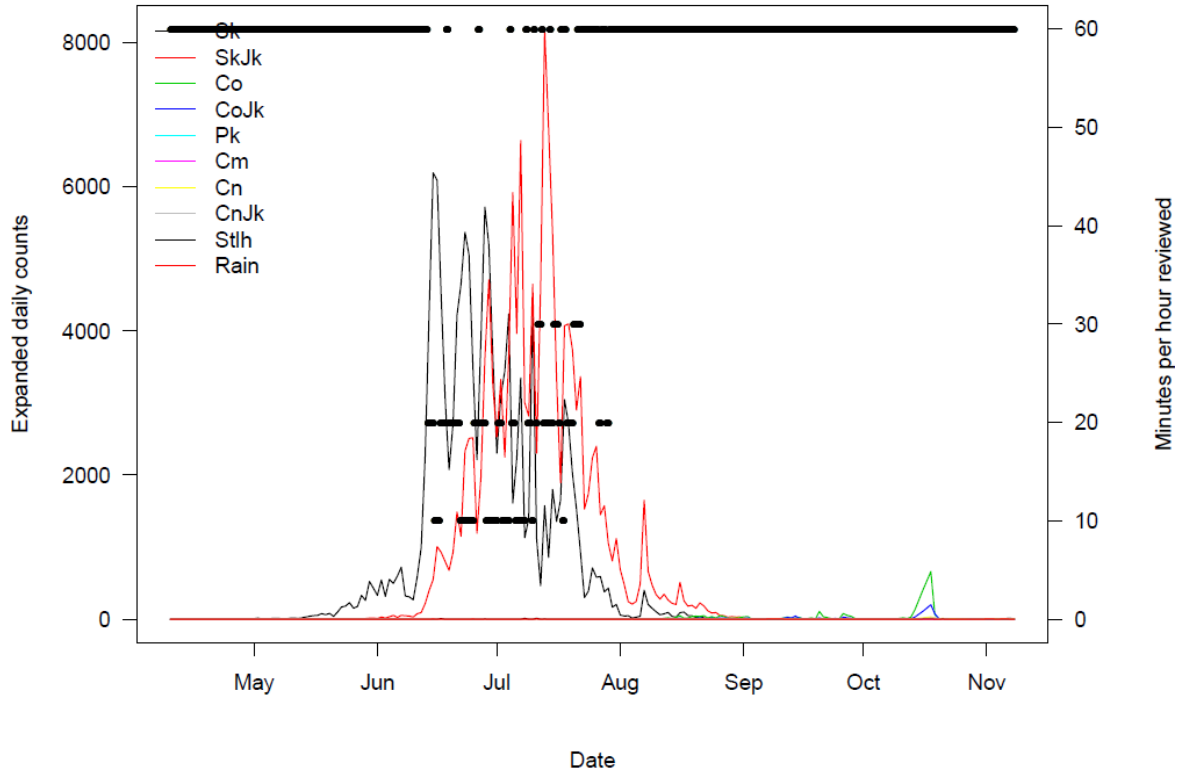
Figure 1: Expanded daily visual counts of all species for **Sproat River** from April 10 to November 8, 2017. Solid horizontal lines show the number of minutes reviewed per hour for each date.
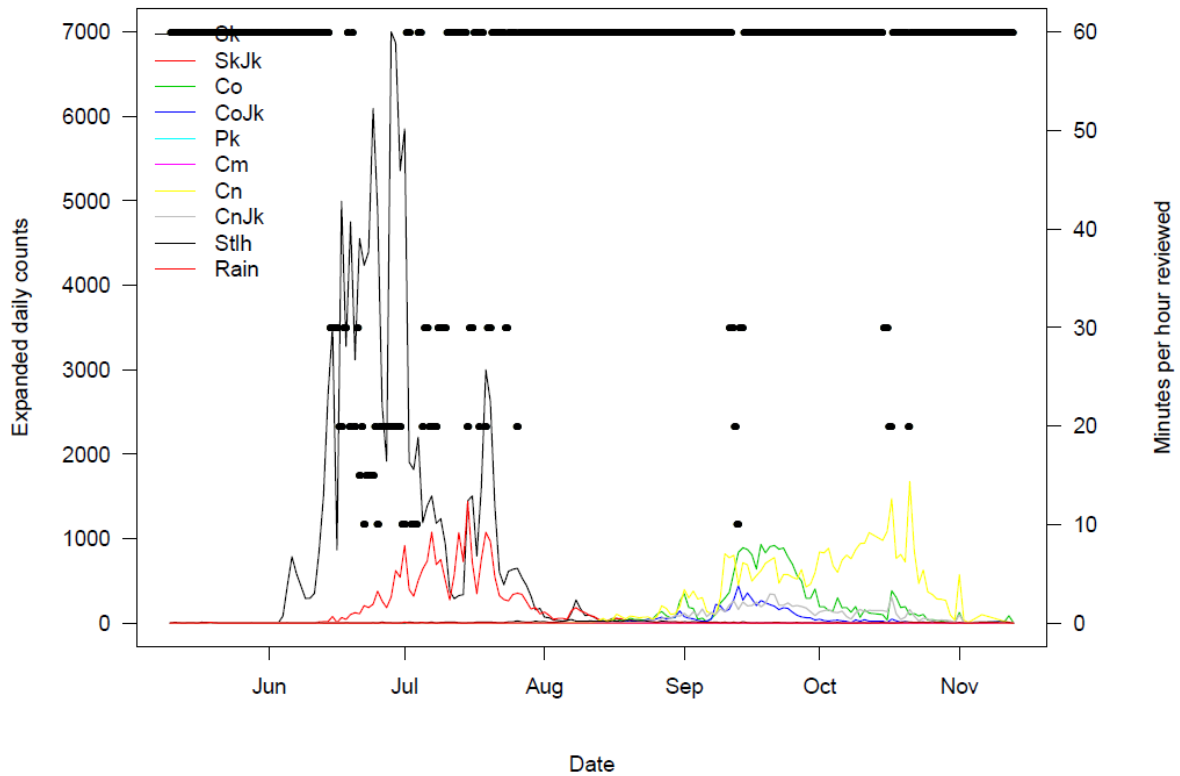


Figure 2: Expanded daily visual counts of all species for **Stamp River** from May 10 to November 13, 2017. Solid horizontal lines show the number of minutes reviewed per hour for each date.

## Assessment of Accuracy of Digital Video Subsampling:  2012 Season

**Objective**: Quantify the accuracy of digital video subsampling (e.g., reviewing only 5, 10, 20 minutes per hour and expanding to hourly counts)

**Data**: Video review data from Somass River sockeye salmon escapement.  A random selection of hours from 2012 season at Stamp Falls was reviewed in 12 X five minute segments.  This allowed for comparison of true hourly count to predicted hourly count from expansion of subsampled minutes.

**Method:** For each subsample segment calculate the predicted number of fish per hour through expansion.  Then calculate absolute percent error of predicted hourly count from expansion vs. true hourly count.
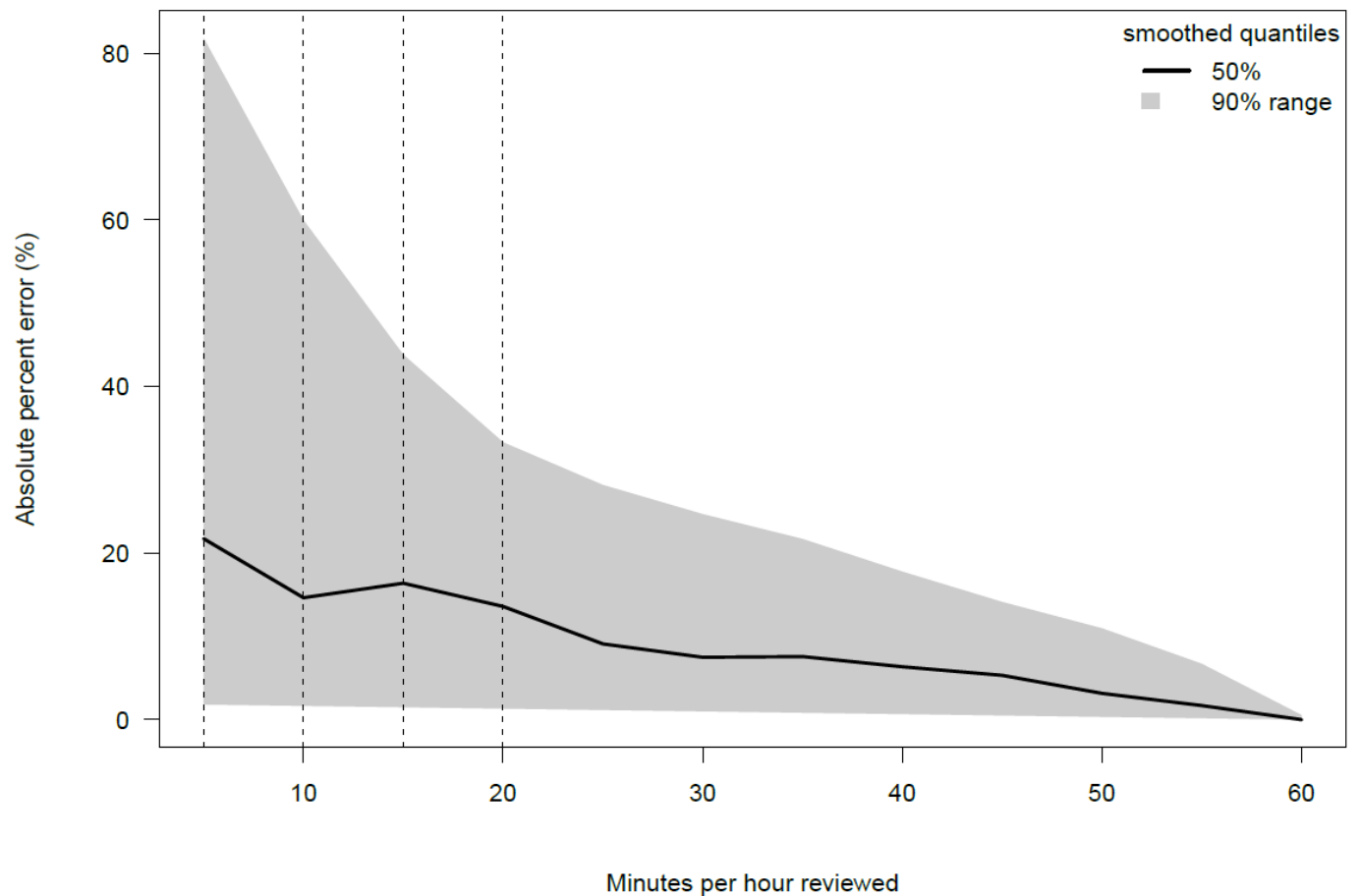
**Results:**



Figure 3: For a range of minutes reviewed per hour the absolute percent error of predicted hourly counts from expanding versus true hourly counts.  Using video review data from Stamp Falls in 2012. The 90% range of absolute percent error is shown for each number of minutes reviewed per hour, with the solid line showing the 50% point.