**Mission Sockeye smolt CPUE calibrations**

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github repository: https://github.com/khdavidson/chum-et-al.git*

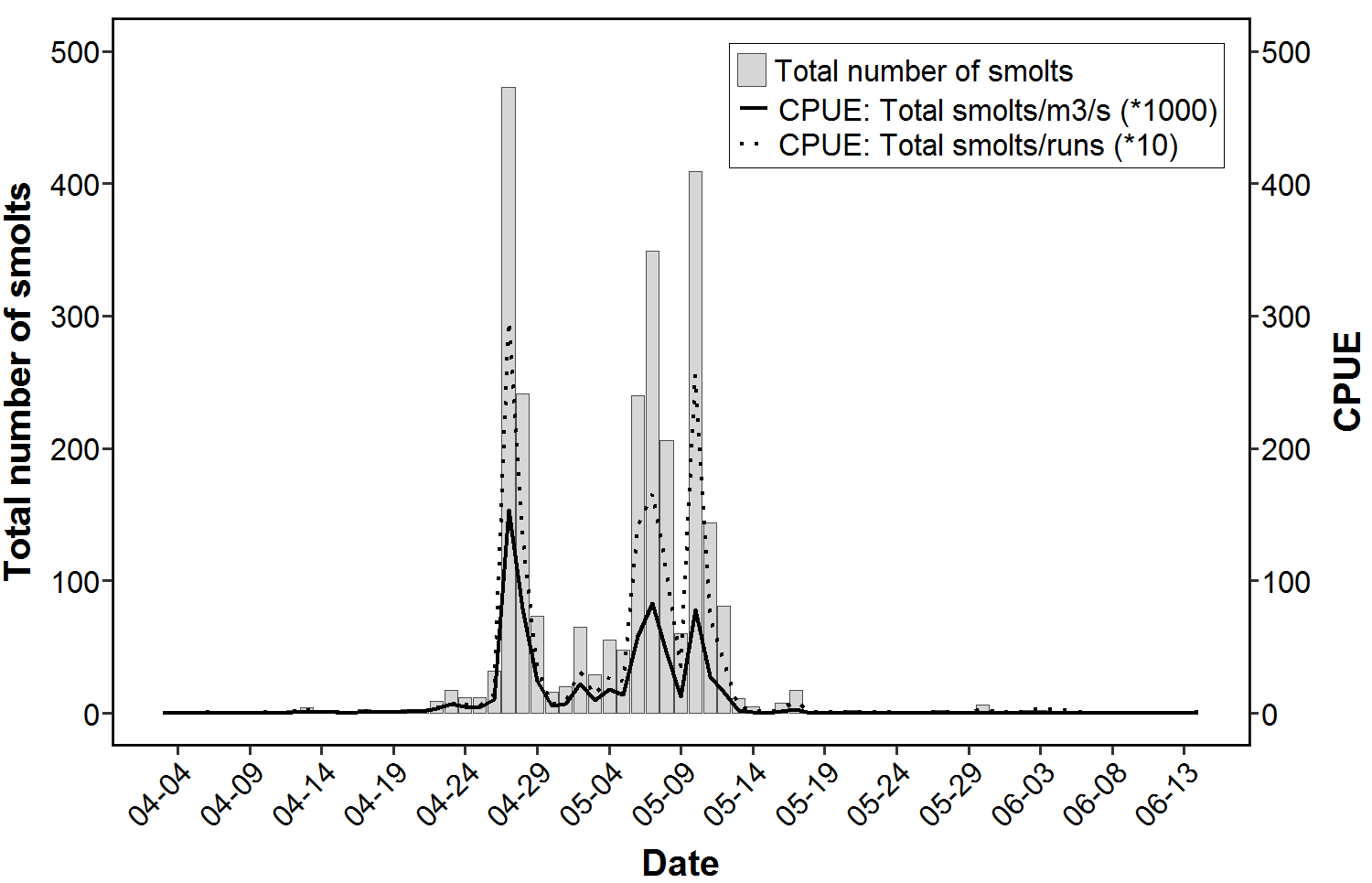
**Objective/Overview**

Exploratory calibration (and comparison) of raw catch numbers by daily number of runs, daily discharge, and flow differences among bays and sampling depths. Previous CPUE has been given as the number of smolts per run, or as the total number of smolts/number of runs (e.g., Townsend et al 2017). The next methods to trial are: 1) daily catch controlling for daily discharge; 2) finer-scale catch by bay, controlling for flow differences among bays; 3) finer-scale catch by depth, controlling for flow differences among sampling depths.

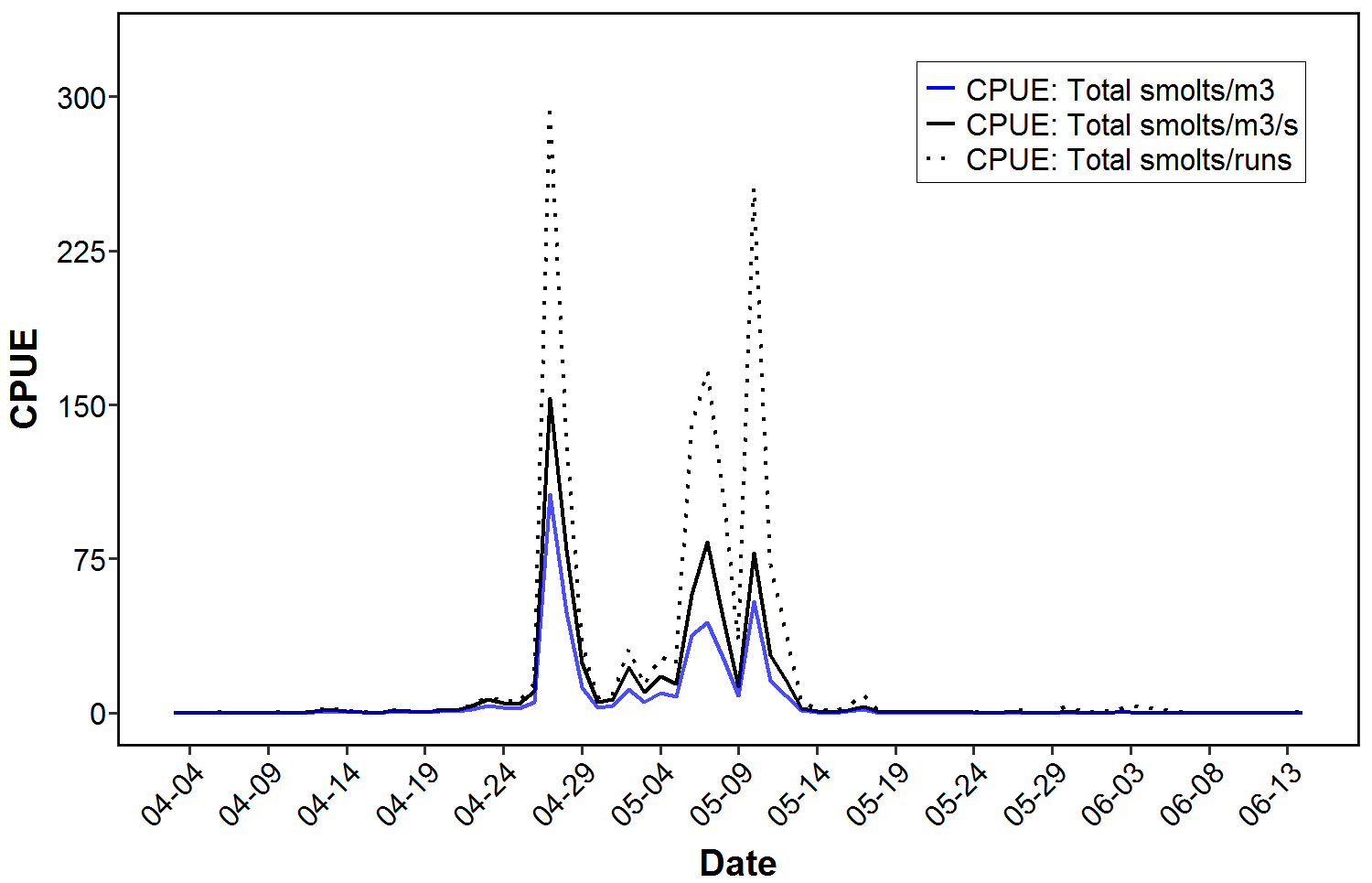
**Method 1: Daily catch/daily discharge (scale: “Day”)**

The daily discharge data was measured at Hope (station #08MF005) by Environment Canada (<https://wateroffice.ec.gc.ca>). For these calculations, discharge data included in the “2017 Mission RST – Main File SOCKEYE” obtained in-season were used as 2017 data are not available online yet.

Starting with a coarse “day” scale, we can divide the total number of sockeye smolts by the daily discharge for an estimate of the number of smolts/m3-s-1 and compare visually to the previous CPUE calculation (Figure 1).



**Figure 1.** Total number of smolts (gray bars), original CPUE increased 1 order of magnitude (smolts/run; dotted line) and new CPUE increased 3 orders of magnitude (smolts/m3s-1 water; black line) for each sampling day in 2017. Only 15 minute run times were included. All traps considered.

However, this new method of calculating CPUE by discharge does not include the sampling effort associated with the previous method (number of runs per day). By including a second level of calculation, dividing again by the daily total of seconds of sampling, we obtain a CPUE estimate that is calibrated for both river discharge over time, and varied sampling effort (given as seconds of fishing) among days. This also gives a potentially more intuitive unit of effort: daily number of fish per cubic-metre of water. This also allows for the inclusion of all runs (n = 4026), and does not have to reduce the dataset to only runs of 15 minute lengths (n = 3996). While the 15 minute runs represent 99% of the total number of runs, this could vary among years (not sure-but seems possible?). This revised CPUE by discharge and sampling time is visualized in Figure 2.

**Figure 2.** Original CPUE increased 1 order of magnitude (smolts/run; dotted line), CPUE accounting for daily discharge and increased 3 orders of magnitude (smolts/m3s-1 water; black line), and CPUE accounting for daily discharge and sampling time, increased 7 orders of magnitude (smolts/m3 water; blue line) for each sampling day in 2017. All traps and run times were considered.

While it is helpful to have one value for total catch, corrected for discharge and sampling time (seconds), the downside is that it creates very small numbers that have to be scaled up several orders of magnitude to give meaningful CPUE estimates (see Figure 2 figure caption).