

2007 Late Run Research on Pre-Spawning Mortality
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In 2006, the in-river mortality estimate for Late Shuswap sockeye salmon was approximately 30%, based on tagging results (Mission to spawning ground area, post-harvest estimates). A further ~25% reduction in future recruitment was estimated based on below average pre-spawn mortality (PSM) estimates (STAD). Two other Late run populations, Weaver and Cultus Lake, also had high estimates of PSM, 30% and ~90% respectively (STAD estimates). The pattern of en route mortality for Late Shuswap in previous years has been consistently correlated to entry timing and thermal exposure; however, the pattern of PSM is more complicated. Despite the large loss of future recruits for these high profile populations, we do not have a consistent hypothesis to explain these natural pre-spawn mortalities. Kidney disease induced by *Parvicapsula* sp. has been implicated in the recent Late-run pre-spawn mortality events (notably 1996-2001), based on prevalence and severity of *Parvicapsula* infection in kidneys. However, these same levels of infection were present in several sockeye populations (including Weaver, Adams) from 2002-2005 without the accompanying high PSM. In 2006, both healthy spawners and moribund un-spawned Weaver and Late Shuswap fish had similar levels of *Parvicapsula* infection. These results, coupled with the complete absence of *Parvicapsula* spores recently found in Quesnel spawners, suggest that our current understanding of both disease progression and prevalence across the Fraser River is incomplete. The most compelling cause for the 2006 pre-spawn losses was the discovery of severe gill pathologies observed during a single sampling event of moribund and dead fish from Cultus Lake; the exact cause of the gill disease is still unknown. This raises the spectre of novel pathogen infecting Late run fish. Corroborating evidence of gill pathologies from similar moribund Weaver or Late Shuswap fish has not occurred. We propose an integrative approach to investigating the similarities and differences in mortality on the spawning ground areas for Late run sockeye using a combination of historic archival samples and field sampling in 2007. The following is short list of immediate issues that still need to be addressed: (1) work on getting a QPCR for *Parvicapsula*, (2) search and confirm intermediate host for *Parvicapsula*, (3) apply in-situ DNA probe for gill tissues to confirm presence of spores within gills from other late run stocks, (4) screen infected gills for other possible infections (e.g. *Loma*, other *Parvicapsula* sp.), and (5) link disease with ecological exposure and behaviour. Rapid senescence is characteristic of spawning salmon and separating the effect of a given pathogen from normal homeostatic deterioration requires detailed assessments of physiological status matched to the pathologies. We will sample healthy and unhealthy fish from different Late-run stocks in 2007 and match behavioural assessments (moribund, location in water column) with physiology and disease pathologies. This funding will provide a proactive plan to respond to potential concerns and work towards more complete understanding of the pre-spawning mortalities. We will work in cooperation with stock assessment and Cultus broodstock personnel to ensure that the information collected from sampling morts is optimized. Kristi Miller and Simon Jones will be involved in this project from planning, to sample analysis, and through to interpretation. Our role will be to insure collection is coordinated, provide physiological and behavioural assessments, and place the results in an ecological context.

Estimated Cost: 40K (Previous Funding Source: PST Late Run)

15K – sample analysis (tissue histology, QPCR, physiology)

5K – material and travel costs

20K – casual labour support for Late run sampling and tissue processing.