

July 28, 2009

Via email: [Robert.Piorkowski@alaska.gov](mailto:Robert.Piorkowski@alaska.gov)

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**Re: ADF&G Fish Resource Permit (#SF2009-142); Collections Report**

This is the collections report required by August 31. I have prepared it here in narrative, since the online forms do not address this type of project. The study goals were partially met, with both failures and success. A complete report will be prepared after consultation with biologists and local ADF&G personnel, and hopefully will be presented at the fall Mat-Su Salmon Symposium.

The project called for collection of 120 fry to be placed in six cages in and out of the City of Palmer's wastewater treatment plant mixing zone. The intent was to examine the effects of the mixing zone on salmon fry growth and survival. Secondary objectives included quantitative p-chem mapping of the mixing zone, and semi-quantitative observations of in-stream fry densities.

Following permission to proceed from Dave Rutz on 5/27/09, five cages were built and placed in the stream, in similar depths and flow rates, marked with permit number and contact. Due to materials limitations, a redundant control cage was eliminated. On 6/4/09, approximately 150 fry were captured using a dip net from a shallow tributary upstream of the outfall and placed in a bucket of stream water. These fry were of uniform size, estimated to be about one month since emerging. They appeared to be predominantly sockeye and the remainder chum, although the parr marks were too indistinct for confident rapid visual identification; this reflected the composition observed of the larger fry in the mixing zone. Coho fry were not observed although second year smolts were seen.

Twenty fry were selected at random from the bucket, observed to ensure the size distribution was representative, and placed in each cage. A total of 100 fry were retained for this study, instead of the 120 originally planned.

An additional ten randomly selected fry from the bucket were retained for more careful determination of species, length, and weight; the remaining fry were then released. After measurement, these too were released live and active to the stream.

During subsequent stream visits, the cages were inspected, limited p-chem sampling was conducted, and observations of fry inside and outside the cages were documented. The cages quickly collected a thick coating of algae, which significantly reduced the flow rate through each cage and made the fry increasingly difficult to count or even observe. Consequently, total fry counts were tallied only at the end of the project. Only one dead fry was observed (cage 5) and removed.

The cages were removed and project halted 7/15/09 due to flooding by the Matanuska (the first time in 20 years at the WWTP). All the cages were impacted to various degrees and the physical barriers to fry egress or ingress compromised. A total of 43 fry were found in the cages. These were euthanized, measured, and identified by species. The attached annotated photo shows the fry in each cage, with average lengths, weights, and percent increase during the study listed.

Cage 1 was above the outfall, outside the mixing zone (~0.4% of outfall ammonia concentration) and contained 7 fry, all live sockeye. Two netting tears were observed near the cage top, and the flood had overtopped the cage.

Cage 2 was just below the outfall, inside the mixing zone (up to ~29% of outfall ammonia concentration) and contained all live fry; 10 sockeye, 3 chum. Netting tears were observed near the top and in the cage floor.

Cage 3 was below the outfall, but outside the mixing zone (~0.7% of outfall ammonia concentration) and contained 19 live and 4 dead fry (plus an additional fry found in the mud, not in the photo), estimated 95% sockeye (some were too small or decomposed for confident identification). The cage was intact but the lid had been overtopped and loosened.

Cage 4 was empty and damaged when found downstream, and cage 5 was intact and empty with a small netting tear near the bottom.

Fry sizes in the cages reflect many field observations; fry in the mixing zone were significantly larger and much more numerous than outside the mixing zone. Mortality rates can not be ventured, due to fry egress and ingress and potential cannibalism of unobserved carcasses.

In summary, 100 fry were placed in the cages (not counting ingress) and 44 accounted for through the end of the study.

I hope to frankly address in the report “what goes awry”, and hope for your insight.

Sincerely,



Ralph Hulbert

cc Dave Rutz, Area Management Biologist, ADF&G  
Ruth, Helen, and Garth Hulbert, Participants

Att: Annotated photo

**Salmon Fry Cage Study 2009; Palmer Wastewater Treatment Plant Outfall Stream (preliminary results)**

Cages 1 and 3 were controls outside of the outfall mixing zone, with 0.4 and 0.7% of the outfall ammonia concentration. Cage 2 was just below the outfall in the stream, with up to 29% of the outfall ammonia concentration. Twenty fry, ~80% sockeye, 3.4 cm and 0.45 g average were placed in each of five cages on 6/4/09 and retrieved on 7/15/09 during a flood event. All cages suffered some damage; cages 4 and 5 had no fry inside, cages 1 and 2 lost some fry, while several fry entered cage 3. The mixing zone consistently had more and larger fry.

**Cage 1**

**Cage 1 averages: 4.5 cm, 32% increase; 0.77 g, 71% increase**



**Cage 2**

**Cage 2 averages: 5.3 cm, 56% increase; 1.5 g, 233% increase**



**Cage 3**

**Cage 3 averages: 4 cm, 18% increase; 0.58 g, 29% increase**

