# Final Report for 2007

## Submitted by Rick Routledge
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**Summary**

We have now completed field work for the 2007 season, and have achieved the following main objectives:

- We obtained a mix of daily and weekly observations on inlet conditions in the lead-up to the juvenile sockeye salmon migration.
- We have analyzed the chlorophyll measurements, and are beginning to assess the results of laboratory analyses of plankton and nutrient sample that we are currently receiving.
- We continued to obtain data on local weather conditions at two sites in the inlet.
- We are nearing completion of the first version of the hydrodynamic model.
- To obtain direct observations of surface currents, we deployed drifters in the inlet as opportunities became available.
- We ran a designed experiment on horizontal plankton tows, and are currently awaiting the results of the laboratory analyses.
- We reinstituted the purse seining for juvenile sockeye salmon during their late spring migration down the inlet.
- We completed the analysis of a pilot version of an experiment on salinity preferences for juvenile sockeye salmon.

In addition, one paper associated with Phase I of this project has been printed in the journal, *Limnology and Oceanography*, a second has been submitted, and a third is nearing completion. Furthermore, Ms. Seana Buchanan successfully defended her M. Sc. thesis in the past year, and has now graduated.

**Sampling:** We took plankton samples, depth profiles, and water samples at eight sites in Rivers Inlet every week from early March to early July. In addition, we collected daily depth profiles at a single site near Florence Island. Observations to date include:

- The inlet experienced record-setting early-spring runoff during March and April.
- The first phytoplankton bloom occurred in late April, a month later than in 2006.
- Chlorophyll abundance at Florence Island (where we obtained daily observations) peaked very sharply (Figure 1). Weekly observations at other sites in 2007 suggested similar time behaviour. By contrast, the observations from 2006 , though taken only once every second week, suggested that the peak was considerably less sharply peaked.
- We observed evidence suggesting a slight delay in the 2007 phytoplankton bloom at the two sites near the inlet head (Kilbella Bay and the mouth of the Wannock River) vs. other sites further down the inlet.

**Weather observations:** The weather stations both needed repairs after the winter. (This unfortunately took considerable time, and we therefore decided to put them in storage at Dawson's Landing for the 2007-8 off-season.) Once these repairs were made, both the Ethel Island station and the new station at the southwest corner of Kilbella Bay provided valuable information on the highly localized weather conditions in the inlet.

**Hydrodynamic Model:** The first working version of the hydrodynamic model is nearing completion. This will provide a two-dimensional moving picture of the circulation and mixing of inlet waters. We shall soon be able to compare model predictions to observations on surface water flows from the drifter deployments.

**Juvenile Sockeye Salmon Sampling:** Preliminary analyses suggest that the sockeye salmon did not grow significantly during their migration down the inlet. We await the laboratory analyses of plankton samples and stomach contents to see if this was accompanied by a lack of food.

**Juvenile Sockeye Salmon Salinity Preferences:** Our pilot study on salinity preferences demonstrated that the small sockeye salmon consistently preferred relatively low salinity levels. In addition, we experienced considerably more difficulty in keeping

the sockeye salmon alive if they were caught near the inlet mouth. This suggests that early marine survival for these fish will have been low this year, and provides further evidence that the inlet plays a critical role in determining marine survival.

Thus we have found direct evidence supporting the importance of inlet conditions in early spring to the marine survival of juvenile sockeye salmon migrating down the inlet in late spring. A late phytoplankton bloom appears to disrupt food production for the late-spring juvenile sockeye salmon migration.

**Field Support:** We received good logistical support from Oweekeno Fisheries and Dawson's Landing. For this, we offer special thanks to Bruce Burrows in Oweekeno Fisheries, to Glenn Johnson and his crew on the Western Bounty, and to Rob and Nola Bachen at Dawson's Landing. In addition, we thank Salmon King Lodge for generously offering us free accommodation and use of one of their boats. This remarkable generosity enabled us to reduce our costs substantially.

**Financial Support:** Once again, we are indebted to the Tula Foundation for supporting the bulk of this project. We also gratefully acknowledge support from NSERC, both through a discovery grant to R. Routledge, and through the National Program for Complex Data Structures.

**Publications:** We report progress on five publications as follows:

- One sediment coring paper, on general methodology, has recently been published: Brahney, Janice, Darren G. Bos, Marlow G. Pellatt, Thomas W. D. Edwards, and Richard Routledge (2006). The influence of nitrogen limitation on $\delta^{15}N$ and carbon: nitrogen ratios in sediments from sockeye salmon nursery lakes in British Columbia, Canada. *Limnology and Oceanography*, **51(5)**: 2333–2340.
- A second one, specific to Long Lake, has been submitted to the *North American Journal of Fisheries Management.*. We continue to work on developing quantitative estimates of past spawning abundances. Early indications are that they were large compared to historic records. Such a conclusion could have major implications for future management of Long Lake sockeye salmon.
- Seana Buchanan has now successfully defended her masters thesis and formally graduated in the June Convocation.
- Conversion of the thesis to a shorter manuscript for submission to scientific journal is nearing completion.
- Current M. Sc. student, Désirée Tommasi, published an article in the Town and Gown series in the Vancouver Sun in early October, highlighting her work on the inlet ecology.

**Integrated Ecosystem Study:**

We are awaiting a decision from the Tula Foundation regarding an application for a continuation and modest expansion of this study. We are also exploring opportunities for further funding that would allow us to extend this project to encompass the entire watershed from the headwater snowfields and glaciers to the inlet mouth.

**Figures:** We conclude with two sample figures generated from data from the 2007 season.

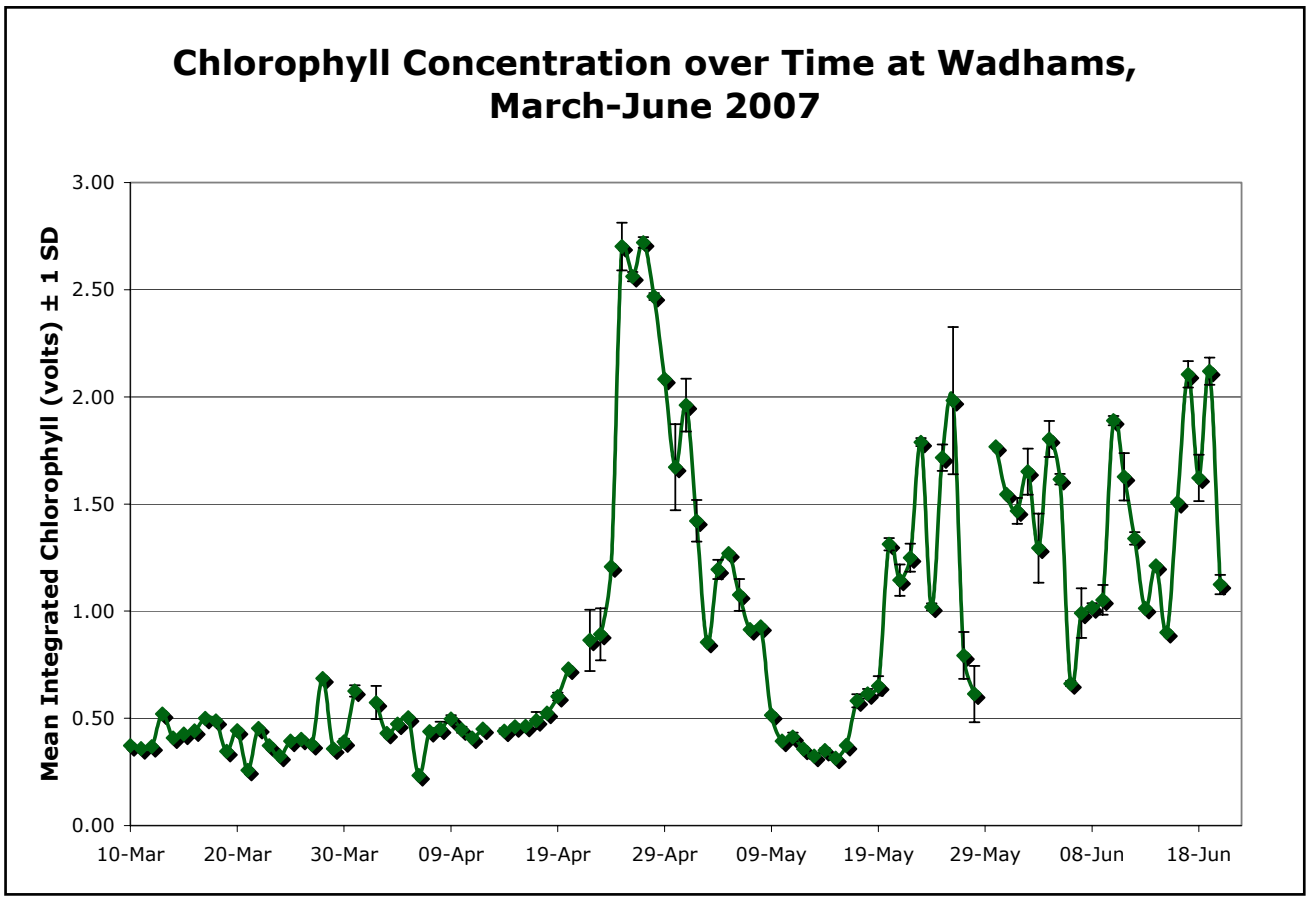


**Figure 1.** Estimated abundance of chlorophyll at the site near Florence Island (offshore from Wadhams) in the spring of 2007. Observations were taken daily with only a few exceptions during inclement weather. Note the sharp peak with the abundance more than doubling in a single day.


**Figure 2.** A drifter track superimposed on a Google Earth image of Rivers Inlet. Note how the drifter became hung up on the west shore of the inlet on two occasions. With these anomalies removed, these tracks provide direct observations on the movement of inlet surface waters. These can be compared to predictions of the hydrodynamic model. We hope eventually to be able to use the model to obtain insight on past inlet conditions given local weather and river discharge data, and then to forecast future inlet conditions in light of predicted changes to Central Coast weather in coming decades.