

EVOS Annual Progress Report

Project Number: # 090817

Project Title: Physical Oceanographic Factors Affecting Productivity in Juvenile Pacific Herring
Nursery Habitats

PI Name: Shelton Gay - PWSSC

Time Period Covered by Report: October 2008 - September 2009

Date of Report: Sept. 7, 2009

Work Performed: In the first quarter of the 2009 budget year hydrography (CTD) data were collected in the four SEA nursery bays during the juvenile herring survey conducted by R. Thorne. Also, during that quarter data from the 2008 summer field season were processed, plotted and compiled into a report describing results of the previous two field seasons of this study titled Hydrography and Circulation in 2007 and 2008 at Simpson Bay and Whale Bay: Two Small Fjords in Prince William Sound Alaska used as Nursery Habitat by Juvenile Pacific Herring (Gay 2008b). The report was submitted to the Exxon Valdez Oil Spill Trustee Council (EVOSTC) in Dec, 2008. In Jan 2009 a poster presentation based on the above report was given at the annual ocean sciences symposium in Anchorage Alaska. In the spring of 2009 a second proposal was submitted to the EVOSTC proposing to continue deployments of moored CTDs and other instruments within various herring nurseries over the next few years to provide ancillary data on seasonal habitat conditions within herring nurseries.

No field work was conducted over the summer of 2009, but more thorough analyses of weather data and moored T/S data were performed. These results will be included in a revised version of the report submitted last December as an addendum to the annual report. Data covered in this report include currents measured by both towed and hull-mounted ADCPs over semidiurnal tide phases; CTD casts made at discrete oceanographic stations over the above cycles; weather data and moored TS time series. Time series analysis involved applying Fourier Transforms to both meteorological and oceanographic data at Simpson Bay to create periodograms of spectral energy (or power spectral density). The purpose of these tests is to determine the dominate frequencies (analogous to physical processes) that cause the greatest amount of variance (i.e. energy or power) in the time series.

In the December 2008 progress report I indicated that interannual climatic variation appears to be increasing in Alaska. For example, in just four years the summer climate of PWS and elsewhere in Alaska went from a markedly warm anomaly in 2004 to a cool anomaly in 2008. In the last two years these climatic trends were extended over all the seasonal weather cycles, and this is leading to a general consensus that Alaska is beginning enter a negative shift in the Pacific Decadal Oscillation (Tom Kline, PWSSC, person. comm.). This shift to cool, stormy conditions was observed in my weather data over the summer of 2008, and was accompanied by a

significant increase in fluorescence (i.e. phytoplankton biomass) between 2007 and 2008 at both Simpson Bay and Whale Bay. This trend in increased plankton abundance appears to be continuing, and indeed over the last summer an extremely large late season bloom of phytoplankton was observed within Simpson Bay at the end of June by Antonietta Quigg of Texas A&M University at Galveston (Alison Skinner, TAMUG, person. comm.).

An additional observation described in the December 2008 report was that the two nurseries studied under my project clearly responded differently to the favorable weather conditions in 2008 in terms of phytoplankton abundance. For example, fluorescence values at Simpson Bay were consistently 4 to 5 times higher than those at Whale Bay, and the chlorophyll concentrations over the summer at Simpson remained significantly higher (5-6 $\mu\text{g/l}$) in comparison to 2007 (1.8-2.6 $\mu\text{g/l}$). This is discussed in greater detail in the revised report, in terms of the proximate meteorological and physical oceanographic factors that may have influenced this interannual variation.

Future Work: Field work for this project (with exception of a minor calibration cruise for the hull-mounted ADCP) was finalized in the summer of 2008. Future research objectives include completion of data analyses and synthesis of the results into publications for my PhD dissertation and the final report, which is due next April 2010. Additional work involves conducting a short (1 day) calibration cruise for the 150 kHz ADCP and implementing the second proposal, which was recently accepted under the herring restoration plan. This will initially call for building moorings containing CT's and thermistors and deploying them within the four SEA herring nurseries over the next three years. Additional moorings will be deployed within other nurseries when equipment becomes available from the AOOS/OSRI moorings already deployed in PWS.

Coordination/Collaboration: The coordination and collaboration with other projects in 2009 was limited to hydrographic measurements (i.e. CTD casts) within the four SEA fjords during the herring cruise performed by R.Thorne in November 2008. In addition to the above work, coordination with research being conducted in Simpson Bay by Alison Skinner (PhD student at TAMUG) will hopefully be organized this fall. Alison is a graduate student of Dr. Antonietta Quigg who is studying primary productivity (i.e. phytoplankton dynamics). Dr. Quigg is analyzing chlorophyll and nutrient samples collected in 2008 and 2009.

Community Involvement/TEK & Resource Management Applications:

During the 2009 field season there were no cruises and research tasks pertained only to data analysis, therefore no community involvement occurred. Resource management applications are also not applicable at this time.

Information Transfer: No publications or presentations were scheduled during the fall of 2008. However, a presentation of the two year's results was made at the January 2009 Ocean Sciences meeting held in Anchorage sponsored by the EVOSTC. In addition, data are currently being analyzed for inclusion in my PhD dissertation, which will be written in part over the 2009 budget year. The dissertation will be included as part of a final report for this project in 2010.

Budget: There are no changes to the budget for this project to be reported

Signature of PI: Shelton M. Dwyer