

**FY16 PROJECT PROPOSAL SUMMARY PAGE**  
**Continuing, Multi-Year Projects**

**Project Title:** Long term monitoring of oceanographic conditions in Prince William Sound

**Project Period:** February 1, 2016 – January 31, 2017

**Primary Investigator(s):** Campbell, Robert W., Prince William Sound Science Center, 300 Breakwater Ave., Box 705, Cordova, AK

**Study Location:** Prince William Sound, Hinchinbrook Entrance, Montague Strait, Simpson Bay, Whale Bay, Eaglek Bay, Zaikof Bay

**Project Website:** [www.gulfwatchalaska.org/monitoring/environmental-drivers/oceanographic-conditions-in-prince-william-sound/](http://www.gulfwatchalaska.org/monitoring/environmental-drivers/oceanographic-conditions-in-prince-william-sound/)

**Abstract\*:** This project is a component of the integrated Long-term Monitoring of Marine Conditions and Injured Resources and Services submitted by McCammon et. al. This project is intended to provide physical and biological measurements that may be used to assess bottom-up impacts on the marine ecosystems of Prince William Sound. Specifically, it is proposed to deploy an autonomous profiling mooring in central Prince William Sound that will provide high frequency (~daily) depth-specific measurements of physical (temperature, salinity, turbidity), biogeochemical (nitrate, phosphate and silicate) and biological (Chlorophyll-a concentration) parameters, over the course of the growing season (focused on the vernal and autumn blooms). Several regular vessel surveys are also proposed to provide ground-truth data for the mooring, and to attempt to capture some of the spatial variability in PWS. As well as the mooring site, the surveys will visit all four of the SEA bays to maintain ongoing EVOSTC funded time series measurements at those sites and to support proposed herring research (Pegau et. al). The major entrances (Hinchinbrook Entrance and Montague Strait) will also be visited. The surveys will make the same suite of measurements as the mooring, and will also collect water and plankton samples. This project will also link significantly with the herring research efforts proposed by Pegau et al.

**Estimated Budget:**

**EVOSTC Funding Requested\*** (must include 9% GA):

<b>FY12</b>	<b>FY13</b>	<b>FY14</b>	<b>FY15</b>	<b>FY16</b>	<b>TOTAL</b>
\$238.1	\$193.2	\$197.3	\$203.7	\$209.3	\$1,041.6

**Non-EVOSTC Funds to be used:**

<b>FY12</b>	<b>FY13</b>	<b>FY14</b>	<b>FY15</b>	<b>FY16</b>	<b>TOTAL</b>
\$23.3	\$23.3	\$23.3	\$145.0	\$135.0	\$349.9

\* Figures given in \$1,000 increments

**Date:** September 1, 2015

## **I. EXECUTIVE SUMMARY**

The goal of this program is to deliver a monitoring program that will return useful information on temporal and spatial changes in the marine environment, at a reasonable cost, and with a reasonable amount of effort. The data should be depth-specific (because water column stability is important to ecosystem productivity), of high enough frequency to capture timing changes (changes that occur on order of weeks), and give an idea of spatial variability in the region. As well, given that PWS herring will remain a funding priority of the EVOSTC in the next 20 years, any long term monitoring efforts should be integrated with future herring studies as well as building upon ongoing work funded by the trustee council. Specific objectives include:

1. Install and maintain an autonomous profiling mooring in PWS that will measure daily profiles of temperature, salinity, oxygen, chlorophyll-a (as a proxy for phytoplankton biomass), turbidity and nitrate concentration in the surface layer (0-100 m).
2. Conduct regular surveys in PWS to tie in spatial variability to the high frequency time series provided by the mooring.
3. Support continued herring research by maintaining the existing time series (hydrography, plankton and nutrients) at the four SEA bays.

## **II. COORDINATION AND COLLABORATION**

### **A. Within a EVOTC-Funded Program**

1. All plankton samples collected by the lower Cook Inlet group (Angela Doroff) are analyzed as part of this project.
2. Following extended discussions as to sampling protocols for zooplankton among the different projects (PIs Batten, Doroff and Hopcroft), we have begun a simple intercomparison study to examine how the different gears used are sampling and how they might be compared.
3. Working specifically with Sonia Batten, plankton categories have been defined so that the more detailed taxonomic categories determined as part of this project may be “downscaled” so to be comparable with the Continuous Plankton Recorder surveys conducted by Batten.
4. A dialog has begun among all of the PIs of the “Environmental Drivers” section on data availability to better understand variability in the spring bloom throughout the northern Gulf of Alaska.

### **B. With Other EVOSTC-funded Projects**

This project has provided plankton data to researchers within the PWS Herring Survey (PI Ron Heintz), and regularly sends live and preserved plankton to the Hershberger group at Marrowstone Research Station for genetic and histological work looking for vectors of fish pathogens. Campbell has collaborated with PIs Batten and Pegau on a publication looking at long term changes in ecosystem and herring productivity.

### **C. With Trustee or Management Agencies**

1. A researcher from NOAA (Johanna Vollenweider) working on a project independent of the council-funded effort has participated in a cruise, to collect herring scales and tissue samples for development of better age determination methods.
2. Seawater samples have been collected for the Ocean Acidification research group at NOAA AFSC/UAF Ocean Acidification Research Center (contact: Natalie Monacci).
3. ADF&G was assisted with a check on reported herring spawn in Port Gravina (contact: Steve Moffitt).
4. Seawater samples were taken to send to the WHOI radioisotope group, which will be tested for the presence of isotopes characteristic of the 2011 Fukushima Daiichi nuclear disaster (contact: Ken Buesseler).

5. Project staff have been an on-call response vessel for emergency retrieval of a number of gliders (surface and subsurface) deployed in PWS by NOAA AFSC staff (contact: Wiley Evans).
6. Campbell regularly coordinates with local ADF&G staff on observations of herring spawn locations, and collected a significant proportion of the age/sex/length samples of adult herring in PWS in 2015 (contact: Steve Moffitt).

### **III. PROJECT DESIGN – PLAN FOR FY16**

#### **A. Objectives for FY16**

**Objective 1.** Install and maintain an autonomous profiling mooring in PWS.

**Objective 2.** Conduct regular surveys in PWS.

**Objective 3.** Support continued herring research by maintaining the existing time series (hydrography, plankton and nutrients) at the four SEA bays.

#### **B. Changes to Project Design**

1. Profiling mooring: The original intention of this project was to leave the profiling mooring in place operationally for most of the year. After 1.5 years of operation, we have learned that significant maintenance and calibration work is required, and that winter conditions are energetic enough that it is unwise to leave such an expensive piece of equipment in place all winter long. Given that much of the profiler's instrumentation is biophysical, we have focused on the productivity season in PWS, deploying the profiler in late winter (prior to the spring bloom), and retrieving it in late autumn (following the autumn bloom period). The profiler is bleeding-edge technology, and this project is by far the most northerly and deepest deployment of the system to date, and it has suffered a number of malfunctions, necessitating unplanned (and unbudgeted) trips to retrieve/redeploy the mooring. Communications have also been something of an issue (the local cellular provider's data service could charitably be referred to as "flakey"), but all data is logged internally and analyzed post-hoc.

Most of bugs in the system have been worked out, and the 2015 deployment of the profiler has been extremely successful: it was deployed on March 21<sup>st</sup>, and has done daily profiles since then, missing only a single day between the initial deployment and the time of this report (the profiler was instructed to skip a day due to an anticipated storm event). The entire spring bloom was observed, as well as several wind-driven productivity events. A proposal to upgrade the profiler was funded by the North Pacific Research Board in 2015, which will upgrade the electronics and communications hardware (improving the reliability of communications), and add an *in situ* plankton camera.

2. Nutrient measurements: It was originally planned to measure macronutrients (nitrate, phosphate, silicic acid) via Capillary Electrophoresis (CE), and considerable time and effort (under this project and other non-EVOSTC projects) has been expended working up various methods, with limited success: CE is a separation technique (similar to HPLC, but using electric current instead of pressure), and the non-nutrient cations present in seawater interfere considerably with the analysis. There is a considerable backlog of samples in storage (frozen), and in 2014 we went back to the standard wet-chemical methods for the analysis of nutrients to work on that backlog. In 2015, a proposal to purchase a Seal Analytical AutoAnalyzer 3 was funded by the Rasmuson Foundation. The instrument will allow automated analysis of nitrate, which is the most labor-intensive macronutrient to measure. The instrument was ordered in July 2015, and it should be installed and operational by October; a technician has been identified to do the work, and will be working through the backlog this autumn.

#### **IV. SCHEDULE**

##### **A. Project Milestones for FY 16**

For each project objective listed (III.A), specify when critical project tasks will be completed, as submitted in your original proposal. Please identify any substantive changes and the reason for the changes. Please format your information as in the following example:

- Objective 1.** Install and maintain an autonomous profiling mooring in PWS.  
*To continue into autumn 2015 (~early November) and resume in March 2016*
- Objective 2.** Conduct regular surveys in PWS.  
*Surveys will be conducted in September/October and November 2014, and six cruises will be conducted in 2016.*
- Objective 3.** Support continued herring research by maintaining the existing time series (hydrography, plankton and nutrients) at the four SEA bays  
*Surveys in the bays will be conducted in September/October and November 2015, and six cruises will be conducted in 2016.*

##### **B. Measurable Project Tasks for FY 16**

###### **FY 16, 1st quarter (February 1, 2016 - April 31, 2016)**

*March: PWS Survey, Mooring deployed*

###### **FY 16, 2nd quarter (May 1, 2016-July 30, 2016)**

*May: PWS Survey, Mooring maintenance*

*June: PWS Survey, Mooring maintenance*

###### **FY 16, 3rd quarter (August 1, 2016 – October 31, 2016)**

*August: PWS Survey, Mooring maintenance*

*October: PWS Survey, Mooring maintenance*

###### **FY 16, 4th quarter (November 1, 2016- January 31, 2017)**

*November: PWS Survey, Mooring maintenance  
PI meeting*

#### **V. PROJECT PERSONNEL – CHANGES AND UPDATES**

No personnel have been added or removed from the project

#### **VI. BUDGET**

##### **A. Budget Forms (Attached)**

Budget form attached.

##### **B. Changes from Original Proposal**

No changes requested

##### **C. Sources of Additional Funding**

PWSSC provides a CTD profiler (SBE model 25plus) with several auxiliary sensors (chlorophyll fluorometer, backscatter turbidometer, oxygen sensor, solid state active fluorometer and nitrate

analyser), which is used for all field surveys, and to cross-calibrate with the profiler (value ~\$75K). Extracted chlorophyll-*a* is read on a Turner Designs TD-700 fluorometer (replacement cost ~\$10K). As well as the moored profiler, PWSSC provides a pair of acoustic releases, and a 1-m diameter syntactic foam float with upward and downward looking RDI ADCP current profilers (value ~\$50K). The Alaska Ocean Observing System has also contributed \$10K in FY15 for surveys in PWS. The North Pacific Research Board will contribute approximately \$100K in upgrades to the profiling mooring in FY16, and support several additional service visits (~\$20K). The Rasmuson foundation contributed \$15K towards purchasing the Seal Analytical Autoanalyzer 3.