

## FY16 PROJECT PROPOSAL SUMMARY PAGE

### Continuing, Multi-Year Projects

**Project Title:** Long term monitoring: Environmental drivers component - The Seward Line: Marine Ecosystem monitoring in the Northern Gulf of Alaska.

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

**Primary Investigator(s):** Russell R Hopcroft, University of Alaska Fairbanks

**Study Location:** Gulf of Alaska shelf (south of Seward), and Prince William Sound

**Project Website:** <http://www.gulfwatchalaska.org> and <https://www.sfos.uaf.edu/sewardline/>

**Abstract\*:**

The ocean undergoes year-to-year variability in the physical environment, superimposed on longer-term cycles, and potential long-term trends. These variations influence ocean chemistry, and propagate through the lower trophic levels, ultimately influencing fish, seabirds and marine mammals. Over the past 50 years the Northern Pacific appears to have undergone at least one clear “regime shift”, while the last 18 years have seen multi-years shifts of major atmospheric indices, leaving uncertainty about what regime the coastal Gulf of Alaska is currently in. Regime shifts are often expressed as fundamental shifts in ecosystem structure and function, such as the 1976 regime shift that resulted in a change from a shrimp dominated fisheries to one dominated by pollock, salmon and halibut. Long-term observations are also critical to describe the current state, and natural variability inherent in an ecosystem at risk of significant anthropogenic impact. Given the potential for such profound impacts, this proposal seeks to continue multidisciplinary observations which began in 1997 along the Seward Line and in PWS that assess the current state of the Northern Gulf of Alaska, during 2012-2017. Such observations form critical indices of ecosystems status that help us understand some key aspects of the stability or change in upper ecosystems components for both the short and longer-term. By analogy, the weather has been studied for more than a hundred years, yet regular observations are still needed to know what is happening and what can be expected in the near future.

**Estimated Budget:**

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

FY12	FY13	FY14	FY15	FY16	TOTAL
\$98.1	\$59.9	\$100.5	\$104.0	\$107.7	\$470.2

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

FY12	FY13	FY14	FY15	FY16	TOTAL
\$0.0	\$0.0	\$0.0	\$300.0	\$300.0	\$600.0

\* *Funds expressed in \$1000 increments*

**Date:** September 1, 2015

## **I. EXECUTIVE SUMMARY**

Long times-series are required for scientists to tease out pattern (and cause) from simple year-to-year variability. Like other regions, the Northern Pacific undergoes significant inter-annual variability, driven partially by variations in major climatic indices (e.g. El Niños, the Pacific Decadal Oscillation). Larger longer-term variations referred to as “regime shifts” have occurred in the past, and will likely occur again. Regime shifts are expressed as fundamental shifts in ecosystem structure and function, such as the 1976 regime shift that resulted in a switch within the Gulf of Alaska from a shrimp-dominated fishery to one dominated by pollock, salmon and halibut. Long-term observations are also critical to describe the current state, and natural variability inherent in an ecosystem at risk of significant anthropogenic impact. Given the potential for such profound impacts, the Seward Line Long-term Observation Program (<http://www.sfos.uaf.edu/sewardline/>) provides these critical observations on the current state of the Northern Gulf of Alaska ecosystem. Seward Line observations over the past 16 years have fundamentally revised our understanding of the coastal Gulf of Alaska ecosystem and allow us an appreciation of not only its major properties, but also their inter-annual variability. To date, we have observed both unusually warm and cold years, which influence the timing of the planktonic communities, but not necessarily their ultimate abundance and biomass.

During surveys conducted during this past year, we found that the anomalously warm water temperatures from fall 2014 have persisted throughout the winter along the Seward line. The average upper-100 m temperatures for the GAK stations were 0.9-1.3 °C above the 18-year mean for those stations, with the largest anomalies at the offshore end. Averaging 1°C along the line, this anomaly is very close to those observed during the 1998 and 2003 El Niño events. We also extended the line offshore to encompass stations GAK14 and GAK15. All offshore stations were sampled to 1000 m depth with the CTD.

## **II. COORDINATION AND COLLABORATION**

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

Project principal investigator, Dr. Russ Hopcroft, interacts with other PIs within Environmental drivers on a regular basis, allowing for cross-comparison of data and discussion of unusual events. In addition, Dr. Hopcroft serves on the Gulf Watch Alaska Science Coordinating Committee, and has regular phone conferences involved in program oversight

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

This project provides environmental context and indices to the EVOSTC funded Herring Research and Monitoring program.

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

The Seward Line is funded by a consortium of the North Pacific Research Board, the Alaska Ocean Observing System and EVOTC Gulf Watch Program, and works in conjunction with the US Fish and Wildlife Service. It has recently started discussion for coordination with ADF&G (NAME) in addition to its ongoing interaction with NOAA (Phil Mundy).

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

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

This project revolves around executing multidisciplinary oceanographic cruises along the Seward Line and in PWS each May and September. The objectives that are met each cruise are:

1. Determine thermohaline, velocity, and nutrient structure of the Seward Line across the Gulf of Alaska shelf, and at stations throughout PWS
2. Determine phytoplankton biomass and size distribution (chlorophyll)

3. Determine the distribution and abundance of micro-zooplankton (starting in 2014)
4. Determine the distribution and abundance of meta-zooplankton
5. Opportunistically, determine rates of growth and egg production of selected key zooplankton species
6. Support determination of carbonate chemistry (i.e. ocean acidification)
7. Determine distribution and composition of seabirds (& marine mammals) along the Seward Line, PWS and Kenai coastline
8. Provide at-sea experience for graduate students within the University of Alaska

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

All bottle-based measurements (i.e. nutrients, chlorophyll) have been discontinued at minor Seward Line stations to streamline cruise logistics and analysis costs. A new bottle carousel allows for additional bottles depth on each CTD cast.

## **IV. SCHEDULE**

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

**Objective 1.** Execute May 2016 cruise.  
*To be met by May 2016*

**Objective 2.** Execute September 2016 cruise.  
*To be met by September 2016*

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

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

*Ongoing: Analysis of samples and data, data submission*

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

*May Cruise: Complete specific tasks in Section III.*

*Ongoing: Analysis of samples and data*

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

*September Cruise: Complete specific tasks in Section III.*

*Ongoing: Analysis of samples and data*

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

*Ongoing: Analysis of samples and data*

*November: Attend PI meeting, present findings*

*January: Attend AMSS, present findings*

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

Through other Consortium funding, Dr. Seth Danielson (UAF), Dr. Suzanne Strom (WWU) and Dr. Kathy Kuletz (USFWS) are now co-PIs on the overall Seward Line project, but not directly funded by Gulf Watch Alaska.

## **VI. BUDGET**

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

Provide completed budget forms.

**B. Changes from Original Proposal**

No changes

**C. Sources of Additional Funding**

The Seward Line is funded by a consortium of the North Pacific Research Board (~50%), the Alaska Ocean Observing System (~25%) and EVOTC Gulf Watch (~25%), and works in conjunction with the US Fish and Wildlife Service (Kathy Kuletz – in kind support).