FY16 PROPOSAL SUMMARY PAGE
Continuing, Multi-Year Projects

Project Title: Long-term monitoring of seabird abundance and habitat associations during late fall and winter in Prince William Sound

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

Primary Investigator(s): Mary Anne Bishop, Ph.D., Prince William Sound Science Center, Cordova
mbishop@pwssc.org

Study Location: Prince William Sound

Project Website: www.Gulf Watch Alaskaalaska.org http://pwssc.org/research/birds-2/seabirds/

Abstract: This project is a component of the integrated Gulfwatch Long-term Monitoring of Marine Conditions and Injured Resources and Services submitted by McCammon et.al. The vast majority of seabird monitoring in areas affected by the *Exxon Valdez* oil spill has taken place around breeding colonies during the reproductive season, a time when food is generally at its most plentiful. However, seabirds spend most of the year widely dispersed. Late fall through winter are critical periods for survival as food tends to be relatively scarce or inaccessible, the climate more extreme, light levels reduced, day length shorter and water temperatures colder. Post-spill ecosystem recovery and changing physical and biological factors all have the potential to affect PWS seabird populations. Of the seabirds that overwinter in PWS, nine species were initially injured by the *Exxon Valdez* oil spill, including three species that have not yet recovered (marbled murrelet, Kittlitz's murrelet and pigeon guillemot). Here we propose to continue to monitor from 2012 through 2016 seabird abundance, species composition, and habitat associations using multiple surveys (up to 5 surveys per season) during late fall and winter. The data will improve our predictive models of seabird species abundance and distribution in relation to biological and physical environmental factors. In addition, by monitoring the top-down forcing by seabirds, a major source of herring predation, this project will complement the suite of *PWS Herring Research & Monitoring* studies, including improved mortality estimates for herring population models. This project is part of the pelagic component within the integrated *Gulf Watch Alaska Long-term Monitoring of Marine Conditions and Injured Resources and Services* submitted by McCammon *et. al*. Our project uses as observing platforms the vessels associated with the *LTM Humpback Whale surveys*, *PWS Herring Research & Monitoring Juvenile Herring Abundance Index* and integrates the seabird observations with those studies. In addition, our projects uses vessels associated with Alaska Dept. of Fish and Game October PWS shrimp surveys, and PWS Science Center February acoustic array cruises.

Estimated Budget:

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

FY12	FY13	FY14	FY15	FY16	TOTAL
$51.7	$78.6	$80.9	$83.4	$86.3	$380.9

Non-EVOSTC Funds to be used:

FY12	FY13	FY14	FY15	FY16	TOTAL
$10.5	$45.5	$63.5	$63.5	$63.5	$246.5

**Figures given in $1,000 increments*

Date: August 31, 2015

I. EXECUTIVE SUMMARY

Of the seabirds that overwinter in Prince William Sound (PWS), nine species were initially injured by the *Exxon Valdez* oil spill, including three species that have not yet recovered (marbled murrelet, Kittlitz's murrelet and pigeon guillemot. Nevertheless, the vast majority of seabird monitoring in areas affected by the Exxon Valdez oil spill has taken place around breeding colonies during the reproductive season, a time when food is generally at its most plentiful. Long-term monitoring of seabirds in PWS during winter is needed to understand how post-spill ecosystem recovery and changing physical and biological factors are affecting seabird abundance and species composition, as well as their distribution and habitat use.

This study is a continuation of systematic late fall and winter seabird surveys begun in 2007 by Bishop and Kuletz. Between October 2011 and February 2015, a seabird observer participated in 18 late fall and winter cruises. These include 14 cruises associated with four EVOS-funded projects: Gulf Watch Alaska *Humpback Whale systematic surveys* (n = 8), PWS Herring Survey *Hydroacoustic Juvenile Herring Surveys* (n = 2), Herring and Research Monitoring *Juvenile Herring Abundance Index* (n = 3), and Herring and Research Monitoring *Expanded Adult Herring Surveys* (n = 1), as well as 2 cruises with Alaska. Department of Fish and Game (ADFG; Oct 2013 & 2014) and 2 cruises with PWS Science Center Ocean Tracking Network (OTN) project (Feb 2014 & 2015). We plan to continue placing an observer onboard the October ADFG and the February PWS Science Center OTN cruises. At the end of first 5 years of the long-term monitoring (September 2016), this study will have monthly data sets from broad-scale coverage of PWS ranging from 4 to 10 years.

We continue to use the same methodology on our cruises that we have used since November 2007. That includes a 300m transect width (150 m each side), and recording all observations into dLog software. Data analyses are ongoing. Data is stored in the form of a Microsoft access database and metadata is available. All milestones have completion dates in 2016.

We collaborated with two EVOS *Gulf Watch* studies (*Humpback whale predation on Pacific herring* and *Forage fish in PWS*) and one EVOS *Herring* study (*Validation of Acoustic Surveys for Pacific Herring Using Direct Capture*) to investigate fall movements of whales, fish, and birds into the Sound via Montague Strait during September 2014. Humpback whales may take advantage of seabird feeding activity by using feeding flocks of marine birds as visual cues to prey concentrations. To characterize these relationships between marine predators and their prey resources, we recorded marine bird observations concurrent with humpback whale surveys and hydroacoustic transects.

In 2014 we contracted with Quanticipate Consulting (Dr. Ali Arab) to assist us with modeling temporal and spatial trends of seabirds in winter while accounting for sampling issues including detection probability estimation. Results will be provided in tables and figures for constant and temporally-varying variables and in form of maps for spatially-varying estimates.

2015 Publications:

Bishop, M.A., J. Watson, K. Kuletz, and T. Morgan. 2015. Pacific herring consumption by marine birds during winter in Prince William Sound, Alaska. *Fisheries Oceanography* 24:1-13.

Dawson, N., M.A. Bishop, K. Kuletz and A. Zuur. 2015. Using ships of opportunity to assess winter habitat associations of seabirds in subarctic coastal Alaska. *Northwest Science* 89(2):111-128.

EVOS Science Syntheses for Gulf Watch:

Bishop, M.A. 2014. Research summary: Long-term monitoring of seabird abundance and habitat associations during late fall and winter in Prince William Sound. pp 3-70 to 3-78.

Popular press:

Schaefer, A. 2015. Fish, birds, whales – they're all connected. *Delta Sound Connections*.

With a circulation of ~15,000, this annual newspaper published about the natural history of PWS and the Copper River Delta is distributed each May to airports and tourist areas in southcentral Alaska.

II. COORDINATION AND COLLABORATION

A. Within the Program

Table 1. Shared vessel platforms for this project with other EVOS projects.

EVOS Program/Project	Agency	Dates
PWS Herring & Research		
Validation of acoustic surveys for Pacific Herring using direct capture	PWS Science Center	Nov 2012-2016
Juvenile herring abundance index	PWS Science Center	Nov 2012-2016
Expanded adult Herring surveys	PWS Science Center	Late Mar/Apr 2013
Gulf Watch Alaska		
Long-term monitoring of humpback whale predation on Pacific herring in PWS	NOAA/UAS	Oct 2011 – Dec 2015
Monitoring long-term changes in forage fish distribution, abundance, and body condition in PWS	USGS	Sept. 2014

Seabird observations from this project is shared and integrated into the whale and herring surveys. In addition, information on herring, other fish and zooplankton prey fields around whale foraging areas, juvenile herring schools and adult herring schools is being used for the seabird analyses.

B. With Other Council-funded Projects

None

C. With Trustee or Management Agencies

Alaska Department of Fish and Game: Maria Wessel. ADFG provides a berth for a seabird observer during the October shrimp surveys.

Prince William Sound Science Center: Mary Anne Bishop. PWSSC provides a berth for a seabird observer during the February cruise to upload the Ocean Tracking Network arrays.

III. PROJECT DESIGN – PLAN FOR FY16

A. Objectives for FY16

1) Characterize the spatial and temporal distribution of seabirds in PWS during late fall and winter.
2) Relate seabird presence to prey fields identified during hydroacoustic surveys.
3) Identify critical biological and physical habitat characteristics for seabirds across PWS within and between winters.
4) Utilize increased temporal sampling resolution to improve our estimates of consumption of herring by seabirds during the winter.

B. Changes to Project Design

The only changes to the project design have had to do with shared vessels and timing of cruises. For October, since 2014 we have used the Alaska Department of Fish and Game annual shrimp survey as a platform for observations. This is a 10-d cruise that samples the exact same locations every year. Originally the Humpback Whale project was going to conduct a cruise in February that a seabird observer would accompany. This cruise is now in April. Similarly, we were going to place an observer on the Expanded Adult Herring Survey cruises, however the timing of these cruises (late March and late April) do not reflect winter bird abundance or habitat use as spring migration and in some cases breeding is already underway by then. As a result, since February 2014 we have placed the seabird observer on an annual February cruise that the PWS Science Center conducts to download acoustic arrays in Hinchinbrook Entrance and Montague Strait. Finally, in September 2014 our Gulf Watch seabird study collaborated with the Gulf WGulf Watch Alaskaatch *Humpback Whale* and *PWS Forage Fish*, and the Herring R& M *Acoustic Validation* in a pilot study to investigate fall movements of whales, fish, and birds into the Sound via Montague Strait.

IV. SCHEDULE

A. Project Milestones for FY 16 *(note: Milestones have been shifted to reflect the change in the project end date from September 30, 2016 to January 31, 2017)*

Objective 1. Characterize the spatial and temporal abundance of seabirds in PWS during late fall and winter.
To be met by January 2017.

Objective 2. Model species abundance and distribution in relation to biological and physical environmental factors
To be met by January 2017.

Objective 3. Assess seabird habitat associations within and between winters
To be met by January 2017.

Objective 4. Relate species composition and distribution to prey fields.
To be met by January 2017.

Objective 5. Identify critical marine habitats used by seabirds during late fall and winter
To be met by January 2017.

B. Measurable Project Tasks for FY 16

FY 16, 1st quarter (Feb 1 – Apr 30, 2016)

Feb	Field cruise: LTM seabird survey in conjunction with PWSSC Ocean Tracking Network cruise
Mar-Apr	Analyze data

FY 16, 2nd quarter (May 1-Jul 31, 2016)

May-Jul	Analyze data

FY 16, 3rd quarter (Aug 1- Oct 31, 2016)

Aug-Oct	Analyze data
Oct	Field cruise: LTM seabird survey in conjunction with ADFG shrimp survey for PWS

FY 16, 4th quarter (Nov 1, 2016 – January 31, 2017)

Nov	Field cruise: LTM seabird survey in conjunction with *Juvenile herring abundance index* and *Acoustic Validation*
Nov	Gulf Watch Alaska PI meeting
Nov-Dec	Analyze Data
Jan	Alaska Marine Symposium
Jan	Submit annual report

V. PROJECT PERSONNEL – CHANGES AND UPDATES

Anne Schaefer arrived in August 2014 and is working as the avian biologist on this project. Jessica Stocking, who previously worked full time at the Science Center, is working on a limited basis with PI Bishop and consultant Dr. Ali Arab on the temporal and spatial modeling effort.

VI. BUDGET

A. Budget Forms

Provide completed budget forms.

B. Changes from Original Proposal

In 2014, we contracted with Quanticipate Consulting (Dr. Ali Arab) to assist us with modeling temporal and spatial trends of seabirds in winter. This contract should be completed by January 2016.

C. Sources of Additional Funding

This project relies on using ships of opportunity to conduct seabird observations. Projected in-kind ship time from non-EVOSTC funds includes $35.0 k ($3.5k/d @ 10 d/yr) from Alaska Department Fish and Game and $18.0k ($3.0k/d @ 6d/yr) from Ocean Tracking Network for the annual cruise to maintain the array (array maintenance is handled by the Prince William Sound Science Center).