

## FY16 PROPOSAL SUMMARY PAGE

### Continuing, Multi-Year Projects

**Project Title:** PWS Herring Research and Monitoring :Validation of Acoustic Surveys for Pacific Herring Using Direct Capture

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

**Primary Investigator(s):** Mary Anne Bishop, Ph.D., Prince William Sound Science Center, Cordova  
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**Study Location:** Prince William Sound

**Project Website:** <http://pwssc.org/research/fish/pacific-herring/>

**Abstract:** Acoustic surveys provide a relatively low-cost, remote sensing tool to estimate species-specific fish biomass and abundance. Interpreting acoustic data requires accurate ground truthing of acoustic backscatter to confirm species and length frequency of insonified targets. Pelagic trawls are the recommended method for validating species composition and for obtaining relatively unbiased information on length frequency distribution, age, and other biological information. Here we propose to use a low-resistance, light-weight midwater sweeper trawl capable of towing speeds (up to 3 knots) as a method to ground truth acoustic surveys for juvenile herring. Our pelagic trawl surveys will take place in conjunction with and onboard the same vessel as two studies in the *PWS Herring Research and Monitoring* program: *Juvenile Herring Abundance Index* (years 2-5) and *Acoustic Consistency: Intensive Surveys of Juvenile Herring* (year 3). In addition, this project will validate acoustic surveys associated with the *PWS Herring Research and Monitoring Program: Expanded Adult Surveys* (years 2-5). For the adult herring surveys, Alaska Dept. Fish and Game has required gillnets and jigging for validation in lieu of trawls. Our project will provide data on species composition and length frequency to aid in the interpretation of current and historical acoustic surveys. Juvenile herring samples collected during our pelagic trawl surveys will be distributed to six projects within the integrated herring program: condition index, energetics, growth, disease, juvenile herring abundance index, juvenile herring intensive surveys. Adult herring are being collected in spring to validate the expanded adult herring acoustic surveys as well as for two additional studies in the herring research program: age at first spawn and herring genetics. Adult herring samples will also be provided to Alaska Dept. Fish and Game for the adult herring age-structure-analyses model. Our trawls will also provide fishery-independent surveys for non-herring species, thus increasing our knowledge of pelagic fishes in Prince William Sound.

#### Estimated Budget:

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

| FY12    | FY13    | FY14     | FY15     | FY16     | TOTAL    |
|---------|---------|----------|----------|----------|----------|
| \$68.0K | \$90.6K | \$148.0K | \$141.0K | \$145.3K | \$592.9K |

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

| FY12 | FY13 | FY14 | FY15 | FY16 | TOTAL |
|------|------|------|------|------|-------|
|      |      |      |      | 0    |       |

\*If the amount requested here does not match the amount on the budget form, the request on the budget form will be considered to be correct.

**Date:** August 14, 2015

## I. EXECUTIVE SUMMARY

Robust Pacific herring (*Clupea pallasii*) populations, suitable for exploitation by commercial fisheries, are typically sustained by periodic recruitment of strong year classes into the adult spawning population. However, the Prince William Sound (PWS) herring population has not had a strong recruitment class since 1989, when the *Exxon Valdez* Oil Spill (EVOS) occurred. In the EVOS settlement, herring were identified as an injured resource and they remain listed as an unrecovered species by the EVOS Trustee Council (EVOSTC). Understanding why herring have not recovered in Prince William Sound requires understanding potential bottlenecks in the herring life cycle. The identification of the limiting conditions to herring recovery requires a series of focused process studies combined with monitoring of the natural conditions that affect herring survival.

Our study, *Validation of Acoustic Surveys for Pacific Herring Using Direct Capture*, is a process study that addresses **objective 3** of the *PWS Herring Research and Monitoring: to address assumptions in the current measurements*. The goals of this project are twofold: a) to ground truth acoustic backscatter to confirm species composition and length frequency of insonified targets; and b) provide fish samples to *PWS Herring Research and Monitoring* programs.

Our project's direct capture efforts are associated with the following HRM acoustic surveys: *Juvenile herring abundance index* (Nov 2012-2016) and the annual *Expanded adult herring surveys* (Mar and Apr 2013-2016). In addition, we conducted a series of trawls associated with two other HRM projects: *Juvenile herring intensive acoustic surveys* (Oct 2013 – Apr 2014) and the pilot study, *Integrated marine bird/whale/forage fish survey at Montague Strait* (Sept 2014). The September 2014 pilot study was a new collaboration with three *GulfWatch* studies: *Humpback whale predation on Pacific herring in PWS* (NOAA, UAS), *Forage fish in PWS* (USGS), and *Seabird abundance and habitat use in fall and winter* (PWSSC). Additionally, during summer 2014 and 2015 we assisted the HRM *Juvenile Herring Aerial Survey* project. Personnel from this project were trained and flew multiple times, sighting and recording forage fish schools.

For our validation efforts, we continue to use the same methodology on our cruises that we have used since November 2013. Based on acoustic surveys, “targets” are identified and returned to for short-distance (0.1-1.6 km), mid-water trawls concomitant with acoustic surveys. Environmental data (conductivity, temperature, and depth data) are collected during trawl transects. For the *Expanded adult herring surveys* we use gillnets instead of the mid-water trawl for validation component because of ADFG concerns that too many adult herring would be captured. We also collect herring for the genetic studies using jigs and gillnets, and to a lesser extent castnets.

Data analyses on ongoing. Since fall 2014, all fish capture data associated with the validation project have been assimilated into a Microsoft access relational database. Using a relational database will facilitate more efficient data management and QA/QC. Metadata for the project is currently available. We continue on track to meet our milestones, all of which have completion dates in 2016.

Within the integrated herring program, seven projects utilized juvenile herring collected as part of our trawl surveys. Another two projects within the herring program as well as ADFG utilize adult herring collected as part of our field work (see Table 2 in section II.A for more details).

### 2015 Popular Press:

Lewandoski, S, 2015. Survival under the ice. *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.

The Science Panel posed a few questions during the last proposal submission that we will attempt to answer.

The question of percent effort related to each project supported by this program is difficult to answer. The validation of acoustics is a large portion of the effort, but if there was not an acoustics project there would still need to be sampling for other projects and the cost of sampling would remain the same.

The general comments regarding the value of acoustic sampling techniques have been provided to that project to address. Dr. Boswell with FIU in collaboration with Dr. Rand of PWSSC are examining the potential for determining if patterns in echograms can be interpreted as different year classes of herring.

## II. COORDINATION AND COLLABORATION

### A. Within the Program

Table 1. Shared vessel platforms for this project.

| EVOS Program/Project                                                                       | Agency             | Dates                    |
|--------------------------------------------------------------------------------------------|--------------------|--------------------------|
| <b><i>PWS Herring &amp; Research</i></b>                                                   |                    |                          |
| Juvenile herring abundance index                                                           | PWS Science Center | Nov 2012-2016            |
| Juvenile herring intensive Acoustic Surveys                                                | PWS Science Center | Oct 2013 – Apr 2014      |
| Expanded Adult Herring Acoustic Surveys                                                    | PWS Science Center | Mar-Apr 2013-2016        |
| <b><i>Gulfwatch</i></b>                                                                    |                    |                          |
| Long-term monitoring of seabird abundance & habitat associations during late fall & winter | PWS Science Center | Nov 2012-2016 & Sep 2014 |
| Monitoring long-term changes in forage fish distribution, abundance, & body condition      | USGS               | Sep 2014                 |
| Long-term monitoring of humpback whale predation on Pacific herring in PWS                 | NOAA/UAS           | Sep 2014                 |

Table 2. EVOS Prince William Sound Herring Research and Monitoring and EVOS Gulfwatch projects that this validation project is collecting sample for.

| EVOS Herring Research                              | Agency             | Samples provided                |
|----------------------------------------------------|--------------------|---------------------------------|
| Juvenile herring abundance index                   | PWS Science Center | All species – measurements only |
| Juvenile herring intensive acoustic surveys (FY14) | PWS Science Center | All species – measurements only |
| Expanded Adult Herring Acoustic                    | PWS Science Center | All species – measurements only |

|                                                              |                    |                                                                                      |
|--------------------------------------------------------------|--------------------|--------------------------------------------------------------------------------------|
| Surveys                                                      |                    |                                                                                      |
| Condition Index                                              | PWS Science Center | Juvenile herring                                                                     |
| Genetic stock structure                                      | ADFG               | Adult herring                                                                        |
| Disease                                                      | USGS               | Juvenile herring                                                                     |
| Energetics                                                   | NOAA Auke Bay      | Juvenile herring/walleye pollock                                                     |
| Growth RNA/DNA                                               | NOAA Auke Bay      | Juvenile herring                                                                     |
| Age at First Spawn                                           | NOAA Auke Bay      | Adult Herring                                                                        |
| <b><i>EVOS Gulfwatch</i></b>                                 |                    |                                                                                      |
| Forage fish distribution, abundance, & body condition in PWS | USGS               | All species – measurements only, Sept. 2014 cruise; Aerial surveys Jun & Jul 2014-15 |
| Humpback whale predation                                     | NOAA/UAS           | All species – measurements only, Sept. 2014 cruise                                   |
| Seabird abundance late fall through winter                   | PWSSC              | All species – measurements only; Sept. 2014 cruise                                   |

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

None

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

Our project, along with the EVOS Herring *Expanded Adult Herring Surveys* rely on information from Alaska Department of Fish and Game to help locate adult herring schools in spring for acoustic surveys and our sampling. To that extent, we work closely with Steve Moffitt and Dr. Rich Brenner at the Cordova office of ADFG.

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

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

Objectives specific to the *Direct Capture* study include:

- 1) Improve capture methods used for ground truthing acoustic surveys.
- 2) Increase the sample size for identification, quantification, and measurement of juvenile (0+, 1+, 2+) and adult (3+ and older) herring schools as well as other fish schools in survey areas.
- 3) Provide data on species composition and length frequency to aid in the interpretation of current and historical acoustic surveys.
- 4) Provide adult herring samples to Alaska Department of Fish and Game for the adult herring age-structure-analyses model.
- 5) Provide juvenile herring samples to researchers investigating juvenile herring fitness and disease.

In addition, to providing better information on acoustic targets, this study will bolster the current understanding of pelagic species composition and abundance in PWS.

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

When we wrote the original proposal for this project we planned to use a trawl that was part of the PWS Science Center's inventory. Unfortunately, this trawl was lost during field work on

another project, forcing us to purchase a new trawl. Due to hydraulic compatibility issues between our reel/winches and the charter vessel during the initial November 2012 survey we were unable to obtain sufficient power to successfully deploy and haul our mid-water sweeper trawl, despite several attempts at system modifications and replumbing. Therefore, within each survey bay variable mesh adult and juvenile herring gillnets were deployed and allowed to soak overnight in areas of high acoustic signature as an alternative validation method. Since Nov 2012, all problems with the trawl have been resolved, and we completed an extremely successful series of trawl surveys during November 2014 with 2,885 captured fish (87% herring).

#### **IV. SCHEDULE**

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

- Objective 1.** Improve capture methods used for ground truthing acoustic surveys.  
*Field work completed November 2016. Synthesis evaluating techniques, January 2017.*
- Objective 2.** Increase the sample size for identification, quantification, and measurement of juvenile (0+, 1+, 2+) and adult (3+ and older) herring schools as well as other fish schools in survey areas.  
*To be met by November 2016.*
- Objective 3.** Provide data on species composition and length frequency to aid in the interpretation of current and historical acoustic surveys.  
*To be met by January 2017.*
- Objective 4.** Provide adult herring samples to Alaska Department of Fish and Game for the adult herring age-structure-analyses model.  
*To be met by April 2016.*
- Objective 5.** Provide juvenile herring samples to researchers investigating juvenile herring fitness and disease.  
*To be met by November 2016.*

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

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

|          |                                                                                            |
|----------|--------------------------------------------------------------------------------------------|
| late Mar | Field cruise: <i>Expanded Adult Herring Survey</i> with hydroacoustic & validation surveys |
| Apr      | Field cruise: <i>Expanded Adult Herring Survey</i> with hydroacoustic & validation surveys |

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

|         |                             |
|---------|-----------------------------|
| May-Jul | Process fish & analyze data |
| Jul     | Prepare mid-year report     |

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

|         |               |
|---------|---------------|
| Aug     | Submit report |
| Aug-Oct | Analyze data  |

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

Nov Field cruise: *Juvenile herring abundance index* with hydroacoustic & validation surveys; disease & energetics collections

Nov PI meeting, herring program

Dec Process fish samples

Jan Alaska Marine Symposium

Jan Submit annual report

**V. PROJECT PERSONNEL – CHANGES AND UPDATES****VI. BUDGET****A. Budget Forms**

| Budget Category:                                | Proposed<br>FY 12 | Proposed<br>FY 13 | Proposed<br>FY 14 | Proposed<br>FY 15 | Proposed<br>FY 16 | TOTAL<br>PROPOSED | ACTUAL<br>CUMULATIVE |
|-------------------------------------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|----------------------|
| Personnel                                       | \$32,500.0        | \$58,300.0        | \$98,100.0        | \$95,000.0        | \$98,000.0        | \$381,900.0       |                      |
| Travel                                          | \$1,000.0         | \$1,000.0         | \$2,000.0         | \$1,200.0         | \$1,200.0         | \$6,400.0         |                      |
| Contractual                                     | \$900.0           | \$1,800.0         | \$2,600.0         | \$2,200.0         | \$2,200.0         | \$9,700.0         |                      |
| Commodities                                     | \$5,400.0         | \$2,800.0         | \$1,800.0         | \$1,100.0         | \$1,100.0         | \$12,200.0        |                      |
| Equipment                                       | \$10,700.0        | \$0.0             | \$0.0             | \$0.0             | \$0.0             | \$10,700.0        |                      |
| Indirect Costs ( <i>will vary by proposer</i> ) | \$11,900          | \$19,200          | \$31,300          | \$29,900          | \$30,800          | \$123,100.0       |                      |
| <b>SUBTOTAL</b>                                 | \$62,400.0        | \$83,100.0        | \$135,800.0       | \$129,400.0       | \$133,300.0       | \$544,000.0       | \$0.0                |
| General Administration (9% of                   | \$5,616.0         | \$7,479.0         | \$12,222.0        | \$11,646.0        | \$11,997.0        | \$48,960.0        |                      |
| <b>PROJECT TOTAL</b>                            | \$68,016.0        | \$90,579.0        | \$148,022.0       | \$141,046.0       | \$145,297.0       | \$592,960.0       |                      |
| Other Resources (Cost Share Funds)              | \$0.0             | \$0.0             | \$0.0             | \$0.0             | \$0.0             | \$0.0             |                      |

**B. Changes from Original Proposal**

None

**C. Sources of Additional Funding**

None