

FY15 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, 2015 – January 31, 2016

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
68,016	90,579	148,022	141,046	145,297	592,960

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 31, 2014

I. EXECUTIVE SUMMARY

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.

Fiscal year 2014 marked the completion of the third year of a five-year Prince William Sound Herring Research and Monitoring program sponsored by the EVOS Trustee Council. From October 2013 through April 2014 we conducted a series of trawls while onboard the *MV Montague* to ground truth acoustic surveys that were part of the EVOS project *Acoustic Consistency: Intensive Surveys of Juvenile Herring*. Study sites for this project included Windy and Simpson Bays in northeast PWS. A total of eight 4-day cruises were accomplished during the study period (Oct – Dec, n = 4 cruises; Feb – Apr, n = 4 cruises). Across both bays a total of 23,801 individual fish representing 17 different species were collected via trawling, with the majority (71%) of fish collected within Simpson Bay. Overall, the mid-water trawl used for acoustic validation of the intensive surveys was effective in not only collecting a diverse array of species but also a wide range of sizes; from larval fish through adults with standard lengths (SL) ranging from 26-530 mm. Over the course of the juvenile herring intensive acoustic study, YOY herring and juvenile walleye pollock were captured most frequently within 62% and 59% of the 95 trawls, respectively; followed by adult walleye pollock, juvenile herring, capelin, YOY walleye pollock and adult herring.

The size distribution and age class structure of herring collected within both Simpson and Windy Bays changed over time; as surveys progressed through the fall into spring the average standard length of herring significantly increased. This was being driven by the increased presence and capture of adult herring as well as an increased average size of both juvenile and YOY herring. The exception to this overall trend occurred during the last intensive cruise after the ice edge in Simpson bay had receded and trawls were able to be conducted closer to the head of the bay in areas previously inaccessible. These trawls resulted in a significant increase in YOY herring CPUE and suggested that ice provides a refugia for YOY herring.

The 2014 *Expanded Adult Herring Acoustic Surveys* were conducted in late March (25-28 March) and late April (21-25 April) aboard the *M/V Auklet*. We used gillnets to collect fish for acoustic validation when requested by PI of the Acoustic Survey project. We also collected herring for the genetic studies using jigs and gillnets, and to a lesser extent castnets. We did not utilize the mid-water trawl for the adult survey validation component because of ADFG concerns that too many adult herring would be captured.

All fish collected to validate the acoustic surveys regardless of species were measured (SL, FL, TL; mm) and weighed (g) for up to the first 200 individuals per species. Any samples larger than 200 individuals per species were counted and total weight measured for all remaining fish. The determined age class structure of measured individuals was used to extrapolate the percentage/ number of individuals of various age classes of the remaining unmeasured fish.

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 utilized adult herring collected as part of our field work (see Table 2 in section II.A for more details).

In 2014 we initiated a new collaboration with three *Gulfwatch* studies: *Humpback whale predation on Pacific herring in PWS*, *Forage fish in PWS*, and *PWS Seabirds in Late Fall and Winter*. We have scheduled a joint survey during September 2014 to describe the fall movements of whales, fish, and

birds into the Sound via Montague Strait. For the Montague Strait study we will be conducting pelagic trawl surveys to validate the USGS acoustic surveys. Finally, in November 2014 we will conduct midwater trawl surveys in conjunction with year 3 of EVOS acoustic survey project *Juvenile herring abundance index*.

Outreach:

Bishop, M.A. 2014. Age 0+ herring: only trawls and time will tell. *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.

EVOS Program/Project	Agency	Dates
<i>PWS Herring & Research</i>		
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
<i>Gulfwatch</i>		
Long-term monitoring of seabird abundance and habitat associations during late fall and winter in PWS	PWS Science Center	Nov 2012-2016
Monitoring long-term changes in forage fish distribution, abundance, and body condition in PWS	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.

<i>EVOS Herring Research</i>	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 Surveys	PWS Science Center	All species – measurements only
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

EVOS Gulfwatch		
Forage fish distribution, abundance, and body condition in PWS	USGS	All species – measurements only; Sept. 2014 cruise

In addition to the above, we are collaborating with three *Gulfwatch* studies (Fall & Winter Seabirds, Humpback whale predation on Pacific herring and Forage fish in PWS) to investigate fall movements of whales, fish, and birds into the Sound via Montague Strait. For the Montague Strait study we will be conducting pelagic trawl surveys to validate the USGS acoustic surveys.

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. Samples of adult herring from the Montague Island area were provided to the Cordova ADFG office for age-sex-length analysis. Samples of juvenile herring from the November 2013 cruise were provided to USGS.

III. PROJECT DESIGN – PLAN FOR FY15

A. Objectives for FY15

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 over the Oct 2013-Apr 2014 season with >24,000 fish captured. We do not anticipate any future changes to the project design.

IV. SCHEDULE

A. Project Milestones for FY 15

- Objective 1.** Improve capture methods used for ground truthing acoustic surveys.
Field work completed April 2016. Synthesis evaluating techniques, August 2016.
- 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 April 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 August 2016.
- 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 2015.

B. Measurable Project Tasks for FY 15

FY 15, 1st quarter (Feb 1 – Apr 30, 2015)

late Mar Field cruise: *Expanded Adult Herring Survey* with hydroacoustic & validation surveys

Apr Field cruise: *Expanded Adult Herring Survey* with hydroacoustic & validation surveys

FY 15, 2nd quarter (May 1-Jul 31, 2015)

May-Jul Process fish & analyze data

Jul Prepare mid-year report & FY16 work plan

FY 15, 3rd quarter (Aug 1- Oct 31, 2015)

Aug Submit report & FY 16 work plan

Aug-Oct Analyze data

FY 15, 4th quarter (Nov 1, 2015 – January 31, 2016)

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

V. PROJECT PERSONNEL – CHANGES AND UPDATES

Megan McKinzie operated the trawl, conducted all the fish measurements, and assisted with report writing during years 2-3. In June 2014 McKinzie left PWS Science Center for a Ph.D. program. Anticipating this change, McKinzie trained Kirsti Jurica on the trawl during the spring 2014 intensive surveys. Jurica has almost 20 years of experience as a fish technician and commercial fisher and will

lead the field component of this project. Beginning in Sept 2014, Sean Lewandoski has also been hired to assist with surveys and help with data analyses. Lewandoski has conducted fisheries research for six years and during summer 2014 completed his M.S. in Fish and Wildlife Management at Montana State University.

VI. BUDGET

A. Budget Forms

Provide completed budget forms.

B. Changes from Original Proposal

None

C. Sources of Additional Funding

None