

**FY12 INVITATION
PROPOSAL SUMMARY PAGE**

Project Title: PWS Herring: Coordination and Logistics

Project Period: 1 October 2011 to 30 September 2016

Primary Investigator(s): W. Scott Pegau, Prince William Sound Science Center

Study Location: Prince William Sound

Abstract:

This project is for the coordination and logistics aspects of the proposed program titled, "PWS Herring Research and Monitoring". The objectives of the program are 1) *Provide information to improve input to the age-structure-analysis (ASA) model, or test assumptions within the ASA model,* 2) *Inform the required synthesis effort,* 3) *Address assumptions in the current measurements,* and 4) *Develop new approaches to monitoring.* The Coordination and Logistics program objectives are to 1) ensure coordination between projects to achieve the program objectives, 2) Provide a synthesis from existing results, and 3) provide logistical support to the various projects.

Coordination includes scheduling of projects to ensure the maximum sharing of vessel time and so that projects dependent on results or samples from another project are in the correct order. Coordination will be primarily through email and teleconference, but each year all the investigators are required to meet in person. Coordination is also taking place with the existing Herring Survey program, the Long-Term monitoring program, and ADF&G herring sampling.

Logistics is primarily in providing vessel time although a remotely operated vehicle is requested in this budget to support non-lethal fish identification and being able to search under the ice.

The synthesis to be provided by this project is leveraging the required synthesis of the existing Herring Survey program. We intend to update that effort with new results and add a section on how environmental conditions affect herring growth.

Estimated Budget:

EVOSTC Funding Requested: \$1,513,000

(breakdown by fiscal year and must include 9% GA)

FY 12	FY13	FY14	FY15	FY16
\$327,200	\$349,300	\$364,200	\$238,600	\$233,700

Non-EVOSTC Funds to be used:

(breakdown by fiscal year)

Date:

May 27, 2011

(NOT TO EXCEED ONE PAGE)

PROJECT PLAN

I. NEED FOR THE PROJECT

A. Statement of Problem

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.

Described here is a single project that is a part of an integrative program that will enhance the current monitoring efforts of the Alaska Department of Fish and Game (ADF&G), and examine aspects of particular life stages to allow better modeling of herring populations. **The long-term goal of the program is to improve predictive models of herring stocks through observations and research.** While we do not anticipate that there will be a major change in our modeling ability in the next five years, we expect that the combination of monitoring and focused process studies will provide incremental changes over the next twenty years and result in a much better understanding of herring populations by the end of the program.

B. Relevance to 1994 Restoration Plan Goals and Scientific Priorities

The proposed program addresses the goals and priorities outlined in the 1994 Restoration Plan (<http://www.evostc.state.ak.us/Universal/Documents/Publications/IHRP%20DRAFT%20-%20July%202010.pdf>) and in the FY 2012 invitation for proposals. In particular our program addresses the need to “Conduct research to find out why Pacific herring are not recovering” and “Monitor recovery”, listed on page 48 of the 1994 Restoration Plan. It will lead to the development of new tools to improve herring management. The latter will be accomplished by providing the information needed to develop or test biological and physical models of herring growth.

In November 2006, a Herring Steering Committee was formed and tasked with developing a focused Restoration Program that identifies strategies to address recovery and restoration of herring, recognizing that activities in the program must span an ecologically relevant time frame that accounts for herring population dynamics and life history attributes. A draft Integrated Herring Restoration Program (IHRP) was completed in the fall of 2008 and was further refined in July of 2010. The main goal of the program is to determine what, if anything, can be done to successfully recover the Pacific herring in PWS. In order to determine what steps can be taken, the program examines the factors limiting recovery of herring in PWS, identifies and evaluates potential recovery options, and recommends a course of action for achieving restoration.

Based on the recommendations of the IHRP the Trustee Council has stated in the FY12 request for proposals that they have chosen Restoration Option #2, Enhanced Monitoring, as the focus for their research interests. The program aims to meet the goals of this option by utilizing a combination of monitoring efforts to provide more information about the existing stock and process studies to elucidate aspects of the herring life cycle necessary to move us towards an improved modeling approach.

II. PROJECT DESIGN

A. Objectives

This project is designed as the oversight and logistics portion of the “PWS Herring Research and Monitoring” proposal submitted by the Prince William Sound Science Center. The objectives of that program are:

- 1) *Provide information to improve input to the age-structure-analysis (ASA) model, or test assumptions within the ASA model.* The ASA model is currently used by ADF&G for estimating herring biomass (Hulson et al. 2008). The proposed monitoring efforts are designed to address this objective by either expanding the data available for the existing ASA model or by providing information about factors that determine the size of recruitment events.
- 2) *Inform the required synthesis effort.* Proper completion of a detailed synthesis means being able to access and manipulate different sources of data and information. We are proposing projects that make data available to all researchers.
- 3) *Address assumptions in the current measurements.* Many of the existing studies are based on historical or logistical constraints. We are proposing research necessary to put the existing measurements into context spatially and temporally. This effort will allow the design of the most accurate and efficient monitoring program.
- 4) *Develop new approaches to monitoring.* With technological advances we have the potential to improve our monitoring programs so they require less effort or reduce the need to collect fish.

This projects objectives are:

- 1) Ensure coordination between projects to achieve the program objectives.
- 2) Provide a synthesis from existing results.
- 3) Provide logistical support to the various projects.

The subcontracts for Data Management and Non-Lethal Sampling projects are contained within the budget of this project since the Coordination project has an oversight role for all projects.

B. Procedural and Scientific Methods

The first objective is to ensure coordination between programs. Program coordination will primarily be through e-mail and phone communications. Annual meetings are planned in Cordova, tentatively in May, for all investigators to share information between themselves and

with the community. These in-person meetings are vital to ensure proper communication among programs.

Dr. Pegau will act as the program team leader and be responsible for ensuring a coordinated and focused research program that leverages other assets whenever possible. He will be responsible for ensuring proper scientific oversight of individual projects and reporting to the EVOSTC. He will lead the development of annual work plans and the synthesis of findings from these programs. He will be responsible for coordinating the efforts of the herring research program with those of the Long-term Monitoring program.

There will be annual Principal Investigator meetings in Cordova each year to provide updates to the oversight panel, improve coordination between projects, and provide outreach and public input opportunities. This meeting will be in the spring so that there is opportunity to provide input on the development of the next year's work plan. In an effort to be proactive in the scientific oversight we sought input on the development of this proposal from ADF&G, NOAA, Cordova District Fishermens United (CDFU), and others. Team development and input on research direction was also sought at the 2011 Alaska Marine Science Symposium.

The wide array of projects that make up PWS Herring Research and Monitoring program required careful integration to ensure the maximum collaboration between projects. Not all observation projects are directly connected to each other, but are connected through the objectives of the program. The full benefits of the linkages will be seen at the points where synthesis efforts occur.

Coordination between programs is also taking place through scheduling of vessels by the Coordination project and the scheduling order of individual projects. All the investigators are required to work together to determine vessel type and number of days needed. Coordination was also achieved through the scheduling of projects to ensure results would be available for projects dependent on samples or data from another project. More information is available in section E. of this proposal.

The second objective is to provide a synthesis of results in year 3. A synthesis is also required for the currently funded herring program and due at approximately the same time. To reduce the cost of this proposal we will be relying on the existing synthesis effort to provide the required work. The aim of the current synthesis effort is not to summarize the existing information, but to use that information to address specific questions. We are looking to address the questions of

- 1) How many bays must we sample to provide a juvenile herring index?
- 2) Where don't we find juvenile herring and why?
- 3) Energetically is it more important to be in good condition in the fall or have food available in the spring? This includes the quality of food available.
- 4) How do the sources of mortality (disease, energy, predation) interact with each other?

For the purpose of the synthesis required in this proposal we will add the question of how does environmental conditions affect growth and refine the answers to the other questions based on results obtained in this program.

The third objective is to supply logistical support. The primary logistical support is providing vessel time to the various projects. This is contained in the coordination budget to ensure maximum utilization of the vessels. This project will also obtain a remotely operated vehicle for use by the various projects. This is needed for non-lethal sampling, but has been identified as a need for the herring tagging project (mooring recovery), and for surveying under ice edges where large numbers of juvenile fish have been observed.

C. Data Analysis and Statistical Methods

This project is dependent on the investigators of the other projects to help identify questions for the synthesis and upon their expertise in the subject areas to define the appropriate data analysis and statistical methods.

D. Description of Study Area

The study area includes all of Prince William Sound (N, E, S, and W boundaries of respectively, $\sim 61, -145.5, 60,$ and -149°). However, most of the projects will focus on the four bays (Zaikof, Whale, Eaglek, and Simpson) that were extensively studied during the Sound Ecosystem Assessment study and PWS Herring Survey program (Figure 2). This allows the work to build upon the historical research completed in those bays. These bays also cover four different quadrants of the Sound. We anticipate a potential build out to include other bays or contraction based on the results from the synthesis. As part of the synthesis effort we will be reviewing the question “What is the appropriate sampling distribution?” as applied to the questions of juvenile herring condition and providing an index of juvenile abundance.

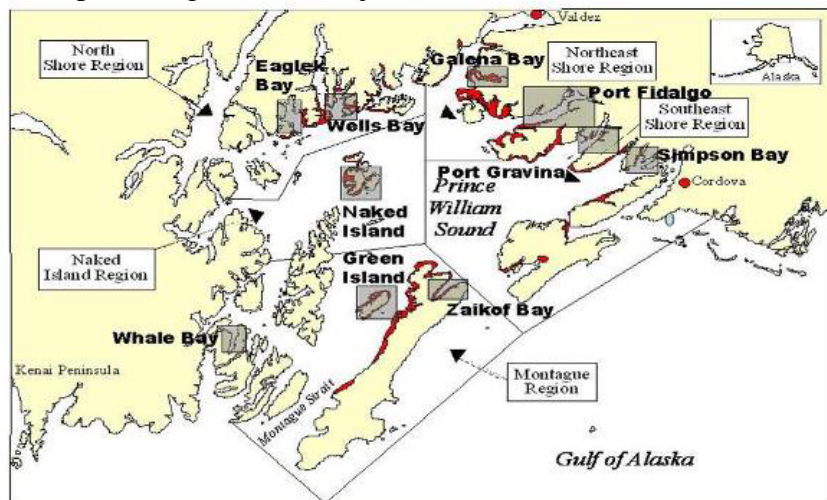


Figure 2. PWS study area, including the four SEA bays (Whale, Zaikof, Eaglek, and Simpson, as well as other bays historically important for juvenile herring.

E. Coordination and Collaboration with Other Efforts

This proposal is structured to be part of a collaborative programmatic effort being led by the Prince William Sound Science Center. Program coordination will primarily be through e-mail and phone communications. Annual meetings are planned in Cordova, tentatively in May, for all investigators to share information between themselves and with the community. These in-person meetings are vital to ensure proper communication among programs.

Dr. Pegau will act as the program team leader and be responsible for ensuring a coordinated and focused research program that leverages other assets whenever possible. He will be responsible for ensuring proper scientific oversight of individual projects and reporting to the EVOSTC. He will lead the development of annual work plans and the synthesis of findings from these programs. He will be responsible for coordinating the efforts of the herring research program with those of the Long-term Monitoring program.

There will be annual Principal Investigator meetings in Cordova each year to provide updates to the oversight panel, improve coordination between projects, and provide outreach and public input opportunities. This meeting will be in the spring so that there is opportunity to provide input on the development of the next year's work plan. In an effort to be proactive in the scientific oversight we sought input on the development of this proposal from ADF&G, NOAA, Cordova District Fishermens United (CDFU), and others. Team development and input on research direction was also sought at the 2011 Alaska Marine Science Symposium.

The wide array of projects that make up this program required careful integration to ensure the maximum collaboration between projects. Not all observation projects are directly connected to each other, but are connected through the objectives of the program. The full benefits of the linkages will be seen at the points where synthesis efforts occur.

Direct overlap between observation projects occurs in the area of logistics. We intend to have the acoustic surveys, direct capture, and non-lethal collection components sharing a vessel. The direct capture and non-lethal collection are intended to provide validation to the acoustics. The direct capture component will be responsible for providing fish to the RNA condition, energetic condition, disease research, fatty acid indicators, and genetic stock indicator projects. Another direct project overlap occurs between the herring scale analysis and primiparous herring projects, which will share growth information as determined from the scales. The combined efforts will lead to a greater number of scales becoming digitized and improving the statistics for both projects. All projects will also interact with the data management efforts to ensure the data is properly archived and maintained.

Indirect project overlap occurs between projects through the scheduling. Projects like the genetic stock indicators are pushed back in the cycle to ensure that the methodologies used by the direct capture program are mature enough to ensure collection of the required samples. Non-lethal collection is also later in the program to ensure new direct capture techniques are fully tested. Fish collected from the RNA and energetics intensive studies will also be used by the fatty acid indicator project. The acoustic tagging project is early in the program to take advantage of the acoustic receiver array that is in place and has a limited life span. Some projects like the disease research component also start later in the program because of coordination with the existing herring monitoring program. We worked hard to ensure that there isn't duplication between the proposed program and the existing program. One apparent exception is the RNA and energetic condition intensives. By moving these projects early in the program we intend to fill what is seen as a major gap in the existing program and hopefully more quickly resolve the information value that each project provides.

Coordination with the EVOSTC Long-term Monitoring program is critical to the success of the herring program. The ability to develop a predictive tool using the juvenile condition component requires an understanding of when feeding may occur and hence the need to coordinate with the oceanographic monitoring component. Predation by whales, fish, and birds are also considered potential factors inhibiting the recovery of herring. In that regard we will be looking to the monitoring program for information on the changes in the predator population base. That information will be critical if the herring program chooses to focus on predation during future efforts. The forage fish component and our efforts to develop an index of juvenile herring populations must inform each other. We expect that our hydroacoustic surveys and direct capture efforts will help provide measures of total fish biomass as well as forage fish populations. We will also work together to identify historical data that both programs would benefit from as part of the data management efforts. Throughout the proposal writing effort, the herring and long-term monitoring efforts led by Kris Holderied have been working together to identify how the two programs can inform and complement each other.

Other important programs for coordinating with are the existing PWS herring survey program and existing ADF&G herring research. This program has been developed with input from both of these programs and the focus of this proposal is extending the interpretation of the data from those two programs. The Herring Survey program will still be operating in FY12 and FY13. There are field observations scheduled in FY12 and in FY13 funds are strictly for analysis and report writing. Included in the report writing is a synthesis of previous and current research. This report will be finished in FY13 and be the basis for the synthesis required under this request for proposals.

III. SCHEDULE

A. Project Milestones

Objective 1. Ensure coordination between projects to achieve the program objectives.

This is an ongoing objective and will last through the proposal period

Objective 2. Provide a synthesis from existing results.

To be met by October 2013

Objective 3 Provide logistical support to the various projects.

This is an ongoing objective and will last through the proposal period

B. Measurable Project Tasks

FY12 1st Quarter (October 1, 11 to December 31, 11)

October Begin juvenile condition intensive, primiparous fish, and herring scale analysis

FY12 2nd Quarter

January Annual Marine Science Symposium

March	Complete ordering ROV
March	Obtain samples for fatty acid analysis
FY12 3 rd Quarter	
May	Conduct annual PI meeting
June	Submit FY13 work plan for review
June	Collect histology samples (timing depends on results of laboratory study)
June	Complete sampling for juvenile intensive
FY12 4 th Quarter	
August	Submit annual report
FY13 1 st Quarter (October 1, 12 to December 31, 12)	
October	Begin fatty acid analysis
November	Conduct juvenile index survey
FY13 2 nd Quarter	
January	Annual Marine Science Symposium
March	Conduct spring juvenile collection
FY13 3 rd Quarter	
April	Conduct extended adult biomass cruise, collect samples for genetics & histology
May	
June	Conduct annual PI meeting
	Submit FY14 work plan for review
FY13 4 th Quarter	
August	Submit annual report
FY14 1 st Quarter (October 1, 13 to December 31, 13)	
October	Submit synthesis to EVOS science council
October	Begin acoustic intensive study
November	Conduct juvenile index survey, test non-lethal sampling systems
December	Complete acoustic tagging project
FY14 2 nd Quarter	
January	Annual Marine Science Symposium
March	Complete acoustic intensive
March	Conduct spring juvenile collection
Winter programs	EVOS sponsored workshop with Herring and Long-term monitoring
FY14 3 rd Quarter	
April	Conduct extended adult biomass cruise, collect samples for genetics
May	Conduct annual PI meeting
June	Submit FY15 work plan for review

FY14 4th Quarter

August Submit annual report

FY15 1st Quarter (October 1, 14 to December 31, 14)

November Conduct juvenile index survey

FY15 2nd Quarter

January Annual Marine Science Symposium

March Conduct spring juvenile collection

FY15 3rd Quarter

April Conduct extended adult biomass cruise

May Conduct annual PI meeting

May Submit five-year plan for FY17-22 and work plan for FY16

FY15 4th Quarter

August Submit annual report

FY16 1st Quarter (October 1, 15 to December 31, 15)

November Conduct juvenile index survey

FY16 2nd Quarter

January Annual Marine Science Symposium

March Conduct spring juvenile collection

FY16 3rd Quarter

April Conduct extended adult biomass cruise

May Conduct annual PI meeting

June Submit work plan for FY17

FY16 4th Quarter

August Submit annual report

PWS Herring Research and Monitoring: Coordination and Logistics
PRINCE WILLIAM SOUND SCIENCE CENTER

Personnel

One month salary is requested in each year for Dr. Pegau to act as the program coordinator. This effort is leveraged by his duties as the Research Program Manager with the Oil Spill Recovery Institute (OSRI). Up to an additional month of salary each year is available to the program from OSRI. Based on experience with the current herring program the one month a year is adequate for coordination efforts in most years. There is also a combination of salary between the two herring programs in years 1 and 2 when the synthesis effort is underway. Salary for an assistant to Pegau is requested each year (1, 2, 2, 1, 1 months in FY12-16) This person will be responsible for helping set up meeting, ensuring data sharing between PIs, and finding material needed for the synthesis effort.

Travel

In each year travel is requested to bring a program advisory group to Cordova to review the program. The intent is to have this review during the annual P.I. meeting. In year 1 travel is requested to allow Pegau to be trained in the operation of a remotely operated vehicle that is to be used for non-lethal identification and for surveying under ice edges. In years 2-5 travel to the Alaska Marine Science Symposium is requested. In year 3 funds are requested to travel to a EVOSTC review of the Herring and Long-Term Monitoring programs as outlined in the RFP. In FY12 and FY16 funds are requested to ensure that the PIs can meet jointly with the Long-Term Monitoring program. Since there is a required joint meeting in year 3, this allows the two teams to meet at a minimum every other year.

Contractual

Each year funds are requested for Information Technology, which includes \$100/person month for network connections, and costs associated with software license renewals or purchases. Funds are requested each year for printing/mailing/copying. The request is based on historic and anticipated usage. Funds are also requested each year for communications, which includes \$50/person month for phone, plus additional funds for long distance and fax costs. Vessel charter funds are requested each year (\$62.5K, \$83.2K, \$104.0K, \$91.8K, and \$86.4K) based on the anticipated number of vessel days required for the projects running that year and the typical rate for the size of vessel needed. In years 2- 5 we are requesting funding for a subcontract with Cordova District Fishermen United to hire local fishermen to collect herring samples in the spring in lieu of scientific cruises. This provides additional local involvement and collects herring necessary for energetics studies. Subcontracts for Data Management (all years) and Non-lethal collection (FY14) are contained within this budget for administrative purposes. Detailed budgets and descriptions are provided separately.

Commodities

In each year funds are requested for office supplies (paper, pens, printers, etc.) that are typically consumed in association with the project. Additional funds are requested for miscellaneous cruise supplies (lines, nets, totes, etc.). We have found that in these multi-

PI projects that some shared items fall between the programs and the logistics office must be prepared to cover the cost of these supplies to ensure proper program performance.

Equipment

Funds are requested in year one to purchase a small remotely operated vehicle. The cost is based on a SeaBotix LBV300-5 for its versatility and camera capabilities.

INDIRECT COSTS

The PWSSC indirect rate is estimated at 30% of total modified direct cost (TMDC) based on our currently negotiated rate. TMDC is calculated as the sum of direct costs minus the cost of equipment and only the first \$25K of subcontracts. Since vessel support is split between multiple vessels each year that contractual line is subject to full indirect cost being applied.