

17120111-A Herring Program – Program Coordination – P.I. Pegau

Science Panel Comments.

The Panel strongly recommends that the Council consider the addition of funding to support a third year of the post-doc position, which the proposer currently budgets as funded for slightly more than two years. In recommending three years of funding, the Panel notes that much of the first year will be spent becoming familiar with existing programs and data. The proposal also needs to add a mentoring plan for the post-doc position. This plan could profit by including interactions between the post-doc and Hershberger, whose disease research continues to inspire new insights into causes of the lack of herring recovery in PWS.

Based on these comments the post-doc position has been budgeted as a full-time position for three years. A mentoring plan has been added. In order to provide additional overlap with Drs. Herberger and Branch, travel for the post-doc to work at the two labs in the Seattle area has been added to the FY18 budget.

The request for an additional \$500,000 in funding to allow for flexibility to respond to changing conditions is not supported by the Panel. If the Program would like to pursue expanded or new work, specific proposals for the expanded or new work should be submitted during the annual proposal cycle to allow for review by the Panel. On the other hand, the Panel supports strongly the need to provide additional assistance to Pegau, whose work load alone is a Herculean task.

The request was removed from the HRM program proposal.

Science Coordinator Comments

I concur with the Science Panel's comments regarding the addition of a third year of funding for the post-doc position. Travel and salary costs to support a science advisory committee should be added to this budget.

The budget has been modified to support the post-doc for three years. The travel and stipend costs associated with the oversight group are included in the budget. \$65K in funding is being requested for logistical support (boat or aircraft time) to be able to fill gaps from removing the aerial survey project and be able to address issues such as means to optimize the timing of acoustic surveys or be able to obtain ASL samples after the ADF&G vessel is done with its surveys. The request for logistical support is being placed in this proposal to maximize the flexibility in how it is used.

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**EVOSTC FY17-FY21 INVITATION FOR PROPOSALS
PROGRAM PROJECT PROPOSAL SUMMARY PAGE**

Project Title

HRM Coordination

Primary Investigator(s) and Affiliation(s)

W. Scott Pegau – Prince William Sound Science Center

Date Proposal Submitted

August 12, 2016

Project Abstract

This proposal is to provide coordination of the Herring Research and Monitoring (HRM) program. In addition to the coordination efforts, it includes a postdoctoral researcher to analyze the relationships between herring stocks and physical and biological oceanographic conditions. Furthermore, it covers the community involvement and outreach activities of the program. The goal of the project is to provide coordination within the HRM program and with the Gulf Watch Alaska (GWA) and Data Management (DM) programs. The objectives of the project are:

- 1) *Coordinate efforts among the HRM projects to achieve the program objectives, maximize shared resources, ensure timely reporting, and coordinate logistics.*
- 2) *Oversee a postdoctoral researcher.*
- 3) *Provide outreach and community involvement for the program.*

The proposed approach follows that used during the Prince William Sound Herring Survey and initial HRM programs. Coordination will primarily be through e-mail and teleconference. The management team of GWA and the lead of DM will be included in the emails to HRM PIs to ensure they are aware of our activities. We also plan joint PI meetings and community involvement activities.

The postdoctoral researcher will be recruited in year one and is funded for three years. The focus area of the research was chosen to overlap with the activities of both HRM and GWA programs.

Outreach efforts will be focused on providing up-to-date information on the projects and their findings. Community involvement includes regular communications with stakeholders, such as the herring division of the Cordova District Fishermen United and Alaska Department of Fish and Game to stay aware of their findings and observations. We also are planning listening sessions in two of the villages to seek additional local and traditional ecological knowledge.

EVOSTC Funding Requested (must include 9% GA)

FY17	FY18	FY19	FY20	FY21	TOTAL
\$138.4	\$270.2	\$284.1	\$256.1	\$90.7	\$1,039.4

Non-EVOSTC Funding Available

FY17	FY18	FY19	FY20	FY21	TOTAL
\$26.0	\$26.6	\$27.2	\$28.0	\$28.3	\$136.1

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Please refer to the Invitation for the specific proposal requirements for each Focus Area. The information requested in this form is in addition to the information requested in each Focus Area and by the Invitation.

1. Executive Summary

Identify the hypotheses the project is designed to address. Describe the background and history of the problem. Include a scientific literature review that covers the most significant previous work history related to the project. Please provide a summary of the project including key hypotheses and overall goals.

The long-term goal of the Herring Research and Monitoring (HRM) program is to improve predictive models of herring stocks through observations and research. Described here is a single project that will coordinate an integrative program focused on enhancing monitoring efforts of the Alaska Department of Fish and Game (ADF&G), and examining aspects of particular life stages to allow better understanding of herring populations.

Statement of the 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 1988. In the Exxon Valdez Oil Spill (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. Identifying conditions that limit herring recovery requires a series of focused process studies combined with monitoring of herring stocks and the natural conditions that affect herring survival.

Background:

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 effort was 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 examined the factors limiting recovery of herring in PWS, identified and evaluated potential recovery options, and recommended courses of action for achieving restoration.

Based on the recommendations of the IHRP the Trustee Council stated in their FY12 request for proposals that they had chosen Restoration Option #2, Enhanced Monitoring, as the focus for their research interests. This program aims to meet the goals of that 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 improve population models.

Another outcome of the IHRP development was the recognition of the need to integrate the herring research projects. In the past there was limited interaction between investigators working on various aspects of herring research. It was recognized that to develop a better understanding of the interactions between the many aspects of research that funding individual projects would need to give way to integrated programs that strove to have investigators interact and to synthesize the knowledge gained from projects within the program. This began with the Prince William Sound Herring Survey Program (2009-2013) and was followed by the first phase of the Herring Research and Monitoring Program (2012-2016). Synthesis reports have been generated by both

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programs (Pegau 2013, HRM team 2014). These documents can be accessed from the herring program website (<http://pwssc.org/research/fish/pacific-herring/>).

Program Coordination Goals and Objectives:

The **goal of this proposal is to provide the coordination necessary to continue integrating the research and monitoring projects** to achieve the program goals. This proposal addresses the program lead components identified as required in the FY17-21 invitation for proposals. These include providing a program lead who will work with and be responsive to the Council's objectives and requirements, who will facilitate the most cost-effective and scientifically-supportive stream of funding, provide a program science panel to provide program oversight, and other duties as identified in the invitation for proposals.

The objectives of the coordination project are as follows:

- 1) *Coordinate efforts among the HRM projects to achieve the program objectives, maximize shared resources, ensure timely reporting, and coordinate logistics.* Integration of the projects throughout the program is necessary to improve our scientific understanding of factors affecting herring and to maximize use of resources, such as ship time. This requires coordination among HRM researchers and the HRM, GWA, and Data Management programs.
- 2) *Oversee a postdoctoral researcher.* To closely examine the connections between herring stocks and the physical and biological conditions requires a more focused effort than can be provided by the program coordinator. The postdoctoral researcher is expected to assist tying together the information from the various projects to develop greater understanding of herring in PWS.
- 3) *Provide outreach and community involvement for the program.* Strong ties to Alaska Department of Fish and Game and the fishing community are important for guiding program efforts, gaining new insights, and demonstrating the relevance to both the management agency and the fishing community. This requires sharing of findings and listening to community members.

Program coordination is to be the responsibility of Dr. W. Scott Pegau who was the program coordinator for the PWS Herring Survey and HRM programs. He has an established record for working with investigators in the HRM program and with the leads of the GWA and Data Management programs.

The focus of the postdoctoral research will be to examine connections between herring recruitment and condition with the physical and biological environmental conditions. We will be seeking proposals for the postdoctoral position in which the specifics of the approach will be described. The intent is to address the program's second hypothesis: *Herring recruitment is driven by bottom up forcing and the total population level is determined by disease and predation.* The program was designed around this hypothesis with data collection and modeling efforts necessary to provide the basic information to test this hypothesis. The postdoctoral position is envisioned as being the person dedicated to analyzing the various sources of information to test the hypothesis. Testing this hypotheses is expected to inform the population modeling effort in a manner that improves the predictive capacity of the modeling.

Outreach and community involvement will be achieved through improved information in the HRM website and through efforts targeted for information exchange with managers, the fishing community, and spill affected communities. We will shift the focus of the website from general descriptions of projects to ones that include more of the findings. Regular exchanges of information with managers and community members provides stronger support in the community and a means of gaining local and traditional ecological knowledge.

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2. Relevance to the Invitation for Proposals

Discuss how the project addresses the projects of interest listed in the Invitation and the overall Program goals and objectives. Describe the results you expect to achieve during the project, the benefits of success as they relate to the topic under which the proposal was submitted, and the potential recipients of these benefits.

This proposal is the coordination component of the Herring Research and Monitoring program proposal that addresses the section in the FY 17-21 RFP by the same name. It addresses the requirements associated with a program lead, and outreach efforts. Through the efforts of a postdoctoral researcher we will address the area of interest described in the RFP to analyze the relationship between physical and biological oceanographic factors.

The overall goal of the Herring Research and Monitoring program is to: Improve predictive models of herring stocks through observations and research. The program objectives are to:

- 1) Expand and test the herring stock assessment model used in Prince William Sound.
- 2) Provide inputs to the stock assessment model.
- 3) Examine the connection between herring condition or recruitment to physical and biological oceanographic factors.
- 4) Develop new approaches to monitoring.

This project addresses the program objectives by ensuring communication between the various researchers that are involved in this program. It is through communication that greater understanding of individual results will allow us to achieve the program objectives. The coordination efforts will assist the individual investigators to ensure timely and proper reporting. It also provides a point person for sharing information with EVOSTC, ADF&G, and the fishing community.

Expected results of the coordination effort are expected to benefit the EVOSTC by providing a program lead who will work with the Council to ensure the program complies with the Council's founding documents and relevant policies and procedures, provide an administrative structure to manage projects, a point person for communications between the program and the Council, a person to ensure the effort is responsive to the Council's objectives, provide the most cost-effective and scientifically-supportive stream of funding, integration of data from all projects, ensuring proper and timely submission of reports and proposals, and other duties outlined in the Invitation for Proposals.

The postdoctoral research component is expected to tie the results of projects within the HRM program and with findings from the GWA program to test the relationships between herring and oceanographic factors in a manner that can help identify potential improvements in the population model. The efforts of the postdoctoral researcher are expected to benefit the other researchers in the program through integration of results from both the HRM and GWA programs.

The outreach efforts address the outreach component of the FY 17-21 IP. They are expected to result in a regularly updated HRM website and any information requested by agency outreach efforts. The benefits are to the agencies and local communities in being able to track the efforts of the program.

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3. Project Personnel

The CV's of all principal investigators and other senior personnel involved in the proposal must be provided. Each resume is limited to two consecutively numbered pages and must include the following information:

- A list of professional and academic credentials, mailing address, and other contact information (including e-mail address)
- A list of up your most recent publications most closely related to the proposed project and up to five other significant publications. Do not include additional lists of publications, lectures, etc.
- A list of all persons (including their organizational affiliations) in alphabetical order with whom you have collaborated on a project or publication within the last four years. If there have been no collaborators, this should be indicated.

Program Coordinator

W. Scott Pegau

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Education:

1990 B.S., Physics, University of Alaska, Fairbanks
1996 Ph.D, Oceanography, Oregon State University

Professional Experience:

1996-1997 Research Associate (Post Doc), Oregon State University
1997-1999 Faculty Research Associate, Oregon State University
1999-2010 Assistant Professor, Oregon State University
2002-2003 Senior Scientist, Kachemak Bay Research Reserve
2003-2007 Research Coordinator, Kachemak Bay Research Reserve
2007-present Research Program Manager, Oil Spill Recovery Institute

Research Interests:

Determining the relationship between oceanographic conditions and fisheries. Developing novel oil spill detection and tracking approaches. Understanding the fate and behavior of oil spilled in cold water environments. Development of response options for oceans with sea ice present. Understanding circulation patterns in Prince William Sound, Cook Inlet and the Gulf of Alaska and the associated larval transport.

Publications

Wang, D. W., H. W. Wijesekera, E. Jarosz, W. J. Teague, and W. S Pegau. Turbulent diffusivity under high winds from acoustic measurements of bubbles. *Journal of Physical Oceanography*. In press.
Batten, S.D., S. Moffitt, W.S. Pegau, and R. Campbell. Plankton indices explain interannual variability in first year Prince William Sound herring growth. *Fisheries Oceanography*. In press.
Musgrave, D.L., M.J. Halverson, and W.S. Pegau, Seasonal Surface Circulation, Temperature, and Salinity in Prince William Sound, Alaska, *Continental Shelf Research*, doi:10.1016/j.csr.2012.12.001, 2012.
Halverson, M.J., J.C. Ohlmann, M.A. Johnson, W.S. Pegau, Disruption of a cyclonic eddy circulation by wind stress in Prince William Sound, Alaska, *Continental Shelf Research*, **63**, S13-S25, 2013.

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- Montes-Hugo, M. A., K. Carder, R. J. Foy, J. Cannizzaro, E. Brown, and S. Pegau, Estimating phytoplankton biomass in coastal waters of Alaska using airborne remote sensing, *Remote Sensing of Environment*. **98**, 481-493, 2005.
- Pegau, W.S., Herring Research and Monitoring Team, Pacific herring in Prince William Sound: A synthesis of recent findings, Science synthesis report for the EVOS Herring Research and Monitoring program 14120111, pp. 106, 2014.
- Pegau, W. S., Community Involvement, Outreach, Logistics, and Synthesis, PWS Herring Survey Program EVOS Restoration Project 10100132 Final Report, pp. 120, 2013.

Collaborators

Mary Abercrombie (USF), Christopher Bassett (WHOI), Mike Banner (UNSW), Job Bello (EIC), P. Bhandari (UM), Mary Anne Bishop (PWSSC), Rob Bochenek (Axiom consulting), Emmanuel Boss (U Maine), Kevin Boswell (FIU), Tim Boyd (SAM), Trevor Branch (UW), John Bradford (BSU), Evelyn Brown (Flying fish), Michele Buckhorn, Lindsay Butters (PWSSC), Rob Cambell (PWSSC), Regina Carns (UW), L Carvalho (UCSB), Grace Chang (UCSB), Yi Chao (JPL), Paula Coble (USF), Robyn Conmy (EPA), Zoe Courville (CRREL), Tim Cowles (OSU), Helen Czerski (U Southampton), M. Darecki (PAS), Tommy Dickey (UCSB), C. Dong (IGGP), Hajo Eicken (UAF), Bruce Elder (CRREL), Peter Eriksen (Norbit), David Farmer (URI), Jim Farr (NOAA), Scott Freeman (NASA), Jessica Garron (UAF), J. Gemmrich (UVic), P. Gernez (U Nantes), Kristen Gorman (PWSSC), Scott Guyer (BLM), Jeff Guyon (NOAA), Nate Hall-Patch (IOS), Mark Halverson (PWSSC), Hayley Hoover (PWSSC), Ron Heintz (NOAA), Paul Hershberger (USGS), Ben Holt (JPL), S. Jiang (UCSB), Mark Johnson (UAF), C. Jones (UCSB), George Kattawar (TAMU), T. King (BIO), Tom Kline (PWSSC), Cory Koch (Wetlabs), Gary Kofinas (UAF), Kathy Kuletz (USFWS), J. Lacoste (Dalhousie), Andone Lavery (WHOI), D. LeBel (Lamont), Ken Lee (BIO), L. Lenain (SIO), Marlin Lewis (Satlantic), Bonnie Light (UW), Y. Liu (MIT), L. Logan (UMiami), Ted Maksym (WHOI), Darek Manov (UCSB), Hans-Peter Marshall (BSU), W. Melville (SIO), Scott Miles (LSU), Steve Moffitt (ADF&G), Mark Moline (Cal Poly), Rue Morison (UNSW), Dave Musgrave, F. Nencioli (MIO), Marc Oggier (UAF), Carter Ohlmann (UCSB), Don Perovich (CRREL), Sean Powers (USA), Pawel Pacwiardowski (Norbit), Pete Rand (PWSSC), B. Reineman (SIO), Ian Robbins (Cal Poly), B. Robinson (BIO), Chris Roman (WHOI), R. Rottgers (HZG), Scott Ryan (BIO), H. Schultz (UMass), Fletcher Sewell (NOAA), Li Shen (Johns Hopkins), M. Shinki (CRI), Matt Slivkoff (ISMO), M. Sokolski (PAS), Frank Spada (Sea Engineering), Nate Statom (SIO), Darius Stramski (SIO), Peter Sutherland (SIO), Hanumat Singh (WHOI), Dajun Tang (UW), Richard Thorne (PWSSC), Mike Twardowski (Wetlabs), S. Vagle (IOS), Ronnie Van Dommelen (Satlantic), Johanna Vollenweider (NOAA), Ken Voss (UMiami), Ian Walsh (Wetlabs), Libe Washburn (UCSB), J. Wei (Dal), Chris Wiggins (IGM), Hemantha Wijesekera (NRL), Sharon Wilde (NOAA), Amanda Whitmire (OSU), Jeremy Wilkinson (POS), Michelle Wood (UO), O. Wurl (Old Domin), D. Yang (John Hopkins), Dick Yue (MIT), Len Zabilansky (CRREL), Ron Zaneveld (Wetlabs), Chris Zappa (Lamont), Brian Zelenke (Cal Poly)

4. Project Design A. Objectives
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List the objectives of the proposed research and briefly state why the intended research is important. If your proposed project builds on recent work, provide detail on why the data set needs to be continued and whether any changes are proposed. If the proposed project is for new work, explain why the new data is needed. Describe the anticipated final product.

B. Procedural and Scientific Methods

For each objective listed in A. above, identify the specific methods that will be used to meet the objective. In describing the methodologies for collection and analysis, identify measurements to be made and the anticipated precision and accuracy of each measurement and describe the sampling equipment in a manner that permits an assessment of the anticipated raw-data quality.

If applicable, discuss alternative methodologies considered, and explain why the proposed methods were chosen. In addition, projects that will involve the lethal collection of birds or mammals must comply with the EVOSTC's policy on collections, available on our website www.evostc.state.ak.us

C. Data Analysis and Statistical Methods

Describe the process for analyzing data. Discuss the means by which the measurements to be taken could be compared with historical observations or with regions that are thought to have similar ecosystems. Describe the statistical power of the proposed sampling program for detecting a significant change in numbers. To the extent that the variation to be expected in the response variable(s) is known or can be approximated, proposals should demonstrate that the sample sizes and sampling times (for dynamic processes) are of sufficient power or robustness to adequately test the hypotheses. For environmental measurements, what is the measurement error associated with the devices and approaches to be used?

D. Description of Study Area

Where will the project be undertaken? Describe the study area, including, if applicable, decimally-coded latitude and longitude readings of sampling locations or the bounding coordinates of the sampling region (e.g., 60.8233, -147.1029, 60.4739, -147.7309 for the north, east, south and west bounding coordinates).

A. Objectives

Herring Research and Monitoring Program goal and objectives

The overall goal of the Herring Research and Monitoring program is to: **Improve predictive models of herring stocks through observations and research.** This is consistent with the overall program goal described in the request for proposals (RFP) and the direction provide by the EVOS Trustee Council when they chose the enhanced monitoring option of the Integrated Herring Restoration Program. By working to improve the predictive models of herring stocks we anticipate using the data to provide a tool that may be used by fisheries managers to make more informed decisions.

To achieve the overall goal over the next five years, the program has the following objectives.

Objectives

1) *Expand and test the herring stock assessment model used in Prince William Sound.* This builds upon the work of the previous five years, during which the age-structure-analysis (ASA) model used by Alaska Department of Fish and Game was built into a Bayesian framework. The model is now ready to be expanded to include earlier life stages, environmental conditions, and new metrics for disease. It is also possible to test the importance of model inputs and assumed relationships, such as the age-of-maturity function.

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2) *Provide inputs to the stock assessment model.* Operation and testing of the model depends on input data. To expand the model to include environmental conditions requires that the model continue to be provided input data on the age structure, biomass indices, and environmental conditions to determine if the model output is consistent with observations.

3) *Examine the connection between herring condition or recruitment to physical and biological oceanographic factors.* Understanding how herring respond to environmental conditions requires understanding the distribution and movement of herring between oceanographic realms, such as from PWS to the Gulf of Alaska. Research has shown that recruitment patterns extend over broad spatial domains, thus requiring not only examining local phenomena, but also regional and even global relationships.

4) *Develop new approaches to monitoring.* Changes in technology and testing of existing approaches lead to important advances in our sampling techniques and design that can either provide simpler data collection, improved measurement accuracy necessary as a basis for future research, or provide more relevant measures of important factors, such as disease.

Our goal and first objective directly addresses the overall program goal provided in the RFP and area of interest 3. The second objective is necessary to run the model in the first objective and addresses topics 4, 6, and 9 of the RFP. The third objective addresses topics 2, 5, 6, 7, 9. It also connected to topics 1, 8, 10, and 11. The fourth objective lays to foundation of future research and monitoring. Achieving these objectives requires collaboration with the Gulf Watch Alaska team that are collecting much of the environmental data.

HRM Coordination project objectives

The coordination project is designed to help the researcher team achieve the program objectives. The objectives of the coordination project are as follows:

- 1) *Coordinate efforts among the HRM projects to achieve the program objectives, maximize shared resources, ensure timely reporting, and coordinate logistics.* Integration of the projects throughout the program is necessary to improve our scientific understanding of factors affecting herring and to maximize use of resources, such as ship time. To achieve objective 3 of the HRM program also requires coordination between the HRM and GWA programs.
- 2) *Oversee a postdoctoral researcher.* Being able to closely examine the connections between herring stocks and the physical and biological conditions requires more focused effort than can be provided by the program coordinator. This person will be responsible for testing the program's second hypothesis: *Herring recruitment is driven by bottom up forcing and the total population level is determined by disease and predation.* The postdoctoral researcher is expected to assist tying together the information from the various projects to develop greater understanding of herring in PWS.
- 3) *Provide outreach and community involvement for the program.* Strong ties to Alaska Department of Fish and Game and the fishing community are important for guiding program efforts, gaining new insights, and demonstrating the relevance to both the management agency and the fishing community.

This work continues the coordination efforts that have been in place during the PWS Herring Survey and HRM programs. The coordination provides a point contact with the program and is responsible for ensuring timely reporting. The objectives of the project help integrate findings within the HRM program and with findings from the environmental drivers and pelagic components of the GWA program. The postdoctoral researcher is a new

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component and is designed to tie results from HRM and GWA together. The final product will be a peer-reviewed manuscript.

B. Procedural and Scientific Methods

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.

To address objective one of the coordination project, 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 Monitoring program with those of the Gulf Watch Alaska and Data Management programs. He was the program coordinator for the PWS Herring Survey and HRM programs. He has a record of working with the investigators in the HRM program and with the leads of the GWA and Data Management programs.

Program coordination will primarily be through e-mail and phone communications. A meeting of participants is expected to occur each year. It will be consecutive to the GWA PI meeting in communities within the spill affected area. We anticipate scheduling the meetings so investigators from both programs have the opportunity to learn of recent results and collaborate. These in-person meetings are vital to ensure proper communications within and among the two programs. They also provide an opportunity for the scientific oversight group to ask questions of the investigators. Meetings in spill affected communities are meant to provide an opportunity for outreach and to get local ecological knowledge from community members.

Coordination between projects is also taking place through scheduling of vessels. All the investigators are required to work together to determine vessel type and number of days needed and find ways to share resources whenever possible. While vessel and aircraft budgets are contained within each of the proposals, during the proposal writing phase we identified where there is overlap and minimized the logistics at that time. The remaining efforts are necessary to achieve the objectives of the individual projects. 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. For example, the postdoctoral researcher would start when results from the tagging project became available to help understand the appropriate local oceanographic areas being occupied by adult herring. The modeling effort to examine environmental factors was pushed back to allow overlap with the postdoctoral researcher.

We will maintain a scientific oversight group to follow the progress of the research and provide input on scientific quality and potential future direction. The current oversight group consists of Sherri Dressel with ADF&G, Jeep Rice, and Steve Martell.

Objective two involves recruiting a postdoctoral researcher to focus on examining the relationship between herring condition and recruitment and physical and biological oceanographic factors. This focal area was chosen because it has the greatest overlap with the other projects within the program and connects to the long-term monitoring work that has been conducted. This position is the one that will be responsible for testing the HRM Program hypothesis 2. We expect that the person will be able to use information from the inputs to the ASA model as well as results from the stock assessment modeling effort. The tracking project will guide selection of

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environmental data for local herring stocks. The researcher will be responsible for gathering information regarding local and regional oceanographic and herring conditions for use in their analysis. This will require them to work with investigators in the HRM and GWA programs.

Potential Postdoctoral researchers will be required to submit a proposal describing how they will address testing the hypothesis, *Herring recruitment is driven by bottom up forcing and the total population level is determined by disease and predation*. The proposals will be reviewed and used to select a candidate to offer the position to. The proposal of the selected candidate will be included in the annual package of EVOS proposals from the HRM program to allow review and comment from the EVOSTC as well. We chose to use this method for recruiting a postdoctoral researcher because it allows the applicant to design their own research project, rather than being hired to do previously defined work. It allows the researcher to bring approaches that we might not consider if the project was fully defined from the outset. It provides a writing sample that can be used to identify needs in an Individual Development Plan. The Individual Development Plan is part of the Mentoring Plan that follows.

A program of mentoring activities will be used to enhance the postdoctoral researcher's development while participating in this project. The goal of the mentoring program will be to provide the experience, knowledge, and skills to advance the researcher's scientific capabilities. By working in the coordination project the researcher will also be provided the experience of working with several different researchers to achieve a goal, thus sharpening their collaboration skills. The mentoring plan follows the guidance of the National Academies of Science and Engineering for postdoctoral researcher development. The mentoring will focus on career skills such as writing proposals and reports, writing manuscripts, communicating results, and collaboration with a group of researchers. Specific elements of the mentoring plan include:

- Work with the postdoctoral researcher to develop and implement an Individual Development Plan that establishes short- and long-term goals. Progress will be assessed in informal meetings to occur on at least a monthly basis and a regular annual evaluation meeting.
- Provide an orientation to the research group and their projects.
- Assist the postdoctoral researcher to expand their professional networks by introducing them to other researchers and having them spend time with the other researchers in the HRM program.
- Develop proposal and report writing skills through including them in the annual proposal and semi-annual report writing process. We will look for opportunities to have the researcher review proposals or participate on proposal review panels.
- The researcher will be encouraged to write proposals to develop their own research program.
- Develop communication skills through presentations at community lecture series, outreach events, Principal Investigator meetings, and when possible scientific symposia. Coaching will be provided to help the person refine the approach necessary for the various audiences.
- Develop coordination and collaborations skills through interactions with the HRM and GWA groups.
- Mentoring will occur on the entire publication process from organizing and writing the manuscript to deciding where to submit and responding to peer reviews.

Success of the mentoring plan will be assessed by tracking the progress of the researcher through their Individual Development Plan, interactions with other researchers, and writing of proposals and manuscripts. Discussions and annual evaluations will be used to judge the researcher's satisfaction with the mentoring program.

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The third project objective is for outreach and community involvement. The outreach effort is focused on updating and enhancing the HRM website (<http://pwssc.org/research/fish/pacific-herring/>). Our past efforts were in developing basic descriptions of each of the projects and a transition to a new website when the PWSSC changed its web format. What needs to be done is to rework sections from the PWS Herring Survey and HRM programs to show what was learned by each of the projects and develop a system for providing regular updates on the findings of the projects.

Community involvement includes planned meetings with Cordova District Fishermen United and other stakeholder organizations to share what we are learning and gain their perspectives into changes in herring behavior or population. We will work with GWA to have a PI meeting in different spill affected communities each year. The PI meetings will be open to the community and we will include time on the agenda to seek input from community members. There are two TEK listening sessions to be held in native communities (e.g. Tatitlek and Nanwalek) to gain their perspectives on the herring populations. The greatest exchange of information is expected to remain the informal channels that have developed over the years. Fishermen have become familiar with the program and will stop researchers as we go past the harbor to let us know what they are finding and learn what we have seen. A person in Tatitlek regularly asks about our herring observations and trades observations. Our intent is to continue to cultivate these informal connections to the various communities.

C. Data Analysis and Statistical Methods

This project does not generate data. The synthesis of results is dependent on the expertise of the project investigators for data analysis and statistical methods. Proposals for the postdoctoral researcher position will be required to address the data analysis and statistical methods.

D. Description of Study Area

The focus of the study area includes all of Prince William Sound (N, E, S, and W boundaries of respectively, ~ 61, -145.5, 60, and -149°, Figure 1). We expect that aspects of the program will require working with regional (Cook Inlet to Sitka) information, and global datasets.

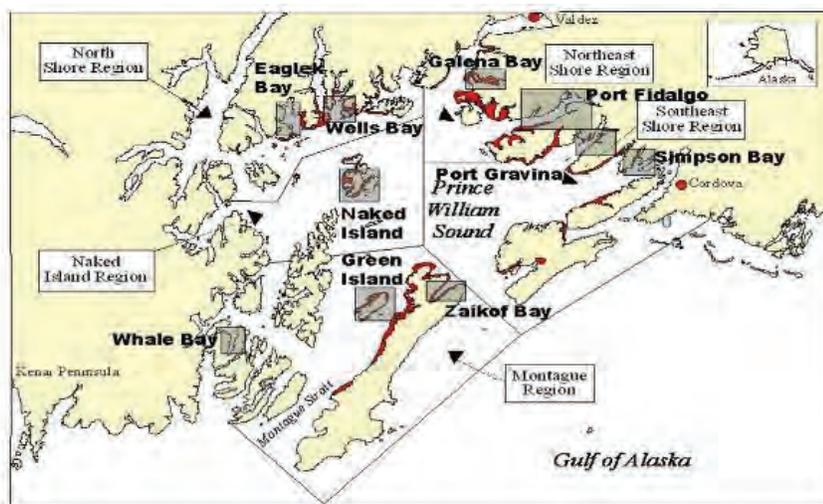


Figure 1. HRM area of focus.

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5. Coordination and Collaboration

Within the Program

Provide a list and clearly describe the functional and operational relationships with the other program projects. This includes any coordination that has taken or will take place and what form the coordination will take (shared field sites or researchers, research platforms, sample collection, data management, equipment purchases, etc.).

With Other EVOSTC-funded Programs and Projects

Indicate how your proposed program relates to, complements or includes collaborative efforts with other proposed or existing programs or projects funded by the EVOSTC.

With Trustee or Management Agencies

Please discuss if there are any areas which may support EVOSTC trust or other agency work or which have received EVOSTC trust or other agency feedback or direction, including the contact name of the agency staff. Please include specific information as to how the subject area may assist EVOSTC trust or other agency work.

If the proposed project requires or includes collaboration with other agencies, organizations or scientists to accomplish the work, such arrangements should be fully explained and the names of agency or organization representatives involved in the project should be provided. If your proposal is in conflict with another project or program, note this and explain why.

With Native and Local Communities

Provide a detailed plan for any local and native community involvement in the project.

Within the Program

This project provides the overall coordination between all projects within the program, therefore is directly linked to each project. This is a continuation of the effort that began with the first HRM program. The coordination effort continued through the development of the HRM proposal in response to the FY17-21 RFP. These researchers have worked together on the previous HRM program and have a good working relationship.

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. Within program coordination will primarily be through e-mail and phone communications. In-person meetings of participants are expected to occur each year for exchange of information and to encourage collaboration between projects.

Coordination between projects is also taking place through scheduling of vessels. 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.

We expect that the postdoctoral researcher will facilitate further collaboration as that person will need information from each of the projects to address the relationships between herring and the environmental conditions.

With Other EVOSTC-funded Programs and Projects

This project provides the primary link between the HRM, GWA, and Data Management programs. Dr. Pegau worked with the GWA team and AOOS/Axiom during proposal development to examine areas of overlap between programs and to ensure data management needs can be met.

We propose to continue our collaborations with these programs. Mandy Lindeberg the GWA science lead and Carol Janzen from the Data management team are included on the HRM email list so they are aware of what is

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going on with the HRM program. Administratively, the annual work plans and reports will continue to be developed together. We plan to have joint PI meetings to encourage individuals to work with people in the other programs. We will work together to design topics for analysis and development of joint scientific manuscripts. We will work with the Data Management project to ensure timely submission of data and metadata.

We are proposing to have a postdoctoral researcher that bridges between the HRM and GWA programs in that they would be looking at the impacts of biological and physical oceanographic conditions on herring populations in PWS. We expect them to work closely with the environmental drivers and pelagic components of the GWA program to collect the data necessary for their analysis.

With Trustee or Management Agencies

Alaska Department of Fish and Game is the primary trustee and management agency that the HRM program aims to serve. The success of the program is highly dependent on the information collected by ADF&G so it is imperative that we work with the agency. We will continue to have an ADF&G person on our scientific oversight group. We are also incorporating ADF&G into the sample collection of the research program to ensure the data needed to understand recovery of herring is collected.

With Native and Local Communities

The HRM program has an established working relationship with the Cordova District Fishermen United (CDFU) that provides a means of communication with fishermen in Cordova. This relationship has created better ties between the scientists and fishing community. The HRM program provides annual updates to the herring section of CDFU. That meeting provides the primary means for focused feedback on the research program from the community and for the program to gain local ecological knowledge. Over the years the individual fishermen and scientists have regular communication in casual situations. These have been important in gaining local knowledge.

Ties to the native communities are limited; however, we have established a link with the village of Tatitlek. They have an interest in learning about fresh spawn near the village for the collection of roe or fish. Providing observations from the HRM program starts a conversation in which local observation are provided. We envision working with GWA to increase our effort to interact with native communities through community involvement activities.

6. Schedule

Program Milestones

Specify when critical program tasks will be completed. Reviewers will use this information in conjunction with annual program reports to assess whether the program is meeting its objectives and is suitable for continued funding.

Measurable Program Tasks

Specify, by each quarter of each fiscal year (February 1 – January 31), when critical program tasks will be completed.

FY17 1st Quarter (Feb1- Apr 30)

Request proposals for postdoctoral researcher

FY17 2nd Quarter (May1- Jul 31)

Select postdoctoral research project to include in annual EVOS proposal submission

FY17 3rd Quarter (Aug 1 – Oct 31)

Semi-annual report to NOAA

FY 18 proposal submitted to EVOS

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- FY17 4th Quarter (Nov 1 – Jan 31)
 - Complete annual website updates
 - Annual PI meeting
- FY18 1st Quarter (Feb1- Apr 30)
 - Semi-annual reports to EVOS and NOAA
- FY18 2nd Quarter (May1- Jul 31)
 - Ensure data submitted from previous year
- FY18 3rd Quarter (Aug 1 – Oct 31)
 - Semi-annual report to NOAA
 - FY 19 proposal submitted to EVOS
- FY18 4th Quarter (Nov 1 – Jan 31)
 - Complete annual website updates
 - Annual PI meeting
- FY19 1st Quarter (Feb1- Apr 30)
 - Semi-annual reports to EVOS and NOAA
- FY19 2nd Quarter (May1- Jul 31)
 - Ensure data submitted from previous year
- FY19 3rd Quarter (Aug 1 – Oct 31)
 - Semi-annual report submitted to NOAA
 - Provide the report required for the Joint Science Workshop
 - FY 20 proposal submitted to EVOS
- FY19 4th Quarter (Nov 1 – Jan 31)
 - Complete annual website updates
 - Attend EVOS Joint Science Workshop
 - Annual PI meeting
- FY20 1st Quarter (Feb1- Apr 30)
 - Semi-annual reports to EVOS and NOAA
- FY20 2nd Quarter (May1- Jul 31)
 - Ensure data submitted from previous year
- FY20 3rd Quarter (Aug 1 – Oct 31)
 - Semi-annual report submitted to NOAA
 - FY 21 proposal submitted to EVOS
- FY20 4th Quarter (Nov 1 – Jan 31)
 - Complete annual website updates
 - Annual PI meeting
- FY21 1st Quarter (Feb1- Apr 30)
 - Semi-annual reports to EVOS and NOAA
- FY21 2nd Quarter (May1- Jul 31)
 - Ensure data submitted from previous year
- FY21 3rd Quarter (Aug 1 – Oct 31)
 - Semi-annual report submitted to NOAA
- FY21 4th Quarter (Nov 1 – Jan 31)
 - Complete annual website updates
 - Annual PI meeting
- FY22 1st Quarter (Feb1- Apr 30)
 - Ensure final reports submitted and sent for review

7. Budget Budget Forms (Attached)
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Please provide completed budget forms. Please note that the following items will not be considered for funding:

- Costs associated with international travel for meetings, symposia, or presentations.
- Costs associated with attendance at meetings, symposia, or presentations outside of those required to coordinate with project members.
- Costs associated with outreach or education efforts.

Sources of Additional Funding

Identify non-EVOSTC funds or in-kind contributions used as cost-share for the work in this proposal. List the amount of funds, the source of funds, and the purpose for which the funds will be used. Do not include funds that are not directly and specifically related to the work being proposed in this proposal.

Budget Category:	Proposed FY 17	Proposed FY 18	Proposed FY 19	Proposed FY 20	Proposed FY 21	TOTAL PROPOSED	AC CUMUL
Personnel	\$57.0	\$153.3	\$164.4	\$161.9	\$51.7	\$588.3	
Travel	\$6.4	\$9.9	\$6.4	\$6.4	\$6.4	\$35.5	
Contractual	\$24.7	\$26.0	\$26.2	\$11.0	\$4.4	\$92.3	
Commodities	\$3.8	\$1.5	\$3.5	\$1.4	\$1.5	\$11.7	
Equipment	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	
Indirect Costs (<i>will vary by proposer</i>)	\$35.1	\$57.20	\$60.15	\$54.2	\$19.2	\$225.8	
SUBTOTAL	\$127.0	\$247.8	\$260.7	\$234.9	\$83.2	\$953.6	
General Administration (9% of	\$11.4	\$22.3	\$23.5	\$21.1	\$7.5	\$85.8	
PROJECT TOTAL	\$138.4	\$270.2	\$284.1	\$256.1	\$90.7	\$1,039.4	
Other Resources (Cost Share Funds)	\$26.0	\$26.6	\$27.2	\$28.0	\$28.3	\$136.1	

Budget Justification

Personnel Costs: Dr. Pegau is requesting one and a half to two months of salary support each year for coordination efforts. Another half month in FY 17 and one month in FY 18, 19, and 20 are requested for recruiting and supervising the postdoctoral researcher. Three months of salary support are requested each year for an assistant for Dr. Pegau. That person will be responsible for updating the website, assist with community involvement events, and compiling the reports. For support of the postdoctoral researcher we are requesting \$8K, \$98.4K, \$100.8K, and \$104.4K in FY 17, 18, 19, and 20 respectively. Costs the first year are for recruiting and some starting salary.

Travel Costs: Travel support is requested for one person to attend a PI meeting associated with AMSS and two people to attend a joint PI meeting with GWA each year. Funds are also requested to support travel of the HRM scientific oversight group. In FY 18 funds are requested for the postdoctoral fellow to spend three months working with Drs. Hershberger and Branch in Seattle. Housing will most likely be through USGS bunkhouses.

Contractual Costs: Information technology costs are the network costs and are calculated at \$100 per man month. Phone and fax costs include \$40 per month for telephone and costs associated with teleconferencing. Printing etc. costs cover other means of communication.

The subcontract for Branch is included in this proposal to provide the PWSSC financial oversight of the project.

Commodities Costs: In year one we are requesting funding for a computer for the postdoctoral researcher. We are requesting funding for miscellaneous office supplies that are needed to support the efforts.

Equipment Costs: No equipment purchases are anticipated.

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Other Resources: Up to an additional two months of salary support for Dr. Pegau is available from the Oil Spill Recovery Institute to support coordination and other activities that improve our understanding of recovery from the *Exxon Valdez* Oil Spill.

**EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
PROGRAM PROJECT BUDGET PROPOSAL AND REPORTING FORM**

Budget Category:	Proposed FY 17	Proposed FY 18	Proposed FY 19	Proposed FY 20	Proposed FY 21	TOTAL PROPOSED	ACTUAL CUMULATIVE
Personnel	\$57.0	\$153.3	\$164.4	\$161.9	\$51.7	\$588.3	
Travel	\$6.4	\$9.9	\$6.4	\$6.4	\$6.4	\$35.5	
Contractual	\$24.7	\$26.0	\$26.2	\$11.0	\$4.4	\$92.3	
Commodities	\$3.8	\$1.5	\$3.5	\$1.4	\$1.5	\$11.7	
Equipment	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	
Indirect Costs (<i>will vary by proposer</i>)	\$35.1	\$57.20	\$60.15	\$54.2	\$19.2	\$225.8	
SUBTOTAL	\$127.0	\$247.8	\$260.7	\$234.9	\$83.2	\$953.6	
General Administration (9% of	\$11.4	\$22.3	\$23.5	\$21.1	\$7.5	\$85.8	N/A
PROJECT TOTAL	\$138.4	\$270.2	\$284.1	\$256.1	\$90.7	\$1,039.4	
Other Resources (Cost Share Funds)	\$26.0	\$26.6	\$27.2	\$28.0	\$28.3	\$136.1	

COMMENTS:

This summary page provides an five-year overview of proposed project funding and actual cumulative spending. The column titled 'Actual Cumulative' must be updated each fiscal year as part of the annual reporting requirements. Provide information on the total amount actually spent for all completed years of the project. On the Project Annual Report Form, if any line item exceeds a 10% deviation from the originally-proposed amount; provide detail regarding the reason for the deviation.

FY17-21

**Project Title: HRM Coordination
Primary Investigator: W. Scott Pegau**

**NON-TRUSTEE AGENCY
SUMMARY PAGE**

