

# *Exxon Valdez* Oil Spill Trustee Council



## DRAFT FY17 – FY21 Work Plan for Restoration, Research and Monitoring Projects:

Fiscal Year 2019

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# EVOSTC Restoration, Research and Monitoring Projects

## Draft FY19 Work Plan

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## PLEASE COMMENT

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You can help the Trustee Council by reviewing this draft work plan and letting us know your priorities for the Fiscal Year. You can comment by:

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## FY19 Proposal Funding Recommendations

*The funding described in this document is for EVOSTC Restoration, Research, and Monitoring Projects and for Habitat Enhancement Projects. Please note that the funding amounts in this document are approximate, and rounded up to the nearest hundred dollars. The Work Plan is a working document and may be revised as needed throughout the fiscal year. Please contact the EVOSTC office if you would like exact funding amounts.*

Page	Project Number	Principal Investigator	Project Title	FY19 Requested	FY19 Funding Amount Recommended				
					Science Panel	Science Coordinator	PAC	Executive Director	Trustee Council
6	19190100	EVOSTC Admin	EVOSTC Annual Budget	\$2,569,700	Not Applicable	Not Applicable	\$2,569,700	Not Applicable	\$2,569,700
8	19120111	Pegau	PWS Herring Program - see table on page 2	\$1,996,900	\$1,996,900 <sup>a</sup>	\$1,996,900 <sup>a</sup>	\$1,996,900 <sup>a</sup>	\$1,996,900 <sup>a</sup>	\$1,996,900 <sup>a</sup>
59	19120114	Lindeberg	Long-Term Monitoring Program – see table on page 3	\$2,540,100	\$2,540,100	\$2,540,100	\$2,540,100	\$2,540,100	\$2,540,100
125	19120113	Janzen	Data Management for Long-Term Programs	\$218,000	\$218,000	\$218,000	\$218,000	\$218,000	\$218,000
133	19110853	Kuletz,Kaler,Irons	Pigeon Guillemot Restoration Project	\$69,500	\$69,500	\$69,500	\$69,500	\$69,500	\$69,500
144	19190122	Von Biela	Chinook Salmon Foraging Ecology	\$63,500	\$0	\$0	Not Applicable Withdrawn	Not Applicable Withdrawn	Not Applicable Withdrawn
148	19190125	Hoffman	PWSSC Facilities Replacement	\$18,000,000	Not Reviewed	\$18,000,000	Individual Comments Received	\$18,000,000	\$18,000,000
151	17170116	Miranda	ADNR/DPOR - Habitat Restoration & Protection Reauthorization	\$327,000	Not Applicable	Not Applicable	\$327,000	\$327,000	\$327,000
154	18180117	Bornemann	Kenai Watershed Forum Stream Watch Program	approved 4/9/2018 \$47,100	Not Applicable	Not Applicable	approved 4/9/2018 \$47,100	approved 4/9/2018 \$47,100	approved 4/9/2018 \$47,100
156	18180119	Miranda	ADNR/DPOR Outreach Project	approved 4/9/2018 \$102,600	Not Applicable	Not Applicable	approved 4/9/2018 \$102,600	approved 4/9/2018 \$102,600	approved 4/9/2018 \$102,600
158	19190121	Miranda	KRSMA Funny River Riverbank Protection & Morgan's Landing Riverbank Restoration	\$824,300	Not Applicable	Not Applicable	\$824,300	\$824,300	\$824,300
159	19190124	Klein	PWS Instream Flow Protection	\$148,600	Not Applicable	Not Applicable	\$148,600	\$148,600	\$148,600
<b>TOTAL REQUESTED, RECOMMENDED &amp; APPROVED</b>				\$26,907,300	\$4,824,500	\$4,824,500	\$8,843,800	\$24,274,100	\$26,843,800

<sup>a</sup>Indicates this review group recommends a Fund Contingent for project within the Program (Project #19170111-D Gorman). Review group revised recommendation to Fund on 10.24.18

### Herring Research and Monitoring Program Projects

The funding described in this document is for EVOSTC Restoration, Research, and Monitoring Projects and for Habitat Enhancement Projects. Please note that the funding amounts in this document are approximate, and rounded up to the nearest hundred dollars. The Work Plan is a working document and may be revised as needed throughout the fiscal year. Please contact the EVOSTC office if you would like exact funding amounts.

**\*The total for these projects can be found under 19120111-Pegau on the page one chart**

Page	Project Number	Principal Investigator	Project Title	FY19 Requested	FY19 Approved	Science Panel	Science Coordinator	PAC	Executive Director	Trustee Council
14	19120111-A	Pegau	Herring Program-Coordination & Logistics, Postdoctoral Researcher	\$302,500	\$302,500	Fund	Fund	Fund	Fund	Fund
18	19120111-B	Bishop	Herring Program - Annual Herring Migration Cycle	\$275,800	\$275,800	Fund	Fund	Fund	Fund	Fund
22	19120111-C	Branch	Herring Program - Modeling and stock assessment	\$297,000	\$297,000	Fund	Fund	Fund	Fund	Fund
29	19170111-D	Gorman	Herring Program - Reproductive Maturity among Age Cohorts	\$165,100	\$165,100	Fund	Fund	Fund	Fund	Fund
37	19120111-E	Hershberger	Herring Program – Herring Disease Program II	\$236,700	\$236,700	Fund	Fund	Fund	Fund	Fund
41	19160111-F	Haught	Herring Program – ASL Study & Aerial Milt Surveys	\$166,300	\$166,300	Fund	Fund	Fund	Fund	Fund
48	19120111-G	Rand	Herring Program - Adult Pacific Herring Acoustic Surveys	\$75,500	\$75,500	Fund	Fund	Fund	Fund	Fund
53	19170115	Whitehead	Lingering Oil – Immunological Compromise of Fish	\$478,000	\$478,000	Fund	Fund	Fund	Fund	Fund

### Long-Term Monitoring Program Projects

The funding described in this document is for EVOSTC Restoration, Research, and Monitoring Projects and for Habitat Enhancement Projects. Please note that the funding amounts in this document are approximate, and rounded up to the nearest hundred dollars. The Work Plan is a working document and may be revised as needed throughout the fiscal year. Please contact the EVOSTC office if you would like exact funding amounts.

**\*The total for these projects can be found under 19120114-Lindeberg on the page one chart**

Page	Project Number	Principal Investigator	Project Title	FY19 Requested	FY19 Approved	Science Panel	Science Coordinator	PAC	Executive Director	Trustee Council
64	19120114-A	Lindeberg	LTM Program - Science Coordination and Synthesis, and Postdoctoral Researcher	\$212,800	\$212,800	Fund	Fund	Fund	Fund	Fund
64	19120114-B	Hoffman	LTM Program -Administration	\$382,500	\$382,500	Fund	Fund	Fund	Fund	Fund
71	19120114-C	Arimitsu & Piatt	LTM Program - Forage Fish Distribution, Abundance, and Body Condition	\$292,100	\$292,100	Fund	Fund	Fund	Fund	Fund
78	19120114-D	Batten	LTM Program - Continuous Plankton Recorders	\$81,200	\$81,200	Fund	Fund	Fund	Fund	Fund
81	19120114-E	Bishop	LTM Program - Seabird Abundance in Fall and Winter	\$121,900	\$121,900	Fund	Fund	Fund	Fund	Fund
87	19120114-G	Campbell	LTM Program - Oceanographic Conditions in PWS	\$228,300	\$228,300	Fund	Fund	Fund	Fund	Fund
91	19120114-H	Coletti	LTM Program - Nearshore ecosystems the Gulf of AK	\$411,400	\$411,400	Fund	Fund	Fund	Fund	Fund
96	19120114-I	Danielson	LTM Program - GAK1 Monitoring	\$132,600	\$132,600	Fund	Fund	Fund	Fund	Fund
99	19120114-J	Holderied & Baird	LTM Program - Oceanographic Monitoring in Cook Inlet/Kachemak Bay	\$183,400	\$183,400	Fund	Fund	Fund	Fund	Fund
103	19120114-L	Hopcroft	LTM Program - Seward Line Monitoring	\$139,500	\$139,500	Fund	Fund	Fund	Fund	Fund
108	19120114-M	Kuletz & Kaler	LTM Program - PWS Marine Bird Surveys	\$24,900	\$24,900	Fund	Fund	Fund	Fund	Fund
112	19120114-N	Matkin	LTM Program -Long-term killer whale monitoring	\$142,100	\$142,100	Fund	Fund	Fund	Fund	Fund



Page	Project Number	Principal Investigator	Project Title	FY19 Requested	FY19 Approved	Science Panel	Science Coordinator	PAC	Executive Director	Trustee Council
116	19120114-O	Moran & Straley	LTM Program - Humpback Whale Predation on Herring	\$187,400	\$187,400	Fund	Fund	Fund	Fund	Fund

## **EVOSTC Annual Budget Description**

**Project Number:** 19190100

**Project Title:** EVOSTC Annual Budget

**Primary Investigator(s):** Elise Hsieh, EVOSTC Executive Director  
Linda Kilbourne, EVOSTC Administrative Manager

**PI Affiliation:** EVOSTC

**Project Manager:** ADFG

**EVOSTC Funding Requested:**

FY19
\$2,569,700

**Abstract:**

The budget structure is designed to provide a clearly identifiable allocation of the funds supporting Trustee Council activities. The program components are:

- Administration Management
- Data Management
- Science Program
- Public Advisory Committee (PAC)
- Habitat Program
- Trustee Agency Project Management
- Trustee Agency Funding
- Alaska Resources Library & Information Services (ARLIS)

The budget estimates detailed within those specified program components are projected based upon prior year actual expenditures and include the application of estimated merit step increases, as well as payroll benefits increases. Detailed 12-month budget component items cover necessary day-to-day operational costs of the *Exxon Valdez* Oil Spill Restoration Office and administrative costs associated with overseeing current Trustee Council program objectives.

**FY19 Funding Recommendations :**

Science Panel	Science Coordinator	PAC	Executive Director	Trustee Council
Not Applicable	Not Applicable	Fund	Not Applicable	Fund

**PAC Comments – FY19**

**Date: September 2018**

No specific comments.

**Trustee Council Comments – FY19**

**Date: September 2018**

The TC meeting was October 17, 2018 and fund recommendations are included in the table above. Any specific comments from that meeting will be added to the Work Plan when the comments are finalized in the meeting notes.

## **Herring Research and Monitoring Program Project Descriptions**

**Project Number:** 19120111

**Project Title:** Herring Research and Monitoring Program

**Primary Investigator(s):** W. Scott Pegau

**PI Affiliation:** PWSSC

**Project Manager:** NOAA

**EVOSTC Funding Requested FY17-21: \$7,724,600**

FY17	FY18	FY19	FY20	FY21
Auth: \$1,252,900	Auth: \$1,578,800	\$1,996,900*	\$1,743,700*	\$1,152,300*

*Requests include 9% GA.*

\*ADNR requires a bond posted (\$2.6K for FY19) and annual fees for land use permits for underwater acoustic arrays (\$2.7K annual for FY19-21) (See FY19 Bishop, pg 18). Includes additional ship-time support request for acoustic surveys (\$10.3K for FY19-21) (See FY19 Rand, pg 46). Includes project 19170115, which will be part of the HRM program starting in FY19.

**Funding From Non-EVOSTC Sources FY 17-21: \$790,000**

FY17	FY18	FY19	FY20	FY21
\$157,200	\$159,700	\$160,700	\$162,700	\$149,700

**Total Past EVOSTC Funding Authorized (FY12-18): \$9,160,000**

**Total EVOSTC Funding Authorized (FY12-18) and Requested (FY19-21): \$14,053,000**

**Total Non-EVOSTC Funding (FY12-21): \$944,700**

**Abstract:**

*\*This abstract is excerpted from the PI's Proposal, dated 10/3/18, budget updated 10/3/18.*

The overall goal of the Herring Research and Monitoring (HRM) 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.

The program is made up of seven projects; Modeling and Stock Assessment of Prince William Sound Herring; Surveys and Age, Sex, and Size Collection and Processing; Adult Pacific Herring Acoustic Surveys; Herring Disease Program; Studies of Reproductive Maturity among Age Cohorts of Pacific Herring; Annual Herring Migration Cycle; and HRM Coordination.

Through these projects we expect to address areas of interest outlined within the HRM section of the FY17-21 invitation for proposals. The modeling project and the postdoctoral fellows are envisioned as the primary integrating efforts that use data and information from all of the projects and the Gulf Watch Alaska and Data Management programs. The primary beneficiaries of our efforts are expected to be Alaska Department of Fish

and Game and Prince William Sound herring fishermen.

Dr. Pegau will serve as the program lead to ensure the proper coordination within the program, with other EVOS funded programs, and as a point person for communications with the EVOSTC. An independent scientific oversight group exists that will provide feedback on the program.

#### **FY19 Funding Recommendations:**

Science Panel	Science Coordinator	PAC	Executive Director	Trustee Council
Fund*	Fund*	Fund*	Fund*	Fund*

*\*Indicates this review group recommends a Fund Contingent for HRM Project #19170111-D Gorman. Review group revised recommendation to Fund for Project #19170111-D.*

#### **Science Panel Comments – FY19**

**Date: September 2018**

We have no program specific comment except that we ask the PIs to evaluate the adequacy of their sampling design to make population-level inferences. Consider the acoustics survey, and age & length sampling.

#### **Science Coordinator Comments – FY19**

**Date: September 2018**

Revisions to the proposal forms were made to address the Science Panel's suggestions in the FY18 Work Plan. All proposals now include hypotheses, highlights and figures reflecting progress made during FY18. Program is on track except for uploading disease prevalence data to the workspace, but otherwise making excellent progress. The program is requesting an additional \$20K to the original FY17-21 proposal annually for unexpected costs of permits and bonds that have arisen for FY19-21 (19120111-B Bishop) and ship time to continue acoustic surveys (19120111-G Rand). Starting in FY19, project 19170115 will be part of the HRM program to facilitate collaboration with the HRM Program and as per discussions with the HRM program and PI of project 19170115; this proposal is revised to include the budget for project 19170115.

#### **PAC Comments – FY19**

**Date: September 2018**

The PAC noted that the Science Programs have produced unique and very important long-term data sets. The PAC also commented on the thoroughness of how proposal information was presented, it was well organized and clear.

#### **Executive Director Comments – FY19**

**Date: September 2018**

I concur with the recommendations of the Science Panel, Science Coordinator and Public Advisory Committee.

#### **FY18 Funding Recommendations:**

Science Panel	Science Coordinator	PAC	Executive Director	Trustee Council
Fund*	Fund*	Fund*	Fund*	Fund*

*\*Indicates this review group recommends a Fund Contingent for Project #18170111-D Gorman. Update (11.21.17) Review group revised recommendation to Fund for Project #18170111-D Gorman.*

### Science Panel Comments – FY18

**Date: September 2017**

Overall, the Panel is pleased with the Program's progress. The Panel strongly recommends that all proposals include hypotheses, highlights and figures reflecting progress made during the previous year(s), as did PIs for two of the proposals (18120111-C Branch and 18120111-E Hershberger/Purcell). The LTM proposal provide good examples of what the Panel is looking for, as they nicely addressed our previous request for this information. They also included a list of publications and datasets uploaded during the previous year, which we endorse and recommend that all proposals now include. This information is very helpful to determine whether changes are warranted in study plans for the upcoming year. Toward this end, improvements to the proposal forms will help. The Panel supports Scott's request to hire Maya Groner for the Post-doc position.

*PI Response (10/11/2017)*

*As the program lead I will review the proposals to ensure they have the hypotheses, goals, and highlights as requested.*

### Science Coordinator Comments – FY18

**Date: September 2017**

I concur with the Science Panel's comments. I will revise the proposal forms to address the Panel's recommendations.

### PAC Comments – FY18

**Date: September 2017**

There are no program specific comments.

### Executive Director Comments – FY18

**Date: September 2017**

I concur with the recommendations of the Science Panel, Science Coordinator and Public Advisory Committee.

### FY17 Funding Recommendations:

Science Panel	Science Coordinator	PAC	Executive Director	Trustee Council
Fund	Fund	Fund	Fund	Fund

### FY17 Funding Recommendations:

Date	Science Panel	Science Coordinator	PAC	Executive Director	Trustee Council
May 2016	Fund Reduced	Fund Reduced	N/A	N/A	N/A
Sept 2016	Fund	Fund	Fund	Fund	Fund

### Science Panel Comments – FY17

**Date: September 2016**

This is a complex proposal with many integrated parts. A key strength of the proposal is the required collaboration and cooperation of PI's from very different disciplines. This cohesion was an initial requirement for the herring program and Dr. Pegau has met this challenge successfully. There were, however, many questions and comments following the initial proposals presented earlier this year. The Panel appreciated the responses of Dr. Pegau and the PI's within the revised Herring Program.

Most questions or comments requested clarification or more information, and were not necessarily intended to point out shortcomings or errors. In this regard, the Panel was pleased and generally satisfied with the responses that we considered to be constructive and informative.

There was one aspect of the revised proposal that elicited some concerns: the brevity of scientific context and rationale for the herring program, as a whole. We acknowledge that this is a demanding request: it is difficult enough to provide such context for individual proposals, let alone a collection of proposals such as the integrated herring program. Nevertheless the Panel would like to have seen more attention provided to explaining how the composite set of proposals addressed basic scientific issues. The two general hypotheses listed in the opening pages of the Herring program (i) bottom-up forcing and (ii) age-specific migration are fine, but there are many other fundamental questions in the literature that are germane to the projects in the herring program. For example, within the initial overview of the herring proposals, there is scant reference to the potential impacts of climate change, as a factor that could affect herring or the research efforts directed at herring. We note, however that this specific issue is mentioned specifically in two projects. The Panel was somewhat reassured, however, when we heard directly from Dr. Pegau during a telephone conversation when he indicated that he shares some of this perspective but is constrained by time and assistance. There is some promise that the additional of a post-doc position may provide some assistance in this regard.

#### **Date: May 2016**

The Science Panel noted some possible inconsistency between the lists of hypothesis in the 'Program proposal summary' (Appendix A) and similar text from Appendix C. Appendix A presents text explaining the roles of a future post-doc position.

Appendix A states: "... the post-doc position will be directed to test the hypothesis: "Herring recruitment is driven by bottom up forcing and the total population level is determined by disease and predation."

Appendix C (HRM Coordination) repeats this hypothesis and adds two more: "Three hypotheses have arisen over the past seven years that guide our current efforts. Individual projects have additional hypotheses that they will address.

These three hypotheses are copied below (in *Italic font*):

***H1: Herring populations exists in two states, high and low biomass, and the transition between states is rapid. This hypothesis comes from the EVOS supported modeling effort of Dale Keifer (EVOS project 070810) prior to the formation of the integrated programs. H2: Herring recruitment is driven by bottom up forcing and the total population level is determined by disease and predation. A postdoctoral research position is proposed to allow a focused effort on using historical data to test this hypothesis. H3: Larger herring migrate out of PWS during the summer, while smaller ones remain in PWS.***

The Panel was surprised by the inclusion of the specific hypotheses: H1 and H3. Also, we do not necessarily agree that these are three important hypotheses that have 'arisen over the last 7 years'. We note that there have been no publications of accessible reports to explain the origins of any of these hypotheses. This text is not well presented and is superfluous to the main thrust of most of the individual proposals. We recommend major editing and appropriate modification of related study plans.



Under the project called “HRM Coordination” there is general text referring to a post-doc position that reads as follows (in *italic font*) with sentences numbered.

*(1) The focus of the postdoctoral research will be to examine connections between herring recruitment and condition with the physical and biological environmental conditions. (2) We will be seeking proposals for the postdoctoral position in which the specifics of the approach will be described. (3). The intent is to address the hypothesis: Herring recruitment is driven by bottom up forcing and the total population level is determined by disease and predation. (4) The postdoctoral position is proposed to as a method that allows a focused effort on using historical data to test this hypothesis. (5) Testing this hypothesis is expected to inform the population modeling effort in a manner that improves the predictive capacity of the modeling. (6) The improved model would then lead to resource managers having a better understanding of potential changes in the population.*

**Revision of Items 3-5 is strongly advised. Items 3-5 present a specific hypothesis that has already been examined in a number of papers for different herring populations. This comment does not mean to imply that the hypotheses are incorrect, or inappropriate, but it does unnecessarily restrict the scope of the postdoctoral position.** It may be simpler and more productive to limit the ‘focus’ to examining connections between herring recruitment and condition with the physical and biological environmental conditions. The Panel also points out that a UAF doctoral student, Fletcher Sewall, located at NOAA’s Ted Stevens Marine Research Institute with Ron Heintz, is examining potential relationships between PWS herring recruitment and environmental and ecological factors. Sewall’s results may help jump start efforts by the post-doc and there may be possibilities of collaboration. Finally, the recruitment process for the post-doc described on page 31 was confusing, but was explained by PI Pegau more clearly over the phone. The text should be clarified.

The Panel reflected on the scope of the herring proposals and whether there might have been other types of approaches. One example was raised during the phone call with Scott Pegau during which it was suggested that a review of the 2015 Incardona et al. paper may be helpful to consider whether low levels of lingering oil might have chronic impacts on recruitment. The Panel was surprised by the categorical rejection of this suggestion and that such experimental approaches may not have merit. We do not concur.

The Panel also reflected on the types and scope of synthesis work that might be conducted by the post-doc, and others, during the next 5 years. The Panel noted that there were a number of potential process-based connections that might be examined – such as connections between disease and predation. Further, there are potentially relevant data on other factors that might affect herring that are not considered in either the herring or LTM programs, such as juvenile salmon competition and impacts on herring growth of condition, or pinniped predation, etc.

*\*Incardona, J., M. G. Carls, L. Holland, T. L. Linbo, D. H. Baldwin, M. S. Myers, K. A. Peck-Miller, M. Tagal, S. D. Rice, N. L. Scholz. 2015. Very low embryonic crude oil exposures cause lasting cardiac defects in herring and salmon. Scientific Reports, 5:13499*

#### **Science Coordinator Comments – FY17**

**Date: September 2016**

I concur with the Science Panel’s comments. I appreciate the Team Lead and individual PI’s careful attention to the Panel’s May comments and feel that the applicable changes made to the Program

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will benefit both the Herring and Long-Term Monitoring Programs.

**Date: May 2016**

I concur with the Science Panel's comments.

**Executive Director Comments – FY17**

**Date: September 2016**

I concur with the Science Panel and Science Coordinator's comments.

**Public Advisory Committee Comments – FY17**

**Date: September 2016**

The PAC meeting was Sept. 22, 2016 and fund recommendations are included in the table above. Any project-specific comments from that meeting will be added to the Work Plan when the comments are finalized in the meeting notes.

**Project Number:** 19120111-A

**Project Title:** Herring Program – Program Coordination, Postdoctoral Researcher

**Primary Investigator(s):** Scott Pegau

**PI Affiliation:** PWSSC

**Project Manager:** NOAA

**EVOSTC Funding Requested FY17-21:** \$1,057,900

FY17	FY18	FY19	FY20	FY21
Auth: \$138,400	Auth: \$270,200	\$302,500*	\$256,100	\$90,700

*Requests include 9% GA. \*Includes additional \$13K for program administrative assistance.*

**Funding From Non-EVOSTC Sources FY17-21:** \$136,100

FY17	FY18	FY19	FY20	FY21
\$26,000	\$26,600	\$27,200	\$28,000	\$28,300

**Total Past EVOSTC Funding Authorized (FY12-18):** \$2,348,700

**Total EVOSTC Funding Authorized (FY12-18) and Requested (FY19-21):** \$2,998,000

**Total Non-EVOSTC Funding (FY12-21):** \$247,800

**Abstract:**

*\*This abstract is excerpted from the PI's Proposal, dated 9/28/18, budget updated 10/3/18.*

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 examining the relationships between herring diseases 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.*

Coordination is primarily through e-mail and teleconference. The management team of GWA and the lead of DM are 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, Dr. Maya Groner, was hired during year one and is focusing her research on understanding the combined impacts of environmental conditions and disease on herring population dynamics using a field collected data, experiments and population models.

Outreach efforts are 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 participating with GWA in listening sessions in two villages within the spill affected are to seek additional local and traditional ecological knowledge.

#### **FY19 Funding Recommendations:**

Science Panel	Science Coordinator	PAC	Executive Director	Trustee Council
Fund	Fund	Fund	Fund	Fund

#### **Science Panel Comments – FY19**

**Date: September 2018**

We agree with the Science Coordinator that the PI and the HRM program would benefit from additional administrative assistance. We have no other project-specific comments.

*PI Response (10/31/18): A new administrative assistant has been added to the coordination proposal as requested.*

#### **Science Coordinator Comments – FY19**

**Date: September 2018**

New postdoc Dr. Groner's previous and current work will make useful contributions to the HRM program. The need for administrative assistance within the HRM program is still a concern with the Science Panel (see May 2016 FY17 comments): "On the other hand, the Panel supports strongly the need to provide additional assistance to Pegau, whose work load alone is a Herculean task." Dr. Groner is supporting the PI in the evaluation of reports and annual proposals being submitted to EVOSTC. While I greatly appreciate the PI's coordination work and effort, and welcome Dr. Groner's help with administrative work within the HRM program, I suggest additional experienced administrative assistance for the HRM program. At the PAC meeting, I was pleased to hear that the PAC understands and strongly supports the need for additional administrative assistance to improve and ensure the quality of reports and other documents that are produced by the program.

*PI Response (10/31/18): A new administrative assistant has been added to the coordination proposal as requested.*

#### **PAC Comments – FY19**

**Date: September 2018**

No project specific comments.

#### **Executive Director Comments – FY19**

**Date: September 2018**

I concur with the recommendations of the Science Panel, Science Coordinator and Public Advisory Committee.

#### **FY18 Funding Recommendations:**

Science Panel	Science Coordinator	PAC	Executive Director	Trustee Council
Fund	Fund	Fund	Fund	Fund

#### **Science Panel Comments – FY18**

**Date: September 2017**

The Panel appreciates Scott's hard work and effort in the coordination of the Herring Research Monitoring Program. We were pleased to hear that PIs are compliant and rapidly uploading their data to the data portal. The panel is especially pleased to see Scott's involvement in promoting the inclusion of a postdoc in the Herring Program.

*PI Response (10/11/2017) Thank you*

#### **Science Coordinator Comments – FY18**

**Date: September 2017**

I concur with the Science Panel's comments.

#### **PAC Comments – FY18**

**Date: September 2017**

There are no project specific comments.

#### **Executive Director Comments – FY18**

**Date: September 2017**

I concur with the recommendations of the Science Panel, Science Coordinator and Public Advisory Committee.

#### **FY17 Funding Recommendations:**

<b>Science Panel</b>	<b>Science Coordinator</b>	<b>PAC</b>	<b>Executive Director</b>	<b>Trustee Council</b>
Fund	Fund	Fund	Fund	Fund

#### **FY17 Funding Recommendations:**

<b>Date</b>	<b>Science Panel</b>	<b>Science Coordinator</b>	<b>PAC</b>	<b>Executive Director</b>	<b>Trustee Council</b>
May 2016	Fund	Fund	N/A	N/A	N/A
Sept 2016	Fund	Fund	Fund	Fund	Fund

#### **Science Panel Comments – FY17**

**Date: September 2016**

The Panel also appreciates that Dr. Pegau's program has endured a number of changes in personnel, with some departing PI's and some new ones. Such changes can be disruptive and the Panel heartily commends Dr. Pegau for his steady and dedicated supervision of a number of complex and varied management issues. In particular we salute the continued operational integration of the projects, especially the collaborative sharing of vessels and other forms of cooperation among PI's, both with and between the Herring and LTM programs.

The Panel appreciates the extension of the postdoc for a full three years.

**Date: May 2016**

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

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post-doc and Hershberger, whose disease research continues to inspire new insights into causes of the lack of herring recovery in PWS.

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.

**Science Coordinator Comments – FY17**

**Date: May and September 2016**

I concur with the Science Panel's comments.

**Executive Director Comments – FY17**

**Date: September 2016**

I concur with the Science Panel's comments.

**Public Advisory Committee Comments – FY17**

**Date: September 2016**

The PAC meeting was Sept. 22, 2016 and fund recommendations are included in the table above. Any project-specific comments from that meeting will be added to the Work Plan when the comments are finalized in the meeting notes.

**Project Number:** 19120111-B

**Project Title:** Herring Program - Annual Herring Migration Cycle

**Primary Investigator(s):** Mary Anne Bishop

**PI Affiliation:** PWSSC

**Project Manager:** NOAA

**EVOSTC Funding Requested FY17-21: \$1,242,400**

FY17	FY18	FY19	FY20	FY21
Auth: \$381,900	Auth: \$379,500	\$275,800*	\$205,200*	\$0

*Requests include 9% GA.*

\* Includes additional request for posting bond required by ADNR (\$2.6K for FY19) and annual fees for land use permits for underwater acoustic arrays (\$2.7K annual for FY19-20).

**Funding From Non-EVOSTC Sources FY17-21: \$60,000**

FY17	FY18	FY19	FY20	FY21
\$15,000	\$15,000	\$15,000	\$15,000	\$0

**Total Past EVOSTC Funding Authorized (FY12-18): \$1,034,000**

**Total EVOSTC Funding Authorized (FY12-18) and Requested (FY19-21): \$1,515,000**

**Total Non-EVOSTC Funding (FY12-21): \$475,500**

**Abstract:**

*\*This abstract is excerpted from the PI's Proposal, dated 8/17/18, budget updated 9/18/18.*

This project is a component of the Herring Research and Monitoring (HRM) program. The goal of the HRM program is to: Improve predictive models of herring stocks through observations and research. Within Prince William Sound (PWS), adult Pacific herring (*Clupea pallasii*) movements between spawning, summer feeding, and overwintering areas are not well understood. Addressing this knowledge gap will improve our ability to assess biomass trends and recovery of this ecologically important species.

In 2013, we documented post-spawn migration of herring from Port Gravina to the PWS entrances by acoustic tagging adult herring and collecting data from the Ocean Tracking Network acoustic arrays, which are located in the major entrances and passages connecting PWS with the Gulf of Alaska (GoA). However, the 2013 study could not establish if herring were seasonally leaving PWS and migrating into the GoA. With funding from EVOS in FY16, we improved our ability to detect movements between PWS and the GoA by deploying additional acoustic receivers at the Ocean Tracking Network arrays. The primary goal of this 2017-2021 project is to clarify the annual migration cycle of PWS adult herring by leveraging this expanded acoustic infrastructure. The specific objectives of this project are to 1) document location, timing, and direction of Pacific herring seasonal migrations between PWS and the GoA; 2) relate large-scale movements to year class and body condition of tagged individuals; and 3) determine seasonal residency time within PWS, at the entrances to PWS, and in the GoA. During spring 2017 we tagged 124 herring in northeast PWS at Port Gravina and detected 59 herring at entrances to the GoA. Nine fish were detected returning to the spawning grounds the following winter/spring. In April 2018, we tagged 202 herring at Port Gravina and at Hawkins Island (Canoe Pass). For FY19 we will tag a total of 210 herring on the spawning grounds.

**FY19 Funding Recommendations:**

Science Panel	Science Coordinator	PAC	Executive Director	Trustee Council
Fund	Fund	Fund	Fund	Fund

**Science Panel Comments – FY19****Date: September 2018**

The Science Panel applauds the PIs work and recognizes that it has greatly advanced our understanding of herring migration within and outside of PWS. It would be nice to be able to compute SE to be comfortable with the accuracy of these data and inferences, given the relatively small sample sizes. What would it take to tag 500 fish? Is it feasible?

*PI Response (10/31/18): We catch fish right before spawning (many are milting when we tag them). Because of the reduced PWS herring population and predominance of younger and smaller age classes, we have had to search long and hard to locate, catch, and tag over 200 fish during the short pre-spawning window. We would like to suggest adding a 4th year of tagging in 2020 of at least 210 fish (right now spring 2019 is scheduled to be the final year for tagging). An additional year of tagging would boost our sample size of fish that move to the entrances to approximately 500 fish. By 2020, the dominant age class would be larger, and it will be easier to find and tag larger herring.*

The PI's work has wide applications. For instance, results from this project help interpret historical ADFG data. We note that, in the FY17 annual report, the PI reports that there is the ability to remotely download data but the PI was not able to access data from all of the receivers. The PI also reports that some of the receivers were tilted. Was the tilting an unexpected event? Is the download problem linked to the tilting issue? What steps will be taken to address tilt issues and loss of data from happening in the future?

*PI Response (10/31/18): We consulted with various people before putting out the receivers in March 2013 and were advised that biofouling would not be an issue at the depths we were deploying. It was not until the September 2017 upload, we noted that some receivers in the Ocean Tracking Network arrays had consistent tilts of 80-90 degrees. Looking at the tilts over time, it appears that biofouling is what is causing the tilting. Depending on the tides, sometimes we can upload receivers with 90 degree tilts. However, receiver tilting appears to affect receiver detection efficiency. We have put a second receiver nearby the 18 receivers that are tilting 80-90 degrees. We are going out 2x a year instead of just once to upload data at Montague Strait and Hinchinbrook Entrance. This way we can identify and resolve problems faster and mitigate data loss.*

**Science Coordinator Comments – FY19****Date: September 2018**

PI is making good progress, project is on track. I am pleased to see the preliminary results from FY18. Additional receivers were deployed in February 2017 to determine what direction tagged herring travel after detection (back into PWS or out towards GOA) and there are unexpected costs associated with expanding the acoustic receiving arrays (\$6.9K annually) for permits and bonds required by ADNR.

**PAC Comments – FY19****Date: September 2018**

No project specific comments.

**Executive Director Comments – FY19****Date: September 2018**



I concur with the recommendations of the Science Panel, Science Coordinator and Public Advisory Committee.

**FY18 Funding Recommendations:**

Science Panel	Science Coordinator	PAC	Executive Director	Trustee Council
Fund	Fund	Fund	Fund	Fund

**Science Panel Comments – FY18**

**Date: September 2017**

The Panel is once again very pleased with the quality of this proposal. These results are relevant and important; the PI has answered the questions that were asked.

*PI Response (10/11/2017) Thank you*

**Science Coordinator Comments – FY18**

**Date: September 2017**

I concur with the Science Panel's comments.

**PAC Comments – FY18**

**Date: September 2017**

There are no project specific comments.

**Executive Director Comments – FY18**

**Date: September 2017**

I concur with the recommendations of the Science Panel, Science Coordinator and Public Advisory Committee.

**FY17 Funding Recommendations:**

Science Panel	Science Coordinator	PAC	Executive Director	Trustee Council
Fund	Fund	Fund	Fund	Fund

**FY17 Funding Recommendations:**

Date	Science Panel	Science Coordinator	PAC	Executive Director	Trustee Council
May 2016	Fund	Fund	N/A	N/A	N/A
Sept 2016	Fund	Fund	Fund	Fund	Fund

**Science Panel Comments – FY17**

**Date: September 2016**

This appears to be a very productive project, in terms of acquiring valuable observations about herring movements in PWS. The original proposal was both well-presented and interesting. This generated questions from the Panel – which were addressed in detail. The Panel thanks the PI for detailed and thorough response to Panel interest and concerns, which put both her work and the proposal at large into broader perspective. We also appreciate the PI adjusting sampling based on Panel comments.

**Date: May 2016**

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The Panel was pleased by the work and rapid reporting of results in the literature. While the Panel endorsed the elements and detail of the proposal, we wondered if the work was limited by funding, or whether there were some incremental tasks that might be considered. Specifically, we wondered if additional tag releases, from different areas and different times, might be considered. While speculative, we wondered if additional tagging might address some key hypotheses that cannot be considered within the present level of funding. For example, does the propensity to migrate out of PWS, or stay within PWS, vary with tagging (spawning) location, or perhaps fish size? Would there be merit in tagging at different times of year – and not only in the spawning season? The main comment was to suggest to the PI that additional increments to this work might be considered if such increments were cost-effective and addressed important hypotheses. Additionally, the Panel was very appreciative of the power analyses presented in the proposal, but cautions that sample sizes estimated for simulated herring in Table 1 may underestimate samples actually required for wild herring.

The Panel understands that annual migrations within PWS, while potentially interesting, are beyond the scope of the project as envisioned. However, we wonder if there may be supplementary data (e.g., herring bycatch in other fisheries) that may be useful to help cobble together a more complete picture of herring migration within and outside PWS.

A different comment on tagging reflects comments made during our call with Scott Pegau who indicated that recent genetics work showed significant differences between PWS herring and those of Kodiak. Less clear was whether there were any genetic differences found within PWS. Based on previously published work, the Panel thought that the likelihood of genetic differences among herring within PWS to be very small – but, on the other hand, if such differences were found then it would be sensible to ensure that tagging was conducted on each of any potential different stocks or sub-stocks. Perhaps a review of fish genetic research done by the Seebis when they worked for ADFG could reveal comparisons among PWS populations that could inform this issue.

The Panel would be supportive of additional project funding for increased tagging as discussed above.

#### **Science Coordinator Comments – FY17**

**Date: May and September 2016**

I concur with the Science Panel's comments.

#### **Executive Director Comments – FY17**

**Date: September 2016**

I concur with the Science Panel's comments.

#### **Public Advisory Committee Comments – FY17**

**Date: September 2016**

The PAC meeting was Sept. 22, 2016 and fund recommendations are included in the table above. Any project-specific comments from that meeting will be added to the Work Plan when the comments are finalized in the meeting notes.

**Project Number: 19120111-C**

**Project Title: Herring Program – Modeling and stock assessment of PWS herring**

**Primary Investigator(s):** Trevor Branch

**PI Affiliation:** University of WA

**Project Manager:** NOAA

**EVOSTC Funding Requested FY17-21: \$1,161,900**

FY17	FY18	FY19	FY20	FY21
Auth: \$124,300	Auth: \$288,300	\$297,000	\$303,300	\$148,900

*Requests include 9% GA.*

**Funding From Non-EVOSTC Sources FY17-21: \$0**

FY17	FY18	FY19	FY20	FY21
\$0	\$0	\$0	\$0	\$0

**Total Past EVOSTC Funding Authorized (FY12-18): \$839,700**

**Total EVOSTC Funding Authorized (FY12-18) and Requested (FY19-21): \$1,588,900**

**Total Non-EVOSTC Funding (FY12-21): \$0**

**Abstract:**

*\*This abstract is excerpted from the PI's Revised Proposal, dated 8/17/18, budget updated 9/18/18.*

Prince William Sound (PWS) herring collapsed shortly after the Exxon Valdez oil spill and has yet to recover. Here, we propose a modeling component to the long-term herring monitoring project, which has as its chief goal an understanding of the current status of PWS herring, the factors affecting its lack of recovery, and an assessment of research and fishery needs into the future. The original proposed project was expanded in FY18 with the addition of a postdoctoral fellow to investigate linkages between PWS herring recruitment to environmental forcing. Key products are the following (items 6-9 are related to the postdoctoral fellow):

1. The core product of the modeling project is the maintenance and updating of the new Bayesian age-structured assessment (BASA) model based on the ASA model used by ADF&G, including annual assessment updates of PWS herring and the revision of BASA to fit to new data sources such as the age-0 aerial survey, condition data, and updated age at maturity.
2. Adapting the BASA model to better model the disease component of natural mortality. Specifically, this would be based on new methods for detecting antibodies of viral hemorrhagic septicemia virus (VHSV) in archival and planned future collections of herring serum using a plaque neutralization assay (described by Hershberger).
3. Continued collection and expansion of catch, biomass, and recruitment time series from all herring populations around the world to place the lack of recovery of PWS herring into context given patterns of change in herring populations around the world.
4. An initial exploration of factors that may be used to predict herring recruitment, including oceanography, climate, competition, and predation.
5. A management strategy evaluation to test alternative harvest control rules for managing the fishery in the future, given realistic variability in productivity over time, and the possibility that the population has moved into a low productivity regime. Ecological, economic and social factors would be considered in the MSE.
6. Identifying relationships among oceanographic, biological, and climate data series from within PWS, the Gulf of Alaska, and the North-east Pacific that can predict PWS herring spawning, survival, and recruitment.
7. Examination of physical and ecological processes linked to PWS herring spawning, spawning survival, and survival of juvenile life stages.
8. The relative influence of physical and ecological processes on recruitment to the PWS and Sitka Sound

herring populations.

9. Identifying environmental inputs for incorporation into the BASA model to improve recruitment predictions.

**FY19 Funding Recommendations:**

Science Panel	Science Coordinator	PAC	Executive Director	Trustee Council
Fund	Fund	Fund	Fund	Fund

**Science Panel Comments – FY19**

**Date: September 2018**

The Science Panel requests for future reports and proposals to please clarify that ADF&G is now using the model from this project. Timeline products: What juvenile data (ages 0-2) are now being incorporated into the model?

*PI Response (10/31/18): The current BASA model was changed to start with age 0, but does not currently fit to any juvenile data. We ran a test series of model fits that included the aerial surveys of age 1+ schools in 2015 (only four data points were available), but this did not improve predictions for age-3 recruits. However, as the length of these surveys continues to grow, these and other juvenile data can be easily reincorporated into the most recent model.*

How are these data collected and have scaling issues of juvenile to adult data been adequately addressed?

*PI Response (10/31/18): When the model fits to juvenile data, these data are scaled using an estimated catchability parameter, so that the trend is captured but the absolute magnitude is scaled up and down automatically to match the adult surveys.*

Can apparent increases in mortality of herring at ages 1-2 be distinguished from selectivity/catchability issues among aerial and acoustic surveys? The answers affect interpretation of the age(s) at which year class strength is determined.

*PI Response (10/31/18): These are currently not incorporated into the BASA model, so the question cannot be addressed from the modeling perspective yet. It seems unlikely that changes in mortality could be estimated precisely enough from the aerial and acoustic surveys.*

Regarding the antibody paper, is the PI working closely with Hershberger to get this done?

*PI Response (10/31/18): We have the most up-to-date antibody data from Hershberger. Initial simulations suggested that it should be possible to estimate disease prevalence by year and age, but the actual data are much more ambiguous than the simulated data we tested. We are developing a more advanced age-structured simulation model to test how much information can be obtained from the noisier actual antibody data. We are in discussion with Hershberger on how best to proceed, but it looks like we may only be able to estimate annual disease prevalence rather than prevalence by both year and age*

Different factors affect herring at different stages which is being incorporated into the ASA model. We

find this valid and useful and are excited to see this published. In the FY18 work plan, the Science Panel suggested the PI to consider the development of a similar model for Sitka herring, which would be valuable as a contrast. We still believe this is an important exercise and it likely will be informative for PWS herring and valuable globally. As Sitka Sound is outside of the spill area, we encourage the PI to seek funding to accomplish this. Collaboration with ADFG in Southeast Alaska would be ideal.

*PI Response (10/31/18): A Bayesian model is being developed in ADMB for Sitka by Jane Sullivan (ADF&G), although this has substantial differences in the data used, model assumptions, and functional forms of the individual components. At the present time we are not able to develop a new model for Sitka, but will continue collaborating with ADF&G about how best to coordinate efforts.*

#### **Science Coordinator Comments – FY19**

**Date: September 2018**

PI continues to be highly productive: two manuscripts published in FY18 and another in prep. I have no project specific comments

#### **PAC Comments – FY19**

**Date: September 2018**

No project specific comments.

#### **Executive Director Comments – FY19**

**Date: September 2018**

I concur with the recommendations of the Science Panel, Science Coordinator and Public Advisory Committee.

#### **FY18 Funding Recommendations:**

Science Panel	Science Coordinator	PAC	Executive Director	Trustee Council
Fund	Fund	Fund	Fund	Fund

#### **Science Panel Comments – FY18**

**Date: September 2017**

The Panel is pleased to see the data presented and supports the elimination of the Ricker SRR. The Panel has some suggestions in regards to the model:

The BASA is a logical extension of the preceding ASA assessment model for PWS herring, and may be of use to fishery managers as a model intended to determine such quantities as the stock abundance relative to the stock size threshold for opening a fishery. Some aspects of the BASA model pose difficulties for the examination of environmental relationships. The Panel does not consider the present BASA to be an adequate operating model for purposes of Management Strategy Evaluation (MSE). EVOSTC research needs would be better met by implementing the following changes to the BASA model to aid in identifying critical population processes and environmental influences on PWS herring:

- A. Extend the time series as early a date as possible (previous assessments go back to 1925). This will greatly increase the statistical power for examining environmental influences. The present BASA model begins in 1980, reducing the length of the time series.

*PI Response (10/11/2017)*

*It is our intent to extend the time series of the BASA model further back in time than the current ASA model used by ADF&G for stock assessments. At present, both BASA and ASA start in 1980, because this marks the start of indices of abundance for this population. In the absence of biomass indices prior to 1980, annual stock assessment estimates of recruitment and biomass will be far more uncertain and less useful in examining the influence of environmental processes. However, prior to 1980, there are data on total catch, proportion at age in catch, and length at age available (e.g. Reid 1971). It should be noted that while much more uncertain estimates of biomass and recruitment can be obtained prior to 1980, this is not true of most of the time series of explanatory factors, many of which rely on time series of data started under the EVOSTC program, or on satellite imagery. Indeed, there are far fewer explanatory variables extending back in time beyond 1980 that could be used in the analysis, reducing the usefulness of this exercise.*

- B. Allow the background natural mortality rate to vary in time and estimate it. An example methodology is provided by the Canadian herring assessments (DFO 2015). This should increase accuracy of recruitment estimates and allow additional insight into possible alternative population states. This also will examination of the influence of top-down drivers (predation) and comparison with trends in predator abundance.

*PI Response (10/11/2017)*

*The Canadian herring assessments (DFO 2015) differ from BASA in two key ways: (1) they estimate varying natural mortality constraints by a random walk with autocorrelation, such that natural mortality cannot vary much from year to year; and (2) they do not estimate additional mortality from disease. There is considerable debate in the stock assessment literature about whether natural mortality can be estimated, since it changes with estimates of recruitment and selectivity. Indeed, in the DFO models, there are unrealistically large changes in natural mortality over time from 0.15 to 1.2 (Figure 5, DFO 2015). Setting that technical issue aside, allowing time-varying natural mortality in BASA would remove the ability to estimate additional mortality from disease, since any signal in natural mortality would be soaked up by time-varying natural mortality. This would compromise goal 2 of the project: the inclusion of new antibody data for VHSV into BASA. It is therefore premature to alter the structure of BASA at this time.*

- C. Consider constructing a similar BASA model for the Sitka fishery. To the extent that Sitka shares previously-identified large-scale environmental influences with PWS (Williams & Quinn 2000), combined models will increase statistical power. Conversely, if this pattern of correlation no longer applies in recent years, comparing models should help isolate the important differences or changes in the PWS system relative to Sitka. A long-term Sitka assessment may possibly allow the time-series gap in PWS assessments (no assessments 1957-1971) to be filled on the basis of correlated recruitment patterns.

*PI Response (10/11/2017)*

*This would be a very interesting addition, especially if the correlations in recruitment for Sitka, Seymour Canal, and Kah-Shakes have continued beyond the 1993 end point in Williams & Quinn (2000). Indeed the herring meta-analysis (in prep.) from the 2011-2016 program examines factors that might explain recruitment in all herring populations worldwide. A new model for Sitka is beyond the scope of our proposal, and would require substantial additional work, but if additional funds are available to support this expansion, we would gladly construct another BASA-type model for Sitka.*

The Panel strongly encourages addressing items A and B before the use of the BASA model for analysis of environmental influences and to take into consideration item C, even though it is not within the scope of the proposal the additional model will add to the already high quality of this project. The Panel also noted the merits of conducting sensitivity analyses to evaluate the importance of errors in assumptions or parameters, such as natural mortality, on model performance. Together with Items A and B, this would help to determine when the model is ready for MSE.

*PI Response (10/11/2017)*

*Sensitivity tests for model parameters are an integral part of the model assessment process for BASA. For instance, Muradian et al. (2017) reran the model with natural mortality of 0.15 and 0.35 in addition to the base value of 0.25 (excluding disease mortality), and also examined retrospective runs to test for bias in recent years.*

The Panel whole-heartedly supports the request to use the CPPG funding (total \$150K) toward 1.5 years of salary for another postdoc (David McGowan) to conduct synthesis work via modeling project with Trevor Branch. However, herring program needs to request an additional \$150K for the remaining 1.5 years (part of FY19 and FY20) needed to create a three-year synthesis, which would provide the minimum time needed for achieve appropriate synthesis.

*PI Response (10/11/2017)*

*We are excited to start work with David McGowan.*

References:

DFO 2015. Stock assessment and management advice for BC Pacific herring: 2015 status and 2016 forecast. Fisheries and Oceans Canada, Canadian Science Advisory Secretariat, Pacific Region, Science Response 2015/038.

Williams, E. H., Quinn, T. H. 2000. Pacific herring, *Clupea pallasii*, recruitment in the Bering Sea and north-east Pacific Ocean, I: relationships among different populations. Fish. Oceanogr. 9:285-299.

**Science Coordinator Comments – FY18**

**Date: September 2017**

I concur with the Science Panel's comments.

**PAC Comments – FY18**

**Date: September 2017**

There are no project specific comments.

**Executive Director Comments – FY18**

**Date: September 2017**

I concur with the recommendations of the Science Panel, Science Coordinator and Public Advisory Committee.

**FY17 Funding Recommendations:**

Science Panel	Science Coordinator	PAC	Executive Director	Trustee Council
Fund	Fund	Fund	Fund	Fund

**FY17 Funding Recommendations:**

Date	Science Panel	Science Coordinator	PAC	Executive Director	Trustee Council
May 2016	Fund	Fund	N/A	N/A	N/A
Sept 2016	Fund	Fund	Fund	Fund	Fund

**Science Panel Comments – FY17****Date: September 2016**

The original proposal, and the revision, was very well presented. The Panel appreciates the feedback from the PI on our concerns and the removal of some aspects of the proposal as suggested by the Panel. We understand the PI's justification to retain other aspects.

**Date: May 2016**

This is a well-written proposal that clearly shows the linkages with most of the other projects. The proposal lists six tasks, that are listed below (in Italics), with some short comments from the Science Panel on each.

*(1) maintenance and updating of the new Bayesian age-structured assessment (BASA) model based on the ASA model used by ADF&G, including annual assessment updates of PWS herring and the revision of BASA to fit to new data sources such as the age-0 aerial survey, condition data, and updated age at maturity.*

The Panel wondered what was meant by 'condition data'. Does this refer to the estimates of condition that can be derived from ASL data or does it refer to something else? Also, we assume that the updated maturity data would come from the Gorman proposal. The Panel also had some discussion on the benefits of new information on size-at-maturity and age-at-maturity or both for BASA. Regarding maturity data, we repeat that there is broad evidence of temporal and spatial structuring of herring on spawning grounds, and sometimes even in over-wintering areas. During spawning, larger, older fish tend to spawn earliest, and perhaps even at different locations than younger fish. Sampling during the spawning time can lead to bias in estimates of age composition, and may lead to errors in assumptions about age-at-maturity. Therefore, the Panel endorses the approach to provide empirical estimates of age-at-maturity with such temporal and spatial structuring in mind (also see Panel comments on Gorman proposal).

*(2) Adapting the BASA model to better model the disease component of natural mortality. Specifically, this would be based on new methods for detecting antibodies of viral hemorrhagic septicemia virus (VHSV) in archival and planned future collections of herring serum.*

The Panel endorses this task.

*(3) Continued collection and expansion of catch, biomass, and recruitment time series from all herring populations around the world to place the lack of recovery of PWS herring into context given patterns of change in herring populations around the world.*

The Panel is puzzled and perhaps ambivalent about this. This seems like a worthy task but the implications for PWS seem remote. Providing that this task is not a big-ticket item, it does not present any issues, although it is not clear why this needs to be shown as a distinct task, when it could have been conducted sub-rosa.



*(4) An initial exploration of factors that may be used to predict herring recruitment, including oceanography, climate, competition, and predation.*

The Panel strongly endorses this task.

*(5) A management strategy evaluation to test alternative harvest control rules for managing the fishery in the future, given realistic variability in productivity over time, and the possibility that the population has moved into a low productivity regime. Ecological, economic and social factors would be considered in the MSE.*

The Panel does not foresee the resumption of active herring fisheries in PWS anytime in the near future. Therefore while this task may have eventual worth, it belongs closer to the back-burner than the front.

*(6) Simulations to evaluate which data sources are the most useful in assessing future herring biomass, based on an MSE of the impact of each form of data on the accuracy of the BASA model.*

We recommend caution. While it may be sensible to proceed with data evaluation, it also is essential to have a concurrent examination of the efficacy and integrity of some of the key databases used in the assessment model. In particular the factors that might affect the time series of acoustics data have not been well explained in any document to date. Similar comments might be made about some other types of data used in the assessment model (see comments made in response to the Moffitt and Gorman proposals).

The proposal would also benefit from a discussion of how this model could be transferred to ADFG for their future use.

#### **Science Coordinator Comments – FY17**

**Date: May and September 2016**

I concur with the Science Panel's comments.

#### **Executive Director Comments – FY17**

**Date: September 2016**

I concur with the Science Panel's comments.

#### **Public Advisory Committee Comments – FY17**

**Date: September 2016**

The PAC meeting was Sept. 22, 2016 and fund recommendations are included in the table above. Any project-specific comments from that meeting will be added to the Work Plan when the comments are finalized in the meeting notes.

**Project Number:** 19170111-D

**Project Title:** Herring Program - Studies of Reproductive Maturity among Age Cohorts of Pacific Herring in Prince William Sound, Alaska

**Primary Investigator(s):** Kristen Gorman

**PI Affiliation:** PWSSC

**Project Manager:** NOAA

**EVOSTC Funding Requested FY17-21: \$850,000**

FY17	FY18	FY19	FY20	FY21
Auth: \$170,000	Auth: \$172,000	\$165,100	\$169,600	\$173,300

Requests include 9% GA.

#### Funding From Non-EVOSTC Sources FY17-21: \$0

FY12-17	FY18	FY19	FY20	FY21
\$0	\$0	\$0	\$0	\$0

**Total Past EVOSTC Funding Authorized (FY12-18): \$342,000**

**Total EVOSTC Funding Authorized (FY12-18) and Requested (FY19-21): \$850,000**

**Total Non-EVOSTC Funding (FY12-21): \$0**

#### Abstract:

*\*This abstract is excerpted from the PI's Proposal, dated 10/12/18, budget updated 9/18/18.*

To address the lack of recovery of Pacific herring (*Clupea pallasii*, hereafter herring) in Prince William Sound (PWS), Alaska, research by the Herring Research and Monitoring (HRM) Program has been focused on improving predictive models of PWS herring stocks through observations and research. To this end, the goal of the project described here is to test the PWS herring Bayesian Age-Structured Assessment model's age at maturity schedule with empirical data. The main objectives of the study originally proposed in FY17 are fourfold: 1) Assess the seasonal timing (spring, summer, fall, and winter) that allows for determination of both previously spawned and maturing female herring, and maturing male herring, based on direct measures of gonad development to assess reproductive maturation states per age cohort of interest (ages two through five) in PWS. The proportion of immature and mature herring per age cohort of interest can then be determined using the information obtained on maturation states. 2) Assess inter-annual variability in the proportion of immature and mature herring per age cohort of interest in PWS collected at the optimal seasonal time as determined by Objective 1 using direct measures of gonad maturation. 3) Couple histological analysis of gonad maturity with annual scale growth information at the individual level, within specific age cohorts of interest, to understand if scale growth patterns reflect reproductive investment; and 4) Assess annual variation in herring age at maturity schedules before and after 1997 using Alaska Department of Fish & Game's (ADF&G) PWS herring scale image library, which allows for understanding maturity schedules of past cohorts. The work to be conducted in FY19 is focused on Objectives 2-4, namely (2) assessing inter-annual variability in the proportion of immature and mature PWS herring per age cohort of interest (ages 2-5) collected at the optimal seasonal time as determined by Objective 1. Methods for determining the proportion of immature and mature herring at the optimal seasonal time in FY19 will follow those employed in FY17 and FY18. The work on Objective 3 couples histology results with annual scale growth information at the individual level, within specific age cohorts of interest, to understand if scale growth patterns reflect reproductive investment. The work on Objective 4 will focus on evaluating the potential of the scale technique for estimating past maturity schedules using ADF&G's PWS herring scale image library. This analysis will examine the progression of bimodal distributions in scale growth as a cohort of herring passes through time. The prediction is that if scale growth is related to investment in reproduction, then the frequency of fish showing reduced scale growth should increase as a cohort of fish matures over time from age 1 through age 6. Methods for conducting the scale image library analysis have been included in this proposal.

#### FY18 Funding Recommendations

Date	Science Panel	Science Coordinator	PAC	Executive Director	Trustee Council
September 2018	Fund	Fund	Fund	Fund	Fund

	Contingent	Contingent	Contingent	Contingent	Contingent
October 2018	Fund	Fund	Fund	Fund	Fund

## Science Panel Comments – FY19

**Date: September 2018**

For the reasons outlined below the Science Panel recommend the PI begin analysis of archived scale samples now and not wait until FY21 as stated in the proposal. The Science Panel recognizes the importance of assessing age of maturity for the ASA model; however, we are still uncertain about some aspects of this project. Specifically, we advise that the efficacy of this approach (using archived scales to evaluate past maturity) should not require many years to evaluate, especially because two past projects (Moffit 2017 and Vollenweider et al (2018) have already made some assessments of scale measurements - although the work by Moffit did not specifically address age-at-maturity. Therefore, this part of the proposal is not clear. For instance, we understand the merit in examining field-captured fish, evaluating their gonads and then linking this with scales (although we have a specific comment below related to ship-board measurements of scales). We also note that this is an extension of the work described by Vollenweider et al (2018). Results from such an extension may have merit, but would not, by itself, address the fundamental objective of an *a posteriori* evaluation of previous maturation ogives which will require detailed measurements of archived scales. If the conclusions of Vollenweider et al. (2018) are valid, then one would expect to see frequency distributions of age-specific scale annuli that deviate from normal, probably beginning at age three - as indicated by Figure 18 in Vollenweider et al (2018). Namely, a bimodal distribution may be expected, where one mode represents fish that have matured and allocate considerable energy to reproduction and the other mode represents immature fish that continue to devote most energy toward somatic growth. If there were no evidence of changes in cohort-specific annuli measurements as the cohort age passed with time (i.e., the same cohort examined in subsequent years), then there would be no basis for the assumption (or hypothesis) that past maturity ogives can be gleaned from examination of archived scales. Inter-annual changes in cohort-specific frequency distributions of scale annuli must be detectable. This is the reason why we suggest that evaluation of archived scale should begin sooner, than later.

Is there a reason why existing scale measurements cannot be used immediately to evaluate the efficacy of the scale approach to estimating past maturity? For instance, Moffit advises that over 7,000 scales from the archived collection were digitized and measured. Can these data be used to evaluate the potential of scale measurements for estimation of the age of maturity?

*PI Response (10/12/18): The SP directive to begin work on ADF&G's scale library in FY19 is important feedback to this project, and I agree that an analysis following the thinking provided by the SP (i.e., cohort specific bimodal distributions) may be useful. A task has been added to the FY19 deliverables to examine if cohort-specific bimodal growth patterns can be discerned from imaged scales as part of the existing ADF&G PWS herring scale library. Further, the proposal has been edited to include details of this analysis, which are reported in the Changes to Project Design and Objectives section.*

We also suggest that the PI seriously consider the potential for macroscopic analysis of gonad histology (see Bucholtz, R.H., Tomkiewicz, J. & Dalskov, J. (2008) *Manual to determine gonadal maturity of herring (Clupea harengus L.)*. DTU Aqua-report 197-08, Charlottenlund: National Institute of Aquatic Resources. 45 pektronisk\_samlet.pdf.). This report, cited in the final EVOSTC report by Vollenweider et al (2018), is not mentioned in this proposal. Is there a reason why macroscopic

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evaluation is not used - especially at time of the year when evidence of maturation would be clear to the naked eye?

*PI Response (10/12/18): Macroscopic analysis of gonad histology was planned from the outset of this project and is following Bucholtz et al. (2008). This paper has been the focus of several conversations with the histology group doing the sample prep and veterinary pathology readings over the last 6 months. This paper has been added as an important citation in the proposal.*

As an aside, the Panel also cautions that measurements of fresh scales at sea might not be directly comparable to scales that are preserved in acetate. If both measurements were to be used, then some control tests (i.e., comparisons of measurements of fresh-mounted scales and acetate imprints) would be warranted.

*PI Response (10/12/18): We follow the ADF&G protocols for collecting, mounting, and measuring scales. We only make scale measurements in the lab once they are preserved in the same manner used by ADF&G. I apologize if the text is confusing about what is measured in the field. I think the confusion is a result of my describing a marine scale to take fish weight measurements right after describing the scale analysis. I modified the proposal text to make it clearer how the marine scale is being used.*

We share the Science Coordinator's concern of waiting until fall to ship all the samples. Rather, samples should be shipped as they are collected as stated in the original proposal. The process and associated costs should have been investigated and included in the original proposal.

*PI Response (10/12/18): Every effort going forward will be made to ship samples for histology as soon as possible. The proposal has been modified to reflect this approach for future field collections.*

Our concerns are sufficiently grave that we would like to see a revised proposal that addresses our concerns by Friday 12 October. We feel this is an important step, because at present we are not convinced that the proposal can achieve its stated goals. So while we do think that evaluation of age at maturity is an important effort that could significantly alter the ASA model output, we need more convincing that the data collected in this proposal will adequately answer those questions before being able to fully support funding.

*PI Response (10/12/18): Details have been added to the proposal to address the Science Panels concerns outlined in the review of the FY19 renewal proposal. I hope the Science Panel will find those changes acceptable. There has been significant progress made on this project in the last year and it would be great to keep this positive momentum going.*

### **Science Coordinator Comments – FY19**

**Date: September 2018**

The Science Panel had reservations at the start of this project and continues to have concerns for FY19 as noted in past Work Plans. I appreciate the figures presented in the preliminary results section but there is no discussion to go along with the figures so the reviewer has to interpret the figures. Discussion could include, for example, comparison of Figures 1, 3 and 5 to answer the question: is the age frequency distribution of herring in PWS different between spring, winter and fall?

*PI Response 9.6.18*

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*My apologies for the lack of a discussion, but the template instructions ask for preliminary results with figures and tables and does not specifically mention including a discussion of preliminary results. I would suggest that if this is a requirement for the project renewal application that it be specifically noted in the instructions. Confusion over what is required by the template forms is the same issue that caused a lot of heartburn with my renewal proposal last year (FY18) in that specific methods were asked for by the Science Panel, when the renewal template never specifically asked for methodology, mainly I think, because the methods were described in full in the original proposals and the renewal proposals were meant to be more streamlined. It would be helpful for the renewal templates to ask for the complete information that is requested for by the Science Panel for review of proposals.*

Figures 2, 4, and 6 show “Relationships between size and GSI” for herring caught during the three seasons but only data points are plotted. The relationship isn’t shown. I suggest running a regression and plotting it on the figure with an  $r^2$  value to show the strength of the relationship or re-labeling those Figures to “Size and GSI data for...”. And state that analysis of the relationship between size and GSI data will occur in FY18 (or FY19) and reported in the FY19 annual report.

*PI Response 9.6.18*

*I agree the text should not read “relationship” if no regression line is plotted. One important note, is that for many of the plots presented in Figs 2, 4, and 6, some have only 1 or 2 data points. I see that I included age class 1 in Fig. 6 to demonstrate that no age 1 fish were collected in spring 2018, and therefore there are no data points at all. It is difficult to run a regression with any confidence with few data points in some of these cases. Thus, for now, I have revised the text to read, as suggested, “Size and GSI data”, etc, and have made a note about the fact that analysis will be completed for the FY18 annual report.*

Also, the story from Figures 2, 4, and 6 would be more powerful if the x-axis starts right before the length of the fish captured, that way any relationship between length and GSI can be more clearly seen. For example, the standard lengths could start at 100 mm (with the exception of a possible outlier for Age-2 in Figure 6).

*PI response 9.6.18*

*I agree with the comment, and I’ve gone ahead and fixed the axes in Figs. 2 and 4. The “outlier” in Fig. 6 will make it difficult to change the axis much. However, the key point to the axes in these graphs is that they were on purpose made to be all the same so that you can compare across the age classes and see the shifts in size. So in this sense, the axes have to relative to the entire variability across all ages classes and therefore may compress some of the data.*

Additionally, the dashed horizontal line in Figures 2, 4, 6 is not defined in the figure captions. A suggestion for Figures 1, 3, 5: edit the x-axis so that the age numbers are centered below the data so it is obvious which each bar the age represents.

*PI response 9.6.18*

*My apologies, I actually meant to include this as I had it in the FY17 annual report. The information has been added to the figures. Agreed, the axes have been updated.*

I understand and appreciate reducing shipping costs by waiting to ship all histology samples after the fall field collection but will this delay data analysis and impede progress? How much will it cost to

send samples after each collection vs. shipping after the fall field collection? Was this not taken into account in the original budget?

*PI response 9.6.18*

*It was not clear from the initial discussion with the histology lab that the samples would have to be transferred to 70% alcohol for shipping to the east coast. Because of the alcohol, they are considered hazmat and must be processed by a certified haz mat shipper. Because there is no fedex in Cordova, the samples in 70% alcohol had to first be shipped from Cordova to Anchorage via barge, as they cannot fly without haz mat shipping papers, received by an agent in Anchorage that prepares the haz mat shipping papers and then forwards the samples via fedex to the east coast. The entire shipping costs are just under \$1000 for the barge, haz mat insurance, paperwork done by the agent in Anchorage, and the air shipment to the east coast. Thus, by shipping these all at once, as opposed to after each collection, we save research funds. However, this shipping schedule is contrasted with somewhat of a time delay. In 2017, the shipping was delayed due to the lack of samples collected in June and September, and we waited to ship samples until after the November collection. For 2018, samples will be shipped following the September collections. I will make sure the lab understands that data are needed for the FY18 annual report due in February 2018.*

The milestone/task timeline in Section 2A may need correcting. Please see the task “Draft FY17-21 Final Report”. Task is scheduled for all quarters in FY17 and FY18 but not in FY19 or FY20.

*PI Response 9.6.18*

*Since this is referring to submitting the final report for the entire project, shouldn't it only be due at the end of the 5-year program in 2021? I have removed the X's in FY17 and FY18, with the only X being at the end of 2021.*

**PAC Comments – FY19**

**Date: September 2018**

No project specific comments.

**Executive Director Comments – FY19**

**Date: September 2018**

I concur with the recommendations of the Science Panel, Science Coordinator and Public Advisory Committee.

**FY18 Funding Recommendations**

Date	Science Panel	Science Coordinator	PAC	Executive Director	Trustee Council
September 2017	Fund Contingent	Fund Contingent	Fund Contingent	Fund Contingent	Fund Contingent
November 2017	Fund	Fund	Fund	Fund	Fund

**Science Panel Comments – FY18**

**Date: September 2017**

The Panel appreciates the PI's work and effort during FY17 and understands that if the fish are not present, they can't be caught. The Panel whole-heartedly endorses the histology component to its full capacity. The Panel also strongly suggests recording gonad weights to determine age of maturity.

**Updated Science Panel and Science Coordinator comments (11/21/2017):**

The revised proposal is considerably improved and we appreciate the effort required for this revision. The objectives are presented more clearly and the technical approaches provide more detail. The study design is better explained and justified, and additional references were included. The revision demonstrates that the PI has a continued positive record of publishing journal articles and that the proposed work is well-coordinated with other concurrent projects in PWS. The Science Panel is pleased that the PI recognizes and acknowledges the risk associated with using scales to determine age at maturity in herring.

The Science Panel understands that the scale work is not proposed to begin until FY19, and the Panel will not expect to see preliminary results from Objective 3 in the FY19 proposal. However, we will expect to see preliminary results from Objectives 1 and 2 in the FY19 proposal. Looking into the future, if results from Objective 3 in FY19 offer no convincing evidence that scales can be used to evaluate or monitor age-specific sexual maturation of herring it is highly likely that this lack of evidence may compel the Science Panel to recommend a Do Not Fund for FY20.

The PI adequately addressed the Science Panel's concerns and comments and therefore, we have revised our recommendation of "Fund Contingent" to "Fund" for the FY18 proposal.

**Please see the FY18 Work Plan comments if you are interested in reading the detailed discussion between the Panel and PI regarding various technical issues the Panel and Science Coordinator requested be resolved before any approved funding is released.**

**Science Coordinator Comments – FY18**

**Date: September 2017**

I concur with the Science Panel's comments. I greatly appreciate Panel's suggestions and the PI's responses to the Panel's concerns.

**PAC Comments – FY18**

**Date: September 2017**

There are no project specific comments.

**Executive Director Comments – FY18**

**Date: September 2017**

I concur with the recommendations of the Science Panel, Science Coordinator and Public Advisory Committee. I appreciate the Science Panel's detailed comments and the PI's responsiveness.

**FY17 Funding Recommendations:**

Science Panel	Science Coordinator	PAC	Executive Director	Trustee Council
Fund	Fund	Fund	Fund	Fund

**FY17 Funding Recommendations:**

Date	Science Panel	Science Coordinator	PAC	Executive Director	Trustee Council
May 2016	Fund	Fund	N/A	N/A	N/A
Sept 2016	Fund	Fund	Fund	Fund	Fund

**Science Panel Comments – FY17**

**Date: September 2016**

We appreciate that the PI responded thoroughly to Panel comments and felt that the responses dealt effectively with some of our concerns. The proposal, and responses to questions made in the Panel review, made good use of the international scientific literature. We recognize a dilemma faced by this PI, however, that is trying attempting to build on results of past EVOSTC-funded work (by other PI's in earlier projects), that do not yet have accessible reports.

**Date: May 2016**

The four objectives are:

- (1) assess the seasonal timing (spring, summer, and fall) that allows for accurate determination of both previously spawned and maturing female herring based on ovary histology to determine maturation states;
- (2) couple histology results with annual scale growth information at the individual level, within specific age cohorts, to understand if scale growth patterns reflect reproductive investment;
- (3) assess whether annual scale growth patterns can be used to infer age at maturity at the individual level across age cohorts given results from objectives 1 and 2; and
- (4) assess inter-annual variability in age at maturity based on coupled histology and scale growth over a five-year period by focused, increased sampling during the optimal seasonal period given results from objectives 1-3.

This is an ambitious project and the Panel endorses the intentions of the proposed work, but not necessarily all of the details. First, and most importantly, the Panel strongly endorses the objective of determining an 'empirical' estimate of 'age-at-maturity'. It is widely recognized that spawning herring often show spatial and temporal segregation during spawning, with larger, older fish spawning early and smaller, younger fish spawning later. This is well documented for herring and for many other spring-spawning fish species. Ignoring this, by assuming that the age structure of samples taken during spawning represents the population at large can lead to serious errors in age-structured-assessments. Therefore to the extent that this proposal recognized that issue, the Panel is strongly supportive. To this end the Panel recommends the measurement of gonad size, and the estimation of a gonosomatic index, as the basis for estimating maturity of individuals. Collection of size data will also allow estimation of size-at-maturity, which may be important, as well.

The Panel also reiterates comments made on the age-structured model here about the likelihood that there is temporal and spatial structuring of herring with respect to size- and age-at-maturity. Estimation of age-at-maturity should keep such temporal and spatial structuring in mind when considering sampling protocols and data analysis.

Objectives 2-4 of this proposal are concerned with herring scales and the assumption that growth increments (or some other feature of scales) can provide a meaningful estimate of the age-of-maturation of a herring. If this were possible, the Panel agrees that such a measure would be useful, providing the criteria were rigorous and repeatable. However, the Panel has several concerns. One is that this proposal makes no mention of similar work that was recently conducted, and supported by the EVOSTC, by NOAA staff. Namely, is there evidence that this approach will work? This comment applies especially to the proposed study on scales, as potential indicators of age-of-maturity, and ovarian histology objectives. Insufficient information was provided to allow the Panel to evaluate the chances for success of this portion of the proposal. It is essential that this proposal shows that the proposed work will build on existing results and knowledge. Absent some basis for this approach, the



Panel is rather dubious of the chances for its success. The second concern is that there are a number of publications on herring and clupeid maturation, and criteria used for assessing maturation. The revised proposal should make it clear that the PI is aware of this work, and when appropriate, build on the existing knowledge base. Finally, the Panel does not understand why this work is proposed for five years. It should not require more than a year, or two, to evaluate the utility of scales as indicators of past maturity. The proposal should be revised accordingly.

**Science Coordinator Comments – FY17**

**Date: May and September 2016**

I concur with the Science Panel's comments.

**Executive Director Comments – FY17**

**Date: September 2016**

I concur with the Science Panel's comments.

**Public Advisory Committee Comments – FY17**

**Date: September 2016**

The PAC meeting was Sept. 22, 2016 and fund recommendations are included in the table above. Any project-specific comments from that meeting will be added to the Work Plan when the comments are finalized in the meeting notes.

**Project Number:** 19120111-E

**Project Title:** Herring Program – Herring Disease Program II (HDP)

**Primary Investigator(s):** Paul Hershberger

**PI Affiliation:** USGS

**Project Manager:** USGS

**EVOSTC Funding Requested FY17-21:** \$1,157,900

FY17	FY18	FY19	FY20	FY21
Auth: \$197,800	Auth: \$228,900	\$236,700	\$243,300	\$251,100

*Requests include 9% GA.*

**Funding From Non-EVOSTC Sources FY17-21:** \$321,400

FY17	FY18	FY19	FY20	FY21
\$61,700	\$63,600	\$64,000	\$65,200	\$66,900

**Total Past EVOSTC Funding Authorized (FY12-18):** \$1,298,500

**Total EVOSTC Funding Authorized (FY12-18) and Requested (FY19-21):** \$2,029,600

**Total Non-EVOSTC Funding (FY12-21):** \$405,600

**Abstract:**

*\*This abstract is excerpted from the PI's Proposal, dated 8/17/18, budget updated 8/28/18.*  
We will investigate fish health factors that may be contributing to the failed recovery of Pacific herring populations in Prince William Sound. Field samples will provide infection and disease prevalence data from Prince William Sound and Sitka Sound that will inform the ASA model, serological data that will indicate the prior exposure history and future susceptibility of herring to VHS, and diet information that will provide insights into the unusually high prevalence of Ichthyophonus that occurs in juvenile herring from Cordova Harbor. Laboratory studies will validate the newly-developed plaque neutralization assay as a quantifiable measure of herd immunity against VHS, provide further understanding of disease cofactors including temperature and salinity, investigate the possibility of an invertebrate host for Ichthyophonus, and assess the virulence of other endemic pathogens to Pacific herring. Information from the field and laboratory studies will be integrated into the current ASA model, a novel ASA-type model that is based on the immune status of herring age cohorts.

**FY19 Funding Recommendations:**

Science Panel	Science Coordinator	PAC	Executive Director	Trustee Council
Fund	Fund	Fund	Fund	Fund

**Science Panel Comments – FY19**

**Date: September 2018**

The Science Panel remains impressed with the level of productivity of the PI and the project. At what age are Abs first present in serum? Is there a difference between Sitka and PWS fish in this regard? In the comparison, were fish of the same age between the sites were they all just pooled? It is not clear in

the figure. If younger fish are most impacted by VHSV and survivors are the ones with serum Abs, then it is an interesting question and related to the Whitehead studies on when herring mount an Ab response and if this differs between populations. Some clarifications would be appreciated. We would like to see more detail regarding this topic so we can better understand the intriguing data presented.

*PI Response (10/31/18): We would like to thank the Science Panel and Science Coordinator for their constructive feedback on the proposed FY '19 work in the Herring Disease Program. We are also very excited about the VHSV antibody results from the fish health surveys in PWS and Sitka Sound. At this point, we are reluctant to overanalyze these observational data until we have more experimental data to facilitate their interpretation. Specifically, we have spent most of the summer of 2018 assessing the levels of antibodies in additional groups of wild herring and determining how these antibody levels correspond to population herd immunity against VHSV. We hope to have these results summarized for the final report of the FY'18 project. Additionally, we suspect that the antibody data presented in Figure 1 may be more meaningful when analyzed by herring year class in Dr. Branch's revised ASA model. We will be working with Dr. Branch to facilitate this integration during the fall of 2018.*

Also, does warmer water enhance disease prevalence?

*PI Response (10/31/18): The question of temperature and disease is rather complex, and Hershberger is currently working to address this issue in more detail by co-authoring a chapter in a Disease Ecology Textbook, describing the impacts of global climate change on disease. In short, the proximate effects of temperature are disease-specific. However, temperature can also influence host, pathogen, and plankton (intermediate host) assemblages that indirectly influence certain diseases.*

#### **Science Coordinator Comments – FY19**

**Date: September 2018**

This novel project continues to make excellent progress and be productive: three papers have already been published in FY18 and two more are in review. I am also impressed with the level of productivity of the PI and the project.

#### **PAC Comments – FY19**

**Date: September 2018**

No project specific comments.

#### **Executive Director Comments – FY19**

**Date: September 2018**

I concur with the recommendations of the Science Panel, Science Coordinator and Public Advisory Committee.

#### **FY18 Funding Recommendations:**

Science Panel	Science Coordinator	PAC	Executive Director	Trustee Council
Fund	Fund	Fund	Fund	Fund

#### **Science Panel Comments – FY18**

**Date: September 2017**

The Panel is pleased with the results, supports the additional funding requested, and finds the request to be reasonable and justified. Would it be beneficial (and cost-effective) for the Post-Doc (Maya

Groner) to help with this project without compromising her proposed research plan? If it can be managed, the Panel feels that this involvement would benefit both the new post-doc and this project.

*PI Response (10/11/2017)*

*Thank you. We anticipate integrating Dr. Groner's work into the HDP, as we feel Dr. Groner's contributions will be beneficial to the HDP, the Herring Research and Monitoring Program, and her scientific career. We foresee no conflicts and we are eager to start working with her.*

#### **Science Coordinator Comments – FY18**

**Date: September 2017**

I concur with the Science Panel's comments.

#### **PAC Comments – FY18**

**Date: September 2017**

There are no project specific comments.

#### **Executive Director Comments – FY18**

**Date: September 2017**

I concur with the recommendations of the Science Panel, Science Coordinator and Public Advisory Committee.

#### **FY17 Funding Recommendations:**

<b>Science Panel</b>	<b>Science Coordinator</b>	<b>PAC</b>	<b>Executive Director</b>	<b>Trustee Council</b>
Fund	Fund	Fund	Fund	Fund

#### **FY17 Funding Recommendations:**

<b>Date</b>	<b>Science Panel</b>	<b>Science Coordinator</b>	<b>PAC</b>	<b>Executive Director</b>	<b>Trustee Council</b>
May 2016	Fund	Fund	N/A	N/A	N/A
Sept 2016	Fund	Fund	Fund	Fund	Fund

#### **Science Panel Comments – FY17**

**Date: September 2016**

The PI adequately responded the questions the Panel raised about methodologies. The Panel fully supports the proposal by this PI. The brevity of this response should be seen as a tribute to the continued excellent work done in this project and the inter-projected cooperation and collaboration.

**Date: May 2016**

As in the past, the Panel reviewed the Herring Disease Program II proposal favorably overall. However, the Panel noted that some of the draft text was repetitious from previous submissions. Further, the Panel noted that not all of the previous objectives were fulfilled, especially related to inter-population comparisons. Therefore there are some distinct revisions that should be considered and incorporated in a final version of the proposal. The following are the points that were discussed:

Several of the Objectives were from the previous 5-year proposal and there was not a clear rationale why these were nearly identical to the previous proposal. While an extension of the earlier objectives makes sense, inadequate descriptions of previous accomplishments and application of these accomplishments will advance the knowledge of disease in PWS herring in the coming 5 years.

Pathogen-free herring have already been established to the Science Panel's knowledge. The proposal should explain how these fish will be used in studies, not how they are cultured. The Panel feels it is critical that disease free populations should be established for PWS and a Sitka or Kodiak/Cook inlet. That is, genetically distinct populations that may have differing disease susceptibilities.

The plaque neutralization assay data were already presented. The proposal should explain how these data will be employed in the coming 5 years. The past proposal indicated that there was to be a comparative study of herring populations from SE Alaska, including populations that are now established as genetically different from PWS fish. These include Sitka and Cook Inlet or Kodiak populations. Puget Sound populations may have different life histories and demographics so geographical comparisons may be less relevant than data from other Alaskan populations. At the Synthesis Symposium in Anchorage 2 years ago, a discussion of the immunity and exposure differences of populations was prominent but this approach is not described clearly in this proposal. Taking into account the very recent discovery of the unique genetic character of PWS herring, this comparative population susceptibility to disease becomes a high priority to the Science Panel.

Further, the Panel noted that there is some interesting new technology (high throughput pathogen monitoring systems based on Fluidigm's Biomark TM technology\*\*) that could be relevant to basic questions about the presence and persistence of diseases in Prince William Sound herring. The Panel is also aware that the PI is familiar with these technical developments. Therefore we would be interested in learning why such an approach was not considered – or alternatively, if such an approach could be considered in a revision of the proposal.

(\*\*<https://pag.confex.com/pag/xxiv/webprogram/Paper21716.html>)

#### **Science Coordinator Comments – FY17**

**Date: September 2016**

I concur with the Science Panel's comments.

**Date: May 2016**

I concur with the Science Panel's comments. The proposal would benefit from further discussion of how the work completed by this team from 2006 to present informed the proposed work.

#### **Executive Director Comments – FY17**

**Date: September 2016**

I concur with the Science Panel's comments.

#### **Public Advisory Committee Comments – FY17**

**Date: September 2016**

The PAC meeting was Sept. 22, 2016 and fund recommendations are included in the table above. Any project-specific comments from that meeting will be added to the Work Plan when the comments are finalized in the meeting notes.

**Project Number:** 19160111-F

**Project Title:** Herring Program – Surveys and age, sex, and size collection and processing

**Primary Investigator(s):** Stormy Haught

**PI Affiliation:** ADFG

**Project Manager:** ADFG

**EVOSTC Funding Requested FY17-21: \$831,500**

FY17	FY18	FY19	FY20	FY21
Auth: \$166,300	Auth: \$166,300	\$166,300	\$166,300	\$166,300

*Requests include 9% GA.*

**Funding From Non-EVOSTC Sources FY17-21: \$272,500**

FY17	FY18	FY19	FY20	FY21
\$54,500	\$54,500	\$54,500	\$54,500	\$54,500

**Total Past EVOSTC Funding Authorized (FY12-18): \$392,600**

**Total EVOSTC Funding Authorized (FY12-18) and Requested (FY19-21): \$891,500**

**Total Non-EVOSTC Funding (FY12-21): \$325,700**

**Abstract:**

*\*This abstract is excerpted from the PI's Proposal, dated 8/18/18, budget updated 9/18/18.*

The proposed project will conduct spring aerial surveys to document Pacific herring *Clupea pallasii* milt distribution and biomass as well as the distribution and abundance of sea lions, other marine mammals, and birds associated with herring schools or spawn. This proposed project will also provide a research platform (R/V Solstice) for an adult herring acoustics survey and disease sample collection and processing. Finally, we will collect and process age, sex, and size of herring for the acoustics surveys, spawning surveys, and the PWS Herring Research and Monitoring Program disease sampling. Aerial survey and age, sex, and size data have been collected since the early 1970s and are an essential part of the age-structured model used by the Alaska Department of Fish and Game to estimate the historical and future biomass for fisheries management. Acoustics surveys have been conducted consistently since 1995 and the age-structured model is also tuned to acoustics biomass estimates. This project will help to meet the overall program goal to improve predictive models of herring stocks through observations and research by providing necessary inputs to the age-structured assessment models of the Alaska Department of Fish and Game and the *PWS Herring Research and Monitoring Program* Bayesian model.

**FY19 Funding Recommendations:**

Science Panel	Science Coordinator	PAC	Executive Director	Trustee Council
Fund	Fund	Fund	Fund	Fund

**Science Panel Comments – FY19**

**Date: September 2018**

The Science Panel appreciates the substantial effort involved in this work and the quality of this proposal. We especially want to acknowledge and express appreciation for the inclusion of

retrospective data summaries, as shown in Figures 1-4. We further recognize that this work is fundamentally important for all of the herring projects. We note specifically the comment that weather impacted aerial survey efforts in 2018 (39.5 hours in 2018) and also that 2018 represented an “historical low” for the estimated mile-days of spawn. Did the adverse weather and low sampling effort contribute to the low estimate?

In view of the vital importance of this estimate of spawn we wondered if the PI had concerns about the adequacy of the survey effort. Specifically, was it limited by resources?

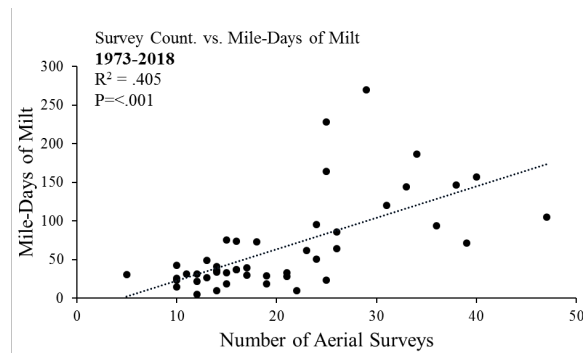
*PI Response (10/31/18): 2018 survey efforts were limited by the unusual prevalence of poor visibility and/or high wind flight conditions. Funding, staff availability, and pilot/aircraft availability were adequate in 2018.*

We also suggest that any further retrospective information about the aerial surveys, especially any data regarding the spatial coverage and temporal frequency and duration of flights could be useful for future analyses, particularly with reference to potential changes in herring distributions. Can and or should the mile-days reported be standardized by sampling effort?

*PI Response (10/31/18): Temporal and spatial data exists for historical surveys and a detailed spatial analysis of survey routes could be informative. The estimates generated by the aerial surveys were designed to be an index of relative abundance, comparable across the historical time series. As such, it is important to keep survey methods as consistent as possible to retain comparability among years. Unless a clear benefit was apparent, we would not support weighting mile-days of milt estimates by survey effort.*

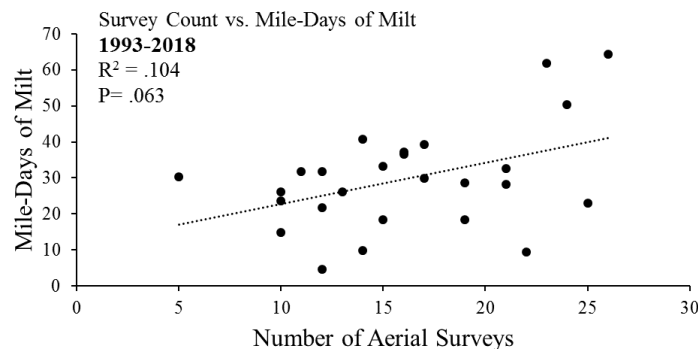
To reiterate we strongly encourage support for adequate survey effort to verify that the observed reduced spawn extent isn't an artifact of reduced survey coverage - and to ensure that major spawning is not missed. As with some other field sampling projects in the HRM program, the Science Panel is concerned that sampling effort is adequate to make population-level inferences.

*PI Response (10/31/18): Aerial surveys can only occur during Visual Flight Rules conditions as weather conditions allow. We fly when the weather allows. Estimates of mile-days of milt should be considered an index, and the surveys were designed to provide an estimate of relative abundance comparable across the historical time series. As such, changes in the method should be avoided if possible to retain the comparability of these estimates. Linear regression, using number of surveys (x) vs. mile-days of milt (y) shows a highly significant positive relationship when applied the entire time series (1973-2018, Figure 2). High numbers of surveys were flown 1981-1992, coinciding with high estimates of mile-days of milt during the same period (Figure 1)*



*Figure 1. Number of aerial surveys vs. mile-days of milt 1973-2018*

*When restricted to the post-commercial fishery time-period (1993-2018, although commercial openings occurred in 1997 and 1998), the relationship is much weaker (Figure 3). The 1981-1992 time-period, when high numbers of surveys coincided with high estimates of mile-days of milt, appears to be driving the strong relationship in figure 2. The poor relationship in recent years (1993-2018) suggests that reduced estimates of spawn extent are not likely an artifact of reduced survey coverage, although, admittedly, this is a simplistic analysis.*



*Figure 2. Number of aerial surveys vs. mile-days of milt 1993-2018*

We suggest that herring body condition index be related to zooplankton data and other parameters (see Batten et al. which examined herring body condition index with phytoplankton data).

*PI Response (10/31/18): We will work with other PIs in the PWS HRM program and others to determine what existing zooplankton data sets are available for analysis.*

We appreciate that the PI followed our suggestion from FY18 for conducting ground-truthing aerial observations with skiff surveys and recommend this to be continued for the remainder of the project (FY19-21).

*PI Response (10/31/18): We were able to ground truth 100% of observations in 2018 due to the limited spatial and temporal extent of spawning activity. Historically, mile-days of milt were not adjusted for ground truth observations. Due to the concerns of standardized survey methods and year-to-year comparability of this index we did not adjust for ground truth observations in 2018. The final estimate for 2018 mile-days of milt (4.52) would have been reduced by about .3 miles if adjusted for ground-truthing.*



### Science Coordinator Comments – FY19

**Date: September 2018**

This project provides important support and useful data for other HRM projects. Project is on task and preliminary results from FY18 are presented. PI is coauthor on a publication that is in review.

### PAC Comments – FY19

**Date: September 2018**

No project specific comments.

### Executive Director Comments – FY19

**Date: September 2018**

I concur with the recommendations of the Science Panel, Science Coordinator and Public Advisory Committee.

### FY18 Funding Recommendations:

Science Panel	Science Coordinator	PAC	Executive Director	Trustee Council
Fund	Fund	Fund	Fund	Fund

### Science Panel Comments – FY18

**Date: September 2017**

The Panel appreciates the support this proposal provides to the entire herring program. The basic survey approach looks reasonable (based on successful work of past years) and the budget also looks reasonable.

This proposal seems to one that provides important technical services to the herring program as well as to ADF&G. The text under ‘Executive summary’ is well-presented, forthright, detailed and appreciated. This text is also very ‘Alaska-centric’ – and almost appears defensive of existing approaches and methodology. A case in point concerns the use of ‘mile-days’ as the fisheries-independent index of herring abundance. This usage should be examined, both within, and outside of the context of the assessment model. There may be valid, biological reasons why ‘mile days’ could tend to inflate estimates of escapement, depending on the circumstances. This comment should not be taken as a criticism of this proposal, but applied to the entire herring program. The metric of spawning is fundamental to PWS herring and it warrants more attention – especially analyses of spatial and temporal variability, combined with herring population characteristics (size, age, etc.) As noted in last year’s work plan, similar comments can be made about the acoustic work. The Panel feels that the entire herring program would benefit from a detailed review of the past work, including times and locations of surveys, acoustic gear used for each survey. This recommendation was also expressed in last year’s work plan.

### PI Response (10/11/2017)

*The text is Prince William Sound centric because it explains the history of the data collection that this proposal continues.*

*The usage various data sets within the ASA model has been examined and reported in the final report for project 16120111-Q Population modeling by Trevor Branch and in the Masters thesis of Melissa Muradian (2015). We reference the work of Willette et al. (1999) as one effort to examine the usage of mile-days-spawn. The mile-days-spawn is only considered an index of the population and not meant to be considered a direct measure of the spawning biomass. The ASA model includes historical*

*dive surveys that the modeling project show as an anchor for the aerial survey data. In the past the logistics of conducting dive surveys were considered to make the effort too expensive to propose. With declining biomass in PWS and reduced dive surveys in Southeast Alaska there may be opportunities to develop a reasonably cost program conducted by divers trained for this type of survey. We will work to determine the feasibility and cost of conducting dive surveys in PWS. We will also continue to consider other approaches (rake or ROV surveys) to determine if a scientifically defensible survey can be conducted by alternate means.*

*There has been work examining the spawning characteristics, but none of it has been published yet. Dick Thorne was working on a manuscript detailing the shifts in timing and location of spawning in relation to predation pressure by whales, and we will have to follow up to determine the status of that effort. We have tried to use water temperature to help predict spawn timing for guiding survey timing. There appears to be a temperature that spawning does not occur below (~14.5C), but overwinter water temperatures have not been a consistent predictor of when spawning will begin. Spawn location, timing, and the relationship to environmental conditions are things appropriate for the analysis that David McGowan has proposed in his postdoc. The required aerial and acoustic survey information exists for that analysis.*

#### **Science Coordinator Comments – FY18**

**Date: September 2017**

I concur with the Science Panel's comments.

#### **PAC Comments – FY18**

**Date: September 2017**

There are no project specific comments.

#### **Executive Director Comments – FY18**

**Date: September 2017**

I concur with the recommendations of the Science Panel, Science Coordinator and Public Advisory Committee.

#### **FY17 Funding Recommendations:**

Science Panel	Science Coordinator	PAC	Executive Director	Trustee Council
Fund	Fund	Fund	Fund	Fund

#### **FY17 Funding Recommendations:**

Date	Science Panel	Science Coordinator	PAC	Executive Director	Trustee Council
May 2016	Fund	Fund	N/A	N/A	N/A
Sept 2016	Fund	Fund	Fund	Fund	Fund

#### **Science Panel Comments – FY17**

**Date: September 2016**

The Panel raised concerns about the need for ground-truthing that the PI explained could not be completed due the lack of vessel availability. The Panel recognized this explanation, but feels strongly enough about the importance of this activity that the we would be supportive of a Trustee Council decision to award modest additional funds needed to complete this activity pending an appropriate proposal.

The Panel recognizes that this project provides essential information and services for all other projects on the herring program. To reiterate the list of activities, the proposed project will:

- 1) conduct spring aerial surveys to document milt distribution and biomass;
- 2) document distribution and abundance of sea lions, other marine mammals, and birds associated with herring schools or spawn;
- 3) provide a research platform (R/V Solstice) for an adult herring acoustics survey and disease sample collection and processing; and
- 4) collect and process age, sex, and size samples of herring collected by the acoustics survey, spawning surveys, and disease sampling.

While supportive of all of these tasks the Science Panel has the following comments on several topic items (underlined below).

Distribution and abundance of sea lions, other marine mammals, and birds. The Panel strongly endorses this line of inquiry and notes that evaluation of the potential impacts of pinniped predation on herring is an active area of research in other parts of the northeast Pacific. The proposers should familiarize themselves with current research.

Aerial surveys. The Panel is aware of the discrepancy between results of past aerial surveys of milt and estimates made from SCUBA diver surveys, as discussed in the paper by Hulson et al (2008). Further, as explained in the Hulson paper, there was a substantial difference between aerial survey estimates of milt and estimates based on dive surveys. In view of the importance of estimates of milt, and/or egg deposition for herring assessments, the Panel strongly recommends that some effort be made to ‘ground-truth’ the aerial surveys. Specifically, at least some of the aerial survey data should be checked by visits to the site to confirm the geographic distribution of eggs. This does not necessarily require quantitative SCUBA surveys to estimate total egg counts (as was done by Willette et al. 1999). Simpler, less expensive approaches could be considered, such as site visits on small vessels, and use of grappling hooks to look for presence/absence of eggs. Regardless, some effort must be made to calibrate the aerial survey data on milt distribution.

Ideally, this effort such an effort at ground-truthing could even provide opportunities to provide some retrospective calibration of past milt surveys. We note elsewhere (see comments on Gorman proposal) however, that an additional measurement of ‘gonad weight’ could provide very useful information related to ‘age-at maturity’. Such an addition to the routine sampling would be relatively inexpensive.

Acoustics surveys. The Panel notes the pivotal role of acoustics survey data in the assessment methodology. However, we also note that this is the only time-series data that have not been systematically examined to account for any variation attributable to varying survey designs or modification of equipment – which could include vessel types. Of course we are aware of the 2008 paper by Thorne et al. (written as a companion paper to the Hulson paper in the same journal). However, unlike aerial survey data (from which there is a large and readily accessible data base), and also unlike the ASL (age-sex-length) databases, there is no readily accessible database on the historical acoustics data. However, there should be such a database, especially if such data are used in support of vital biomass assessments. Therefore a recommendation from the Panel is for the

development of a report on the acoustics data, as it is used, and has been used for herring assessments. Such a report should point out the strengths and limitations of such data, with emphasis on any methodological factors that might affect temporal trends in the data. Finally, to conform to normal protocols for assessments, we advise that the data, as it is used in the assessments, should be made accessible.

*Hulson, P-J. F., Miller, S. E., Quinn, T. J. II, Marty, G. D., Moffitt, S. D., and Funk, F. 2008. Data conflicts in fishery models: incorporating hydroacoustic data into the Prince William Sound Pacific herring assessment model. – ICES Journal of Marine Science, 65: 25–43.*

*Willette, T. M., Carpenter, G. S., Hyer, K., and Wilcock, J. A. 1999. Herring natal habitats, Exxon Valdez Oil Spill Restoration Project. Final Report (Restoration Project 97166), Alaska Department of Fish and Game, Division of Commercial Fisheries, Cordova, Alaska.*

*Thorne, R. E., and Thomas, G. L. 2008. Herring and the “Exxon Valdez” oil spill: an investigation into historical data conflicts. ICES Journal of Marine Science, 65: 44–50.*

#### **Science Coordinator Comments – FY17**

**Date: May and September 2016**

I concur with the Science Panel’s comments.

#### **Executive Director Comments – FY17**

**Date: September 2016**

I concur with the Science Panel’s comments.

#### **Public Advisory Committee Comments – FY17**

**Date: September 2016**

The PAC meeting was Sept. 22, 2016 and fund recommendations are included in the table above. Any project-specific comments from that meeting will be added to the Work Plan when the comments are finalized in the meeting notes.

*Footnote: This project has gone through several titles and PIs*  
*FY12: 12120111-F Buckhorn Juvenile Herring Abundance Index*  
*FY13: 13120111-F Buckhorn Juvenile Herring Abundance Index*  
*FY14: 14120111-F Buckhorn Juvenile Herring Abundance Index*  
*FY15: 15120111-F Buckhorn Juvenile Herring Abundance Index*  
*FY16: 16120111-F Rand Juvenile Herring Abundance Index and 16160111-T Moffit ASL Study & Aerial Milt Surveys began*  
*FY17: the work in 16120111-F was rolled into 16160111-T to create 17160111-F Moffit ASL Study & Aerial Milt Surveys.*  
*FY18: the project has a new PI, correct number is 18160111-F Haught*

**Project Number:** 19120111-G

**Project Title:** Herring Program – Adult Pacific Herring Acoustic Surveys in PWS

**Primary Investigator(s):** Peter Rand

**PI Affiliation:** PWSSC

**Project Manager:** NOAA

**EVOSTC Funding Requested FY17-21: \$379,900**

FY17	FY18	FY19	FY20	FY21
Auth: \$74,200	Auth: \$73,800	\$75,500*	\$77,300*	\$79,100*

*Requests include 9% GA.*

*\*Includes request for additional \$13K annually for FY19-21 for ship-time support and associated indirect costs to conduct more thorough surveys.*

**Funding From Non-EVOSTC Sources FY17-21: \$0**

FY17	FY18	FY19	FY20	FY21
\$0	\$0	\$0	\$0	\$0

**Total Past EVOSTC Funding Authorized (FY12-18): \$482,000**

**Total EVOSTC Funding Authorized (FY12-18) and Requested (FY19-21): \$713,900**

**Total Non-EVOSTC Funding (FY12-21): \$0**

**Abstract:**

*\*This abstract is excerpted from the PI's Proposal, dated 8/17/18, budget updated 8/28/18.*

We are continuing a long-term data set of biomass estimates of the spawning population of Pacific herring in Prince William Sound. This work primarily addresses Objectives 1 (expanding and testing the herring ASA model) and 2 (providing input to the ASA model). Since 1993, the Prince William Sound Science Center (PWSSC) has been carrying out acoustic surveys as a cost-effective approach to estimate the biomass of adult Pacific herring just prior to the spawning period. Here we propose to continue this sampling during 2019. **Our main goal for this proposed project is to produce an estimate of adult biomass of the spawning population of Pacific herring during 2019 in support of the age-structured assessment (ASA) model.** Prince William Sound herring stock biomass estimates from hydroacoustic surveys provide a measure of the stock abundance for use in the ASA model that is the forecasting tool used for management. Prior to 2001, the hydroacoustic surveys were conducted exclusively by the Prince William Sound Science Center (PWSSC). Since 2001, the effort has been shared between PWSSC and the Cordova office of Alaska Department of Fish and Game (ADF&G). While the ADF&G considers the hydroacoustic surveys to be critical the lack of a commercial herring fishery in PWS since 1998 resulted in reduced management priorities for herring. Thus, the PWSSC contribution has become critically important for the long-term, especially if a future fishery appears a remote possibility. As in recent years, we intend to continue to survey the two main spawning aggregation regions (Port Gravina and Fidalgo, and along the northeast coast of Montague Island). This will allow us to continue generating estimates of the total herring spawning biomass in PWS and provide an alert to changes in biomass in these two different regions. We propose to carry out this assessment in spring (March-April) to assess adult spawning biomass. Some adjustments are made each year based on aerial observations carried out by ADF&G. This

project will use the ADF&G data from direct sampling for age, sex and length in the estimates of biomass. The estimate will then be provided to the modeling project.

**FY19 Funding Recommendations:**

Science Panel	Science Coordinator	PAC	Executive Director	Trustee Council
Fund	Fund	Fund	Fund	Fund

**Science Panel Comments – FY19**

**Date: September 2018**

The Science Panel understands that both competition and cooperation for vessel time can occur. We further understand that results from acoustic surveys have an immediate impact on biomass assessments and other understanding of herring distribution and biology in PWS. Therefore, we have questions and concerns about the spatial and temporal consistency of herring distributions in PWS and the adequacy of the present acoustic surveys to detect change. This is not a criticism. Instead, it is a question about the adequacy of the spatial coverage of the surveys. We observe broad environmental changes that could impact herring distributions and we are concerned that potential changes in herring distributions could go undetected. Shifts in Pacific herring spawning distributions have been observed in other regions (e.g., SE AK, British Columbia). Thus, we support the request for additional funding to continue simultaneous surveys. We would also like to know what is the extent to which aerial surveys can be used to inform the acoustic surveys? Does the timing of each survey allow this?

*PI Response (10/31/18): Thanks for clarifying your concerns about the acoustic survey. It is important to note that each survey we conduct relies on information from the following sources:*

- 1. Aerial surveys conducted by ADF&G. This helps us in terms of timing and in identifying what areas to focus on in our survey. Observations of particular interest are the presence and distribution of predators (particularly sea lions and whales). Based on my experience in recent years, we receive information from 2-3 aerial surveys just prior to and during our acoustic survey, and we have found them very helpful to help us focus our field effort.*
- 2. Some early, reconnaissance surveys by a vessel charter in the eastern sound (particularly in Fidalgo and Gravina, and along Hawkins Island, beginning in mid-March). These surveys (both visual surveys for predators and evidence of herring aggregations from ship-board sonar) provides additional information early in the season.*
- 3. During a typical vessel charter day during our survey, we run long transects during the day to observe predators and roughly map out the area that contains any herring schools (based on ship-board sonar). This is done at a higher speed (compared to our night time transects with our tow fin deployed) to enable us to cover a relatively large area and determine the rough boundaries of our survey area.*
- 4. To maximize spatial coverage over the night, we use a sawtooth transect design and adjust the length of each transect leg based on our observations leading up to the time of the survey so we can be assured we are covering a large enough area.*
- 5. In addition, we do visit some bays where herring predators were noted in the ADF&G aerial survey (outside our traditional focal areas in Gravina/Fidalgo and NE Montague Island region). To date, none of these bays have yielded evidence of herring aggregations.*

*In short, I am confident that our survey coverage has been adequate to capture any changes that might be occurring in the distribution of spawning herring in PWS. Maintaining the amount of shiptime we have used in past survey years will allow us to continue this level of survey coverage into the future.*

**Science Coordinator Comments – FY19****Date: September 2018**

PI is making good progress, has already published one manuscript in FY18. Project is on track, even ahead of schedule for some tasks. PI anticipates compressed field seasons in the future due to recent patterns of fish distribution and behavior and multiple projects competing for R/V Solstice ship time. There has been difficulty in scheduling acoustic sampling that will allow for a complete survey. Thus, PI is requesting additional funding (\$10.3K annually for FY19-21) for 5 days of separate ship time for two simultaneous surveys in both eastern and western regions of herring spawning range. A complete acoustics survey is a critical component of the age-structured model, as it is the primary current data component driving population trends and the resulting forecasts.

**PAC Comments – FY19****Date: September 2018**

No project specific comments.

**Executive Director Comments – FY19****Date: September 2018**

I concur with the recommendations of the Science Panel, Science Coordinator and Public Advisory Committee

**FY18 Funding Recommendations:**

Science Panel	Science Coordinator	PAC	Executive Director	Trustee Council
Fund	Fund	Fund	Fund	Fund

**Science Panel Comments – FY18****Date: September 2017**

The Panel agrees that the acoustic surveys provide valuable information toward achieving the goals of the herring program. As noted in last year's work plan, the Panel appreciates the progress made to date but would like to see included results from the previous years, history of assessments and maps of survey tracks.

*PI Response (10/13/2017)*

*We thought the results from previous years was already available on the AOOS Gulf of Alaska data catalog. We are working with the Data Management program to make it available as soon as possible. The history of assessments and maps of survey tracks are available in the cruise reports and EVOS annual reports from 2000-2016. Raw data from 1993-1999 was not collected digitally and is no longer available, only the final processed biomass estimates remain. We will work with the data management program to make these available through the AOOS data catalog.*

**Science Coordinator Comments – FY18****Date: September 2017**

I concur with the Science Panel's comments.

**PAC Comments – FY18****Date: September 2017**

There are no project specific comments

## Executive Director Comments – FY18

**Date: September 2017**

I concur with the recommendations of the Science Panel, Science Coordinator and Public Advisory Committee.

### FY17 Funding Recommendations:

Science Panel	Science Coordinator	PAC	Executive Director	Trustee Council
Fund	Fund	Fund	Fund	Fund

### FY17 Funding Recommendations:

Date	Science Panel	Science Coordinator	PAC	Executive Director	Trustee Council
May 2016	Fund	Fund	N/A	N/A	N/A
Sept 2016	Fund	Fund	Fund	Fund	Fund

## Science Panel Comments – FY17

**Date: September 2016**

The Panel particularly appreciated the assembly of the historical acoustic database. This database is one of two key databases used for annual biomass assessments. Such an accessible database, supported by an accessible report is an essential component for continued biological assessments.

Therefore we salute the progress made to date but urge the complete of the documentation of past acoustic surveys.

**Date: May 2016**

This proposal was well-written and the objectives are very clearly stated: “to continue a long term data set of biomass estimates of the spawning population of Pacific herring in Prince William Sound.” This proposal primarily addresses Objectives 1 (expanding and testing the herring ASA model) and 2 (providing input to the ASA model). Since 1993, the Prince William Sound Science Center (PWSSC) has been carrying out acoustic surveys as a cost-effective approach to estimate the biomass of adult Pacific herring just prior to the spawning period. The stated goal is to “produce a reliable estimate of adult biomass of the spawning population of Pacific herring for each year during 2017-2021 in support of the age-structured assessment (ASA) model”.

The Panel notes that this work provides essential information for the herring assessment model, and for this reason the work should continue as proposed. We also note and commend the PI for ensuring that the continuity of this work will continue as it has been conducted in the past. The Panel has several concerns and comments, however, one of which was mentioned in the response to the Moffitt proposal. That is, there is not a readily accessible database of the past acoustic surveys. Ideally there should have been annual reports showing dates and time and location of surveys, and locations where herring were, and were not, found. As much as possible these last surveys should also have commented on any issues (technical, methodological or biological) related to species identification and other factors that might have affected that validity of the data. In lieu of this and in recognition of the vital importance of these past acoustics data to the herring assessment process, the Panel recommends that a quantitative synopsis of past work be prepared, as an essential element in the assessment process. Further, the Panel appreciated that comments on target strength of herring, but also notes that there have been changes in size-at-age, and perhaps condition of PWS



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herring during the past several decades. Could such changes affect target strength? Perhaps there have been other changes? Therefore we wonder how such changes in the physical and biotic environment would have affected estimates of herring biomass. Clearly there may be other concerns about acoustic work as reliable indicators of herring biomass. In view of such uncertainties, the Panel encourages the PI to take a more rigorous and critical approach to acoustic assessments. We suggest that such an approach would be, in the longer term, the most valuable information that could be provided, regardless of whether it supported, or challenged the historical time-series of acoustics data. The PI of this project, more than anyone else, is in a position to put many assumptions to the test – while still providing the necessary data that will provide a time-series input to the assessment model.

**Science Coordinator Comments – FY17**

**Date: May 2016**

I concur with the Science Panel’s comments.

**Executive Director Comments – FY17**

**Date: September 2016**

I concur with the Science Panel’s comments.

**Public Advisory Committee Comments – FY17**

**Date: September 2016**

The PAC meeting was Sept. 22, 2016 and fund recommendations are included in the table above. Any project-specific comments from that meeting will be added to the Work Plan when the comments are finalized in the meeting notes.

**Project Number:** 19170115

**Project Title:** Genomic mechanisms that underlie lack of recovery of Prince William Sound herring following the 1990s collapse

**Primary Investigator(s):** Andrew Whitehead

**PI Affiliation:** UC Davis

**Project Manager:** USGS

**EVOSTC Funding Requested FY17-21: \$1,761,000**

FY17	FY18	FY19	FY20	FY21
Auth:\$224,700	Auth:\$492,800	\$478,000*\$	\$322,700\$	\$242,900\$

Requests include 9% GA. \*Includes additional \$54.9K recommended by the PAC for oil dosing equipment. \$Includes additional requests for travel (\$2.6K) to the HRM Annual PI meeting for FY19-21.

**Funding From Non-EVOSTC Sources FY17-21: \$0**

FY17	FY18	FY19	FY20	FY21
\$0	\$0	\$0	\$0	\$0

**Total Past EVOSTC Funding Authorized (FY18-19): \$717,500**

**Total EVOSTC Funding Authorized (FY17-18) and Requested (FY19-21): \$1,761,000**

**Total Non-EVOSTC Funding (FY17-21): \$0**

**Abstract:**

*\*This abstract is excerpted from the PI's Proposal, dated 8/16/18, budget updated 10/3/18.*

The long-term health of fisheries is of crucial importance for the economic health of our coastal communities and for the food security of our nation. Therefore, the causes and consequences of changes in stock abundance merit careful scientific evaluation. The causes of the collapse of the Prince William Sound (PWS) Pacific herring stock are controversial, and the reasons for the lack of recovery remain a mystery. In the research proposed here we interrogate the genome structure and genome function of PWS fish to test hypotheses about the causes and consequences of the collapse, by revealing ecological, evolutionary, and genetic mechanisms governing the demographic trajectory of PWS fish over the past ~30 years. Conspicuous events that coincided with the dramatic PWS collapse include the *Exxon Valdez* oil spill (EVOS) four years previous, and the emergence of disease. We test hypotheses concerning the effects of oil exposure, the effects of disease challenge, and their potential interactive effects, on herring health and fitness. We will test predictions and hypotheses by reconstructing genome-wide genetic change through time (over the past 30 years) in PWS fish, and compare this to population genetic change through time in two reference site populations. Furthermore, a series of laboratory-based experiments will test for population differences in their response to oil exposure in early life and subsequent resilience to pathogen exposures. Physiological measurements and patterns of genome-wide gene expression will serve to reveal similarities and differences in mechanisms of response to these stressors between PWS and reference population fish. These studies should provide novel insights into the causes and consequences of recent dramatic demographic changes in PWS fish, potentially inform novel intervention strategies, and provide modern genomic resources for management and conservation of Pacific herring.

**FY19 Funding Recommendations:**

Science Panel	Science Coordinator	PAC	Executive Director	Trustee Council
Fund	Fund	Fund	Fund	Fund

**Science Panel Comments – FY19****Date: September 2018**

The Science Panel was very pleased with the project and its development and the extent to which the PI has trouble-shot various approaches and arrived a rigorous way to address questions without being able to simultaneously access samples from all populations. The reallocation of funds by the PI to purchase the oil dosing system had the unanimous support of the science panel, and we look forward to seeing further results. The PI has made rapid use of technological advances in genomic analysis leading to what we considered “great bang for the buck”. The Science Panel and Science Coordinator remained impressed with this work and the broad application these results will have to other fisheries globally. We are excited to see comparisons made with data from Puget Sound. We continue to be enthusiastic for your project and appreciate your hard work and efforts.

**Science Coordinator Comments – FY19****Date: September 2018**

PI continues to make excellent progress. Milestones and tasks are on track. The first draft of a reference genome assembly for herring has been completed. Differences in the seasonal timing of spawning from each population requires oil dosing for these considerably complex experiments to be highly reproducible so accurate and robust population contrasts can be made. The results of this experiment will make valuable contributions in determining the potential of PWS herring to resist disease after exposure to oil compared to other stocks and will be an important contribution to understanding the dynamics of herring as well as the potential effects for fish stocks exposed to other oil spills globally. Noted is that there is strong support for this project from the PAC and recommendation for an additional \$50K for the cost of the oil dosing equipment. To facilitate collaboration with the HRM Program and as per discussions with the HRM program and PI this project will be part of the HRM program starting in FY19; this proposal is revised to include travel costs to the annual HRM PI meeting.

**PAC Comments – FY19****Date: September 2018**

The PAC discussed the fact that the PI reprogrammed funds to purchase an oil dosing system that was not in the original project budget. It was discussed that prior similar studies would have been strengthened by use of this equipment. The PAC noted the need for high tech equipment in genetics work and recommended the additional funding of \$50K for the oil dosing system for this project.

**Executive Director Comments – FY19****Date: September 2018**

I concur with the recommendations of the Science Panel, Science Coordinator and Public Advisory Committee.

**FY18 Funding Recommendations:**

<b>Science Panel</b>	<b>Science Coordinator</b>	<b>PAC</b>	<b>Executive Director</b>	<b>Trustee Council</b>
Fund	Fund	Fund	Fund	Fund

#### **Science Panel Comments – FY18**

**Date: September 2017**

The Panel was pleased to see the integration with Paul Hershberger's disease work, linking them to see if there is a genomic change in response to these different pathogens in the PWS herring population. The Panel appreciates that goals are being achieved ahead of schedule and cost-effectively, allowing for additional samples at other locations. The Panel approves the shift of funds from future years to FY18 to get the postdoc onboard to work with the data being generated. There are many great collaborations being made. The Panel is excited to have the entire genome and transcriptome for herring mapped for other studies, including the possibility of adding more value to herring stock responses in Southeast Alaska. There might be another source of archived samples in Pacific Northwest (Doug Hay - Barkley Sound?).

#### **Science Coordinator Comments – FY18**

**Date: September 2017**

I concur with the Science Panel's comments.

#### **PAC Comments – FY18**

**Date: September 2017**

There are no project specific comments.

#### **Executive Director Comments – FY18**

**Date: September 2017**

I concur with the recommendations of the Science Panel, Science Coordinator and Public Advisory Committee.

#### **FY17 Funding Recommendations:**

<b>Science Panel</b>	<b>Science Coordinator</b>	<b>PAC</b>	<b>Executive Director</b>	<b>Trustee Council</b>
Fund	Fund	Fund	Fund	Fund

#### **Science Panel Comments – FY17**

**Date: September 2016**

This innovative proposal complements the Herring Research and Monitoring Program by conducting a retrospective (pre-spill to present) analysis of genome diversity and the potential impacts of oil exposure on immune deficiency, as well as an assessment of the ability of current genetic diversity to cope with ongoing disease issues. The current Herring Program is focused primarily on stock assessments and current factors affecting the lack of recovery (e.g., whale predation, disease monitoring, and recruitment issues). The Science Panel is supportive of the proposal because of the potential to answer important questions about the cause of the herring population crash as well as important genetic factors that may inhibit recovery. Notably, this project combines genome (Whitehead) and disease (Hershberger) expertise, and makes use of valuable genetic samples archived by ADFG pre-spill to present. The Panel is quite enthusiastic about this new approach and opportunity to assess the evidence for mechanistic ties between oil and herring immune deficiency by bringing genomic expertise to bear on herring disease issues. The PI has an excellent track record of

productivity and expertise. A major strength of the proposal is the utilization of fish tissues samples that have been archived for almost 30 years at ADFG. This work draws upon ADFG's existing tissue collection, in combination with advanced genomic techniques, to provide a unique (and possibly unparalleled) view into the population, genetic and evolutionary history of Alaskan herring before, during and after the oiling event. This unique opportunity to utilize ADFG samples, collected and archived across decades, will facilitate a novel approach to the pressing problem of lack of herring recovery and result in valuable information regarding the PWS herring genome.

The PI builds a strong case in support of the hypothesis that oil exposure has suppressed the immune response of herring to disease thereby contributing to the crash and slowing recovery of PWS herring. The PI is uniquely positioned to address this question given that he has found strong evidence that exposure to PAHs and oil on the Atlantic and Gulf Coasts respectively has suppressed immune responses of killifish. The PI works with Paul Hershberger, who has produced internationally groundbreaking herring disease work supported by EVOSTC funding. The second tier of experiments will rear disease-naïve herring embryos from PWS and two other stocks, expose embryos to oil, and determine if there is a difference in response and in genome diversity with disease response genes. Rearing and exposure of fish will take place in the laboratory of Paul Hershberger, who has vast experience in producing disease naïve fish. This research on herring immune deficiency will be valuable in determining the potential of PWS herring to resist disease after exposure to oil compared to other stocks and will be an important contribution to understanding the dynamics of PWS herring, as well as the potential for fish stocks in general exposed to other spills elsewhere. In addition, the research is valuable regardless of the outcome (i.e., whether the link between oil and herring immune deficiency is supported mechanistically and whether or not there is a genetic diversity bottleneck effect) as the proposed work has the potential to contribute significantly to our understanding of both the causes of herring decline and the failure to recover to date – key issues to the mission of the EVOSTC.

The proposal's costs have been reviewed and are found to be appropriate for this level of technological capacity and typical for these types of advanced genomic techniques.

#### **General Comments:**

The PWS herring population collapsed several years after the spill and has not since had a sustained period of incremental growth. Scientific reports that describe potential causative linkages are matched by an approximately equal number of reports that describe alternative explanations for either the collapse, or lack of sustained recovery, or both. In short, even after several decades of research, we are still uncertain about whether there have been any long-term impacts of the spill on herring, or the herring collapse in 1993-94 and the lack of any sustained recovery. This project has the greatest potential to have a retrospective look at the past in a scientifically meaningful way.

This proposal has an unprecedented capacity to apply novel, highly technical research on Alaskan herring genomics to actually test the hypothesis that exposure to oil during the egg (or embryo) and early larval stages has led to a decrease in the genetic capacity of PWS herring to resist naturally-occurring, endemic disease organisms. This retrospective genome determination from archived genetics samples would determine if present-day PWS herring would be detectably different than their ancestors residing in PWS prior to the spill, and from other Alaskan herring populations. The proposal consists of several tests. One would be based on a time-series analyses of archived samples of herring collected and stored annually since the spill to test for change in the frequency of alleles

related to disease resistance or susceptibility in PWS versus areas that were not exposed to oil. A related test of differences in disease resistance of PWS herring from other herring would be based on laboratory experiments of reared herring from PWS and two other populations.

The proposal is important to EVOSTC and the State of Alaska. It addresses the most fundamental question of the herring program: what is the impact of the spill on herring and what factors are now affecting recovery? This project builds off the current herring monitoring program, and, most importantly, builds off the unique collection of archived herring collections from ADFG, the work proposed in this proposal, regardless of the results, will reflect positively on the EVOSTC. Moreover, the proposed work will likely have worldwide implications and applications for coastal marine fishes.

### **Specific Technical Comments:**

As is often the case with such novel, groundbreaking proposals, the Panel had a number of questions that the PI should address and submit to EVOSTC before reaching a final decision on the recommendation for funding the proposal. We are confident, given the expertise and track record of the investigators, that the PIs will submit appropriate details to these comments:

1. Add technical detail on pathogen exposure experiments. The Panel had several questions that need clarification. Which pathogens will fish be exposed to? Are these from purified sources that can be used at different times of exposure? Given the population differences and pathogen responses, this is a key detail that needs to be included. Will embryos/larvae from the different populations be tested simultaneously for oil and disease exposure in the lab? If not what assurances will be made that exposure (oil as well as pathogens) conditions are identical across populations? For example, how reproducible is the oiled gravel treatment and the pathogen challenge? What steps will be taken to ensure and verify this reproducibility? What will be the age of embryos at collection? That is, 10-14 day embryos may have a different transcriptome than 5-7 day embryos because they might have been exposed to environmental stressors such as UV, desiccation and salinity changes.
2. Aim 3 needs more details on replication, exposure duration and intensity.
3. Functional annotation of genes. It would be useful to mention existing genomic resources for similar species to assure the Panel that these genes and others of potential relevance can be identified and the genome annotated.
4. Add detail on retrospective population genomics sampling. Please provide information on where fish were sampled and the age classes of collected fishes to clarify how the longitudinal time series will be interpreted. For example, age 3 fish collected in 1993 would not have been exposed to oil, but age 8 would have been. Additional information is needed to ensure that samples were representative of the population at the time of sampling and that sample numbers are sufficiently large and were preserved in such a way that genomic level data can be recovered from the samples.
5. Ignoring alleles with less than 5% frequency. While this makes sense, with N=50 individuals, this means that genotypes with fewer than 3 individuals will be discarded. Depending on the degree of polymorphism, if diverse populations have large numbers of rare genotypes, this could result in many genotypes being ignored. This is a question, especially if disease perhaps maintains

diversity via negative frequency dependent selection. It would be helpful if the PI could address this potential issue.

6. Clarify Hershberger's role and budget needs. There appears to be considerably more effort from Hershberger than indicated by the total dollar request. We assume that this is the result of "in-kind" contributions, but it would be good to document the source of those funds so that we can both be assured that they will happen and to account for any leveraging of funds. The Panel noted that this sort of in-kind contribution might be time sensitive and this is another very good reason to support funding the project in this cycle.
7. Add additional detail on the budget. Please clarify budget details for each objective to allow the reviewers and Trustees to know what the cost for each piece of the work would be and to assess what funds from other projects (both those funded by EVOSTC and others) might be being already leveraged in this proposal (see #6).

#### **Science Coordinator Comments – FY17**

**Date: September 2016**

This proposal comes from a highly qualified team and offers a new and novel approach. I concur with the Panel's comments and recommendations for further detail.

#### **Executive Director Comments – FY17**

**Date: September 2016**

I concur with the Science Panel and Science Coordinator's comments.

#### **Public Advisory Committee Comments – FY17**

**Date: September 2016**

The PAC meeting was Sept. 22, 2016 and fund recommendations are included in the table above. Any project-specific comments from that meeting will be added to the Work Plan when the comments are finalized in the meeting notes.

## **Long-Term Monitoring Program Project Descriptions**



**Project Number:** 19120114

**Project Title:** Long-Term Research and Monitoring Program (Gulf Watch Alaska)

**Primary Investigator(s):** Mandy Lindeberg

**PI Affiliation:** NOAA

**Project Manager:** NOAA

**EVOSTC Funding Requested FY17-21: \$12,616,300**

FY17	FY18	FY19	FY20	FY21
Auth:\$2,278,800	Auth:\$2,574,900	\$2,540,100*	\$2,691,300*	\$2,531,400*

*Requests include 9% GA.*

*\*Funding includes additional requests for four projects. See project proposals for more details.*

**Funding From Non-EVOSTC Sources FY17-21: \$15,600,800**

FY17	FY18	FY19	FY20	FY21
\$1,795,000	\$1,786,000	\$1,632,000	\$1,651,000	\$1,596,000

**Total Past EVOSTC Funding Authorized (FY12-18): \$18,679,965**

**Total EVOSTC Funding Authorized (FY12-18) and Requested (FY19-21): \$26,442,565**

**Total Non-EVOSTC Funding (FY12-21): \$17,395,000**

**Abstract:**

*\*This abstract is excerpted from the PI's Proposal, dated 8/23/17, budget updated 9/18/18.*

The Gulf Watch Alaska (GWA) program directly addresses the Exxon Valdez Oil Spill Trustee Council's focus area, integrated long-term monitoring of marine conditions and injured resources services. The overarching goal of GWA is to provide sound scientific data and products that inform management agencies and the public of changes in the environment and the impacts of these changes on injured resources. GWA has a consortium of 13 projects organized in the following functional groups: three monitoring components (environmental drivers, pelagic, and nearshore), a program management team, a science review panel, a science coordinating committee, and an outreach steering committee.

The program has five primary objectives: 1) sustain and build upon existing time series in the EVOS-affected regions of the Gulf of Alaska, 2) provide scientific data, data products and outreach to management agencies and a wide variety of users, 3) develop science synthesis products to assist management actions, inform the public and guide monitoring priorities for the next 15 years, 4) continue to build on collaborations between the GWA and Herring Research and Monitoring (HRM) programs, as well as other Trustee program focus areas including the data management program, lingering oil and potential cross-program publishing groups, and 5) leverage partnerships with outside agencies and groups to integrate data and expand capacity through collaborative efforts.

To date in FY18, all field sampling projects have been completed as planned, PIs continued to leverage GWA funding and resources to enhance collaborative efforts in the Gulf of Alaska, and the program management team has completed reporting requirements, continued development of data products and outreach activities to engage stakeholders.

Overall, there are only minor changes to GWA program management, outreach, and sampling effort for FY19. We are requesting additional funding in four of the 13 work plans to replace agency-supported vessel charter

costs that are no longer available, resume summer forage fish surveys and aerial survey validation in PWS, and partially fund a postdoc to support science synthesis efforts.

#### **FY19 Funding Recommendations:**

Science Panel	Science Coordinator	PAC	Executive Director	Trustee Council
Fund	Fund	Fund	Fund	Fund

#### **Science Panel Comments – FY19**

**Date: September 2018**

Science Panel is pleased to see the continued increase in quality of the program and the program proposals. Science Panel was pleased with the increased emphasis by PIs on dissemination and publication of results from individual projects. The Panel encourages all PIs to bring their data together to tell a story that encompasses a bigger picture, which may be partially accomplished through the proposed synthesis papers.

*PI response (10/10/18)*

*The GWA program management team (PMT) and principal investigators (PIs) are devoted to the success of the program and maintaining professional quality. Currently, the program and PIs are focused on data syntheses for the 3rd year (monitoring year 8) science synthesis report, which will be a series of peer reviewed papers doing just that, bringing data together to tell bigger picture stories. In the long-term, we are discussing continued cross-component analyses and synthesis projects - including various modeling efforts - that will continue into the next 5-year (FY22-26) funding cycle.*

#### **Science Coordinator Comments – FY19**

**Date: September 2018**

The GWA program continues to be productive. I'm looking forward to the synthesis products that will be coming out of this program which will make important contributions in understanding how environmental changes have affected the GOA. I recognize that there are unforeseen circumstances (i.e., loss of previously leveraged vessel time) that have led to these project needs for FY19-21. The program is requesting an additional \$189K (includes GA) annually for four projects to replace agency-supported vessel charter costs that are no longer available, resume summer forage fish surveys and aerial survey validation in PWS, and partially fund a postdoc to support science synthesis efforts. I appreciate the process that was used to assess unfunded project needs which demonstrates that the Program Management Team and PIs are continually evaluating the GWA science program and determined to improve the projects where needed and fill knowledge gaps that exist.

#### **PAC Comments – FY19**

**Date: September 2018**

The PAC noted that the Science Programs have produced unique and very important long-term data sets. The PAC also commented on the thoroughness of how proposal information was presented, it was well organized and clear.

#### **Executive Director Comments – FY19**

**Date: September 2018**

I concur with the recommendations of the Science Panel, Science Coordinator and PAC.

#### **FY18 Funding Recommendations:**

Science Panel	Science Coordinator	PAC	Executive Director	Trustee Council
Fund	Fund	Fund	Fund	Fund

#### Science Panel Comments – FY18

**Date: September 2017**

The Panel is very pleased with Mandy's role in coordinating logistics and synthesizing results. The Panel is pleased about the hiring of Rob and Donna as the Science Coordinator and Program Coordinator, respectively, and looks forward to working with them. The quality of this proposal has improved greatly compared to previous years. The Panel is encouraged to see data presented and the evaluation of past years data to determine what the projects should do in the future. This Program has published many papers, which is a positive development and the panel is excited about the Long-Term Ecological Research funding (National Science Foundation) awarded to some of the projects. The Panel was encouraged and about Rob's plans for synthesis products including an analysis and publication(s) on biological impacts of the recent environmental changes.

#### Science Coordinator Comments – FY18

**Date: September 2017**

I concur with the Science Panel's comments. I also greatly appreciate the addition of point 7 in the proposal and will add it as a requirement for future proposals.

#### PAC Comments – FY18

**Date: September 2017**

There are no program specific comments

#### Executive Director Comments – FY18

**Date: September 2017**

I concur with the recommendations of the Science Panel, Science Coordinator and Public Advisory Committee.

#### FY17 Funding Recommendations:

Science Panel	Science Coordinator	PAC	Executive Director	Trustee Council
Fund Reduced	Fund Reduced	Fund Reduced	Fund Reduced	Fund

#### FY17 Funding Recommendations:

Date	Science Panel	Science Coordinator	PAC	Executive Director	Trustee Council
May 2016	Fund Reduced	Fund Reduced	N/A	N/A	N/A
Sept 2016	Fund Reduced	Fund Reduced	Fund Reduced	Fund Reduced	Fund

#### Science Panel Comments – FY17

**Date: September 2016**

The Panel appreciated the thorough and organized responses to our comments. The responsiveness of the program to Panel concerns was very much appreciated. Project specific comments for each proposal are included on each proposal's individual page below.

**Date: May 2016**

This LTM Program includes spatially and temporally linked studies that monitor abundances of many important predator-prey systems, especially ones involving forage fishes, a key forage-fish-consuming marine mammal – humpback whales, seabirds, and an apex predator – the killer whale, all in the context of continued monitoring of historic long-term transects for physical, chemical, and biological (phytoplankton, zooplankton) parameters . This set of concurrent temporal information holds promise for understanding how ocean conditions and climate change are modifying the PWS and NGOA ecosystems. Unfortunately, the proposed program did not seem to build off of the Program’s 2013 Synthesis document. There is a lack of some descriptions of previous work where needed and an absence of depth of hypotheses, comparisons and evolving discussions on the work proposed, so much of which is a continuation from past or related projects. For example, there continues to be a lack of discussion in individual project designs of previous scientific work that may be used to develop their hypotheses or that could be treated as a contrasting interactive web of species.

**Science Coordinator Comments – FY17****Date: May and September 2016**

I concur with the Science Panel’s comments.

**Executive Director Comments – FY17****Date: September 2016**

I concur with the Science Panel’s comments.

**Public Advisory Committee Comments – FY17****Date: September 2016**

The PAC meeting was Sept. 22, 2016 and fund recommendations are included in the table above. Any project-specific comments from that meeting will be added to the Work Plan when the comments are finalized in the meeting notes.

**Project Number:** 19120114-A and B

**Project Title:** LTM Program  
Program Management I – Synthesis and Coordination, Postdoctoral Researcher  
Program Management II – Administration, Science Review Panel, PI Meeting Logistics, Outreach and Community Involvement

**Primary Investigator(s):** Mandy Lindeberg (PM I)  
Katrina Hoffman (PM II)

**PI Affiliation:** NOAA, PWSSC

**Project Manager:** NOAA

**PM I EVOSTC Funding Requested FY17-21: \$1,105,600**

FY17	FY18	FY19	FY20	FY21
Auth: \$226,800	Auth: \$227,600	\$212,800*	\$216,100*	\$222,300*

*Requests include 9% GA.*

*\* Changes reflect transfer of funds for GWA program coordinator position from PM I to PM II (NOAA contract to NOAA Grant) for FY19-21 (no new additional funds are being requested. See Science Coordinator comments for details). Total also includes an additional requested \$62.3K per year to partially fund a postdoc position for science synthesis efforts for FY19-21.*

**PM I Funding From Non-EVOSTC Sources FY17-21: \$345,000**

FY17	FY18	FY19	FY20	FY21
\$69,000	\$69,000	\$69,000	\$69,000	\$69,000

**PM I Total Past EVOSTC Funding Authorized (FY12-18): \$1,162,900**

**PM I Total EVOSTC Funding Authorized (FY12-18) and Requested (FY19-21): \$1,814,100**

**PM I Total Non-EVOSTC Funding (FY12-21): \$410,000**

**PM II EVOSTC Funding Requested FY17-21: \$1,728,900**

FY17	FY18	FY19	FY20	FY21
Auth: \$277,100	Auth: \$282,400	\$382,500*	\$384,600*	\$402,300*

*Requests include 9% GA.*

**PM II Funding From Non-EVOSTC Sources FY12-21: \$0**

FY17	FY18	FY19	FY20	FY21
\$0	\$0	\$0	\$0	\$0

*\* Changes reflect transfer of funds for GWA program coordinator position from PM I to PM II (NOAA contract to NOAA Grant) for FY19-21. No new additional funds are being requested. See Science Coordinator comments for details.*

**Total Past EVOSTC Funding Authorized (FY12-18): \$1,977,600**

**Total EVOSTC Funding Authorized (FY12-18) and Requested (FY19-21): \$3,147,000**

**Total Non-EVOSTC Funding (FY12-21): \$0**

**Abstract:**

*\*This abstract is excerpted from the PI's Proposal, dated 8/17/18, budget updated 9/18/18.*

The Program Management I (PM I) project provides program coordination and science synthesis of data for the EVOSTC's integrated Long-term Monitoring of Marine Conditions and Injured Resources and Services program, referred to as Gulf Watch Alaska (GWA). The Program Management II (PM II) project is the administrative and outreach component of GWA. The Prince William Sound Science Center (PWSSC) serves as the fiscal agent for non-Trustee Agency recipients of GWA funds. The work plans for these two projects are combined because together they represent management of the GWA program and because the *Exxon Valdez* Oil Spill Trustee Council (EVOSTC) Science Panel requested combining the projects in 2017. The program management team (PMT, collectively PM I and PM II) oversees more than two dozen principal investigators, collaborators, and science reviewers to produce and integrate a wealth of scientific information on the northern Gulf of Alaska ecosystem and spill-affected area and share that information with others. Program coordination and science synthesis (PM I) improves linkages between monitoring efforts spanning large regional areas (Prince William Sound, Gulf of Alaska shelf, lower Cook Inlet). Program coordination includes facilitating program planning and sharing of information between principal investigators, other Trustee-funded programs, and non-Trustee organizations. High quality products and science synthesis efforts help communicate monitoring results by delivering reports, publishing data, developing scientific papers, supporting outreach, and integrating information across the entire program. Program administration, science review panel (SRP), logistics, and outreach and community involvement (PM II) complements work under the PM I project in many ways. The administrative portion of the PM II project oversees funds for non-trustee agencies, while also providing travel and logistics for GWA in-person meetings, teleconferences, maintaining GWA's website, and managing community outreach and engagement. So far in FY18, the PMT has maintained all of the program administration and outreach activities noted above and included hosting a community engagement event in Port Graham, producing 14 presentations/outreach products, and continued FY17-21 science synthesis efforts for four cross-component manuscripts and 6 - 10 new time series indicators (15-19 total from GWA) to assess ecosystem status in the Gulf of Alaska. Overall there are no changes to these projects' objectives, we are requesting partial funding to support a postdoc to assist with data integration and synthesis manuscripts.

**FY19 Funding Recommendations:**

Science Panel	Science Coordinator	PAC	Executive Director	Trustee Council
Fund	Fund	Fund	Fund	Fund

**Science Panel Comments – FY19**

**Date: September 2018**

The Science Panel continues to be impressed with the leadership of the PMT. The long list of publications and presentations is a reflection of the effective guidance applied by the PMT. Science Panel shares the Science Coordinator's concern that the postdoc is not lead author on any of the synthesis papers and the scientific growth for the product. Synthesis is part of the GWA program as stated in the original proposal: Program Goal C-Assess monitoring data holistically in order to better understand the range of factors affecting individual species and the ecosystem. And Objective 2- Provide and document integration of monitoring results – This includes cross-program standardization of data collection, GWA science synthesis products, and publications. However the Science Panel recognizes that this would be a good opportunity to inexpensively fund a program experienced postdoc.

The Science Panel is pleased that the graduate student will transition to a 60% postdoc in FY19 as this provides a career opportunity for him as well as synthesis opportunity. The Panel felt it was important that this is a true change in position from graduate student status and there was some concern expressed that the 40% portion of the position would remain in a "graduate student mode". It is important from a career perspective that the postdoc make independent contributions to synthesis efforts.

*PI Response (10/10/18)*

*We appreciate the positive feedback regarding GWA PMT leadership and our attempts to continually improve the program. Regarding postdoc mentoring, we understand the importance of providing opportunities for senior authored papers and professional development for a postdoc working with GWA. The immediate supervisors of the postdoc, D. Esler (19120114-H, Nearshore) and R. Suryan (19120114-A, this project), both formally held academic positions and have experience mentoring postdocs and graduate students. We have discussed and would develop the equivalent of a postdoc individual development plan, similar to what is required at academic institutions. As a 3-year postdoc position, there is ample time for contribution as both senior and co-author on publications currently in progress and yet to be identified, both synthesis-focused and otherwise. The student would transition to 100% postdoc following completion of degree requirements. This indeed would be a transition out of "graduate student mode" to an emphasis on career development and professional advancement.*

**Science Coordinator Comments – FY19**

**Date: September 2018**

The Program Management Team continues to provide excellent leadership for the GWA program. The GWA Science Coordinator is making progress with Science Synthesis products which includes 4 manuscripts to date. PMII has been productive with outreach activities and products.

There are two requests from the PMT. The first is for the GWA Program Coordinator's funding to be transferred to PMII (would be NOAA grant through PWSSC instead of NOAA contract) to avoid the costly overhead fees associated with the new NOAA contractor. The second is to partially fund a postdoc at \$63.2k/yr (includes GA) for FY19-21 that will be dedicated to synthesis efforts across components. Current PI time is largely devoted to collection and presentation of data within their projects, hiring a qualified postdoc who can link data streams from throughout the program would result in high value, broad-scale product in a timely manner. The postdoc candidate is well qualified; as a current PhD student in the GWA program, he is already familiar with the Program and has been highly productive. He is scheduled to complete his dissertation in 2019 so timing would work out well. The candidate is already being funded 0.40 FTE for FY19-21. What are the candidate's current responsibilities for FY19-21? If these responsibilities are different than working on synthesis products, how will they be distributed and accomplished or will these tasks be in addition to working on synthesis products?

*PI Response 8.31.18*

*The graduate student's current responsibilities in FY17-21 for a 0.40 FTE appointment with GWA is field data collection, logistics, data management, and analysis with the Nearshore component. When this candidate completes their degree in FY19 and switches to full-time, their current employer (USGS) will not have the additional 0.6 FTE funds to support their full-time employment. The nearshore PIs and GWA Science Coordinator are confident that the candidate could maintain their current 0.40 FTE GWA responsibilities while contributing an additional 0.60 FTE to GWA science synthesis in FY19-21. The*

*GWA Science Coordinator is currently the only person devoted to science synthesis and he is committed to leading one manuscript and supporting all others to the extent possible. The addition of a postdoc would provide much needed support to the Science Coordinator and to PIs who are volunteering to lead synthesis manuscripts. We feel this is a unique opportunity to obtain support for GWA science synthesis efforts while only having to request funding for an additional 0.60 FTE - and to avoid trying to replace the graduate student's knowledge and expertise in our program after completing their degree and moving on to full-time employment elsewhere.*

#### **PAC Comments – FY19**

**Date: September 2018**

No project specific comments.

#### **Executive Director Comments – FY19**

**Date: September 2018**

I concur with the recommendations of the Science Panel, Science Coordinator and Public Advisory Committee.

#### **FY18 Funding Recommendations:**

Science Panel	Science Coordinator	PAC	Executive Director	Trustee Council
Fund	Fund	Fund	Fund	Fund

#### **Science Panel Comments – FY18**

**Date: September 2017**

As stated above, the Panel is pleased with Mandy's leadership skills and very pleased with the proposal and organizational structure. The Panel appreciates the different management aspects of this proposal and proposal 18120114-B and suggests consolidating these two proposals into one Program management proposal. This would help to clarify how the two program management components relate to one another and to demonstrate lack of duplication.

#### *PI Response (10/11/2017):*

*The Program Management Team appreciates the Science Panel's suggestion to consolidate the management proposals: 1) 18120114-A or Program Management I and 2) 18120114-B or Program Management II projects. We are willing to consolidate the program management proposals and reports; however, the budgets for PMI and PMII need to remain separate, and would be reported on separately. We will work with EVOSTC staff to develop a reasonable format for consolidation and tracking.*

#### **Science Coordinator Comments – FY18**

**Date: September 2017**

I concur with the Science Panel's comments. I will work with Mandy to address the Panel's suggestion.

#### **PAC Comments – FY18**

**Date: September 2017**

There are no project specific comments.

#### **Executive Director Comments – FY18**

**Date: September 2017**



I concur with the recommendations of the Science Panel, Science Coordinator and Public Advisory Committee.

**FY17 Funding Recommendations:**

Science Panel	Science Coordinator	PAC	Executive Director	Trustee Council
Fund	Fund	Fund	Fund	Fund

**FY17 Funding Recommendations:**

Date	Science Panel	Science Coordinator	PAC	Executive Director	Trustee Council
May 2016	Fund	Fund	N/A	N/A	N/A
Sept 2016	Fund	Fund	Fund	Fund	Fund

**Science Panel Comments – FY17**

**Date: September 2016**

The Science Panel was pleased with the proposal and organizational structure. The structure of the coordinating committee and science review Panel sets the mechanisms for evaluation and adaptive management of the project. We also appreciated the responsiveness to Panel requests to streamline the budget.

**Date: May 2016**

The Panel is encouraged and gratified by Mandy Lindeberg's acceptance and participation in the role of Science Lead and looks forward to her leadership. The Panel did express concern that the science coordinator position is intended to be filled after the start of the Program. This key position will be responsible for the design and implementation of the Program and it may take longer than anticipated to find an individual with the appropriate education and skill sets. Is there a plan in place, if the hiring process takes longer than planned or a qualified candidate is not identified? If the position is not a NOAA employee as hoped, will this impact the projected five year cost?

**Science Coordinator Comments – FY17**

**Date: May and September 2016**

I concur with the Science Panel's comments.

**Executive Director Comments – FY17**

**Date: September 2016**

I concur with the Science Panel's comments.

**Public Advisory Committee Comments – FY17**

**Date: September 2016**

The PAC meeting was Sept. 22, 2016 and fund recommendations are included in the table above. Any project-specific comments from that meeting will be added to the Work Plan when the comments are finalized in the meeting notes.

**Project Number:** 19120114-B

**Project Title:** LTM Program - Program management II – Administration, Science Review Panel, PI Meeting Logistics, Outreach, and Community Involvement

**Primary Investigator(s):** Katrina Hoffman

**PI Affiliation:** PWSSC

**Project Manager:** NOAA

**SEE 19120114-A and B above for FY19-FY21**

**FY18 Funding Recommendations:**

Science Panel	Science Coordinator	PAC	Executive Director	Trustee Council
Fund	Fund	Fund	Fund	Fund

**Science Panel Comments – FY18**

**Date: September 2017**

The Panel appreciates the PI's coordination activities. The Panel suggests combining this proposal with 18120114-A into one Program management proposal.

*PI Response (10/11/2017):*

*See response in section above for project 18120114-A.*

**Science Coordinator Comments – FY18**

**Date: September 2017**

I concur with the Science Panel's comments.

**PAC Comments – FY18**

**Date: September 2017**

There are no project specific comments.

**Executive Director Comments – FY18**

**Date: September 2017**

I concur with the recommendations of the Science Panel, Science Coordinator and Public Advisory Committee.

**FY17 Funding Recommendations:**

Science Panel	Science Coordinator	PAC	Executive Director	Trustee Council
Fund	Fund	Fund	Fund	Fund

**FY17 Funding Recommendations:**

Date	Science Panel	Science Coordinator	PAC	Executive Director	Trustee Council
May 2016	Fund	Fund	N/A	N/A	N/A
Sept 2016	Fund	Fund	Fund	Fund	Fund

**Science Panel Comments – FY17**

**Date: September 2016**

The Panel appreciated the responsiveness to Panel requests to streamline the budget.

**Date: May 2016**

The administrative budget is substantial and the Program should be cautious with regard to such costs.

**Science Coordinator Comments – FY17****Date: May and September 2016**

I concur with the Science Panel's comments.

**Executive Director Comments – FY17****Date: September 2016**

I concur with the Science Panel's comments.

**Public Advisory Committee Comments – FY17****Date: September 2016**

The PAC meeting was Sept. 22, 2016 and fund recommendations are included in the table above. Any project-specific comments from that meeting will be added to the Work Plan when the comments are finalized in the meeting notes.

**Project Number:** 19120114-C

**Project Title:** LTM Program – Monitoring long-term changes in forage fish distribution, abundance, and body condition in PWS

**Primary Investigator(s):** Mayumi Arimitsu & John Piatt

**PI Affiliation:** USGS

**Project Manager:** USGS

**EVOSTC Funding Requested FY17-21: \$1,318,900**

FY17	FY18	FY19	FY20	FY21
Auth: \$198,800	Auth: \$229,800	\$292,100*	\$295,300*	\$302,800*

*Requests include 9% GA.*

\*Totals in FY19-21 include additional annual requests of \$70,850 per year that will be used to reinstate summer validation sampling of Herring Research and Monitoring Program aerial juvenile forage fish surveys (funding secured through PWSRCAC) and summer acoustic-trawl surveys.

**Funding From Non-EVOSTC Sources FY17-21: \$1,280,000**

FY17	FY18	FY19	FY20	FY21
\$256,000	\$256,000	\$256,000	\$256,000	\$256,000

**Total Past EVOSTC Funding Authorized (FY12-18): \$1,396,200**

**Total EVOSTC Funding Authorized (FY12-18) and Requested (FY19-21): \$2,286,400**

**Total Non-EVOSTC Funding (FY12-21): \$2,541,000**

**Abstract:**

*\*This abstract is excerpted from the PI's Proposal, dated 8/17/18, budget updated 9/18/18.*

Identifying drivers of change in forage fish populations is key to understanding recovery potential for piscivorous species injured by the *Exxon Valdez* oil spill. The goals of the Gulf Watch Alaska (GWA) forage fish monitoring project are to provide information on the population trends of forage species in the Gulf of Alaska (GOA) and to better understand how underlying predator-prey interactions influence recovering species and pelagic ecology within Prince William Sound (PWS) and the GOA. Sampling in FY17 (FY18 sampling begins Sept 11, 2018) indicated predator and prey abundances in PWS were low and forage species such as capelin and sand lance continued a 4-year trend of low occurrence in seabird diets in the GOA. Our continued sampling will provide insight into how forage fish populations respond to the persistence of or recovery from the recent Pacific marine heat wave. In FY19, we will continue acoustic-trawl sampling for the integrated predator-prey survey in PWS during fall (Sept/Oct), and seabird diet sampling at Middleton Island during spring/summer (Apr-Aug). We are requesting additional funds for FY19-21 to reinstate summer aerial forage fish surveys in PWS previously conducted by the Herring Research and Monitoring Program (HRM). The additional funding would provide the needed species composition and age class validation during HRM aerial forage fish surveys and extend the aerial and acoustic forage fish time-series that began during the North Pacific marine heat wave in 2014-16 and will be used to monitor the recovery of middle-trophic level species following a major Gulf-wide perturbation.

**FY19 Funding Recommendations:**

Science Panel	Science Coordinator	PAC	Executive Director	Trustee Council
Fund	Fund	Fund	Fund	Fund

## Science Panel Comments – FY19

**Date: September 2018**

The Science Panel recognizes the importance of annual ground-truthing of aerial surveys, and supports reinstating aerial surveys especially given that HRM has secured funding from RCAC for aerial surveys. The Science Panel wondered about the interannual spatial and temporal consistency of acoustic surveys. Shouldn't they be conducted over as broad an area as possible? It was noted that a lot of PWS has not been surveyed. Specifically how much of PWS is surveyed, including the deeper areas? Can the PIs advise whether this is important?

### *PI Response (10/10/18)*

*From our original 2012-2016 research program we concluded that a reduced and targeted set of summer acoustic transects would be an efficient way to conduct forage fish surveys over a broader area within Prince William Sound (PWS). These acoustic transects were designed with information on the distribution of forage fish in PWS, and were meant to sample high density forage fish areas important to breeding marine birds during summer in PWS. The summer surveys (conducted in 2014-2016) include 463 km of transects at 16 locations throughout the Sound. They target nearshore and relatively shallow areas because that's where the majority of forage fish biomass is concentrated in the Sound during summer. Accordingly, the shallow nearshore areas contain greater densities of marine birds than deeper offshore areas during summer as these are predators of sand lance, capelin, and juvenile herring. The Integrated Predator Prey surveys (Fall) began in the second funding cycle (FY17-21) with the purpose of better integrating the humpback whale, forage fish, and fall marine bird surveys. They were designed around three historically important humpback whale feeding areas where krill and juvenile and adult herring occur in coastal (<50m) and deeper waters (<300m) of PWS. The fall surveys include 139 km of transects in Montague Strait, Bainbridge Passage, and Port Gravina.*

The Science Panel is also curious to know what is the value added of this project over data already captured by herring surveys as most of the forage fish found in this project appear to be herring. Can the herring data be used to help assess forage fish abundance? The Science Panel realizes that the goals of these two projects are different, but could data and perhaps vessels be shared between this project and the HRM herring surveys?

### *PI Response (10/10/18)*

*Herring are very important prey in many areas of PWS and when populations are at high levels, they are the dominant prey item. However, herring alone does not support predator populations in PWS. Capelin, krill, and sand lance, are also important prey items. Our proposed survey work does not duplicate herring research. The Herring Research and Monitoring (HRM) program's aerial and GWA acoustic surveys of herring and forage fish are complementary as they sample different scale, habitats, and target species/size classes during the same time period. Broad-scale aerial surveys are useful for counting schools of juvenile herring and Pacific sand lance along shorelines. Finer-scale acoustic trawl surveys are better suited for capelin, juvenile walleye pollock, juvenile and adult herring, and krill. HRM acoustic surveys occur during spring and focus on herring spawning; the other important prey for predators in PWS that are noted above are not quantified by these herring-specific acoustic surveys. It would not be possible for GWA and HRM to share vessels for acoustic surveys because of differences in timing of surveys and survey objectives involving multi- vs. single-species surveys.*

## Science Coordinator Comments – FY19

**Date: September 2018**

Project is on track except for some metadata which is in progress and anticipated to be completed in fall 2018. I am encouraged to see that PIs are coauthors on a publication in review.

*Questions were emailed to PI for response on 8.30.18*

Are there any results besides the Middleton Island data to report for FY18?

*PI Response 9.4.18*

*The only field work for this project that has occurred so far in FY18 is Middleton Island. The Integrated Predator-Prey (IPP) surveys in Prince William Sound will take place 11-20 September. These results will be reported in the FY18 annual report*

The project requested an additional ~71K (includes GA) to resume June aerial forage fish surveys which will provide data for (1) validation for the HRM aerial surveys (which will now be funded by RCAC) and juvenile and adult herring indices for the ASA model, and (2) acoustic indices for important forage fish (capelin and sand lance) age structure and body condition during summer, species composition of zooplankton, juvenile pollock, herring for understanding food web dynamics. In regards to supporting the HRM aerial surveys, results from the first 5 yr program show that “validation efforts suggest herring and sand lance schools can be classified to species by aerial observers. Additionally, adult herring schools were always classified correctly; but smaller age-classes (i.e., age-0 and age-1) of herring could not be reliably distinguished from one another and were therefore combined as juvenile herring for our work conducted in July.”(16120114-O Final Report) and “In both this work and the previous effort, the majority of misidentified fish involved age-0 herring and sand lance.” and “Because the transformation of these age-0 fish usually occurs sometime in July, we conclude that identification errors by aerial observers would be lower in June when age-0 herring and sand lance are not visible from the air.” (HRM project 15120111-R Aerial Survey Support Final Report). So, if HRM is resuming aerial surveys in June and these aerial surveys have already been validated with acoustic surveys in 2012, 2013 and 2014, it’s not apparent why these surveys need to be validated again with acoustic surveys.

*PI Response 9.4.18*

*First just to clarify, the aerial survey validation is separate from the acoustic surveys. The aerial survey validation includes directed sampling of specific fish schools detected by the aerial observer. To do this, our team on the ground (in skiffs or a larger vessel) was directed to schools by the pilot after he had assessed the species and age of the schools. We collected fish using jigs, purse seine, cast net, or video to ground-truth the pilot's observations, which ultimately provided a measure of uncertainty in the pilot's observations.*

*In practice, the aerial surveys need to be ground-truthed every time they are conducted to validate species and age composition of fish observed from the aircraft – similar to targeted net sampling conducted during vessel-based hydroacoustic surveys. We validated the aerial surveys in 2014, 2015, and 2016. While the aerial surveys have been conducted in some years without ground-truthing, those surveys lack calibration and estimates of uncertainty. Furthermore, in addition to species and age composition, direct sampling of fish allows specimens to be collected for laboratory analyses (otolith analysis, stable isotope, energetics, etc.).*

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*Acoustic surveys in deeper water compliment the aerial surveys where fish are only observed in shallow nearshore waters. Additionally, the aerial shoreline surveys take 2 weeks to complete in the plane, and a boat needs to be on the water wherever the plane happens to be working. Because the boat is slow and can't leave from Cordova every day to get to all areas of PWS, and because validation only takes a few hours out of every day, it makes the most sense to use the vessel to also conduct summer acoustic surveys while it waits for the plane. Whether we do the acoustic surveys or not the vessel costs are the same (i.e., 2 weeks of charter time), so the summer acoustic-trawl surveys would just be value-added to make the project most efficient.*

Perhaps, more importantly, these data can be used to understand how prey resources influence marine bird trends during the breeding season and how prey resources affect humpback whale distribution and abundance. June survey data will aid in the understanding of how animals are responding to the blob, effects of which are still being observed in 2018. However, from the FY12-16 project final report (Appendix A), it appears that observations from Middleton Island support results from the summer forage fish surveys. Therefore, can the Middleton Island seabird breeding season diet sampling data be used as a proxy for the June forage fish surveys?

*PI Response 9.4.18*

*Middleton Island seabird diets are a good proxy for what's happening with many forage fish in the GOA and PWS. For example, we do think that Middleton diets are representative for capelin and sand lance, however, due to low occurrence in seabird diets in most years, they are likely insufficient for tracking PWS juvenile herring populations. Furthermore, it is prudent to sample fish within PWS because these habitats are oceanographically and structurally different from Middleton, and it's possible that changes can affect one area and not the other. Directly sampling forage fish in PWS will better relate to marine bird surveys that GWA is conducting in PWS. Finally, the summer 2014-2016 acoustic-trawl surveys were important because they provided indices of other important pelagic taxa not sampled effectively with aerial surveys, such as krill, young of the year walleye pollock, and gelatinous zooplankton. The summer acoustic surveys are especially interesting because they documented the middle-trophic conditions in PWS during the marine heat wave years (2014-2016) and continuing this time series could be very valuable moving forward as we document the recovery following this major perturbation. For example, we find in Cook Inlet that common murre have just experienced their third year in a row (at least 2016-2018) of complete failures, which is directly related to food availability and indicates the ecosystem has not bounced back yet. PWS was the center of distribution for the murre die-off over the winter of 2015-16, we have a very unique forage fish dataset from those years but we need more years of data to put them into context as the system recovers. For FY17-21 proposals, we prioritized continuation of the Middleton diet data collection as it provides the best and longest timeseries information on forage fish for the GOA region, however, it is not a replacement for summer forage fish sampling in PWS.*

**PAC Comments – FY19**

**Date: September 2018**

No project specific comments.

**Executive Director Comments – FY19**

**Date: September 2018**

I concur with the recommendations of the Science Panel, Science Coordinator and Public Advisory Committee.

**FY18 Funding Recommendations:**

Science Panel	Science Coordinator	PAC	Executive Director	Trustee Council
Fund	Fund	Fund	Fund	Fund

**Science Panel Comments – FY18****Date: September 2017**

The Panel was gratified to see a broader and stronger use of the Middleton Island monitoring data into the overall project and appreciates the sound science being conducted by the PIs. Huge improvements were made in data management, which can be attributed to the leadership of the Program.

**Science Coordinator Comments – FY18****Date: September 2017**

I concur with the Science Panel's comments.

**PAC Comments – FY18****Date: September 2017**

There are no project specific comments.

**Executive Director Comments – FY18****Date: September 2017**

I concur with the recommendations of the Science Panel, Science Coordinator and Public Advisory Committee.

**FY17 Funding Recommendations:**

Science Panel	Science Coordinator	PAC	Executive Director	Trustee Council
Fund Reduced	Fund Reduced	Fund Reduced	Fund Reduced	Fund

**FY17 Funding Recommendations:**

Date	Science Panel	Science Coordinator	PAC	Executive Director	Trustee Council
May 2016	Fund	Fund	N/A	N/A	N/A
Sept 2016	Fund Reduced	Fund Reduced	Fund Reduced	Fund Reduced	Fund

**Science Panel Comments – FY17****Date: September 2016**

The Panel expressed some concern about how the data would be interpreted. The PIs recognize they cannot provide sound-wide abundance estimates because of limited spatial sampling, but do not consider the implications of their limited sampling being a biased subset of potential sampling locations (only locations with whales). Some interpretations seem potentially circular: if there are fewer predators and fewer prey is that because the prey populations have declined and predators are declining or moving elsewhere, or because predators have reduced prey populations and are foraging elsewhere? Presumably within a season the correlation might even shift from initially positive to negative as the season moves on. Care will need to be taken in the interpretation of these data and what they mean for forage fish abundance. The PIs should carefully consider exactly how and for what



the data will be used.

Regarding the Middleton Island sampling, the Panel considered the relevance of this sampling both on biological and geographic considerations. It was not clear to us how the PIs would use data on presence in the diet to estimate abundance of forage fish? Presumably the bird diet is not just a strict reflection of abundance due to prey selectivity, spatial patterns in abundance of different prey species, etc. The Panel has concerns regarding the location of this work in the project and recommends the removal of the proposed effort at Middleton Island.

**Date: May 2016**

This project is part of a newly proposed “Integrated Predator-Prey Survey” program that seeks to integrate three proposed projects (Arimitsu, Moran, Bishop) into a single integrated survey. The survey would be conducted in the fall and would target persistent humpback whale feeding locations.

While the Panel is supportive of continued forage fish work, there are concerns regarding the actual integration of the three projects. The proposal appears to be an integration of PIs collecting data at the same time and location through a shared vessel. It was unclear from any of the three proposals how the data would actually be integrated to address the hypotheses of the Integrated Predator-Prey Survey. If the intent is not a true integration, then the project should be renamed accordingly. Also, based on the focus on known seabird and marine mammal foraging areas, the proposal should note that it does not intend to scale-up results to the level of PWS. Moreover, the Panel was unsure of how the seabird diet data from Middleton Island would be incorporated into the Survey, given its offshore GOA location, 130 km southwest of Cordova. The other projects are benefiting from data collected at the same time and location, but Middleton Island is not within any of the anticipated survey areas. The Panel acknowledges that inclusion of Middleton Island allows incorporation of a set of important seabirds not included elsewhere in the LTM Program, specifically an auklet, black-legged kittiwake, and puffins. The proposal is short on methodology. The Panel requests the proposers to expand the description of their methods as there is insufficient information for a thorough review.

**Science Coordinator Comments – FY17**

**Date: September 2016**

I concur with the Panel’s comments and, like the Panel, remain concerned regarding the applicability of the proposed Middleton Island data set. I appreciate the desire to maintain an existing data set but do not believe that the data is useful to either the individual project or the overall LTM Program. A stated goal of this project is an integrated data set from simultaneous surveys of three component projects to reduce vessel cost while combining sampling efforts with spatial and temporal consistency. Middleton Island is not within any of the proposed survey areas and the data will not be collected at the same intervals as the rest of the project. I recommend removing the requested amount for this work (\$40,000 for FY17) from the funding request and removing the scope of the work for the entire five-year Program.

**Date: May 2016**

I concur with the Science Panel’s comments. I support the individual projects that are part of the proposed “Integrated Predator-Prey Survey” but cannot determine how, if at all, the projects will actually integrate beyond sharing vessel time. The Middleton Island bird diet work appears incongruous with the other projects.

**Executive Director Comments – FY17****Date: September 2016**

I concur with the Science Panel and Science Coordinator's comments.

**Public Advisory Committee Comments – FY17****Date: September 2016**

The PAC meeting was Sept. 22, 2016 and fund recommendations are included in the table above. Any project-specific comments from that meeting will be added to the Work Plan when the comments are finalized in the meeting notes.

**Project Number:** 19120114-D

**Project Title:** LTM Program - Continuous Plankton Recorders

**Primary Investigator(s):** Sonia Batten

**PI Affiliation:** SAHFOS

**Project Manager:** NOAA

**EVOSTC Funding Requested FY17-21: \$406,200**

FY17	FY18	FY19	FY20	FY21
Auth: \$76,500	Auth: \$78,800	\$81,200	\$83,600	\$86,100

*Requests include 9% GA.*

**Funding From Non-EVOSTC Sources FY17-21: \$932,500**

FY17	FY18	FY19	FY20	FY21
\$183,700	\$183,900	\$186,300	\$188,300	\$190,300

**Total Past EVOSTC Funding Authorized (FY12-18): \$435,300**

**Total EVOSTC Funding Authorized (FY12-18) and Requested (FY19-21): \$676,200**

**Total Non-EVOSTC Funding (FY12-21): \$1,525,000**

**Abstract:**

*\*This abstract is excerpted from the PI's Proposal, dated 8/17/18, budget updated 9/18/18.*

The Continuous Plankton Recorder (CPR) transect samples the Alaskan shelf from lower Cook Inlet across the slope into the open Gulf of Alaska, providing a now 18-year record of taxonomically resolved, seasonal, near-surface zooplankton and large phytoplankton abundance over a wide spatial scale. Sampling takes place approximately monthly, six times per year, usually between April and September. Outputs from the project include indices of plankton abundance (e.g., large diatom abundances, estimated zooplankton biomass), seasonal cycles (phenology of key groups) and community composition (e.g., appearance of warm water species, change in dominance by some groups). Variability in any, or all, of these indices might be expected to flow-through to higher trophic levels such as herring, salmon, birds and mammals that forage across the region, some of which have been impacted by the *Exxon Valdez* oil spill. Results show that interannual variability in plankton dynamics is high and plankton responded clearly and rapidly to the warm conditions of 2014-2016, with changes evident in abundance, composition and timing. We are not proposing any major changes to this project for FY19.

**FY19 Funding Recommendations:**

Science Panel	Science Coordinator	PAC	Executive Director	Trustee Council
Fund	Fund	Fund	Fund	Fund

**Science Panel Comments – FY19**

**Date: September 2018**

The Science Panel would like to note that the PI's 2016 Fisheries Oceanography paper is a great example on how to present synthesis of data across trophic levels. The PI presented and discussed the preliminary results well. This project continues to produce valuable data and the Science Panel appreciates that this project has a diversity of other funding sources.

**Science Coordinator Comments – FY19****Date: September 2018**

PI continues to have a record of staying on track. This long-term time series continues to provide information to other projects. No other comments.

**PAC Comments – FY19****Date: September 2018**

No project specific comments.

**Executive Director Comments – FY19****Date: September 2018**

I concur with the recommendations of the Science Panel, Science Coordinator and Public Advisory Committee.

**FY18 Funding Recommendations:**

Science Panel	Science Coordinator	PAC	Executive Director	Trustee Council
Fund	Fund	Fund	Fund	Fund

**Science Panel Comments – FY18****Date: September 2017**

The Panel has no project specific comments.

**Science Coordinator Comments – FY18****Date: September 2017**

I concur with the Science Panel's comments.

**PAC Comments – FY18****Date: September 2017**

There are no project specific comments.

**Executive Director Comments – FY18****Date: September 2017**

I concur with the recommendations of the Science Panel, Science Coordinator and Public Advisory Committee.

**FY17 Funding Recommendations:**

Science Panel	Science Coordinator	PAC	Executive Director	Trustee Council
Fund	Fund	Fund	Fund	Fund

**FY17 Funding Recommendations:**

Date	Science Panel	Science Coordinator	PAC	Executive Director	Trustee Council
May 2016	Fund	Fund	N/A	N/A	N/A
Sept 2016	Fund	Fund	Fund	Fund	Fund

**Science Panel Comments – FY17****Date: September 2016**

The Panel has no project specific comments.

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**Date: May 2016**

The Panel notes this is a continuing time series of zooplankton information useful to a variety of other projects. The proposer (Batten) has a solid record of producing timely results, including a consistent dataset.

**Science Coordinator Comments – FY17**

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**Date: May and September 2016**

I concur with the Science Panel's comments.

**Executive Director Comments – FY17**

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**Date: September 2016**

I concur with the Science Panel's comments.

**Public Advisory Committee Comments – FY17**

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**Date: September 2016**

The PAC meeting was Sept. 22, 2016 and fund recommendations are included in the table above. Any project-specific comments from that meeting will be added to the Work Plan when the comments are finalized in the meeting notes.

**Project Number:** 19120114-E

**Project Title:** LTM Program - Long-term monitoring of marine bird abundance and habitat associations during fall and winter in PWS

**Primary Investigator(s):** Mary Anne Bishop

**PI Affiliation:** PWSSC

**Project Manager:** NOAA

**EVOSTC Funding Requested FY17-21: \$557,300**

FY17	FY18	FY19	FY20	FY21
Auth: \$90,100	Auth: \$92,700	\$121,900*	\$124,800*	\$127,900*

*Requests include 9% GA.*

*\* Totals in FY19-21 include additional annual request of \$26,200 to conduct November & March surveys in bays of PWS.*

**Funding From Non-EVOSTC Sources FY17-21: \$265,000**

FY17	FY18	FY19	FY20	FY21
\$53,000	\$53,000	\$53,000	\$53,000	\$53,000

**Total Past EVOSTC Funding Authorized (FY12-18): \$563,700**

**Total EVOSTC Funding Authorized (FY12-18) and Requested (FY19-21): \$928,300**

**Total Non-EVOSTC Funding (FY12-21): \$511,500**

**Abstract:**

*\*This abstract is excerpted from the PI's Proposal, dated 8/17/18, budget updated 8/28/18.*

The fall-winter marine bird surveys in Prince William Sound (PWS) will continue to build upon an 11-year time series (2007-2018) of marine bird abundance and habitat associations. Marine bird surveys occur onboard research vessels conducting oceanographic, fisheries, or marine mammal surveys, thereby increasing opportunities for cross-project collaboration and reducing project costs. Our September marine bird surveys are integrated with Gulf Watch Alaska forage fish assessments of prey availability and humpback whale prey consumption and population monitoring with all three projects sharing logistics, timing, and location of sampling. These integrated surveys allow us to estimate forage biomass at the same locations in which marine birds and humpback whales are feeding, thereby providing comparable information on both predator density and prey availability. We use established protocols employed by all other Gulf Watch Alaska marine bird survey efforts (Kachemak Bay/Cook Inlet, Seward Line/Gulf of Alaska, PWS summer). Of the marine birds that overwinter in PWS, nine species were initially injured by the *Exxon Valdez* oil spill, including three species that have not yet recovered or their recovery status is unknown (pigeon guillemot, marbled murrelet, and Kittlitz's murrelet). Fall through winter are critical periods for survival as food tends to be relatively scarce or inaccessible, the climate more extreme, light levels and day length reduced, and water temperatures colder. By monitoring marine birds during fall and winter we will improve our predictive models of species abundance and distribution across PWS in relation to biological and physical environmental factors. Our long-term monitoring has shown that the nonbreeding season cannot be characterized as a single time period when describing marine bird distribution and suggests that multiple surveys are required to quantify wintering populations and understand changes in marine bird distribution. The only change to the FY19 work plan is a request for charter vessel funding for November and March surveys. These surveys had relied on fishery survey vessels of opportunity that are no longer funded. The November and March surveys were originally conducted in

collaboration with the Herring Research and Monitoring program, then NOAA chartered vessels in FY17-18. New dedicated survey funding would allow us to continue identifying shifts in the winter marine bird community of PWS as well as their potential impact on juvenile herring.

#### **FY19 Funding Recommendations:**

<b>Science Panel</b>	<b>Science Coordinator</b>	<b>PAC</b>	<b>Executive Director</b>	<b>Trustee Council</b>
Fund	Fund	Fund	Fund	

#### **Science Panel Comments – FY19**

**Date: September 2018**

Was the same NOAA vessel leveraged by both projects during the March cruises? The Science Panel asks that the PMT and the PIs communicate with trust agencies, such as NOAA, USFWS and ADFG, to see if they could also use this vessel for any agency activities. We understand the reason for nearshore bay surveys and would like to know if using ships of opportunity is really efficient and if effort and funds should be redirected from open water to preferred nearshore habitats. Can parts of Figure 2 surveys be eliminated if they are not proving to be useful? Is it possible to leverage ship time for surveys from project 19120114-G Campbell? Specifically, there appears to be considerable overlap in spatial sampling proposed in bays in this proposal [Fig 4] with those in Campbell [Fig 1 from 19120114-G], and Campbell proposes 6 times yearly sampling.

#### *PI Response (10/10/18)*

*Yes, the same National Oceanic and Atmospheric Administration (NOAA) vessel was leveraged by both humpback whale and fall/winter marine bird projects (18120114-O, Moran & Straley, and 18120114-E, Bishop) during FY17 and FY18.*

*We will coordinate with agencies such as NOAA, U.S. Fish and Wildlife Service, and Alaska Department of Fish and Game to see if they could also use the dedicated marine bird survey vessel for additional activities.*

*Our surveys cover three basic habitat types: open waters, bays, and passages. The first 10 years of our surveys onboard ships of opportunity included all three habitats. However, when the juvenile herring surveys were discontinued in 2016 there was no longer coverage in the bays because the available ships of opportunity only covered open waters and passages. By using a dedicated marine bird vessel in November and March we can once again target bays for surveys in addition to continuing our data collection in open waters and passages while in transit between bays. The within-bay transects would be fixed, thus sampling within bays would not be opportunistic. The in-transit transects are while taking the shortest route between fixed bay transects and would also be relatively consistent, reducing spatial variability of the marine bird surveys. Given the geographic extent and high variability of the PWS ecosystem, sampling open-water areas while traveling between sampling locations is valuable to understanding distribution of marine birds in PWS. For example, our past surveys have identified several areas of high marine bird densities in open waters including Montague Strait and Orca Bay. Also, our current survey design is the most efficient way to sample bays distributed throughout PWS.*

*Finally, we are currently in communication with Dr. Campbell (project 19120114-G, PWS oceanography) regarding vessel-sharing during November and March. Dr. Campbell's sampling events typically occur over a 3-day period, while our surveys take approximately 6 days, so there would be additional personnel costs on his end. In addition, in its current configuration the vessel (R/V New Wave) would*

*need to be modified to accommodate a marine bird observer. Specifically, a small observing platform would need to be fabricated that would be placed on top of the cabin. We recognize that combining efforts could ultimately reduce costs by ~20%, so talks are ongoing.*

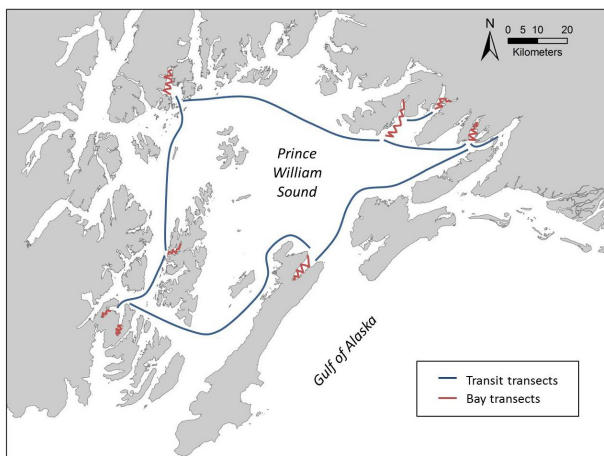
#### **Science Coordinator Comments – FY19**

**Date: September 2018**

PI continues to make good progress and the project is on track. PI continues to be productive and has another manuscript in prep for FY18. This project provides important data for regional comparisons of marine bird densities and other GWA projects in the Environmental Drivers group. NOAA vessels were leveraged for FY17 and FY18 for this project and 18120114-O Moran & Straley to conduct winter and early spring surveys and will no longer be available for FY19 and beyond. Funding (\$24K includes GA) is requested to continue the November and March cruises to continue work as described in the original project proposal. This study has shown that marine birds aggregate in nursery bays during nonbreeding seasons which may impact juvenile herring populations, knowledge which would contribute to the HRM program. Additionally, both projects 114-O and E are proposing to continue a spring/March cruise with requested funding. Is each project requesting its own vessel? If so, is there any way to share a vessel in March to reduce costs?

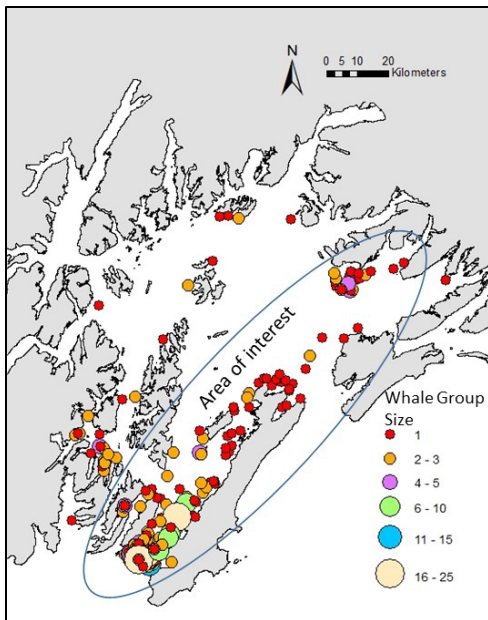
#### *PI Response 9.5.18*

*Yes, each project is requesting their own vessel. When identifying projects with unfunded needs, we did have a lengthy discussion about sharing vessels, as the nearshore team also requested funding for March survey in PWS (that project did not rank in top 3 to request funds). We concluded that projects 19120114-E (fall/winter seabirds) and 19120114-O (humpback whales) would not be able to share a charter vessel. March surveys for marine birds and whales have different objectives, methods, and proposed spatial coverage (Figs. 1 and 2) and, therefore, require separate survey vessels. For example, the marine bird surveys (Fig. 1) are fixed transects sampled annually using the chartered vessel as the survey platform. In contrast, the whale survey route changes annually depending on where the whale and herring aggregations are (Fig. 2), and once an aggregation is encountered, the chartered vessel that is also used as the survey platform engages in focal following of predators and prey. Timing also differs. For marine birds, surveys would be conducted in early to mid-March before spring migration. On the other hand, we attempt to time whale surveys just prior to herring spawning in late March or early April. This is often too late for winter bird work.*



*Figure 1. Proposed dedicated marine bird surveys to occur in November and March in Prince William Sound, AK. Surveys will replicate our longest time series (2007 - 2016) and most consistent data.*





*Figure 2. Area of interest for spring whale surveys in Prince William Sound, AK. Given limited vessel time, effort will focus on southern PWS an area of high whale and pre-concentrations.*

#### **PAC Comments – FY19**

**Date: September 2018**

No project specific comments.

#### **Executive Director Comments – FY19**

**Date: September 2018**

I concur with the recommendations of the Science Panel, Science Coordinator and Public Advisory Committee.

#### **FY18 Funding Recommendations:**

Science Panel	Science Coordinator	PAC	Executive Director	Trustee Council
Fund	Fund	Fund	Fund	Fund

#### **Science Panel Comments – FY18**

**Date: September 2017**

This proposal was very well presented and seems very reasonable. The Panel was pleased to see that the PI incorporated previous suggestions into the proposal. The Panel commends the PI's effort to integrate seabirds and mammals in her work on herring.

Regarding a statement on pg. 66 of this proposal: "As currently designed for FY17-21, the fall/winter marine bird project will not be working directly with the PWS Herring Research and Monitoring Program." The Panel would like clarification on what is meant here. The Panel recommends coordinating and collaborating to the extent reasonable.

#### **PI Response (10/11/17):**

Thank you for the opportunity to clarify our coordination and collaboration with the Herring Research and Monitoring (HRM) program. In past years, we have placed a marine bird observer onboard HRM project cruises. The HRM program has no scheduled cruises between September 2018 and March 2019.

*Thus, we are not able to collaborate directly with HRM during FY18. However, this project will share data with the HRM program and we will explore possibilities for joint publications.*

#### **Science Coordinator Comments – FY18**

**Date: September 2017**

I concur with the Science Panel's comments.

#### **PAC Comments – FY18**

**Date: September 2017**

There are no project specific comments.

#### **Executive Director Comments – FY18**

**Date: September 2017**

I concur with the recommendations of the Science Panel, Science Coordinator and Public Advisory Committee.

#### **FY17 Funding Recommendations:**

Science Panel	Science Coordinator	PAC	Executive Director	Trustee Council
Fund	Fund	Fund	Fund	Fund

#### **FY17 Funding Recommendations:**

Date	Science Panel	Science Coordinator	PAC	Executive Director	Trustee Council
May 2016	Fund	Fund	N/A	N/A	N/A
Sept 2016	Fund	Fund	Fund	Fund	Fund

#### **Science Panel Comments – FY17**

**Date: September 2016**

The Panel was pleased with the changes made by the PIs in response to Panel comments, including the methodology. Some concerns were raised about the interpretation of data given that survey tracks are specifically targeted to the presence of whales. If survey tracks are chosen because of whale foraging presence, then how useful will it be to use these data to detect associations? Almost by definition any birds in their survey will be associated with whales. The question is, how close and are they interacting? Is 150 m close enough? Too close?

**Date: May 2016**

The Panel noted that the proposal was difficult to review as a majority of the text was copied from the other Predator-Prey Survey proposal. It was challenging to find information within the text specific to this project. The Panel requests a revised proposal that focuses on the details of this specific project and how its data will be integrated into a wider cross-project set of analyses of interacting forage "fish", and piscivorous seabirds, and whales (humpback whales explicitly) .

#### **Science Coordinator Comments – FY17**

**Date: May and September 2016**

I concur with the Science Panel's comments.

**Executive Director Comments – FY17****Date: September 2016**

I concur with the Science Panel's comments.

**Public Advisory Committee Comments – FY17****Date: September 2016**

The PAC meeting was Sept. 22, 2016 and fund recommendations are included in the table above. Any project-specific comments from that meeting will be added to the Work Plan when the comments are finalized in the meeting notes.

**Project Number:** 19120114-G

**Project Title:** LTM Program – Monitoring of oceanographic conditions in PWS

**Primary Investigator(s):** Robert Campbell

**PI Affiliation:** PWSSC

**Project Manager:** NOAA

**EVOSTC Funding Requested FY17-21:** \$1,142,300

FY17	FY18	FY19	FY20	FY21
Auth: \$218,700	Auth: \$223,400	\$228,300	\$233,300	\$238,500

*Requests include 9% GA.*

**Funding From Non-EVOSTC Sources FY17-21:** \$1,425,000

FY17	FY18	FY19	FY20	FY21
\$300,000	\$300,000	\$275,000	\$275,000	\$275,000

**Total Past EVOSTC Funding Authorized (FY12-18):** \$1,483,700

**Total EVOSTC Funding Authorized (FY12-18) and Requested (FY19-21):** \$2,183,800

**Total Non-EVOSTC Funding (FY12-21):** \$1,774,900

**Abstract:**

*\*This abstract is excerpted from the PI's Proposal, dated 8/17/18, budget updated 9/18/18.*

This project will continue physical and biological measurements to assess trends in the marine environment and bottom-up impacts on the marine ecosystem of Prince William Sound (PWS). Regular (~6 per year) vessel-based surveys of PWS will be conducted to maintain ongoing time series observations of physical (temperature, salinity, turbidity), biogeochemical (nitrate, phosphate, silicate, dissolved oxygen), and biological (chlorophyll-a concentration, zooplankton abundance and composition) parameters in several parts of PWS. Sampling sites include central PWS, the entrances (Hinchinbrook Entrance and Montague Strait), and four priority bays that were part of the *Exxon Valdez* Oil Spill Trustee Council (EVOSTC)-funded Sound Ecosystem Assessment (SEA) project in the 1990s and the ongoing Herring Research and Monitoring project. Additionally, an autonomous profiling mooring will be deployed in central PWS to provide high frequency (twice daily) depth-specific measurements of the surface layer that will be telemetered out in near real-time. The profiler will include measurements that complement the survey activities (temperature, salinity, oxygen, nitrate, chlorophyll-a, turbidity). An *in situ* plankton camera was recently developed for the profiler and will be used to enumerate zooplankton, large phytoplankton and other particles, with some taxonomic discrimination. FY18 spring and early summer observations in PWS indicate the spring bloom was about on time, the surface layer water temperature was above average but trending towards the climatology. Some warm water copepod (southern species) are still present. We are not proposing any major changes to this project for FY19.

**FY19 Funding Recommendations:**

Science Panel	Science Coordinator	PAC	Executive Director	Trustee Council
Fund	Fund	Fund	Fund	Fund

**Science Panel Comments – FY19**

Science Panel appreciates this time series and looks forward to seeing how the zooplankton community in Cook Inlet relates to oceanographic conditions. The Panel notes that there was a significant increase in warm water zooplankton species in 2016/2017 (Figure 5) after the blob occurred and would like to see analyses that might explain that lag response. We acknowledge that analyses are underway and encourage the PI to publish.

*PI Response (10/10/18)*

*A region-wide comparison of the results of the Prince William Sound (PWS), Seward Line, and lower Cook Inlet projects has been identified as a good potential synthesis manuscript topic and is part of our ongoing science synthesis discussions. Analysis of a now 40 year conductivity and temperature at depth (CTD) profile database in the PWS region shows that temperatures there tend to lag those in the Gulf of Alaska (GOA; as proxied by the Pacific Decadal Oscillation index) by about 12 months (see Fig. 12 in Campbell 2018). Temperature anomalies did shift towards positive anomalies in late 2013 in PWS as they did in the GOA during the emergence of the marine heatwave. An estimate of heat flux at the mid-PWS National Data Buoy Center buoy (Buoy 46060) suggests that heat flux out of the surface ocean in PWS was low in the marine heatwave years (late 2013-2016), which has also been proposed as the mechanism for the genesis of the marine heatwave (e.g., Bond et al. 2015). We take from this that the same atmospheric phenomenon (the “ridiculously resilient ridge” as stated in Swain 2015) that drove the formation of the marine heatwave in the central GOA was also operating in PWS and led to those positive anomalies. The transport lags into PWS discussed in Campbell (2018) then led to temperature anomalies in PWS remaining elevated longer than they were in the GOA, well into 2017. There was already some indication of a higher prevalence of warm water zooplankton species in PWS in 2013, but it is a good observation that it was not until 2015/2016 that they are almost uniformly prevalent. We would attribute that to both the lag due to transport and the lag that one can expect from a biological system responding to a physical forcing. McKinstry and Campbell (2018) discuss in detail some of the species shifts observed during the marine heatwave years (see section 4.2. Climatic shifts and zooplankton variation). Briefly, several of the “warm water” species identified in Fig. 5 of project 19120114-G’s FY19 work plan have been observed in PWS for some time; many of them fell into what our Indicator Species Analysis termed “winter taxa.” While recently comparing our observations with those by Russ Hopcroft’s along the Seward Line, we have noticed that a number of those species tend to be more prevalent in PWS, and hypothesize that it might be some sort of refugium for those species. We would extend that hypothesis and suggest that those already present warm-water species were at a comparative advantage during the marine heatwave years (and cool-preferring species may have conversely been at a disadvantage), and so there was a trend to become more prevalent over time as conditions remained advantageous. So rather than there being a large shift in 2015, there was a trend towards more warm water species over time (with some noise, as one expects from plankton observations). There are other possible explanations, but this is perhaps the most plausible hypothesis given the available data. Approaching the question quantitatively would be difficult, but we will be vigilant for potential opportunities. The basic life histories of many of the warm water diagnostic species (*Mesocalanus tenuicornus*, *Clausocalanus anglicus*, *Corycaeus pacificus*) are not well described in general (really, *Calanus pacificus* is the sole exception), much less so in Alaska, and even less is known about their vital rates. As the GWA oceanographic time series extend beyond the impact of the marine heatwave, program PIs expect to be able to say more about the lags in zooplankton populations.*

**Science Coordinator Comments – FY19**

PI is making good progress and project is on task. I appreciate the preliminary results presented in the proposal. Good to read that PI is already collaborating with HRM postdoctoral research McGowan who just started in FY18.

#### **PAC Comments – FY19**

**Date: September 2018**

No project specific comments.

#### **Executive Director Comments – FY19**

**Date: September 2018**

I concur with the recommendations of the Science Panel, Science Coordinator and Public Advisory Committee.

#### **FY18 Funding Recommendations:**

Science Panel	Science Coordinator	PAC	Executive Director	Trustee Council
Fund	Fund	Fund	Fund	Fund

#### **Science Panel Comments – FY18**

**Date: September 2017**

The Panel believes the PI is conducting important work that supports the goals of the EVOSTC. The Panel was happy to see that there are peer-reviewed publications in press and encourages the PI to keep publishing.

#### **Science Coordinator Comments – FY18**

**Date: September 2017**

I concur with the Science Panel's comments.

#### **PAC Comments – FY18**

**Date: September 2017**

There are no project specific comments.

#### **Executive Director Comments – FY18**

**Date: September 2017**

I concur with the recommendations of the Science Panel, Science Coordinator and Public Advisory Committee.

#### **FY17 Funding Recommendations:**

Science Panel	Science Coordinator	PAC	Executive Director	Trustee Council
Fund	Fund	Fund	Fund	Fund

#### **FY17 Funding Recommendations:**

Date	Science Panel	Science Coordinator	PAC	Executive Director	Trustee Council
May 2016	Fund	Fund	N/A	N/A	N/A
Sept 2016	Fund	Fund	Fund	Fund	Fund

#### **Science Panel Comments – FY17**

**Date: September 2016**

The Panel has no project specific comments.

**Date: May 2016**

The Panel acknowledges the value of continued time series of physical, chemical, and biological primary production data to provide the basis for analyses of how changing environmental conditions are affecting the higher trophic level animals of the PWS and other spill-affected regions of the Northern Gulf of Alaska.

**Science Coordinator Comments – FY17****Date: May and September 2016**

I concur with the Science Panel's comments.

**Executive Director Comments – FY17****Date: September 2016**

I concur with the Science Panel's comments.

**Public Advisory Committee Comments – FY17****Date: September 2016**

The PAC meeting was Sept. 22, 2016 and fund recommendations are included in the table above. Any project-specific comments from that meeting will be added to the Work Plan when the comments are finalized in the meeting notes.

**Project Number:** 19120114-H

**Project Title:** LTM Program – Nearshore Ecosystems in the Gulf of Alaska

**Primary Investigator(s):** Heather Coletti, Brenda Konar, Katrin Iken, Dan Esler, Thomas Dean

**PI Affiliation:** NPS, USGS, NOAA, **Project Manager:** USGS  
Coastal Resources

**EVOSTC Funding Requested FY17-21: \$2,071,000**

FY17	FY18	FY19	FY20	FY21
Auth: \$401,900	Auth: \$452,700	\$411,400	\$402,300	\$402,800

*Requests include 9% GA.*

**Funding From Non-EVOSTC Sources FY17-21: \$2,014,000**

FY17	FY18	FY19	FY20	FY21
\$410,000	\$410,000	\$410,000	\$392,000	\$392,000

**Total Past EVOSTC Funding Authorized (FY12-18): \$2,414,500**

**Total EVOSTC Funding Authorized (FY12-18) and Requested (FY19-21): \$3,631,000**

**Total Non-EVOSTC Funding (FY12-21): \$3,502,000**

**Abstract:**

*\*This abstract is excerpted from the PI's Proposal, dated 8/17/18, budget updated 9/18/18.*

Nearshore monitoring in the Gulf of Alaska (GOA) provides ongoing evaluation of the status and trend of more than 200 species, including many of those injured by the 1989 *Exxon Valdez* oil spill (EVOS). The monitoring design includes spatial, temporal and ecological features that support inference regarding drivers of change. Application of this monitoring design to date includes assessment of change in sea otter populations in relation to EVOS recovery and density dependent factors, as well as the assessment of the relative roles of static versus dynamic environmental drivers in structuring benthic communities. Continued monitoring will lead to a better understanding of variation in the nearshore ecosystem across the GOA and a more thorough evaluation of the status of spill-injured resources. This information will be critical for anticipating and responding to ongoing and future perturbations in the region, as well as providing for global contrasts. In FY19, we propose to continue sampling in Kachemak Bay (KBAY), Katmai National Park and Preserve (KATM), Kenai Fjords National Park (KEFJ), and Western Prince William Sound (WPWS) following previously established methods. Monitoring metrics include marine invertebrates, macroalgae, birds, mammals, and physical parameters such as temperature. In addition to taxon-specific metrics, monitoring includes recognized important ecological relations such as predator-prey dynamics, measures of nearshore ecosystem productivity, and contamination. In FY18, sea star observations continue to include some recruitment and recovery in WPWS and KEFJ but not in KBAY or KATM. We would expect a lag in recovery in these latter two regions as the disease seemed to move across the GOA from the east to the west; however, total star counts remain low across all sites following the large sea star die-off that began in 2015. We also initiated marine bird and mammal surveys and black oystercatcher productivity monitoring as well as increased sea otter foraging data collection efforts in FY18 in KBAY. We are not proposing any major changes to this project or budget for FY19.



**FY19 Funding Recommendations:**

Science Panel	Science Coordinator	PAC	Executive Director	Trustee Council
Fund	Fund	Fund	Fund	Fund

**Science Panel Comments – FY19****Date: September 2018**

Science Panel is curious to know if this project interacts with the LTER program and specifically whether LTER and EVOSTC funding are responsible for different sampling locations.

*PI Response (10/10/18)*

*With the start of a new long-term ecological research (LTER) site in the northern GOA, the nearshore component will continue to actively engage with the Environmental Drivers component as we explore linkages from the offshore to the nearshore environments. Currently, that includes a proposed synthesis product examining the relationship between offshore and coastal temperatures. An additional proposed synthesis product includes biological responses to the marine heatwave. As for the sampling sites within the nearshore component, they were randomly selected to allow for inference across the regions of the GOA prior to the start of GWA. Kachemak Bay sites are the exception and are a continuation of historical sampling.*

We recognize that there are several informative time series of individual species, but would like to see analyses to explore the relationships among species. Current analyses only report single species trends over time, which are certainly useful, but given the rich literature on species interactions in these nearshore systems (e.g., keystone effects of sea stars) it seems that assessing correlations among taxa across space and/or time would be a profitable approach that might produce hypotheses for the extent to which changes observed were the direct effect of environmental variation vs indirect effects mediated through species interactions.

*PI Response (10/10/18)*

*We agree that assessing correlations among taxa across space and time will be a valuable contribution. For example, the nearshore component submitted a section to the NOAA GOA Ecosystem Status Report showing negative anomalies of *Fucus* and sea stars, with concurrent positive anomalies for large ( $\geq 20$  mm) mussel density across the GOA. The negative anomaly for *Fucus* and sea stars is correlated with warm water temperatures in nearshore areas. The decline in sea star abundance was likely due to sea star wasting disease, which was first detected in 2014 and is generally associated with the warm water temperature anomalies. The positive anomalies during 2015–2017 for large mussels is possibly a response to the reduced predation pressure given the synoptic decline of sea stars. A decline in small mussel density (an indicator of recruitment) was also observed during this time period, likely because of the decrease in *Fucus* as available settlement habitat and possibly reduction in primary productivity. If funded, the postdoc working with GWA would conduct analyses exploring linkages within and across components.*

Please provide clarification on the overarching hypotheses referred to in the text under Figure 6 in the proposal.

*PI Response (10/10/18)*

*To clarify the overarching hypotheses referred in our FY19 EVOSTC work plan: Our overarching goal is to understand drivers of variation in the GOA nearshore ecosystem. The foundational hypotheses of the*

*Nearshore Project include: (1) What are the spatial and temporal scales over which change in nearshore ecosystems is observed? (2) Are observed changes related to broad-scale environmental variation, local perturbations, or underlying ecological processes? (3) Does the magnitude and timing of changes in nearshore ecosystems correspond to those measured in pelagic ecosystems?*

#### **Science Coordinator Comments – FY19**

**Date: September 2018**

Project milestones and tasks are on track. I am gratified to see the data from this project being used in several manuscripts that have been published, in review or in prep during FY18.

#### **PAC Comments – FY19**

**Date: September 2018**

No project specific comments.

#### **Executive Director Comments – FY19**

**Date: September 2018**

I concur with the recommendations of the Science Panel, Science Coordinator and Public Advisory Committee.

#### **FY18 Funding Recommendations:**

Science Panel	Science Coordinator	PAC	Executive Director	Trustee Council
Fund	Fund	Fund	Fund	Fund

#### **Science Panel Comments – FY18**

**Date: September 2017**

The Panel appreciates the amount of data being collected on multiple nearshore sites. There is not a clear integration with oceanographic studies, but there is enough substance to make this a meaningful, stand- alone nearshore ecosystem project. The Panel is very pleased with their productivity and integration of students into the studies.

#### *PI Response (10/11/2017):*

*The nearshore component greatly appreciates the Science Panel's support of our progress towards an integrated nearshore program. There have been recent discussions to use oceanographic data, initially temperature, across all components to examine linkages between offshore and nearshore systems. We anticipate that analyses of temperature data will be our first step in integrating other oceanographic processes to pelagic and coastal systems for the GWA program.*

The Panel would like to see more of the synoptic surveys, what they are finding or not finding temporally and on a spatial scale. A question from the Panel for the PIs to ponder: Have egg-eating seabirds/waterfowl changed their distribution in regards to location in time and space to herring spawning?

#### *PI Response (10/11/2017):*

*Several PIs in the nearshore program did publish a paper in Ecosphere (<http://onlinelibrary.wiley.com/doi/10.1002/ecs2.1489/full>) that examined temporal trends in sea otter abundance, energy recovery rates, and demographics at varying spatial scales. However, based on the design of the nearshore component, an exercise examining trends across space and time could be done*

*for a variety of species. We are meeting as a component prior to the PI meeting in November to examine data trends to date and develop product ideas for the next 1-3 years within the nearshore component. Specific to the Science Panel's question about changing seabird/waterfowl distribution, we have set aside time for cross-component bird data integration and synthesis discussions at the PI meeting in November. All parties will have data summaries to discuss and determine how we may be able to look at trends over time, and changes in distribution, and integration with data from other components, including environmental drivers.*

#### **Science Coordinator Comments – FY18**

**Date: September 2017**

I concur with the Science Panel's comments.

#### **PAC Comments – FY18**

**Date: September 2017**

The PAC meeting was 28 September 2017 and fund recommendations are included in the table above. Any project-specific comments from that meeting will be added to the Work Plan when the comments are finalized in the meeting notes.

#### **Executive Director Comments – FY18**

**Date: September 2017**

I concur with the recommendations of the Science Panel, Science Coordinator and Public Advisory Committee.

#### **FY17 Funding Recommendations:**

Science Panel	Science Coordinator	PAC	Executive Director	Trustee Council
Fund	Fund	Fund	Fund	Fund

#### **FY17 Funding Recommendations:**

Date	Science Panel	Science Coordinator	PAC	Executive Director	Trustee Council
May 2016	Fund	Fund	N/A	N/A	N/A
Sept 2016	Fund	Fund	Fund	Fund	Fund

#### **Science Panel Comments – FY17**

**Date: September 2016**

The Panel wished to draw attention of the PIs to similar recent declines in mussels in the Gulf of Maine in the Atlantic. No action is required by the PIs, but they might find parallel research on a similar problem interesting. A paper by Sorte et al. in *Global Change Biology* would be once place to look: Sorte, C. J. B., Davidson, V. E., Franklin, M. C., Benes, K. M., Doellman, M. M., Etter, R. J., Hannigan, R. E., Lubchenco, J. and Menge, B. A. (2016), Long-term declines in an intertidal foundation species parallel shifts in community composition. *Glob Change Biol.* doi:10.1111/gcb.13425

**Date: May 2016**

The Panel has no project specific comments.

**Science Coordinator Comments – FY17****Date: May and September 2016**

I have no project specific comments.

**Executive Director Comments – FY17****Date: September 2016**

I concur with the Science Panel's comments.

**Public Advisory Committee Comments – FY17****Date: September 2016**

The PAC meeting was Sept. 22, 2016 and fund recommendations are included in the table above. Any project-specific comments from that meeting will be added to the Work Plan when the comments are finalized in the meeting notes.

**Project Number:** 19120114-I

**Project Title:** LTM Program – Long-term Monitoring of Oceanographic Conditions in the Alaska Coastal Current from Hydrographic Station GAK-1

**Primary Investigator(s):** Seth Danielson

**PI Affiliation:** UAF

**Project Manager:** NOAA

**EVOSTC Funding Requested FY17-21: \$680,800**

FY17	FY18	FY19	FY20	FY21
Auth: \$146,800	Auth: \$148,400	\$132,600	\$125,600	\$127,400

*Requests include 9% GA.*

**Funding From Non-EVOSTC Sources FY17-21: \$0**

FY17	FY18	FY19	FY20	FY21
\$0	\$0	\$0	\$0	\$0

**Total Past EVOSTC Funding Authorized (FY12-18): \$874,400**

**Total EVOSTC Funding Authorized (FY12-18) and Requested (FY19-21): \$1,260,000**

**Total Non-EVOSTC Funding (FY12-21): \$0**

**Abstract:**

*\*This abstract is excerpted from the PI's Proposal, dated 8/17/18, budget updated 9/18/18.*

This project continues a 45-year time-series of temperature and salinity measurements at hydrographic station GAK-1. The data set, which began in 1970, now consists of quasi-monthly conductivity-temperature versus depth casts and a mooring outfitted with seven temperature/conductivity recorders distributed throughout the water column and a fluorometer at 20 m depth. The project monitors five important Alaska Coastal Current (ACC) ecosystem parameters that quantify and help us understand hourly to seasonal, interannual, and multi-decadal period variability in: 1) temperature and salinity throughout the 250 m-deep water column, 2) near surface stratification, 3) surface pressure fluctuations, 4) fluorescence as an index of phytoplankton biomass, and 5) along-shelf transport in the ACC. All of these parameters are basic descriptors that characterize the workings of the inner shelf and the ACC, an important habitat and migratory corridor for organisms inhabiting the northern Gulf of Alaska, including Prince William Sound and resources injured by the *Exxon Valdez* oil spill. We are aware of 69 publications utilizing data collected at station GAK-1, and since 2000 the citation list has grown by nearly three publications per year. Topics covered by these publications range from physical oceanography and climate through trophic (including commercial fisheries) level components and ecosystem analyses. Recent water temperatures have returned to average in the upper 100 m, but warmer than average water remains below 100 m. A recently awarded National Science Foundation Long-term Ecological Research program (awarded to Gulf Watch Alaska principal investigators R. Hopcroft and S. Danielson) will leverage and compliment this and other environmental drivers sampling within Gulf Watch Alaska. We are not proposing any major changes to this project in FY19.

**FY19 Funding Recommendations:**

Science Panel	Science Coordinator	PAC	Executive Director	Trustee Council
Fund	Fund	Fund	Fund	Fund

**Science Panel Comments – FY19****Date: September 2018**

Science Panel is interested in understanding better how the LTER program is integrated with the GAK1, Seward line and nearshore monitoring, specifically activities and monitoring.

*PI Response (10/10/18)*

*Please see nearshore ecosystems (19120114-H, Coletti et al.) and Seward Line (19120114-L, Hopcroft) projects for comprehensive responses to this comment.*

**Science Coordinator Comments – FY19****Date: September 2018**

Milestones and tasks have been completed on planned. Thanks for the update regarding the replacement update for the R/V Little Dipper. Pleased to see that additional funding from other sources have been secured for the new set of moorings, this will add to the important long-term time series provided by the GAK1 mooring.

**PAC Comments – FY19****Date: September 2018**

No project specific comments.

**Executive Director Comments – FY19****Date: September 2018**

I concur with the recommendations of the Science Panel, Science Coordinator and Public Advisory Committee.

**FY18 Funding Recommendations:**

Science Panel	Science Coordinator	PAC	Executive Director	Trustee Council
Fund	Fund	Fund	Fund	Fund

**Science Panel Comments – FY18****Date: September 2017**

This is an important long-term data collection project that needs to continue. The Panel supports the research and welcomes the news of the Long-Term Ecological Research (National Science Foundation) funding awarded to the PIs, which will insure the stability of gathering long-term data while expanding the scope of the project. PIs are using graduate students productively.

**Science Coordinator Comments – FY18****Date: September 2017**

I concur with the Science Panel's comments.

**PAC Comments – FY18****Date: September 2017**

There are no project specific comments.

**Executive Director Comments – FY18****Date: September 2017**

I concur with the recommendations of the Science Panel, Science Coordinator and Public Advisory Committee.

**FY17 Funding Recommendations:**

Science Panel	Science Coordinator	PAC	Executive Director	Trustee Council
Fund	Fund	Fund	Fund	Fund

**FY17 Funding Recommendations:**

Date	Science Panel	Science Coordinator	PAC	Executive Director	Trustee Council
May 2016	Fund	Fund	N/A	N/A	N/A
Sept 2016	Fund	Fund	Fund	Fund	Fund

**Science Panel Comments – FY17****Date: September 2016**

The Panel has no project specific comments.

**Date: May 2016**

This long-term data set provides critical information to both Programs and to researchers beyond the Programs. The resultant data are heavily used. The Panel supports the continued funding of this work. The Panel also awaits seeing new analyses that integrate these environmental variables into the changing abundances of members of the food webs of importance.

**Science Coordinator Comments – FY17****Date: May and September 2016**

I concur with the Science Panel's comments.

**Executive Director Comments – FY17****Date: September 2016**

I concur with the Science Panel's comments.

**Public Advisory Committee Comments – FY17****Date: September 2016**

The PAC meeting was Sept. 22, 2016 and fund recommendations are included in the table above. Any project-specific comments from that meeting will be added to the Work Plan when the comments are finalized in the meeting notes.

**Project Number:** 19120114-J

**Project Title:** LTM Program – Long-term monitoring of oceanographic conditions in Cook Inlet/Kachemak Bay

**Primary Investigator(s):** Kris Holderied and Steve Baird

**PI Affiliation:** NOAA and KBRR

**Project Manager:** NOAA

**EVOSTC Funding Requested FY17-21: \$796,500**

FY17	FY18	FY19	FY20	FY21
Auth: \$169,700	Auth: \$174,400	\$183,400	\$135,800	\$133,300

*Requests include 9% GA.*

**Funding From Non-EVOSTC Sources FY17-21: \$1,044,000**

FY17	FY18	FY19	FY20	FY21
\$205,000	\$213,000	\$215,000	\$217,000	\$194,000

**Total Past EVOSTC Funding Authorized (FY12-18): \$1,122,400**

**Total EVOSTC Funding Authorized (FY12-18) and Requested (FY19-21): \$1,574,900**

**Total Non-EVOSTC Funding (FY12-21): \$2,196,000**

**Abstract:**

*\*This abstract is excerpted from the PI's Proposal, dated 8/17/18, budget updated 9/18/18.*

The Cook Inlet/Kachemak Bay monitoring project provides year-round, high temporal resolution oceanographic and plankton community data to assess the effects of seasonal and inter-annual oceanographic variability on nearshore and pelagic species affected by the Exxon Valdez Oil Spill. We continue a 7-year time-series of shipboard oceanography surveys along the estuarine gradient from Kachemak Bay into southeast Cook Inlet, as well as a 17-year time series of continuous nearshore water quality station observations in Kachemak Bay. Shipboard sampling includes conductivity-temperature-vs-depth (CTD) casts, and phytoplankton and zooplankton net tows. Outputs from the project include seasonally-resolved oceanographic patterns, plankton abundance and community composition, and cycles for harmful algal species. The project provides oceanographic data to support Gulf Watch Alaska (GWA) Nearshore Component monitoring in Kachemak Bay. It also provides year-round information on estuary-shelf oceanographic gradients for the GWA Environmental Drivers component to help evaluate local (within estuary) and remote (shelf, North Pacific) climate forcing effects on nearshore and pelagic ecosystems. Results show that: 1) water temperatures in 2017 were cooler than during the 2014-2016 marine heat wave but still above long-term averages; 2) zooplankton response to environmental variability in Kachemak Bay was higher between years than spatially; and 3) summer abundances of the toxic phytoplankton species that causes paralytic shellfish poisoning were sensitive to warm temperatures and higher in Kachemak Bay than lower Cook Inlet. The only proposed change for FY19 is for Steve Baird to replace Jessica Shepherd as Kachemak Bay National Estuarine Research Reserve co-principal investigator.

**FY19 Funding Recommendations:**

Science Panel	Science Coordinator	PAC	Executive Director	Trustee Council
Fund	Fund	Fund	Fund	Fund



## Science Panel Comments – FY19

**Date: September 2018**

The Science Panel is pleased to see the multivariate analyses of community composition relating changes in temperature and chlorophyll and would like to see these type of analyses in other projects. In regard to the FY17 annual proposal, we would like clarification on how the Kachemak Bay phytoplankton samples in 2016 were processed improperly and what will be done to prevent this from happening again in the future. We note the increase in tunicates; what species are they? Are they pyrosomes as reported from SE AK and along the US west coast?

*PI Response (10/10/18)*

*We appreciate the Science Panel's comment on our multivariate analyses for zooplankton community composition and plan to work with other Environmental Drivers component projects on more of these analyses in FY19. In FY16, the phytoplankton samples from all our EVOSTC-funded shipboard sampling stations were processed normally. However, some of the samples from intensive phytoplankton sampling at the Kasitsna Bay Lab dock (part of other NOAA programs) were processed with a different Lugol's preservative concentration that did not work effectively and has not been used since. While the dock sampling is not part of our EVOSTC-funded work, we do use those data to provide a better temporal context for our monthly shipboard sampling. Regarding tunicates, we have not detected pyrosomes in our zooplankton samples; we also have not detected an increasing trend in the tunicate larvaceans that appear through the 2016 results included in our last annual report. We will update those results in our FY18 annual report.*

## Science Coordinator Comments – FY19

**Date: September 2018**

I am pleased to see data from this project being used by several other GWA projects. Two papers using project data have already been published in FY18, demonstrating the usefulness of these data. I appreciate seeing the preliminary results from FY18. Project is on track. Steve Baird is an appropriate replacement for Jessica Shepherd as project PI.

## PAC Comments – FY19

**Date: September 2018**

No project specific comments.

## Executive Director Comments – FY19

**Date: September 2018**

I concur with the recommendations of the Science Panel, Science Coordinator and Public Advisory Committee.

## FY18 Funding Recommendations:

Science Panel	Science Coordinator	PAC	Executive Director	Trustee Council
Fund	Fund	Fund	Fund	Fund

## Science Panel Comments – FY18

**Date: September 2017**

The Panel was happy to see that the PIs explained how data from this study tie into the decline in sea stars, marine mammal and seabird mortalities and changes in the presence of zooplankton species. The Panel was pleased to see how the funding is being used and how the PIs found connections as

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previously requested.

#### **Science Coordinator Comments – FY18**

**Date: September 2017**

I concur with the Science Panel's comments.

#### **PAC Comments – FY18**

**Date: September 2017**

There are no project specific comments.

#### **Executive Director Comments – FY18**

**Date: September 2017**

I concur with the recommendations of the Science Panel, Science Coordinator and Public Advisory Committee.

#### **FY17 Funding Recommendations:**

<b>Science Panel</b>	<b>Science Coordinator</b>	<b>PAC</b>	<b>Executive Director</b>	<b>Trustee Council</b>
Do Not Fund	Do Not Fund	Do Not Fund	Do Not Fund	Fund

#### **FY17 Funding Recommendations:**

<b>Date</b>	<b>Science Panel</b>	<b>Science Coordinator</b>	<b>PAC</b>	<b>Executive Director</b>	<b>Trustee Council</b>
May 2016	Do Not Fund	Do Not Fund	N/A	N/A	N/A
Sept 2016	Do Not Fund	Do Not Fund	Do Not Fund	Do Not Fund	Fund

#### **Science Panel Comments – FY17**

**Date: September 2016**

The Science Panel appreciated the PI's responses to our comments. The proposal is fundamentally sound. However, our primary concern was not addressed. The proposed research is beyond the core area of interest, and it remains unclear how the study would significantly advance the core mission of EVOSTC and justify a second cycle of \$800,000 in funding.

As noted in a follow-up Panel discussion with the Program Team Leads, the results from the original research proposal in Cook Inlet and Kachemak Bay provided data that may be useful to those interested in this project's study area, and, for example, the proposal may serve those with an interest in harmful algal blooms, bivalve mariculture, invasive species and to EVOSTC PIs currently sampling in PWS but who would be pleased to expand activities to the project area. However, the proposal did not demonstrate actual use of these data by other projects in either the Long-Term Monitoring Program or the Herring Program and it still remains to be seen just how relevant these data will be to EVOSTC.

**Date: May 2016**

The Panel does not recommend funding this project. The investigators propose to modify sampling conducted in 2012-2016 to profile oceanographic variables (water temperature, salinity, nutrients) and plankton from ship and shore in lower Cook Inlet and Kachemak Bay in response to the anomalously warm waters in 2014-2015. The warm-water event was concurrent with harmful algal

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blooms with consequences for shellfish, otters and murre, much like elsewhere along the West Coast. Higher frequency sampling (monthly, quarterly) on the eastern side of the study area together with semiannual (spring, fall) sampling across the entrance to Cook Inlet would better resolve the exchange of water masses and nutrients between the Gulf of Alaska and a hotspot for primary production and foraging by fishes, seabirds and marine mammals near lower Cook Inlet and outer in Kachemak Bay in response to changing oceanographic forcing. To compensate for this increased effort, sampling at locations on the northern side of Cook Inlet is proposed to be reduced.

The Panel does not feel that the proposed research is a priority, given the cost and the relative lack of connection to the larger program. Answers to the proposed hypotheses are largely self-evident as stated and seemingly could be tested with data already in hand. A more compelling justification for the proposed research would have been helpful. For instance, hypothesis 1 that lower Cook Inlet is mostly synchronous with PWS suggests that continued oceanographic measurements in Cook Inlet may be redundant. It is not clear that extending a modified version of the previous five years of research via monitoring would significantly advance our understanding of productivity and links to nearshore species, seabirds and marine mammals in the study area, especially given the expense of the project. The proposal also would have benefitted from a robust statement of how the expected outcomes of the proposed research would be integrated with those from the rest of the program. The methods appear to be appropriate; though including a fluorometer with the CTDs to profile chlorophyll fluorescence throughout the water column would have been beneficial.

#### **Science Coordinator Comments – FY17**

**Date: September 2016**

I concur with the Science Panel's comments. The project offers sound science and is managed by an experienced team but the applicability of the data toward addressing the LTM Program's hypotheses appears weak at best after the first five years of funding.

**Date: May 2016**

I concur with the Science Panel's comments.

#### **Executive Director Comments – FY17**

**Date: September 2016**

I concur with the Science Panel and Science Coordinator's comments.

#### **Public Advisory Committee Comments – FY17**

**Date: September 2016**

The PAC meeting was Sept. 22, 2016 and fund recommendations are included in the table above. Any project-specific comments from that meeting will be added to the Work Plan when the comments are finalized in the meeting notes.

**Project Number:** 19120114-L

**Project Title:** LTM Program – Seward Line Monitoring

**Primary Investigator(s):** Russell Hopcroft

**PI Affiliation:** UAF

**Project Manager:** NOAA

**EVOSTC Funding Requested FY17-21: \$697,900**

FY17	FY18	FY19	FY20	FY21
Auth: \$132,700	Auth: \$136,100	\$139,500	\$143,000	\$146,600

*Requests include 9% GA.*

**Funding From Non-EVOSTC Sources FY17-21: \$7,180,300**

FY17	FY18	FY19	FY20	FY21
\$1,424,000	\$1,438,000	\$1,411,800	\$1,466,000	\$1,450,500

**Total Past EVOSTC Funding Authorized (FY12-18): \$739,000**

**Total EVOSTC Funding Authorized (FY12-18) and Requested (FY19-21): \$1,168,100**

**Total Non-EVOSTC Funding (FY12-21): \$7,780,300**

**Abstract:**

*\*This abstract is excerpted from the PI's Proposal, dated 8/17/18, budget updated 9/18/18.*

Long times-series are required for scientists to tease out pattern and causation in the presence of substantial year-to-year variability. For the 5 year period beginning in 2017, we are continuing multi-disciplinary oceanographic observations begun in fall 1997 in the northern Gulf of Alaska. Cruises occur in early May and early September to capture the typical spring bloom and summer conditions, respectively, along a 150-mile cross shelf transect to the south of Seward, Alaska. The line is augmented by stations in the entrances and deep passages of Prince William Sound. We determine the physical-chemical structure, the distribution and abundance of phytoplankton, microzooplankton, and mesozooplankton, and survey seabirds and marine mammals. These observations enable descriptions of the seasonal and inter-annual variations of this ecosystem. Our goal is to characterize and understand how different climatic conditions influence the biological conditions across these domains within each year, and what may be anticipated under future climate scenarios. We are not proposing any major changes to this project for FY19. Beginning in 2018, funding as one of the National Science Foundation's Long-term Ecological Research sites is allowing expanded sampling on the shelf upstream of Prince William Sound, including near Middleton Island, to help better understand spatial variability on the shelf.

**FY19 Funding Recommendations:**

Science Panel	Science Coordinator	PAC	Executive Director	Trustee Council
Fund	Fund	Fund	Fund	Fund

**Science Panel Comments – FY19**

**Date: September 2018**

Science Panel is interested in understanding better how the LTER program is integrated with the GAK1, Seward line and nearshore monitoring, specifically activities and monitoring.

*PI Response (10/10/18)*

*The Northern Gulf of Alaska (NGA) LTER program provides a massive leveraged expansion of the GAK1 (19120114-I) and Seward Line programs (19120114-L), by adding additional monitoring transects, times of year, measurement types (and resolutions), process studies, ecological modeling efforts, and educational activities that each extend the reach of both the GAK1 and Seward Line time-series. Put another way, the NGA LTER adds (both logistically and financially) to the GWA program rather than replaces or duplicates its activities. Please see the nearshore ecosystems project (19120114-H, Coletti et al.) for comprehensive response regarding integration between the Environmental Drivers component, the LTER, and the Nearshore component.*

*The LTER expands spatial coverage, with transect measurements near Kodiak, Middleton Island, the Copper River, and Kayak Island. In this regard, the LTER greatly improves connectivity between the recently added GWA seabird diet studies at Middleton Island associated with the forage fish project (19120114-C, Arimitsu and Piatt) and the Environmental Drivers Component. The LTER provides increased temporal coverage with the addition of cruises each July. New process studies complement the monitoring of the GWA program by examining ecosystem dynamics to provide deeper mechanistic understandings of the controls that impact the ecosystem at all of the Seward Line stations, including GAK1. New measurements include carbon export, iron concentration and limitation, plankton growth (both primary and secondary), and the role of the Copper River plume in stimulating production. Modeling will help us better understand ecological consequences of events such as the recent marine heatwave and the manner in which the runoff, iron, and the shelf carbon cycles impact the shelf ecosystem. Additional expansions from collaborative efforts also include assessments of the macro-jellyfish (funded by the Pollock Conservation Cooperative Research Center), larval fish (to be analyzed by NOAA), and various physiological measurements (funded by the North Pacific Research Board and the National Science Foundation [NSF]).*

*Additionally, the LTER program is providing ship time in support of the new mooring that will be deployed on the mid/outer shelf near Seward Line station GAK7. A modest amount (9%) of this mooring's new equipment was leveraged with LTER and GAK1 project funds; the bulk of the new equipment comes from the MJ Murdock Charitable Trust (50%) along with the Alaska Ocean Observing System (28%) and University of Alaska Fairbanks (UAF) (13%). This mooring will provide year-round core physical, chemical, and biological monitoring that will immediately open doors to extending and comparative analyses with data from the Seward Line, GAK1, and the GWA mooring in PWS (project 19120114-G) maintained by the PWS Science Center. LTER is also facilitating measurements at much higher resolution than have been possible under GWA. Use of R/V Sikuliaq on one cruise per year allows us to integrate undulating towed CTD measurements, 5-frequency fisheries acoustics, water column velocity profile measurements, and many other novel underway data collections such as surface nitrate and surface heat fluxes that have not been possible in the past. For example, we now are using a nitrate sensor to collect full-resolution macronutrient profiles from the CTD in real-time.*

*The LTER program maintains a significant outreach component as part of its activities, and in the NGA project we have teamed up with NOAA's Teacher at Sea program. We also will have several undergraduate NSF internships to award each summer and will directly fund multiple UAF graduate students who will work with both GAK1 and Seward Line data to increase our publication output.*

We note that Figure 5 in 19120114-G Campbell and Figure 2 in this proposal tell conflicting stories. The Panel would like the PIs to consider why this may be and see this reconciled. The Science Panel is curious to know what the PI's thoughts are in regards to the change in 2016-17 zooplankton species (warm vs. cold) and if this observed change is related to herring declines over the same period.

*PI Response (10/10/18)*

*The Environmental Drivers PIs have been pondering differences between the GOA shelf and PWS since the inception of the program. On the shelf, we think these species are constantly seeded into the branch of the North Pacific current that flows northward as the Alaska Stream, with warmer waters favoring longer survival and potentially even their reproduction. These species are then mixed across the shelf and into the Alaska Coastal Current by winds and other processes during their northward transport. As noted in Campbell's response (19120114-G, PWS oceanography) to this question, we can only conclude that these warm-water taxa have taken a better foothold in PWS than on the shelf proper, possibly due to lags in warming and cooling in PWS. There are, however, other possible explanations that we are exploring. For example, Campbell's sampling is confined to the upper 50 m (compared to 100 m for the Seward Line project) and occurs in bays rather than the deeper passages of PWS; both factors possibly favoring higher catches of these species. Furthermore, most cold water GOA species move downward into deeper waters during winter, and this then leaves these southern species (that don't move downward) as the prominent community members in surface waters during winter. More fully examining these differences between projects is planned as one of the synthesis activities during the current 5-year funding cycle.*

*While it is true that these warm-water taxa are less energetic than many resident species, even the resident taxa appeared to be atypically lipid-poor during the warm years, so it is hard to know which was of greater influence in potentially affecting herring populations.*

**Science Coordinator Comments – FY19**

**Date: September 2018**

Milestones and tasks have been completed as planned. PI continues to be productive: one paper accepted and another published in FY18. This project, along with the GAK1 monitoring, is an important long-term data collection project. I look forward to seeing results from sampling around Middleton Island and the integration with the predator-prey project.

**PAC Comments – FY19**

**Date: September 2018**

No project specific comments.

**Executive Director Comments – FY19**

**Date: September 2018**

I concur with the recommendations of the Science Panel, Science Coordinator and Public Advisory Committee.

**FY19 Funding Recommendations:**

Science Panel	Science Coordinator	PAC	Executive Director	Trustee Council
Fund	Fund	Fund	Fund	Fund

**Science Panel Comments – FY18****Date: September 2017**

This is an important long-term data collection project that needs to continue. The Panel is enthusiastic about the incorporation of an LTER site to expand the scope of this project. The Panel is pleased to see that sampling will occur around Middleton Island, and that there will be integration with the predator-prey project.

**Science Coordinator Comments – FY18****Date: September 2017**

I concur with the Science Panel's comments.

**PAC Comments – FY18****Date: September 2017**

There are no project specific comments.

**Executive Director Comments – FY18****Date: September 2017**

I concur with the recommendations of the Science Panel, Science Coordinator and Public Advisory Committee.

**FY17 Funding Recommendations:**

Science Panel	Science Coordinator	PAC	Executive Director	Trustee Council
Fund	Fund	Fund	Fund	Fund

**FY17 Funding Recommendations:**

Date	Science Panel	Science Coordinator	PAC	Executive Director	Trustee Council
May 2016	Fund	Fund	N/A	N/A	N/A
Sept 2016	Fund	Fund	Fund	Fund	Fund

**Science Panel Comments – FY17****Date: September 2016**

The Science Panel appreciates transfer of funds among projects to support additional sampling relevant to the spill area.

**Date: May 2016**

The Science Panel notes that this transect of moorings has value as professed in the proposal for purposes of assessing long-term environmental forcing of the base of the pelagic food chains.

**Science Coordinator Comments – FY17****Date: May and September 2016**

I concur with the Science Panel's comments.

**Executive Director Comments – FY17**

**Date: September 2016**

I concur with the Science Panel's comments.

**Public Advisory Committee Comments – FY17**

**Date: September 2016**

The PAC meeting was Sept. 22, 2016 and fund recommendations are included in the table above. Any project-specific comments from that meeting will be added to the Work Plan when the comments are finalized in the meeting notes.



**Project Number:** 19120114-M

**Project Title:** LTM Program – PWS Marine Bird Population Trends

**Primary Investigator(s):** Kathy Kuletz, Robb Kaler

**PI Affiliation:** USFWS

**Project Manager:** USFWS

**EVOSTC Funding Requested FY17-21: \$519,100**

FY17	FY18	FY19	FY20	FY21
Auth: \$24,900	Auth: \$222,200	\$24,900	\$222,200	\$24,900

*Requests include 9% GA.*

**Funding From Non-EVOSTC Sources FY17-21: \$180,000**

FY17	FY18	FY19	FY20	FY21
\$23,000	\$56,000	\$23,000	\$56,000	\$22,000

**Total Past EVOSTC Funding Authorized (FY12-18): \$928,800**

**Total EVOSTC Funding Authorized (FY12-18) and Requested (FY19-21): \$1,200,800**

**Total Non-EVOSTC Funding (FY12-21): \$392,000**

**Abstract:**

*\*This abstract is excerpted from the PI's Proposal, dated 8/17/18, budget updated 9/18/18.*

We conduct small boat surveys to monitor the abundance of marine birds in Prince William Sound, Alaska. The surveys are conducted every two, even numbered, years and therefore occur during July 2018 and 2020 during the current Gulf Watch Alaska (GWA) funding cycle (FY17-21). Fifteen surveys over a 29-year period have monitored population trends of marine birds and mammals in Prince William Sound after the *Exxon Valdez* oil spill. We use data collected to examine trends from summer to determine whether populations in the oiled zone are increasing, decreasing, or stable. We will also examine overall population trends for the Sound. Continued monitoring of marine birds and synthesis of the data are needed to determine whether populations injured by the spill are recovering. Data collected from 1989 to 2016 indicated that pigeon guillemots (*Cepphus columba*) and marbled murrelets (*Brachyramphus marmoratus*) are declining in the oiled areas of Prince William Sound. We have found high inter-annual variation in numbers of some bird species and therefore recommend continuing to conduct surveys every two years. These surveys are the primary means to evaluate recovery of most of these injured marine bird species. Surveys also benefit the nearshore and forage fish components of the GWA Long-term Monitoring program, as well as the Herring Research and Monitoring program. In FY18, we recently completed our July survey and have been working with other GWA investigators to integrate marine bird survey datasets for all of GWA to conduct analyses across-components and regions. We are not proposing changes to this project for FY19.

**FY19 Funding Recommendations:**

Science Panel	Science Coordinator	PAC	Executive Director	Trustee Council
Fund	Fund	Fund	Fund	Fund

### Science Panel Comments – FY19

**Date: September 2018**

We have no project specific comments.

### Science Coordinator Comments – FY19

**Date: September 2018**

Gratified that marine bird datasets will be integrated across the rest of the GWA program. Project is on track. No other project specific comments.

### PAC Comments – FY19

**Date: September 2018**

No project specific comments.

### Executive Director Comments – FY19

**Date: September 2018**

I concur with the recommendations of the Science Panel, Science Coordinator and Public Advisory Committee.

### FY18 Funding Recommendations:

Science Panel	Science Coordinator	PAC	Executive Director	Trustee Council
Fund	Fund	Fund	Fund	Fund

### Science Panel Comments – FY18

**Date: September 2017**

The Panel is pleased with the work the PIs are conducting and impressed with the survey coverage. Would it be worth surveying a subset of sites to monitor annually?

*PI Response (10/11/2017):*

*We agree with the Science Panel that, ideally, we would improve trends analysis by adding surveys to include even numbered years to our current ‘odd year’ July surveys. However, budgetary constraints make such an effort impractical. The additional time and costs would include boat preparation and post-survey maintenance, hiring extra personnel or covering salary of in-house personnel, lodging, per diem, fuel, and additional data control and analyses. Even selecting a much reduced number of transects to survey during even years (by ‘subset of sites’ we presume the panel is referring to transects), the cost of gearing up and operating a survey in Prince William Sound (PWS) is not substantially reduced by reducing the number of transects. A rough estimate of surveys during even years would be \$150-180K per year, in addition to the current \$222K per odd year under the current work plan.*

*If additional funds were added to this project to cover a reduced survey during even years, we would first want to conduct an analysis to determine what level of effort would be statistically robust, and how those transects or regions (sites) should be selected. Such an analysis could be useful for future planning, but would require additional funds for a contract or to cover time for the U.S. Fish and Wildlife Service (USFWS) biometrician.*

*We have some indication of what a reduced level of effort can provide, based on an analysis conducted for USFWS by WEST, Inc. in 2003 (Nielson et al. 2003). In brief, although the effect varied among species, the conclusion was that, on average, the coefficient of variation (CV) would not decrease*

substantially at 80% of our current effort, but increased substantially after that, which would greatly reduce our ability to detect population trends of < 50%. The report states: "However, for many species with low CVs at 100% of the original sample size (i.e., CV around 0.2 or less), the CV almost doubles when the sampling effort is reduced to 30%." We add that for species of conservation concern, typically with low or variable numbers, an unusually low or high abundance estimate in any given year will result in much reduced probability of detecting change in the population over time. The report also notes, however, that "... a systematic sample of blocks across habitats will likely provide more precise estimates of species abundance than the stratified random sample." With additional years of data since 2003, analysis of sampling effort by habitats may help with design of a reduced effort during even years.

Alternative to reduced surveying during even years, additional funds for the PWS marine bird surveys could be directed towards 'winter' (March) surveys. The March survey had fewer transects than July surveys, but has not been funded since 2010. The species composition of PWS changes substantially between July and March, with nine species or species groups primarily represented only in March (see Table 1 of the WEST, Inc. report); these were waterfowl, seaducks, and grebes. March surveys would provide population estimates and trends for all species during this critical season.

#### Literature Cited:

Nielson, R., S. Howlin, L. McDonald. 2003. "Bootstrapping to investigate effects of sample size on variance and bias of estimated species totals for Prince William Sound Marine Bird Surveys". Report by WEST, Inc. to U.S. Fish and Wildlife Service, Anchorage, Alaska, April 28, 2003.

#### Science Coordinator Comments – FY18

**Date: September 2017**

I concur with the Science Panel's comments.

#### PAC Comments – FY18

**Date: September 2017**

There are no project specific comments.

#### Executive Director Comments – FY18

**Date: September 2017**

I concur with the recommendations of the Science Panel, Science Coordinator and Public Advisory Committee.

#### FY17 Funding Recommendations:

Science Panel	Science Coordinator	PAC	Executive Director	Trustee Council
Fund	Fund	Fund	Fund	Fund

#### FY17 Funding Recommendations:

Date	Science Panel	Science Coordinator	PAC	Executive Director	Trustee Council
May 2016	Fund	Fund	N/A	N/A	N/A
Sept 2016	Fund	Fund	Fund	Fund	Fund

**Science Panel Comments – FY17****Date: September 2016**

The Panel has no project specific comments.

**Date: May 2016**

There are no project specific comments.

**Science Coordinator Comments – FY17****Date: May and September 2016**

I have no project specific comments.

**Executive Director Comments – FY17****Date: September 2016**

I have no project specific comments.

**Public Advisory Committee Comments – FY17****Date: September 2016**

The PAC meeting was Sept. 22, 2016 and fund recommendations are included in the table above. Any project-specific comments from that meeting will be added to the Work Plan when the comments are finalized in the meeting notes.

**Project Number:** 19120114-N

**Project Title:** LTM Program – Long-term killer whale monitoring

**Primary Investigator(s):** Craig Matkin

**PI Affiliation:** North Gulf Oceanic **Project Manager:** NOAA

**EVOSTC Funding Requested FY17-21: \$726,100**

FY17	FY18	FY19	FY20	FY21
Auth: \$152,800	Auth: \$151,300	\$142,100	\$140,300	\$139,500

*Requests include 9% GA.*

**Funding From Non-EVOSTC Sources FY17-21: \$125,000**

FY17	FY18	FY19	FY20	FY21
\$25,000	\$25,000	\$25,000	\$25,000	\$25,000

**Total Past EVOSTC Funding Authorized (FY12-18): \$840,200**

**Total EVOSTC Funding Authorized (FY12-18) and Requested (FY19-21): \$1,262,100**

**Total Non-EVOSTC Funding (FY12-21): \$242,500**

**Abstract:**

*\*This abstract is excerpted from the PI's Proposal, dated 8/17/18, budget updated 9/18/18.*

This project is a continuation of the long-term photo-identification based program that has continuously monitored killer whale populations in Prince William Sound since 1984. A primary focus has been on resident killer whales and the recovery of AB pod and the threatened AT1 population of transient killer whales. These two groups of whales suffered serious losses at the time of the oil spill and have not recovered at projected rates. Assessment of population dynamics, feeding ecology, movements, range, and contaminant levels for all major pods in the area will help determine their vulnerability to future perturbations and environmental change, including oil spills. In addition to population dynamics from annual photo-identification, this project uses other techniques to determine the health and trends of the population. These techniques include biopsy/skin sampling to compare genetics between populations, biopsy/blubber to investigate contaminants, fatty acid and stable isotope profiles, prey sampling of flesh, fish scales, and whale scat to investigate diet, behavioral observation, and remote acoustic monitoring to determine important off-season habitat. During FY18, remote recording hydrophones have been recovered and redeployed in Montague Strait, Hinchinbrook Entrance, and Kenai Fjords. Initial investigation of this raw acoustic data suggests that strong fall activity in Montague Strait still occurs, but in 2016 and 2017 were 2-3 weeks later than in past years. If this timing continues, we may adjust the field effort dates to improve encounter rates. Between our surveys and contributed photos, we were able to confirm that all seven of the remaining Threatened AT1 transient population has survived to 2018. We are not proposing any major changes to this project for FY19.

**FY19 Funding Recommendations:**

Science Panel	Science Coordinator	PAC	Executive Director	Trustee Council
Fund	Fund	Fund	Fund	Fund

Date: September 2018

We agree with the Science Coordinator that the diet analysis and understanding killer whale feeding ecology is important. It behooves the PI to locate another lab to process the biopsy samples and continue the work. We would like to know if the PI has any publications planned for the future.

*PI Response (10/10/18)*

*Thanks for your comments regarding our long-term killer whale monitoring project and for giving me a chance to respond. I agree with the importance of a paper summarizing the results of the stable isotope and contaminant work as it relates to killer whale diet. We have obtained the commitment of another chemist at the Northwest Fisheries Science Center (NWFSC) who will completely reconstruct the statistical analysis (this is needed because the original chemist retired and is unreachable). Hopefully, this paper will be completed this winter.*

*In regard to continuing the blubber chemistry segment of the study there are a number of reasons that we have elected not to continue it, at least not on an annual basis. To summarize:*

- 1. The NWFSC was supporting 90% of the costs outside of the fieldwork and has had their staff and budget seriously reduced in recent years. They can no longer support the chemist required to do the analytical, statistical, and interpretive work. Additional funds would be required to contract with another lab and chemist to take responsibility for this type of work.*
- 2. We have attempted to eliminate the invasive aspects of our study that requires piercing of the whales' bodies. This was stimulated in part by the death of a southern resident killer whale (SRKW) that was clearly attributed to the infection resulting from the wound associated with tagging. Hence, within our project, and for killer whale research in the North Pacific, there is restructured emphasis on remote acoustic monitoring and collection of prey and scat material.*
- 3. We have added a non-invasive, genetics-based scat study to examine feeding habits in more detail. This will be used in conjunction with the prey sampling program already in place to continue what we believe is a more robust and detailed examination of killer whale feeding ecology. This component of the project is possible due to the concurrent work being completed on the endangered SRKW population and the NWFSC desire to compare those results with our study. We could not fund this work independently within our budget. The geneticist, Dr. Kim Parsons, who is working with us on the project, provides the following response: "Molecular genetic prey identification from marine mammal feces has proved valuable for a number of species of interest. For southern resident killer whales, fecal genetic analyses have allowed us to generate data from a large ( $n > 400$ ) number of fecal samples collected over multiple seasons and years. This sampling approach generates relative proportions of prey species detected in each fecal sample representing samples from across individuals, geographic regions and time periods. From these data, we have been able to genetically assign each fecal sample to individual whales and characterize the diet of the SRKW population across both seasons and geographic regions, detecting both common and rare, but potentially important, prey species. In addition, we are currently optimizing existing salmon genetic stock identification methods for future application to fecal samples, allowing us to assign salmon detected in killer whale feces to individual stocks. The unique ability to hone in on stocks of importance to endangered marine predators provides critical information supporting their conservation and management".*

*4. Chemical analysis of killer whale blubber certainly has value and contaminant trends as well as stable isotope values have been instructive. We could discuss a program of sampling at 3-5 year intervals to keep the trend data alive. There would need to be concurrent discussions in regard methods of funding this, particularly the lab work, interpretation, and analysis.*

*Our group sincerely thanks you for your consistent and unflagging support over the years, which has been the backbone for compiling a unique long-term database on killer whales in PWS/Kenai Fjords.*

#### **Science Coordinator Comments – FY19**

**Date: September 2018**

Project tasks are being completed as planned. The PI's efforts to secure other funding sources is noted and appreciated. From the FY12-16 Final Report, it is apparent that biopsy sampling provided important results in regards to contaminants and stable isotope analyses (i.e., probable changes in diet, contaminant levels supports this change in diet). However, the PI is deemphasizing the collection of biopsy samples for examination of feeding habits due in part to the retirement of the chemist at NOAA Northwest Region who led the project. The biopsy sampling and data are one of the more intriguing aspects of this work at this stage.

#### **PAC Comments – FY19**

**Date: September 2018**

No project specific comments.

#### **Executive Director Comments – FY19**

**Date: September 2018**

I concur with the recommendations of the Science Panel, Science Coordinator and Public Advisory Committee.

#### **FY18 Funding Recommendations:**

Science Panel	Science Coordinator	PAC	Executive Director	Trustee Council
Fund	Fund	Fund	Fund	Fund

#### **Science Panel Comments – FY18**

**Date: September 2017**

The Panel applauds the work being conducted by the PI demonstrating the impact of oil on killer whales depends on whether the group of whales is transient or resident. These results help refine the restoration goal of this species, which might otherwise not capture the genetic differences between pods. These differences suggest unanswered questions about their social activities, which will be further addressed by the PI. The Panel appreciates that the PI does an excellent job regarding outreach.

#### **Science Coordinator Comments – FY18**

**Date: September 2017**

I concur with the Science Panel's comments.

#### **PAC Comments – FY18**

**Date: September 2017**

There are no project specific comments.

**Executive Director Comments – FY18****Date: September 2017**

I concur with the recommendations of the Science Panel, Science Coordinator and Public Advisory Committee.

**FY17 Funding Recommendations:**

Science Panel	Science Coordinator	PAC	Executive Director	Trustee Council
Fund	Fund	Fund	Fund	Fund

**FY17 Funding Recommendations:**

Date	Science Panel	Science Coordinator	PAC	Executive Director	Trustee Council
May 2016	Fund	Fund	N/A	N/A	N/A
Sept 2016	Fund	Fund	Fund	Fund	Fund

**Science Panel Comments – FY17****Date: May and September 2016**

There are no project specific comments.

**Science Coordinator Comments – FY17****Date: May and September 2016**

I have no project specific comments.

**Executive Director Comments – FY17****Date: September 2016**

I have no project specific comments.

**Public Advisory Committee Comments – FY17****Date: September 2016**

The PAC meeting was Sept. 22, 2016 and fund recommendations are included in the table above. Any project-specific comments from that meeting will be added to the Work Plan when the comments are finalized in the meeting notes.



**Project Number:** 19120114-O

**Project Title:** LTM Program – Long-term monitoring of humpback whale predation on Pacific herring in Prince William Sound

**Primary Investigator(s):** John Moran and Jan Straley

**PI Affiliation:** NOAA and UAS

**Project Manager:** NOAA

**EVOSTC Funding Requested FY17-21: \$865,700**

FY17	FY18	FY19	FY20	FY21
Auth: \$161,900	Auth: \$155,000	\$187,400*	\$184,400*	\$177,000*

*Requests include 9% GA.*

*\* Totals in FY19-21 include additional annual requests of \$27,000 (+ 9% GA) that will be used to conduct an early spring survey (March). Funding for this survey has previously funded by NOAA.*

**Funding From Non-EVOSTC Sources FY17-21: \$800,000**

FY17	FY18	FY19	FY20	FY21
\$220,000	\$220,000	\$120,000	\$120,000	\$120,000

**Total Past EVOSTC Funding Authorized (FY12-18): \$908,800**

**Total EVOSTC Funding Authorized (FY12-18) and Requested (FY19-21): \$1,369,300**

**Total Non-EVOSTC Funding (FY12-21): \$1,136,700**

**Abstract:**

*\*This abstract is excerpted from the PI's Proposal, dated 8/17/18, budget updated 8/28/18.*

The humpback whale monitoring project is part of the Gulf Watch Alaska (GWA) pelagic component's integrated predator-prey survey. Humpback whale predation has been identified as a significant source of mortality on over-wintering Pacific herring in Prince William Sound (PWS) and a likely top-down force constraining their recovery. Humpback whales in PWS have a higher percentage of herring in their diet and forage longer on herring during non-summer months than their counterparts in Southeast Alaska. Currently, North Pacific humpback whales in the Gulf of Alaska may be experiencing nutritional stress and increased use of inland waters like PWS could result in increased predation on herring. We will continue to evaluate the impact by humpback whales foraging on Pacific herring populations in PWS following protocols established during 2007/08 and 2008/09 (EVOSTC project PJ090804). Prey selection by humpback whales is determined through acoustic surveys, visual observation, scat analysis, and prey sampling. Chemical analyses of skin and blubber biopsy samples provide a longer term perspective on shifts in prey type (trophic level from stable isotopes) and quality (energy content). These data are combined in an updated bioenergetic model that allows us to assess the impact of recovering humpback whale populations on the PWS ecosystem. By integrating with the forage fish and fall/winter marine bird components, we contribute to a comprehensive understanding of bottom-up influences and top-down controls on the PWS herring population. Our project has conducted three cruises per year: a September cruise funded by GWA, and December and March cruises funded (\$100K) by NOAA Alaska Fisheries Science Center. The December and March surveys during FY19-21 will no longer be funded by NOAA. Our research has demonstrated that humpback whale predation on herring peaks in the fall and spring when

fish are aggregated. With the fall survey funded by GWA, we are requesting additional funding to maintain the spring cruise. A spring survey, in particular, provides an important assessment of whale abundance and predator-directed impact on pre-spawning herring schools.

#### **FY19 Funding Recommendations:**

<b>Science Panel</b>	<b>Science Coordinator</b>	<b>PAC</b>	<b>Executive Director</b>	<b>Trustee Council</b>
Fund	Fund	Fund	Fund	Fund

#### **Science Panel Comments – FY19**

**Date: September 2018**

The Science Panel would like to see these data linked with forage fish and seabird data. If whales aren't there is it directly correlated with herring numbers? Namely, does reduced herring biomass lead to fewer whale observations?

*PI Response (10/10/18)*

*Anecdotally, yes, the decline in whale abundance mirrors the recent drop in herring biomass. Prior to recent marine heatwave adult overwintering and spawning herring were the preferred prey for whales in PWS. Our 2017 and 2018 surveys found fewer whales in PWS and a shift in feeding behavior to more dispersed prey such as juvenile herring. We saw similar shifts in whale abundance and feeding behaviors in Southeast Alaska. Quantifying the relationship between whales, birds, and herring is one of the objectives of the Pelagic Component's integrated predator-prey surveys that were piloted in 2014 and adopted during the current five year funding cycle. We have acoustic data from herring schools in September and December of 2017 and March and September of 2018 to compare with earlier surveys. The December and March survey vessels were funded through NOAA, but with no additional support for data analysis. However, we are exploring options to have these data analyzed, which will collectively provide valuable information on the relationship between whales and herring when herring abundance is extremely low.*

Also, changes in whale abundance should be distinguished from shifts in whale distributions to the extent possible. Comparison of whale trends in PWS with the greater North Pacific may be helpful.

*PI Response (10/10/18)*

*Yes, there are two possibilities for the decline in whale numbers within PWS: 1) they died, or 2) they moved. Unfortunately, there is no effort to determine trends for the greater population of humpback whales in Alaska or any attempts to survey offshore.*

*The PIs are leading the SPLISH Project (Survey of Population Level Indices for Southeast Alaska Humpback) to assess trends in abundance, calf production, spatial and temporal distribution, prey composition, and body condition for humpback whales in northern Southeast Alaska, and work closely with the Glacier Bay National Park long term monitoring program for humpback whales. These are the only projects in the state addressing humpback whale abundance trends.*

*Due to the lack of a comprehensive humpback whale survey in Alaska, data from our PWS and southeast Alaska surveys have been relied on by NOAA for section 7 consultations under the Endangered Species Act, establishing critical habitat, and evaluating unusual mortality events.*

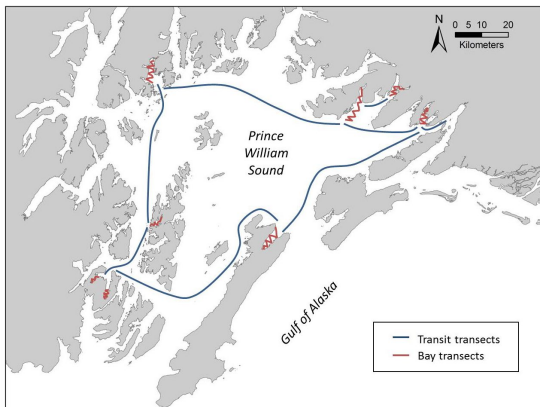
## Science Coordinator Comments – FY19

Date: September 2018

The project is on track. NOAA vessels were leveraged for FY17 and FY18 for this project and 18120114-E Bishop to conduct winter and early spring surveys and will no longer be available for FY19 and beyond. Funding (\$29.4K includes GA) is requested for only the spring cruise in March to continue work as described in both original project proposals. March surveys have provided an important assessment of spring conditions prior to herring spawning, whale abundance, and quantification of predator consumption of pre-spawning herring schools. These data are useful to the HRM program. Both projects 114-O and E are proposing to continue a spring/March cruise with requested funding. Is each project requesting its own vessel? If so, is there any way to share a vessel to reduce costs?

### *PI Response 9.5.18*

*Yes, each project is requesting their own vessel. When identifying projects with unfunded needs, we did have a lengthy discussion about sharing vessels, as the nearshore team also requested funding for March survey in PWS (that project did not rank in top 3 to request funds). We concluded that projects 19120114-E (fall/winter seabirds) and 19120114-O (humpback whales) would not be able to share a charter vessel. March surveys for marine birds and whales have different objectives, methods, and proposed spatial coverage (Figs. 1 and 2) and, therefore, require separate survey vessels. For example, the marine bird surveys (Fig. 1) are fixed transects sampled annually using the chartered vessel as the survey platform. In contrast, the whale survey route changes annually depending on where the whale and herring aggregations are (Fig. 2), and once an aggregation is encountered, the chartered vessel that is also used as the survey platform engages in focal following of predators and prey. Timing also differs. For marine birds, surveys would be conducted in early to mid-March before spring migration. On the other hand, we attempt to time whale surveys just prior to herring spawning in late March or early April. This is often too late for winter bird work.*



*Figure 1. Proposed dedicated marine bird surveys to occur in November and March in Prince William Sound, AK. Surveys will replicate our longest time series (2007 - 2016) and most consistent data.*

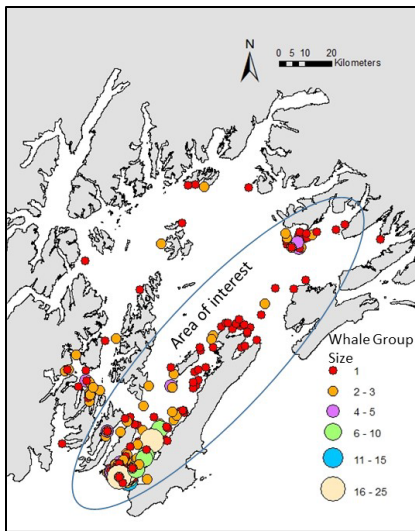


Figure 2. Area of interest for spring whale surveys in Prince William Sound, AK. Given limited vessel time, effort will focus on southern PWS an area of high whale and pre-concentrations.

#### PAC Comments – FY19

Date: September 2018

No project specific comments.

#### Executive Director Comments – FY19

Date: September 2018

I concur with the recommendations of the Science Panel, Science Coordinator and Public Advisory Committee.

#### FY18 Funding Recommendations:

Science Panel	Science Coordinator	PAC	Executive Director	Trustee Council
Fund	Fund	Fund	Fund	Fund

#### Science Panel Comments – FY18

Date: September 2017

The Panel was excited to see the results presented in Figure 1 in the proposal and encourages the PIs to make comparisons to the relevant study conducted by the National Center for Ecological Analysis and Synthesis (NCEAS) working group. Results shown in Figure 1 of the proposal are important and so strikingly incompatible with what was suggested previously by the time series analysis of the NCEAS working group (Ward et al 2017). That working group's model, of necessity, made some quite restrictive assumptions. Can the PIs look at the NCEAS model, and consider whether the new findings invalidate one or more key conclusions from that synthesis work?

#### PI Response (10/11/2017):

Thank you for the close review of project 18120114-O's work plan. Comparisons to Ward et al. (2017) are problematic because these authors depend on summer whale counts from western PWS (Teerlink et al. 2014), while our project focuses on fall/winter and spring time periods when herring form large, dense schools that are most vulnerable to whale predation. Observations of whales and prey when herring are aggregated allow us to study the potential impact of foraging humpback whales on herring as a possible contributor to the lack of herring recovery. The following are three important

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*differences between our approach and the Teerlink et al. (2014) approach to modeling whale predation on herring:*

- 1. The Teerlink et al. (2014) study estimates the number of whales that use PWS in summer, not the number that are present at any given time (for example, 10 whales spending 90 days in the Sound would have the same effect on prey as 900 whales spending one day in the Sound). It is important to know how many whales are feeding on herring for how many days within the Sound and the Ward et al. (2017) paper does not address this.*
- 2. Ward et al. (2017) used whale population estimates from summer surveys, when overall whale abundance is generally low in PWS compared to other seasons. Our work identified adult herring as the preferred prey of humpbacks in PWS, especially when herring are aggregated in the fall, winter, and spring (spawning); thus, whale numbers peaked in the fall and spring, and dropped during the summer months.*
- 3. Neither Ward et al. (2017) nor Teerlink et al. (2014) identify prey consumed by humpback whales.*

Additionally, the Panel is concerned that objective #3 may be overly ambitious and suggests re-wording and editing to “predation rate”?

*PI Response (10/11/2017):*

*With regards to objective #3 being overly ambitious and the Science Panel’s suggestion of rewording and editing to “predation rate”? We agree and will change the wording of this objective.*

#### **Science Coordinator Comments – FY18**

**Date: September 2017**

I concur with the Science Panel’s comments.

#### **PAC Comments – FY18**

**Date: September 2017**

There are no project specific comments.

#### **Executive Director Comments – FY18**

**Date: September 2017**

I concur with the recommendations of the Science Panel, Science Coordinator and Public Advisory Committee.

#### **FY17 Funding Recommendations:**

<b>Science Panel</b>	<b>Science Coordinator</b>	<b>PAC</b>	<b>Executive Director</b>	<b>Trustee Council</b>
Fund	Fund	Fund	Fund	Fund

#### **FY17 Funding Recommendations:**

<b>Date</b>	<b>Science Panel</b>	<b>Science Coordinator</b>	<b>PAC</b>	<b>Executive Director</b>	<b>Trustee Council</b>
May 2016	Fund	Fund	N/A	N/A	N/A
Sept 2016	Fund	Fund	Fund	Fund	Fund

**Science Panel Comments – FY17****Date: May and September 2016**

There are no project specific comments.

**Science Coordinator Comments – FY17****Date: May and September 2016**

I have no project specific comments.

**Executive Director Comments – FY17****Date: September 2016**

I have no project specific comments.

**Public Advisory Committee Comments – FY17****Date: September 2016**

The PAC meeting was Sept. 22, 2016 and fund recommendations are included in the table above. Any project-specific comments from that meeting will be added to the Work Plan when the comments are finalized in the meeting notes.

## **Lingering Oil Project Descriptions**

No Projects Submitted for FY19.



## **Data Management Program Project Descriptions**

**Project Number:** 19120113

**Project Title:** Data Management Program

**Primary Investigator(s):** Carol Janzen

**PI Affiliation:** AOOS

**Project Manager:** NOAA

**EVOSTC Funding Requested FY17-21:** \$1,090,000

FY17	FY18	FY19	FY20	FY21
Auth: \$218,000	Auth: \$218,000	\$218,000	\$218,000	\$218,000

*Requests include 9% GA.*

**Funding From Non-EVOSTC Sources FY17-21:** \$14,400

FY17	FY18	FY19	FY20	FY21
\$2,700	\$2,800	\$2,900	\$3,000	\$3,000

**Total Past EVOSTC Funding Authorized (FY12-18):** \$3,566,342

**Total EVOSTC Funding Authorized (FY12-18) and Requested (FY19-21):** \$4,220,342

**Total Non-EVOSTC Funding (FY12-21):** \$2,992,959

**Abstract:**

*\*This abstract is excerpted from the PI's Proposal, dated 8/20/18, budget updated 9/18/18.*

The Exxon Valdez Oil Spill Trustee Council (EVOSTC) requires a data management program composed of tools covering the entire data lifecycle, from immediately after data collection, to long-term preservation, to discovery and reuse. During the last EVOSTC five-year funding cycle, the Alaska Ocean Observing System (AOOS) provided data management services for both the "Long-Term Monitoring of Marine Conditions and Injured Resources and Services" Program, referred to as Gulf Watch Alaska (GWA), and the "Herring Research and Monitoring" (HRM) Program. These two programs leveraged the existing data management capacity of AOOS, and have also helped inform and improve the overall AOOS data and metadata management, access, and visualization tools. Because of these past investments, the AOOS team and infrastructure are best situated to provide data services to the EVOSTC for the next five years and thus maintain continuity and build upon the ongoing efforts and data management system development. Through these efforts, AOOS will continue to provide access to these tools and services for which the principal investigators (PIs) of the GWA and HRM Programs depend. Among these, the Research Workspace (an enhanced version of the former web-based data management platform, the Ocean Workspace) will be maintained and supported to upload, organize, and document data, as well as to facilitate program administration. This platform is familiar to GWA and HRM PIs from the prior funded effort and allows data to be made promptly and securely available to team members and program administrators. During the spring of 2016, the existing Ocean Workspace was updated with an enhanced metadata editor designed to help researchers more easily generate flexible yet robust, standards-compliant metadata. As in previous years, GWA and HRM Program data will be shared publicly (or 'published') through the AOOS Gulf of Alaska Data Portal, where it can be accompanied by any supplemental files or project documentation. Publishing through AOOS makes the data available to a wide-ranging and established network of resource managers, scientists, and the general public to support decision-making. In addition, the GWA and HRM Program datasets will be ingested into DataONE for long-term preservation, where each dataset will be assigned a digital object identifier (DOI) and made discoverable through other DataONE nodes. Through the

AOOS data management system, the significant expertise of the data management staff at its technical partner organization, Axiom Data Science, is leveraged. The Axiom staff have extensive experience with the GWA and HRM Programs and their associated data through the prior five-year effort. Building upon these established relationships and infrastructure, AOOS is well-poised to deliver continued success in its data management services to facilitate the access and curation of data to support decision-making related to Spill affected ecosystems.

#### **FY19 Funding Recommendations:**

<b>Science Panel</b>	<b>Science Coordinator</b>	<b>PAC</b>	<b>Executive Director</b>	<b>Trustee Council</b>
Fund	Fund	Fund	Fund	Fund

#### **Science Panel Comments – FY19**

**Date: September 2018**

The Science Panel applauds the Data Management team for the progress they have made with the program. The process for uploading and sharing data, making data publicly available appears to be seamless. The Data Management team provides detailed instructions and good support to PIs and programs, EVOSTC staff and reviewing committees. We recognize that the PI compliance is high, which is a reflection of how well the program is functioning and supporting the long-term monitoring programs. We note that Table A could be effectively summarized to highlight the high compliance rates and data availability.

#### **Science Coordinator Comments – FY19**

**Date: September 2018**

I use the Workspace to provide documents to the Science Panel and other reviewing committees. I greatly appreciate how much easier it is to share information. Program is on track except for one task due to technical difficulties and scheduled for the next quarter.

There is one question from the Science Panel in 2017 (from the FY18 Work Plan) that needs a follow up: Are the ADFG herring data sets available on the DataOne portal? If not, they should be made accessible.

PI Response (10/13/2017):

The ADFG Prince William Sound datasets have been submitted to the Research Workspace for sharing among collaborators. Some of these datasets have been made available to the public through both the GOA data portal and DataONE. An inventory of these datasets and their publication status are shown in the below table.

The data management team is awaiting a final decision from ADFG Commercial Fisheries division about whether to make the remainder of the data available publicly. We will update the EVOSTC and the EVOS Science Panel with this information as soon as we have a response.  
Has this been done?

*PI Response 9.6.18*

*The ADFG Prince William Sound datasets through 2017 (with the exception of the acoustic and scale measurement data) have been submitted to the Research Workspace for sharing among collaborators.*

- *Some of these datasets have been made available to the public through both the GOA (Gulf of*

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*Alaska) data portal and DataONE.*

- *An updated inventory of these datasets and their publication status are attached. (See xlsx file attached).*

*In March 2018, the data management team received the final decision from ADFG Commercial Fisheries division to allow the remainder of the data to be made available publicly with appropriate permissions.*

- *A copy of this communication is attached below this response, as an email from Sherri Dressel. Since that time, the following actions have been taken by the Data Management team to prepare these data for archive.*

- 1. The visualization of the Herring ASL data (including biomass, survey, ASL, spawn, marine mammal, and marine bird datasets) has been updated through 2017 in the GOA data portal.*
- 2. For all datasets, the ADFG Use Constraints disclaimer described in the Dressel email below has been added to the portal overview page for each dataset and to the corresponding metadata.*
- 3. The FGDC version of the historical metadata records (created by Steve Moffitt) has been migrated into the contemporary ISO metadata standard within the Research Workspace. This is a necessary precursor towards data archive and helps to ensure that metadata can be more readily updated by the PI in the coming years.*
- 4. As the ADFG database structure evolved over many decades, there were inconsistencies in the presentation of some of the aerial survey data. In consultation with ADFG, updates were made to correct errors within the data files.*

*It should be noted that many of these data are long-term historical datasets that, while a considerable resource to the Herring Research and Monitoring Program, extend beyond the life of the 2012-2016 Data Management Program. It is our intention to help ensure the long-term preservation of these data by submitting them to DataONE within this funding cycle, assuming confirmation from ADFG about the readiness of those data.*

#### **PAC Comments – FY19**

**Date: September 2018**

The PAC noted the importance of data management and supports providing more administrative support for uploading data, metadata, and reports.

#### **Executive Director Comments – FY19**

**Date: September 2018**

I concur with the recommendations of the Science Panel, Science Coordinator and Public Advisory Committee.

#### **FY18 Funding Recommendations:**

Science Panel	Science Coordinator	PAC	Executive Director	Trustee Council
Fund	Fund	Fund	Fund	Fund

## Science Panel Comments – FY18

**Date: September 2017**

The Panel greatly appreciates the PI's efforts on this project. The coordination between the data management program and the HRM and LTM Programs has greatly improved. The proposal was well written and organized.

Can the PI confirm that data will be available and not require specially approved access to get to the data?

*PI Response (10/13/2017):*

*The process for making data from the EVOS Gulf Watch Alaska (GWA) and Herring Research and Monitoring (HRM) programs publicly available is as follows. Project PIs upload preliminary and final datasets to the Research Workspace within one year of collection for sharing among collaborators. PIs maintain ownership of the data they have submitted to the Research Workspace; therefore, they have access to data from the 2012-16 and 2017-21 funding cycles without needing special permissions. Once data are finalized (e.g., within one year of data collection, in most cases) data are published from the Research Workspace to the AOOS Gulf of Alaska (GOA) data portal.*

*All data published to the GOA portal are accessible by the public with no restrictions or specially approved access. In the portal, these data are discoverable alongside the publicly-available final data from the 2012-2016 GWA and HRM projects. These data are further made available to the public through the Research Workspace DataONE member node, a preservation-oriented data repository that is openly accessible to the public. The DataONE archives, similar to the GOA portal, will continue to be updated with final data from the 2017 to 2021 funding cycle.*

*To navigate to the public-facing data in the GOA portal:*

- 1. Visit the AOOS website (<http://data.aos.org>) and select the Gulf of Alaska portal (image below), or navigate directly to the portal at <http://portal.aos.org/gulf-of-alaska>.*
- 2. To view data, click on Data Layer Catalog*
- 3. From the catalog labels on the left hand side, select the Gulf Watch or Herring Projects*
- 4. Click on the project you want to open from the list.*
- 5. To view data files, click 'Project Data' in the upper right (top image below). Browse the files and click those you want to download*

Are the ADFG herring data sets available on the DataOne portal? If not, they should be made accessible.

*PI Response (10/13/2017):*

*The ADFG Prince William Sound datasets have been submitted to the Research Workspace for sharing among collaborators. Some of these datasets have been made available to the public through both the GOA data portal and DataONE. An inventory of these datasets and their publication status are shown in the below table.*

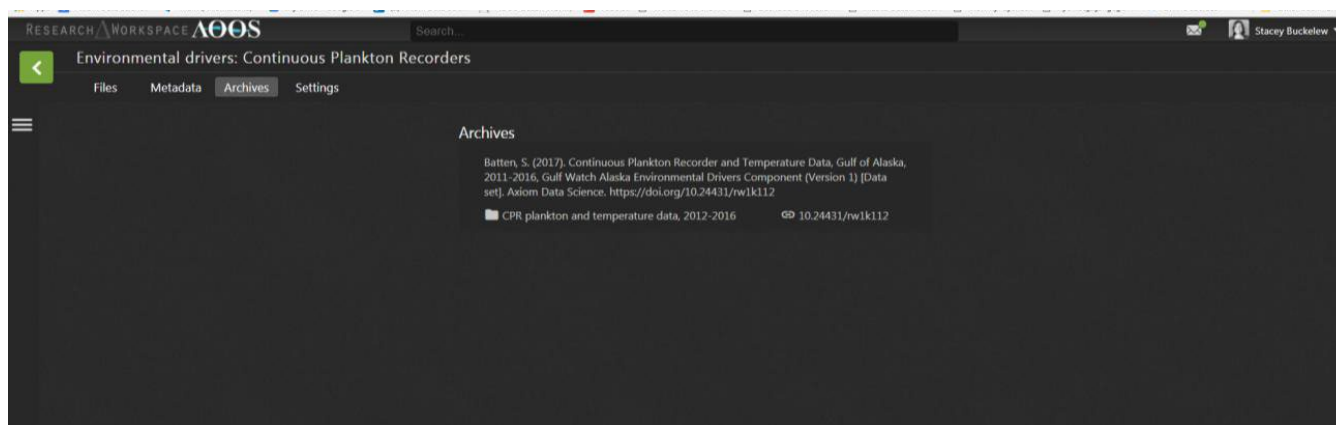
Dataset	Years	Public in GOA portal?	GOA portal link	Archived with DataONE?	DataONE doi link
Aerial herring biomass observations	1973-2016	yes; visualized & available for download	<a href="http://portal.aos.org/gulf-of-alaska.php#module-metadata/ad7118be-ea24-11e0-b488-0019b9dae22b/ee8a692c-ea24-11e0-b73c-0019b9dae22b">http://portal.aos.org/gulf-of-alaska.php#module-metadata/ad7118be-ea24-11e0-b488-0019b9dae22b/ee8a692c-ea24-11e0-b73c-0019b9dae22b</a>	yes; 2007-09 only	<a href="https://search.dataone.org/#view/df35a.22.16">https://search.dataone.org/#view/df35a.22.16</a>
Aerial herring spawn observations	1973-2016	yes; visualized & available for download	<a href="http://portal.aos.org/gulf-of-alaska.php#module-metadata/ad7118be-ea24-11e0-b488-0019b9dae22b/ee8a753e-ea24-11e0-a20d-0019b9dae22b">http://portal.aos.org/gulf-of-alaska.php#module-metadata/ad7118be-ea24-11e0-b488-0019b9dae22b/ee8a753e-ea24-11e0-a20d-0019b9dae22b</a>	yes; 2007-09 only	<a href="https://search.dataone.org/#view/df35a.22.17">https://search.dataone.org/#view/df35a.22.17</a>
Aerial herring spawn observations	1973-2016	yes; visualized & available for download	<a href="http://portal.aos.org/gulf-of-alaska.php#module-metadata/ad7118be-ea24-11e0-b488-0019b9dae22b/79b1cc76-5f1f-41d7-bb79-3f7e995d6d89">http://portal.aos.org/gulf-of-alaska.php#module-metadata/ad7118be-ea24-11e0-b488-0019b9dae22b/79b1cc76-5f1f-41d7-bb79-3f7e995d6d89</a>	yes; 2007-09 only	<a href="https://search.dataone.org/#view/df35a.22.18">https://search.dataone.org/#view/df35a.22.18</a>
Aerial survey marine bird observations	2008-2016	yes; visualized & available for download	<a href="http://portal.aos.org/gulf-of-alaska.php#module-metadata/258864ed-5fe3-4ae1-af41-fee3222612aa/d3964546-4786-11e5-953e-00265529168c">http://portal.aos.org/gulf-of-alaska.php#module-metadata/258864ed-5fe3-4ae1-af41-fee3222612aa/d3964546-4786-11e5-953e-00265529168c</a>	yes; 2007-09 only	<a href="https://search.dataone.org/#view/df35a.22.19">https://search.dataone.org/#view/df35a.22.19</a>
Aerial survey marine mammal observations	2008-2016	yes; visualized & available for download	<a href="http://portal.aos.org/gulf-of-alaska.php#module-metadata/ad7118be-ea24-11e0-b488-9212b588cc43/00357656-e3b9-4d22-9d03-345fb0b7320">http://portal.aos.org/gulf-of-alaska.php#module-metadata/ad7118be-ea24-11e0-b488-9212b588cc43/00357656-e3b9-4d22-9d03-345fb0b7320</a>	yes; 2007-09 only	<a href="https://search.dataone.org/#view/df35a.22.20">https://search.dataone.org/#view/df35a.22.20</a>
Aerial survey sea lion observations	2008-2016	yes; visualized & available for download	<a href="http://portal.aos.org/gulf-of-alaska.php#module-metadata/c893364d-0e8a-42de-8947-9212b588cc43/d39650b8-4786-11e5-9543-00265529168c">http://portal.aos.org/gulf-of-alaska.php#module-metadata/c893364d-0e8a-42de-8947-9212b588cc43/d39650b8-4786-11e5-9543-00265529168c</a>	yes; 2007-09 only	<a href="https://search.dataone.org/#view/df35a.22.21">https://search.dataone.org/#view/df35a.22.21</a>
Age Sex Length Data	1973-2014	no	-	yes	<a href="https://search.dataone.org/#view/df35b.273.7">https://search.dataone.org/#view/df35b.273.7</a>
Age Sex Length Data	2015-2016	no	-	no	-
PWS Herring Acoustics	1997-2014	no	-	no	-
Scale Measurement Data	1982-2016	no	-	no	-
PWS Herring Acoustic	1997-2014	no	-	no	-
Scale Measurement Data	1982-2016	no	-	no	-

The data management team is awaiting a final decision from ADFG Commercial Fisheries division about whether to make the remainder of the data available publicly. We will update the EVOSTC and the EVOS Science Panel with this information as soon as we have a response.

What is the status on linking DataOne to Workspace for all the projects?

PI Response (10/13/2017):

In June 2017, we launched the Research Workspace DataONE1 Member Node, a preservation-oriented data repository serving as the archival home for datasets published from the Research Workspace (news release here). Datasets published from the Research Workspace to the Research Workspace DataONE Member Node are issued a citable digital object identifier (DOI), and are discoverable through DataONE search interfaces alongside datasets and metadata from the other 40+ repositories that make up the DataONE federation. The final data holdings from the 2012-2016 GWA and HRM programs were archived in the Research Workspace DataONE Member Node and are now publicly discoverable and citable through both the AOS Gulf of Alaska data portal<sup>2</sup> and the DataONE Search<sup>3</sup> catalog. These archived resources are linked to any related datasets from the EVOS historical data salvage project (conducted by NCEAS), which are also stored in DataONE. Within the Research Workspace, the GWA and HRM program datasets archived with DataONE are visible under the Archives tab within each project (see below image). Here PIs can view the resource title, DOI, and link to the associated data and metadata. Additionally, the DOI is reflected in the Gulf of Alaska data portal, from which any member of the public can navigate from the Gulf of Alaska portal to the archived dataset within DataONE. In future Research Workspace updates, an archive page will be added to the EVOS GWA and HRM campaign which lists the archive dataset citations for the entire program (as opposed to individually by projects), and this list will include links to DataONE.



## Science Coordinator Comments – FY18

**Date: September 2017**

I concur with the Science Panel's comments. I greatly appreciated the Key Highlights section.

## PAC Comments – FY18

**Date: September 2017**

The PAC emphasizes the importance of being able to access raw data, not just scientific papers. The PAC is pleased with the improvements made to make data available in recent years.

## Executive Director Comments – FY18

**Date: September 2017**

I concur with the recommendations of the Science Panel, Science Coordinator and Public Advisory Committee.

## FY17 Funding Recommendations:

Science Panel	Science Coordinator	PAC	Executive Director	Trustee Council
Fund	Fund	Fund	Fund	Fund

## FY17 Funding Recommendations:

Date	Science Panel	Science Coordinator	PAC	Executive Director	Trustee Council
May 2016	Fund	Fund	Fund	Fund	N/A
Sept 2016	Fund	Fund	Fund	Fund	Fund

## Science Panel Comments – FY17

**Date: September 2016**

We appreciate the Team Lead's thorough responses to our questions and comments. We do not have any additional questions or comments on the revised proposal.

**Date: May 2016**

The Panel appreciates the refocusing of the data management program to better meet the needs of the Programs and the EVOSTC. Making the data collected by the Programs available to other researchers and trust agencies is the primary goal of the data management program. The development and implementation of the data portal in conjunction with the partnership with DataONE in the first five-year program has helped to meet that goal.

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The Panel was encouraged to see a more defined data policy that provided clear repercussions for non-compliant PIs. The Panel was gratified to learn that AXIOM has developed or is developing a presumably online training course for PIs on how to construct metadata for their projects, so as to address one cause for slow compliance with data submittal time tables.

The Panel is concerned about the availability of data from the first five-years of the Program to the new and continuing PIs. Milestone 2 on page 21 of the proposal needs further clarification. “Some PIs in the current funding cycle may need access to previously collected datasets in the Workspace.” Does this mean that new and continuing PIs will not be able to routinely access data collected in the first five-year Program unless they submit a special request? Access to both the historical data assembled by NCEAS and data collected by projects in the first five years is critical to the success of both Programs.

The Panel strongly encourages the continued coordination and collaboration with both major Programs (Long-Term Monitoring and Herring Research) in the design and updating of the system.

The Panel was concerned that the Program lead was unable to answer several questions regarding the design of the Program and the PI appeared unfamiliar with the content of the proposal, thus inhibiting a full discussion of the Workspace functionality.

#### **Science Coordinator Comments – FY17**

**Date: May and September 2016**

I concur with the Science Panel’s comments.

#### **Executive Director Comments – FY17**

**Date: September 2016**

I concur with the Science Panel’s comments.

#### **Public Advisory Committee Comments – FY17**

**Date: September 2016**

The PAC meeting was Sept. 22, 2016 and fund recommendations are included in the table above. Any project-specific comments from that meeting will be added to the Work Plan when the comments are finalized in the meeting notes.



## **Project (not in a Program) Descriptions**

**Project Number:** 19110853

**Project Title:** Pigeon Guillemot Restoration Research in Prince William Sound

**Primary Investigator(s):** Kathy Kuletz, Robb Kaler, David Irons

**PI Affiliation:** USFWS

**Project Manager:** USFWS

**EVOSTC Funding Requested FY17-21: \$531,700**

FY17	FY18	FY19	FY20	FY21
Auth: \$149,800	Auth: \$173,400	\$69,500*	\$69,500*	\$69,500*

*Requests include 9% GA.*

\*Includes USDA-FS request for ~\$17K annually for permit fees.

**Funding From Non-EVOSTC Sources FY 17-21: \$713,000**

First line is from National Fish and Wildlife Foundation Grant, Second line is USFWS in-kind support

FY17	FY18	FY19	FY20	FY21
\$215,600	\$215,600	\$0	\$0	\$0
\$98,000	\$98,000	\$28,600	\$28,600	\$28,600

**Total Past EVOSTC Funding Authorized (FY07-18): \$2,204,500**

**Total EVOSTC Funding Authorized (FY07-18) and Requested (FY19-21): \$2,413,000**

**Total Non-EVOSTC Funding (FY07-23): \$2,433,100**

**Abstract:**

*\*This abstract is excerpted from the PI's Proposal, dated 9/14/18, budget updated 9/18/18.*

Historically, the Naked Island group had the largest breeding population of pigeon guillemot (*Cepphus columba*) in Prince William Sound (PWS), Alaska, but it declined over 90% after the 1989 *Exxon Valdez* Oil Spill. Following the effects of the oil spill, predation of adults and their nests by introduced American mink (*Neovison vison*) was the primary factor limiting population recovery. However, with the major changes in the ocean ecosystem in the Gulf of Alaska in the past few decades, sufficient food availability for nesting has also been a concern, as the guillemots in PWS overall have been gradually declining since the oil spill. Mink trapping in guillemot nesting areas was conducted 2014-2018 and mink were caught during the first three years (2014-2018; 76, 23, 7, 0, and 0 mink, respectively). In 2017, mink tracks were observed at one location, but no mink were caught. In 2018, no mink tracks were observed and no mink were captured. While trapping was restricted to pigeon guillemot nesting areas, which were placed along 70% of the shoreline throughout the islands, male mink were likely traveling greater distances in search of females, thereby increasing their exposure to traps. During this 5-year restoration study, counts of pigeon guillemots at Peak, Naked and Story islands has more than doubled from 2014-2018 (69 to 167 individuals) and numbers of nests increased more than four times (11 to 51 nests). Enough food has been available to allow good breeding success the last three years. Numbers of pigeon guillemots counted at control islands did not show a similar increase in population gain.

From a management perspective, it is important to determine if mink are absent from the islands, when or if they might return and at what numbers will they start having an effect on the pigeon guillemots again. We propose to continue to: (i) search for evidence of mink in guillemot breeding areas, (ii) monitor the recovery of pigeon guillemots, and (iii) monitor relative food availability, using black-legged kittiwakes (*Rissa tridactyla*) as indicators. While we expect no mink remain on the Naked Island group, we propose three additional years of winter/spring monitoring using bait stations, camera traps, and track surveys focused on 10 previously high-density mink areas to determine need for continued management of mink. To monitor continued population recovery of guillemots, we propose five years of annual guillemot population surveys. The surveys would be conducted, as they have been in the past, in spring at the Naked Island group and control islands (Fool, Seal, Smith and Little Smith islands). To monitor relative food availability, we will use black-legged kittiwakes as an indicator. We propose a cost efficient survey to follow productivity trends of black-legged kittiwake colonies in PWS to provide information on the relative availability of food for nesting. Together, these data will inform future management actions by determining if mink are absent from the islands, measure the rate of recovery of pigeon guillemots following the removal of mink, and provide an indicator for productivity patterns of ocean conditions to help interpret pigeon guillemot population trends.

#### **FY19 Funding Recommendations:**

<b>Science Panel</b>	<b>Science Coordinator</b>	<b>PAC</b>	<b>Executive Director</b>	<b>Trustee Council</b>
<a href="#">Fund</a>	<a href="#">Fund</a>	<a href="#">Fund</a>	<a href="#">Fund</a>	<a href="#">Fund</a>

#### **Science Panel Comments – FY19**

**Date: September 2018**

The Science Panel greatly appreciates the detailed responses by the PI to the Science Coordinator's questions. We acknowledge the importance of this follow-up project and determining if and when the mink might return. This information will add to what we already know about fox predation on seabirds. Furthermore, the utility of this method of culling mink improves our ability to conserve and restore pigeon guillemots and other ground-nesting seabirds. We continue to be impressed with the results of the first five years of this project, one of the few in which active restoration was observed in a surprisingly short amount of time. We also recognize that it will not cost much more to conduct the black-legged kittiwake monitoring (\$7.5K) and believe this would cost-effectively add forage fish availability information to this project and knowledge of seabird ecology in PWS.

#### **Science Coordinator Comments – FY19**

**Date: September 2018**

Determining if mink are truly absent from the islands is important but also when or if mink might return and what numbers will the start having an effect on PIGU populations again. Furthermore, I was gratified to hear the strong PAC support for this project, including the BLKI monitoring at the PAC meeting. I have several questions for the PIs:

PIs propose to search for evidence in mink in PIGU breeding areas through 3 years of winter/spring monitoring using bait stations, camera traps and track surveys focused on 10 previously high-density mink areas to determine the need for continued management of mink. Is this sufficient compared to monitoring 70% of the coastline? How will mink movement be accounted for?

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*PI Response 9.6.18*

*We trapped for two months each year for five years at the Naked Island group and found 11 areas (10 accessible) with 2 Km or less shoreline where 5 to 10 mink were trapped. During our 5-year effort, 68% (72 of 106) of mink were caught in these 11 areas, from which we interpret that these areas provide preferred habitat. Further support for our interpretation includes the ADF&G American Mink info page (<http://www.adfg.alaska.gov/index.cfm?adfg=americanmink.printerfriendly>) which reports mink are found in close association with water, preferring saltwater beaches, riparian habitats of lakeshores, marshes, and stream banks, with coastal mink selecting shallow vegetated slopes and tidal slopes with protection from wave action. As much of the Naked Island group coastline is composed of steep cliffs with little riparian, marshes or streambank habitat, focusing our efforts on the 10 proposed areas is a reasonable approach. Additionally, based on patterns observed from our trapping efforts, once a male mink was removed from a territory, another male quickly moved in. Many of the females were also captured in these high mink density areas. If mink remain at the Naked Island group, or if new mink arrive (highly unlikely; please see additional comments below under PIGU population model question), we surmise that they would select territories in preferred habitats, which are these 11 areas. We feel that our plan is sufficient to capture evidence of mink coming into the pigeon guillemot nesting areas. Based on the patterns observed during pre-mink trapping using bait stations and cameras, as well as patterns of movements of males as fewer females were present during the trapping effort, we are confident that our approach using bait stations, cameras, and track surveys will detect mink if they are present.*

PIs propose to monitor relative food availability by conducting BLKI productivity surveys for 5 years and using productivity as an index for food availability. PIs also state that “the forage fish project (Arimitsu and Piatt; 19120114-C) and Middleton Island seabird research led by Dr. Scott Hatch (Institute for Seabird Research and Conservation) will provide background on forage fish availability in the northern Gulf of Alaska and PWS region.” Isn’t this sufficient for providing information on forage fish availability?

*PI Response 9.6.18*

*Obtaining PWS-wide forage fish population/biomass estimate was not feasible given the funding available so Drs. Yumi Arimitsu and John Piatt’s forage fish project shifted directions for 2017-2021 to integrate directly with the humpback whale study (Moran and Straley, Gulf Watch Project 1912011-O). The forage fish monitoring now focuses survey efforts during the fall (September/October) and at areas with high densities of fall whale observations (Montague Strait, Bainbridge Passage, Bligh Island). Owing to these different sampling times (July versus late September/early October), we are not confident the forage fish study will provide sufficient information during the July PIGU chick rearing period. Regarding BLKI monitoring at Middleton Island led by Dr. Scott Hatch (Institute for Seabird Research and Conservation), we agree it will provide background on forage fish availability in the northern Gulf of Alaska, but Middleton Island is 100 Km from Hinchinbrook Entrance and most kittiwakes from Middleton do not forage in PWS during the chick rearing period.*

I appreciate the leveraging of other data and equipment from the GWA projects and using a less costly method of BLKI productivity monitoring as a proxy but I’m concerned that this may not be appropriate or as useful as we would like it to be. The PI’s rationale is that there is 35 years of data that shows strong evidence that BLKI productivity in PWS is directly linked to food availability and provides good indices of “good”, “moderate”, and “poor” years regarding food availability for seabirds in PWS. BLKI do well when sand lance, herring and capelin are present, previous studies also show that PIGU have higher nesting success when the same lipid-rich forage fish are available.

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The assumption is that high BLKI productivity = good food availability for PIGU. And BLKI are coastal and offshore pelagic foragers? And PIGU typically forage in nearshore benthic environments (Golet et al. 2002). They eat sand lance, herring and smelt but also demersal fish such as gadid, sculpins, and blennies. Are BLKI an appropriate indicator of food availability for PIGU?

*PI Response 8.6.18*

*As you mentioned, PIGUs have higher nesting success with lipid rich forage fish are available, as do BLKI. BLKI are the only indicator available, they are not perfect but they would add information to help interpret the PIGU population trends.*

How would the BLKI productivity monitoring be used to interpret PIGU observations?

So, if PIGU populations on Naked Island group continue to increase and BLKI productivity is high, then you would infer that this increase is due to the absence of mink and good food availability?

*PI Response 8.6.18*

Yes

But if what if BLKI productivity is low? Then the increase in PIGU populations would be due to only the absence of mink? And this would indicate that PIGU are finding enough to eat but something different than BLKI?

*PI Response 8.6.18*

*If BLKI productivity is low and PIGU populations increase, there are two reasons regarding food: (i) Since the PIGU population is very low compared to carrying capacity it takes less total food to be successful and will change as the PIGU population increases; (ii) The PIGU can and do feed on demersal fish, but as has been pointed out, they can do better when high-lipid forage fish are abundant. There is another scenario that may happen, which is of concern. The PIGU remain stable (like 2018) or decline. If we have the BLKI data and they are doing well, then we suspect it is not a food issue, but something else. If the BLKI are doing poorly, then we might suggest the reason for the PIGU not increasing despite being well below carrying capacity is lack of food. We think this scenario is a strong reason to monitor the BLKI, especially since the PIGU did not go up this year.*

PIGU Population Model: this addresses the SP's comments from 2017 (see Science Panel comments – from FY18). Question – can mink emigrate from other areas? Does this need to be taken into account in the model?

*PI Response 9.6.18*

*We believe it is highly unlikely that mink will immigrate to the Naked Island group. While mink are native to mainland PWS and inhabit other larger islands in PWS (e.g., Knight, Hinchinbrook, Hawkins, Bainbridge, Latouche, and Elrington islands) they never swam to the Naked Island group, Smith Islands, Seal Island, or Montague Island. Looking at a map of PWS one observes that all these islands are in the middle of PWS several miles from other islands and the mainland. In 1951 the USFWS gave ADF&G money to introduce mink to Montague Island to increase trapping opportunity in PWS. The origin of mink to the Naked Island group followed two fox farms at the island group that were active from about 1900 to 1940. Following the end of fox farming on the islands, a family homesteaded and continue to have an in-holding and house on Peak Island. In the 1970s, one of the family's sons living*

*in Cordova decided he wanted to trap mink at the Naked Island group and started live-trapping mink from other islands, taking one or two a year out to the island group. The mink population did not increase quickly so the son continued to release mink for about 10 years. After extensive trapping in PWS we know that the first mink caught in an area is likely to be a male, because males travel more defending their territory. We suspect that the son kept catching males and brought them to the Naked Island group and finally he caught a female. By 1998 the mink population had increased enough that there was 60% PIGU nest predation. We trapped 106 mink off the island so the population level was likely about 100. We expect that they increased from a few to about 100 in about 15 years. Given this evidence we do not feel it is necessary to include immigration or emigration into the population models.*

#### **PAC Comments– FY19**

**Date: September 2018**

The PAC recognized the excellent results from this project, with one member stating that PIGU have been observed in PWS in higher numbers. Several PAC members also strongly supported the kittiwake monitoring as these seabirds have not been doing well either.

#### **Executive Director Comments – FY19**

**Date: September 2018**

I concur with the recommendations of the Science Panel, Science Coordinator and Public Advisory Committee.

#### **FY18 Funding Recommendations:**

<b>Science Panel</b>	<b>Science Coordinator</b>	<b>PAC</b>	<b>Executive Director</b>	<b>Trustee Council</b>
Fund	Fund	Fund	Fund	Fund

#### **Science Panel Comments – FY18**

**Date: September 2017**

The Panel approves of the additional funding requested for a full field season to remove all mink from 70% of the shoreline where PIGU nested or currently nest. Again, the panel is very pleased with how quickly the population is increasing. As noted in past work plans, unless expanded trapping is permitted, the observed success will likely be temporary. A subsequent increase in the mink population resulting from only a partial eradication will probably, again, decimate the PIGU population over time. As noted in last year's work plan, population projections of both predator and prey may be useful to evaluate the merits and timeliness of future management agency decisions regarding predator controls.

#### **Science Coordinator Comments – FY18**

**Date: September 2017**

I concur with the Science Panel's comments.

#### **PAC Comments– FY18**

**Date: September 2017**

There are no project specific comments.

**Executive Director Comments – FY18****Date: September 2017**

I concur with the recommendations of the Science Panel, Science Coordinator and Public Advisory Committee.

**FY17 Funding Recommendations:**

Science Panel	Science Coordinator	PAC	Executive Director	Trustee Council
Fund	Fund	Fund	Fund	Fund

**FY17 Funding Recommendations:**

Date	Science Panel	Science Coordinator	PAC	Executive Director	Trustee Council
May 2016	Fund	Fund	N/A	N/A	N/A
Sept 2016	Fund	Fund	Fund	Fund	Fund

**Science Coordinator Comments – FY17****Date: May and September 2016**

I concur with the Science Panel's comments.

**Science Panel Comments – FY17****Date: September 2016**

We have no additional comments for this project.

**Date: May 2016**

This project has continued to demonstrate marked progress toward the recovery of a historically important PIGU nesting site on Naked Island and the Panel is supportive of continued funding. The Panel has noted in past work plans that, unless expanded trapping is permitted, this success may only be temporary with mink remaining in other areas of the island. Ultimately, lacking a program to fully eradicate mink from this island, redistribution of a rebounding mink population would be expected to once again cause a PIGU population decline over the long term. Population projections of both predator and prey may be useful to evaluate the merits and timeliness of future management agency decisions regarding predator controls.

**Science Coordinator Comments – FY17****Date: May and September 2016**

I concur with the Science Panel's comments.

**Executive Director Comments – FY17****Date: September 2016**

I concur with the Science Panel's comments.

**Public Advisory Committee Comments – FY17****Date: September 2016**

The PAC meeting was Sept. 22, 2016 and fund recommendations are included in the table above. Any project-specific comments from that meeting will be added to the Work Plan when the comments are

finalized in the meeting notes.

**FY16 Funding Recommendations:**

Science Panel	Science Coordinator	PAC	Executive Director	Trustee Council
Fund	Fund	Fund	Fund	Fund

**Science Panel Comments – FY16**

**Date: September 2015**

Trapping of mink to promote restoration of pigeon guillemots is already a remarkable success story, well ahead of expected time frames for recovery. The project is well along to remove all mink from PIGU nesting sites, and a positive PIGU population response has already been observed. Documentation of population trends of predator and prey over the full 5-year course of this project will make for an excellent case study. However, over the long term, the question is whether this success will be temporary or sustained, given that mink remain on other parts of the islands. The Pls have made estimates of PIGU population doubling times as a result of mink eradication from nesting sites. Additionally, it would be informative to estimate mink population trends in the absence of an ongoing trapping program after the conclusion of this project. Ultimately, lacking a program to fully eradicate mink from these islands, redistribution of a rebounding mink population would be expected to once again cause a PIGU population decline over the long term. Population projections of both predator and prey may be useful to evaluate the merits and timeliness of future management agency decisions about predator controls.

**Science Coordinator, Executive Director Comments – FY16**

**Date: September 2015**

I concur with the Science Panel's comments.

**Public Advisory Committee Comments – FY16**

**Date: September 2015**

There are no project specific comments.

**FY15 Funding Recommendations:**

Science Panel	Science Coordinator	PAC	Executive Director	Trustee Council
Fund	Fund	Fund	Fund	Fund

**Science Panel Comments – FY15**

**Date: September 2014**

The Panel notes that the proposal is strong and well written and provides a level of detail that allows for constructive review. We do note the high cost of the mink trapping effort in relation to the number culled in FY14. We are concerned about the effectiveness of the project and its ability to achieve its goals in the long term given that eradication of mink will not be allowed.

**Science Coordinator, PAC, Executive Director Comments – FY15**

**Date: September and October 2014**

We concur with the Science Panel.

**FY14 Funding Recommendations:**

Science Panel	Science Coordinator	PAC	Executive Director	Trustee Council
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Fund	Fund Contingent	Not Reviewed	Fund	Fund
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#### **Science Panel Comments – FY14**

**Date: September 2013**

The panel recommends funding of this proposal. The panel notes that the proposal is strong and well-written and provides a level of detail that allows for constructive review. The panel does acknowledge that culling could be a temporary or on-going solution and a “money sink,” if continued into future years and that it is a substantial commitment to fund and monitor over time. However, it is active restoration, which is rare among submitted proposals, and it is an interesting scientific experiment.

#### **Science Coordinator Comments – FY14**

**Date: September 2013**

I concur with the science panel regarding the scientific merit of the proposal. I also echo the concerns of the Panel this is likely a temporary solution and a full cull would be needed to increase the population by the numbers cited in the proposal. Dr. Irons stated in his final report for Phase 1 of this project (Page 12):

*“... because even a single mink can devastate a guillemot colony (U.S. Fish and Wildlife, unpubl. data), culling is unlikely to significantly reduce the level of guillemot nest predation or facilitate population recovery.”*

Has something changed since the report was accepted that a limited cull would now be considered useful? I also have several questions regarding the design of the project including: If the number of birds increases, are there any plans to determine if the increase was from the predator removal or other factors? The plan includes monitoring the population on Smith Island as a control which is currently mink-free. However, there is no monitoring plan discussed in the proposal. Will Smith Island be surveyed at the same time and frequency as Naked Island? The proposal states that ADFG is only willing to consider a limited cull at this time. If a complete removal is found to be necessary, would a permit to complete this work be possible or denied due to the mixed genetic stock of the mink on the Island?

At this time, I feel that the Council should postpone a funding decision until a final Environmental Assessment is provided by the PI and the question above regarding the limited cull is answered.

#### **Public Advisory Committee – FY14**

**Date: October 2013**

The October 2013 PAC meeting was cancelled due to the federal government shutdown. Abstracts were submitted to the PAC; no individual comments were received.

#### **Executive Director Comments – FY14**

**Date: September 2013**

I concur with the Science Panel and support the concerns of the Science Coordinator. Due to the prospect of matching funds if this proposal is funded at this time and the opportunity for active restoration, I recommend funding, conditioned upon completion of the EA to the satisfaction of EVOSTC Executive Director and the coordinating agencies (USFWS, APHIS, ADFG, USFS).

## FY12 FUNDING RECOMMENDATIONS

Date	Science Panel	Science Coordinator	PAC	Executive Director
June/July 2011	Fund	No consensus	No comments	No consensus

### Science Panel Comments – FY12

#### Date: June 2011

This proposal has been previously submitted to the EVOS Trustee Council and reviewed by the Science Panel. Support for the work was strong among the Science Panel members. One concern that arose pertained to the question of whether the mink found today on Naked and nearby Islands in the Naked group are descendants of the animals introduced artificially or whether these are fully native mink with an intact natural genome. That question has now been answered with DNA analysis revealing a mixed genome, not reflecting a pure native stock. This answer would appear to satisfy the question of whether these mink are natural (no) and to allow the extermination to move forward, if supportable scientifically by the Science Panel and Trustee staff and if politically and financially acceptable to the Trustee Council. Here we will provide a review of the adequacy of the science. First, it is noteworthy that PIGUs are the only bird species still listed as Not Recovering after EVOS. Second, the importance of Naked Island and its potential recovery to this species is evident – the Naked Island group held about 25% of the PIGU population in PWS prior to the spill despite representing only 2 % of the PWS shoreline. Third, the inference that mink represent the impediment to PIGU recovery on Naked is strong, based especially on comparison Smith Island where mink are absent and PIGU survival is good. Fourth, the contention that strong recovery of PIGUs on Naked would lead to spread and re-colonization of other suitable sites in PWS is a reasonable expectation, so restoration on Naked pays a wider dividend of recovery elsewhere in PWS. Fifth, we know that the introduced foxes are now gone from Naked so that isn't the problem. Sixth, the alternatives analysis is compelling in showing that no other restoration option would work and that eradication is the only solution. For example, providing more of the now reduced lipid-rich prey would be useless, resulting in feeding mink better not in enhancing PIGU survival and abundance. Culling would be a half-step and require costly intervention forever, and thus can be rejected as a viable restoration option. Seventh, elimination of predatory mammals on islands is a well-established practice to enhance ground-nesting seabirds and other birds. Consequently, this proposal makes good sense scientifically and addresses an ongoing restoration failure of importance. The only questions involve the costs and the potential use of dogs, if trapping fails to get every last mink in the eradication process. The costs are 2.4 Million or 1.3 Million if a National Wildlife Foundation match is obtained. We concur that these cost estimates are reasonable because a 3-5 year time frame is needed to complete the removal. So while high, the expenditures are likely justified. The use of dogs in the removal of mink seems to possibly conflict with animal rights as an unacceptably cruel practice.

### Science Coordinator Comments – FY12

#### Date: June 2011

This proposal is scientifically compelling and builds on four years of work focused on this topic. While the idea of a direct restoration project is appealing, I am concerned that the total project cost is very high in relation to the total number of nests that they project will be added to the island complex.

### Public Advisory Committee Comments – FY12

#### Date: July 2011

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No project specific comments.

#### **Executive Director Comments – FY12**

**Date: July 2011**

I do not have a recommendation for this project. The project is very compelling because it potentially provides active restoration for an injured species. However, the high cost and speculation regarding the long-term outcome needs to be weighed carefully by the Council.

#### **FY07 FUNDING RECOMMENDATIONS**

<b>Science Panel</b>	<b>Science Coordinator</b>	<b>PAC</b>	<b>Executive Director</b>
Fund reduced	Not reviewed	Not reviewed	Fund reduced

#### **Science Panel Comments – FY07**

**Date: Fall 2006**

This proposal investigates the efficacy of direct restoration techniques for the pigeon guillemot population in PWS. They will genetically sample mink that reside on Naked Island Archipelago to determine if the population was introduced or native and make recommendations for a recovery plan for pigeon guillemots based on the findings. Pigeon guillemots are one of two non-recovered species and this project represents one of the few restoration based proposals that have been submitted. The genetic sampling of mink and studies examining the relative contribution of mink vs. other predators to pigeon guillemot survival and reproduction are important in evaluating mink removals as a potential restoration activity. However, there is some concern that removal of mink may not be an appropriate restoration activity if the mink are in fact native. Also, food limitation studies may be difficult to interpret with respect to restoration and are perhaps premature. Mink removal may still prove an effective restoration tool even if food quality is poor. Furthermore, given the likely annual variation in food supply, a lack of food in one year may not be a reasonable predictor of future food limitation. We recommend funding the initial year of this proposal and suggest that efforts be made to provide genetic evidence on mink at the end of that year so that reasoned decisions can be made regarding future funding.

#### **Science Coordinator Comments – FY07**

**Date: Fall 2006**

The Science Director is on a long-term detail from the FWS and must therefore, recuse herself from making recommendations on FWS proposals. The PI on this proposal is employed by the FWS.

#### **Public Advisory Committee – FY07**

**Date: Fall 2006**

Not Reviewed.

#### **Executive Director Comments – FY07**

**Date: April 2006**

Salaries and logistics are the major expenses of this proposal. Assuming mink predation on pigeon guillemots, any direct restoration will likely involve controlling the mink population on Naked Island. Before this can be undertaken a determination must be made whether the mink population is indigenous or introduced. Therefore, I only recommend funding the minimum mink capture and genetic testing program necessary to determine where the population is indigenous or introduced. I further recommend local trappers and logistics be utilized in this effort to reduce expense.



**Project Number:** 19190122 WITHDRAWN

**Project Title:** An assessment of Chinook Salmon feeding ecology and food web linkages to EVOS injured species in central Gulf of Alaska coastal waters

**Primary Investigator(s):** Vanessa von Biela

**PI Affiliation:** USGS

**Project Manager:** USGS

**EVOSTC Funding Requested FY19-22:** \$253,100

FY19	FY20	FY21	FY22
\$63,500	\$91,900	\$71,300	\$26,300

*Requests include 9% GA.*

**Funding From Non-EVOSTC Sources FY 19-22:** \$58,400

FY19	FY20	FY21	FY22
\$14,600	\$14,600	\$14,600	\$14,600

**Total Past EVOSTC Funding Authorized (FY17-18):** \$0

**Total EVOSTC Funding Authorized (FY17-18) and Requested (FY19-22):** \$253,100

**Total Non-EVOSTC Funding (FY17-22):** \$58,400

**Abstract:**

*\*This abstract is excerpted from the PI's Proposal, dated 8/15/18, budget updated 9/18/18.*

The diets of coastal feeding Chinook salmon are poorly documented in the northern Gulf of Alaska despite their importance to the food webs, fisheries, and population trajectories of injured species that rely on them. Chinook salmon are particularly important for resident killer whales (*Orcinus orca*), listed as “recovering” by EVOSTC, as abundance of salmon appears to drive population trajectories and set carrying capacity for killer whale populations. Observations from recreational and commercial fishers suggests that coastal feeding salmon depend on forage fish and are a likely competitor with piscivorous seabirds including injured species (e.g., pigeon guillemots and marbled murrelets) and predator of Pacific herring (*Clupea pallasii*), which remain listed as an unrecovered species by EVOSTC. We propose an analysis of Chinook salmon stomach contents from individuals captured by local fisheries to: (1) Identify the prey resources supporting salmon and, indirectly, killer whales in the oil spill affected area, (2) Provide information necessary to link process studies focused on oceanographic drivers of lower and mid-trophic production to top predators, and (3) Provide an index of forage fish species composition by using salmon as a sampler. The need to fill these information gaps and better understand coastal food webs is now pressing following a decade of low Chinook salmon returns and indications of food web disruptions in the coastal Gulf of Alaska. The causes of low Chinook salmon returns and declining body size are currently unknown, but food web interactions are suspected.

**FY19 Funding Recommendations:**

Science Panel	Science Coordinator	PAC	Executive Director	Trustee Council
Do Not Fund	Do Not Fund	Not Applicable Withdrawn	Not Applicable Withdrawn	Not Applicable Withdrawn

**Science Panel Comments – FY19**

The Science Panel believes that this project is well-motivated in that understanding the biology and dynamics of intermediate predators in the PWS ecosystem has value, and when those intermediate predators are targets of a fishery, that increases the value further. The PIs have extensive experience with the subject matter, methods and have strong publication histories. However, we have several significant concerns that have led us to recommend not funding this project as it is proposed. Largely, we do not believe that the PIs will be able to meet Objective 2 (Estimate the total biomass of forage fishes and other prey consumed by returning and resident Chinook salmon using a bioenergetics model) given the data they propose to collect. We would need considerably more information on how gut contents data will actually be used to calculate population biomass and not just relative abundance change-- we were skeptical that is even possible as changes in the abundance of salmon or density of other predators could lead to decreases in gut fullness even if forage fish populations do not change, for example. The bioenergetics model that the PIs propose to apply uses data from Chinook salmon from Lake Michigan under laboratory conditions where the salmon have not gone through the same metabolic challenges as Chinook salmon in marine waters of PWS. Furthermore, the paper referenced states that the parameters calculated should not be used as proxies for those of wild salmon, as the authors recognized that the food assimilation efficiency of Chinook salmon in the lab is likely different from the rates of salmon in the wild.

*PI Response (10/12/18)*

*We appreciate your detailed and thoughtful comments on our recent proposal, "19190112 Chinook Salmon Feeding Ecology." Thank you for the opportunity to respond to the reviews of the proposal. The reviewers raise valid criticisms of Objective 2 (Estimate the total biomass of forage fishes and other prey consumed by returning and resident Chinook salmon using a bioenergetics model), which was meant to be a minor component of the study. In fact, we had intended to only use the bioenergetics model to generate an index of biomass consumed by Chinook salmon; we realize that our communication of the second objective was inadvertently misleading. Bioenergetics models are best used as heuristic tools to explore how consumption demand changes under different scenarios (e.g., with changing temperature or prey quality). An additional critique was the use of a bioenergetics model parameterized for Great Lakes Chinook salmon under laboratory conditions. While this is not ideal, it is common for bioenergetics model parameters developed for one salmon species to be used as surrogates for others because the mass- and temperature-dependent physiological functions are expected to take the same functional form across salmonids (Beauchamp et al. 2007, Deslauriers et al. 2017). Despite these limitations, we believe that the model is useful in scaling up the snapshot of the diets provided by stomach content data to an index of seasonal consumption that provides relative information on how consumption may change under varying scenarios of diet and temperature.*

We suggest that the PIs contact researchers in the Biophysical Ecology Division at NOAA Southwest Fisheries Science Center for suggestions on a more appropriate parameter set to use in the model.

*PI Response (10/12/18)*

*If we pursued this approach, we would follow the recommendation of the reviewers to communicate with NOAA colleagues regarding updated parameters that are more relevant to our study system. Additionally, we would perform extensive sensitivity analyses to evaluate how uncertainty in our parameters drives model output.*

We appreciate the PIs proposed use of Chinook salmon as an indicator of forage fish availability but this role is already being applied by several GWA seabird projects.

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*PI Response (10/12/18)*

*Chinook salmon diets would offer a different prospective on forage fish abundance over a greater horizontal and vertical range. Seabird foraging tends to be limited to an area near their colony and can also be depth limited by the diving capacity of the species. Ultimately, a greater diversity of predators provides the best information on forage fish availability as is the approach in the NMFS Ecosystem Considerations chapter (Zador and Yasumiishi 2016) which compiles information on the prey of seabirds and predatory fish for the index of capelin and sand lance abundance using dynamic factor analysis.*

We ask for clarification on what paper the Pls cite (Haught et al. 2017) as it is missing from the literature cited section. We do not doubt the Pls' research capabilities but as it stands we do not feel that this proposal can adequately address the Trustee Council's mission to restore injured resources. We recognize the trust agency support for the project but would like specific details on how agencies would use these data.

*PI Response (10/12/18)*

*The missing reference for Haught et al. 2017: Haught, S, J Botz, S Moffitt, B Lewis. 2017. 2015 Prince William Sound Area Finfish Management Report. Alaska Department of Fish and Game, Fishery Management Report No. 17-17, Anchorage. Our primary intention and motivation for submitting this proposal was to address Objective 1: Quantify the diet composition of adult Chinook salmon during summer and winter in nearshore habitats of the central Gulf of Alaska. This information need directly relates to the EVOSTC goal to recover resident killer whales. Salmon appear to drive population trajectories and set carrying capacity for killer whale populations, but information gaps in the diets of these salmon species impedes tracing the bottom-up flow of energy and understanding how environmental drivers influence killer whales through their food web. Given the low returns of wild Chinook salmon across the region in recent years, the Trustee Agencies tasked with managing salmon populations are especially interested in filling critical information gaps such as basic knowledge of diet. Alaska Department of Fish and Game interested is evident through the Dr. Richard Brenner's (Fisheries Biologist, Division of Commercial Fisheries) participation as a co-investigator in this proposal. Letters of support from Trustee staff provide the best insight to how this information would be used. Indeed, a letter of support from Jeffry Anderson, Fish and Wildlife Service Cook Inlet Area Inseason Manager, states "Inferences about diet... can inform development of escapement goals, preseason forecasts, and in-season management activities." Another letter of support from Catherine Coon, Bureau of Ocean Energy Management's Chief of Environmental Science Management for Alaska states "The information garnered from this study would also benefit BOEM given the information needs of the National Environmental Policy Act (NEPA) in the Cook Inlet Planning Area." Trustee agency staff we communicated with during proposal development (identified in our proposal) generally discussed how the lack of information about Chinook salmon diet was a barrier for using other information about the marine ecosystem to inform their management actions for salmon. For instance, if a diet study identified Pacific herring as a key prey item of Chinook salmon, agency staff may examine the utility of indices produced by the HRM program in their salmon management activities.*

**Science Coordinator Comments – FY19**

**Date: September 2018**

I appreciate the time spent crafting this proposal and thought it was well written. However, after

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lengthy discussion with the Science Panel on the merits and feasibility of this proposal, I concur with the Science Panel's decision. I encourage the PIs to follow up on the Science Panel's request for detailed information from Trustee agency staff on how data generated from this proposal will be used by their agency.

**PAC Comments– FY19**

**Date: September 2018**

No comments; the proposal was withdrawn.

**Executive Director Comments – FY19**

**Date: September 2018**

I concur with the Science Panel and Science Coordinator.



**Project Number:** 19190125

**Project Title:** Prince William Sound Science Center Facilities Replacement

**Primary Investigator(s):** Katrina Hoffman

**PI Affiliation:** PWSSC

**Project Manager:** NOAA

**EVOSTC Funding Requested FY19:** \$18,000,000

FY19
\$18,000,000

*Requests include 9% GA.*

**Funding From Non-EVOSTC Sources FY 19:** \$122,000

FY19
\$122,000

**Total Past EVOSTC Funding Authorized (FY17-18):** \$0

**Total EVOSTC Funding Authorized (FY17-18) and Requested (FY19-21):** \$18,000,000

**Total Non-EVOSTC Funding (FY17-22):** \$122,000

**Abstract:**

*\*This abstract is excerpted from the PI's Proposal, dated 8/17/18, budget updated 10/18/18*  
Prince William Sound (PWS) remains economically and ecologically the hardest-hit region in the wake of the Exxon Valdez Oil Spill (EVOS). Lingering oil remains on many beaches, and numerous species have yet to recover from the spill that occurred 29 years ago. Decades of research by the Prince William Sound Science and Technology Institute (dba Prince William Sound Science Center, the Science Center or PWSSC) and others have revealed that true recovery may still be decades away. To continue this work, PWSSC must find a new home. *We are losing our facility lease and must vacate our current location in 3.25 years.* For our institution to continue to generate recovery benefits through long-term research and to retain and attract staff, we must replace our facility. Support by the Exxon Valdez Oil Spill Trustee Council (EVOSTC) for this project will benefit ecosystem research as well as economic and educational opportunities in our heavily spill-affected region for the next 50-100 years. Consolidated and expanded facilities are key to PWSSC's strategy to continue serving as a significant contributor to the resilience and recovery of the region.

**FY19 Funding Recommendations:**

Science Panel	Science Coordinator	PAC	Executive Director	Trustee Council
Not Reviewed	Fund	Reviewed Individually	Fund	Fund

**Science Panel Comments – FY19**

**Date:** September 2018

Not Reviewed.

**Science Coordinator Comments – FY19**

**Date: September 2018**

No project specific comments.

**PAC Comments– FY19**

**Date: September 2018**

Individual PAC members reviewed the proposal. ED received positive comments from individual PAC members.

**Executive Director Comments – FY19**

**Date: September 2018**

Funding approved, please see conditions in [Resolution 18-04](#) for additional information.

## **Habitat Program Project Descriptions**

**Project Number:** 17170116

**Project Title:** ADNR/DPOR Riverbed Habitat Restoration & Protection

**Primary Investigator(s):** Rys Miranda

**PI Affiliation:** ADNR

**Project Manager:** ADNR

**EVOSTC Funding Requested FY17-21: \$2,214,400**

FY17	FY18	FY19	FY20	FY21
Auth: \$2,214,400	Reauth: \$327,000	Reauth: \$327,000	\$0	\$0

*Requests include 9% GA.*

**Funding From Non-EVOSTC Sources FY 17-21: \$1,600,000**

FY17	FY18	FY19	FY20	FY21
\$1,600,000	\$0	\$0	\$0	\$0

**Total Past EVOSTC Funding Authorized (FY17): \$2,214,400**

**Total EVOSTC Funding Authorized (FY17) and Reauthorized (FY18-21): \$2,214,400**

**Total Non-EVOSTC Funding FY17-21: \$1,600,000**

**Abstract:**

In Fall 2016, the Department of Natural Resources, Division of Parks and Outdoor Recreation (DNR-DPOR) submitted six projects for funding under the *Exxon Valdez* Oil Spill (EVOS) Restoration Program. **The Council approved funding for projects 2-6. As noted in 2016, reauthorization of Project 1 is needed due to the multi-year nature of the work and schedule for application for potential Federal ATAP funding. Thus, the request is for Project 1 of 6:**

**Project 1: Kenai River Special Management Area (KRSMA): Kenai River Flats Riverbank Protection, Phase I – Total project cost: \$1,436,650 | Total recommended by ED for funding (with GA): \$327,000**

**The projects that were approved Fall 2016:**

Project 2: KRSMA: Eagle Rock Riverbank Protection – Total project cost \$410,450 | Total recommended by ED for funding (with GA): \$447,391

Project 3: Crooked Creek State Recreation Site Riverbank Restoration– Total project cost \$445,900 | Total recommended by ED for funding (with GA): \$486,031

Project 4: KRSMA: Kenai River Ranch Riverbank Restoration – Total project cost \$166,200 | Total recommended by ED for funding (with GA): \$181,158

Project 5: KRSMA: Pipeline Crossing Riverbank Restoration – Total project cost \$282,450 | Total recommended by ED for funding (with GA): \$307,871

Project 6: Anchor River State Recreation Area Riverbank Protection – Total project cost \$426,600 | Total recommended by ED for funding (with GA): \$464,994

These six projects address fish habitat restoration and protection of spill area ecosystems that support numerous species affected by EVOS. The primary goal of each project is to restore fish habitats that have been adversely impacted by human activity and to provide continuing habitat protection into the future. These projects restore and protect fish habitats that have been and continue to be adversely impacted by human activities and will limit future access so that those restored areas will be protected while still accommodating human activities, such as recreational use. These projects are very similar in character, scope, and objective as the previous EVOSTC- funded project "Kenai River Habitat Restoration and Recreational Enhancement Project" (Restoration Project 96180/99180), which was performed during the late 1990s. Additionally, these projects are also aligned with DNR-DPOR management documents or development plans such as the Kenai River Comprehensive Management Plan.

#### **FY19 Funding Recommendations:**

Science Panel	Science Coordinator	PAC	Executive Director	Trustee Council
Not Applicable	Not Applicable	Fund	Fund	Fund

#### **PAC Comments – FY19**

**Date: September 2018**

The PAC is pleased with the restoration work being conducted. One PAC member voiced her support of this type of work as it greatly improves these habitats; these restoration projects offer tangible benefits. Another PAC member noted that impacts from sport fishermen have been significant and these are great mitigation projects.

#### **Executive Director Comments – FY19**

**Date: September 2018**

I concur with the recommendations of the Public Advisory Committee.

#### **FY18 Funding Recommendations:**

Science Panel	Science Coordinator	PAC	Executive Director	Trustee Council
Not Applicable	Not Applicable	Fund	Fund	Fund

#### **PAC Comments – FY18**

**Date: September 2017**

The PAC is pleased with the restoration work being conducted.

#### **Executive Director Comments – FY18**

**Date: September 2017**

I concur with the recommendations of the Public Advisory Committee.

#### **FY17 Funding Recommendations:**

Science Panel	Science Coordinator	PAC	Executive Director	Trustee Council
Not Applicable	Not Applicable	Fund	Fund	Fund

#### **Executive Director Comments – FY17**

**Date: September 2016**

There are no project specific comments.

**Public Advisory Committee Comments – FY17****Date: September 2016**

The PAC meeting was Sept. 22, 2016 and fund recommendations are included in the table above. Any project-specific comments from that meeting will be added to the Work Plan when the comments are finalized in the meeting notes.

**Project Number:** 18180117

**Project Title:** Kenai Watershed Forum Stream Watch Program

**Primary Investigator(s):** Brandon Bornemann

**PI Affiliation:** KWF

**Project Manager:**

USFWS

**EVOSTC Funding Requested FY17-21:** \$147,300

FY17	FY18	FY19*	FY20	FY21
\$0	Auth: \$52,400	Auth: \$47,100	\$47,800	\$0

*Requests include 9% GA. \*FY19 funding was also approved on 9 April 2018 to accommodate for the FY19 Field Season.*

**Funding From Non-EVOSTC Sources FY 17-21:** \$0

FY17	FY18	FY19	FY20	FY21
\$0	\$0	\$0	\$0	\$0

**Total Past EVOSTC Funding Authorized (FY17-18):** \$52,400

**Total EVOSTC Funding Authorized (FY17-18) and Reauthorized (FY19-21):** \$99,500

**Total Non-EVOSTC Funding FY17-21:** \$0

**Abstract:**

*\*This abstract is excerpted from the PI's Proposal, dated 2/20/18, budget updated 9/18/18.*

Founded in 1997 by a group of concerned citizens, the Kenai Watershed Forum (KWF) has grown from a small grassroots collective focusing on the Kenai River Watershed (2,200 square miles) to a regionally respected 501(c)3 non-profit organization whose mission now encompasses the entire Kenai Peninsula (16,000 square miles). Kenai Watershed Forum proposes a multi-year program, with an initial eighteen-month funding cycle to provide for the 2018 and 2019 summer field seasons. This funding would expand Stream Watch services in the spill area communities of Kasilof, Ninilchik and Anchor Point. Following this initial 2018-2019 program, KWF proposes a third summer field season with funding for 2020 that would be reviewed by the Council in fall 2019. With EVOSTC funding, Stream Watch would expand and leverage its existing resources and beach cleaning by: 1) training, supporting, and equipping its volunteer base to patrol for and remove litter and fishing debris from seven designated waterways and coast line sites, and 2) meeting the additional goals during summer field seasons as noted below for 2018-2019:

- Hire one 5-month south peninsula volunteer coordinator
- Recruit one 3-month student intern
- Conduct 10 beach litter patrol and debris removal "events" per summer (an expansion of five events in 2017)
- Conduct daily volunteer patrols of three major coastal fishing areas of the Kenai Peninsula-Kasilof River, Deep Creek/Ninilchik River and the Anchor River.
- Triple our geographical reach by conducting beach litter patrols and debris removal at new locations
- Remove 3000 pounds of trash from our beaches per summer (1500 lbs. more than 2017)
- Enlist over 400 volunteer hours specifically related to beach litter patrols and camp site cleaning per summer (almost double that of 2017)
- Secure matching grant funds up to \$25,000

**FY19 Funding Recommendations:**

Science Panel	Science Coordinator	PAC	Executive Director	Trustee Council
Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable

**PAC Comments – FY19****Date: September 2018**

No comments.

**Executive Director Comments – FY19****Date: September 2018**

No comments.

**FY18 Funding Recommendations:**

Science Panel	Science Coordinator	PAC	Executive Director	Trustee Council
Not Applicable	Not Applicable	Fund	Fund	Fund

**PAC Comments – FY18****Date: April 2018**

No comments.

**Executive Director Comments – FY18****Date: April 2018**

No comments.



**Project Number:** 18180119

**Project Title:** ADNR/DPOR Outreach Project

**Primary Investigator(s):** Rys Miranda

**PI Affiliation:** ADNR/DPOR

**Project Manager:**

EVOSTC

**EVOSTC Funding Requested FY17-21: \$102,600**

FY17	FY18	FY19	FY20	FY21
\$0	Auth: \$102,600	Reauth: \$102,600	\$0	\$0

*Requests include 9% GA.*

**Funding From Non-EVOSTC Sources FY 17-21: \$0**

FY17	FY18	FY19	FY20	FY21
\$0	\$0	\$0	\$0	\$0

**Total Past EVOSTC Funding Authorized (FY17-18): \$102,600**

**Total EVOSTC Funding Authorized (FY17-18) and Reauthorized (FY19-21): \$102,600**

**Total Non-EVOSTC Funding FY17-21: \$0**

**Abstract:**

*\*This abstract is excerpted from the PI's Proposal, dated 3/28/18, budget updated 8/28/18.*

As requested by the Council in November 2017, the EVOSTC office worked with ADNR State Parks to provide an outreach proposal up to \$102,562 (\$94,094 plus \$8,468 GA) to create the following outreach products. These products can be shared in social media and the EVOSTC office has also received strong interest by the Alaska Marine Highway System Ferries, the Anchorage School District, Anchorage Museum, Seward's Alaska SeaLife Center, Homer's Pratt Museum, Valdez Museum, Kodiak's Baranov Museum and the Cordova Center as venues for the film and the traveling displays noted below. The proposal includes production of: a 10-minute film and accompanying display poster reviewing the EVOS and Trustee Council work; traveling displays of two pop-up banners that can be used for a variety of events, similar to the older versions that were created 10 years ago and are still in use; and three interpretive displays to be installed at habitat enhancement project sites. Similar to the Eagle Rock panels, these can be generic enough for multiple locations and a second panel can also be site specific, including information regarding support for EVOS-affected species and habitat restoration. ADNR has identified three locations so far for placement: 1) Dimond Creek, Homer; 2) Mineral Creek, Valdez, (3) Eshamy Bay Public-Use Cabin, Prince William Sound.

**FY19 Funding Recommendations:**

Science Panel	Science Coordinator	PAC	Executive Director	Trustee Council
Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable

**PAC Comments – FY19****Date: September 2018**

The PAC feels that this project provides excellent outreach. One PAC member is especially pleased with the use of interpretive panels and the fact that they give credit to the EVOSTC for this restoration work.

**Executive Director Comments – FY19****Date: September 2018**

No comments.

**FY18 Funding Recommendations:**

Science Panel	Science Coordinator	PAC	Executive Director	Trustee Council
Not Applicable	Not Applicable	Fund	Fund	Fund

**PAC Comments – FY18****Date: April 2018**

No comments.

**Executive Director Comments – FY18****Date: April 2018**

No comments.

**Project Number:** 19190121

**Project Title:** KRSMA Funny River Riverbank Protection & Morgan's Landing Riverbank Restoration

**Primary Investigator(s):** Rys Miranda

**PI Affiliation:** ADNR

**Project Manager:** ADNR

**EVOSTC Funding Requested FY17-21: \$824,300**

FY17	FY18	FY19	FY20	FY21
\$0	\$0	\$824,300	\$0	\$0

*Requests include 9% GA.*

**Funding From Non-EVOSTC Sources FY 17-21: \$0**

FY17	FY18	FY19	FY20	FY21
\$0	\$0	\$0	\$0	\$0

**Total Past EVOSTC Funding Authorized (FY17-18): \$0**

**Total EVOSTC Funding Authorized (FY17-18) and Reauthorized (FY19-21): \$824,300**

**Total Non-EVOSTC Funding FY17-21: \$0**

**Abstract:**

*\*This abstract is excerpted from the PI's Proposal, dated 8/27/18, budget updated 8/28/18.*

This project will restore and protect fish habitat at two state park units that continue to be adversely impacted by human activities, including recreational access. The two park units, Funny River and Morgan's Landing are within the Kenai River Special Management Area and the Exxon Valdez Oil Spill area of impact. Restoration work will include bioengineered systems consistent with techniques proven successful on the Kenai River. The protection component will include elevated, light-penetrating (ELP) walkways and river access stairs to allow foot traffic to travel above sensitive riverbank and prevent impacting riparian resources. This project will benefit the injured resources Dolly Varden, Pink Salmon, and Sockeye Salmon and the injured services Recreation and Tourism.

**FY19 Funding Recommendations:**

Science Panel	Science Coordinator	PAC	Executive Director	Trustee Council
Not Applicable	Not Applicable	Fund	Fund	Fund

**PAC Comments – FY19**

**Date: September 2018**

No project specific comments.

**Executive Director Comments – FY19**

**Date: September 2018**

I concur with the recommendations of the Public Advisory Committee.

**Project Number:** 19190124

**Project Title:** PWS Instream Flow Protection

**Primary Investigator(s):** Joe Klein

**PI Affiliation:** ADF&G

**Project Manager:** ADF&G

**EVOSTC Funding Requested FY19-23:** \$493,300

FY19	FY20	FY21	FY22	FY23
\$148,600	\$83,700	\$87,000	\$83,700	\$90,300

*Requests include 9% GA.*

**Funding From Non-EVOSTC Sources FY 19-23:** \$230,000\*

FY19	FY20	FY21	FY22	FY23
\$58,000	\$43,000	\$43,000	\$43,000	\$43,000

*\*Uncommitted Leverage Resources*

**Total Past EVOSTC Funding Authorized (FY18):** \$0

**Total EVOSTC Funding Authorized (FY18) and Reauthorized (FY19-23):** \$493,300

**Total Non-EVOSTC Funding FY18-23:** \$230,000

**Abstract:**

*\*This abstract is excerpted from the PI's Proposal, dated 2/7/18, budget updated 10/9/18.*

The Alaska Department of Fish and Game (ADF&G) and the U.S. Forest Service (USFS) collaboratively propose to acquire the necessary hydrologic data and jointly file for reservations of water on identified priority streams and lakes within western Prince William Sound (PWS). Securing adequate instream flows in these priority reaches with reservations will provide protection for perpetuity to injured fish and wildlife habitats within these important areas affected by the *Exxon Valdez* Oil Spill. The objective of this project is to collect the hydrologic data needed to file reservation of water applications on three lakes and seven streams to maintain healthy habitat for injured fish species, specifically pink and sockeye salmon, cutthroat trout, and Dolly Varden. This project will also benefit injured wildlife species dependent on healthy rivers and lakes, including bald eagles, common loons and river otters. Project objectives will be accomplished by collecting sufficient hydrologic data to meet DNR guidelines, quantifying instream flow requirements for injured and other indigenous fish species, and preparing reservation of water applications for submittal to DNR to protect fish and wildlife habitat, migration, and propagation.

**FY19 Funding Recommendations:**

Science Panel	Science Coordinator	PAC	Executive Director	Trustee Council
Not Applicable	Not Applicable	Fund	Fund	Fund

**PAC Comments – FY19**

**Date: September 2018**

No project specific comments.

**Executive Director Comments – FY18**

**Date: October 2018**

The ED has some reservations regarding this project and thus relies on trust agency support in recommending this project to fund.

## **Cross Program Publication Group Project Descriptions**

No Projects Submitted for FY19.