

FY15 PROGRAM PROPOSAL SUMMARY PAGE

Proposals are due to the EVOSTC office by September 2, 2014. Please note that the information in your proposal and budget form will be used for funding review. Late proposals, revisions or corrections may not be accepted.

Program Title: Herring Research and Monitoring

Program Period: February 1, 2015 – January 31, 2016

Team Lead(s): W. Scott Pegau Prince William Sound Science Center

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

Abstract*:

The goal of the Herring Research and Monitoring program is to improve the predictive models of herring stocks through observations and research. The program is designed around a twenty year time frame with changes in emphasis of the process studies every five years. During this period we have four objectives to help us move towards our goal. They are: *Provide information to improve input to the age-structure-analysis (ASA) model, or test assumptions within the ASA model. Inform the required synthesis effort. Address assumptions in the current measurements. Develop new approaches to monitoring.*

A combination of monitoring and process studies will be used to address these objectives. The monitoring projects follow changing conditions and provide inputs to modeling efforts. The process studies are designed to be much shorter and to answer a very specific question.

The monitoring components include tracking the prevalence of disease, aerial surveys, increased adult biomass surveys, and juvenile condition and biomass surveys. All of the monitoring components address the first objective.

There are eighteen studies that range in length of one to five years designed to address the different objectives. To address the first objective we are examining the age that fish join the spawning stock, the genetic structure, and examining the approaches available to model herring stocks. To address the second objective we are working on gathering relevant datasets and providing visualization, conducting an analysis using the herring scale library owned by ADF&G, and providing coordination between projects to examine the connectivity. To address the third objective there are intensive studies of juvenile condition and acoustic estimates of juvenile populations, trying to determine if immigration may impact our surveys, providing validation to the acoustic surveys, and conducting laboratory studies of disease. We are looking to herring tagging, disease forecasting, and non-lethal acoustic validation to address the last objective.

Estimated Budget:

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

FY12	FY13	FY14	FY15	FY16	TOTAL
1,027,390	1,264,759	1,429,195	1,365,678	1,241,321	6,237,343

Non-EVOSTC Funds to be used:

FY12	FY13	FY14	FY15	FY16	TOTAL
			154,731		

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

Date: 8/15/2014

I. EXECUTIVE SUMMARY

The goal of the Herring Research and Monitoring program is to improve the predictive models of herring stocks through observations and research. The program is designed around a twenty year time frame with changes in emphasis of the process studies every five years. During this period we have four objectives to help us move towards our goal. They are: *Provide information to improve input to the age-structure-analysis (ASA) model, or test assumptions within the ASA model. Inform the required synthesis effort. Address assumptions in the current measurements. Develop new approaches to monitoring.*

A combination of monitoring and process studies will be used to address these objectives. The monitoring projects follow changing conditions and provide inputs to modeling efforts. The process studies are designed to be much shorter and to answer a very specific question.

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Based on the several indicators, including aerial survey of age-1 herring data, we believe that there may be a large herring brood year that will recruit to the spawning stock in 2015. If this occurs it will be the first large brood year observed by any of the herring research programs including the Sound Ecosystem Assessment program. It will also provide an opportunity to assess our ability to predict the incoming recruitment, which is a very important new capability that can be used to address our goal.

The aerial surveys conducted in 2014 suggest that the 2013 brood year will result in little recruitment to the spawning stock. Advances were made in the design of the aerial surveys in coordination with the forage fish project in the Gulf Watch Alaska program. In coordination with the forage fish project we shifted the sampling from a systematic flight of the coastline used for detecting schools of age-1 herring to a stratified random design where blocks were selected for survey. In 2014 we were surprised by an early appearance of age-0 herring and sandlance that affected the identification accuracy. The early appearance of these fish suggests a year with rapid early growth of the age-0 fish that is typically needed to reduce predation and increase energetic content. There were whales observed preying on the age-0 herring.

The juvenile herring energetics work demonstrated that the peak in energetic content occurs in November and the minimum is in March, which confirms that the dates we using in the monitoring program are appropriate. In most years the energy level observed in March is at the threshold of the minimum for survival and if feeding doesn't begin soon we expect to lose a lot of fish at this time. Fish with the lowest lipid levels in March are foraging the most as determined from stomach fullness. This puts them at greater risk to predation. Through the winter the loss of energy begins much more rapid and then slows. This is very different than the energy loss model that we were working with.

The historic scale growth showed a surprising result in that the growth has demonstrated periods of several years where it would be above or below average. This suggests that there are long-period conditions that favor growth. Growth in the first year is not a good predictor of recruitment though.

The intensive acoustic surveys showed that there were large fluctuations in the numbers of fish detected within a bay between surveys spaced two weeks apart. In the spring of 2014 a large ice shelf existed in Simpson Bay that limited the extent of the acoustic transects. The Non-lethal Sampling project found juvenile herring sheltering under the ice shelf and when the shelf broke out the Acoustic Validation project collected more and smaller age-0 herring than they were able to access when the ice shelf was present.

Major advances have been made in our ability to detect the three most common diseases in herring. The improvements in detecting Ichthyophonosis will allow us to look for intermediate hosts of the disease. This is important because we demonstrated that the disease cannot be transmitted between fish without an intermediary. The improvement related to VEN will simplify the sampling procedures required in the field and allow us to examine fish that are found dead for the disease.

II. COORDINATION AND COLLABORATION

A. Within the Program

Coordination within the HRM program includes scheduling of projects to ensure the maximum sharing of vessel time so that projects dependent on results or samples from another project are in the correct order. The Validation of Acoustics Survey project collects fish for the three different acoustic survey projects, the disease project, condition monitoring, and the genetics project. Fish are shared between the acoustic surveys, genetics, herring condition, and disease projects, Coordination is primarily through email and teleconference, but each year all the investigators are required to meet in person.

Coordination between the HRM and GWA programs is accomplished through the HRM coordinator attending the Gulf Watch Alaska principal investigator (PI) meetings and teleconferences. The team leads of both programs coordinate reporting and proposal documents. Ideas and field opportunities are coordinated. The aerial surveys are coordinated between the two programs to maximize benefit to both programs. This was the first year of the coordinated aerial survey project and we were able to achieve our objectives and find new approaches that may help refine our future protocols. The forage fish project provided equipment and protocols and the herring program provided observers. The aerial surveys also provided the summertime observations to the humpback whale project. The HRM growth and energetics are working with investigators in the environmental drivers portion of GWA to examine relationships between the environmental conditions and herring growth and condition. There is a bird observer from the GWA program is on the vessel during the November herring survey cruise.

B. With Other Council-funded Projects

There is some coordination with the Cordova Clean Harbor project.

C. With Trustee or Management Agencies

The HRM program is conducted in close collaboration with ADF&G. The long-term goal and objectives of the program are designed to benefit ADF&G by improving information and testing assumptions of the age-structure-analysis model. Steve Moffitt in Cordova (local area biologist) and Sherri Dressel in Juneau (statewide herring coordinator and member of the HRM oversight group) are our primary two contacts in ADF&G. The HRM program includes a project that is scanning in a portion of the ADF&G scale library so it is preserved in a form that can be used within and external to ADF&G. HRM provides some aerial survey time to document herring spawn in areas or at times that ADF&G are unable to fly. We coordinated with them the location of remote cameras for testing their ability to provide an indication of when spawn may occur in remote locations. We have also supported the collection of herring at Kayak Island the past two years and at Montague Island to provide some indication of the age structure at those locations. ADF&G has provided an opportunity for the HRM disease project to sample the adult spawning population. The prevalence of the three major diseases are then reported back to ADF&G. We also coordinate with ADF&G in providing acoustic estimates of the adult herring spawning biomass.

The National Oceanographic and Atmospheric Administration (Ron Heintz) and the United States Geological Service (Paul Hershberger) also are participants in the HRM program. As participants in the program they are involved in the coordination efforts.

III. PROGRAM DESIGN – PLAN FOR FY15

A. Objectives for FY15

The long-term goal of the program is to improve predictive models of herring stocks through observations and research.

Objectives

- 1) *Provide information to improve input to the age-structure-analysis (ASA) model, or test assumptions within the ASA model.*
- 2) *Inform the required synthesis effort.*
- 3) *Address assumptions in the current measurements.*
- 4) *Develop new approaches to monitoring.*

B. Changes to Program Design

We are contemplating small changes to the program design. The changes are minor enhancements within the existing budget that will increase the probability of succeeding in addressing our assumptions. The changes include adding scanning age-0 herring scales to determine a length versus scale growth relationship that can be applied to the historic scale growth data. We are also looking for means to improve our success in finding adult herring aggregations prior to the acoustic surveys. In 2014 many schools of adult herring were observed near the coast of Montague Island, no spawn was observed on the island however.

V. SCHEDULE

A. Program Milestones for FY 15

Objective 1. Provide information to improve input to the age-structure-analysis (ASA) model, or test assumptions within the ASA model.

The age at first spawn project is expected to be completed in this fiscal year. All other projects are ongoing.

Objective 2. Inform the required synthesis effort.

Data management is an ongoing effort. Delivery and presentation of the synthesis will be completed in March. The herring scale analysis is expected to be completed before the start of this fiscal year.

Objective 3. Address assumptions in the current measurements.

The energetics and acoustic intensives will be completed by the end of the fiscal year. Analysis of the fatty acid project will be completed. There will be ongoing work related to disease and acoustic validation.

Objective 4. Develop new approaches to monitoring.

The tagging and non-lethal components will be completed by the end of the fiscal year. There will be continued work on new approaches in the disease project.

B. Measurable Tasks for FY 15

FY 15, 1st quarter (February 1, 2015 - April 31, 2015)

February: EVOS synthesis meeting
February: Submit annual report
March: Spring juvenile herring collection
April: Conduct expanded adult herring survey

FY 15, 2nd quarter (May 1, 2015-July 30, 2015)

May: Conduct annual PI meeting
May: Complete written outreach materials
July: Complete annual aerial surveys

FY 15, 3rd quarter (August 1, 2015 – October 31, 2015)

August: Submit FY16 proposal
September: Complete genetics analysis
September: Complete outreach efforts

FY 15, 4th quarter (November 1, 2015- January 31, 2016)

October: Assess data submitted to data management
November: Conduct juvenile index survey, validation and sampling for energetics and disease.

V. PROJECT PERSONNEL – CHANGES AND UPDATES

There are no anticipated changes to the team lead. Dr. Buckhorn who has led the acoustic projects will be leaving before FY15 and we are seeking a replacement. Dr. Thorne is the Co-PI on the project and will provide continuity during the transition.

VI. BUDGET

A. Budget Forms

Provide completed budget forms.

B. Changes from Original Proposal

The only change in the total budget is the funding for the aerial surveys that were added in FY14. The budget for the Genetic Stock Structure project has been restructured because the laboratory processing is being done by NOAA contractors rather than NOAA personnel as originally proposed.

C. Sources of Additional Funding

The projects led by Heintz and Hershberger are able to leverage off of funding from NOAA and USGS respectively. The program coordination receives additional support through the Oil Spill Recovery Institute. The data management is able to leverage funding from several other sources that support the design and improvements to the basic infrastructure that the herring workspace benefits from. The education and outreach efforts receive funding through multiple sources.

FY15 PROPOSAL SUMMARY PAGE
Continuing, Multi-Year Projects

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

Project Period: February 1, 2015 – January 31, 2016

Primary Investigator(s): Mary Anne Bishop, Ph.D., Prince William Sound Science Center, Cordova
mbishop@pwssc.org

Study Location: Prince William Sound

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

Abstract:

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

Estimated Budget:

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

FY12	FY13	FY14	FY15	FY16	TOTAL
68,016	90,579	148,022	141,046	145,297	592,960

Non-EVOSTC Funds to be used:

FY12	FY13	FY14	FY15	FY16	TOTAL
			0		

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

Date: August 31, 2014

I. EXECUTIVE SUMMARY

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

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

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

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

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

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

In 2014 we initiated a new collaboration with three *Gulfwatch* studies: *Humpback whale predation on Pacific herring in PWS*, *Forage fish in PWS*, and *PWS Seabirds in Late Fall and Winter*. We have scheduled a joint survey during September 2014 to describe the fall movements of whales, fish, and birds into the Sound via Montague Strait. For the Montague Strait study we will be conducting pelagic trawl surveys to validate the USGS acoustic surveys. Finally, in November 2014 we will conduct midwater trawl surveys in conjunction with year 3 of EVOS acoustic survey project *Juvenile herring abundance index*.

Outreach:

Bishop, M.A. 2014. Age 0+ herring: only trawls and time will tell. *Delta Sound Connections*. With a circulation of ~15,000, this annual newspaper published about the natural history of PWS and the Copper River Delta is distributed each May to airports and tourist areas in southcentral Alaska.

II. COORDINATION AND COLLABORATION

A. Within the Program

Table 1. Shared vessel platforms for this project.

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

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

<i>EVOS Herring Research</i>	Agency	Samples provided
Juvenile herring abundance index	PWS Science Center	All species – measurements only
Juvenile herring intensive Acoustic Surveys (FY14)	PWS Science Center	All species – measurements only
Expanded Adult Herring	PWS Science Center	All species – measurements only

Acoustic Surveys		
Condition Index	PWS Science Center	Juvenile herring
Genetic stock structure	ADFG	Adult herring
Disease	USGS	Juvenile herring
Energetics	NOAA Auke Bay	Juvenile herring/walleye pollock
Growth RNA/DNA	NOAA Auke Bay	Juvenile herring
Age at First Spawn	NOAA Auke Bay	Adult Herring
<i>EVOS Gulfwatch</i>		
Forage fish distribution, abundance, and body condition in PWS	USGS	All species – measurements only; Sept. 2014 cruise

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

B. With Other Council-funded Projects

None

C. With Trustee or Management Agencies

Our project, along with the EVOS Herring *Expanded Adult Herring Surveys* rely on information from Alaska Department of Fish and Game to help locate adult herring schools in spring for acoustic surveys and our sampling. To that extent, we work closely with Steve Moffitt and Dr. Rich Brenner at the Cordova office of ADFG. Samples of adult herring from the Montague Island area were provided to the Cordova ADFG office for age-sex-length analysis. Samples of juvenile herring from the November 2013 cruise were provided to USGS.

III. PROJECT DESIGN – PLAN FOR FY15

A. Objectives for FY15

Objectives specific to the *Direct Capture* study include:

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

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

B. Changes to Project Design

When we wrote the original proposal for this project we planned to use a trawl that was part of the PWS Science Center's inventory. Unfortunately, this trawl was lost during field work on another project, forcing us to purchase a new trawl. Due to hydraulic compatibility issues between our reel/winches and the charter vessel during the initial November 2012 survey we were unable to obtain sufficient power to successfully deploy and haul our mid-water sweeper trawl, despite several attempts at system modifications and replumbing. Therefore, within each survey bay variable mesh adult and juvenile herring gillnets were deployed and allowed to soak overnight in areas of high acoustic signature as an alternative validation method. Since Nov 2012, all problems with the trawl have been resolved, and we completed an extremely successful series of trawl surveys over the Oct 2013-Apr 2014 season with >24,000 fish captured. We do not anticipate any future changes to the project design.

IV. SCHEDULE

A. Project Milestones for FY 15

- Objective 1.** Improve capture methods used for ground truthing acoustic surveys.
Field work completed April 2016. Synthesis evaluating techniques, August 2016.
- Objective 2.** Increase the sample size for identification, quantification, and measurement of juvenile (0+, 1+, 2+) and adult (3+ and older) herring schools as well as other fish schools in survey areas.
To be met by April 2016.
- Objective 3.** Provide data on species composition and length frequency to aid in the interpretation of current and historical acoustic surveys.
To be met by August 2016.
- Objective 4.** Provide adult herring samples to Alaska Department of Fish and Game for the adult herring age-structure-analyses model.
To be met by April 2016.
- Objective 5.** Provide juvenile herring samples to researchers investigating juvenile herring fitness and disease.
To be met by November 2015.

B. Measurable Project Tasks for FY 15

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

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

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

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

May-Jul Process fish & analyze data

Jul Prepare mid-year report & FY16 work plan

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

Aug Submit report & FY 16 work plan

Aug-Oct Analyze data

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

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

Nov PI meeting, herring program

Dec Process fish samples
Jan Alaska Marine Symposium

V. PROJECT PERSONNEL – CHANGES AND UPDATES

Megan McKinzie operated the trawl, conducted all the fish measurements, and assisted with report writing during years 2-3. In June 2014 McKinzie left PWS Science Center for a Ph.D. program. Anticipating this change, McKinzie trained Kirsti Jurica on the trawl during the spring 2014 intensive surveys. Jurica has almost 20 years of experience as a fish technician and commercial fisher and will lead the field component of this project. Beginning in Sept 2014, Sean Lewandoski has also been hired to assist with surveys and help with data analyses. Lewandoski has conducted fisheries research for six years and during summer 2014 completed his M.S. in Fish and Wildlife Management at Montana State University.

VI. BUDGET

A. Budget Forms

Provide completed budget forms.

B. Changes from Original Proposal

None

C. Sources of Additional Funding

None

FY15 PROJECT PROPOSAL SUMMARY PAGE

Continuing, Multi-Year Projects

Proposals are due to the EVOSTC office by September 2, 2014. Please note that the information in your proposal and budget form will be used for funding review. Late proposals, revisions or corrections may not be accepted.

Project Title: Data Management Support for the Integrated Herring Research Program

Project Period: February 1, 2015 – January 31, 2016

Primary Investigator(s): Rob Bochenek, Axiom Consulting & Design

Study Location: EVOS Spill Affected Area

Project Website (if applicable): <http://pwssc.org/research/fish/pacific-herring/>

Abstract*: This project supports the EVOS Integrated Herring Research Program with critical data management support to assist study teams in efficiently meeting their objectives and ensuring data produced or consolidated through the effort is organized, documented and available to be utilized by a wide array of technical and non technical users. This effort leverages, coordinates and cost shares with a series of existing data management projects, cyber-infrastructure and partnerships which contribute capacity and information to this effort. During year one and two, this project would focus on providing informatics support to streamline the transfer of information between various study teams and isolate and standardize historic data sets in the general spill affected area for use in retrospective analysis, synthesis and model development. This work would scale down in year three thru five to provide support for general project level data management and archival.

Estimated Budget:

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

FY12	FY13	FY14	FY15	FY16	TOTAL
130,800	130,800	22,345	23,217	23,980	331,142

Non-EVOSTC Funds to be used:

FY12	FY13	FY14	FY15	FY16	TOTAL
			21,200		

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

Date: August 8, 2014

I. EXECUTIVE SUMMARY

As originally proposed, the objectives of this project are to 1) provide data management oversight and services for EVOS Integrated Herring Research Program team data centric activities which include data structure optimization, metadata generation, and transfer of data between project teams; 2) consolidate, standardize and provide access to study area data sets that are critical for retrospective analysis, synthesis and model development; and 3) integrate all data, metadata and information products produced from this effort into the AOOS data management system for long term storage and public use.

Project investigators continue to provide core data management oversight and services for the EVOS sponsored Herring Research and Monitoring (HRM) program. The focus continues to be on establishing – and implementing - protocols for data transfer, metadata requirements and salvage of historic data, both those data funded by the *Exxon Valdez* Oil Spill Trustee Council and ancillary historic data from other projects. Investigators meet with National Center for Ecological Analysis and Synthesis investigator Matt Jones to coordinate future activities. PIs have participated in regular PI meetings, including the in-person meeting in November 2013 and the January 2014 data meeting and are coordinating activities between the HRM and LTM programs. In addition, the AOOS Ocean Research Workspace, rolled out to PIs in Year 1, continues to be used as the internal staging area for PI data and work products, with individual PI user and group profiles created. Several training seminars have been held via webinars, and PIs are now using the system to organize and consolidate their project level data. Software engineers at Axiom are providing support for the Workspace, resolving bugs and implementing new functionality in response to user feedback.

Investigators have been involved in several exercises and meetings to optimize approaches to managing EVOS Integrated Herring Research and Monitoring Program data in more effective ways. Most notable of these activities occurred in January of 2014 during an EVOSTC sponsored Data Management Meeting. During that meeting, several recommendations were made which have spurred investigators to adapt their data management approach in support of the entire EVOS HRM program. Investigators have been modifying protocols defined in the EVOS HRM program data management plan to address these issues.

II. COORDINATION AND COLLABORATION

A. Within a EVOTC-Funded Program

The Research Workspace technology being used for data management of the HRM program is designed to help facilitate the integration of datasets across disciplines and researchers within the HRM program. This technology is also being used by the EVOSTC sponsored Gulf Watch program. Teams and investigators are able to access each other's datasets in a seamless fashion.

B. With Other EVOSTC-funded Projects

The Research Workspace is also being used to organize and centralize data and electronic resources for historic EVOS funded projects. NCEAS and AOOS data management teams have been working together over the span of the project to salvage and document as much information as possible for historic EVOS data that is in jeopardy of being lost to time.

C. With Trustee or Management Agencies

In September 2013 the data management team released the Alaska Ocean Observing System's Gulf of Alaska (GOA) Data Portal, which integrates a large number of additional GIS, numerical modeling and remote sensing data resources that have been centralized through efforts of this project. The team was able to leverage the AOOS Ocean Data Explorer portal which has been developed using other funding (primarily NOAA) and has these additional features: an integrated search catalog which allows users to

search by category or key word, ability to preview data before downloading files, and advanced visualization tools. The platform provides open access to a large array of valuable scientific information that can be accessed and used by managers and scientists with Trustee Council agencies. AOOS data management has worked with several data consumers within USGS, NPS, BOEM and NOAA in accessing and using data contained within this data portal. The Research Workspace is also being used by the North Pacific Research Board's Gulf of Alaska Integrated Ecosystem Research Program. Historic data acquired through that program is also being provided to HRM PIs.

III. PROJECT DESIGN – PLAN FOR FY15

A. Objectives for FY15

- 1) Provide data management oversight and services for EVOS HRM project team data centric activities, which include data structure optimization, metadata generation, and transfer of data between project teams.
- 2) Consolidate, standardize and provide access to study area data sets that are critical for retrospective analysis, synthesis and model development.
- 3) Integrate all data, metadata and information products produced from this effort into the AOOS data management system for long-term storage and public use.

B. Changes to Project Design

Small changes have been made to protocols within the HRM Data Management Plan to address concerns of the EVOSTC Science Panel and include clarification of QA/QC procedures and review of Standard Operating Procedures (SOPs) by the program's internal science advisory team.

IV. SCHEDULE

A. Project Milestones for FY 15

For each project objective listed (III.A), specify when critical project tasks will be completed, as submitted in your original proposal. Please identify any substantive changes and the reason for the changes. Please format your information as in the following example:

- Objective 1.** Provide data management oversight and services for EVOS HRM project team data centric activities, which include data structure optimization, metadata generation, and transfer of data between project teams.
Assess and review year 4 data sets – To be met by September 2015
- Objective 2.** Consolidate, standardize and provide access to study area data sets that are critical for retrospective analysis, synthesis and model development.
*Data ingested in year 3 will be available via data access tools – To met by June 2015
Any additional historical data will be made available through the AOOS Gulf of Alaska portal - Ongoing*
- Objective 3.** Integrate all data, metadata and information products produced from this effort into the AOOS data management system for long-term storage and public use.
This task is ongoing.

B. Measurable Project Tasks for FY 15

FY 15, 1st quarter (February 1, 2015 - April 31, 2015)

February *EVOS synthesis workshop with Herring and Long-term monitoring programs*
March *Submit annual report*
March *Submit annual financial report*

FY 15, 2nd quarter (May 1, 2015-July 30, 2015)

May *Participate in Herring Program annual PI meeting*
July *Submit Y5 work plan for review*
June *Release version 2 of user tool platform*

FY 15, 3rd quarter (August 1, 2015 – October 31, 2015)

September *Oversee transfer of field year 4 data*
October *Assess year 4 datasets and metadata submitted through Ocean Workspace*

FY 15, 4th quarter (November 1, 2015- January 31, 2016)

January *Annual Marine Science Symposium*

V. PROJECT PERSONNEL – CHANGES AND UPDATES

None

VI. BUDGET

A. Budget Forms (Attached)

Attached

B. Changes from Original Proposal

No Change

C. Sources of Additional Funding

AOOS brings a significant level of leveraged resources, infrastructure, regional data management projects and partnerships to this proposed effort. The data management effort for the LTM and HRM programs could not be accomplished for the budgeted amount by a team without these leveraged resources.

1. AOOS – (540k to AOOS DM) Alaska oceanographic data management effort. Supports open source, standards based data system that serves up and archives real-time sensor feeds, models & remote sensing data, GIS data layers, and historical datasets. Data system developed on interoperability concepts and meets NOAA Integrated Ocean Observing System standards and protocols for streaming data feeds to national data assimilation centers. Data Management Committee chaired by Dr. Phil Mundy provides ongoing advice, prioritization and direction to the team at Axiom Consulting & Design. AOOS board is made up of federal and state agencies, and major marine research institutions in the state that have committed to data sharing. The AOOS board has committed to supporting a statewide data system for as long as AOOS exists. Federal funding is stable, although we would like to see it increase. In the event AOOS was to end, all data and data products would be transferred to the University of Alaska.
2. NPRB GOAIERP – (80K) During this project year, NPRB will be providing funding to the AOOS data management team to support the Gulf of Alaska Integrated Ecosystem Research

Program, which is performing research in the same area as EVOS Integrated Herring Research Program.

3. USFWS Seabird Data System – (\$50K) Project involves the creation and population of a series of new seabird metric databases (diet and productivity) and integrating these new databases with legacy seabird databases (species distribution and abundance at seabird colonies, pelagic species distribution and abundance, USGS seabird monitoring databases and NPRB’s North Pacific Seabird Diet Database). Modern spatially explicit, web based data entry interfaces have and continue to be developed to assist researchers existing in distributed agencies to contribute their historic and current seabird metric data into standard data structures. Project will result in vastly increasing the amount and quality of seabird species distribution, diet and other seabird data available for use in retrospective analysis and management. Though data includes areas around all of Alaska, most available data is located in GOA and PWS.
4. AOOS – collaborator with Alaska Data Integration Working Group – an initiative with the Alaska Climate Change Executive Roundtable – to develop protocols for serving up project data to increase data sharing among federal and state agencies.
5. AOOS and NOAA – initiatives to develop data sharing agreements with private sector, including oil & gas companies.
6. Kenai Fish Habitat Partnership/Cook Inlet Regional Citizens Advisory Council (28K) – contract with Axiom to develop a data management system for their oceanographic and contaminants data in Cook Inlet.
7. NOAA – Project to Axiom to develop a Cook Inlet beluga sightings database.

FY15 PROJECT PROPOSAL SUMMARY PAGE

Continuing, Multi-Year Projects

Proposals are due to the EVOSTC office by September 2, 2014. Please note that the information in your proposal and budget form will be used for funding review. Late proposals, revisions or corrections may not be accepted.

Project Title: PWS Herring Research and Monitoring: Expanded Adult Herring Surveys

Project Period: February 1, 2015 – January 31, 2016

Primary Investigator(s): Michele Buckhorn, PhD; Richard Thorne, PhD; Prince William Sound Science Center, Cordova, AK

Study Location: Prince William Sound, AK

Project Website (if applicable): <http://pwssc.org/research/fish/pacific-herring/>

Abstract*: Prince William Sound herring stock biomass estimates from hydroacoustic surveys provide a direct measure of the stock abundance for use in the age-structured assessment (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 (Steve Moffitt, personal communication) the lack of a commercial herring fishery in PWS since 1998 has reduced management priorities for herring. Thus the PWSSC contribution has become critically important for the long-term, especially if a future fishery appears only a remote possibility. With the level of effort available over the past several years, PWSSC and ADF&G individually have achieved herring biomass estimates with a precision of about $\pm 30\%$, which is insufficient for management purposes. However, the combined effort currently meets management requirements for precision. Current stock assessment efforts by ADF&G resource managers in PWS focus on the largest spawning aggregations. The objective of this study is to increase the current survey area of adult spawning beyond the Port Gravina and Fidalgo areas to provide a more precise estimate of spawning biomass. We propose to extend the PWSSC acoustic surveys to help identify the relative contributions of additional spawning aggregations over temporal and spatial scales. This will help establish more accurate estimates of the total herring biomass in PWS and provide an alert to changes in biomass in different regions. Beginning in FY2013 and continuing until 2016, hydroacoustic surveys will be conducted in late spring (April-May) to assess adult spawning biomass. ADF&G will continue to conduct direct sampling for age/length/weight. Additional direct capture will be conducted at adult spawning sites (See Bishop proposal).

Estimated Budget:

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

FY12	FY13	FY14	FY15	FY16	TOTAL
\$6,540	\$84,366	\$68,125	\$90,579	\$84,366	\$333,976

Non-EVOSTC Funds to be used:

FY12	FY13	FY14	FY15	FY16	TOTAL

Date: 8/15/2014

I. EXECUTIVE SUMMARY

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

The current management of the Prince William Sound (PWS) herring stock by the Alaska Department of Fish and Game (ADF&G) includes information from hydroacoustic surveys. Biomass estimates from these surveys provide a direct measure of the stock abundance and are provided for input into the age-structured assessment (ASA) model that is the primary forecasting tool. The hydroacoustic surveys were initiated in 1993 when fishers were unable to locate concentrations of herring despite a forecast for high abundance. Over time period the hydroacoustic survey has shown to be an early and accurate measure of the herring stock abundance and compares well with the recent ASA model estimates that now can incorporate hydroacoustic survey information as well as an index of male spawning abundance.

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. Over the past 5 years, the PWSSC effort has been supported by EVOS TC. The cooperative effort has been critical since both PWSSC and ADF&G have limited resources for this effort. While ADF&G considers the hydroacoustic surveys to be critical (Steve Moffitt, personal communication) the lack of a commercial herring fishery in PWS since 1998 has reduced management priorities for herring during a time of overall limited funding for the state agency. Thus the PWSSC contribution has become critically important for the long-term, especially if a future fishery appears only a remote possibility.

With the level of effort available over the past several years, PWSSC has achieved herring biomass estimates with a precision of about $\pm 30\%$. This level of precision is insufficient for management purposes. There is concern that some concentrations of fish are not located and surveyed under current levels, in which case the estimate is biased, a factor not incorporated into variance calculations for precision.

II. COORDINATION AND COLLABORATION

A. Within a EVOTC-Funded Program

This project is part of the integrated “PWS Herring Research and Monitoring” proposal submitted by the Prince William Sound Science Center to the Exxon Valdez Oil Spill Trustee Council. It includes the collaboration and coordination described there for work within the herring research group and with the Long-Term Monitoring proposal submitted by the Alaska Ocean Observing System. The vessel is shared with the Validation of Acoustic Survey Project. We explored putting a bird observer from the Gulf Watch Alaska program onboard, however, the pattern for exploring for is not conducive to results that can be used by the bird project.

B. With Other EVOSTC-funded Projects

N/A

C. With Trustee or Management Agencies

Fish and biomass estimates are provided to Steve Moffitt with ADF&G in Cordova.

III. PROJECT DESIGN – PLAN FOR FY15

A. Objectives for FY15

The objective of this study is to increase the current survey area of adult spawning beyond the Port Gravina and Fidalgo areas to provide a more accurate estimate of spawning biomass.

B. Changes to Project Design

N/A

IV. SCHEDULE

A. Project Milestones for FY 15

Objective 1. To increase the current survey area of adult spawning beyond the Port Gravina and Fidalgo areas to provide a more precise estimate of spawning biomass.

To be met by May 2015

B. Measurable Project Tasks for FY 15

FY 15, 1st quarter (February 1, 2015 - April 31, 2015)

April: Survey

FY 15, 2nd quarter (May 1, 2015-July 30, 2015)

May 30: Annual PI meeting

FY 15, 3rd quarter (August 1, 2015 – October 31, 2015)

August: Submit Annual Report

September 1: Complete Adult Survey Analysis

FY 15, 4th quarter (November 1, 2015- January 31, 2016)

December 15: Report and manuscript writing

V. PROJECT PERSONNEL – CHANGES AND UPDATES

Dr. Buckhorn will be leaving the project before the FY15 funding begins. The PWSSC is beginning the search for a suitable replacement. Dr. Thorne remains available as the Co-PI to assist with the transition.

VI. BUDGET

A. Budget Forms (Attached)

Provide completed budget forms.

B. Changes from Original Proposal

No changes are requested.

C. Sources of Additional Funding

No additional funding is provided.

FY15 PROJECT PROPOSAL SUMMARY PAGE

Continuing, Multi-Year Projects

Proposals are due to the EVOSTC office by September 2, 2014. Please note that the information in your proposal and budget form will be used for funding review. Late proposals, revisions or corrections may not be accepted.

Project Title: PWS Herring Research and Monitoring: Juvenile Herring Abundance Index

Project Period: February 1, 2015 – January 31, 2016

Primary Investigator(s): Michele Buckhorn, PhD (Lead PI)
Richard Thorne, PhD (co-PI); Prince William Sound Science Center, Cordova, AK

Study Location: Prince William Sound, AK

Project Website (if applicable): <http://pwssc.org/research/fish/pacific-herring/>

Abstract*:

Management of the Pacific herring stock in Prince William Sound (PWS), Alaska, is based primarily on an age-structured-assessment (ASA) model. The current model, developed in 2005, incorporates both hydroacoustic estimates of the adult herring biomass and an index of the male spawning, called the “mile-days of spawn”. Unfortunately, the forecast is based on measurements from the previous year and does not have a direct measure of future age 3 recruitment. Current knowledge suggests that most mortality occurs during the first winter of life, so the relative recruitment may be fixed by the end of the first year. Consequently, estimates of relative abundance of age 1 and age 2 fish should provide an index of future recruitment. An index of age 0 fish would also provide a forecast of recruitment if additional information were available on the magnitude of the first year mortality. We will conduct annual fall surveys (FY2013-2016) of 8 bays; four of which will be the Sound Ecosystem Assessment (SEA) bays (Cooney et al. 2001). This will maintain a continual database from these locations. The other 4 bays will be selected based upon the survey results of the current EVOSTC FY10 Herring Survey Project (# 10100132). Surveys will be conducted using 120 kHz split-beam hydroacoustic unit in a stratified systematic survey design (Adams et al. 2006). For this study, direct capture will be directed to size and species composition. A midwater trawl will be used to sample randomized transects within each strata.

Estimated Budget:

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

FY12	FY13	FY14	FY15	FY16	TOTAL
90,143	80,155	66,054	84,911	82,949	404,172

Non-EVOSTC Funds to be used:

FY12	FY13	FY14	FY15	FY16	TOTAL

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

Date: 8/15/2014

I. EXECUTIVE SUMMARY

Management of the Pacific herring stock in Prince William Sound (PWS), Alaska, is based primarily on an age-structured-assessment (ASA) model. The current model, developed in 2005, incorporates both hydroacoustic estimates of the adult herring biomass and an index of the male spawning, called the “mile-days of spawn”. Evidence suggests that the current model performs adequately. Unfortunately, the forecast is based on measurements from the previous year and does not have a direct measure of future recruitment. Since herring are a relatively short-lived fish, this uncertain recruitment can be a substantial component of the forecast abundance.

Herring in Prince William Sound are believed to recruit primarily as age 3. Current knowledge suggests that most mortality occurs during the first winter of life, so the relative recruitment may be fixed by the end of the first year. Consequently, estimates of relative abundance of age 1 and age 2 fish should provide an index of future recruitment. An index of age 0 fish would also provide a forecast of recruitment if additional information were available on the magnitude of the first year mortality.

Hydroacoustic surveys of juvenile herring abundance have been conducted over the past 4 years. These surveys have been conducted in both fall and late winter. The focus has been on age 0 herring, driven by interest in the extent of the critical first overwinter mortality, and has included energetics and disease research as well as research on sources of predation mortality

II. COORDINATION AND COLLABORATION

A. Within a EVOTC-Funded Program

This project is part of the integrated “PWS Herring Research and Monitoring” proposal submitted by the Prince William Sound Science Center to the Exxon Valdez Oil Spill Trustee Council. It includes the collaboration and coordination described there for work within the herring research group and with the Long-Term Monitoring proposal submitted by the Alaska Ocean Observing System. This includes working with the Validation of Acoustic Surveys, Herring Disease, and Non-Lethal Sampling projects in the Herring Research and Monitoring program, and bird surveys from the Gulf Watch Alaska program.

B. With Other EVOSTC-funded Projects

N/A

C. With Trustee or Management Agencies

N/A

III. PROJECT DESIGN – PLAN FOR FY15

A. Objectives for FY15

Project Objectives:

1. Conduct annual surveys of juvenile herring to create an index of future recruitment
2. Validate species and size composition of fish ensoufied during acoustic transects (See Bishop proposal).

B. Changes to Project Design

Three have been no changes from the original proposal.

IV. SCHEDULE

A. Project Milestones for FY 15

Objective 1. Conduct annual surveys of juvenile herring to create an index of future recruitment
November 2014

Objective 2. Validate species and size composition of fish ensouffied during acoustic transects (See Bishop proposal).
November 2014

B. Measurable Project Tasks for FY 15

FY 15, 1st quarter (February 1, 2015 - April 31, 2015)

January: Finish Nov. 2014 analysis

FY 15, 2nd quarter (May 1, 2015-July 30, 2015)

May PI meeting

FY 15, 3rd quarter (August 1, 2015 – October 31, 2015)

FY 15, 4th quarter (November 1, 2015- January 31, 2016)

November Acoustic-trawl surveys

V. PROJECT PERSONNEL – CHANGES AND UPDATES

Dr. Buckhorn will be leaving the project before the FY15 funding begins. The PWSSC is beginning the search for a suitable replacement. Dr. Thorne remains available as the Co-PI to assist with the transition.

VI. BUDGET

A. Budget Forms (Attached)

Provide completed budget forms.

B. Changes from Original Proposal

No changes are requested.

C. Sources of Additional Funding

No additional funding is provided.

FY15 PROJECT PROPOSAL SUMMARY PAGE

Continuing, Multi-Year Projects

Proposals are due to the EVOSTC office by September 2, 2014. Please note that the information in your proposal and budget form will be used for funding review. Late proposals, revisions or corrections may not be accepted.

Project Title: PWS Herring Research and Monitoring: Intensive surveys of juvenile herring

Project Period: February 1, 2015 – January 31, 2016

Primary Investigator(s): Michele Buckhorn, PhD (Lead PI)
Richard Thorne, PhD (co-PI); Prince William Sound Science Center, Cordova, AK

Study Location: Prince William Sound, AK

Project Website (if applicable): <http://pwssc.org/research/fish/pacific-herring/>

Abstract*: Hydroacoustic surveys of juvenile herring nursery areas in Prince William Sound have been conducted during fall and late-winter for the last several years. The number of locations surveyed have varied from 5-9, including the 4 Sound Ecosystem Assessment (SEA) bays. However, each seasonal effort has conducted only a single night survey in each of these locations. Thorne (2010) examined seasonal changes from fall 2006 to spring 2009. He showed that apparent overwinter mortality of age 0 herring appeared to be greatest in Simpson Bay and least in Whale Bay. However, the differences in seasonal abundance could be attributed to mortality, emigration, or changes in ambient light. We propose to address these uncertainties with an intensive fall and late winter/spring intensive survey.

The fall series started mid-October 2013 and extend to the first week of December. The late winter/spring series began in February 2014, and extended into the 2nd week of April. Sampling was conducted in Simpson and Windy Bays. Fish were collected using a mid-water trawl. And the survey design followed the historic zig zag transects run by Thorne since 1993 in order to remain consistent with that sampling design and to put the long term fall and spring surveys into context.

Estimated Budget:

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

FY12	FY13	FY14	FY15	FY16	TOTAL
50,140	29,757	46,543	6,758	0	133,198

Non-EVOSTC Funds to be used:

FY12	FY13	FY14	FY15	FY16	TOTAL

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

Date: 8/15/2014

I. EXECUTIVE SUMMARY

Hydroacoustic surveys of juvenile herring nursery areas in Prince William Sound have been conducted during fall and late-winter for the last several years. The objectives of this effort have been to improve understanding of habitat utilization by juvenile herring, especially age 0, and to help identify candidate sites that could be potentially used for supplementation efforts. The surveys have also been a focus for other studies on juvenile herring energetics, disease and predation. The number of locations surveyed have varied from 5-9, including the 4 Sound Ecosystem Assessment (SEA) bays. However, each seasonal effort has conducted only a single night survey in each of these locations. Thorne (2010) examined seasonal changes from fall 2006 to spring 2009. He showed that apparent overwinter mortality of age 0 herring appeared to be greatest in Simpson Bay and least in Whale Bay. However, he also pointed out that the differences over winter could also be the result of emigration. Not only might age 0 herring move among bays during the winter, but movement into and out of bays may be progressive during a season. It is possible the overwintering component of age 0 may not be fully recruited into a bay at the time a single fall survey, or may have begun spring movement out of bays prior to any given late-winter survey. Another potential source of variability could be the stage of the moon. Ambient light is known to affect fish distributions. On many occasions, age 0 concentrations were readily identified by their distinct distribution: a diffuse layer near surface, near shore and near the heads of bay. On other occasions, this distinctive distribution was absent even though age 0 herring were present. The change might have been the result of different ambient light regimes.

II. COORDINATION AND COLLABORATION

A. Within a EVOTC-Funded Program

This project is part of the integrated “PWS Herring Research and Monitoring” proposal submitted by the Prince William Sound Science Center to the Exxon Valdez Oil Spill Trustee Council. It includes the collaboration and coordination described there for work within the herring research group and with the Long-Term Monitoring proposal submitted by the Alaska Ocean Observing System. This project worked with the Validation of Acoustic Survey and Non-Lethal Sampling projects of the Herring Research and Monitoring program.

B. With Other EVOSTC-funded Projects

N/A

C. With Trustee or Management Agencies

N.A

III. PROJECT DESIGN – PLAN FOR FY15

A. Objectives for FY15

It will put current single season measurements of juvenile herring into a temporal context to address estimates of mortality and immigration/emigration.

The objectives of this study are:

1. to improve the accuracy of both annual and seasonal comparisons from single-night surveys by intensively sampling throughout a fall and spring season
2. estimate the level of immigration and emigration of age 0 herring between bays.

B. Changes to Project Design

There are no substantive changes to project design.

IV. SCHEDULE

A. Project Milestones for FY 15

For each project objective listed (III.A), specify when critical project tasks will be completed, as submitted in your original proposal. Please identify any substantive changes and the reason for the changes. Please format your information as in the following example:

Objective 1. To improve the accuracy of both annual and seasonal comparisons from single-night surveys by intensively sampling throughout a fall and spring season. *To be met by January 2015*

Objective 2. To improve the accuracy of both annual and seasonal comparisons from single-night surveys by intensively sampling throughout a fall and spring season. *To be met by January 2015*

B. Measurable Project Tasks for FY 15

FY 15, 1st quarter (February 1, 2015 - April 31, 2015)

January: Finish report

FY 15, 2nd quarter (May 1, 2015-July 30, 2015)

FY 15, 3rd quarter (August 1, 2015 – October 31, 2015)

FY 15, 4th quarter (November 1, 2015- January 31, 2016)

V. PROJECT PERSONNEL – CHANGES AND UPDATES

Dr. Buckhorn will be leaving the project before the FY15 funding begins. The PWSSC is beginning the search for a suitable replacement. Dr. Thorne remains available as the Co-PI to assist with the transition.

VI. BUDGET

A. Budget Forms (Attached)

Provide completed budget forms.

B. Changes from Original Proposal

No changes are requested.

C. Sources of Additional Funding

No additional funding is provided.

FY15 PROJECT PROPOSAL SUMMARY PAGE

Continuing, Multi-Year Projects

Proposals are due to the EVOSTC office by September 2, 2014. Please note that the information in your proposal and budget form will be used for funding review. Late proposals, revisions or corrections may not be accepted.

Project Title: *PWS Herring Research and Monitoring: Outreach & Education*

Project Period: February 1, 2015 – January 31, 2016

Primary Investigator(s): Hayley Hoover, Education Specialist, PWS Science Center (PWSSC)

Study Location: Prince William Sound (PWS)

Project Website (if applicable): <http://pwssc.org/research/fish/pacific-herring/>

Abstract*: The *Outreach & Education* project is designed to enhance the PWS Herring Program research activities by showcasing their relevancy, broadening their applicability and extending their impact to people in the community. PWSSC educators will work with PWS Herring Research and Monitoring principal investigators (PI) and project collaborators to prepare public education materials that communicate the purpose, goals and results of the research program to “non-scientist” audiences and stakeholders in communities in and beyond the spill affected area.

Outreach and education products will extend and transfer Pacific herring and marine ecosystem information to inform the public of local research activities and improve their ecological and ocean science literacy.

The specific objectives of this proposal, which includes the outreach and education components of the PWS Herring Research and Monitoring Program, are to:

- 1) Disseminate PWS herring research information and lessons learned in this program to individuals, groups, policy makers, resource managers and institutions in PWS, including the effected fishing community.
- 2) Extend and transfer PWS herring research-based outreach and education products to general audiences in and beyond the spill affected areas of PWS.
- 3) Integrate community involvement into the planning and sampling programs through citizen science opportunities and public workshops

Estimated Budget:

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

FY12	FY13	FY14	FY15	FY16	TOTAL
16,459	30,520	32,700	35,970	38,259	153,908

Non-EVOSTC Funds to be used:

FY12	FY13	FY14	FY15	FY16	TOTAL
50,000	50,000	65,000	65,000		

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

Date: 8/15/2014

I. EXECUTIVE SUMMARY

The **Outreach & Education** project is designed to enhance the PWS herring research activities by showcasing their relevancy, broadening their applicability and extending their impact to people in communities in and beyond the spill affected areas of PWS. Outreach products and education activities will extend and transfer herring and ecosystem information to inform the public of local research activities and improve their ecological and ocean science literacy. Both formal and informal approaches to science education are used.

The PWSSC education group has experience developing and implementing a diverse array of public outreach and educational activities through its *Headwaters to Ocean* program. Educators will work closely with PWS herring research principal investigators and project collaborators to prepare and distribute public education materials that communicate the purpose, goals and results of the research program to “non-scientist” audiences and stakeholders in communities in and beyond the spill affected area.

Table 1. The informal or formal education approaches (**bold**) used to meet objectives, specific products (*italics*), and schedule and frequency/number of outreach and education products developed/delivered by our staff.

1. Written project profiles and articles for public information and use; appropriate for lay audiences for inclusion in newsletters or other science/education publications.		
<i>Delta Sound Connections</i>	15,000 copies distributed annually to residents and visitors to PWS	Contribution of articles by herring researchers FY12-16. Sponsorship and herring program feature FY13 & FY15
<i>PWSSC Breakwater newsletter</i>	emailed to 325 households/businesses in and outside of Alaska	2-3 articles per year FY12-16
<i>Project Profiles</i>	Distribution points: PWSSC, and website	Three profiles per year developed or updated FY12-16
2. Public presentations to general public audiences.		
<i>Community Lecture Series</i>	(live in Cordova, broadcast to Valdez)	Three presentations delivered by Herring researchers per year FY12-16
<i>Field Notes radio program</i>	(aired and archived KCHU public radio)	Three radio programs produced based on Herring projects per year FY12-16
3. Advertise and involve community members in opportunities to participate in herring research as “citizen scientists.”		
<i>Citizen Science Opportunities</i>	Provide and promote opportunities for the public	Citizen science opportunities promoted on

	to become involved in research project activities	web and during community presentations
4. Develop and advertise web-based materials to communicate the basis, goals and results of the herring research project, and provide access to outreach and education products.		
<i>Herring Program webpage:</i> http://www.pwssc.org/herringsurvey	Basic information about each herring project can be found and links to the annual reports on the EVOSTC website.	Continue to use this as a place to make documents associated with the herring program accessible FY12-16
<i>PWSSC YouTube channel:</i> http://www.youtube.com/user/PWSSC	Podcasts (based on <i>Field Notes</i> radio programs) and video clips posted on YouTube	Continue to use popular social media to outreach information associated with the herring program FY12-16
5. Educate targeted groups in the application of research information and sampling methods.		
<i>Discovery Room</i>	5 th Grade Oceanography and Herring curriculum	6 2-hour classroom sessions/monitoring field trips delivered Oct-Apr FY12-16
<i>Outreach Discovery</i>	Stand-alone, hands-on herring and ocean science education programs for students in grades 3-12	1 program delivered to school group outside of Cordova per year FY12-16
<i>Summer Field Programs</i>	Field-based, hands-on herring and ocean science activities for participants in science and environmental camps and day programs	1 program delivered in PWSSC or partner summer program per year FY12-16

II. COORDINATION AND COLLABORATION

A. Within a EVOTC-Funded Program

This project provides outreach and education for all projects within the Herring Research and Monitoring Program. We participate on research cruises when opportunity allows. Other project investigators provide the basic materials needed through a description of their research, interviews, and other presentations. We also connect with the Gulf Watch Alaska program in areas of overlap of the two programs.

B. With Other EVOSTC-funded Projects

We participate in the Cordova Clean Harbor oversight group that is connected to the Cordova Clean Harbor project being led by the Native Village of Eyak with funding from EVOS.

C. With Trustee or Management Agencies

We work with the investigators in the HRM program from ADF&G, NOAA, and USGS to develop project profiles, *Field Notes* programs, and community lecture opportunities to provide outreach of their research.

III. PROJECT DESIGN – PLAN FOR FY15

A. Objectives for FY15

The specific objectives of this proposal, which includes the outreach and education components of the PWS Herring Research and Monitoring Program, are to:

- 1) Disseminate PWS herring research information and lessons learned in this program to individuals, groups, policy makers, resource managers and institutions in PWS, including the effected fishing community.
- 2) Extend and transfer PWS herring research-based outreach and education products to general audiences in and beyond the spill affected areas of PWS.
- 3) Integrate community involvement into the planning and sampling programs through citizen science opportunities and public workshops

B. Changes to Project Design

Turnover in the education department has made consistency in meeting objectives challenging. Hayley Hoover was hired in FY 14 to replace Lindsay Butters. It is Hayley's goal to get the education program caught up and on track with its deliverable objectives in FY 15. Specifically Field Notes has undergone formatting changes as well as leadership changes. Instead of a narrative framework, program will be interview based. One challenge with this approach is Herring PIs are not all in a central location. Logistically, getting PIs to commit to contributing to this program can be difficult.

The structure of the PWSSC summer programs is currently being revised. There were no summer programs delivered in FY 14 and we do not anticipate being able to deliver summer programs in FY 15. The funding will be used to ensure that the herring materials can be incorporated into the revised summer programs.

We no longer anticipate maintaining the herring program facebook page. We will provide updates through the PWSSC blog. Blog posts are used in the *Breakwater* and can be forwarded to the PWSSC facebook page.

IV. SCHEDULE

A. Project Milestones for FY 15

- Objective 1.** Disseminate PWS herring research information and lessons learned in this program to individuals, groups, policy makers, resource managers and institutions in PWS, including the effected fishing community.
A continuing objective
- Objective 2.** Extend and transfer PWS herring research-based outreach and education products to general audiences in and beyond the spill affected areas of PWS.
A continuing objective
- Objective 3.** Integrate community involvement into the planning and sampling programs through citizen science opportunities and public workshops.
A continuing objective

B. Measurable Project Tasks for FY 15

FY 15, 1st quarter (February 1, 2015 - April 31, 2015)

*February: Continue implementing oceanography and herring Discovery Room
Submit annual report*

FY 15, 2nd quarter (May 1, 2015-July 30, 2015)

April: Develop/update Project Profiles based on surveys & herring data

*May: Evaluate oceanography and herring Discovery Room program
Participate in Principal Investigator update and outreach meeting
Delivery of Community Lectures and Field Notes complete for FY15
Written outreach materials complete for FY15 (Delta Sound Connections,
Breakwater newsletter articles, Project Profiles)*

FY 15, 3rd quarter (August 1, 2015 – October 31, 2015)

August: Submit Report

September: Continue implementing oceanography and herring Discovery Room

FY 15, 4th quarter (November 1, 2015- January 31, 2016)

December: Develop Field Notes radio program based on fall surveys

V. PROJECT PERSONNEL – CHANGES AND UPDATES

Hayley Hoover has been hired to lead the herring program outreach and education activities. Her CV is provided at the end of this report.

VI. BUDGET

A. Budget Forms (Attached)

Provide completed budget forms.

B. Changes from Original Proposal

No budget changes are requested.

C. Sources of Additional Funding

The delivery of Discovery Room activities, the development of the *Breakwater* and *Delta-Sound Connections* documents, Outreach Discovery, and the community lecture series are also supported by a number of different contributions including \$55,000 from the Oil Spill Recovery Institute and \$10,000 from Conoco-Phillips.

Hayley to Fibroner

PO Box 2302 • Cordova, AK 99574
Phone: (206)371-7856 • E-Mail: hayhoov.cdv@gmail.com

Experience

F/V Tina Deckhand

Summer 2013

As a seine deck hand I stacked the lead line and cooked all the meals. As a team we mended gear, maintained mechanics, and kept the boat orderly.

Reluctant Fisherman

2013

Waited tables.

Orca Adventure Lodge

Summers 2012 -2013

Waited tables occasionally helped with cooking, and washed dishes.

Forestry Crew Technician

2010 - 2012

Crew duties included conducting silvicultural practices, providing forest products to the College, trail and logging road maintenance, and shiitake mushroom propagation.

Personal experience included: felling, bucking, and limbing trees up to twenty inches in diameter, operating a band saw mill, stacking lumber, assisting in tree marking (for timber cuts), cutting, splitting, and stacking firewood, running hydraulic splitter, assisting with simple carpentry projects, inoculating shitake mushroom logs, harvesting shitake mushrooms, creating wildlife brush piles, maintaining and repairing equipment (mostly chainsaws), performing prescribed burns, using herbicides to treat of invasive species, and enrichment planting of rare and medicinal plants.

F/V Mariah Deckhand

Summer 2012

As a gillnet deckhand I was responsible for pitching fish, picking fish out of net, keeping a clean and orderly deck and cabin, and shared cooking responsibilities.

Landscaping Crew Technician

2008 - 2010

Crew tasks ranged from operating heavy machinery to weeding garden beds on main campus. As a crew we planned the landscape design for the campus. This entailed quite a bit of research, planning, coming to the drawing board, and then finally carrying out our plan in the field.

F/V Obsidian Deckhand

Summers 2004 - 2010

On this boat I had the same responsibilities as on the Mariah. As a gillnet deckhand I was responsible for pitching fish, picking fish out of net, keeping a clean and orderly deck and cabin, and shared cooking responsibilities.

College Education

Warren Wilson College

2008-2012

I graduated Warren Wilson College (WWC) with a Bachelor of Arts in Environmental Science with a concentration in Sustainable Forestry.

Forest Management Course**Spring 2012**

The objective of this class was to give students the ability to apply the sivicultural techniques learned in previous classes to the real world. During this course two other students and I had the opportunity to survey and apply our knowledge on a community member's property. The majority of my last semester of college was spent collecting data and writing management techniques for 150 acres of Walter Harill's family property in Fairview NC. As a team we wrote a management plan that outlined suggestions for timber management, agriculture management, potential agroforestry techniques, and NTFP management.

Natural Science Seminar (NSS)**Spring 2012**

During the last two years of college I prepared for and executed my undergraduate thesis. I did a study on the effects of sedimentation on spawning habitat in our very own Lake Eyak. Through the course of my studies I worked with teachers at WWC as well as members of the Copper River Watershed Project, EcoTrust, and The Prince William Sound Science Center. This opportunity helped me develop my scientific writing voice, research style, data collection skills, public speaking skills as well as networking skills.

Yarbrough Research Grant**Spring 2011**

Part of my NSS experience was budgeting and applying for grants. In order to perform my data collection and get my samples back to the lab at WWC I applied for the Yarbrough Research Grant and was awarded my requested sum.

GIS**Fall 2011**

I have taken a GIS course in college but am not certified. I used this program for many of my classes including Forest Management, Agroforestry, Aquatic ecology, hydrology and my independent study geology courses.

Certifications**Forest Service**

I am a certified B Sawyer by the USFS. I am also certified by the NCFS in wild-land fire fighting.

PADI/SCUBA

I was trained in Thailand to be a certified Open Water diver.

CPR/First Aid

I have been trained twice before, but unfortunately by certification has recently expired.

Conferences**River Network Rally****2013**

The Native Village of Eyak gave me the chance to attend the River Network's annual Rally. I was fortunate enough to go to workshops on topics ranging from Effects of Fraking on water supply to The Art of Environmental Education.

North Carolina Academy of Science Annual Meeting**2012**

After being awarded grant moneys for my undergraduate thesis I was asked to present my study at Campbell University. Here I was company to other grant winners and many graduate students also presenting their studies

FY15 PROJECT PROPOSAL SUMMARY PAGE

Continuing, Multi-Year Projects

Proposals are due to the EVOSTC office by September 2, 2014. Please note that the information in your proposal and budget form will be used for funding review. Late proposals, revisions or corrections may not be accepted.

Project Title: PWS Herring Research and Monitoring: Herring Disease Program (HDP)

Project Period: February 1, 2015 – January 31, 2016

Primary Investigator(s): Paul Hershberger (USGS – Marrowstone Marine Field Station)

Study Location: Wild herring will be collected from PWS, laboratory studies will be performed at the Marrowstone Marine Field Station

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

Abstract*:

The *Herring Disease Program (HDP)* is part of a larger integrated effort, Prince William Sound Research and Monitoring (outlined in a separated proposal by Dr. Scott Pegau). Within this integrated effort, the *HDP* is intended to evaluate the impact of infectious and parasitic diseases on the failed recovery of the PWS herring population. The framework for the 2012 – 2016 *HDP* involves a combination of field surveillance efforts, field-based disease process studies, and laboratory-based controlled studies. Field surveillance efforts will provide continued and expanded infection and disease prevalence data for herring populations in Prince William Sound (PWS), Sitka Sound, and Puget Sound. During FY 2015 we will continue the health assessments of adult herring from Prince William Sound and Sitka Sound, we will continue to rear colonies of specific-pathogen-free Pacific herring for controlled studies in the laboratory, we will compare the relative sensitivities of four newly-developed diagnostic assays that are capable of identifying prior exposure to VHS virus in Pacific herring. Additionally, by employing the qPCR and chromogenic in situ hybridization tools that were developed as products of the HDP, we will begin searching for intermediate invertebrate hosts for *Ichthyophonus*.

Estimated Budget:

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

FY12	FY13	FY14	FY15	FY16	TOTAL
		\$281,874	\$291,902	\$298,006	\$871,782

Non-EVOSTC Funds to be used:

FY12	FY13	FY14	FY15	FY16	TOTAL
			\$42,100		

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

Date: August 15, 2014

I. EXECUTIVE SUMMARY

A major emphasis during 2014 involved the development of a chromogenic *in situ* assay, capable of providing a confirmatory diagnosis of *Ichthyophonus* in fixed tissues. This tool, in conjunction with a quantitative PCR assay for *Ichthyophonus*, will be employed in 2015 to screen zooplankton in an effort to determine whether an intermediate host exists for this parasite. Additionally, four assays have been developed that are capable of identifying prior herring exposure to VHSV, including a viral replication in excised fin tissues (VREFT), competitive enzyme linked immunosorbent assay (cELISA), indirect ELISA (iELISA), and virus neutralization assay. During 2015, we will compare the relative sensitivities of each assay in herring that survive a single exposure to VHSV. Results from this comparison will determine which assay will be employed for the processing of archived from PWS herring samples.

2014 Publications:

Emmenegger, E.J., J.A. Glenn, J.R. Winton, W.N. Batts, J.L. Gregg, P.K. Hershberger. *Accepted*. Molecular identification of erythrocytic necrosis virus (ENV) from the blood of Pacific herring (*Clupea pallasii*). *Journal of Veterinary Microbiology*.

Kocan, K., L. Hart, N. Lewandowski, P. Hershberger. *In Press*. Viability and infectivity of *Ichthyophonus sp.* in post-mortem Pacific herring, *Clupea pallasii*. *Journal of Parasitology*.

Conway, C.M., M.K. Purcell, D.G. Elliott, P.K. Hershberger. *In Press*. Detection of *Ichthyophonus* by chromogenic *in situ* hybridization. *Journal of Fish Diseases*.

Wilson, A. E., T. L. Goldberg, S. V. Marquenski, W. J. Olson, R. F. Goetz, P. K. Hershberger, K. L. Toohey-Kurth. 2014. Development and evaluation of a blocking enzyme-linked immunosorbent assay and virus neutralization assay to detect antibodies to viral hemorrhagic septicemia. *Clinical and vaccine Immunology* 21: 435-442.

Burge, C. A., C. M. Eakin, C. S. Friedman, B. Froelich, P. K. Hershberger, E. E. Hofmann, L. E. Petes, K. C. Prager, E. Weil, B. L. Willis, S.E. Ford, C. D. Harvell. 2014. Climate change influences on marine infectious diseases: implications for management and society. *Annual Review of Marine Science* 6: 249-277.

II. COORDINATION AND COLLABORATION

A. Within a EVOTC-Funded Program

- 1) Samples from juvenile herring are being collected by the Validation of Acoustic Survey Project and field processing by the Herring Condition Monitoring project.
- 2) Zooplankton samples are being provided by Dr. Rob Campbell in an effort to screen for intermediate hosts of *Ichthyophonus*.
- 3) We are currently planning a manuscript, describing a series of ecosystem in-balances that predisposed the PWS herring population to crash in the early 1990's. This will be co-authored with our colleagues at the Auke Bay Labs: to be drafted and submitted during 2015.

B. With Other EVOSTC-funded Projects

N/A

C. With Trustee or Management Agencies

- 1) Samples of wild adult herring during the spring are being collected in collaboration by ADF&G.

- 2) Field samples are being processed by the ADF&G Fish Pathology Laboratory in Juneau.
- 3) Data on disease prevalence is being provided to Steve Moffitt with ADF&G in Cordova.

III. PROJECT DESIGN – PLAN FOR FY15

A. Objectives for FY15

- Provision of disease prevalence data for the ASA herring model
- Provision of disease process studies intended to investigate the seasonality of herring diseases in PWS
- Collection of novel disease forecasting data
- Production of Specific Pathogen-Free Pacific herring intended as laboratory hosts for controlled experiments intended to determine cause-and-effect disease relationships
- Compare sensitivity of recently-developed assays capable of identifying prior herring exposure to VHSV
- Collect and screen zooplankton for *Ichthyophonus*

B. Changes to Project Design

No changes in project design.

IV. SCHEDULE

A. Project Milestones for FY 15

Objective 1. Provision of disease prevalence data necessary for the ASA herring model

To be met by June 2015

Objective 2. Provision of disease process studies intended to investigate the seasonality of herring diseases in PWS

To be met by December 2015

Objective 3. Collection of novel disease forecasting data

To be met by June 2015

Objective 4. Production of Specific Pathogen-Free Pacific herring intended as laboratory hosts for controlled experiments intended to determine cause-and-effect disease relationships

To be metamorphosed by August 2015

Objective 5. Compare sensitivity of recently-developed assays capable of identifying prior herring exposure to VHSV

To be met by May 2015

Objective 6. Collect and screen zooplankton for *Ichthyophonus*

Collections will continue to occur throughout the year, processing by qPCR will start in the summer of 2015; any qPCR-positive samples will be confirmed by CISH by September 2015.

B. Measurable Project Tasks for FY 15

FY 15, 1st quarter (February 1, 2015 - April 31, 2015)

Field sampling, egg collections, laboratory experiments, manuscript preparation

FY 15, 2nd quarter (May 1, 2015-July 30, 2015)

Larval rearing, laboratory experiments, manuscript preparation

FY 15, 3rd quarter (August 1, 2015 – October 31, 2015)

Juvenile rearing, laboratory experiments, manuscript preparation

FY 15, 4th quarter (November 1, 2015- January 31, 2016)

Juvenile rearing, laboratory experiments, manuscript preparation

V. PROJECT PERSONNEL – CHANGES AND UPDATES

N/A

VI. BUDGET

A. Budget Forms

Completed budget forms attached.

B. Changes from Original Proposal

No Changes proposed

C. Sources of Additional Funding

\$42,100 In kind contribution from USGS includes salary and benefit contributions (20%) for P. Hersberger (\$26,400) and J. Gregg (\$15,700)

FY15 PROJECT PROPOSAL SUMMARY PAGE

Continuing, Multi-Year Projects

Proposals are due to the EVOSTC office by September 2, 2014. Please note that the information in your proposal and budget form will be used for funding review. Late proposals, revisions or corrections may not be accepted.

Project Title: PWS Herring Program – Herring Condition Monitoring

Project Period: February 1, 2015 – January 31, 2016

Primary Investigator(s): Ron Heintz, NOAA Auke Bay Laboratory, 17109 Pt. Lena Loop Road, Juneau, AK 99801, ron.heintz@noaa.gov and Kristen B. Gorman, Prince William Sound Science Center, 300 Breakwater Ave, PO Box 705, Cordova, AK 99574, kgorman@pwssc.org

Study Location: Prince William Sound

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

Abstract*: Outlined here is a single herring monitoring project that is a part of an integrative program that will enhance the current herring monitoring efforts and examine aspects of particular life stages to allow better modeling of Prince William Sound herring populations. The long-term goal of the program is to improve predictive models of herring stocks through observations and research.

This project will be furthering the development of an overwinter herring mortality model that began with an ongoing monitoring project initiated in 2007, and incorporates results from Prince William Sound herring research dating as far back as the 1990's. Accordingly, herring are sampled in November and the following March (Objectives 1 and 2). The model runs by applying herring condition observations made before and after winter (Objective 3). Proposed sampling will commence in November 2012 and end in March 2016. The purpose of the time series is to relate overwinter mortality to herring recruitment.

Additionally, this project will be furthering the development of an overwinter herring mortality model with additional data types including proximate composition, RNA/DNA, and diet (Objective 6), as well energy levels per se. The goal is to use physiological indicators to realistically modify the daily energy loss rate in the overwintering model. The results of model improvement will be tested using the March data model validation approach that began in 2007.

We will no longer be assessing competitive effects of other juvenile fishes on condition of age-0 herring using stable isotope analysis as noted in previous proposals (Objective 4). Our experience with the sampling program is that we were unable to target the sample sizes needed for other species to make this a realistic goal. However, this year we intend to examine the relationship between age-0 herring length and scale growth (Objective 5) using existing data collected as part of this program, in order to better interpret long-term scale data held by Alaska Department of Fish and Game within the context of energetics.

Estimated Budget:

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

FY12	FY13	FY14	FY15	FY16	TOTAL
0	230,620	238,601	251,572	253,861	974,654

Non-EVOSTC Funds to be used:

FY12	FY13	FY14	FY15	FY16	TOTAL
0	0	0	42,431	0	0

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

Date: 8/15/2014

I. EXECUTIVE SUMMARY

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

Studies conducted since the 1990's suggest that age-0 PWS herring begin winter deficient in energy, which leads to significant overwinter mortality. Starvation was confirmed by using RNA/DNA as a physiological indicator. It is hypothesized that when these constraints are relaxed, first winter survival is much greater and this leads to enhanced recruitment. Specific objectives for the Herring Condition Monitoring (HCM) project follow:

Objective 1. Monitor juvenile herring condition by sampling in November.

Objective 2. Monitor juvenile herring condition by sampling in March.

Objective 3. Apply resultant observations from Objectives 1 and 2 to continue refining an overwintering mortality model with the addition of physiological indicators.

Objective 4. Assess competitive interactions with fishes using stable isotope analyses (objective not continued in 2015).

Objective 5. Examine relationships between age-0 herring scale growth and body length (objective new in 2015).

Objective 6. Monitor seasonal changes in juvenile herring diets (November vs. March) and examine relationship between diet and herring condition (continuing objective although not specifically defined in previous proposals).

II. COORDINATION AND COLLABORATION

A. Within a EVOSTC-Funded Program

The HCM project is structured to be part of a collaborative programmatic effort being led by the Prince William Sound Science Center (PWSSC), the Prince William Sound Herring Research and Monitoring (HRM) program supported by EVOSTC. The HRM program also includes monitoring of disease, as well as studies of adult and juvenile biomass using acoustic techniques. As part of the HRM, the HCM project interacts with virtually all other aspects of the program and personnel from multiple projects work in cooperation. For example, the HCM project will furnish one field technician for field sampling. Previous herring technicians have been simultaneously collecting, sorting, and preparing samples for multiple investigators such as Dr. Hershberger's disease program as part of research cruise duties. Field sampling is being conducted on shared research vessels, with funding for vessel charter time outside the scope of this project. We further rely on environmental data provided by the Gulf Watch Alaska program. Additionally, local fishermen associated with Cordova District Fishermen United, which is a component of the larger HRM program's logistics, collects spring herring samples.

B. With Other EVOSTC-funded Projects

None

C. With Trustee or Management Agencies

The HCM project is an ongoing collaboration between PWSSC and NOAA. Bomb calorimetry and preparation of samples for stable isotope analyses are conducted at PWSSC under the supervision of project PI, Kristen Gorman. Proximate composition, RNA/DNA, and dietary analyses are conducted at NOAA's Auke Bay laboratory under the supervision of project PI, Ron Heintz. The current proposal also includes a new collaboration between PWSSC and ADF&G in Cordova to conduct scale analyses.

Here, a new collaboration is proposed with ADF&G in Cordova to conduct scale analyses. Steve Moffitt, Fisheries Biologist III with ADF&G in Cordova, has indicated a willingness to collaborate on this component of the proposal by provided services for herring scale analysis and access to long-term herring scale datasets through a revision in budgets to cover ADF&G personnel.

III. PROJECT DESIGN – PLAN FOR FY15

A. Objectives for FY15

Objective 1. Monitor juvenile herring condition by sampling in November.

Objective 2. Monitor juvenile herring condition by sampling in March.

Objective 3. Apply resultant observations from Objectives 1 and 2 to continue refining an overwintering mortality model with the addition of physiological indicators.

Objective 4. Assess competitive interactions with fishes using stable isotope analyses (objective not continued in 2015).

Objective 5. Examine relationships between age-0 herring scale growth and body length (objective new in 2015).

Objective 6. Monitor seasonal changes in juvenile herring diets (November vs. March) and examine relationship between diet and herring condition (continuing objective although not specifically defined in previous proposals).

B. Changes to Project Design

There are no major changes planned for the design of the HCM project within the scope of energetic sampling and application to the overwinter herring mortality model (**Objectives 1-3, 6**).

We have decided to discontinue work aimed at assessing competitive interactions between age-0 herring and other fishes (**Objective 4**). As a new PI, Kristen Gorman has decided that the current database does not have the necessary sample sizes to achieve this objective as previous collections of other fishes have been sparse do to sampling techniques.

This year, we plan to pursue a new project that examines age-0 herring growth using scale data as a predictor of age-0 herring body size (**Objective 5**). This information will be used to improve our understanding of how changes in scale growth patterns correlate with known variation in fish length and

energetic state, specifically for age-0 herring. Importantly, this relationship will greatly expand ADF&G's long-term database that includes age-0 herring growth based on scale analysis of older fish, and allow for insights on how relationships between fish size and energetic state relate to successful recruitment. This project will use existing data already collected as part of the HCM project. We plan to examine a stratified random sample of 8 size classes between 50 and 120 mm defined by 10 mm increments. Within each 10 mm size class, we expect to analyze between 50 – 60 individual scales, which would result in the analysis of approximately 400 - 500 samples. Scales will be examined through a microfiche equipped with a scanner by an ADF&G technician located in Cordova, AK. The scanner feeds the image into a computer's frame-grabber board. Using software calibrated to the magnification of the image, a series of lines will be overlaid on the scale image from the focus to the scale edge by the reader to mark the annuli on the image. The number of annuli and the spacing between annuli will be collected in a database and collated with the existing information about the herring. The image and the overlaid measurements maybe saved for future reference. Predictive models will use standard statistical approaches (i.e., least-squares regression, ANOVA) within an Information-Theoretic (AIC) context.

IV. SCHEDULE

A. Project Milestones for FY 15

Objective 1. Monitor juvenile herring condition by sampling in November.

Fieldwork to be accomplished by November 2015

Laboratory work to be accomplished by July 2016

Objective 2. Monitor juvenile herring condition by sampling in March.

Fieldwork to be accomplished by March 2015

Laboratory work to be accomplished by November 2015

Objective 3. Apply resultant observations from Objectives 1 and 2 to continue refining an overwintering mortality model with the addition of physiological indicators.

Analyses to be accomplished by November 2015 with data collected in November 2014 and March 2015.

Objective 4. Assess competitive interactions with fishes using stable isotope analysis.

This objective is no longer being pursued as discussed previously.

Objective 5. Examine relationships between age-0 herring scale growth and fish length/energetic state.

Laboratory and statistical analyses to be accomplished by January 2016.

Objective 6. Monitor seasonal changes in juvenile herring diets (November vs. March) and examine relationship between diet and herring condition.

Laboratory work to be accomplished by July 2016, for fieldwork samples collected in March and November 2015.

B. Measurable Project Tasks for FY 15

FY 15, 1st quarter (February 1, 2015 - April 31, 2015)

February – April 2015: Ongoing laboratory work for samples collected in November 2014 and March 2015

March 2015: 2015 Sampling

FY 15, 2nd quarter (May 1, 2015-July 30, 2015)

May – July 2015: Ongoing laboratory work for samples collected in March 2015

FY 15, 3rd quarter (August 1, 2015 – October 31, 2015)

*August – October 2015: Ongoing laboratory work for samples collected in March 2015
Application of data collected in November 2014 and March 2015 to
overwinter mortality model.*

FY 15, 4th quarter (November 1, 2015- January 31, 2016)

*November – January 2016: Ongoing laboratory work for samples collected in November 2015
November 2015: 2015 Sampling*

V. PROJECT PERSONNEL – CHANGES AND UPDATES

Kristen Gorman is a new PI at the Prince William Sound Science who will be taking up projects previously led by Dr. Tom Kline including the current Herring Condition Monitoring project. Kristen is will defend her Ph.D. in the fall of 2014. She completed a M.Sc. in 2005 at Simon Fraser University, Vancouver BC, working in collaboration with Alaska USGS scientists on the energetics of egg production by female greater scaup ducks nesting in western Alaska. Her PhD work was also conducted at Simon Fraser University under the supervision of Prof. Tony D. Williams. Her dissertation work examined Southern Ocean marine food webs and variation in breeding performance by three species of *Pygoscelis* penguins. Her thesis work incorporated techniques such as stable isotope analyses, physiological assays related to energy management in birds, and population genetic markers to examine regional breeding rookery structure along the western Antarctic Peninsula.

Fletcher Sewall is a PhD candidate researching juvenile herring survival and recruitment who contributes to the project components associated with the NOAA Auke Bay Laboratory and within the purview of Ron Heintz, including sample processing, data analysis, and drafting reports and manuscripts.

Kristen B. Gorman
CV Short

Prince William Sound Science Center
300 Breakwater Ave
P.O. Box 705
Cordova, Alaska 99574

Email: kgorman@pwssc.org
Tel: 907-242-5800 ext. 239
Fax: 907-424-5820
Web: <http://www.sfu.ca/~kgorman>

Professional Preparation

- 2014: Simon Fraser University, Faculty of Science; Ph.D. Major: Ecology and Evolutionary Biology, expected Fall 2014.
2005: Simon Fraser University, Faculty of Science; M.Sc. Major: Ecology and Evolutionary Biology.
1996: Dickinson College, Carlisle, PA, USA; B.S. Major: Biology.

Appointments

- 2014: Research Ecologist, Prince William Sound Science Center, Cordova, AK.
2008: Ph.D. Candidate, Department of Biological Sciences, Simon Fraser University, Burnaby, BC.
2005: Research Assistant, Polar Oceans Research Group, Sheridan, MT.
2002: M.Sc. Candidate, Department of Biological Sciences, Simon Fraser University, Burnaby, BC.
1999: Wildlife Field Technician, Oregon State University, Corvallis, OR.
1997: Wildlife Field Technician, University of Wisconsin, Madison, WI.

Selected Publications

- Gorman, K.B.**, T.D. Williams, and W.R. Fraser. 2014. Ecological sexual dimorphism and environmental variability within a community of Antarctic penguins (genus *Pygoscelis*). *PLoS ONE* 9(3): e90081.
- Crossin, G.T., P.N. Trathan, R.A. Phillips, **K.B. Gorman**, A. Dawson, K.Q. Sakamoto, and T.D. Williams. 2012. Variation in baseline corticosterone predicts foraging behaviour and parental care in macaroni penguins. *The American Naturalist* 180(1):E31-E41.
- Bestelmeyer, B.T., A.M. Ellison, W.R. Fraser, **K.B. Gorman**, S.J. Holbrook, C.M. Laney, M.D. Ohman, D.P.C. Peters, F.C. Pillsbury, A. Rassweiler, R. Schmitt, and S. Sharma. 2011. Analysis of abrupt transitions in ecological systems. *Ecosphere* 2(12):art129.
- Gorman, K.B.**, D. Esler, P.L. Flint, and T.D. Williams. 2008. Nutrient reserve dynamics during egg production by female Greater Scaup (*Aythya marila*): relationships with timing of reproduction. *Auk* 125(2):384-394.
- Gorman, K.B.**, P.L. Flint, D. Esler, and T.D. Williams. 2007. Ovarian follicle dynamics of female Greater Scaup during egg production. *Journal of Field Ornithology* 78(1):64-73.

Other Relevant Publications

- Schofield, O., H. Ducklow, K. Bernard, S. Doney, D. Patterson-Fraser, **K.B. Gorman**, D. Martinson, M. Meredith, G. Saba, S. Stammerjohn, D. Steinberg, and W. Fraser. Penguin biogeography along the West Antarctic Peninsula: Testing the canyon hypothesis with Palmer LTER observations. *Submitted Apr 2013*.
- Crossin, G.T., A. Dawson, R.A. Phillips, P.N. Trathan, **K.B. Gorman**, S. Adlard, and T.D. Williams. 2012. Seasonal patterns of prolactin and corticosterone secretion in an Antarctic seabird that moults during reproduction. *General and Comparative Endocrinology* 175(1):74-81.

- Badzinski, S.A., P.L. Flint, **K.B. Gorman**, and S.S. Petrie. 2009. Relationships between hepatic trace element concentrations, reproductive status, and body condition of female greater scaup. *Environmental Pollution* 157(6):1886-1893.
- Gorman, K.B.**, D. Esler, R.L. Walzem, and T.D. Williams. 2009. Plasma yolk precursor dynamics during egg production by female Greater Scaup (*Aythya marila*): characterization and indices of reproductive state. *Physiological and Biochemical Zoology* 82(4):372-381.
- Gorman, K.B.** and T.D. Williams. 2005. Correlated evolution of maternally derived yolk testosterone and early developmental traits in passerine birds. *Biology Letters* 1(4):461-464.

Synergistic Activities

- Peer-review of manuscripts for *Biology Letters* (4), *Journal of Animal Ecology* (1), *Journal of Avian Biology* (1), *Marine Ecology Progress Series* (4), *Polar Biology* (2), *Waterbirds* (1).
- Association of Polar Early Career Scientists (APECS) Council Member, Research Activities and Education/Outreach Committees (September 2012-2013).
- Graduate student representative to the US Long-Term Ecological Research (LTER) Network for Palmer Station, Antarctica LTER program (September 2010-September 2012).
- Co-organizer for *Les Ecologistes* Seminar Series, Department of Biological Sciences, Simon Fraser University (2010-2011).

Collaborators (last 48 months).

S Badzinski (Bird Studies Canada), B Bestelmeyer (New Mexico State U), J Blum (Polar Oceans Res. Group), G Crossin (Dalhousie U), S Doney (Woods Hole), A Dawson (C. Ecol Hydrol, NERC), H Ducklow (Marine Biological Lab), A Ellison (Harvard U), E Erdmann (U Wisconsin Madison), D Esler (Simon Fraser U), P Flint (AK-USGS), W Fraser (Polar Oceans Res Group), M Hipfner (Canadian Wildlife Service), S Holbrook (UC Santa Barbara), P Horne (Polar Oceans Res Group), J Joy (Simon Fraser U), S Laney (U Texas El Paso), H Lucas (Polar Oceans Res. Group), D Martinson (Lamont-Doherty), M Meredith (Brit Ant Surv), M Ohman (SCRIPPS), D Patterson-Fraser (Polar Oceans Res. Group), D Peters (New Mexico State U), S Petrie (Bird Studies Canada), B Pickering (Polar Oceans Res. Group), R Phillips (BAS), F Pillsbury New Mexico State U), A Rassweiler (UC Santa Barbara), K Sakamoto (Hokkaido U), O Schofield (Rutgers U), S Sharma (U Wisconsin Madison), S Stammerjohn (Inst Arctic Alpine Res), D Steinberg (VIMS), P Trathan (BAS), R Vos (Simon Fraser U), R Walzem (Texas A&M), T Williams (Simon Fraser U).

Graduate Advisors (PhD)

Simon Fraser University: T. Williams, W. Fraser (Polar Oceans Res Group), D. Esler, R. Ydenberg

Memberships

Sigma Xi, American Society of Naturalists, The American Ornithologists' Union, Pacific Seabird Group, The Explorers Club.

CURRICULUM VITAE

Fletcher Sewall

NOAA Auke Bay Laboratories, 17109 Pt. Lena Loop Rd

Juneau, AK 99801

Tel.: (907) 789 – 6024, E-mail: fletcher.sewall@noaa.gov

EDUCATION

- PhD candidate, Fisheries Oceanography 2010 – present
University of Alaska Fairbanks
- Master of Applied Science, Marine Ecology and Fisheries Biology 2005
James Cook University, Australia.
- Bachelor of Science, Psychology 1993
University of Alaska Anchorage

PROFESSIONAL EXPERIENCE

Chemical/Biological Laboratory Assistant.

12/15/2005 – present NOAA-NMFS Auke Bay

Laboratories Recruitment Energetics & Coastal Assessment program (independent contractor).

Eight years of research-related experience including manuscript preparation, data analyses, chemical laboratory analyses, and fieldwork in support of NOAA fisheries research at the Auke Bay Laboratories.

Publications and presentations

- Principal investigator/lead author of study concerning use of nucleic acid ratios and lipid content as indicators of winter performance of juvenile Pacific herring. In preparation for submission to peer-reviewed scientific journal. [Sewall, Heintz, and Vollenweider. In review. Value of growth and energy storage as predictors of winter survival of YOY herring in Prince William Sound.]
- Principal investigator/lead author of study concerning proximate composition and fatty acid analysis of fish embryos and larvae. Published findings in peer-reviewed scientific journal. [Sewall & Rodgveller 2009, Changes in body composition and fatty acid profile during embryogenesis of quillback rockfish (*Sebastes maliger*), Fishery Bulletin 107(2): 207-220.]
- Developing poster presentations of research findings. Alaska Marine Science Symposium, 2009 – 2014.
- Presenting research findings. Prince William Sound Herring Survey principal investigators meetings, 2011 – 2014.
- Collaborating with scientists from Auke Bay Labs and other state, federal, university, and private agencies to develop research proposals and to synthesize research findings for dissemination.

Chemical and biological laboratory analysis

- Familiarity and experience with sample preparation and extraction procedures for analysis of hydrocarbons in marine tissue and sediment samples, including use of column chromatography and high performance liquid chromatography (HPLC).
- Cleaning and maintaining laboratory glassware, analytical instruments, and other chemistry laboratory equipment to a high standard that ensures contaminant-free use in multiple applications, including fatty acid analysis and trace hydrocarbon analysis.
- Performing lipid analysis on juvenile and adult fish, marine mammal, and invertebrate samples by modified method of Folch et al (1957): extracting lipids from homogenized tissue samples using accelerated solvent extractor (ASE) and other equipment described in the analytical chemistry protocols for Auke Bay Labs lipid analysis; determining masses of lipid extracts using gravimetric analysis.
- Using microscale laboratory techniques to extract lipids from larval fish and small tissue samples and analysing using spectrophotometry with sulphophosphovanillin (SPV) reagent.
- Preparing lipid samples for fatty acid analysis by carrying out acid-catalyzed transesterification of fatty acids in lipid extracts.
- Familiarity and experience with operation of gas chromatograph-mass spectrometer (GC-MS) for fatty acid quantification in marine tissue samples.
- Determining concentrations of nucleic acids and RNA/DNA ratios in larval fish and in muscle tissues of juvenile and adult fish by protocols of Calderone et al (2001), using a microplate fluorescence spectrophotometer and ethidium bromide.

- Verifying that sample results from chemical processing are within acceptable statistical bounds for quality assurance, including reproducibility of results, comparability to standard reference materials, and minimal contaminant levels.
- Collaborating with senior chemist in ongoing refinement of standard operating procedures and quality assurance criteria for analytical chemistry processes.
- Preparing a variety of types and size ranges of sample organisms and tissues for analyses, including: using preservative solutions for small invertebrate organisms, anaesthetizing fish, and homogenizing sample tissues through physical mixing by mortar/pestle, electric tissue homogenizer, and sonification equipment.
- Organizing, storing and processing biological samples in accordance with processing needs to maintain sample integrity, including use of supercold (-80 °C) freezing, liquid nitrogen, nitrogen gas flushing of storage containers, and BHT antioxidant.
- Generating biological data on a variety of fish species at different life stages, including: lengths of adult and larval fish; wet and dry tissue masses of adult, larval, and embryonic fish; size and maturity stage of gonads; fish stomach contents; bioelectrical impedance analysis (BIA) data.
- Dissecting juvenile and adult fish and preparing samples for pathological analyses, including collecting peripheral blood smears, and aseptic removal of heart, kidneys, spleen and liver.

Data analysis and recordkeeping

- Performing univariate and multivariate statistical analyses on biological, chemical, and bioenergetics data using MS Access database, MS Excel, and Minitab software.
- Maintaining accurate, organized records including sample chain of custody information for extensive sample inventories, biological data, and chemical data, in both paper records and Access database.

Mentorship and training experience

- Training multiple personnel in various analytical chemistry procedures, including sample processing, and cleaning and maintaining scientific instruments.
- Training multiple personnel in sample chain of custody recordkeeping and entry of biochemical and biological data in Access database.
- Coordinating and overseeing completion of chemical and biological processing tasks by contractors to accomplish project objectives within specified timelines.
- Mentoring high school biology students competing in regional Intel Science Fair; advised on study design, implementation, and statistical analysis.
- Judging regional Intel Science Fair projects, involving evaluation of written and oral presentations by high school students, and student interviews.
- Assisting outreach coordinator with Sea Week activities, including conducting age-appropriate activities for pre-school through junior high students.

Wet laboratory animal husbandry

- Assisting with design and set up of equipment for use in wet laboratory experiments, e.g., carbon dioxide-enriched seawater exposure of fish embryos.
- Feeding and maintenance of live marine organisms (fish, invertebrates) in Auke Bay Labs wet laboratory facilities for bioenergetics studies.
- Assisting with maintenance of aquaria and touch tanks for public display, including feeding and care of fish and invertebrate organisms.

Fieldwork

- Collecting and identifying of a variety of Alaskan marine fishes, including forage fishes.
- Conducting fieldwork for obtaining forage fish and invertebrate samples, habitat and environmental data, and marine mammal observations, including: live-aboard marine research cruises of over two weeks' duration, traveling by small plane, transporting equipment by foot over rugged terrain, and working in remote locations in all weather conditions.
- Deploying various types of field equipment for obtaining forage fish and other biological samples and environmental/oceanographic data, including: beach seines, mid-water trawls, hook-and-line, fyke nets, cast nets, plankton nets, Niskin bottles, CTD devices, split-beam echo sounder, rotary laser level/stadia rods, and salinity/temperature/DO/pH meters.

VI. BUDGET

A. Budget Forms (Attached)

See attached documents.

B. Changes from Original Proposal

If your FY15 funding request differs from your original proposal, provide a detailed list of the changes and discuss the reason for each change.

TALK TO SCOTT AND STEVE MOFFIT about funds for scales

C. Sources of Additional Funding

NOAA in-kind contributions:		
<i>Source</i>	<i>Purpose</i>	<i>Amount</i>
NOAA staff salaries	Training and oversight of labor for sample processing, contract writing and administration	\$ 40,088.13
NOAA instrument amortization	Use of instruments in sample processing, analytical chemistry	\$ 2,343.25
	Total	\$ 42,431.38

FY15 PROJECT PROPOSAL SUMMARY PAGE

Continuing, Multi-Year Projects

Proposals are due to the EVOSTC office by September 2, 2014. Please note that the information in your proposal and budget form will be used for funding review. Late proposals, revisions or corrections may not be accepted.

Project Title: Herring Research and Monitoring – Coordination and Logistics

Project Period: February 1, 2015 – January 31, 2016

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

Study Location: Prince William Sound

Project Website (if applicable): <http://pwssc.org/research/fish/pacific-herring/>

Abstract*:

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

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

Logistics is primarily in providing vessel time.

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

Estimated Budget:

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

FY12	FY13	FY14	FY15	FY16	TOTAL
364,126	510,261	388,136	339,007	338,583	1,940,113

Non-EVOSTC Funds to be used:

FY12	FY13	FY14	FY15	FY16	TOTAL
20,000	21,000	22,000	24,000		

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

Date: 15 August 2014

I. EXECUTIVE SUMMARY

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

Coordination includes scheduling of projects to ensure the maximum sharing of vessel time and ensuring that projects dependent on results or samples from another project are in the correct order. Coordination is primarily through email and teleconference, but each year all the investigators are required to meet in person. Coordination is also taking place with the existing Herring Survey program, the Long-Term monitoring program (Gulf Watch Alaska, GWA), and Alaska Department of Fish and Game (ADF&G) herring sampling. This coordination is accomplished through attendance in the Gulf Watch Alaska principal investigator (PI) meetings and teleconferences. The aerial surveys are also coordinated between the two programs to maximize benefit to both programs. This was the first year of the coordinated aerial survey project and we were able to achieve our objectives and find new approaches that may help refine our future protocols.

Logistics is primarily in providing vessel and aircraft time. It also includes setting up PI meetings for all projects to share information.

The synthesis to be provided by this project is leveraging the required synthesis of the Herring Survey program that was submitted in 2013. We intend to update that effort with new results and add a section on how environmental conditions affect herring growth.

II. COORDINATION AND COLLABORATION

A. Within a EVOTC-Funded Program

Coordination within the HRM program includes scheduling of projects to ensure the maximum sharing of vessel time so that projects dependent on results or samples from another project are in the correct order. Coordination is primarily through email and teleconference, but each year all the investigators are required to meet in person.

Coordination between the HRM and GWA programs is accomplished through attendance in the Gulf Watch Alaska principal investigator (PI) meetings and teleconferences. The aerial surveys are also coordinated between the two programs to maximize benefit to both programs. This was the first year of the coordinated aerial survey project and we were able to achieve our objectives and find new approaches that may help refine our future protocols. The forage fish project provided equipment and protocols and the herring program provided observers. The aerial surveys also provided the summertime observations to the humpback whale project. The HRM growth and energetics are working with investigators in the environmental drivers portion of GWA to examine relationships between the environmental conditions and herring growth and condition.

B. With Other EVOSTC-funded Projects

We do not have collaborative work with EVOSTC-funded projects outside of the HRM and GWA programs.

C. With Trustee or Management Agencies

The HRM program is conducted in close collaboration with ADF&G. The long-term goal and objectives of the program are designed to benefit ADF&G by improving information and testing assumptions of the age-structure-analysis model. Steve Moffitt in Cordova (local area biologist) and Sherri Dressel in Juneau (statewide herring coordinator and member of the HRM oversight group) are our primary two contacts in ADF&G. The HRM program includes a project that is scanning in a portion of the ADF&G scale library so it is preserved in a form that can be used within and external to ADF&G. HRM provides some aerial survey time to document herring spawn in areas or at times that ADF&G are unable to fly. We coordinated with them the location of remote cameras for testing their ability to provide an indication of when spawn may occur in remote locations. We have also supported the collection of herring at Kayak Island the past two years and at Montague Island to provide some indication of the age structure at those locations. ADF&G has provided an opportunity for the HRM disease project to sample the adult spawning population. The prevalence of the three major diseases are then reported back to ADF&G. We also coordinate with ADF&G in providing acoustic estimates of the adult herring spawning biomass.

The National Oceanographic and Atmospheric Administration (Ron Heintz) and the United States Geological Service (Paul Hershberger) also are participants in the HRM program. As participants in the program they are involved in the coordination efforts.

III. PROJECT DESIGN – PLAN FOR FY15

A. Objectives for FY15

This projects objectives are:

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

B. Changes to Project Design

We are not anticipating any large changes to the design of the Coordination and Logistics project. The meeting with the EVOSTC Science Panel to discuss the synthesis and design is scheduled to occur in FY15 although in the original proposal we expected that to occur in FY14. The Coordination and Logistics project is now also providing personnel to be the observer and data recorder on the aerial survey flights in June and July.

IV. SCHEDULE

A. Project Milestones for FY 15

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

Because of the coordination required for synthesis and science meeting we may choose not to hold another PI meeting in the spring. We anticipate meeting in November 2014 and January 2015.

Objective 2. Provide a synthesis from existing results.

Synthesis due in December 2014, but presentation to the EVOSTC staff and science panel in February 2015.

Objective 3. Provide logistical support to the various projects.

Continuing objective

B. Measurable Project Tasks for FY 15

FY 15, 1st quarter (February 1, 2015 - April 31, 2015)

*February: Attend EVOSTC Science workshop
Submit annual report*

*March: Support spring collection of juvenile herring
Support expanded adult survey cruises*

April: Support Aerial surveys of herring spawn

FY 15, 2nd quarter (May 1, 2015-July 30, 2015)

May: Conduct Annual PI meeting (tentative)

June: Support Aerial surveys of juvenile herring

July: Support Aerial surveys of forage fish

FY 15, 3rd quarter (August 1, 2015 – October 31, 2015)

August: Submit FY16 proposal

FY 15, 4th quarter (November 1, 2015- January 31, 2016)

November: Support fall juvenile herring survey

January: Attend Alaska Marine Science Symposium

V. PROJECT PERSONNEL – CHANGES AND UPDATES

No personnel changes are anticipated

VI. BUDGET

A. Budget Forms (Attached)

Provide completed budget forms.

B. Changes from Original Proposal

The FY 15 budget has funding in contractual for the “Aerial Survey Support” project that wasn’t part of the original proposal. All other categories remain the same.

C. Sources of Additional Funding

OSRI provides up to two months (\$24,000) of additional support for salary to Dr. Pegau to complete the coordination efforts.

FY15 PROJECT PROPOSAL SUMMARY PAGE

Continuing, Multi-Year Projects

Proposals are due to the EVOSTC office by September 2, 2014. Please note that the information in your proposal and budget form will be used for funding review. Late proposals, revisions or corrections may not be accepted.

Project Title: Genetic stock structure - Herring

Project Period: February 1, 2015 – January 31, 2016

Primary Investigator(s): Dr. Jeffrey Guyon and Sharon Wildes (NOAA)

Study Location: Prince William Sound, Gulf of Alaska

Project Website (if applicable): <http://pwssc.org/research/fish/pacific-herring/>

Abstract*:

Understanding if there is one PWS herring stock or multiple stocks is important for proper management of fisheries. We propose to study the genetic uniqueness of herring from PWS to determine if it may be a complicating factor in the recovery process. A previous genetic study of herring in the region indicated that the PWS herring population was genetically distinct from other stocks spawning outside the Sound (O'Connell et al. 1998), providing an impetus for additional work. Several recent studies have made advancements in herring research using microsatellite loci, and have detected fine-scale genetic differentiation among local regions of herring (Beacham et al. 2008; Andre et al. 2011; Wildes et al. 2011). Each microsatellite locus contains multiple alleles making microsatellites ideal genetic markers for analyzing migratory fish with limited stock structure like herring. Based on our experience studying Pacific herring in Southeast Alaska using microsatellite markers (Wildes et al. in 2011), successful completion of this proposal will require (1) increasing the number of genetic samples per collection from the 50 used in the previous analysis (O'Connell et al. 1998) to 150 fish, (2) using an increased number of informative markers (from 5 to 15), (3) analyzing at least two years of collections to examine temporal stability, **and if sampling allows** (4) spatial stability from collections from two different historical locations (east, west). Evaluation of temporal and spatial variation of herring population(s) in and around PWS using updated genetic protocols will provide important information about herring life history that will contribute to improving the application of the ASA model.

Estimated Budget:

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

FY12	FY13	FY14	FY15	FY16	TOTAL
		50,467	53,083		103,550

Non-EVOSTC Funds to be used:

FY12	FY13	FY14	FY15	FY16	TOTAL

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

Date: 8/15/2014

I. EXECUTIVE SUMMARY

Pacific herring, once an important fishery, form a critical part of the Prince William Sound (PWS) ecosystem. Stocks remain depressed over the majority of the last 20 years and reasons for lack of recovery remain complex and unknown. Information about herring stock structure is critical to determining the best management objectives for recovery of Pacific herring (*Clupea pallasii*) population(s), particularly if a fishery were re-established. It would be important to understand the uniqueness of spawning areas. Results from the genetic analysis outlined in this proposal will help managers understand if multiple sub-stocks are involved in issues such as spawning sites and fidelity, which may contribute to the complexities in understanding their lack of recovery.

While we have obtained a large number of samples from the Eastern Sound, the number of fish from the Montague area was limited in 2014 and no fish were observed to spawn there. Another attempt to sample spawning herring on Montague is planned for 2015.

II. COORDINATION AND COLLABORATION

A. Within a EVOTC-Funded Program

This project is part of the Overall Project Objective 1: Provide information to improve input to the age-structure-analysis (ASA) model, or test assumptions within the ASA model. Evaluation of temporal and spatial variation of herring population(s) in PWS using updated genetic protocols will provide important information about herring life history that will contribute to improving the application of the ASA model. We have been provided samples by the Logistics and Coordination, and Validation of Acoustic Surveys projects in the HRM program.

B. With Other EVOSTC-funded Projects

n/a

C. With Trustee or Management Agencies

This project is being done in partnership with many researchers including the Alaska Department of Fish and Game and others who are providing samples for the analysis. There are no known conflicts.

III. PROJECT DESIGN – PLAN FOR FY15

A. Objectives for FY15

The primary objective of this proposal is to identify genetic uniqueness of herring in Prince William Sound using a group of 15 informative microsatellite markers to:

- a. Determine if unique populations exist by sampling within and around PWS;
- b. Determine temporal stability by sampling for two consecutive years at each location;
- c. Determine if fine-scale structure exists across two age classes at each site -if ample sample size allows (Same, or different? Answer will aid in evaluation of the adopted-migrant hypothesis);
- d. Determine spawning site fidelity of herring in PWS by comparing PWS spawners and nearby spawners outside of the Sound.

B. Changes to Project Design

No changes to the design are planned.

IV. SCHEDULE

A. Project Milestones for FY 15

The primary objective of this proposal is to identify genetic uniqueness of herring in Prince William Sound using a group of 15 informative microsatellite markers to:

- a. Determine if unique populations exist by sampling within and around PWS;
Sampling complete, Analyses to be met by Jan. 2016.
- b. Determine temporal stability by sampling for two consecutive years at each location;
Sampling complete (except collection of Montague samples in spring 2015). Analyses to be met by Jan. 2016.
- c. Determine if fine-scale structure exists across two age classes at each site -if ample sample size allows (Same, or different? Answer will aid in evaluation of the adopted-migrant hypothesis);
Adequate samples have been obtained to look at this question. Analyses to be met by Jan. 2016.
- d. Determine spawning site fidelity of herring in PWS by comparing PWS spawners and nearby spawners outside of the Sound.
To be met by Jan. 2016.

B. Measurable Project Tasks for FY 15

FY 15, 1st quarter (February 1, 2015 - April 31, 2015)

PCR fragments from each sample of DNA and genotype.

FY 15, 2nd quarter (May 1, 2015-July 30, 2015)

Carry out preliminary analyses and data quality control.

FY 15, 3rd quarter (August 1, 2015 – October 31, 2015)

Complete analyses.

FY 15, 4th quarter (November 1, 2015- January 31, 2016)

Write report.

V. PROJECT PERSONNEL – CHANGES AND UPDATES

No changes.

VI. BUDGET

A. Budget Forms (Attached)

Provide completed budget forms.

B. Changes from Original Proposal

Because of issues hiring new personnel we are requesting that the funding for personnel be moved to the contractual line so that we can contract personnel for sample processing. We also are requesting to reduce the travel by eliminating the trip to Yakutat. That funding has been moved to the commodities line for laboratory expendables associated with sample processing.

C. Sources of Additional Funding

n/a

FY15 PROJECT PROPOSAL SUMMARY PAGE

Continuing, Multi-Year Projects

Proposals are due to the EVOSTC office by September 2, 2014. Please note that the information in your proposal and budget form will be used for funding review. Late proposals, revisions or corrections may not be accepted.

Project Title: Modeling the population dynamics of Prince William Sound herring.

Project Period: February 1, 2012 – January 31, 2017

Primary Investigator(s): Trevor A. Branch, School of Aquatic and Fishery Sciences, University of Washington

Study Location: Prince William Sound / University of Washington

Project Website (if applicable): <http://pwssc.org/research/fish/pacific-herring/>

Abstract*:

Shortly after the Exxon Valdez oil spill, the Prince William Sound herring populations collapsed and have not yet recovered. We propose a modeling project to (1) revise and update the ASA model used to manage this population, (2) conduct simulations to test which data sources are most important in assessing the current status of this population, and (3) collect data on herring populations worldwide to find out how often these populations collapse under ordinary conditions.

**The abstract should provide a brief overview of the overall goals and hypotheses of the project and provide sufficient information for a summary review as this is the text that will be used in the public work plan and may be relied upon by the PAC and other parties.*

Estimated Budget:

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

FY12	FY13	FY14	FY15	FY16	TOTAL
\$36,907	\$87,013	\$97,836	\$100,407	\$104,920	\$427,083

Non-EVOSTC Funds to be used:

FY12	FY13	FY14	FY15	FY16	TOTAL
0	0	0	0	0	0

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

Date: 18 August 2014

I. EXECUTIVE SUMMARY

The hypotheses and goals outlined in the project abstract have been addressed as outlined here. Progress has continued on revising and updating the ASA stock assessment model for Prince William Sound herring. We have reframed the model from one that minimized sums of squares to a fully Bayesian framework, implemented in AD Model Builder (the underlying basis for most NOAA fisheries stock assessments in Alaska) instead of Excel. There are two key advantages to this approach: a statistically sound way of weighting different datasets using likelihoods; and the estimation of uncertainty around key management parameters including stock status. Preliminary results suggest that the herring population is slowly recovering, with a high probability of being above 22,000 t.

Progress has also been made on the assessment of which data sources are most valuable in assessing the status of the herring population. A modeling framework has been developed where each data set can be excluded, one at a time, and the resulting uncertainty and bias in the estimates of stock status obtained. There is an obvious tradeoff between the cost of obtaining data and the precision of resulting biomass estimates.

The graduate student, Melissa Muradian, employed on the project is planning to defend her MS thesis in Fall 2014 on the previously outlined projects. A new graduate student, John Trochta, will arrive at the University of Washington in Fall 2014 to start his MS thesis on the third component of the project: a meta-analysis of global data on herring populations to estimate the frequency and duration of collapses expected in such populations.

The following scientific papers were coauthored during the past 12 months, related to the stock assessment modeling conducted under funding from EVOST:

1. Ono, K., R. Licandeo, **M. L. Muradian**, C. J. Cunningham, S. C. Anderson, F. Hurtado-Ferro, K. F. Johnson, C. R. McGilliard, C. C. Monnahan, C. S. Szuwalski, J. Valero, K. A. Vert-Pre, A. R. Whitten, and A. E. Punt. 2014. The importance of length and age composition data in statistical age-structured models for marine species. *ICES Journal of Marine Science* doi:10.1093/icesjms/fsu007.
2. Johnson, K. F., C. C. Monnahan, C. R. McGilliard, K. A. Vert-pre, S. C. Anderson, C. J. Cunningham, F. Hurtado-Ferro, R. R. Licandeo, **M. L. Muradian**, K. Ono, C. S. Szuwalski, J. L. Valero, A. R. Whitten, and A. E. Punt. 2014. Time-varying natural mortality in fisheries stock assessment models: identifying a default approach. *ICES Journal of Marine Science* doi:10.1093/icesjms/fsu055.

II. COORDINATION AND COLLABORATION

A. Within a EVOSTC-Funded Program

The stock assessment acts as a synthesis of many of the components of the current program, including age-sampling, disease estimates, and hydroacoustic survey. This year, the graduate student participated in the hydroacoustic surveys, both from the Prince William Sound Science Center and ADF&G. Regular meetings between the PIs on the project ensure information sharing.

B. With Other EVOSTC-funded Projects

None.

C. With Trustee or Management Agencies

The stock assessment revisions and updates are regularly shared with, and collaboratively developed with Steven Moffitt and Rich Brenner from ADF&G. They also worked with the graduate student Muradian to ensure she participated in the spawning survey to better understand how the data are collected. In addition, Sherri Dressell of ADF&G has provided extensive feedback on research methods, results and conclusions. In the short term, the Bayesian assessment developed here will likely be used as an alternative assessment in deciding how to manage Prince William Sound herring.

III. PROJECT DESIGN – PLAN FOR FY15

A. Objectives for FY15

1. Finalize gathering of time series of abundance and recruitment for herring stocks and other clupeids
2. Attend the Annual Marine Science Symposium, Anchorage, and the annual Cordova meeting with the project PIs.
3. Prepare and submit manuscript combining the stock assessment details and the project to identify the most informative datasets using management strategy evaluation.

B. Changes to Project Design

The main change to the original proposal is that the assessment model (of life history dynamics of herring) will now be included in the scientific manuscript on identifying the most informative datasets using management strategy evaluation. This manuscript is currently in preparation and anticipated to be completed in December 2014. The current student Melissa Muradian has elected not to continue with a PhD on the project and will be graduating in December 2014. This should reduce the time to publication of the manuscript.

A new graduate student, John Trochta, is starting on the project in September 2014, and will focus on continuing the annual stock assessment updates with the new model in addition to starting the third component of the project, the meta-analysis of herring dynamics from global population models and catches. He will need some time in FY2015 to complete required graduate school coursework. During the overlap (Fall 2014) between Muradian and Trochta, Muradian will be funded through being a teaching assistant on a programming course; and will focus on training Trochta in using the assessment model.

IV. SCHEDULE

A. Project Milestones for FY 15

Objective 1. Prepare and submit manuscript combining the stock assessment details and the project to identify the most informative datasets using management strategy evaluation.

To be met by June 2015.

Objective 2. Complete required coursework (John Trochta).

Ongoing through end of 2016. (New item since Trochta is a new student.)

Objective 3. Finalize gathering of time series of abundance and recruitment for herring stocks and other clupeids

Intended for December 2014, to be met by September 2015.

B. Measurable Project Tasks for FY 15

FY 15, 1st quarter (February 1, 2015 - April 31, 2015)

March: Draft manuscript: identification of most informative datasets using management strategy evaluation

FY 15, 2nd quarter (May 1, 2015-July 30, 2015)

May: Annual Cordova meeting with broader project PIs

FY 15, 3rd quarter (August 1, 2015 – October 31, 2015)

September: Finalize gathering of time series of abundance and recruitment for herring stocks and other clupeids [formerly December 2014]

September: Manuscript submission: identification of most informative datasets using management strategy evaluation

FY 15, 4th quarter (November 1, 2015- January 31, 2016)

January: Attend Annual Marine Science Symposium, Anchorage

V. PROJECT PERSONNEL – CHANGES AND UPDATES

None.

VI. BUDGET

A. Budget Forms (Attached)

Provide completed budget forms.

B. Changes from Original Proposal

No change.

C. Sources of Additional Funding

1. During the overlap period between the two graduate students (Muradian and Trochta), funding for Muradian will be supplied by the University of Washington through a teaching assistantship for the programming courses FISH552 and FISH553 we teach our graduate students. One quarter of tuition and salary are supplied from this source.

2. During 2014 one quarter of salary and tuition support was supplied by PI Trevor Branch to cover the unexpected increase in MS student salary mandated by the School of Aquatic and Fishery Sciences. It is anticipated that this will be sufficient to account for the salary increases to the end of the project in 2017.

FY15 PROJECT PROPOSAL SUMMARY PAGE

Continuing, Multi-Year Projects

Proposals are due to the EVOSTC office by September 2, 2014. Please note that the information in your proposal and budget form will be used for funding review. Late proposals, revisions or corrections may not be accepted.

Project Title: Herring Research and Monitoring – Aerial Survey Support

Project Period: February 1, 2015 – January 31, 2016

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

Study Location: Prince William Sound

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

Abstract*:

This project is for providing aerial survey support to the EVOSTC sponsored Herring Research and Monitoring (HRM) and Gulf Watch Alaska (GWA) programs. For the HRM program the aerial support will be used to help collect herring samples for the genetics project and to provide an aerial index of age-1 herring abundance. For the GWA program the aerial support will be used by the forage fish project. The desire is to provide an aerial index of forage fish abundance and guide the capture efforts of the vessel. In turn the vessel will be providing ground truth of fish types and size of schools for better interpretation of the aerial based forage fish information. This proposal request is strictly for aerial support, all analysis and vessel funding will come from the existing projects. Funding for this project will be managed as a supplement to the HRM Coordination and Logistics project led by Dr. Pegau.

Estimated Budget:

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

FY12	FY13	FY14	FY15	FY16	TOTAL
		70,850	70,850		141,700

Non-EVOSTC Funds to be used:

FY12	FY13	FY14	FY15	FY16	TOTAL
		4,000			

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

Date: 8/15/2014

I. EXECUTIVE SUMMARY

Please provide a summary of the project including key hypotheses and overall goals, as submitted in your original proposal. If there are additional highlights that you would like to include since you submitted your annual report, please include them here. Also, please list any publications that have been submitted and/or accepted since you submitted your annual report.

This project is for providing aerial survey support to the EVOSTC sponsored Herring Research and Monitoring (HRM) and Gulf Watch Alaska (GWA) programs. For the HRM program the aerial support will be used to help collect herring samples for the genetics project and to provide an aerial index of age-1 herring abundance. For the GWA program the aerial support will be used by the forage fish project.

Fish collection for the genetics project entails finding spawn occurring in multiple locations around Prince William Sound (PWS) and either guiding vessels or landing and sampling fish. In 2014 we assisted with fish collection at Kayak Island. We desired to collect spawning fish from Montague Island. Despite several schools being observed near the beach on Montague Island there was no spawn observed and therefore we did not assist in collecting fish.

In June we completed a survey of the coastal areas of PWS to get an index of the number of age-1 herring schools observed. Approximately 225 schools of age-1 herring were seen, which is a tenth of that observed in 2013, but more than 2011, and 2012.

We worked with Mayumi Arimitsu with the forage fish project in the GWA program to revise sampling protocols and collect observations using various methods. The desire is to provide an aerial index of forage fish abundance and guide the capture efforts of the vessel. We used a stratified random sampling technique. PWS was broken into blocks and previous July observations were used to stratify sampling into high, medium, and low numbers of schools. We surveyed over 140 blocks in 2014 and worked with the vessel on six days to provide validation of the aerial observations. The ground truth of fish types and size of schools allows for better interpretation of the aerial based forage fish information.

This proposal request is strictly for aerial support, all analysis and vessel funding will come from the existing projects. Funding for this project will be managed as a supplement to the HRM Coordination and Logistics project led by Dr. Pegau. The budget for this project is included in that project's budget.

II. COORDINATION AND COLLABORATION

A. Within a EVOTC-Funded Program

This project involves tight coordination between the GWA Forage Fish project and the HRM Coordination and Logistics project. The Forage Fish project provides equipment for logging observations and the Coordination and Logistics project provides observers. The two projects work together to develop sampling protocols.

We anticipate continuing to search for additional spawning populations for the genetics project.

B. With Other EVOSTC-funded Projects

We have not contributed to other EVOSTC-funded projects.

C. With Trustee or Management Agencies

We will continue to work with Steve Moffitt, the regional fisheries biologist for Alaska Department of Fish and Game (ADF&G) in Cordova. We share all observations of herring spawn and work to assist in the collection of herring from populations ADF&G is unable to sample. The forage fish surveys are done in conjunction with John Piatt and Mayumi Arimitsu of USGS. All data is provided to them.

III. PROJECT DESIGN – PLAN FOR FY15

A. Objectives for FY15

This project's objectives are:

- 1) Provide aerial support for collection of samples for the genetics project.
- 2) Provide an index of abundance of age-1 herring.
- 3) Provide aerial support to the forage fish project of the GWA program:
 - a. Test the efficiency of adaptive vs. conventional sampling methods to optimize survey design for estimating stock size with an accurate estimate of the associated variance
 - b. Validate aerial observations for species, age class, average biomass and school density.

B. Changes to Project Design

We will continue to search for herring spawn along Montague Island to collect fish for genetic sampling and to provide to ADF&G for their age-structure analysis. Originally this was planned for 2014 only, but no fish were observed spawning that year.

The sampling protocols may change based on results from 2014. The expected amount of effort provided by the aerial surveillance will remain the same.

IV. SCHEDULE

A. Project Milestones for FY 15

Objective 1. Provide aerial support for collection of samples for the genetics project.

To be met by May 2015

Objective 2. Provide an index of abundance of age-1 herring.

To be met by July 2015

Objective 3. Provide aerial support to the forage fish project of the GWA program.

To be met by August 2015

B. Measurable Project Tasks for FY 15

Specify, by each quarter of each fiscal year, when critical project tasks (for example, sample collection, data analysis, manuscript submittal, etc.) will be completed, as submitted in your original proposal.

Please identify any substantive changes and the reason for the changes. Please format your schedule as in the following example:

FY 15, 1st quarter (February 1, 2015 - April 31, 2015)

March-April: Spawn observations and collection of genetic samples

FY 15, 2nd quarter (May 1, 2015-July 30, 2015)

June: Survey coastal areas for age-1 herring
July: Survey PWS for the Forage Fish project and work on validation

V. PROJECT PERSONNEL – CHANGES AND UPDATES

No changes in personnel are anticipated.

VI. BUDGET

A. Budget Forms (Attached)

This budget is included in that of the Coordination and Logistics project.

B. Changes from Original Proposal

No changes are requested

C. Sources of Additional Funding

Cordova District Fishermen United has supported the spawn surveys at approximately \$4,000 for the past two years. It is expected that funding will continue.

**EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
PROJECT BUDGET PROPOSAL AND REPORTING FORM FY 12-FY16**

Budget Category:	Proposed FY 12	Proposed FY 13	Proposed FY 14	Proposed FY 15	Proposed FY 16	TOTAL PROPOSED	ACTUAL CUMULATIVE
Personnel	\$19,100.0	\$27,900.0	\$28,700.0	\$20,900.0	\$21,700.0	\$118,300.0	\$ 20,481
Travel	\$9,500.0	\$4,100.0	\$5,000.0	\$4,000.0	\$8,700.0	\$31,300.0	\$ 9,107
Contractual	\$216,960.0	\$375,999.0	\$282,288.0	\$244,916.0	\$243,657.0	\$1,363,820.0	\$ 478,840
Commodities	\$2,300.0	\$4,000.0	\$2,300.0	\$4,400.0	\$1,000.0	\$14,000.0	\$ 4,896
Equipment	\$50,500.0	\$0.0	\$0.0	\$0.0	\$0.0	\$50,500.0	\$ 52,143
Indirect Costs (<i>will vary by proposer</i>)	\$35,700	\$56,130	\$37,800	\$36,800	\$35,570	\$202,000.0	\$ 71,730
SUBTOTAL	\$334,060.0	\$468,129.0	\$356,088.0	\$311,016.0	\$310,627.0	\$1,779,920.0	\$637,197.0
General Administration (9% of	\$30,065.4	\$42,131.6	\$32,047.9	\$27,991.4	\$27,956.4	\$160,192.8	
PROJECT TOTAL	\$364,125.4	\$510,260.6	\$388,135.9	\$339,007.4	\$338,583.4	\$1,940,112.8	
Other Resources (Cost Share Funds)	\$0.0	\$0.0	\$0.0	\$24,000.0	\$0.0	\$0.0	

COMMENTS:

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

This proposal contains the budgets of Bochenek-data management, Boswell-non-lethal sampling, and Branch-population dynamics within the contractual section.

FY12-16

Project Title: PWS Herring: Coordination and Logistics
Primary Investigator: W. Scott Pegau

**FORM 3A
NON-TRUSTEE AGENCY
SUMMARY**

**EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
PROJECT BUDGET PROPOSAL AND REPORTING FORM FY 12-FY16**

Budget Category:	Proposed FY 12	Proposed FY 13	Proposed FY 14	Proposed FY 15	Proposed FY 16	TOTAL PROPOSED	ACTUAL CUMULATIVE
Personnel	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	
Travel	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	
Contractual	\$0.0	\$0.0	\$50,000.0	\$50,000.0	\$0.0	\$100,000.0	
Commodities	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	
Equipment	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	
Indirect Costs (<i>will vary by proposer</i>)	\$0.0	\$0.0	\$15,000	\$15,000	\$0	\$30,000.0	
SUBTOTAL	\$0.0	\$0.0	\$65,000.0	\$65,000.0	\$0.0	\$130,000.0	
General Administration (9% of	\$0.0	\$0.0	\$5,850.0	\$5,850.0	\$0.0	\$11,700.0	
PROJECT TOTAL	\$0.0	\$0.0	\$70,850.0	\$70,850.0	\$0.0	\$141,700.0	
Other Resources (Cost Share Funds)	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	

COMMENTS:

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FY12-16

**Project Title: PWS Herring: Aerial Survey Support
Primary Investigator: W. Scott Pegau**

**FORM 3A
NON-TRUSTEE AGENCY
SUMMARY**

**EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
PROJECT BUDGET PROPOSAL AND REPORTING FORM FY 12-FY16**

Budget Category:	Proposed FY 12	Proposed FY 13	Proposed FY 14	Proposed FY 15	Proposed FY 16	TOTAL PROPOSED	ACTUAL CUMULATIVE
Personnel	\$2,800.0	\$16,300.0	\$16,800.0	\$18,900.0	\$22,900.0	\$77,700.0	\$ 2,905
Travel	\$1,400.0	\$1,800.0	\$3,600.0	\$2,500.0	\$2,000.0	\$11,300.0	\$ 2,076
Contractual	\$400.0	\$2,000.0	\$800.0	\$2,100.0	\$1,000.0	\$6,300.0	\$ 2,042
Commodities	\$7,000.0	\$1,400.0	\$1,900.0	\$1,900.0	\$1,100.0	\$13,300.0	\$ 1,750
Equipment	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	
Indirect Costs (<i>will vary by proposer</i>)	\$3,500	\$6,500	\$6,900	\$7,600	\$8,100	\$32,600.0	\$ 2,632
SUBTOTAL	\$15,100.0	\$28,000.0	\$30,000.0	\$33,000.0	\$35,100.0	\$141,200.0	\$11,405.0
General Administration (9% of	\$1,359.0	\$2,520.0	\$2,700.0	\$2,970.0	\$3,159.0	\$12,708.0	
PROJECT TOTAL	\$16,459.0	\$30,520.0	\$32,700.0	\$35,970.0	\$38,259.0	\$153,908.0	
Other Resources (Cost Share Funds)	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	

COMMENTS:

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FY12-16

Project Title: PWS Herring: Outreach and Education
Primary Investigator: Hayley Hoover

**FORM 3A
NON-TRUSTEE AGENCY
SUMMARY**

**EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
PROJECT BUDGET PROPOSAL AND REPORTING FORM FY 12-FY16**

Budget Category:	Proposed FY 12	Proposed FY 13	Proposed FY 14	Proposed FY 15	Proposed FY 16	TOTAL PROPOSED	ACTUAL CUMULATIVE
Personnel	\$0.0	\$64,700.0	\$67,300.0	\$70,000.0	\$72,800.0	\$274,800.0	\$ 3,568
Travel	\$0.0	\$3,000.0	\$5,900.0	\$5,900.0	\$6,100.0	\$20,900.0	
Contractual	\$0.0	\$24,800.0	\$25,600.0	\$26,300.0	\$28,900.0	\$105,600.0	\$ 1,825
Commodities	\$0.0	\$7,500.0	\$5,000.0	\$8,300.0	\$6,700.0	\$27,500.0	\$ 42
Equipment	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	
Indirect Costs (<i>will vary by proposer</i>)	\$0	\$30,000	\$31,200	\$33,200	\$34,400	\$128,800.0	\$ 1,631
SUBTOTAL	\$0.0	\$130,000.0	\$135,000.0	\$143,700.0	\$148,900.0	\$557,600.0	\$7,066.0
General Administration (9% of	\$0.0	\$11,700.0	\$12,150.0	\$12,933.0	\$13,401.0	\$50,184.0	N/A
PROJECT TOTAL	\$0.0	\$141,700.0	\$147,150.0	\$156,633.0	\$162,301.0	\$607,784.0	
Other Resources (Cost Share Funds)	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	

COMMENTS:

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FY12-16

**Project Title: PWS Herring: Herring condition monitoring
Primary Investigator: Kristen Gorman**

**FORM 3A
NON-TRUSTEE AGENCY
SUMMARY**

**EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
PROJECT BUDGET PROPOSAL AND REPORTING FORM FY 12-FY16**

Budget Category:	Proposed FY 12	Proposed FY 13	Proposed FY 14	Proposed FY 15	Proposed FY 16	TOTAL PROPOSED	ACTUAL CUMULATIVE
Personnel	\$64,800.0	\$41,200.0	\$13,700.0	\$0.0	\$0.0	\$119,700.0	\$ 73,122
Travel	\$2,700.0	\$2,700.0	\$0.0	\$0.0	\$0.0	\$5,400.0	\$ 1,909
Contractual	\$41,600.0	\$8,500.0	\$700.0	\$0.0	\$0.0	\$50,800.0	\$ 14,656
Commodities	\$13,900.0	\$2,200.0	\$0.0	\$0.0	\$0.0	\$16,100.0	\$ 4,069
Equipment	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	
Indirect Costs (<i>will vary by proposer</i>)	\$36,900	\$16,300	\$4,300			\$57,500.0	\$ 28,075
SUBTOTAL	\$159,900.0	\$70,900.0	\$18,700.0	\$0.0	\$0.0	\$249,500.0	\$121,831.0
General Administration (9% of	\$14,391.0	\$6,381.0	\$1,683.0	\$0.0	\$0.0	\$22,455.0	
PROJECT TOTAL	\$174,291.0	\$77,281.0	\$20,383.0	\$0.0	\$0.0	\$271,955.0	
Other Resources (Cost Share Funds)	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	

COMMENTS:

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FY12-16

**Project Title: PWS Herring: Juvenile herring
intensive
Primary Investigator: Pegau**

**FORM 3A
NON-TRUSTEE AGENCY
SUMMARY**

**EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
PROJECT BUDGET PROPOSAL AND REPORTING FORM FY 12-FY16**

Budget Category:	Proposed FY 12	Proposed FY 13	Proposed FY 14	Proposed FY 15	Proposed FY 16	TOTAL PROPOSED	ACTUAL CUMULATIVE
Personnel	\$32,500.0	\$58,300.0	\$98,100.0	\$95,000.0	\$98,000.0	\$381,900.0	\$ 21,881
Travel	\$1,000.0	\$1,000.0	\$2,000.0	\$1,200.0	\$1,200.0	\$6,400.0	\$ 91
Contractual	\$900.0	\$1,800.0	\$2,600.0	\$2,200.0	\$2,200.0	\$9,700.0	\$ 7,884
Commodities	\$5,400.0	\$2,800.0	\$1,800.0	\$1,100.0	\$1,100.0	\$12,200.0	\$ 6,074
Equipment	\$10,700.0	\$0.0	\$0.0	\$0.0	\$0.0	\$10,700.0	\$ 17,071
Indirect Costs (<i>will vary by proposer</i>)	\$11,900	\$19,200	\$31,300	\$29,900	\$30,800	\$123,100.0	\$ 10,780
SUBTOTAL	\$62,400.0	\$83,100.0	\$135,800.0	\$129,400.0	\$133,300.0	\$544,000.0	\$63,781.0
General Administration (9% of	\$5,616.0	\$7,479.0	\$12,222.0	\$11,646.0	\$11,997.0	\$48,960.0	
PROJECT TOTAL	\$68,016.0	\$90,579.0	\$148,022.0	\$141,046.0	\$145,297.0	\$592,960.0	
Other Resources (Cost Share Funds)	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	

COMMENTS:

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FY12-16

**Project Title: PWS Herring: Validation of
acoustics
Primary Investigator: Mary Anne Bishop**

**FORM 3A
NON-TRUSTEE AGENCY
SUMMARY**

**EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
PROJECT BUDGET PROPOSAL AND REPORTING FORM FY 12-FY16**

Budget Category:	Proposed FY 12	Proposed FY 13	Proposed FY 14	Proposed FY 15	Proposed FY 16	TOTAL PROPOSED	ACTUAL CUMULATIVE
Personnel	\$7,300.0	\$8,900.0	\$11,300.0	\$0.0	\$0.0	\$27,500.0	\$ 9,976
Travel	\$5,100.0	\$2,700.0	\$0.0	\$0.0	\$0.0	\$7,800.0	\$ 206
Contractual	\$400.0	\$300.0	\$1,000.0	\$0.0	\$0.0	\$1,700.0	\$ 15,854
Commodities	\$37,100.0	\$500.0	\$0.0	\$0.0	\$0.0	\$37,600.0	\$ 31,451
Equipment	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	
Indirect Costs (<i>will vary by proposer</i>)	\$15,000	\$3,700	\$3,700			\$22,400.0	\$ 17,208
SUBTOTAL	\$64,900.0	\$16,100.0	\$16,000.0	\$0.0	\$0.0	\$97,000.0	\$74,695.0
General Administration (9% of	\$5,841.0	\$1,449.0	\$1,440.0	\$0.0	\$0.0	\$8,730.0	
PROJECT TOTAL	\$70,741.0	\$17,549.0	\$17,440.0	\$0.0	\$0.0	\$105,730.0	
Other Resources (Cost Share Funds)	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	

COMMENTS:

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FY12-16

Project Title: PWS Herring: Tracking seasonal movements
Primary Investigator: Mary Anne Bishop

**FORM 3A
NON-TRUSTEE AGENCY
SUMMARY**

**EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
PROJECT BUDGET PROPOSAL AND REPORTING FORM FY 12-FY16**

Budget Category:	Proposed FY 12	Proposed FY 13	Proposed FY 14	Proposed FY 15	Proposed FY 16	TOTAL PROPOSED	ACTUAL CUMULATIVE
Personnel	\$16,200.0	\$49,900.0	\$40,900.0	\$55,300.0	\$55,900.0	\$218,200.0	\$ 20,762
Travel	\$0.0	\$2,600.0	\$2,600.0	\$2,600.0	\$2,600.0	\$10,400.0	\$ 958
Contractual	\$500.0	\$4,000.0	\$1,600.0	\$2,000.0	\$0.0	\$8,100.0	\$ 4,134
Commodities	\$1,500.0	\$0.0	\$1,500.0	\$0.0	\$0.0	\$3,000.0	\$ 1,339
Equipment	\$59,000.0	\$0.0	\$0.0	\$0.0	\$0.0	\$59,000.0	\$ 57,261
Indirect Costs (<i>will vary by proposer</i>)	\$5,500	\$17,000	\$14,000	\$18,000	\$17,600	\$72,100.0	\$ 8,147
SUBTOTAL	\$82,700.0	\$73,500.0	\$60,600.0	\$77,900.0	\$76,100.0	\$370,800.0	\$92,601.0
General Administration (9% of	\$7,443.0	\$6,615.0	\$5,454.0	\$7,011.0	\$6,849.0	\$33,372.0	
PROJECT TOTAL	\$90,143.0	\$80,115.0	\$66,054.0	\$84,911.0	\$82,949.0	\$404,172.0	
Other Resources (Cost Share Funds)	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	

COMMENTS:

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FY12-16

**Project Title: PWS Herring: Juvenile herring index
Primary Investigator: Michele Buckhorn**

**FORM 3A
NON-TRUSTEE AGENCY
SUMMARY**

**EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
PROJECT BUDGET PROPOSAL AND REPORTING FORM FY 12-FY16**

Budget Category:	Proposed FY 12	Proposed FY 13	Proposed FY 14	Proposed FY 15	Proposed FY 16	TOTAL PROPOSED	ACTUAL CUMULATIVE
Personnel	\$0.0	\$21,000.0	\$30,100.0	\$4,700.0	\$0.0	\$55,800.0	\$ 10,827
Travel	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	
Contractual	\$0.0	\$0.0	\$1,000.0	\$100.0	\$0.0	\$1,100.0	
Commodities	\$0.0	\$0.0	\$2,000.0	\$0.0	\$0.0	\$2,000.0	\$ 1,148
Equipment	\$46,000.0	\$0.0	\$0.0	\$0.0	\$0.0	\$46,000.0	\$ 45,886
Indirect Costs (<i>will vary by proposer</i>)	\$0	\$6,300	\$9,600	\$1,400		\$17,300.0	\$ 3,294
SUBTOTAL	\$46,000.0	\$27,300.0	\$42,700.0	\$6,200.0	\$0.0	\$122,200.0	\$61,155.0
General Administration (9% of	\$4,140.0	\$2,457.0	\$3,843.0	\$558.0	\$0.0	\$10,998.0	
PROJECT TOTAL	\$50,140.0	\$29,757.0	\$46,543.0	\$6,758.0	\$0.0	\$133,198.0	
Other Resources (Cost Share Funds)	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	

COMMENTS:

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

FY12-16

**Project Title: PWS Herring: Intensive surveys of
juvenile herring
Primary Investigator: Michele Buckhorn**

**FORM 3A
NON-TRUSTEE AGENCY
SUMMARY**

**EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
PROJECT BUDGET PROPOSAL AND REPORTING FORM FY 12-FY16**

Budget Category:	Proposed FY 12	Proposed FY 13	Proposed FY 14	Proposed FY 15	Proposed FY 16	TOTAL PROPOSED	ACTUAL CUMULATIVE
Personnel	\$0.0	\$49,900.0	\$40,900.0	\$55,300.0	\$55,900.0	\$202,000.0	\$ 13,499
Travel	\$0.0	\$3,600.0	\$3,600.0	\$3,600.0	\$3,600.0	\$14,400.0	
Contractual	\$0.0	\$2,000.0	\$3,600.0	\$3,000.0	\$0.0	\$8,600.0	\$ 250
Commodities	\$0.0	\$4,000.0	\$0.0	\$2,000.0	\$0.0	\$6,000.0	\$ 315
Equipment	\$6,000.0	\$0.0	\$0.0	\$0.0	\$0.0	\$6,000.0	\$ 6,000
Indirect Costs (<i>will vary by proposer</i>)	\$0	\$17,900	\$14,400	\$19,200	\$17,900	\$69,400.0	\$ 4,219
SUBTOTAL	\$6,000.0	\$77,400.0	\$62,500.0	\$83,100.0	\$77,400.0	\$306,400.0	\$24,283.0
General Administration (9% of	\$540.0	\$6,966.0	\$5,625.0	\$7,479.0	\$6,966.0	\$27,576.0	
PROJECT TOTAL	\$6,540.0	\$84,366.0	\$68,125.0	\$90,579.0	\$84,366.0	\$333,976.0	
Other Resources (Cost Share Funds)	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	

COMMENTS:

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

FY12-16

**Project Title: PWS Herring: Expanded adult herring survey
Primary Investigator: Michele Buckhorn**

**FORM 3A
NON-TRUSTEE AGENCY
SUMMARY**

**EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
PROJECT BUDGET PROPOSAL AND REPORTING FORM FY 12-FY16**

Budget Category:	Proposed FY 12	Proposed FY 13	Proposed FY 14	Proposed FY 15	Proposed FY 16	TOTAL PROPOSED	ACTUAL CUMULATIVE
Personnel	\$0.0	\$0.0	\$17,500.0	\$0.0	\$0.0	\$17,500.0	
Travel	\$0.0	\$0.0	\$3,400.0	\$3,400.0	\$0.0	\$6,800.0	
Contractual	\$0.0	\$0.0	\$0.0	\$17,500.0	\$0.0	\$17,500.0	
Commodities	\$0.0	\$0.0	\$25,400.0	\$27,800.0	\$0.0	\$53,200.0	
Equipment	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	
SUBTOTAL	\$0.0	\$0.0	\$46,300.0	\$48,700.0	\$0.0	\$95,000.0	
General Administration (9% of subtotal)	\$0.0	\$0.0	\$4,167.0	\$4,383.0	\$0.0	\$8,550.0	N/A
PROJECT TOTAL	\$0.0	\$0.0	\$50,467.0	\$53,083.0	\$0.0	\$103,550.0	
Other Resources (Cost Share Funds)	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	

COMMENTS:

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

FY12-16

Project Title: Herring genetics
Primary Investigator: Guyon and Wildes
Agency: NOAA

FORM 4A
TRUSTEE AGENCY
SUMMARY

**EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
PROJECT BUDGET PROPOSAL AND REPORTING FORM FY 12-FY16**

Budget Category:	Proposed FY 12	Proposed FY 13	Proposed FY 14	Proposed FY 15	Proposed FY 16	TOTAL PROPOSED	ACTUAL CUMULATIVE
Personnel	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	
Travel	\$2,000.0	\$0.0	\$0.0	\$0.0	\$0.0	\$2,000.0	\$1,123.0
Contractual	\$23,000.0	\$0.0	\$0.0	\$0.0	\$0.0	\$23,000.0	\$21,550.0
Commodities	\$5,000.0	\$0.0	\$0.0	\$0.0	\$0.0	\$5,000.0	\$3,000.0
Equipment	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	
SUBTOTAL	\$30,000.0	\$0.0	\$0.0	\$0.0	\$0.0	\$30,000.0	\$25,673.0
General Administration (9% of subtotal)	\$2,700.0	\$0.0	\$0.0	\$0.0	\$0.0	\$2,700.0	N/A
PROJECT TOTAL	\$32,700.0	\$0.0	\$0.0	\$0.0	\$0.0	\$32,700.0	
Other Resources (Cost Share Funds)	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	

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

FY12-16

Project Title:PWS Herring: Juvenile herring intensive
Primary Investigator: Ron Heintz
Agency: NOAA

**FORM 4A
 TRUSTEE AGENCY
 SUMMARY**

**EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
PROJECT BUDGET PROPOSAL AND REPORTING FORM FY 12-FY16**

Budget Category:	Proposed FY 12	Proposed FY 13	Proposed FY 14	Proposed FY 15	Proposed FY 16	TOTAL PROPOSED	ACTUAL CUMULATIVE
Personnel	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	
Travel	\$0.0	\$6,400.0	\$0.0	\$0.0	\$0.0	\$6,400.0	
Contractual	\$15,000.0	\$36,000.0	\$0.0	\$0.0	\$0.0	\$51,000.0	\$59,650.0
Commodities	\$1,900.0	\$2,800.0	\$0.0	\$0.0	\$0.0	\$4,700.0	\$1,802.0
Equipment	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	
SUBTOTAL	\$16,900.0	\$45,200.0	\$0.0	\$0.0	\$0.0	\$62,100.0	\$61,452.0
General Administration (9% of subtotal)	\$1,521.0	\$4,068.0	\$0.0	\$0.0	\$0.0	\$5,589.0	N/A
PROJECT TOTAL	\$18,421.0	\$49,268.0	\$0.0	\$0.0	\$0.0	\$67,689.0	
Other Resources (Cost Share Funds)	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	

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

FY12-16

Project Title: PWS Herring Survey: Fatty acid analysis
Primary Investigator: Heintz and Vollenweider
Agency: NOAA

**FORM 4A
TRUSTEE AGENCY
SUMMARY**

**EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
PROJECT BUDGET PROPOSAL AND REPORTING FORM FY 12-FY16**

Budget Category:	Proposed FY 12	Proposed FY 13	Proposed FY 14	Proposed FY 15	Proposed FY 16	TOTAL PROPOSED	ACTUAL CUMULATIVE
Personnel	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	
Travel	\$4,000.0	\$3,100.0	\$0.0	\$0.0	\$0.0	\$7,100.0	\$2,256.0
Contractual	\$38,000.0	\$14,400.0	\$0.0	\$0.0	\$0.0	\$52,400.0	\$54,980.0
Commodities	\$3,500.0	\$2,500.0	\$0.0	\$0.0	\$0.0	\$6,000.0	\$6,200.0
Equipment	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	
SUBTOTAL	\$45,500.0	\$20,000.0	\$0.0	\$0.0	\$0.0	\$65,500.0	\$63,436.0
General Administration (9% of subtotal)	\$4,095.0	\$1,800.0	\$0.0	\$0.0	\$0.0	\$5,895.0	N/A
PROJECT TOTAL	\$49,595.0	\$21,800.0	\$0.0	\$0.0	\$0.0	\$71,395.0	
Other Resources (Cost Share Funds)	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	

COMMENTS:

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

FY12-16

**Project Title: PWS Herring Survey: Age at first
spawn
Primary Investigator: Heintz and Vollenweider
Agency: NOAA**

**FORM 4A
TRUSTEE AGENCY
SUMMARY**

**EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
PROJECT BUDGET PROPOSAL AND REPORTING FORM FY 12-FY16**

Budget Category:	Proposed FY 12	Proposed FY 13	Proposed FY 14	Proposed FY 15	Proposed FY 16	TOTAL PROPOSED	ACTUAL CUMULATIVE
Personnel	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	
Travel	\$0.0	\$0.0	\$3,900.0	\$7,100.0	\$4,000.0	\$15,000.0	
Contractual	\$0.0	\$75,000.0	\$75,000.0	\$75,000.0	\$75,000.0	\$300,000.0	\$54,800.0
Commodities	\$0.0	\$6,000.0	\$5,000.0	\$5,000.0	\$5,000.0	\$21,000.0	
Equipment	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	
SUBTOTAL	\$0.0	\$81,000.0	\$83,900.0	\$87,100.0	\$84,000.0	\$336,000.0	\$54,800.0
General Administration (9% of subtotal)	\$0.0	\$7,290.0	\$7,551.0	\$7,839.0	\$7,560.0	\$30,240.0	N/A
PROJECT TOTAL	\$0.0	\$88,290.0	\$91,451.0	\$94,939.0	\$91,560.0	\$366,240.0	
Other Resources (Cost Share Funds)	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	

COMMENTS:

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

FY12-16

Project Title: PWS Herring Survey: Herring condition monitoring
Primary Investigator: Heintz
Agency: NOAA

**FORM 4A
TRUSTEE AGENCY
SUMMARY**

**EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
PROJECT BUDGET PROPOSAL AND REPORTING FORM FY 12-FY16**

Budget Category:	Proposed FY 12	Proposed FY 13	Proposed FY 14	Proposed FY 15	Proposed FY 16	TOTAL PROPOSED	ACTUAL CUMULATIVE
Personnel	\$0.0	\$0.0	\$170,400.0	\$186,600.0	\$190,800.0	\$547,800.0	
Travel	\$0.0	\$0.0	\$17,000.0	\$17,000.0	\$18,400.0	\$52,400.0	
Contractual	\$0.0	\$0.0	\$12,000.0	\$12,000.0	\$12,000.0	\$36,000.0	
Commodities	\$0.0	\$0.0	\$46,000.0	\$39,000.0	\$39,000.0	\$124,000.0	
Equipment	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	
SUBTOTAL	\$0.0	\$0.0	\$245,400.0	\$254,600.0	\$260,200.0	\$760,200.0	
General Administration (9% of subtotal)	\$0.0	\$0.0	\$22,086.0	\$22,914.0	\$23,418.0	\$68,418.0	N/A
PROJECT TOTAL	\$0.0	\$0.0	\$267,486.0	\$277,514.0	\$283,618.0	\$828,618.0	
Other Resources (Cost Share Funds)	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	

COMMENTS:

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FY12-16

**Project Title: Herring Disease
Primary Investigator: Paul Hershberger
Agency: USGS**

**FORM 4A
TRUSTEE AGENCY
SUMMARY**

**EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
PROJECT BUDGET PROPOSAL AND REPORTING FORM FY 12-FY16**

Budget Category:	Proposed FY 12	Proposed FY 13	Proposed FY 14	Proposed FY 15	Proposed FY 16	TOTAL PROPOSED	ACTUAL CUMULATIVE
Personnel	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	
Travel	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	
Contractual	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	
Commodities	\$0.0	\$0.0	\$13,200.0	\$13,200.0	\$13,200.0	\$39,600.0	
Equipment	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	
SUBTOTAL	\$0.0	\$0.0	\$13,200.0	\$13,200.0	\$13,200.0	\$39,600.0	
General Administration (9% of subtotal)	\$0.0	\$0.0	\$1,188.0	\$1,188.0	\$1,188.0	\$3,564.0	N/A
PROJECT TOTAL	\$0.0	\$0.0	\$14,388.0	\$14,388.0	\$14,388.0	\$43,164.0	
Other Resources (Cost Share Funds)	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	

COMMENTS:

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FY12-16

**Project Title: Herring Disease
Primary Investigator: Hershberger
Agency: ADFG contract**

**FORM 4A
TRUSTEE AGENCY
SUMMARY**

**EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
PROJECT BUDGET PROPOSAL AND REPORTING FORM FY 12-FY16**

Budget Category:	Proposed FY 12	Proposed FY 13	Proposed FY 14	Proposed FY 15	Proposed FY 16	TOTAL PROPOSED	ACTUAL CUMULATIVE
Personnel	\$58,800.0	\$39,200.0	\$0.0	\$0.0	\$0.0	\$98,000.0	\$72,280.0
Travel	\$1,100.0	\$500.0	\$0.0	\$0.0	\$0.0	\$1,600.0	\$2,210.0
Contractual	\$200.0	\$0.0	\$0.0	\$0.0	\$0.0	\$200.0	\$20.0
Commodities	\$4,000.0	\$0.0	\$0.0	\$0.0	\$0.0	\$4,000.0	\$7,750.0
Equipment	\$15,000.0	\$0.0	\$0.0	\$0.0	\$0.0	\$15,000.0	\$9,500.0
SUBTOTAL	\$79,100.0	\$39,700.0	\$0.0	\$0.0	\$0.0	\$118,800.0	\$91,760.0
General Administration (9% of subtotal)	\$7,119.0	\$3,573.0	\$0.0	\$0.0	\$0.0	\$10,692.0	N/A
PROJECT TOTAL	\$86,219.0	\$43,273.0	\$0.0	\$0.0	\$0.0	\$129,492.0	
Other Resources (Cost Share Funds)	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	

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

FY12-16

Project Title: Scales as growth history records
Primary Investigator: Steve Moffitt
Agency: ADFG

**FORM 4A
 TRUSTEE AGENCY
 SUMMARY**

**EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
PROJECT BUDGET PROPOSAL AND REPORTING FORM FY 12-FY16**

Budget Category:	Proposed FY 12	Proposed FY 13	Proposed FY 14	Proposed FY 15	Proposed FY 16	TOTAL PROPOSED	ACTUAL CUMULATIVE
Personnel	\$94,400.0	\$93,700.0	\$16,700.0	\$17,300.0	\$17,900.0	\$240,000.0	\$ 197,251
Travel	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	
Contractual	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	
Commodities	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	
Equipment	\$3,900.0	\$4,800.0	\$0.0	\$0.0	\$0.0	\$8,700.0	
Indirect Costs (23%)	\$21,700	\$21,500	\$3,800	\$4,000	\$4,100	\$55,100.0	\$ 42,749
SUBTOTAL	\$120,000.0	\$120,000.0	\$20,500.0	\$21,300.0	\$22,000.0	\$303,800.0	\$240,000.0
General Administration (9% of	\$10,800.0	\$10,800.0	\$1,845.0	\$1,917.0	\$1,980.0	\$27,342.0	
PROJECT TOTAL	\$130,800.0	\$130,800.0	\$22,345.0	\$23,217.0	\$23,980.0	\$331,142.0	
Other Resources (Cost Share Funds)	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	

COMMENTS:

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

FY12-16

**Project Title: PWS Herring: Data Management
Primary Investigator: Rob Bochenek**

**FORM 3A
NON-TRUSTEE AGENCY
SUMMARY**

**EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
PROJECT BUDGET PROPOSAL AND REPORTING FORM FY 12-FY16**

Budget Category:	Proposed FY 12	Proposed FY 13	Proposed FY 14	Proposed FY 15	Proposed FY 16	TOTAL PROPOSED	ACTUAL CUMULATIVE
Personnel	\$0.0	\$16,500.0	\$21,700.0	\$0.0	\$0.0	\$38,200.0	\$ 1,700
Travel	\$0.0	\$8,600.0	\$8,600.0	\$0.0	\$0.0	\$17,200.0	\$ 1,700
Contractual	\$0.0	\$0.0	\$7,000.0	\$0.0	\$0.0	\$7,000.0	
Commodities	\$0.0	\$6,700.0	\$0.0	\$0.0	\$0.0	\$6,700.0	\$ 2,300
Equipment	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	
Indirect Costs (<i>will vary by proposer</i>)		\$8,270	\$9,730			\$18,000.0	\$ 1,470
SUBTOTAL	\$0.0	\$40,070.0	\$47,030.0	\$0.0	\$0.0	\$87,100.0	\$7,170.0
General Administration (9% of	\$0.0	\$3,606.3	\$4,232.7	\$0.0	\$0.0	\$7,839.0	
PROJECT TOTAL	\$0.0	\$43,676.3	\$51,262.7	\$0.0	\$0.0	\$94,939.0	
Other Resources (Cost Share Funds)	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	

COMMENTS:

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

FY12-16

**Project Title: PWS Herring: Non-lethal sampling
Primary Investigator: Kevin Boswell**

**FORM 3A
NON-TRUSTEE AGENCY
SUMMARY**

**EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
PROJECT BUDGET PROPOSAL AND REPORTING FORM FY 12-FY16**

Budget Category:	Proposed FY 12	Proposed FY 13	Proposed FY 14	Proposed FY 15	Proposed FY 16	TOTAL PROPOSED	ACTUAL CUMULATIVE
Personnel	\$20,734.0	\$34,445.7	\$35,823.5	\$37,256.4	\$38,746.7	\$167,006.3	\$ 53,217
Travel	\$982.0	\$3,636.0	\$8,194.0	\$7,812.0	\$8,508.0	\$29,132.0	\$ 3,775
Contractual	\$0.0	\$16,884.0	\$0.0	\$0.0	\$0.0	\$16,884.0	\$ 19,044
Commodities	\$200.0	\$0.0	\$20,552.4	\$21,286.5	\$22,050.0	\$64,088.9	\$ 339
Equipment	\$0.0	\$4,000.0	\$0.0	\$0.0	\$0.0	\$4,000.0	\$ 5,032
Indirect Costs (<i>will vary by proposer</i>)	\$11,944	\$20,863	\$25,188	\$25,761	\$26,952	\$110,708.0	\$ 31,327
SUBTOTAL	\$33,860.0	\$79,828.7	\$89,757.9	\$92,115.9	\$96,256.7	\$391,819.2	\$112,734.0
General Administration (9% of	\$3,047.4	\$7,184.6	\$8,078.2	\$8,290.4	\$8,663.1	\$35,263.7	
PROJECT TOTAL	\$36,907.4	\$87,013.3	\$97,836.1	\$100,406.4	\$104,919.8	\$427,082.9	
Other Resources (Cost Share Funds)	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	

COMMENTS:

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

FY12-16

Project Title: PWS Herring: Population dynamics modeling
Primary Investigator: Trevor Branch

**FORM 3A
NON-TRUSTEE AGENCY
SUMMARY**

**EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
PROJECT BUDGET PROPOSAL AND REPORTING FORM FY 12-FY16**

Budget Category:	Proposed FY 12	Proposed FY 13	Proposed FY 14	Proposed FY 15	Proposed FY 16	TOTAL PROPOSED	ACTUAL CUMULATIVE
Personnel	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	
Travel	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	
Contractual	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	
Commodities	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	
Equipment	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	
Indirect Costs (<i>will vary by proposer</i>)							
SUBTOTAL	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	
General Administration (9% of	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	N/A
PROJECT TOTAL	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	
Other Resources (Cost Share Funds)	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	

COMMENTS:

This summary page provides an five-year overview of proposed funding and actual cumulative spending. The column titled 'Actual Cumulative' should be updated each fiscal year to provide information on the total amount actually spent for all completed years of the project. For years where funding is not requested, please leave zeroes. The EVOSTC fiscal year is February 1 - January 31.

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

FY12-16

Project Title: PWS Herring: Coordination and Logistics
Primary Investigator: W. Scott Pegau

**FORM 3A
NON-TRUSTEE AGENCY
SUMMARY**

**EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
PROJECT BUDGET PROPOSAL AND REPORTING FORM FY 12-FY16**

Budget Category:	Proposed FY 12	Proposed FY 13	Proposed FY 14	Proposed FY 15	Proposed FY 16	TOTAL PROPOSED	ACTUAL CUMULATIVE
Personnel	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	
Travel	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	
Contractual	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	
Commodities	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	
Equipment	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	
SUBTOTAL	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	
General Administration (9% of subtotal)	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	N/A
PROJECT TOTAL	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	
Other Resources (Cost Share Funds)	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	

COMMENTS:
This summary page provides an five-year overview of proposed funding and actual cumulative spending. The column titled 'Actual Cumulative' should be updated each fiscal year to provide information on the total amount actually spent for all completed years of the project. For years where funding is not requested, please leave zeroes. The EVOSTC fiscal year is February 1 - January 31.

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

FY12-16

Project Title:
Primary Investigator:
Agency:

**FORM 4A
TRUSTEE AGENCY
SUMMARY**