ATTACHMENT D EVOSTC Annual Program Status Summary Form

Form Rev. 1.17.14

*Please refer to the Reporting Policy for all reporting, due date and submission requirements.

1. Program Number: *See,* Reporting Policy at III (D)(1).

13120111

2. Program Title: *See,* Reporting Policy at III (D) (2).

Herring Research and Monitoring

3. Team Lead(s) Submitting the Summary: *See,* Reporting Policy at III (D) (3).

W. Scott Pegau

4. Time Period Covered by the Summary: *See,* Reporting Policy at III (D) (4).

1 February 2013 to 31 January 2014

5. Date of Summary: *See,* Reporting Policy at III (D) (5).

14 February 2014

6. Program Website (if applicable): *See,* Reporting Policy at III (D) (6).

Http://pwssc.org/research/fish/pacific-herring/

7. Overview of Work: *See,* Reporting Policy at III (D) (7).

This report covers the second year of work associated with the Herring Research and Monitoring (HRM) program. This work continues from the PWS Herring Survey Program that was sponsored by the Exxon Valdez Oil Spill Trustee Council. The goal and objectives of the HRM program are as follows.

Goal: 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.*

Program highlights

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

- Model rebuilt to allow Bayesian statistics
- Disease prevalence consistent with other areas

- Aerial surveys indicate a larger age-1 class in 2013 than observed in previous years
- Condition of those fish as age-0 was higher than previous years
- Samples from herring at Kayak Island were collected for genetics analysis
- Over 5000 fish were collected for the various projects using a range of methods
- Adult herring spawning biomass in PWS decreased some in 2013

2) *Inform the required synthesis effort.*

- Revised and updated herring portal released
- Nearly 3000 scales have been scanned and growth increments measured.
- Growth is correlated with diatom abundance
- Growth is not correlated with recruitment

3) *Address assumptions in the current measurements.*

- RNA/DNA indicates that no growth occurs between November and March
- Energy density decreases faster than predicted by linear model
- Fortnightly acoustic surveys show significant differences in biomass
- Technique to show population immunity to VHSV was developed
- VHSV susceptibility is negatively related to water temperature

4) *Develop new approaches to monitoring.*

- 93% of adult herring with acoustic tags were detected at various receivers
- Fish were observed to make rapid transitions between the spawning grounds and the entrances to PWS
- The ROV with the Didson was able to identify age-0 herring

Program summary

To address the first objective by improving inputs to the ASA model we continued to monitor for disease prevalence, expanded the acoustic surveys for adult biomass, surveyed for juvenile herring using acoustic and aerial surveys, and monitored the condition of age-0 herring. To examine assumptions in the ASA model we conducted research on the age at first spawn and collect fish for genetics research. Finally, we address the first objective by rebuilding the ASA model in the AD model builder framework to allow the model to be run in a Bayesian mode instead of simply reducing the sum of squares.

The disease prevalence data is provided to ADF&G for use in their ASA model. Prevalence rates do not show anything anomalous compared to other years and that found in Sitka.

This was the first year of the expanded adult biomass surveys and after surveying the primary spawning biomass we expanded our search around Naked Island, Knight Island, and historic areas on Montague Island. No other herring biomasses were found, nor were any concentrations of whales that may indicate the presence of herring. Water temperatures in PWS were abnormally cold, which appears to have disrupted the typical spawning behavior of the herring. We found 16,300 mt of herring associated with the primary spawning biomass and provided that information to ADF&G.

Aerial and acoustic surveys were used to help develop an index of juvenile herring that may be used to help improve the prediction of age-3 fish to recruit to the spawning stock. The aerial survey was flown in June. Based on the previous three years it was felt that at this time the identification of forage fish schools were best because of the geographic segregation of the schools. Examining the number of schools of what were believed to be age-1 herring we found over 2100 schools in 2013. This is compared to 579, 75, and 279 in 2010, 2011, and 2012. Based on the age composition data the 2009 brood year (observed in 2010) was moderately strong and the 2010 brood year was very weak. We are still waiting for the 2014 run of the ASA model to see official estimates of recruitment each year. There was a change in approach to the acoustic surveys that occurred in this fiscal year and analysis of a juvenile index is still underway.

The processing of the condition data from November 2012 was completed. That data was incorporated into the historic dataset that extends back to 2007. It was found that the 2010 brood year went into the winter in the poorest condition and the 2012 brood year was in the best condition going into the winter (Figure 1). It appears that there is a minimum condition level in the spring of 3.2 kj/g. There are too few years to make comparisons between recruitment and condition in the spring or fall.

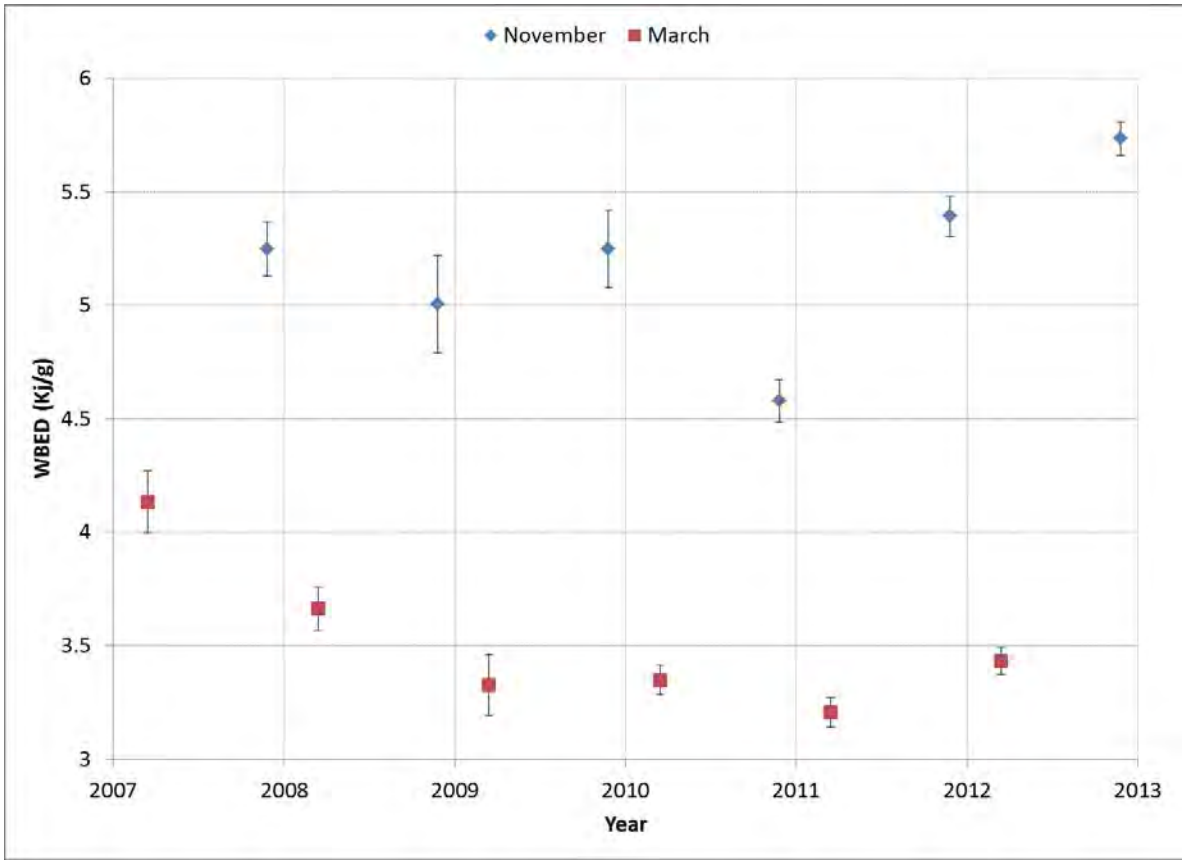


Figure 1. The whole body energy density from the March and November sampling periods from 2007 to present pooling all sampling techniques and locations. Error bars denote the 95% confidence interval.

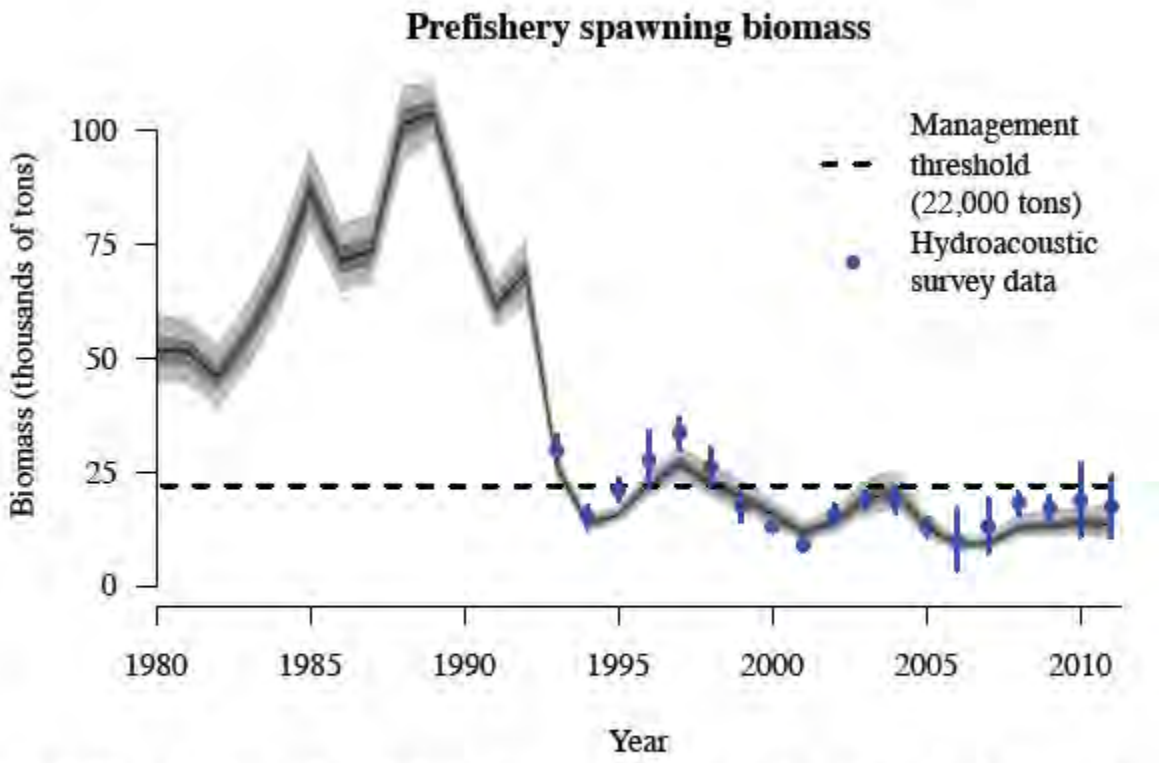
We found that the average length did not follow the same pattern over time as WBED. Length is much more dependent on the sampling methodology. Controlling for sampling approach we find that the average size is greater in March than the previous November. Based on findings of the RNA/DNA research conducted in the condition intensive study there is no evidence for growth through the winter. Most likely the increase in the standard length is caused by size dependent mortality, with smaller fish having greater mortality due to a lack of energy reserves.

The age at first spawn research has demonstrated that histology can determine if a fish had spawn previously. The project is now examining if there is a difference in growth as observed in herring scales that can be used to determine the percentage of fish that spawn at different ages. The growth of herring that spawn is expected to be less than that of fish that do not spawn. The growth data from the growth history project have been contributed to this effort to increase the sample size the project is working with.

The project to examine if separate stocks can be identified using genetics has not yet begun, but we were able to collect fish from Kayak Island. This was only the second time that fish from that area were collected. This was the only other major spawning event outside of the spawning at Port Gravina. The age structure of the fish at Kayak Island was similar to those at Port Gravina except the age-4 year class

was not present at Kayak Island. They may have been represented at a later spawning event that occurred after the sample was collected.

The modeling project completed building the ASA model used by ADF&G in AD Model Builder framework. This allows the model to be run in a Monte Carlo mode to provide more information on the potential estimate error. The modeling team is working with ADF&G to establish error margins for the inputs to the ASA model (Figure 2). The next step is to examine the importance of each input to the model.



Model fits of estimated pre-fishery spawning biomass trajectories to hydroacoustic survey biomass including 10, 50 and 90% credibility intervals from two million Markov chain Monte Carlo simulations, thinned every two thousandth.

There are two projects that address objective two. The data visualization project completed updates in data and structure of the herring portal. The new portal allows for visualization of herring data with other sources of information. Over 5000 scales from age 4, 5, and 6 herring collected between 1983 and 2013. In each year 30 males and 30 females at each age were selected for analysis. Growth in the first year had a long period cycle (Figure 3). The growth in the first year is not related to recruitment. Growth in the first year was negatively correlated with adult biomass up to 2003. This suggests a possible density dependent growth. The shift after 2000 is consistent with a shift in the primary spawning ground and may have restricted the nursery area creating more competition between juvenile herring.

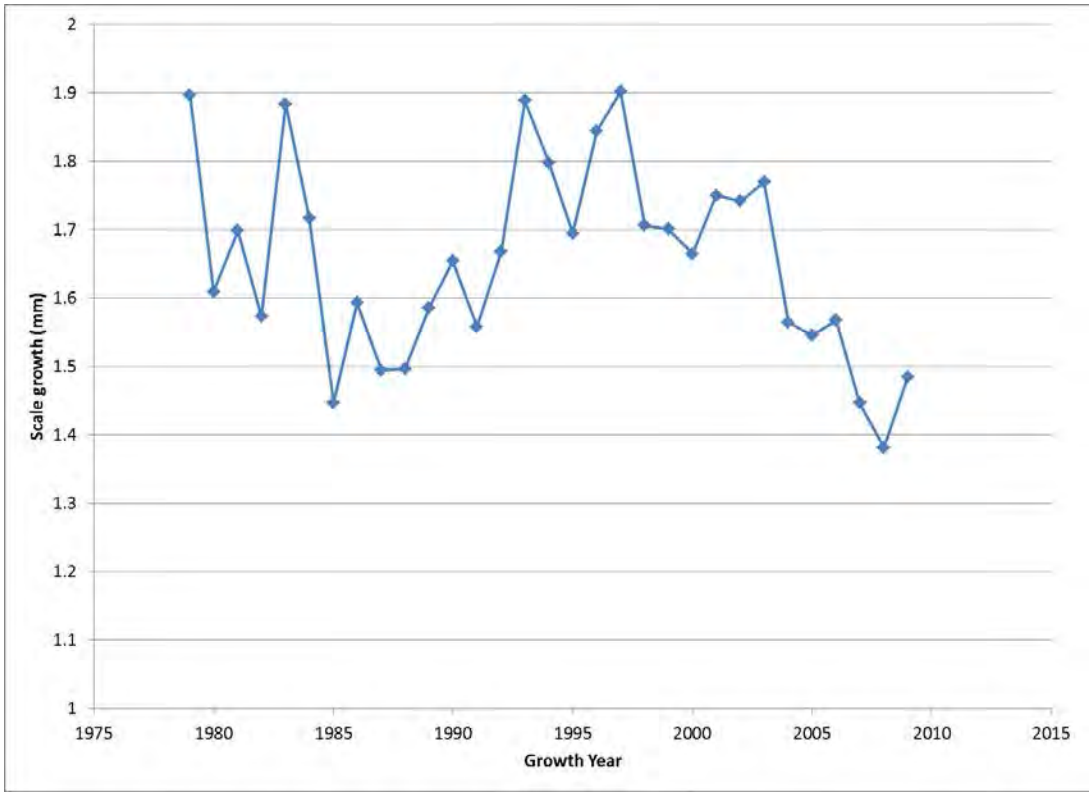


Figure 3. Scale growth increment in the first year.

There is a correlation between scale growth in the first year and the diatom abundance anomaly as determined by the continuous plankton recorder project of the Gulf Watch Alaska program (Figure 4). No lag is applied to the data. Since diatom growth is primarily earlier in the year the most likely life stage to be affected is growth at the larval stage.

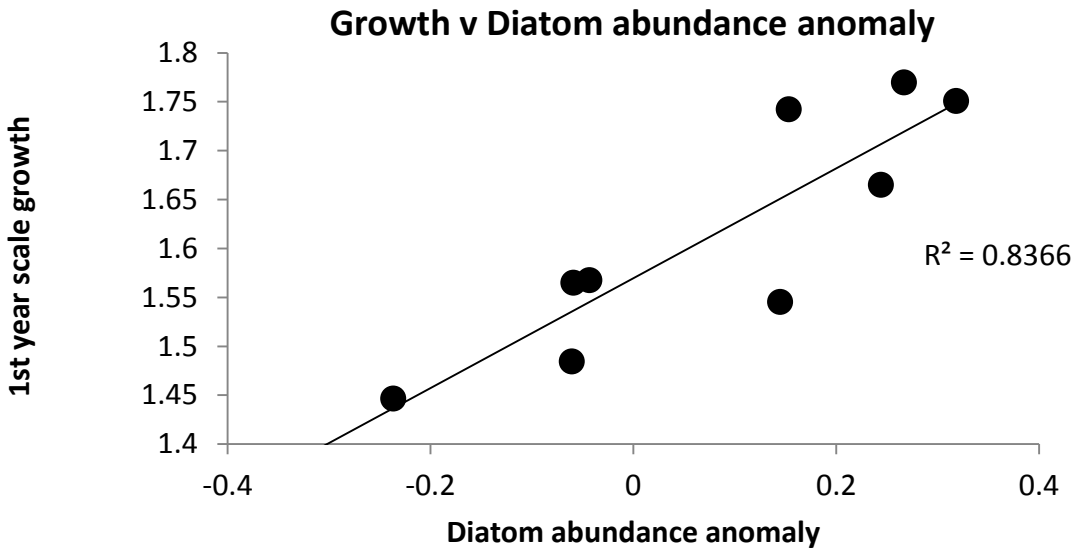


Figure 4. First year scale growth versus diatom abundance anomaly as measured by the continuous plankton recorder.

To address the assumptions in the current measurements we have been analyzing the data from fish collected monthly at Simpson Bay. The data shows that the whole body energy density peaked in November and decreased rapidly through January then it remained stable (Figure 5). Between September and November there was a decrease in RNA/DNA and an increase in lipid content that indicated a change in energy allocation from growth to building an energy reserve for the winter. This work supported the assumption that sampling in November and March provided the maximum and minimum values for overwintering condition studies. The decrease in WBED was more rapid than would be predicted by the linear model that has been used in the past.

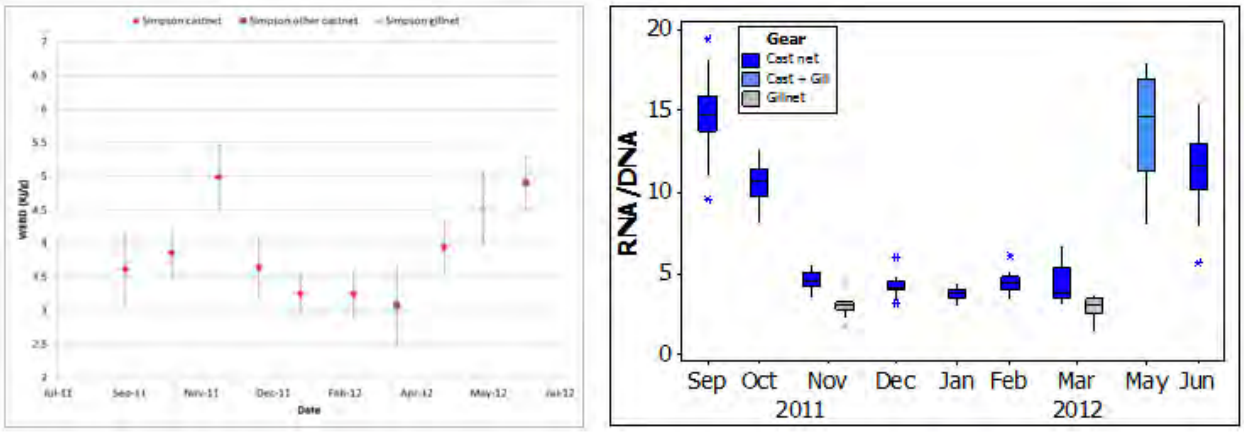


Figure 5. Left. The best estimate of the WBED time series for age-0 herring collected in Simpson Bay. Error bars represent one standard deviation. Right. The RNA/DNA ratio. Higher values indicate growth.

An intensive set of acoustic surveys in Simpson and Windy Bay began in October. While the data collection in this study remains underway, it was evident that large changes in biomass occurred between the fortnightly cruises. The fatty acid analysis project was designed to address the question of detecting immigration and emigration that might lead to the variability seen by the acoustic project. We were not able to collect fish in all the desired locations and have shifted to analyzing other samples when different locations within a bay were sampled. One set of samples collected by cast net in Simpson Bay during this study showed that the length distribution of fish collected in shallow and deep water was different, and there were differences in the WBED between the two arms of Simpson Bay.

A little over 5500 fish have been collected to support all aspects of the research program. The primary collection system is a mid-water trawl, although gill nets, cast nets, and jigs continue to be used as needed. Age-0 herring, Age-0 pollock, capelin, and jellyfish make up the majority of the catch (Figure 6). The catch of juvenile herring has been consistent with acoustic survey results during the acoustic intensive survey.

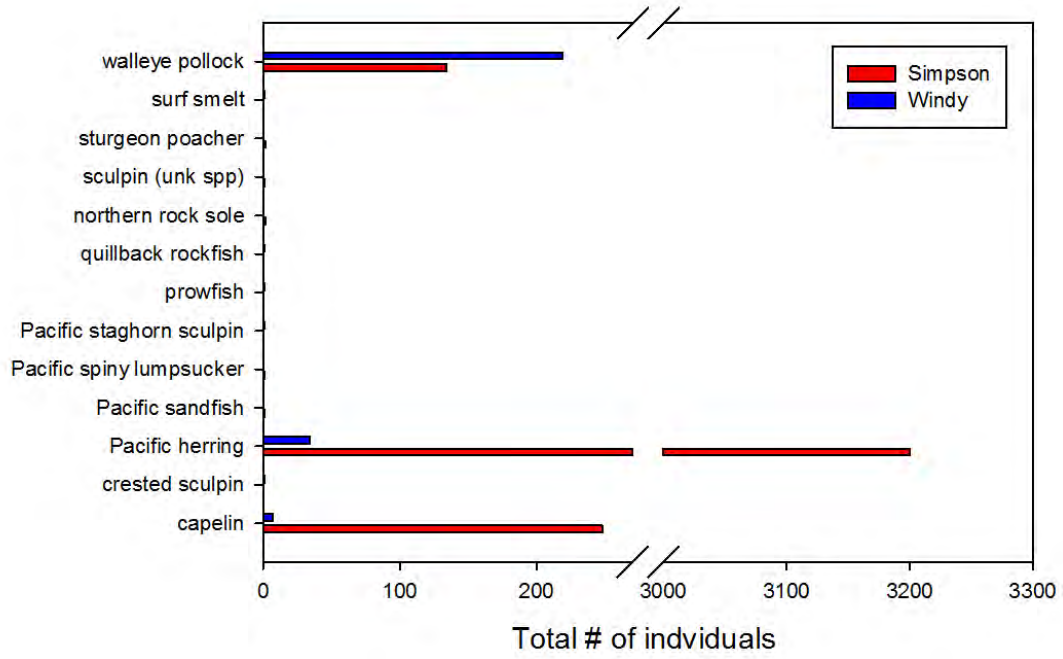


Figure 11. Total number of individuals collected by species using a mid-water trawl within Simpson Bay (n = 21 trawls) and Windy Bay (n = 24 trawls); 02 October—06 December 2013.

The disease project was not funded through this program in the last year, but instead it was still funded under the PWS Herring Survey program. We feel it is important that the project results still be considered as part of the overall HRM program. A more detailed report is available as the FY13 annual report for EVOS project 13100132-I. A major issue has been in the determination of how susceptible the herring population is to outbreaks of *Viral Hemorrhagic Septicemia Virus* (VHSV). In the past it was only possible to determine if a fish was currently infected, but it wasn't possible to determine if a fish had survived an infection and was now immune. A combination of a virus neutralization assay and blocking enzyme-linked immunosorbent assay has now been shown to correctly identify all survivors and unexposed fish.

Other laboratory work showed that Pacific herring are most susceptible to the endemic strain of the VHSV. Testing showed that it is possible for Atlantic salmon to be infected by VHSV and then transmit the disease to herring, which stresses the importance of precautions to prevent VHSV in net pens.

The role of water temperature on the susceptibility of VHSV was investigated. A negative relationship between water temperature and susceptibility was found. At higher temperatures the immune response is greater, which likely was the cause of the relationship between susceptibility and temperature.

Addressing objective four were the herring tagging study and the non-lethal sampling project. The non-lethal sampling project began this fall with the integration of a Didson sonar on several platforms to compare to results from the acoustic measurements and trawl catch. This work remains underway in connection with the herring intensive acoustic surveys.

The tagging and tracking of adult herring has been more successful than we anticipated. Sixty nine adult herring were tagged during spawning in Port Gravina in 2014. Sixty four fish had been detected by one or more of the receiver arrays, although data had not been uploaded from receivers in some of the smaller passages until February 2014, so additional fish may still be detected (Table 1). Three of the tagged herring remained in the Port Gravina area for over a month and two were still being detected when that temporary array was retrieved at the end of May.

Forty of the tagged fish were detected in Montague Strait or Hinchinbrook Entrance by September with some fish detected on both arrays. The majority of the detection was on the receivers closest to the coast. Movement from Port Gravina to both entrances was often rapid. Five of the 14 herring recorded at HE arrived from Port Gravina within 2 (n = 3) and 3 d (n = 2). Similarly at MS, five of the 27 herring recorded arrived from Port Gravina within 3 (n = 2) and 4 d (n = 3). Fish remained near the Montague Strait array for several weeks between April and July. Data from the array was uploaded in February 2014 and it is too early to tell when fish began to be detected again as we assume they are returning to Prince William Sound. We do know that fish were detected as late as January 2014 by the arrays.

Table 1. Number of tagged fish detected by array location and first and last dates of detections, 7 Apr to 12 Sep 2013.

Tagged Fish (n = 69)	Port Gravina	Hinchinbrook Entrance (HE)	Montague Strait (MS)
Total detected	56	14	33
% of total tagged	81%	20%	48%
First detection post tagging	56	1	7
% of total tagged	81%	1%	10%
Moved HE to MS	-	6	-
Moved MS to HE	-	-	1
Date of first detection	7 Apr	10 Apr	11 Apr
Date of last detection	21 May*	8 Jul	12 Sep*

Coordination and Collaboration

Principal investigator meetings in March and January provided opportunities for the projects to be updated on each other's progress and coordinate projects. Representatives from the HRM and GWA programs attended each other's principal investigator meetings to ensure coordination between programs.

Collaborations occurred between the modeling project and ADF&G in establishing the model parameters and inputs. This continued in the estimation of errors in the input fields. The modeling program also received adult herring biomass estimates from that portion of the program. The acoustic validation program also collected fish for disease analysis and the juvenile herring condition projects. The herring acoustic intensive worked with the non-lethal sampling project to provide opportunities to

deploy the Didson sonar in various alignments with the survey sonar. ADF&G provided adult herring for the age-at first spawn, genetics, and disease studies.

The HRM program worked with the forage fish project in the GWA program to ensure similar sampling methodology and provide aerial survey support. The forage fish project provided critical validation data for the aerial observations. A GWA winter bird survey person was on the November herring cruise and daytime transects run to allow continuation of their historic survey efforts. The GWA PWS ocean condition component is working with the herring disease research to supply organisms that may be an intermediate host for *Ichthyophonus*. We used data from the continuous plankton recorder from the GWA program with the scale growth data and found a relationship between growth and diatom abundance (Figure 5).

The herring tracking project relied heavily on the presence of receiver arrays that were deployed under the Ocean Tracking Network (OTN) program. Vessel time to upload data has come from the OTN program.

Community and Resource Managers

Results from the acoustic surveys of adult spawning biomass and disease prevalence work were provided to ADF&G for use in their ASA model. Dr. Hershberger also presented on his research at the Alaska Herring Managers Meeting.

We involved the fishing community in collection of juvenile herring in March instead of a dedicated scientific cruise to collect the fish necessary for the over wintering condition studies. Results of the program were presented to the board of Cordova District Fishermen United. We also worked with them to provide additional aerial surveys and the collection of herring from Kayak Island. Upon request from a local pilot we demonstrated the potential for using satellite data to identify herring spawn in remote conditions. The pilot was able to use that information to observe a late spawn on Kayak Island and fly out and confirm what was seen in the satellite imagery. Working with both pilots and fishermen has improved communication between the scientists and them and we are benefiting from more rapid reports of observations. This includes the initial observation of spawn on Kayak Island that allowed ADF&G to conduct an aerial survey of the spawn.

Problems

The primary problem was the departure of Dr. Kline and Lindsay Butters. We are currently identifying replacement personnel for both the juvenile conditions studies and the education and outreach program.

There was some damage to fish collected by the fishermen in March because they were not frozen while at sea. We now have small portable freezing units to send out with the fishermen to improve the handling of samples.

Other Significant Information

The aerial surveys of age-1 herring is one of several indicators that 2012 may have been an extraordinary year in the marine environment. PWS also saw a record return from the pink salmon that entered the ocean in 2012. The bycatch of age-0 pollock in the salmon smolt surveys were at the highest level in over ten years. And we are continuing to get reports of strong recruitment of marine species from the 2012 brood year. This provides some optimism that we finally have observations from a strong recruitment class, however we won't know for sure for two more years when those fish join the spawning stock.

The ability to detect herring spawn from space is limited because it requires clear skies and a spawn that is a few kilometers wide and nearly a half kilometer wide. These conditions have existed during spawn

at Kayak Island during two of the last four years, and at the primary spawning grounds in Port Gravina on occasion as well. There is lots of interest from the local fishing fleet to better understand the Kayak Island stock because of potential impact to the local fishery and potential connections to stocks within PWS. We are looking for inexpensive methods to monitor for spawn at Kayak Island as a test for detecting spawn at other remote locations that are often missed under the existing survey approach.

8. Information and Data Transfer: *See*, Reporting Policy at III (D) (8).

Publications:

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 in press. 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.

Winton, J.R., P.K. Hershberger. *Submitted*. Viral Erythrocytic Necrosis. *In*: Fish Health Section Blue Book: Suggested Procedures for the Detection and Identification of Certain Finfish and Shellfish Pathogens. American Fisheries Society.

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

Emmenegger, E.J., C.H. Moon, P.K. Hershberger, G. Kurath. 2013. Virulence of viral hemorrhagic septicemia virus (VHSV) genotypes Ia, IVa, IVb, and IVc in five fish species. Diseases of Aquatic Organisms 107: 99-111.

Lovy, J., P. Piesik, P.K. Hershberger, K. A. Garver. 2013. Experimental infection studies demonstrating Atlantic salmon as a host and reservoir of viral hemorrhagic septicemia virus type IVa with insights into pathology and host immunity. Veterinary Microbiology 166: 91-101.

Kocan, R, S. LaPatra, P. Hershberger. 2013. Evidence for an amoeba-like infectious stage of *Ichthyophonus* sp. and description of a circulating blood stage: a probable mechanism for dispersal within the fish host. Journal of Parasitology 99: 235-240.

Hershberger, P.K., M. K. Purcell, L.M. Hart, J.L. Gregg, R.L. Thompson, K.A. Garver, J.R. Winton. 2013. Influence of temperature on viral hemorrhagic septicemia (Genogroup IVa) in Pacific herring, *Clupea pallasii* Valenciennes. Journal of Experimental Marine Biology and Ecology 444: 81-86.

Workshops

Pegau reported on the overall program at the Alaska chapter of the American Fisheries Society, Alaska Marine Science Symposium (AMSS), and at a Cordova District Fishermen United Board meeting. Posters were presented at the AMSS by Sewall et al., Muradian and Branch, and Moffitt. The data portal was also demonstrated during AMSS. In January 2014 Muradian presented on the modeling effort to the joint SAFS-NWFSC-AFSC Fisheries Think Tank. Another eight presentations were given by researchers in the disease program at various venues.

Outreach efforts included revisions to the HRM web page on the PWSSC website, articles in the *Delta Sounds Connections, Breakwater, and Project Profiles*, and community lectures.

Products

Disease prevalence and acoustic estimates of adult biomass data were provided to ADF&G as inputs to the ASA model. The herring research and monitoring website was substantially revised.

Data Uploaded

Updated data from the juvenile condition, scale as growth history, herring tagging, and disease prevalence projects have been uploaded to the herring workspace. The data on the herring portal was updated to include newer data from ADF&G.

9. Response to EVOSTC Review, Recommendations and Comments: *See,* Reporting Policy at III (D) (9).

17. Herring Program Advisory Group, academic position suggestion: Some additional expertise that could assist with this group are Tim Essington (UW) and Alec McCall, SWFSC would also be a good choice for membership. *See also Attrition of Experienced Personnel, above.

Response:

Thank you very much for the suggestions. Tim Essington works closely with Dr. Branch who is a part of this program so we don't feel he is appropriate. Dr. Pegau has been trying to identify a person to replace Ted Cooney on that group. So far there has been no response and we are still working to get a commitment for a person to serve.

18. Defining program priorities

There is a basic requirement of the herring program to develop a credible and defensible program/project to assess herring abundance. In practice this means the implementation of a modern stock assessment model. This requirement supersedes all others because virtually all other projects in the herring program, and some in the Gulf Watch program, are dependent on the confidence levels associated with the herring assessments. Such assessment is essential even in the absence of any commercial fishery of in Prince William Sound, because herring abundance will impact so much of the ecology of other species.

Stock assessments usually are done by an agency, such as ADFG, but because of the importance of herring it is reasonable for other experts to develop a state-of-the-art age-structured stock assessment (ASA) model tailored for PWS herring, perhaps to be done cooperatively with ADFG. From the proposals this seems to be happening, but, in the opinion of the science panel, not rapidly enough. The concern with delay is that it will be difficult to fully appreciate many of the ecological processes of

Prince William Sound unless there is a reasonable understanding of the abundance of herring. In other worlds, the scientific value of nearly all of the herring projects depends partly on the reliability of the herring assessments.

Typically, an age-structure-assessment (ASA) model requires a ‘tuner’ or an independent dataset that provides a time-series index of abundance (i.e., to tune the model). For PWS herring there may be only two options: a time series of (i) spawn data or (ii) acoustic data. The problem is complex, because the time series of these two datasets are of differing length. Perhaps there are other data options, but the modelers need to ensure that they understand the strengths and limitations of all the data they use in the model. This is a task that requires experience.

It is important to note that, while acoustic estimates of abundance of herring are commonly used around the world, they seldom are used as stand-alone independent measures of biomass. Instead, they usually contribute time-series data to more complex models that incorporate age structure data and other information. If the available time series data (from spawn or acoustics) are not suitable for an ASA model, then other assessment models or approaches must be considered – and presumably this could involve acoustic approaches, or even simple models based mainly on spawn abundance data. Therefore a firm recommendation of the science panel is that the direction and requirements of the stock assessment process, through ASA models, should be clarified and evaluated as soon as possible.

We wish to further elaborate about why all the other herring projects are secondary in importance to stock abundance estimation. It is because much of the biology and life history of herring is impacted by density-dependent processes and this, in turn, can affect growth, maturation, migration, condition, disease and recruitment – all subjects of the proposals in the herring program. Herring abundance also affects other fauna, especially seabirds and marine mammals. Therefore, the science panel recommendation is that the assessment of herring abundance should get top priority, and proceed as vigorously and rapidly as possible. This is not to say that the other projects are unworthy or should stop - on the contrary. The assessment project, while vital, is among the most scientifically routine of the lot, because it involves the implementation of exiting protocols and methodologies. That does not mean it is simple or easy to do, but it is not a ‘hypothesis testing’ enterprise in the usual sense. Nevertheless, the products of assessments will provide a basis for better science for almost all of the other projects. The common element on all the other projects, with the possible exception of some acoustics projects, is that they aim to determine why and how herring populations change – physiologically or ecologically. In a sense their value is dependent on the rigor of the herring abundance assessments.

What are the implications of this recommendation?

(1) The project on ASA modeling work should be acknowledged as a priority (even a pre-requisite) among the other herring projects. It needs to be implemented rapidly because its requirements could impact that way that other projects develop, especially acoustic projects.

(2) The immediate implication is that the development of a functional herring ASA model should be proceeding much more rapidly than indicated in the progress report. If this task cannot be implemented in a timely manner, than the herring program should consider other ways of getting this work done.

(3) A longer-term implication is that some of the closely related projects that might provide input data to the ASA, especially some of the acoustic projects, could require modification or reconsideration. If the age-structured model cannot incorporate the acoustic data, as it is presently acquired, then the design of

the acoustic programs should be adjusted and re-evaluated. However, this cannot be determined until the ASA model is functional and evaluated.

(4) Once the ASA model is functional, then it should be formally reviewed by 1-2 independent (outside) experts to evaluate its formulation, application and efficacy. Such a review is a common practice and should culminate in a report that documents the review findings. This report would then provide direction about the data requirements for a reliable ASA model of PWS herring. (Note: this was a recommendation in the 2011 science panel report).

(5) If the fully-developed ASA model cannot provide acceptable results because of the limitations of the input data, then other approaches to herring biomass assessments must be considered. These could include simpler models that rely more directly on acoustics or spawn deposition.

Response:

We fully agree about the importance of the stock assessment model. Improving that capability is the goal of this program. ADF&G currently has an operational stock assessment model (ASA) that our modeling project has replicated in a form that can be run to determine the Bayesian statistics. The population modeling project is presently examining the value of each of the inputs into that model.

The expanded adult herring biomass surveys along with the proposed aerial survey proposal are designed specifically to improve the quality of the abundance assessments used as inputs to the model. As the Science Panel points out, they are not meant to be hypothesis driven, but are necessary for understanding how the population is changing. We continue to examine the assessment projects to determine if there are ways to make improvements to our approach and if other measures of abundance are more appropriate. The two longest time series of abundance measures/indices are the miles-days of spawn and the acoustic biomass estimates. We are working closely on the issue of how good these inputs are and we are reviewing other forms of input such as aerial biomass estimates and spawn deposition surveys used both in Alaska and elsewhere to determine if they are likely to be able to be implemented and would improve our abundance estimates. Both of the previously mentioned methods have been used in PWS and are to be evaluated in the modeling project.

Answers to the specific recommendations follow:

1) The existing ASA model run by ADF&G is fully operational and central to the design of the HRM program. The projects addressing objective 1 of the HRM program are specifically designed around the needs of the existing model. The HRM program is looking at other methods of modeling the herring population.
2) Because there is a fully functional ASA model available to the program and we recognize the need to train future researchers, we chose to work this aspect of the program through a graduate student. This is a bit slower than putting a PI directly on the project, but that pace is necessary if the student is to be trained. That student has completed the development of a second fully functional ASA model with features outside of that used by ADF&G. This project is on track with the original proposed timeline.

3) Both ASA models incorporate the adult biomass estimates that the acoustic project provides. The acoustic biomass estimates have been an input to the model since the late 1990s. We are researching the ability to use acoustic estimates of juvenile populations as inputs to the ASA model, but we are still determining how well we can provide an estimate of potential new recruitment.
4) The operational ASA model has been presented in peer-reviewed publications, which we feel meets the need for independent review. In essence our modeling project is designed to provide an independent review of the ADF&G ASA model and its inputs as you are recommending and was recommended earlier.
5) There will always be a question about what piece of information provides the best measure of herring biomass. Every one of the methods used to provide a measure of biomass has definite sampling issues. We agree that a simpler model may be as accurate as the present version of the ASA model. We will also be exploring more complex models that incorporates the information on life history determined by other projects in this program, such as the disease, energetics and growth projects

19. Inter-project cooperation and communication

The science panel acknowledges and salutes the efforts made to coordinate logistics of field projects, especially following a long period when PIs worked relatively independently on most projects. However we are not convinced that some of the individual projects are as well connected as they should be, in terms of communication among PIs. This comment is based on an apparent lack of connectivity among some of the proposals.

Response:

Meetings of the PIs within the program and with those of the Gulf Watch Alaska program are held regularly. What appears to be a lack of connection between proposals arises because the single original proposal has been split into several individual projects for your review rather than being presented as a single program. The single program cannot provide as much detail about individual components, and individual components don't show the connectivity of the program as a whole.

20. Project gap: microchemistry

The panel noted that the PWS herring population could have important spatial structure that might go undetected by genetic analysis of microsatellites. This could occur if PWS herring consist of a meta-population with spatially separate sub-populations that, nevertheless, have sufficient genetic exchange to preclude genetic detectable differentiation. Therefore it is important to re-examine this issue

because the previous genetic work, conducted more than a decade ago, had a short duration and a limited number of probes. Based on the previous genetic study in Prince William Sound, and similar but more recent genetic analyses of other herring populations in the eastern Pacific, the panel does not anticipate that the current genetic studies will demonstrate new evidence of genetic variation within PWS. Instead these studies will probably provide important confirmatory evidence of a lack of genetic differentiation detectable within different parts of the Sound. Such evidence, however, would not necessarily mean that PWS herring lack any spatial variation.

It is possible that PWS herring constitute a meta-population consisting of several sub-populations that may have spatially distinct life histories for parts of their lives. If so, these populations could have different growth rates, and population parameters. Knowledge of such possible spatial structure is integral to understanding factors affecting the abundance of PWS herring. The absence of such

understanding represents an ongoing gap in the program. Such a gap could be addressed by analyses of microchemistry of otoliths. Time spent by herring in different bays within PWS and the surrounding region, could be reflected in the chemical composition of otoliths that can be detected by analyses of microchemistry. This approach would have linkages to several other projects. Thus, the microchemistry approach would provide helpful new insights to ongoing projects while improving linkages among them.

The panel is aware of difficulties associated with previous attempts to examine microchemistry of herring. We acknowledge that microchemistry must be used carefully as a research tool, but point out that it can be a powerful and informative approach when done properly. For this reason we suggest that the herring program could consider the incorporation of this approach. For technical reasons, explained below, we further suggest that the optimal approach would be the examination of otoliths.

Regarding scales vs. otoliths: Herring scales may not be a good tissue for microchemistry, but otoliths may be useful. The main problem with scales is that herring resorb calcium and other minerals from their scales as they mature sexually. The effect does not interfere with annulus formation on scales but it could confound comparisons of putative population groups. This is not a concern for otoliths where, in theory, the chemical signatures are retained unchanged with age/time. The main concern with otolith collections is that they need to be collected and stored carefully prior to analysis. As they dry, otoliths tend to develop hairline cracks that can accumulate extraneous material – which again can confound results.

Potential Resource - The current director of the UAF Alaska Stable Isotope Facility is Matt Woller. He is well respected and is an excellent collaborator. See: http://ine.uaf.edu/werc/asif/

Response:

This is one of many gaps in the program that we have identified. The program is designed to review and change focus with each 5-year proposal. As you mention, this technique has been applied to herring in PWS with some difficulty. We think it would be most appropriate as a component of a program that examines larval drift, which is one of the potential focal areas for the future. At this point we would prefer to see a small demonstration project funded to ensure we overcome the issues with the previous work. We have been retaining otoliths from the juvenile herring we collect so that we have samples to work with when we have the ability to fund this type of research, but want to also point out that otolith work can be expensive.

21. Forage Fish

The Science Panel supports the enhanced attention to estimating population abundances of important Forage fish in the Long-term Monitoring/Gulf Watch Project, while noting that the Herring Program will also be sampling forage fishes acoustically and during net tows, such as those planned to ground-

truth acoustic signals. Except for herring itself, the early studies of EVOS impacts on the PWS ecosystem unfortunately failed to establish population assessment on any of the forage fishes of known significance to supporting higher-order predators: sand lance, capelin, and eulachon in particular. The Piatt project in LTM/Gulf watch can serve as the centerpiece study of forage fish to which information gathered by PIs on other projects could be transferred to provide enhanced knowledge of abundances and dynamics of forage fishes.

Response: We agree about the importance of forage fish monitoring, and the Piatt project was included in the GWA program for that reason. We expect that the initial results of that project will lead to a fruitful discussion in advance of and during the joint Science Workshop.

This project is conducted in close connection with the HRM program. We are working to find ways so that both programs fill gaps for the other program and ensure we have comparable results. Nearly identical equipment is being used by the forage fish and herring acoustics and validation projects. We are examining what new questions might be addressed by the temporal difference in sampling between the forage fish and herring projects. We have identified the need for additional support for aerial surveys, and would appreciate more discussion on this.

10. Budget: *See*, Reporting Policy at III (D) (10).

Budget Category:	Proposed FY 12	Proposed FY 13	Proposed FY 14	Proposed FY 15	Proposed FY 16	TOTAL PROPOSED	ACTUAL CUMULATIVE
Personnel	$201,500.0	$377,300.0	$535,700.0	$524,200.0	$518,000.0	$2,156,700.0	$249,301.0
Travel	$26,800.0	$31,500.0	$47,000.0	$49,700.0	$46,600.0	$201,600.0	$19,936.0
Contractual	$336,960.0	$544,799.0	$456,188.0	$417,616.0	$362,757.0	$2,118,320.0	$716,485.0
Commodities	$81,600.0	$33,700.0	$104,100.0	$100,300.0	$67,100.0	$386,800.0	$69,836.0
Equipment	$187,200.0	$0.0	$0.0	$0.0	$0.0	$187,200.0	$187,861.0
Indirect Costs (*will vary by proposer*)	$108,500.0	$173,030.0	$168,200.0	$161,100.0	$144,370.0	$755,200.0	$147,716.0
SUBTOTAL	$942,560.0	$1,160,329.0	$1,311,188.0	$1,252,916.0	$1,138,827.0	$5,805,820.0	$1,391,135.0
General Administration (9% of subtotal)	$84,830.4	$104,429.6	$118,006.9	$112,762.4	$102,494.4	$522,523.8	
PROJECT TOTAL	$1,027,390.4	$1,264,758.6	$1,429,194.9	$1,365,678.4	$1,241,321.4	$6,328,343.8	
Other Resources (Cost Share Funds)	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	N/A

COMMENTS:
This 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 program. 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.

The program is currently behind in spending. This is largely due to two of the PIs departing the program and we are still filling in their positions. Contractually we have several cruises coming up that will bring that portion back on schedule.

ATTACHMENT C ***EVOSTC Annual Project Report Form***

Form Rev. 1.17.14

*Please refer to the Reporting Policy for all reporting, due date and technical submission requirements.

1. Project Number: *See,* Reporting Policy at III (C) (1).

13120111-A

2. Project Title: *See,* Reporting Policy at III (C) (2).

PWS Herring Program – Validation of acoustic surveys

3. Principal Investigator(s): *See,* Reporting Policy at III (C) (3).

Mary Anne Bishop

4. Time Period Covered by the Report: *See,* Reporting Policy at III (C) (4).

1 February 2013 to 31 January 2014

5. Date of Report: *See,* Reporting Policy at III (C) (5).

14 February 2014

6. Project Website (if applicable): *See,* Reporting Policy at III (C) (6).

Http://pwssc.org/research/fish/pacific-herring/

7. Summary of Work Performed: *See,* Reporting Policy at III (C) (7).

Fiscal year 2013 marked the completion of the second year of the five-year Prince William Sound Herring Research and Monitoring program sponsored by the EVOS Trustee Council. Five projects within the integrated herring program are utilizing collected juvenile herring: condition index, energetics, growth, disease, and validation of acoustic measurements. Adult herring are being collected in spring to validate the extended adult herring acoustic surveys as well as for two additional studies in the herring research program: age at first spawn and herring genetics (Table 1). This report primary focuses on the acoustic validation component.

Acoustic surveys provide a low-cost, remote sensing tool to estimate species- specific fish biomass and abundance as well as distribution of pelagic fish and zooplankton. To ground truth acoustic data, a variety of fishing methods were utilized. Mid-water trawls provided the primary *in situ* method to validate species composition facilitate estimation of acoustic biomass for juvenile herring surveys , and collect additional biological data such as length-frequency distribution and age. Gillnets, castnets and jigs were also used to supplement trawls and provide samples to associated projects. For adult herring acoustic surveys, gillnets, castnets and jigs were the primary validation method due to ADFG permit stipulations.

The primary objectives for the *Direct Capture* study include:

1) Improve capture methods used to validate 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.

Table 1. Prince William Sound Herring Research and Monitoring projects that this validation project is collecting sample for.

Project	Agency	Species provided
Acoustic Validation	PWS Science Center	All species – measurements only
Condition Index	PWS Science Center	Juvenile herring
Genetic stock structure	ADFG	Adult herring
Disease	USGS	Juvenile herring
Energetics	NOAA Auke Bay	Juvenile herring/walleye pollock
Growth RNA/DNA	NOAA Auke Bay	Juvenile herring
Age at First Spawn	NOAA Auke Bay	Adult Herring

Expanded Adult Herring Survey. The first expanded adult herring acoustic survey was conducted from 27 March – 5 April 2013 aboard the *M/V Auklet*. The primary objective of this expanded survey is to locate schools of adult herring in Prince William Sound, specifically by searching areas that have been previously excluded from past adult herring acoustic surveys. We started our survey in Port Gravina and Fidalgo, moving up the Valdez arm; after which we headed across the Sound and through Montague Strait and the southwest passages, and then back up Knight Passage to the NW portion of the Sound making our way back east toward Port Gravina. During the initial daytime survey we used the Auklet's depth sounder to look for areas with signs of adult herring. Nighttime acoustic transects were conducted in areas that displayed the most acoustic noise on the depth sound indicative of potential herring schools. Acoustic transects were conducted in Gravina, Fidalgo, Rocky and Cedar Bays.

We collected fish primarily using jigs and gillnets, and to a lesser extent castnets (Table 1). 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. Fishing method and net depth (20-25 m) varied by bay and were dictated by depth, type and strength of acoustic signature. Adult herring gillnets (60' x 16'; 3/4, 1, 1 ¼, 1 ½") were utilized in Fidalgo, Rocky and Cedar Bays, while jigging and castnetting (6 ft; 3/16" mesh) was conducted within Port Gravina. Within Cedar Bay we also deployed a juvenile herring gillnet (60' x 16'; ¼, 5/16, 3/8") along the ice edge at the mouth of the bay due to presence of a strong juvenile acoustic signature in this portion of the bay.

Juvenile Herring Surveys: Fall Intensives and November Abundance Index. To prepare for the upcoming fall juvenile herring surveys, we made adjustments to our trawl winches by

installing a new mono-block valve bank with power beyond capabilities along with larger diameter hydraulic hoses and JIC fittings. This was necessary to mitigate the hydraulic flow and pressure problems that had significantly reduced our trawling capabilities during the November 2012 Juvenile Herring Index Survey. On 15 March 2013 we tested out the trawl to ensure it was fully functional and that we had the necessary power to deploy and retrieve the net. Overall, the modifications were a success.

Additional improvements to our trawling set-up included installing stanchions aboard the *R/V Montague*, as well as canting out the trawl wenches to ~ 45 ° angles to better align towlines to stanchions and to improve net spreading capabilities. We installed an idler system to relieve tow line and bridle tension when deploying and retrieving the net, thereby ensuring an increased level of safety for the vessel crew and PWSSC scientists. In addition, we purchased two mini-CTDs (StarOddi) which are attached to the net during deployment to monitor head- and foot-rope depth and corresponding environmental conditions (salinity and temperature) during the course of each trawl.

For juvenile herring, we sampled 8 bays (Simpson, Port Gravina, Fidalgo, Eaglek, Lower Herring, Whale, Zaikof and Windy Bays; Fig. 1) during 6-13 November 2013 as part of the Juvenile Herring Abundance Index. Additionally, from early October through early December 2013 we conducted a series of intensive surveys of juvenile herring in Simpson and Windy Bays approximately every two weeks. For each intensive survey (n = 4) we sampled both bays over a a three night period (Fig. 2). All research was conducted aboard the M*/V Montague*. For all of these surveys, the primary collection method was a sweeper mid-water trawl (14 X 11 X 22 m) with a mesh size of 38 mm dropping down to a 12 mm mesh liner at the codend.

For each sampling event (N = 67), the trawl was towed at 1.8 ± 0.2 kt (± SD) for an average of 16 ± 6 min generally at 20-24 m over water depths of 25 to 170 m. To collect additional samples needed to support congruent studies under the larger herring research program we supplemented our trawling efforts with gillnets (60'X 16'; 1/4, 5/16, 3/8" mesh) and castnets. Nets were deployed opportunistically while at anchor. All fish collected to validate the acoustic surveys regardless of species were measured (SL, FL, TL; mm) and weighed (g). All herring samples were then separated for future analysis by the other four studies (Table 1). All other bycatch was either released alive immediately after capture or retained for further analysis.

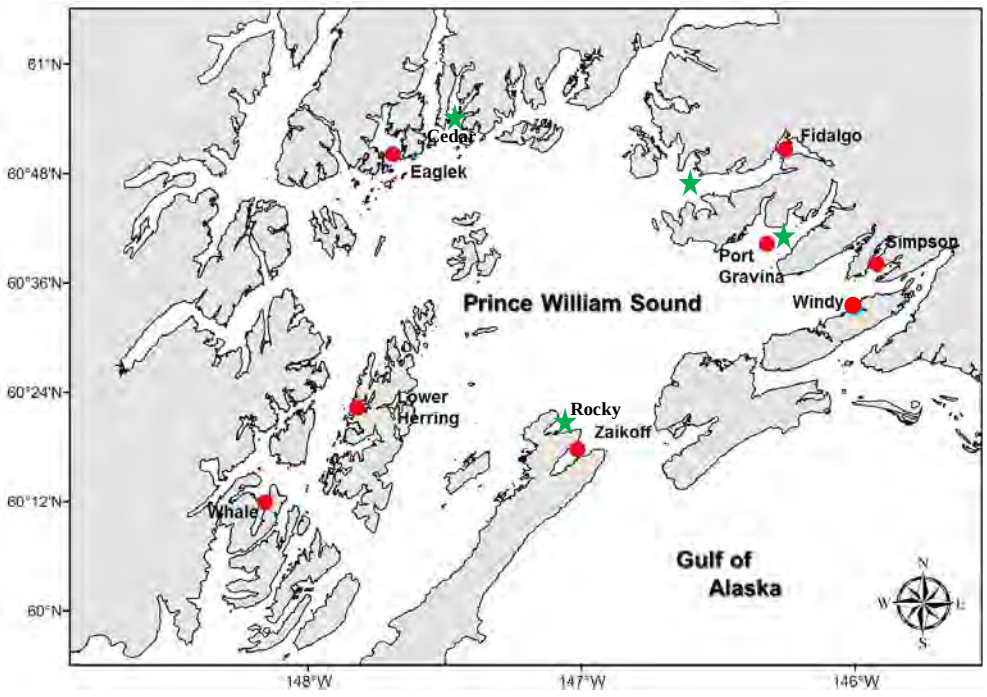


Figure 1. Location of acoustic surveys and corresponding validation efforts conducted March-April 2013 for adult herring (green stars) and October-December 2013 for juvenile herring (red circles).

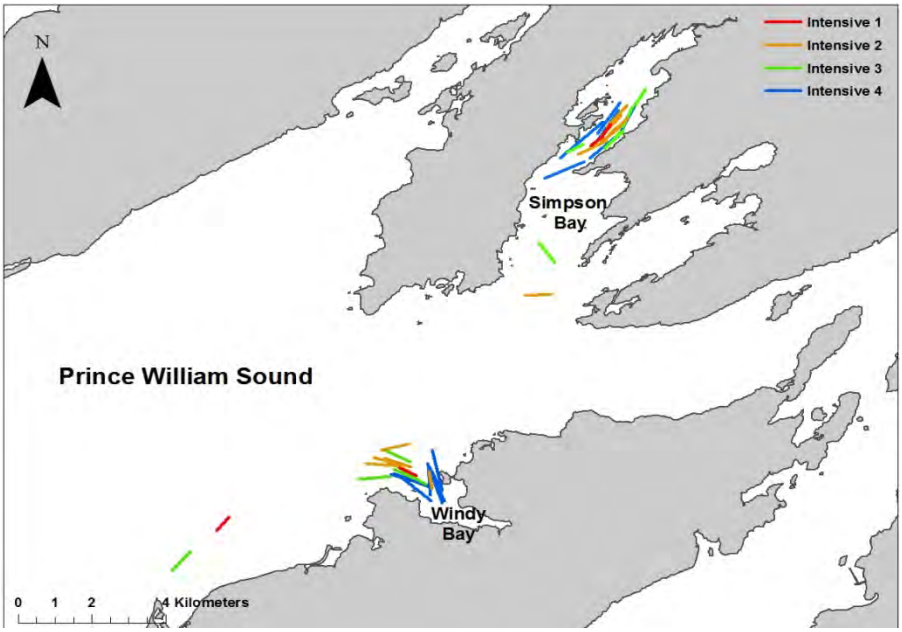


Figure 2. Locations of trawls conducted for each intensive survey in Simpson and Windy Bays.

Based on the experience and results from this falls acoustic surveys and corresponding trawling efforts, it has become apparent that additional modifications to the trawl are still necessary to ensure optimal functionality. Currently, we are able to obtain approximately a 5-6:1 scope of towline deployed to actual fishing depth and can only reach fishing depths of 30-35 m regardless of conditions or tow speed. To improve upon our scope and depth capabilities we will be doubling the weight of the foot-rope lead lines as suggested by the net manufacturer and decreasing the length of chain attached to the bottom towline, helping the trawl to dive deeper by adding weight to the wing tips and decreasing the angle of the bridle as it reacts to the trawl. If future adjustments are still needed, we will consider adding an extra weight panel to our trawl doors. These adjustments will be made February 2014 before the start of our spring juvenile herring intensive acoustic surveys. Prior to the November 2014 Juvenile Herring Index Survey, we hope to purchase a trawlmaster system to allow us to monitor trawl depth, net spread and fullness in real-time.

Preliminary Results:

Expanded Adult Herring Survey. During the spring adult herring survey a total of 343 herring were captured across all study sites and capture methods. Of these, 317 were adults; with an average (±SD) standard length (SL) of 210.4 ± 19.8 mm, weighing 128.5 ± 43.9 g (Fig. 3). Of the bays surveyed, adult herring were captured within Fidalgo, Port Gravina and Rocky Bays. The remaining 26 individuals were juveniles collected at Cedar Bay averaging 77.8 ± 7.6 mm (Fig. 4) and weighing 4.8 ± 1.4 g. Walleye pollock (N = 2) was the only incidental bycatch species and was only collected within Rocky Bay, where the acoustic signature was indicative of a mixed school.

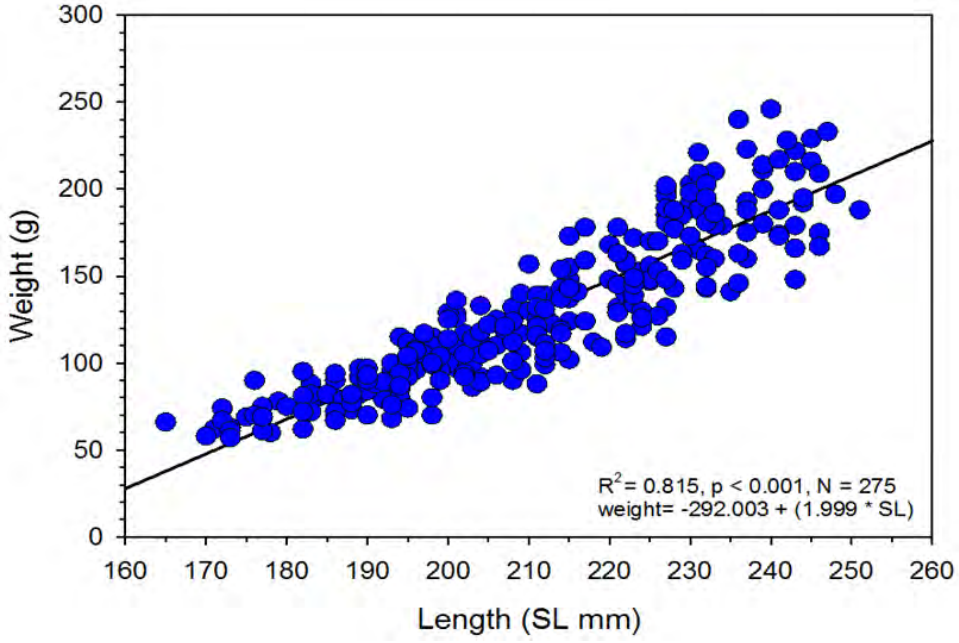


Figure 3. Length/weight regression of adult herring captured during the spring expanded adult survey.

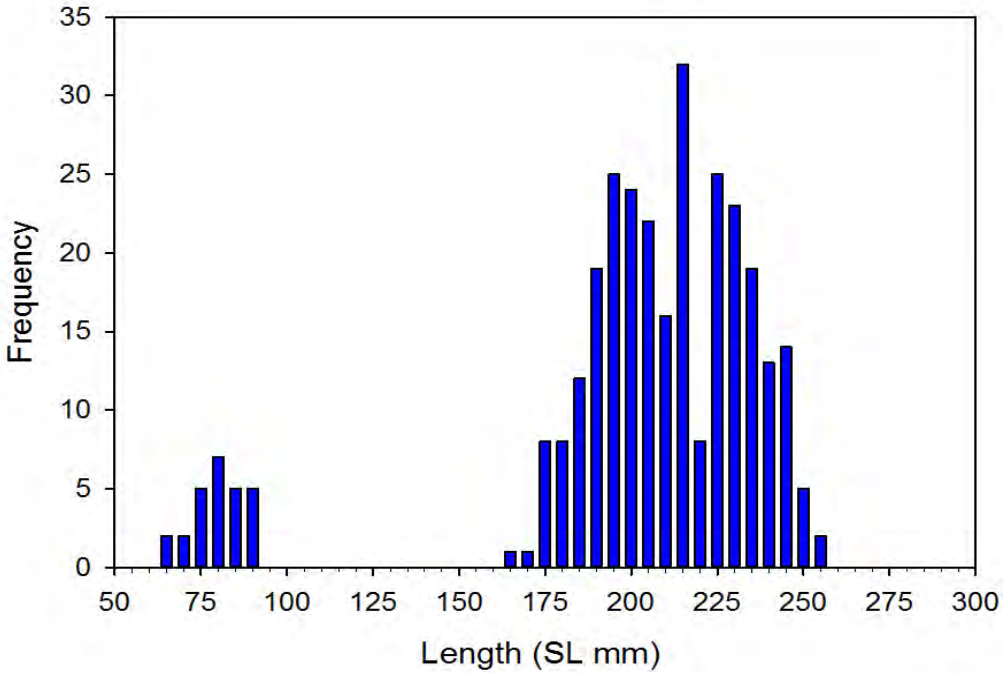


Figure 4. Length (SL, mm) frequency histogram of Pacific herring collected via gillnets, castnets and jigging during the expanded adult survey conducted 27 March – 5 April 2013.

Juvenile Herring Surveys: Fall Intensives and November Abundance Index. Juvenile herring surveys were conducted from 02 October - 06 December 2013 and were comprised of both the November Juvenile Herring Index cruise and four intensive cruises. During this time a total of 5297 fish representing 15 species were collected. Pacific herring, walleye pollock and capelin were the most abundant species across all bays and sampling methods (trawl, gillnet and castnet) (Fig. 5). Overall, Simpson and Zaikof bays showed highest species richness (n = 5). From the collected individuals, juvenile and YOY herring and walleye pollock were saved for analysis for five projects (Table 2).

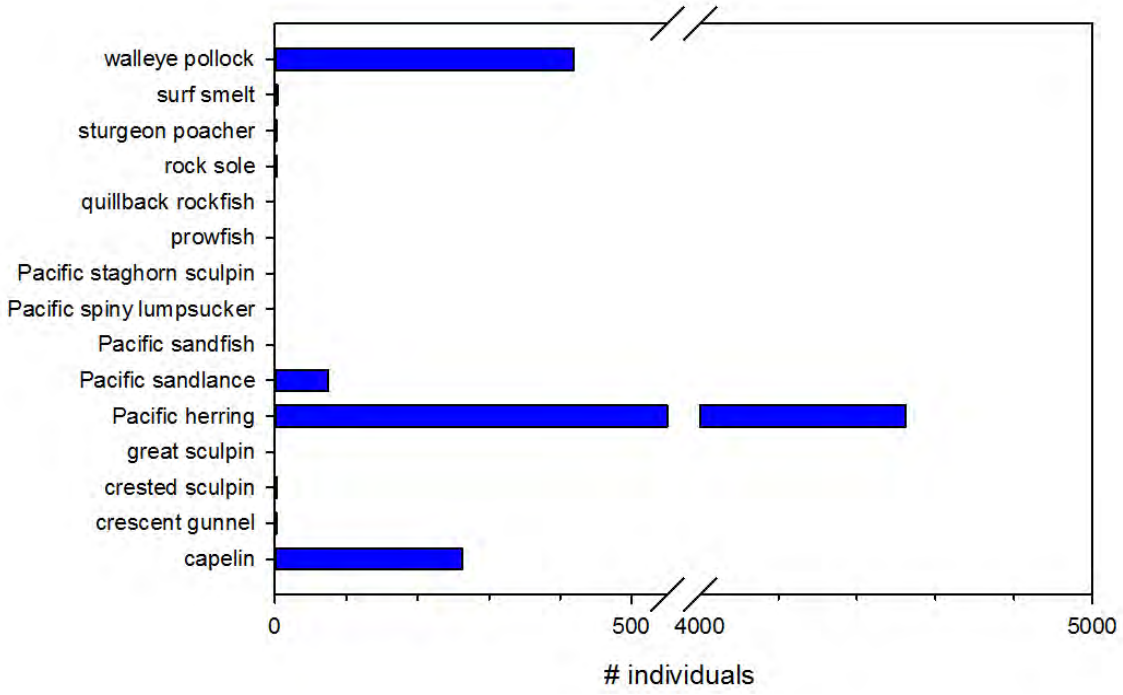


Figure 5. Total fish collected during fall 2013 juvenile herring cruises by species across all bays and sampling methods used for validation, disease, and energetics projects.

Table 2. List of shipped samples collected by date, location, species and recipient agency to be used for herring studies. Not shown are samples for PWS Science Center studies and sampled collected in December 2013.

Date Caught	Location	# Samples	Species	Agency
10/2/2013	Windy Bay	50	*Theragra chalcogramma*	NOAA
10/2/2013	Windy Bay	6	*Clupea pallasii*	NOAA
10/3/2013	Simpson Bay	9	*Theragra chalcogramma*	NOAA
10/3/2013	Simpson Bay	5	*Clupea pallasii*	NOAA
10/4/2013	Windy Bay	14	*Theragra chalcogramma*	NOAA
10/16/2013	Simpson Bay	16	*Theragra chalcogramma*	NOAA
10/16/2013	Simpson Bay	9	*Clupea pallasii*	NOAA
10/17/2013	Windy Bay	53	*Theragra chalcogramma*	NOAA
10/18/2013	Simpson Bay	11	*Theragra chalcogramma*	NOAA

10/18/2013	Simpson Bay	17	*Clupea pallasii*	NOAA
10/18/2013	Windy Bay	32	*Theragra chalcogramma*	NOAA
10/19/2013	Simpson Bay	7	*Theragra chalcogramma*	NOAA
10/19/2013	Simpson Bay	16	*Clupea pallasii*	NOAA
10/30/2013	Simpson Bay	57	*Clupea pallasii*	NOAA
10/31/2013	Windy Bay	5	*Clupea pallasii*	NOAA
11/9/2013	Lower Herring	60	*Clupea pallasii*	USGS
11/13/2013	Port Gravina	40	*Clupea pallasii*	USGS
11/20/2013	Cordova Harbor	60	*Clupea pallasii*	USGS

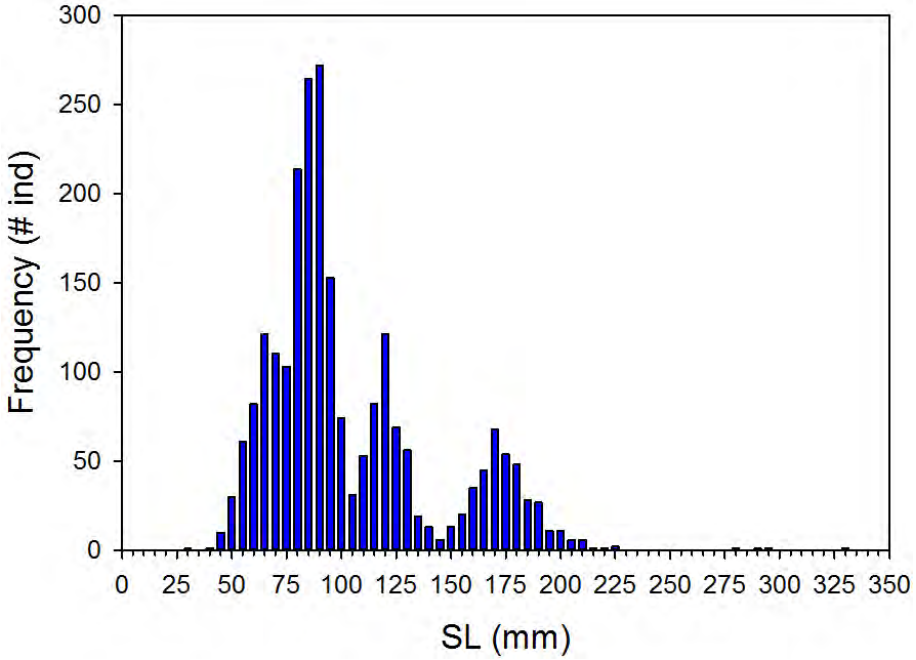


Figure 6. Length (SL, mm) frequency histograms of all fish caught using a mid-water trawl during the juvenile herring cruises.

The mid-water trawl used for acoustic validation of juvenile herring surveys was effective in collecting a wide range of sizes from larval fish through adults with standard length (SL) ranging from 26-330 mm (Fig. 6). While adult, juvenile and young of the year (YOY) Pacific herring and walleye pollock were represented within our catch (Fig. 7 & 8), only a limited number of individuals and age classes were represented for all the other species collected (Table 3).

Table 3. Invertebrate and fish species, size range (SL, mm), catch-per-unit-effort (CPUE, # ind/km), standard deviation and frequency of occurrence from mid-water trawls (N = 67). Prince William Sound, Alaska, 02 Oct—06 Dec 2013.

Common Name	Size Range (SL, mm)	Average CPUE (# ind/km)	CPUE SD (# ind/km)	Frequency of Occurrence
Capelin	40-123	15.65	26.72	0.40
crested sculpin	128	1.35	0.00	0.01
Pacific herring (adult)	160-225	26.79	45.16	0.06
Pacific herring (juvenile)	116-159	47.41	105.96	0.28
Pacific herring (YOY)	42-115	125.89	362.19	0.64
Pacific sandfish	107	1.13	0.00	0.01
Pacific spiny lumpsucker	45	1.36	0.00	0.01
Pacific staghorn sculpin	163	1.38	0.00	0.01
Prowfish	26	0.89	0.00	0.01
quillback rockfish	280	0.81	0.00	0.01
northern rock sole	115-135	4.58	0.00	0.01
sculpin (unknown spp)	180	1.20	0.00	0.01
sturgeon poacher	140-144	1.27	0.19	0.03
surf smelt	130-167	1.19	0.42	0.03
walleye pollock (adult)	180-330	2.18	2.04	0.27
walleye pollock (juvenile)	137-179	10.84	17.86	0.54
walleye pollock (YOY)	46-105	5.22	5.37	0.61
shrimp (all species)		5.68	8.69	0.22

For 66 of the 67 trawls conducted between October and December 2013, jelly fish combined with ctenophores represented the largest proportion of total catch, with jellies representing on

average 93% of the total biomass collected for any given trawl (Fig. 9). Based on mid-water trawls, YOY herring and YOY walleye pollock were captured most frequently within 64% and 61% of the 67 trawls respectively; followed by juvenile walleye pollock, capelin, juvenile herring and adult walleye pollock. All other species were only caught in 6% or less of the trawls. Catch per unit effort was greatest for YOY, juvenile and adult herring followed by capelin and juvenile walleye pollock (Table 3).

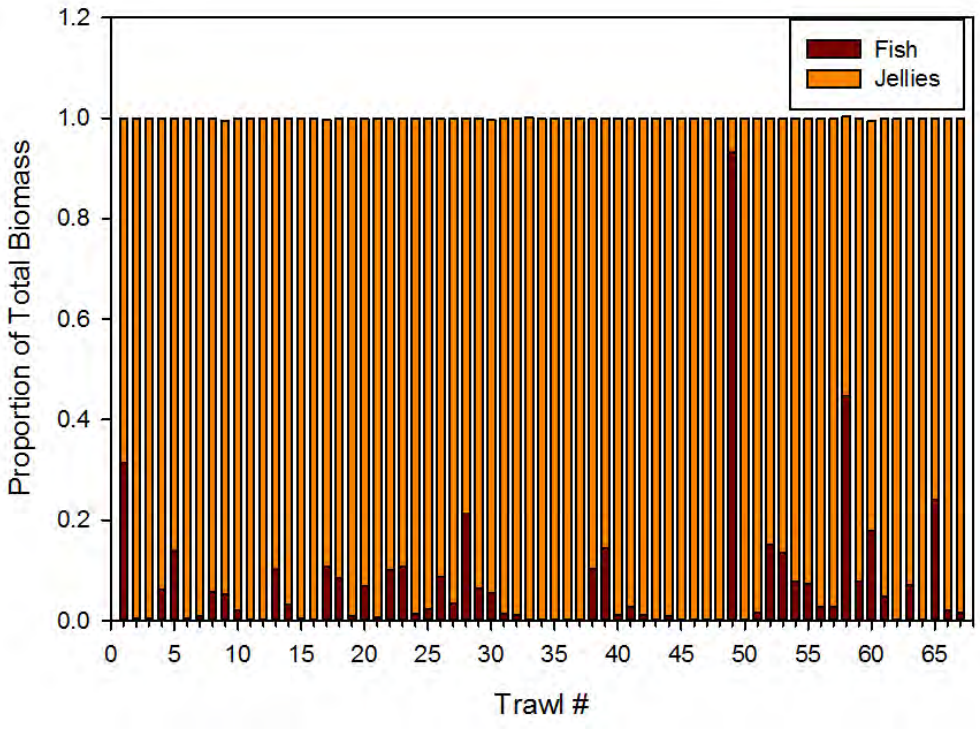


Figure 9. Proportion of total biomass comprised of fish (purple) and jellyfish/ctenophores (orange) by trawl number.

When comparing Simpson and Windy Bays, the two bays sampled as part of the juvenile herring intensive surveys, Simpson was consistently more diverse and yielded a significantly higher catch than Windy (Fig. 10 & 11). While the number of herring collected remained low in Windy Bay and did not fluctuate over the course of the study period, Simpson showed a peak in YOY herring numbers during late October and a peak in juvenile herring in early November (Fig. 12 & 13). Adult herring were only collected in one trawl conducted in Windy Bay on 4 December. Overall, trawl speed, trawl depth or time of day, or conditions did not have a significant effect on YOY or juvenile CPUE (Table 4).

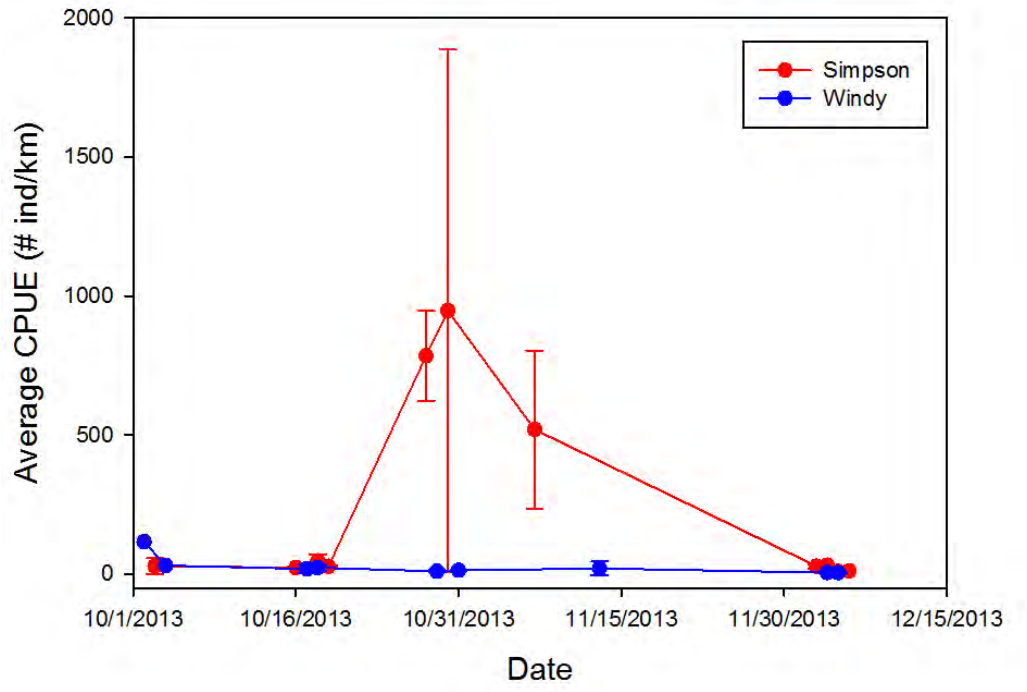


Figure 10. Average (± SD) CPUE for all individuals regardless of species collected by date within Simpson and Windy bays.

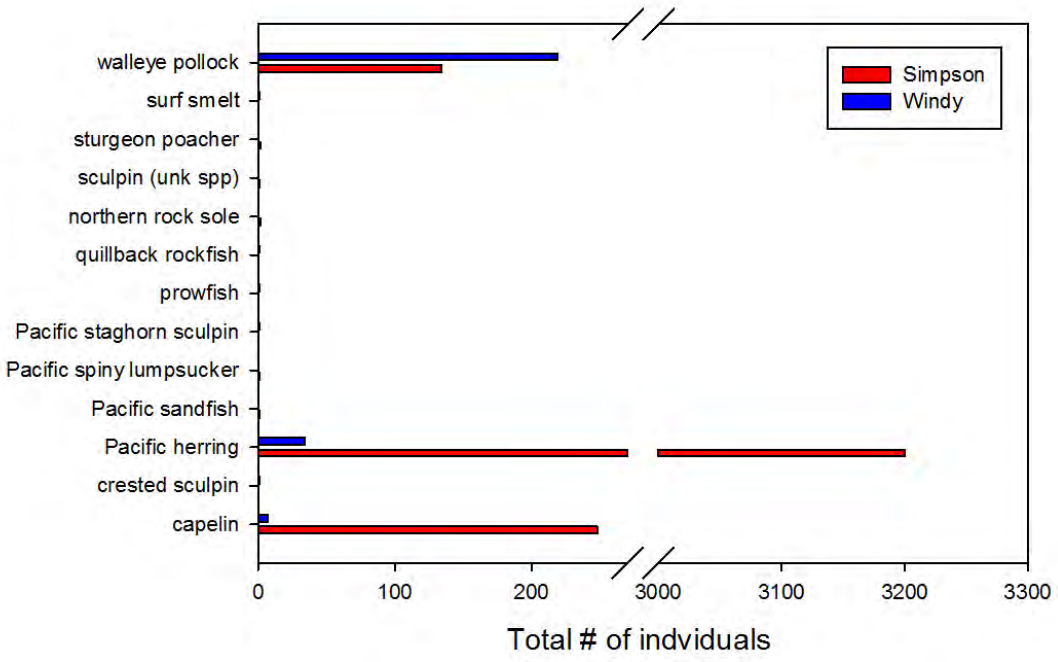


Figure 11. Total number of individuals collected by species using a mid-water trawl within Simpson Bay (n = 21 trawls) and Windy Bay (n = 24 trawls); 02 October—06 December 2013.

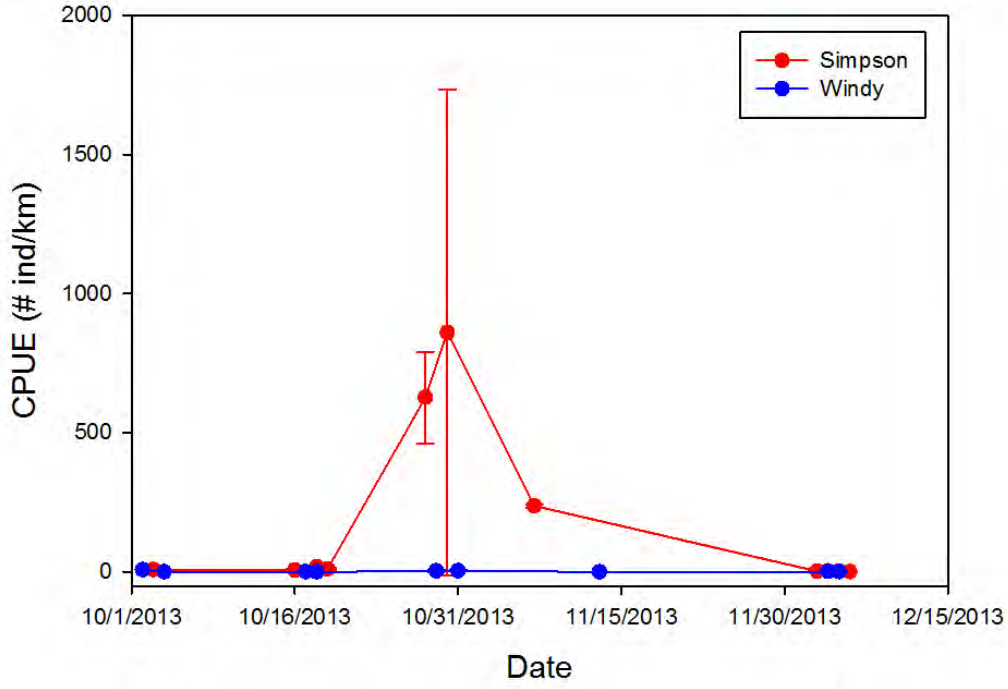


Figure 12. Average (± SD) CPUE for age-O herring (< 115 mm, SL) collected by date within Simpson and Windy Bays.

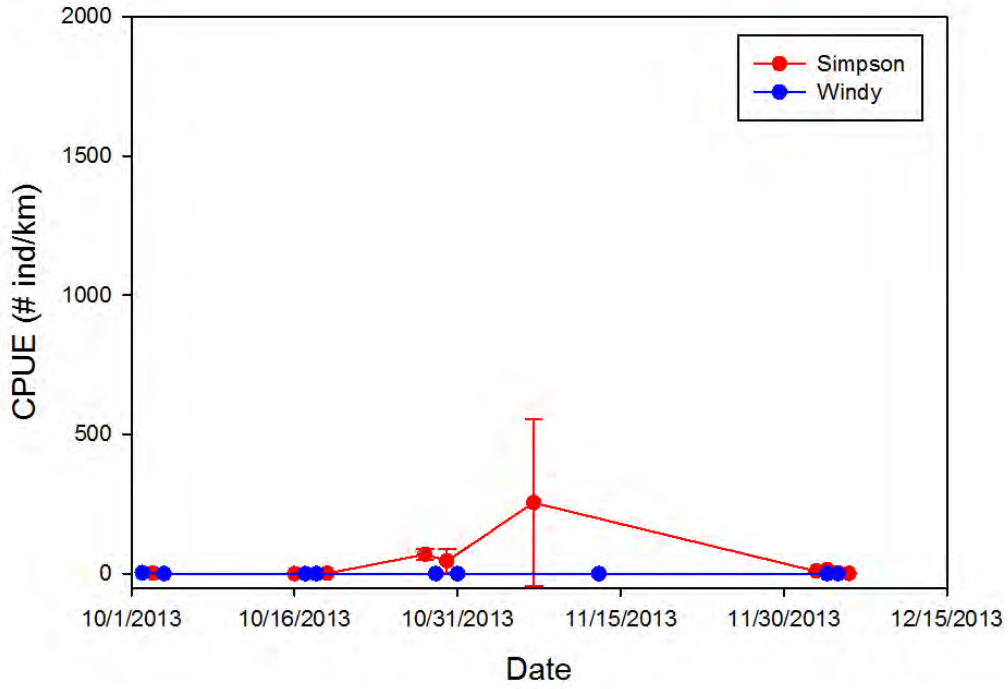


Figure 13. Average (± SD) CPUE for juvenile herring collected by date within Simpson and Windy Bays. Herring with SL >115 and < 160 mm were considered juvenile herring.

8. Table 4. Catch per unit effort for juvenile and YOY herring and corresponding average trawl depth, bottom depth and conditions (water temperature, salinity and sea state), as well as date, time and location for each trawl conducted within Windy (N = 24) and Simpson bays (N = 21).

Intensive #	Bay	Date (dd_mmm-yy)	Time (hh:mm)	Juvenile CPUE (# ind/km)	YOY CPUE (# ind/km)	Avg Trawl Depth (m±SD)	Bottom Depth (m)	Avg Water Temp (°C±SD)	Avg Salinity (PSU ± SD)	Beaufort Sea State (0-10)
1	Windy	2-Oct-13	23:02	3.794	7.589	21.7 ± 2.4	160	10.3 ± 0.2	28.8 ± 0.1	-
1	Simpson	3-Oct-13	02:24		7.788	13.5 ± 1.7	58	10.1 ± 0.1	26.9 ± 0.1	-
1	Simpson	3-Oct-13	22:09	2.291	9.164	19.6 ± 2.8	67	9.2 ± 0.2	27.3 ± 0.2	-
1	Windy	4-Oct-13	02:23			24.7 ± 3.8	170	10.6 ± 0.1	27.7 ± 0.6	-
2	Simpson	16-Oct-13	21:46		2.779	23.8 ± 2.3	40-120	10.2 ± 0.1	28.8 ± 0.1	1
2	Simpson	16-Oct-13	22:41		10.211	23.7 ± 2.1	65-70	10.1 ± 0.1	30.0 ± 0.1	1
2	Windy	17-Oct-13	02:36		1.900	20.5 ± 4.4	80	10.6 ± 0.1	30.2 ± 0.1	1
2	Windy	17-Oct-13	03:07	1.299		17.1 ± 5.1	80-150	10.5 ± 0.1	30.0 ± 0.2	1
2	Windy	17-Oct-13	21:53			23.2 ± 2.8	> 160	10.5 ± 0.03	28.4 ± 0.1	-
2	Windy	17-Oct-13	22:29			23.8 ± 2.8	> 160	10.5 ± 0.1	29.2 ± 0.2	-
2	Simpson	18-Oct-13	01:43		21.157	24.4 ± 4.4	55	9.9 ± 0.1	27.2 ± 0.7	3
2	Simpson	18-Oct-13	02:23		15.646	19.7 ± 2.4	55	9.8 ± 0.1	29.2 ± 0.1	2
2	Windy	18-Oct-13	21:14			22.3 ± 2.5	> 170	10.4 ± 0.03	30.2 ± 0.1	2
2	Windy	18-Oct-13	21:48			26.9 ± 2.4	> 170	10.3 ± 0.03	30.5 ± 0.1	2
2	Simpson	19-Oct-13	00:55	2.945	7.362	28.0 ± 2.2	60	9.8 ± 0.1	30.5 ± 0.04	1
2	Simpson	19-Oct-13	01:28		13.308	20.3 ± 2.4	60	9.9 ± 0.1	30.4 ± 0.1	1
3	Simpson	28-Oct-13	22:48	82.755	743.313	21.9 ± 3.2	60	9.6 ± 0.1	29.3 ± 0.8	2
3	Simpson	28-Oct-13	23:18	57.197	510.690	17.6 ± 1.9	60	9.7 ± 0.03	27.1 ± 0.4	2
3	Windy	29-Oct-13	03:12		7.254	19.3 ± 2.3	100	9.5 ± 0.03	28.6 ± 0.5	3
3	Windy	29-Oct-13	20:49		1.368	27.9 ± 3.9	115-140	10.0 ± 0.04	30.9 ± 0.5	4
3	Windy	29-Oct-13	21:46		2.663	16.0 ± 2.0	> 150	9.9 ± 0.1	29.0 ± 1.7	4
3	Simpson	30-Oct-13	00:50	64.435	1793.449	21.5 ± 2.3	40-42	9.4 ± 0.2	29.5 ± 0.1	2
3	Simpson	30-Oct-13	01:19	98.983	1410.503	21.3 ± 2.6	42	9.5 ± 0.1	30.9 ± 0.1	2
3	Simpson	30-Oct-13	21:14		9.843	17.0 ± 2.2	50	9.8 ± 0.1	28.5 ± 0.1	1
3	Simpson	30-Oct-13	21:57	22.254	230.629	21.0 ± 3.5	60-69	9.7 ± 0.1	28.2 ± 0.3	1
3	Windy	31-Oct-13	02:02		2.753	26.1 ± 4.4	80-130	10.0 ± 0.02	31.2 ± 0.4	3
3	Windy	31-Oct-13	02:37		5.745	18.1 ± 2.3	120-144	10.0 ± 0.02	31.0 ± 0.4	3
index	Simpson	7-Nov-13	00:36	466.547	233.274	24.4 ± 3.2	52	9.5 ± 0.04	30.4 ± 0.7	2
index	Simpson	7-Nov-13	01:00	43.679	241.521	13.4 ± 2.9	54	9.7 ± 0.1	30.2 ± 0.2	2
index	Windy	13-Nov-13	19:40			22.9 ± 2.2	124-150	9.7 ± 0.1	32.0 ± 0.6	1

index	Windy	13-Nov-13	20:20			25.0 ± 3.7	>150	9.7 ± 0.1	32.3 ± 0.1	1
index	Windy	13-Nov-13	20:56			26.8 ± 3.1	73-150	9.8 ± 0.05	32.2 ± 0.4	1
4	Simpson	3-Dec-13	19:50	13.020	4.006	19.9 ± 2.3	49-58	8.5 ± 0.04	30.1 ± 0.1	1
4	Simpson	3-Dec-13	20:29	4.545	0.909	24.2 ± 2.2	40-55	8.5 ± 0.04	30.6 ± 0.2	1
4	Windy	4-Dec-13	00:29		0.853	23.5 ± 3.1	89-100	7.7 ± 0.3	32.5 ± 0.1	1
4	Windy	4-Dec-13	01:06			17.2 ± 1.9	80-100	7.6 ± 0.2	32.3 ± 0.1	1
4	Windy	4-Dec-13	19:52		2.567	21.9 ± 1.8	37-40	7.5 ± 0.2	32.4 ± 0.2	1
4	Windy	4-Dec-13	20:23		1.067	25.5 ± 3.1	29-78	7.6 ± 0.1	32.3 ± 0.1	1
4	Windy	4-Dec-13	20:57		1.134	21.0 ± 1.5	44-50	7.6 ± 0.2	32.4 ± 0.1	1
4	Simpson	4-Dec-13	23:51	13.860	3.465	21.6 ± 2.9	36-50	8.4 ± 0.1	30.4 ± 0.1	1
4	Simpson	5-Dec-13	00:31			21.8 ± 2.5	38-49	7.9 ± 0.1	31.0 ± 0.3	1
4	Windy	5-Dec-13	19:15		1.622	23.8 ± 1.9	30-45	7.4 ± 0.1	31.6 ± 0.1	1
4	Windy	5-Dec-13	19:54		0.810	20.6 ± 2.9	27-63	7.4 ± 0.1	31.4 ± 0.05	1
4	Windy	5-Dec-13	20:33			21.9 ± 2.1	44-85	7.2 ± 0.1	31.7 ± 0.1	1
4	Simpson	5-Dec-13	23:39	5.253	4.378	11.6 ± 4.1	20-63	8.0 ± 0.1	32.4 ± 0.1	1
4	Simpson	6-Dec-13	00:22	0.635	0.635	17.0 ± 2.3	42-73	8.0 ± 0.2	32.3 ± 0.3	1

Table 5. Status of project deliverables for this reporting period. No milestones were scheduled for FY 2013.

Deliverable/Milestone	**Status**
Mar/Apr *Expanded Adult Herring Survey* with validation & collections for genetics & age at first spawn	Completed, 27 Mar—5 Apr 2013
Oct through Dec *Juvenile Herring Intensive Acoustic & Validation Surveys;* collections for multiple herring projects	Completed, Intensive # 1: 1 Oct—4 Oct 2013 Intensive # 2: 15 Oct—18 Oct 2013 Intensive # 3: 28 Oct—31 Oct 2013 Intensive # 4: 3 Dec—6 Dec 2013
Nov *Juvenile herring abundance index* with hydroacoustic & validation surveys; disease, condition index & energetics collections	Completed, 5 Nov—15 Nov 2013

9. Information and Data Transfer: *See*, Reporting Policy at III (C) (8).

Principal investigator Bishop attended the April 2013 EVOS Herring meeting in Cordova.

Data sets and associated metadata for November 2012 through December 2013 have been uploaded to the herring portal.

Both Bishop and McKinzie, participated in the metadata (Morpho) training workshop

Bishop, M.A. Sampling herring – no school please! *Delta Sound Connections*. April 2013. A popular press article describing the project was published in the 2013 *Delta Sound Connections* (circulation ~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.

10. Response to EVOSTC Review, Recommendations and Comments: *See*, Reporting Policy at III (C) (9).

The acoustic program is dependent on direct capture to provide information about the organisms being ensonified to be able to convert the signal to a biomass measurement. The capture program also provides fish for the energetics and growth, disease prevalence, and genetics projects.

We have converted the technology from a single beam acoustic system to a split beam unit because we realized that the older unit was no longer the most appropriate technology. In theory this should not change the biomass estimate provided by the two units. The practicality is that the error margins on the acoustic estimate caused by survey error are much larger than those associated with the acoustic signal. The changes in survey protocols are something we are examining for their impact on our estimates of juvenile populations. We have not modified the protocols for adult surveys.

The retrospective analysis would be the responsibility of Buckhorn, P.I. in the acoustic survey projects. The question at hand is if different portions of the pattern can be attributed to different fish assemblages. For instance, are age-0 herring found in schools in the top 15 meters only? We agree about the importance of getting peer reviewed methodology in place.

11. Budget: *See*, Reporting Policy at III (C) (10).

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 (*will vary by proposer*)	$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	N/A
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:
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.

Underbudget on personnel: We experienced some delays in hiring personnel that have since been remedied, so we will be on track by the end of the next fiscal year.

Overbudget on equipment: When we originally wrote the proposal for this project we planned to use Dr. Rob Campbell's trawl. Unfortunately, Campbell lost this trawl during field work, forcing us to purchase a new sweeper mid-water trawl, along with doors and reel.

Overbudget on "Other" - we had to purchase stanchions for the trawl doors – something we had not originally budgeted for. These cost $4,986 – just under the $5000 minimum to be considered equipment.

ATTACHMENT C ***EVOSTC Annual Project Report Form***

Form Rev. 1.17.14

*Please refer to the Reporting Policy for all reporting, due date and technical submission requirements.

1. Project Number: *See*, Reporting Policy at III (C) (1).

13120111-B

2. Project Title: *See*, Reporting Policy at III (C) (2).

PWS Herring Program – Tracking Seasonal Movements of Adult Pacific Herring in Prince William Sound

3. Principal Investigator(s): *See*, Reporting Policy at III (C) (3).

Mary Anne Bishop

4. Time Period Covered by the Report: *See*, Reporting Policy at III (C) (4).

1 February 2013 to 31 January 2014

5. Date of Report: *See*, Reporting Policy at III (C) (5).

14 February 2014

6. Project Website (if applicable): *See*, Reporting Policy at III (C) (6).

Http://pwssc.org/research/fish/pacific-herring/

7. Summary of Work Performed: *See*, Reporting Policy at III (C) (7).

Adult Pacific herring in PWS disperse after spawning, but their movements are poorly understood. Observations from fishers suggest that they migrate out of PWS and onto the shelf. The original objectives of this proposal were to:

1) Field test the application of recent advances in acoustic telemetry on wild adult herring.
(2) Elucidate herring movement patterns between overwinter and spawning sites.
(3) Utilize the PWS acoustic arrays to monitor herring migration into and out of PWS.

Objective 2 relied on the Alaska Department of Fish and Game to capture adult herring in November for our tagging efforts. Due to capture difficulties with their seine, as well as recent technological changes that prevent the VR3 acoustic receiver array at Port Gravina from detecting the new generation of transmitters, we modified objective 2. This objective now focuses on capturing and implanting transmitters in prespawning herring when they are highly aggregated and relatively easy to capture using jigs. Our revised objective 2 is:

(2) Elucidate postspawn herring movement patterns.

Table 1. Status of project deliverables for this reporting period

Deliverable/Milestone	Status
Tag & monitor fish at spawn	Completed Apr-May 2013
Upload data from array	Completed May 2013.
no milestones are associated with the second year	

From 5-8 Apr 2013 we went to Port Gravina on the *MV Montague* to tag prespawning adult herring. While the day prior to our arrival, ~1.5 km of spawn had been noted at Redhead (sw Port Gravina), during our 4-day charter, no spawning occurred in Port Gravina. In addition, herring were relatively scarce, and as a result we spent a lot of time searching for schools to jig. Between 6-7 Apr we surgically implanted coded acoustic transmitters (Model V9-2L/2H, 69kHz) into 69 adult herring from 3 separate schools (24, 20 and 25 tagged). Mean SL (± sd) of tagged herring was 230.1 ± 11.3 mm (min = 197, max = 250; Table 2, Fig. 1). Using Alaska Department of Fish and Game age-length-weight data (S. Moffitt, ADFG, unpubl. data), we estimated that 62/69 fish were 7 years old (>216 mm), with the 8 year old class being the dominating class. Most of the tagged herring were ripe, with some males releasing milt while in captivity. Only 1 of 69 herring appeared to have previously spawned. Shortly after the final surgery within each tagging cohort, tagged fish and controls (untagged fish) were released simultaneously near a school (Fig. 2).

Table 2. Mean standard length (mm) and mean mass (mg) of acoustic tagged Pacific herring. Port Gravina, 6-7 Apr 2013.

	Standard Length (mm)		Mass (g)	
Sex	X ± sd	Min, Max	X ± sd	Min, Max
Female (N = 35)	230 ± 13	197, 250	184 ± 31	107, 250
Male (N = 31)	230 ± 10	208, 249	181 ± 30	111, 236
Unk (N = 3)	235 ± 2	232, 236	186 ± 10	174, 193

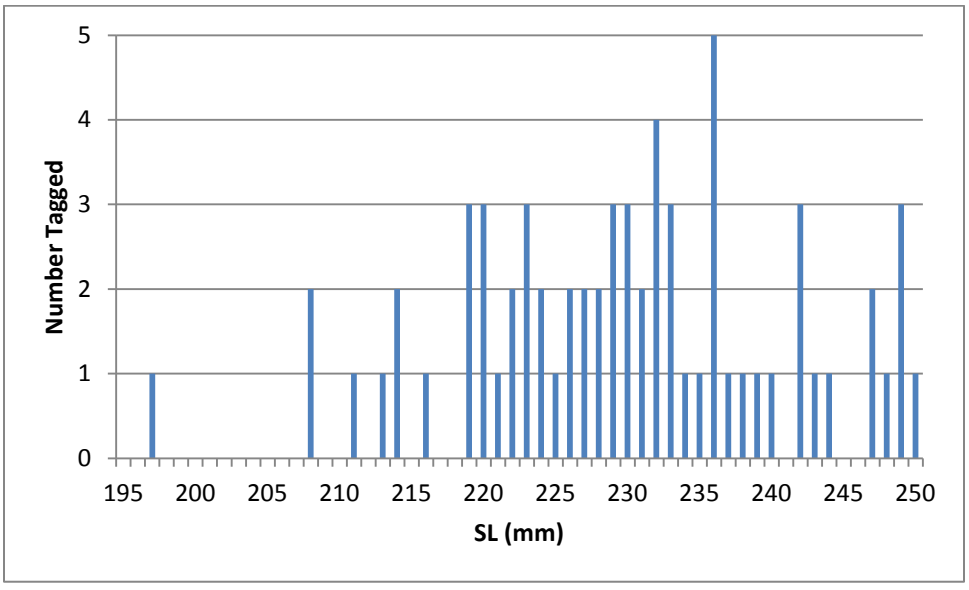


Fig. 1. Measurements of standard length (mm) of Pacific herring tagged at Port Gravina, 6-7 Apr 2013.

We installed a temporary acoustic array on 7 and 8 Apr 2013. The array was comprised of nine, VR2W receivers (Fig. 2). Eight of the nine receivers were retrieved on 21 May 2013 and data uploaded. One acoustic release (mfgr. Desert Star) malfunctioned, preventing recovery of that receiver (station ID 2013_7).

Figure 2. From 7 Apr - 21 May 2013, a series of 9 VR2W receivers (noted in red) were positioned in sw Port Gravina near our release sites (noted by green arrows).

Detections. We defined a valid detection as ≥ 2 detections during a 24h period. Of the 69 tagged individuals, only 7% (3 females, 2 males) were never detected at the three arrays for which we currently have data: Port Gravina, Hinchinbrook Entrance (HE) or Montague Strait (MS). At Port Gravina, 56 (81%) were detected at the array on one or more days. Most detections occurred over three distinct periods: 7-9, 15-16 and 20-26 Apr (Fig. 3). Of the 56 detected fish, 34 (61 %) fish left the array by 9-Apr and were not detected again in Port Gravina suggesting immediate emigration from the bay. The remaining 22 herring (39 %) left and returned over multiple spawning periods. One month after tagging three female herring remained present in Port Gravina with two still being detected on 21 May 2013 when the temporary array was removed (Fig. 3).

The March 2013 installation of six acoustic receiver arrays across the entrances to the Gulf of Alaska (GOA) has provided the first opportunity to detect movements from the Port Gravina spawning grounds to the GOA. These arrays are part of Canada's worldwide Ocean Tracking Network. The PWS Science Center maintains the six PWS arrays (Fig. 4). We uploaded data on 12 and 13 September 2013 from HE and MS arrays, but not from the arrays located in the four passages. At HE we were unable to upload data from one of the 16 receivers (receiver HE03).

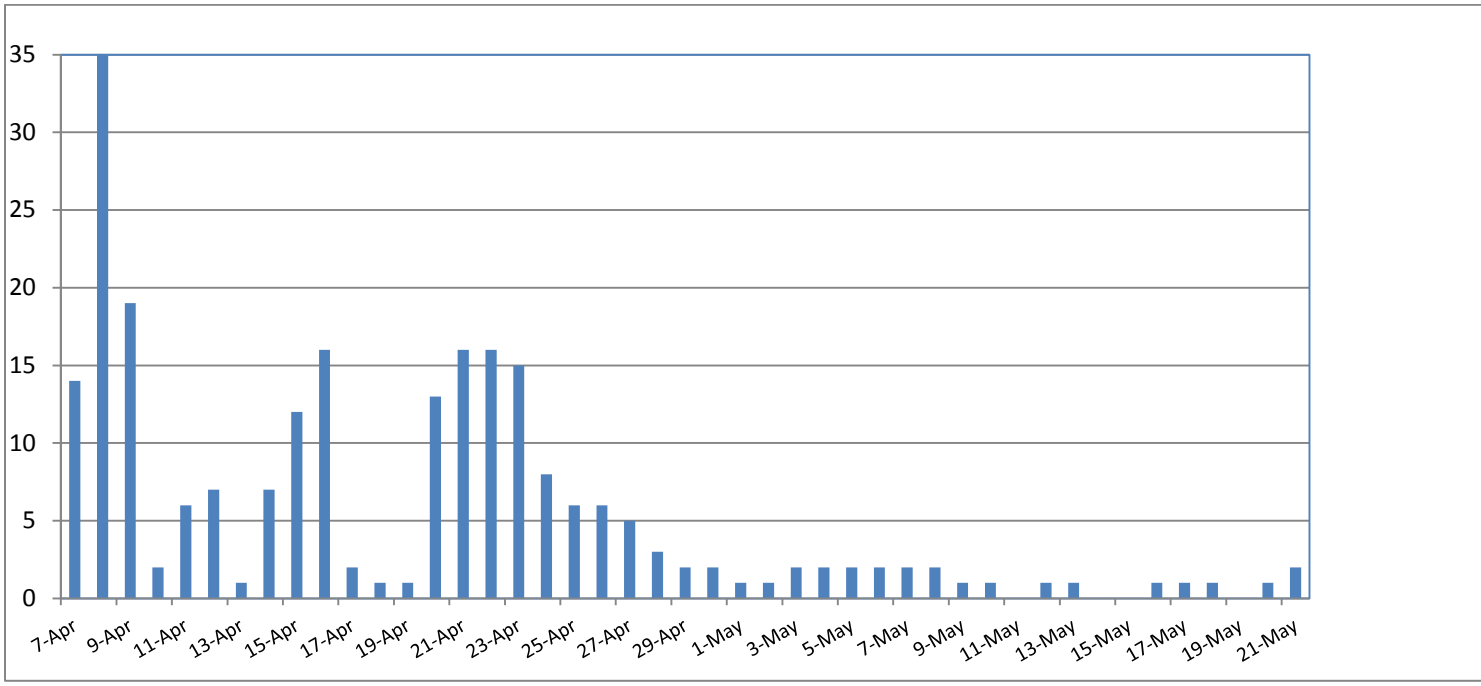


Fig 3. Number of acoustic tagged Pacific herring detected by date, Port Gravina, 7 Apr – 21 May 2013. Sixty-nine Pacific herring were acoustic tagged on 6 and 7 Apr 2013.

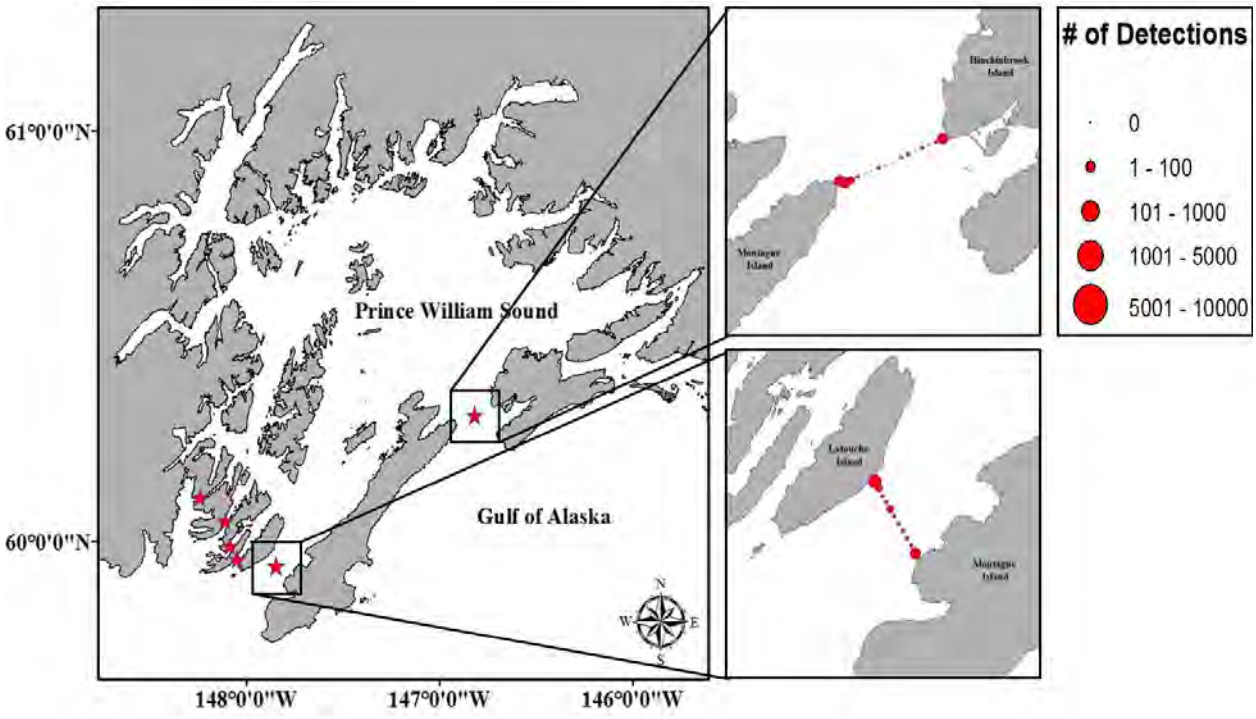


Figure 4. Location of six Ocean Tracking Network acoustic receiver arrays (red stars). Two small maps indicate number of detections by receiver for Hinchinbrook Entrance (top) and Montague Strait (bottom), 10 Apr – 12 Sep 2013.

A total of 58% (n = 40) of the 69 tagged herring were detected at one or both of the major entrances to the GOA (Table 3). Montague Strait recorded the higher number of tagged fish, with 33 of the 69 tagged fish detected compared with 14 tagged herring at HE. There was a striking gap in detections at both entrances from early July (HE) and late July (MS) through early September (Fig. 5) suggesting that fish may have moved out to the GOA.

At both HE and MS, tagged herring tended to be detected at the outermost receivers (Fig 4). Of detections recorded at HE (n = 7,330), the easternmost receiver (HE1) recorded 18%, while the two westernmost receivers recorded 41% (receiver HE15) and 37% (receiver HE16) of all detections. Of detections recorded at MS (n = 7,276), the easternmost receiver (MS01) recorded 19% of all detections while the westernmost receiver (MS11) recorded 74% of all detections. While there is seasonal variation, generally comparing these two entrances, HE is characterized by inflow from the GOA whereas at MS both sides of the channel are associated with outflow to the GOA. At both arrays, the strong association with the outermost arrays on the west side is probably due to a stronger outflow occurring along the western shoreline (Halverson et al. 2013).

Table 3. Number of tagged fish detected by array location and first and last dates of detections, 7 Apr to 12 Sep 2013.

Tagged Fish (n = 69)	Port Gravina	Hinchinbrook Entrance (HE)	Montague Strait (MS)
Total detected	56	14	33
% of total tagged	81%	20%	48%
First detection post tagging	56	1	7
% of total tagged	81%	1%	10%
Moved HE to MS	-	6	-
Moved MS to HE	-	-	1
Date of first detection	7 Apr	10 Apr	11 Apr
Date of last detection	21 May*	8 Jul	12 Sep*

*Port Gravina array removed 21 May 2013. Hinchinbrook Entrance & Montague Strait receiver data uploaded 12 Sep 2013.

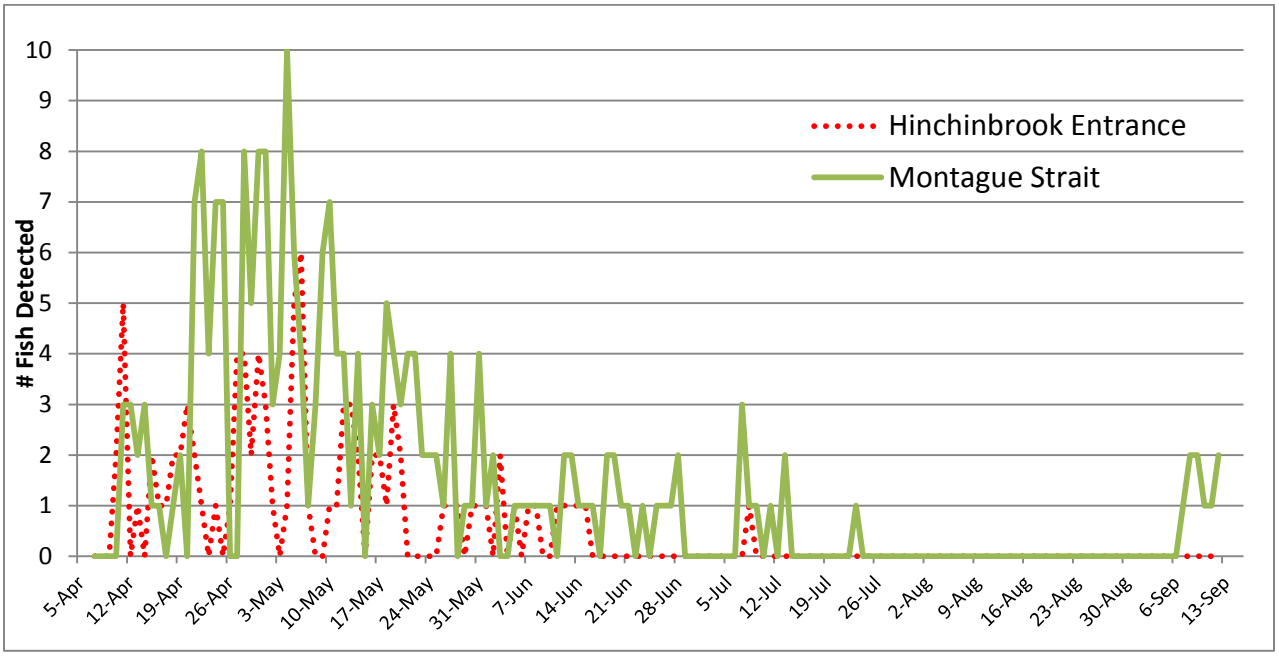


Fig. 5. Number of acoustic tagged Pacific herring detected by date at Hinchinbrook Entrance and Montague Strait arrays. No detections were recorded at Hinchinbrook Entrance from 9 Jul through 12 Sep 2013 upload, and at Montague Strait from 24 Jul until 7 Sep 2013. Fish were tagged at Port Gravina 6-7 Apr 2013. Data was uploaded at the two arrays 12 September 2013.

Movements to and between Hinchinbrook Entrance & Montague Strait.

Departure from Port Gravina was concentrated during two time periods: 6-10 Apr and 22-26 Apr (Fig. 3), and coincided with spawning activity in the area. Based on the number of days since tagging (i.e. herring not detected at the Port Gravina array) or last detection at Port Gravina array, herring were detected at HE array (~50 km from the Port Gravina array) on average 8.9 $\pm$ 10.1 d later (sd; n = 14; range = 2, 41d) and 24.8 $\pm$ 33.6 d (range = 3, 80) later at MS array (~113 km from Port Gravina). Movement from Port Gravina to both entrances was often rapid. Five of the 14 herring recorded at HE arrived from Port Gravina within 2 (n = 3) and 3 d (n = 2). Similarly at MS, five of the 27 herring recorded arrived from Port Gravina with 3 (n = 2) and 4 d (n = 3; Fig. 6).

We recorded six herring at HE that were later detected at MS (Table 4), while only one herring was first detected at MS and then later at HE. Of the six herring moving from HE to MS, four arrived at MS between 18-20 May, suggesting they may have been part of the same fish school.

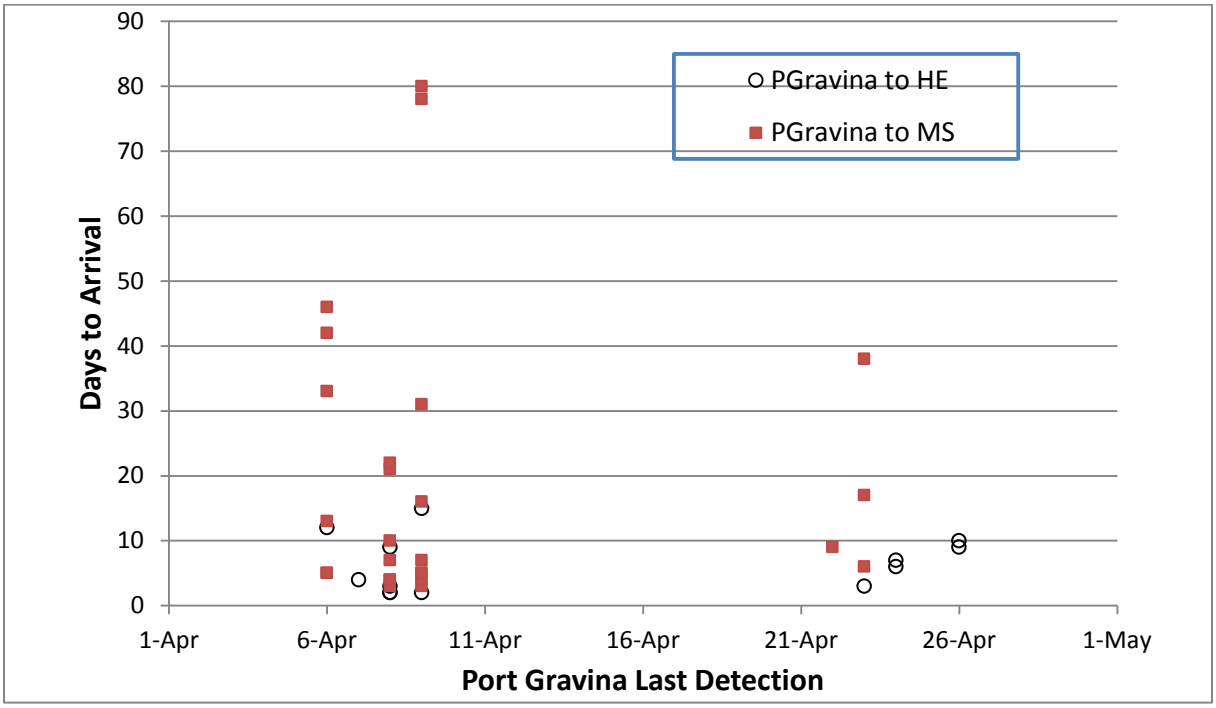


Fig. 6. Number of days from either release date (n = 7) or final detection at Port Gravina array (n = 33) to the first detection at Hinchinbrook Entrance (HE; circles) or Montague Strait (MS, squares). Herring were tagged at Port Gravina 6 and 7 Apr 2013. Not shown is 1 fish first detected at Montague Strait on 8 Sep (155 d after tagging).

Table 4. Summary description of herring initially tagged in 2013 at Port Gravina (PG) and that later moved between Hinchinbrook Entrance (HE) and Montague Strait (MS).

ID Code	Date tagged	PG last detection	HE first detection	HE last detection	MS first detection
9395	6-Apr	24-Apr	30-Apr	6-May	19-May
9403	6-Apr	24-Apr	1-May	4-May	20-May
9411	6-Apr	7-Apr	11-Apr	15-Apr	3-May
9432	7-Apr	8-Apr	10-Apr	11-Apr	14-Apr
9435	7-Apr	8-Apr	10-Apr	13-May	20-May
9436	7-Apr	8-Apr	11-Apr	6-May	18-May

Length of stay at Entrances

For each fish detected at MS and HE we calculated the length of time an individual herring was monitored at the array (first day detected to last day detected at that array) and the number of days an individual was present during the monitoring period. We defined a herring present at an array on days with $\geq$ 2 detections.

The total number of days monitored per individual herring ranged from 1-43 d at HE ($x = 17.6 \pm 14.6$) and at MS from 1-148 d ($x = 32.3 \pm 35.7$). Fish detected only one day, suggesting movement either out to or in from the GOA included 1 of 14 fish (7%) at HE and 5 of 33 fish (15%) at MS (Fig. 7). The proportion of days an individual was recorded ranged from 0 .21 – 1.0 ($x = 0.55$, $n = 14$) at HE and from 0.10 – 1.0 at MS ($x = 0.46$, $n = 33$; Fig. 8).

For each herring detected >1 d at MS and HE we calculated the maximum number of consecutive days it was detected. Results were similar at both arrays. At HE the maximum number of consecutive days averaged 3.1 d $\pm$ 1.5 (range 0- 5d, $n = 13$) while at MS it averaged 2.7 $\pm$ 1.6 (range = 0-6 d, $n = 28$). In conclusion, our preliminary results demonstrate the exceptional opportunity to document migration patterns by PWS herring, and specifically the connectivity between the Gulf of Alaska and Prince William Sound.

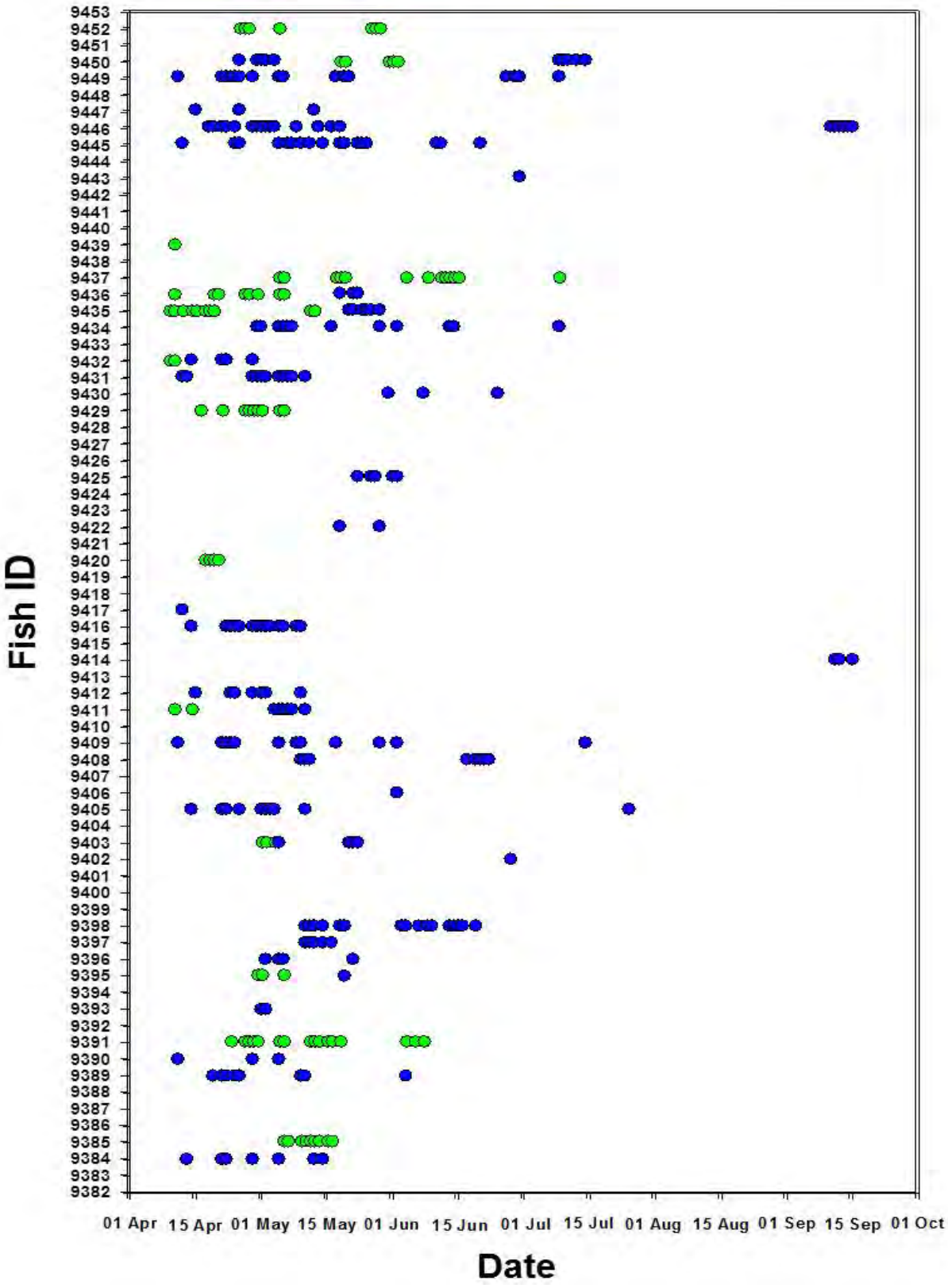


Fig. 7. Detection days for individual herring at Hinchinbrook Entrance (green) and Montague Strait (blue), 10 Apr through 12 Sep, 2013 when data was downloaded.

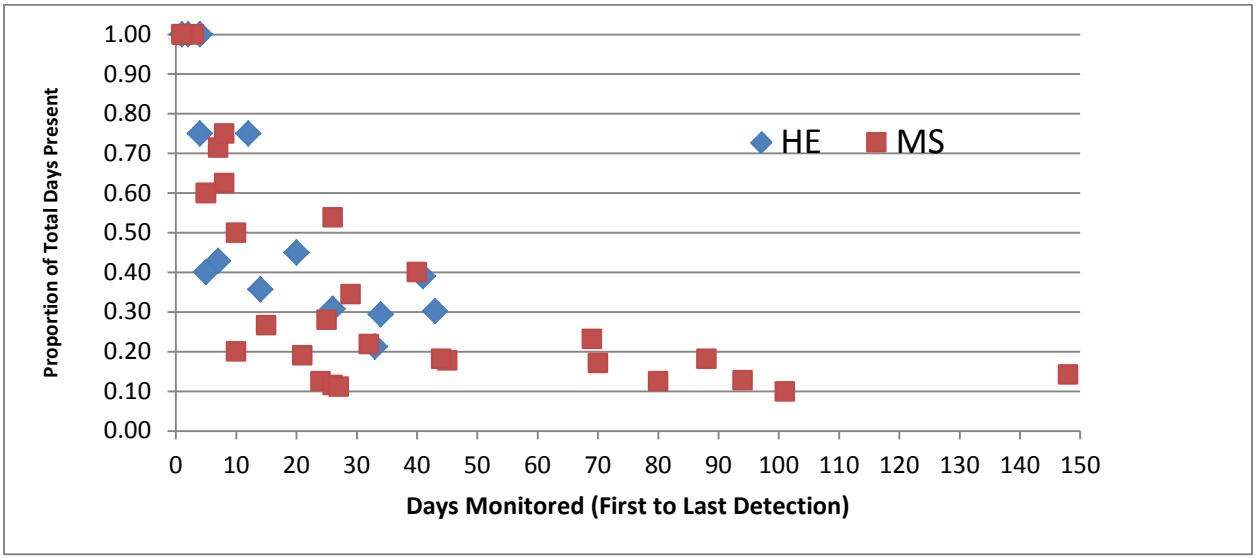


Fig.8. Total days monitored for individual tagged fish (first day detected to last day detected at HE or MS array) and proportion of monitored days detected. HE = Hinchinbrook Entrance; MS = Montague Strait. HE had 3 fish and MS 7 fish heard on all days monitored (proportion = 1.0).

14. Information and Data Transfer: *See*, Reporting Policy at III (C) (8).

Community presentations:

Bishop, M.A. Using Acoustic Telemetry to Determine Movements of Lingcod and Pacific Herring. Community Lecture. Mar 2013, Cordova.

Poster presentations:

Bishop, M.A., M. McKinzie, J. Eiler, B. Reynolds, and S. Powers. Using acoustic telemetry to monitor Pacific herring during spring spawning. Alaska Chapter American fisheries Society, Oct 2013, Fairbanks.

Popular science:

Bishop, M.A. New acoustic arrays to reveal if herring leave Prince William Sound. *2013 Delta Sound Connections,* May 2013. (With a circulation of 20,000, this annual newspaper is about the natural history of PWS and the Copper River Delta. It is distributed each May to airports and tourist areas in southcentral Alaska.)

Bishop, M.A. Where do herring go after spawning? http://pwssc.org/where-do-herring-go-after-spawning/ Prince William Science Center Breakwater. April 2013. Breakwater is the newsletter of PWSSC and is available on the PWSSC web site. It is distributed by mail to over 500 individuals and organizations, including PWSSC members, past and current funders, stakeholders, and community leaders in the central GOA region.

Data sets:

Data sets and associated metadata that have been uploaded to the program's data portal.

15. Response to EVOSTC Review, Recommendations and Comments: *See*, Reporting Policy at III (C) (9).

This project was designed as a proof of concept that has resulted in better than anticipated returns. The gender of the fish was identified during tagging. Objective 2 is unlikely to be achieved and the analysis is being revised. The shift in timing of the tagging allowed us to examine how long the fish remained near the spawning grounds (some for nearly two months) and determine when the fish leave and return to PWS. The change in timing shortened the duration that the tags needed to transmit to observe the movement out and into the Sound. The information from the acoustic arrays at the entrances was uploaded in early September and 41 of the 69 fish were observed at the entrances. There was a gap in time between detections and the fish were just starting to be detected again when the data was uploaded.

Since this was a demonstration project, it is now reaching its analysis phase. Dr. Bishop has been funded by NPRB to do other fish tagging work and has a technician with significant experience with acoustic tagging procedures. We feel we have enough expertise to complete the project as described, even without contributions from Dr. Powers.

16. Budget: *See*, Reporting Policy at III (C) (10).

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 (*will vary by proposer*)	$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	N/A
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:
Ocean Tracking Network: $337.2 in-kind equipment (6 acoustic arrays across major entrances Prince William Sound & Gulf of Alaska)
Ocean Tracking Network: $22.7 in boat time for uploading data in Sept 2013 & Feb 2014
Alaska Dept. Fish & Game: $12.0 for boat time (4 d@ $3.5/d to catch herring for tagging)
NOAA ~$10.0 for J. Eiler, in-kind personnel as collaborator on this projectl.

Overbudget on "Other" - This includes contractual costs for the 2012 spring charter to tag herring, (>$11,000) as well as the cost of upgrading acoustic releases for the tagging array ($>$1800) .

Form Rev. 1.17.14

*Please refer to the Reporting Policy for all reporting, due date and technical submission requirements.

1. Project Number: *See,* Reporting Policy at III (C) (1).

13120111-C

2. Project Title: *See,* Reporting Policy at III (C) (2).

Data Management Support for the EVOSTC Herring Program

3. Principal Investigator(s): *See,* Reporting Policy at III (C) (3).

Rob Bochenek

4. Time Period Covered by the Report: *See,* Reporting Policy at III (C) (4).

February 1, 2013-January 31, 2014

5. Date of Report: *See,* Reporting Policy at III (C) (5).

March 1, 2014

6. Project Website (if applicable): *See,* Reporting Policy at III (C) (6).

https://workspace.aoos.org/

7. Summary of Work Performed: *See,* Reporting Policy at III (C) (7).

From the beginning of the EVOS Herring project investigators have been focused on establishing protocols for data transfer, metadata requirements and initiating the data salvage effort. Investigators have been meeting and planning with Matt Jones to coordinate future activities. PIs have participated in several PI meetings and are coordinating activities between the Herring and LTM programs. In addition, the AOOS ocean workspace has been rolled out to PIs and their user and group profiles have been created. Several training seminars have been held via webinars and PIs are beginning to use the system to organize and consolidate their project level data. Software engineers at Axiom have also been working to support the workspace, resolving bugs and implementing new functionality in response to user feedback. The Herring Portal was released in September 2013 showcasing Herring projects resources alongside environmental data sets ingested by the project team.

Table 1. Project milestones status

Deliverable/Milestone	**Status**
GOA Data Portal Showcasing Herring data sets	Completed, 1 September 2013
Continue to support the transfer and documentation of Herring data sets. Auditing and restructuring/reorganizing	Ongoing
Continue to cultivate and support the functional capabilities of the AOOS Ocean Workspace to address Herring researcher needs	Ongoing

Improved Herring Portal project profile by exposing underlying file level metadata	Completed, 15 January 2014

The primary results produced by this project include the acquisition and documentation of Guf Watch PI-produced data sets and the aggregation of ancillary environmental data sets for integration into the AOOS GOA Data Portal. As a result of this, the Ocean Workspace has become more useful and easier to use. The increase in use by PIs is represented in the following figures.

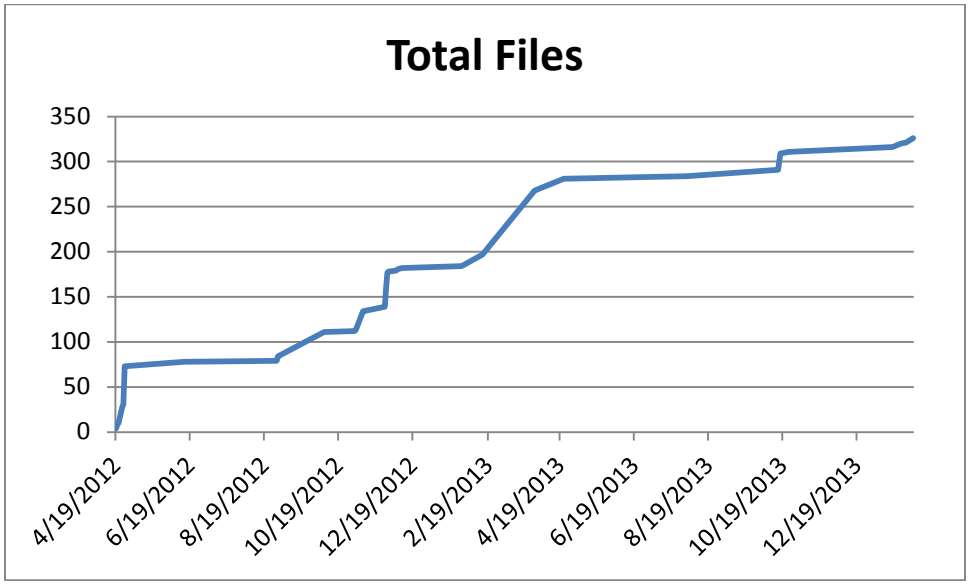


Figure 1. The number of files uploaded by Herring team members.

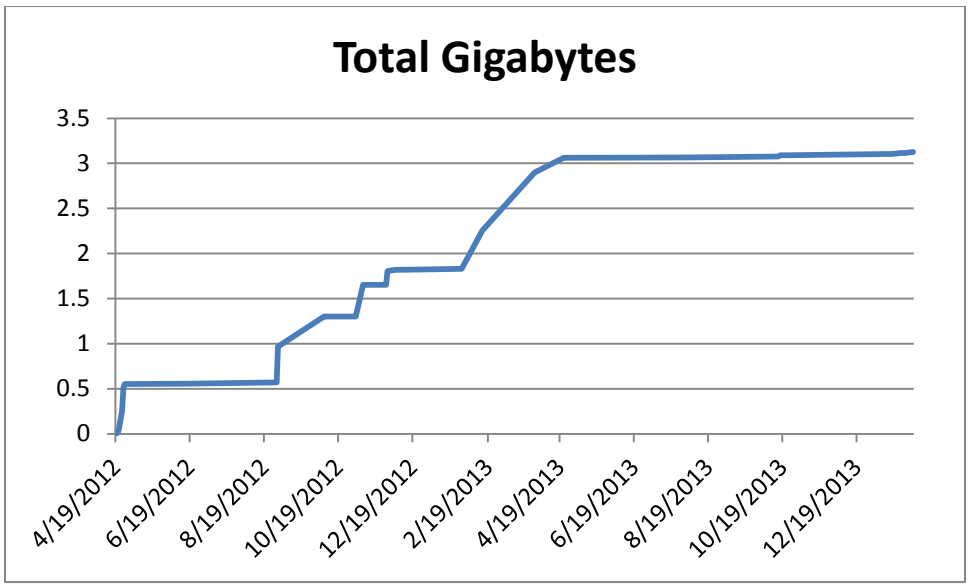


Figure 2. The amount of total storage used by Herring team members.

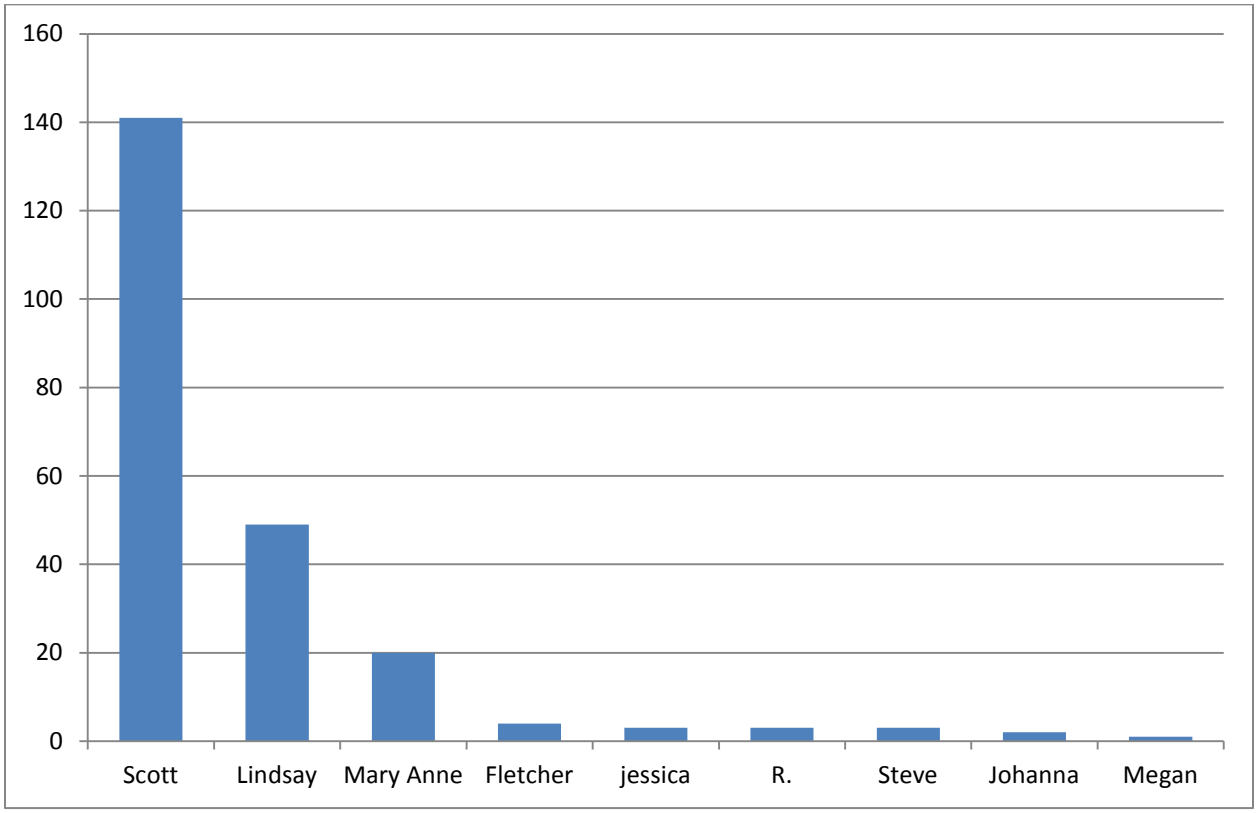


Figure 3. The distributions of file upload effort across Herring users.

The Ocean Workspace is a web-based data management application built specifically for storing and sharing data among members of scientific communities. Twelve regional and national research groups currently use the Workspace, which has over 200 active individuals sharing thousands of digital files. The Workspace provides users with an intuitive, web-based interface that allows scientists to create projects, which may represent scientific studies or particular focuses of research within a larger effort. Within each project, users create topical groupings of data using folders and upload data and contextual resources (e.g., documents, images and any other type of digital resource) to their project by simply dragging and dropping files from their desktop into their web-browser. Standard, ISO 19115-2 compliant metadata can be generated for both projects and individual files. Users of the Workspace are organized into campaigns, and everyone within a campaign can view the projects, folders and files accessible to that campaign. This allows preliminary results and interpretations to be shared by geographically or scientifically diverse individuals working together on a project or program before the data is shared with the public. It also gives program managers, research coordinators, and other stakeholders a transparent and front-row view of how users have structured and described projects and how their programs are progressing through time. The Workspace has the following capabilities:

Secure group, user, and project profiles — Users of the Workspace have a password protected user profile that is associated with one or more disciplinary groups or research programs. The interface allows users to navigate between groups in which they are involved through a simple drop down control. Transfer of data and information occur over Secure Socket Layer (SSL) encryption for all interactions with the Workspace. The Workspace supports authentication through Google accounts, so if users are already logged into their Google account (e.g., Gmail, Google Docs, etc.), they can use the Workspace without creating a separate username and password.

Metadata authoring — Metadata elements currently available to researchers in the Workspace are common to the Federal Geographic Data Committee (FGDC) designed Content Standard for Digital

Geospatial Metadata (CSDGM) and the ISO 19115 standards for geospatial metadata, extended with the biological profiles of those standards. Axiom also developed an integrated FGDC biological profile extension editor that allows users to search the ~625,000 taxonomic entities of the Integrated Taxonomic Information System (ITIS) and rapidly generate taxonomic metadata. Because the Workspace is a cloud-based service, researchers can move between computers during the metadata generation process in addition to allowing team members and administrators to simultaneously review and edit metadata in real time.

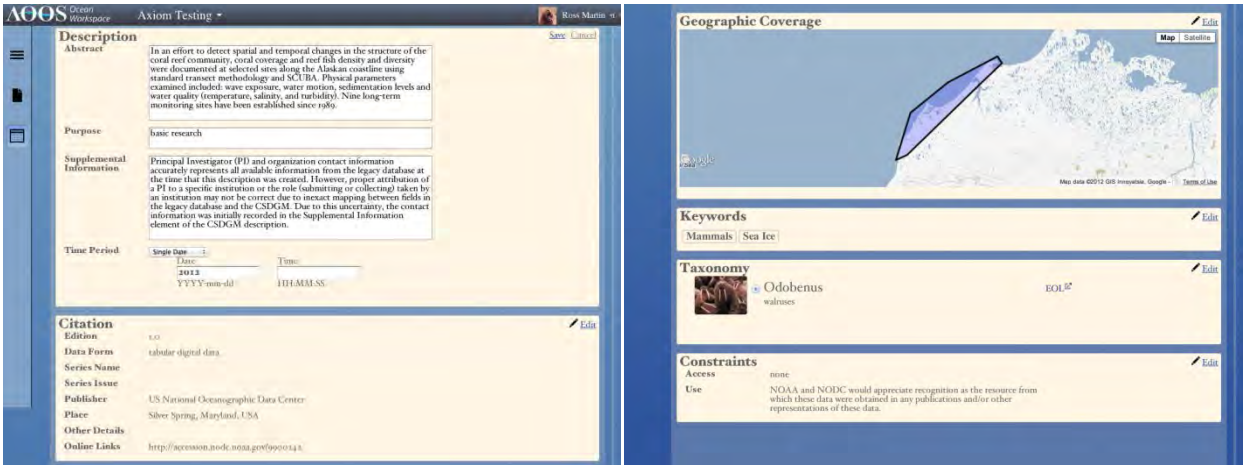


Figure 4. Screenshots of the Workspace metadata interface. The first screenshot shows the interface to author basic descriptive and citation metadata fields. The second screenshot displays a tool which allows researchers to describe the geographic extent of the project, keywords, taxonomic information and data constraints.

Advanced and secure file management — A core functionality of the Workspace is the ability to securely manage and share project-level digital resources in real-time with version control among researchers and study teams. Users of the Workspace are provided with tools that allow them to bulk upload files, organize those documents into folders or collections, create projects with predefined and user-created context tags, and control read and write permissions on files within projects. The Workspace also has the ability to track file versions: if a user re-uploads a file of the same name, the most current version of the file is displayed, but access is provided to past versions as well.

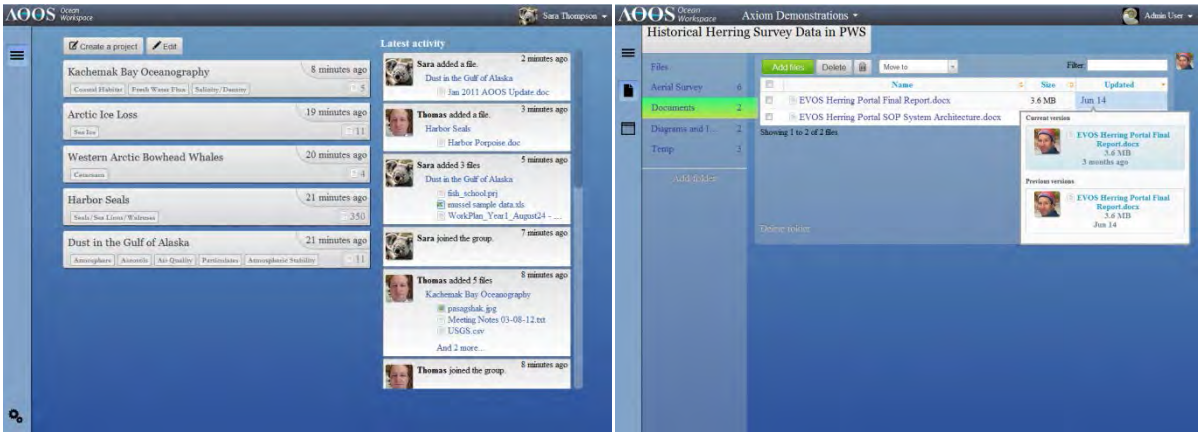


Figure 5. Screenshots of project and file management in the Workspace. The first screenshot shows a list of projects to which the example user has access rights. The second screenshot displays the interface a researcher would use to organize independent files into folders, and the way two versions of the same file are tracked by the Workspace.

The Data Management team also released the GOA Data Portal which integrates data and project information produced by Herring researchers with 260 additional GIS, numerical modeling and remote sensing data resources.

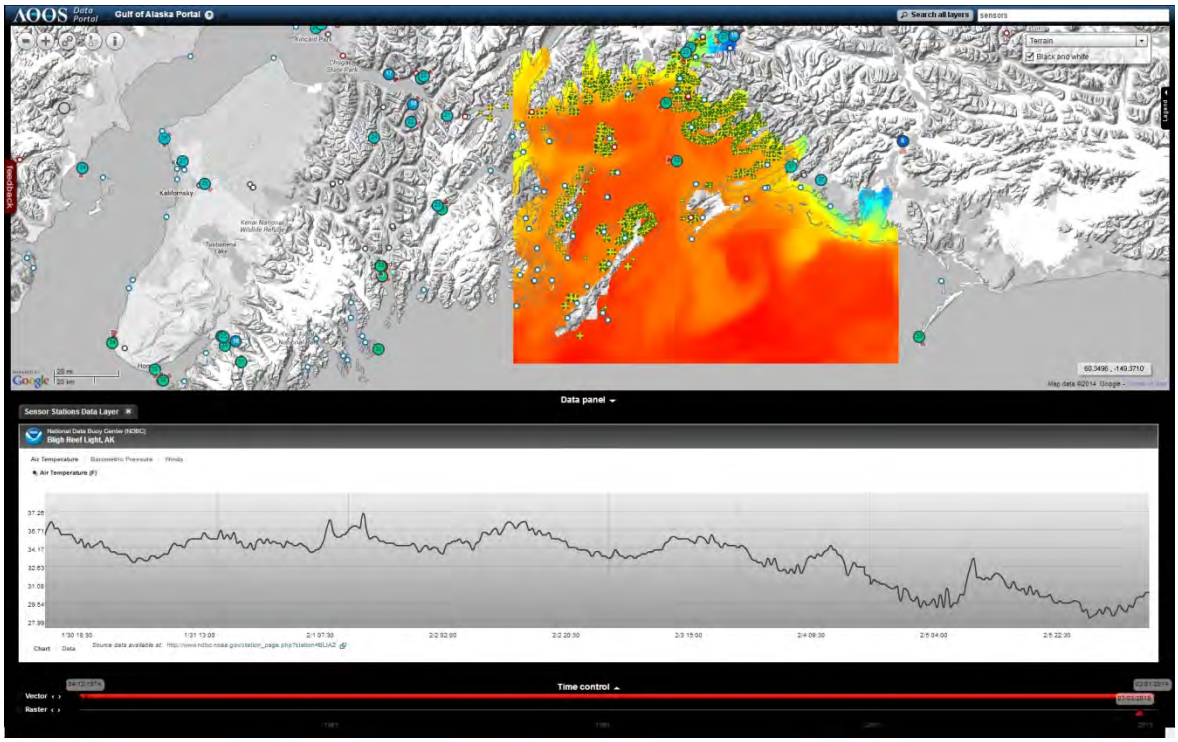


Figure 6. Screenshot of AOOS GOA Data Portal.

8. Information and Data Transfer: *See,* Reporting Policy at III (C) (8).

- Publications produced during the reporting period;

  None completed.

- Conference and workshop presentations and attendance during the reporting period; The technology

  Several demonstrations of the Workspace have been given to a wide variety of users including Herring PIs, GOAIERP PIs, Molly McCammon referred to this project in her talk at the Lowell Wakefield Symposium in Anchorage March 29, 3013.

  The AOOS Gulf of Alaska Portal featuring Herring Data sets was demonstrated at the Alaska Marine Science Symposium during several workshops.

9. Response to EVOSTC Review, Recommendations and Comments: *See,* Reporting Policy at III (C) (9).

The EVOS staff and Science Panel raised several concerns in September of 2013 regarding the data management component of both the Gulf Watch and Herring Monitoring Program. Furthermore, a two day workshop was held in January 2014 to review the data management components of both monitoring programs. The workshop was attended by regional agency data management staff, members of the EVOS Science Panel and EVOS staff.

Response to science panel comments below

The science panel is concerned about progress on data management. The data management proposal drew heavily on their old proposal without including sufficient updated evidence of interactions between the programs' PIs and the data management team. In addition, there does not appear to be a data management policy or QA/QC policy created as the programs approach Year Three. In addition, no milestones were reported in the newly submitted proposals, so it was difficult to gauge how much progress had been made in the last two years. Moreover, it was not clear how data would be available for synthesis. The panel recommends that the Council condition funding upon the creation of a credible and detailed data management policy and a QA/QC policy and include clear milestones in for their proposal.

Regarding a QA/QC policy: such a document is a basic need of any data management. We note too that instruments commonly need to be calibrated before and after use to be able to adjust for measurement drift, if it occurs. With two separate data centers operating under the EVOSTC program it is crucial that a high level of QA/QC be maintained. The Science Panel is concerned that adequate attention is not being devoted to this fundamental aspect of data management. It is particularly important that to assemble complete metadata to ensure that long-term data sets can be verified and understood once the current participants have moved on to new positions. For example, EPA and NSF require detailed data management and QA/QC plans as part of all proposals. Large monitoring programs, such as NSF's LTER and oceanographic programs, devote considerable time and effort to addressing these critical needs.

Example: As a specific example, the Ocean Tracking Network (OTN) has four nearly full-time people creating metadata forms that are required to be filled out, submitted and checked for QA-QC before data can be added to the database. Since OTN is currently adding equipment to tracking arrays in PWS, it would be particularly appropriate at this time to arrange communication between senior OTN data managers with EVOSTC program data PIs to ensure that data standards are adequate. As with OTN, and as emphasized in the initial funding of the EVOSTC programs, skilled data management resulting in data that can be relied upon by the scientific community and resource agencies will ultimately determine the long-term success and influence of the programs. The contact at OTN is Bob Branton (bob.branton@gmail.com) or (bob.branton@dal.ca).

LTM and HRM Program Team Lead Response:

As mentioned above, all of the GWA projects have sampling protocols that address QA/QC, including instrument calibration. The sampling protocols are maintained on the GWA's Research Workspace account. In addition, all PIs were required to sign a Program Management Plan, which included a detailed Data Management and Public Access Policy. That policy was developed after review of a multitude of data policies for programs such as GLOBEC, NSF LTERs, NCEAS, North Pacific Research Board's Bering Sea and Gulf of Alaska Integrated Research Programs, PISCO, ORNL (NASA), and TEAM Network.

Because of limited funding for data management services in this proposal (about 7% of total budget), the Program Management Team and Science Coordinating Committee adopted an approach that provide tools for PIs to assist with managing their data themselves. These tools include assistance with writing metadata in ways that follow national standards, and use of the Research Workspace to provide greater data and information access to the entire program team for use in synthesis and analysis activities. We would greatly appreciate more funding and staff to devote to this effort, but the entire program has been encouraged to work within the existing budget limits. Despite those limitations, we have conducted two metadata training sessions with project investigators, and the AOOS and NCEAS teams have conducted

training and data prioritization activities relating to data management for PIs at all of the annual meetings. Finally, in addition to the metadata tools developed by AOOS for managing current monitoring data, NCEAS has employed a full-time Projects Data Coordinator and three half-time graduate student assistants that conduct historical data salvage, metadata generation, and data QA. This has resulted in the salvage of extensive data from the region that had been previously funded by EVOSTC, and is now publicly accessible and will be used in synthesis activities. See Appendix B for details.

Our approach has been to leverage the resources of the Alaska Ocean Observing System's data management system, which is the only one of its kind with the mission of serving as a regional data assembly center and archive for Alaska ocean and coastal data and information products. All PIs submit their data annually to a private, password-protected GWA account on the AOOS Research Workspace. That data is then available for all program members to access and use for synthesis and analysis activities. At agreed upon times, the most current, QA/QC'd data are "published" from this site into the publicly accessible Gulf of Alaska portion of the AOOS Ocean Portal. We are also developing an automated means to publish this data to a DataONE node and to NOAA's National Oceanographic Data Center.

As with most research and monitoring programs, we have had challenges changing the culture from individuals holding on to their own data on personal computers, to one of more open access and sharing. However, we are making progress, and the investigators see the value in doing so. We have already started making data publicly available and are actively working with our PIs, science coordinator, NCEAS and data management team to further streamline processes for internal data sharing and public access.

Budget: *See,* Reporting Policy at III (C) (10).

There were no deviations from the predicted budget

ATTACHMENT C ***EVOSTC Annual Project Report Form***

Form Rev. 1.17.14

*Please refer to the Reporting Policy for all reporting, due date and technical submission requirements.

1. Project Number: *See*, Reporting Policy at III (C) (1).

13120111-D

2. Project Title: *See*, Reporting Policy at III (C) (2).

PWS Herring Program – Non-lethal sampling

3. Principal Investigator(s): *See*, Reporting Policy at III (C) (3).

Kevin M. Boswell

4. Time Period Covered by the Report: *See*, Reporting Policy at III (C) (4).

1 February 2013 to 31 January 2014

5. Date of Report: *See*, Reporting Policy at III (C) (5).

14 February 2014

6. Project Website (if applicable): *See*, Reporting Policy at III (C) (6).

Http://pwssc.org/research/fish/pacific-herring/

7. Summary of Work Performed: *See*, Reporting Policy at III (C) (7).

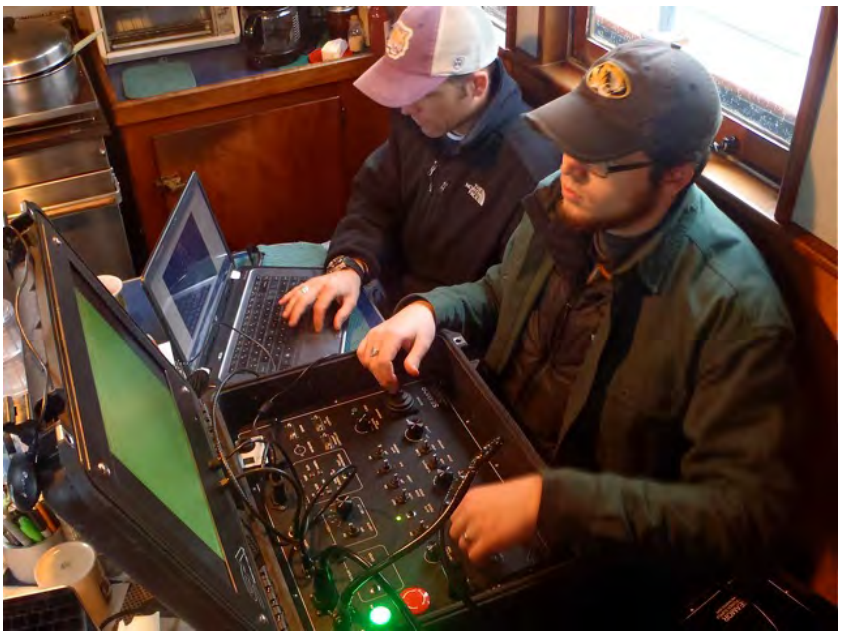
The integration of the imaging sonar into the ROV was completed and tested during the October 2013 cruise where we successfully deployed and retrieved the ROV/ imaging sonar system in Prince William Sound (Simpson Bay). Data from this cruise are being analyzed to derive estimates of in situ juvenile herring sizes and density to compare directly with those estimates derived from direct capture and the intensive acoustic surveys.

During the first cruise we were not able to deploy the ROV/imaging sonar system in direct combination with the intensive survey (i.e., trawling and acoustic surveys) due to logistical issues with initially mobilizing the equipment. Subsequent to the first attempt, three additional attempts were made, one in October, November and December to directly compare among techniques. At the moment, data are being analyzed to examine the potential biases among methods and determine the effectiveness of this additional method (i.e., ROV/ imaging sonar) for enhancing and augmenting current estimation practices.

Collection of data has been in collaboration with the intensive surveys of juvenile herring being conducted by Dr. Buckhorn. The shorter cruises of the intensive program allow for more opportunities to adapt the sampling than the longer November cruise. The shorter intensive cruises provide more space, more time for experimentation, and an opportunity to redesign the sampling approach between cruises.

Based on initial results, we have determined that the imaging sonar is not effective when mounted directly to the tow-body from which the echosounder is mounted, and is primarily a function of the

limited range of the imaging sonar with respect to the required resolution. Thus, in current and future plans, we anticipate that it will always be deployed directly from the ROV system.



ROV and imaging sonar system (left panel) on deck and control system for the ROV and imaging sonar systems (right panel) during initial field testing.

Table 1. Status of project deliverables for this reporting period

Deliverable/Milestone	**Status**
Integration of imaging sonar to ROV	Completed, 18 October 2013
Initiate data collection program	Completed, 18 October 2013
Attend AMSS Meeting	Completed 24 Jan 2014
Data analysis	Underway

8. Information and Data Transfer: *See*, Reporting Policy at III (C) (8).

Attended 2014 AMSS Meeting and HRM PI meeting

9. Response to EVOSTC Review, Recommendations and Comments: *See*, Reporting Policy at III (C) (9).

Text

10. Budget: *See*, Reporting Policy at III (C) (10).

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 (*will vary by proposer*)		$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	N/A
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. 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.

ATTACHMENT C ***EVOSTC Annual Project Report Form***

Form Rev. 1.17.14

*Please refer to the Reporting Policy for all reporting, due date and technical submission requirements.

1. Project Number: *See*, Reporting Policy at III (C) (1).

13120111-E

2. Project Title: *See*, Reporting Policy at III (C) (2).

PWS Herring Program – Expanded adult surveys

3. Principal Investigator(s): *See*, Reporting Policy at III (C) (3).

Michele Buckhorn, PhD and Dick Thorne, PhD

4. Time Period Covered by the Report: *See*, Reporting Policy at III (C) (4).

1 February 2013 to 31 January 2014

5. Date of Report: *See*, Reporting Policy at III (C) (5).

14 February 2014

6. Project Website (if applicable): *See*, Reporting Policy at III (C) (6).

Http://pwssc.org/research/fish/pacific-herring/

7. Summary of Work Performed: *See*, Reporting Policy at III (C) (7).

The 2013 acoustic survey of adult herring in Prince William Sound was conducted between March 27 and April 5 aboard the chartered vessel Auklet. The first two days of the survey were focused on Port Gravina and Port Fidalgo, and included an acoustic survey over a substantial concentration of herring in Port Fidalgo the night of March 28. The next day was spent searching for herring in Tatitlek Narrows and Galena Bay, before returning to Port Fidalgo for a second night-time acoustic survey. Zaikof Bay and Rocky Bay were searched on March 30, and an acoustic survey was conducted on a small concentration of fish in Rocky Bay. The next two days included searches for herring off Montague Point, Stockdale, Chalmers, Green Island, Drier Bay, Herring Bay, Northwest Bay, around Naked Island and into Wells Inlet ending in a night survey on a small concentration of fish in Cedar Bay. The next day, April 2, we returned to Port Fidalgo, but the herring concentrations observed previously were absent. The last two days of the survey focused in Port Gravina and included a broad-scale survey on April 3 and a more focused survey on April 4 of a large concentration of herring between Hells Hole and Redhead.

Survey methods were identical to those used in previous years. The results indicated a similar rapid movement from Port Fidalgo to Port Gravina, as has been observed in previous years. The final survey in Port Gravina on April 4 centered on the adult herring concentration with few fish outside the surveyed area and is considered a reasonable estimate of herring biomass. The result (Table 1) was 16,300 metric tons with 95% confidence intervals of 13,700 to 18,800. The small amounts of herring observed in Rocky Bay and Cedar Bay were probably immature herring, and no appreciable fish abundance was located in any of the other areas.

Table 1. Herring Biomass Estimates for Spring 2013

Location	Date	Density kg/m2	Area km2	Biomass 1000 mt
Port Fidalgo	28-Mar	0.65	13.20	8.6
	29-Mar	0.32	8.00	2.6
Port Gravina	3-Apr	0.20	24.80	5.0
	4-Apr	1.87	8.70	16.3
Total For Biomass Estimate				16.3
95% confidence interval	Lower	Upper		
	13.7	18.8		

Table 2. Status of project deliverables for this reporting period

Deliverable/Milestone	**Status**
Prince William Sound Adult Herring Survey	Completed, March 28-April 4, 2013
Adult Biomass estimation	Completed December 2013

In this project we collaborate/coordinate with ADF&G. We rely on any aerial surveys they are able to perform in order to catch the spawn. They also provide us with age/weight/length data in order to make the biomass estimates. We provide them with our biomass estimates.

8. Information and Data Transfer: *See*, Reporting Policy at III (C) (8).

- attendance at Alaska Marine Science Symposium January 2014;
- echograms, data integration files, and maps will be added to the AOOS portal workspace

9. Response to EVOSTC Review, Recommendations and Comments: *See*, Reporting Policy at III (C) (9).

Buckhorn. Expanded adult herring surveys 14120111-E

If acoustic information is to be used for annual herring assessments (by ADFG or anyone else) then it would seem reasonable that there were some meaningful communication between the people doing the survey and those doing the assessments (see specific comments on the previous proposal).

There is active dialogue between Michele Buckhorn and Steve Moffitt and Rich Brenner at the Cordova office of ADF&G. When post-processing is complete the datasets will be given to Steve for use in the ASA model. The data will also be made available on the AOOS herring portal so it is also available to other researchers associated with the herring projects.

Is there a data source, or database on areas that were 'historically surveyed'? If so, what or where is it? Will it be made available to the data synthesis projects? Has there been any effort made to report on these data?

Dick Thorne is currently working on archiving all his historical data and will be made available on the AOOS herring portal.

Because of PI departures, a very junior, although promising scientist without any peer-reviewed publications, is left alone to execute this project. The Science Panel urges engagement of a more senior experienced partner to help guide and enhance this project.

Michele Buckhorn has attended a Biosonics course and plans to attend an Echoview course. She will potentially attend a short summer course at UW if it is offered this year and doesn't not conflict with her other research projects. She has also reached out to people in the "acoustics community" for guidance and is looking for people active in acoustics to work with on a consulting basis.

10. Budget: *See,* Reporting Policy at III (C) (10).

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 (*will vary by proposer*)	$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	N/A
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:
There are no non-EVOSTC funds associated with this project. Equipment used for this project was purchased using previous EVOSTC funds.

1. The majority of project spending has been on salary for the PI and co-pi. Travel was provided to Dick Thorne from Seattle to Cordova for the surveys and for Michele Buckhorn for the Alaska Marine Science Symposium. This project contributed $6,000 for the trawl winch equipment purchased by Mary Anne Bishop as part of the capture/acoustic groundtruth project.
2. See attached spreadsheet. Discrepancies between budgeted amount and spent amount are due to the acoustic technician resigning and has not yet been replaced. The technician will either be replaced or that salary will be used towards consulting fees for a graduate student or postdoctoral associate in acoustics to help with data post-processing.

ATTACHMENT C ***EVOSTC Annual Project Report Form***

Form Rev. 1.17.14

*Please refer to the Reporting Policy for all reporting, due date and technical submission requirements.

1. Project Number: *See*, Reporting Policy at III (C) (1).

13120111-F

2. Project Title: *See*, Reporting Policy at III (C) (2).

PWS Herring Program – Juvenile Herring Abundance Index

3. Principal Investigator(s): *See*, Reporting Policy at III (C) (3).

Michele Buckhorn, PhD

4. Time Period Covered by the Report: *See*, Reporting Policy at III (C) (4).

1 February 2013 to 31 January 2014

5. Date of Report: *See*, Reporting Policy at III (C) (5).

14 February 2014

6. Project Website (if applicable): *See*, Reporting Policy at III (C) (6).

Http://pwssc.org/research/fish/pacific-herring/

7. Summary of Work Performed: *See*, Reporting Policy at III (C) (7).

The 2013 acoustic survey of juvenile herring abundance was conducted November 6-13, 2013 aboard the R/V Montague. The bays surveyed were: Simpson, Eaglek, Zaikof, Whale (SEA bays), Lower Herring, Port Gravina, Port Fidalgo, and Windy. Acoustic surveys were conducted using 120 kHz Biosonics split-beam hydroacoustic unit in a stratified systematic survey design. After the acoustic surveys were done in a particular bay, then concurrent acoustic and midwater trawl transects were conducted. Day transects were conducted along the historic zig zag survey tracks for bird observations. Night transects were conducted along stratified survey tracks.

Due to low herring catches in the mid-water trawl additional capture methods were used to ensure proper sample sizes to the other projects. The integration and analysis of the acoustic data is currently underway, but the general observations were that there was very little biomass to catch in the water column depths the trawl could reach. Even if the net were to reach the lower biomass, it would be targeting larger species not necessary for this particular study (large single targets such as rockfish or adult pacific cod).

This project coordinated with the bird survey project in the Gulf Watch Alaska program lead by Bishop and the validation effort in the HRM program led by Bishop.

Table 1. Status of project deliverables for this reporting period

Deliverable/Milestone	**Status**
Prince William Sound Juvenile Herring Abundance Index Survey	Completed, November 6-13, 2013
First stage post-processing	Completed December 2013
Second stage post-processing and analysis	On-going

8. Information and Data Transfer: *See*, Reporting Policy at III (C) (8).

- Article in Delta-Sound Connections
- attendance at Alaska Marine Science Symposium January 2014;
- echograms, data integration files, and maps will be added to the AOOS portal workspace

9. Response to EVOSTC Review, Recommendations and Comments: *See*, Reporting Policy at III (C) (9).

There is reference made to the assessment model but there is nothing in the new population dynamics proposal to indicate any meaningful communication between the acoustics work and the developing assessment models. Specifically, is it anticipated that data derived from acoustic surveys will be used as input to the assessment model? If so, it is important that there is an active dialogue among people working on inter-related projects.

There is active dialogue between Michele Buckhorn and Steve Moffitt and Rich Brenner at the Cordova office of ADF&G. When post-processing is complete the datasets will be given to Steve for use in the ASA model. The data will also be made available on the AOOS herring portal so it is also available to other researchers associated with the herring projects.

This juvenile herring project is predicated on the assumption that it will provide a useful prediction of age-3 recruitment. If there were a commercial fishery this prediction could be especially useful but its value as a predictor would diminish if commercial fisheries for herring were not re-established. In any event such a juvenile index could provide a measure of first year survival, or 'over-wintering' survival, and then this could be useful, especially to the projects concerned with disease and 'condition'.

Michele Buckhorn is not in part of the modeling effort but the understanding is that this parameter could fine-tune the ASA model similar to when disease was added as a parameter. This information would be useful if predictions showed that there could be a fishery opening up soon and allow for both management and the fishery to be prepared. As mentioned in the comments, this project is the backbone on which other projects piggy-back, as the acoustics gather distribution and abundance data for juvenile herring throughout Prince William Sound it also collets specimens for the disease and energetics projects.

Please clarify: will the survey design in 2014 match that in 2013? Again, Dr. Buckhorn and the project could benefit greatly by engaging a senior collaborator for this project.

Yes, the 2014 survey design will match the 2013 design. Michele Buckhorn has attended a Biosonics course and plans to attend an Echoview course. She will potentially attend a short summer course at UW if it is offered this year and doesn't not conflict with her other research projects. She has also reached out to people in the "acoustics community" for guidance and is looking for people active in acoustics to work with on a consulting basis.

10. Budget: *See,* Reporting Policy at III (C) (10).

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 (*will vary by proposer*)	$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	N/A
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:
No non-EVOSTC funds used on this project

1. The majority of project spending has been on salary for the PI and a part-time assistant. Most equipment and supply purchases were completed in 2012.
2. See attached spreadsheet. Discrepancies between budgeted amount and spent amount are due to the acoustic technician resigning and has not yet been replaced. The technician will either be replaced or that salary will be used towards consulting fees for a graduate student or postdoctoral associate in acoustics (potentially from John Horne's lab) to help with data post-processing and analysis. There was an unexpected $4000 expense due to Echoview – an annual license renewal that I was not informed I would need when I requested the quote or wrote the budget.

ATTACHMENT C ***EVOSTC Annual Project Report Form***

Form Rev. 1.17.14

*Please refer to the Reporting Policy for all reporting, due date and technical submission requirements.

1. Project Number: *See*, Reporting Policy at III (C) (1).

13120111-G

2. Project Title: *See*, Reporting Policy at III (C) (2).

PWS Herring Program – Intensive surveys of juvenile herring

3. Principal Investigator(s): *See*, Reporting Policy at III (C) (3).

Michele Buckhorn, PhD

4. Time Period Covered by the Report: *See*, Reporting Policy at III (C) (4).

1 February 2013 to 31 January 2014

5. Date of Report: *See*, Reporting Policy at III (C) (5).

14 February 2014

6. Project Website (if applicable): *See*, Reporting Policy at III (C) (6).

Http://pwssc.org/research/fish/pacific-herring/

7. Summary of Work Performed: *See*, Reporting Policy at III (C) (7).

Four fall 2013 intensive juvenile herring surveys were conducted October 1-4, October 16-19, October 28-31, and December 3-6. The surveys were conducted by Michele Buckhorn, Megan McKinzie, and Megan Roberts aboard the F/V Montague. The fall intensive surveys were designed to sample two juvenile herring bays per night for three consecutive nights at four different intervals between October and December using the hydroacoustic equipment and the midwater trawl. Samples from the midwater trawl were intended to ground truth the acoustic data, but certain catches of forage fish were provided to the energetics and other projects. The bays that were surveyed were Windy Bay on Hawkins Island and the west arm of Simpson Bay. The first day of the first intensive survey was spent running the survey tracks during the daylight since this was the first time this particular vessel conducting the survey tracks (it is a much larger vessel than used in the past) and to look for potential obstructions that could potentially damage the trawl net.

The integration and analysis of the acoustic data is currently underway, but the general observations were the acoustic surveys were highly variable between each survey for each bay. There were differences in the acoustics and fish catches between Simpson and Windy. In Simpson there was typically more biomass on the echograms and we caught more herring. When we caught herring, we rarely caught just herring, they were often mixed with walleye pollock, capelin, and sandlance. In Windy there was typically less biomass on the echograms and the majority of the fish catches consisted of walleye pollock. Another observation was that catches of jellyfish decreased as the season progressed.

Table 1. Status of project deliverables for this reporting period

Deliverable/Milestone	**Status**
Prince William Sound intensive surveys	Completed, October-December, 2013
First stage post-processing	Completed January 2013
Second stage post-processing and analysis	On-going

8. Information and Data Transfer: *See*, Reporting Policy at III (C) (8).

- Article in Delta-Sound Connections
- attendance at Alaska Marine Science Symposium January 2014;
- echograms, data integration files, and maps will be added to the AOOS portal workspace

9. Response to EVOSTC Review, Recommendations and Comments: *See*, Reporting Policy at III (C) (9).

No comments provided on this project

10. Budget: *See*, Reporting Policy at III (C) (10).

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 (*will vary by proposer*)	$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	N/A
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:
No non-EVOS funding was used to support this project.

1. The majority of project spending has been on salary for the PI and a part-time assistant. Most equipment and supply purchases were completed in 2012.

2. See attached spreadsheet. Discrepancies between budgeted amount and spent amount are due to the acoustic technician resigning and has not yet been replaced. The technician will either be replaced or that salary will be used towards consulting fees for a graduate student or postdoctoral associate in acoustics (potentially from John Horne's lab) to help with data post-processing and analysis.

ATTACHMENT C ***EVOSTC Annual Project Report Form***

Form Rev. 1.17.14

*Please refer to the Reporting Policy for all reporting, due date and technical submission requirements.

1. Project Number: *See*, Reporting Policy at III (C) (1).

13120111-H

2. Project Title: *See*, Reporting Policy at III (C) (2).

PWS Herring Program – Outreach and Education

3. Principal Investigator(s): *See*, Reporting Policy at III (C) (3).

Lindsay Butters

4. Time Period Covered by the Report: *See*, Reporting Policy at III (C) (4).

1 February 2013 to 31 January 2014

5. Date of Report: *See*, Reporting Policy at III (C) (5).

14 February 2014

6. Project Website (if applicable): *See*, Reporting Policy at III (C) (6).

Http://pwssc.org/research/fish/pacific-herring/

7. Summary of Work Performed: *See*, Reporting Policy at III (C) (7).

Several incidents impacted the delivery of outreach materials. The principal investigator had a baby at the beginning of the fiscal year and was on maternity leave for several months. She returned to work part time to complete products and then resigned in November 2013. Other members of the education department resigned about the same time or reduced their hours, which led to a search for new education personnel and a decision about how to meet the deliverables. Staff has been brought on to complete the education deliverables and Haley Hoover has been identified to take the lead on the HRM education and outreach component.

During the summer of 2013 the PWSSC made a major revision to its website. This required us to put effort to rebuilding the herring portion of the website. This was done in conjunction with the development of project profiles. The PWSSC also reviewed their approach and format for the *Field Notes* radio programs. This process was not completed until late in 2013 so no *Field Notes* radio programs in FY13. The effort scheduled for *Field Notes* were put towards revising the herring webpage.

We believe that with the addition of Hayley Hoover we will be able to meet all deliverables in FY14.

This project coordinates with the other projects within the HRM program to get materials for the various education and outreach projects. There is also coordination with the outreach projects of the Gulf Watch Alaska program.

Table 1. Status of project deliverables for this reporting period

Deliverable/Milestone	**Status**
Develop/update *Project Profiles* based on surveys & herring data analysis	Three *Project Profiles* completed, June 2013
Participate in Principal Investigator update and outreach meeting	Meeting held in Juneau, March 2013
Evaluate oceanography and herring *Discovery Room* program	Three *Discovery Room* sessions held, evaluated and lesson plans updated, February-April 2013
Delivery of *Community Lectures* and *Field Notes* complete for FY13	Three *Community Lecture* were given. *Field Notes* were not completed.
Written outreach materials complete for FY13	Four articles in *Delta Sound Connections* and one in the *Breakwater* were published, May 2013. *Project Profiles* complete, June 2013
Deliver *Summer Field Program*	Herring-themed lessons were delivered in three PWSSC *Summer Field Programs*, July 2013
Submit semi-annual report	Completed August 2013
Begin implementing *Discovery Room*	Herring components have been implemented in *Discovery Room* activities beginning in October.
Develop *Field Notes* program based on fall surveys	This has not yet occurred. The *Field Notes* programs have been given a priority status for the beginning of FY14.
Attend Alaska Marine Science Symposium	Completed

8. Information and Data Transfer: *See,* Reporting Policy at III (C) (8).

Revised the HRM web page on the PWSSC website with articles in the *Delta Sounds Connections, Breakwater, and Project Profiles*.

9. Response to EVOSTC Review, Recommendations and Comments: *See,* Reporting Policy at III (C) (9).

Science Panel Comments **Butters & Pegau. Outreach 14120111-H**

Was there any attempt to coordinate output with Gulf monitoring group? *The lead on this project is also on the Gulf Watch Alaska outreach team. There is coordination on products between the two programs.*

There may be opportunities and requirements for increased communication among PI's within the herring project. A key point is how the different projects relate to each other, especially their connections or inter-dependences. This aspect was not well developed in this (2013) set of proposals. *The relationship between projects was defined in the original proposal.* Perhaps this outreach project can assist in this regard? *We will look at how to make the connections more obvious on the herring website. The project connectivity is not part of the existing website.*

10. Budget: *See,* Reporting Policy at III (C) (10).

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 (*will vary by proposer*)	$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	N/A
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:
In the past year approximately $8,000 was spent from various other sources to deliver herring related materials in the education projects.

The pregnancy and subsequent departure of the principal investigator has led to this project being underspent. At the end of FY13 Hayley Hoover was identified as the new lead on the project and has been instructed to try and get the project fully up to date. Hayley has been tasked with completing the purchase of materials necessary for outreach activities. She is also aware that portions of this budget are to go to other staff who conduct the educational activities. All education deliverables were met this past year using other funding and most outreach deliverables have been met.

ATTACHMENT C ***EVOSTC Annual Project Report Form***

Form Rev. 1.17.14

*Please refer to the Reporting Policy for all reporting, due date and technical submission requirements.

1. Project Number: *See*, Reporting Policy at III (C) (1).

13120111-I

2. Project Title: *See*, Reporting Policy at III (C) (2).

PWS Herring Program – Fatty acid analysis as evidence for winter migration of age-0 herring in Prince William Sound

3. Principal Investigator(s): *See*, Reporting Policy at III (C) (3).

Ron Heintz, Johanna Vollenweider

4. Time Period Covered by the Report: *See*, Reporting Policy at III (C) (4).

1 February 2013 to 31 January 2014

5. Date of Report: *See*, Reporting Policy at III (C) (5).

14 February 2014

6. Project Website (if applicable): *See*, Reporting Policy at III (C) (6).

Http://pwssc.org/research/fish/pacific-herring/

7. Summary of Work Performed: *See*, Reporting Policy at III (C) (7).

Completed sample acquisition and participation in annual PI meeting. Lipid extraction and fatty acid sample preparation from lab study and fieldwork were completed; analysis of fatty acids is ongoing. Due to limited sample availability from the high temporal and spatial resolution study in 2012, and the March 2013 herring collections for the Research and Monitoring program, sample sources from herring collections in PWS in support of the Herring Survey program were identified and analysis of these samples is ongoing. Laboratory equipment problems related to the fatty acid analysis, and the federal government shutdown in 2013 caused a delay in the completion of sample analysis from the original timeline.

Analysis of fatty acid samples has resumed after delays and is expected to be completed in April 2014. We anticipate being able to address objectives 1 and 2 as proposed, while our ability to address objectives 3 – 5 will be limited due to fish not being caught at the necessary spatial scales in both fall and spring.

This project has required coordination of P.I.s at PWSSC and ABL for distribution and sharing of fieldwork samples.

Deliverable/Milestone	**Status**
Attend PI meeting	Attended PI meeting – Juneau, May 2013
Acquire samples from monitoring program	Received samples – August 2013. Supplemented by stored samples from Herring Survey program due to

	limited catch for monitoring project.
Finish sample analysis of fish from monitoring project	Lipid extraction and sample preparation for fatty acid analysis were completed. Fatty acid analysis is ongoing.
Report preliminary results at AMSS	Reporting results was delayed due to incomplete data analysis at the time of AMSS.

8. Information and Data Transfer: *See,* Reporting Policy at III (C) (8).

Data and the final report for this project are to be made available on the AOOS Ocean Workspace website.

9. Response to EVOSTC Review, Recommendations and Comments: *See,* Reporting Policy at III (C) (9).

No comments specific to this project were provided.

10. Budget: *See,* Reporting Policy at III (C) (10).

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	$0.0
Travel	$0.0	$6,400.0	$0.0	$0.0	$0.0	$6,400.0	$0.0
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	$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:

NOAA staff salaries, for training and oversight of labor for sample processing and administration	$44,619
NOAA instrument amortization, existing instrument use	$ 3,125
Total	$47,744

Travel expenses were less than anticipated in FY13 due to a change in venue for the PI meeting, which was moved from Cordova to Juneau. Travel to AMSS to present results also was not completed due to unexpected delays in the completion of the fatty acid analysis resulting from equipment problems and the federal government shutdown. These delays required additional funds for contracts to complete sample processing. Commodities expenses were less than expected due to needs being met through shared commodities from other projects.

ATTACHMENT C ***EVOSTC Annual Project Report Form***

Form Rev. 1.17.14

*Please refer to the Reporting Policy for all reporting, due date and technical submission requirements.

1. Project Number: *See*, Reporting Policy at III (C) (1).

13120111-I

2. Project Title: *See*, Reporting Policy at III (C) (2).

PWS Herring Program – What is the age at first spawning for female herring in Prince William Sound

3. Principal Investigator(s): *See*, Reporting Policy at III (C) (3).

Johanna Vollenweider, Ron Heintz

4. Time Period Covered by the Report: *See*, Reporting Policy at III (C) (4).

1 February 2013 to 31 January 2014

5. Date of Report: *See*, Reporting Policy at III (C) (5).

14 February 2014

6. Project Website (if applicable): *See*, Reporting Policy at III (C) (6).

Http://pwssc.org/research/fish/pacific-herring/

7. Summary of Work Performed: *See*, Reporting Policy at III (C) (7).

Hosted and participated in annual PI meeting in Juneau, March 2013. Completed sample acquisition of 4 cases of wild-caught herring from 2013 PWS spawn through cooperative efforts with ADF&G, Cordova. Fish dissections are complete, including morphological measurements (lengths, weights, gonad weights). Scales were removed and mounted on slides using standard protocols employed by ADF&G, Juneau. Scales were examined on a Indus microfiche, model 4601-11 and digitized. Once digitized, herring scales were aged and measurements of growth increments between annuli on are complete. We are currently in the process of statistical analysis of growth increments, which is expected to be complete for the March 2014 PI meeting. The federal government shutdown in 2013 caused a delay in the award of the contract for scale analysis and data analysis is slightly delayed from the original timeline.

This project has benefited substantially through the data sharing of the Scales as growth history records (PI Steve Moffit).

Deliverable/Milestone	**Status**
March 2013 – Collect fish	Collected scales from spawning herring in PWS
January 2014 - AMSS	Attended AMSS
March 2014 – Final Report	Fish are dissected, scales are mounted on slides and digitized. Growth increments of scale annuli are nearly complete. Data analysis is to follow

8. Information and Data Transfer: *See,* Reporting Policy at III (C) (8).

Data and the final report for this project are to be made available on the AOOS Ocean Workspace website.

9. Response to EVOSTC Review, Recommendations and Comments: *See,* Reporting Policy at III (C) (9).

The progress report is very brief. Is this statement: "Histology can identify fish that have not previously spawned" based on the results of the analysis of this project or from published papers on this topic? If the former it would be helpful to know more about the criteria used to differentiate between first-time and repeat spawners.

This sentence was founded upon extensive published work describing the use of histological analyses of ovaries to improve the precision of macroscopic staging techniques in the determination of the reproductive stage of herring. Macroscopic reproductive scales are used to evaluate maturity of herring (Hjort scale), however discrimination of recruit (virgin fish) from recovering spent fish can be difficult (Hay et al. 1987). Histological analysis can show unequivocal evidence of recent spawning history using maturation processes like that depicted below for albacore tuna (Figure 1), with specific details tailored to Pacific herring (Figure 2). Maturing herring and non-maturing herring can be discriminated histologically by oocyte size (170 um cutoff) (Hay et al. 1987). Furthermore, ovary histology of post-spawners is generally characterized by a state of disorganization, with ruptured and collapsed follicles, hemorrhages of blood vessels, folding/wrinkling of relatively thick ovary walls (4x thicker), some unspawned ripe eggs undergoing degeneration, and unorganized connective tissue resulting from ovulation.

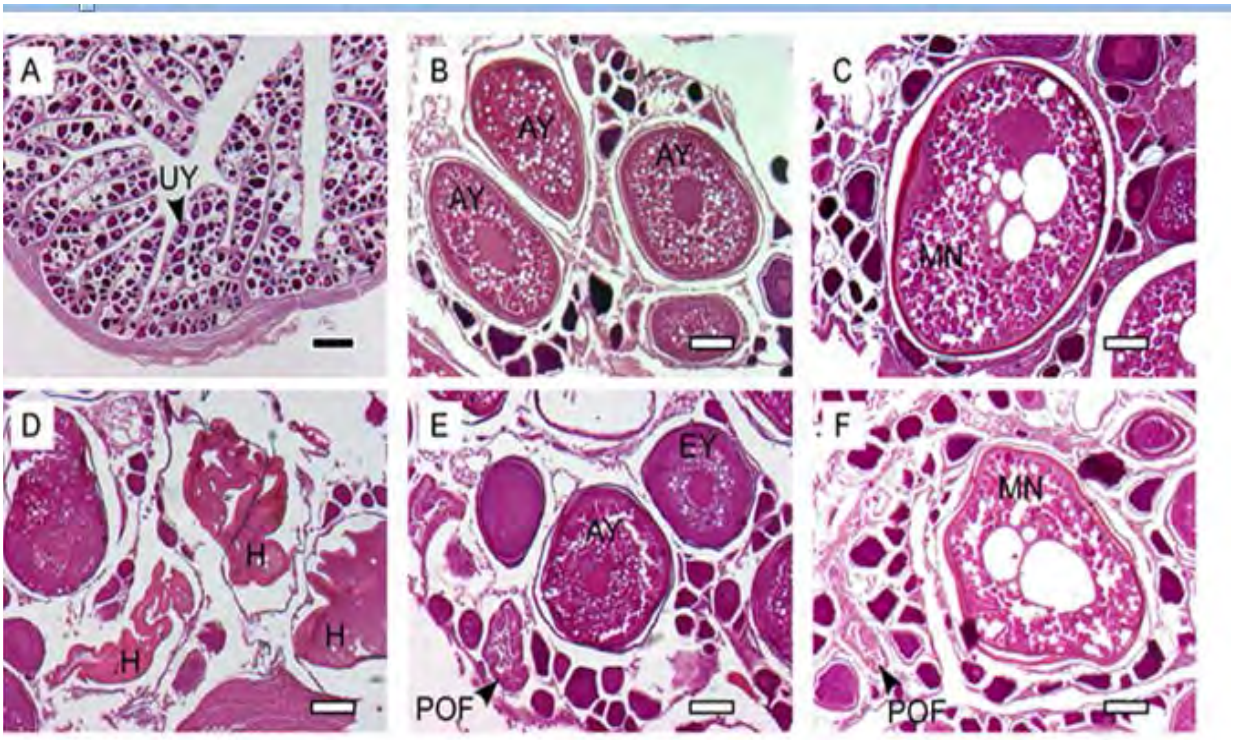


Figure 1: Histological sections of ovaries showing examples of development classes, oocyte stages and postovulatory follicles (POF).(A) unyolked oocytes in an immature ovary, (B) advanced yolked oocytes in a spawning capable ovary, (C) migratory nucleus oocyte in a spawning ovary, (D) hydrated oocytes in a spawning ovary, (E)12 hour Post-Ovulatory Follicles in a spawning ovary, (F)12 hour Post-Ovulatory Follicles in a spawning ovary. UY =unyolked, EY = early yolked, AY = advanced yolked, MN = migratory nucleus, H = hydrated. The scale bars are 200mm (black) and 100mm (white).

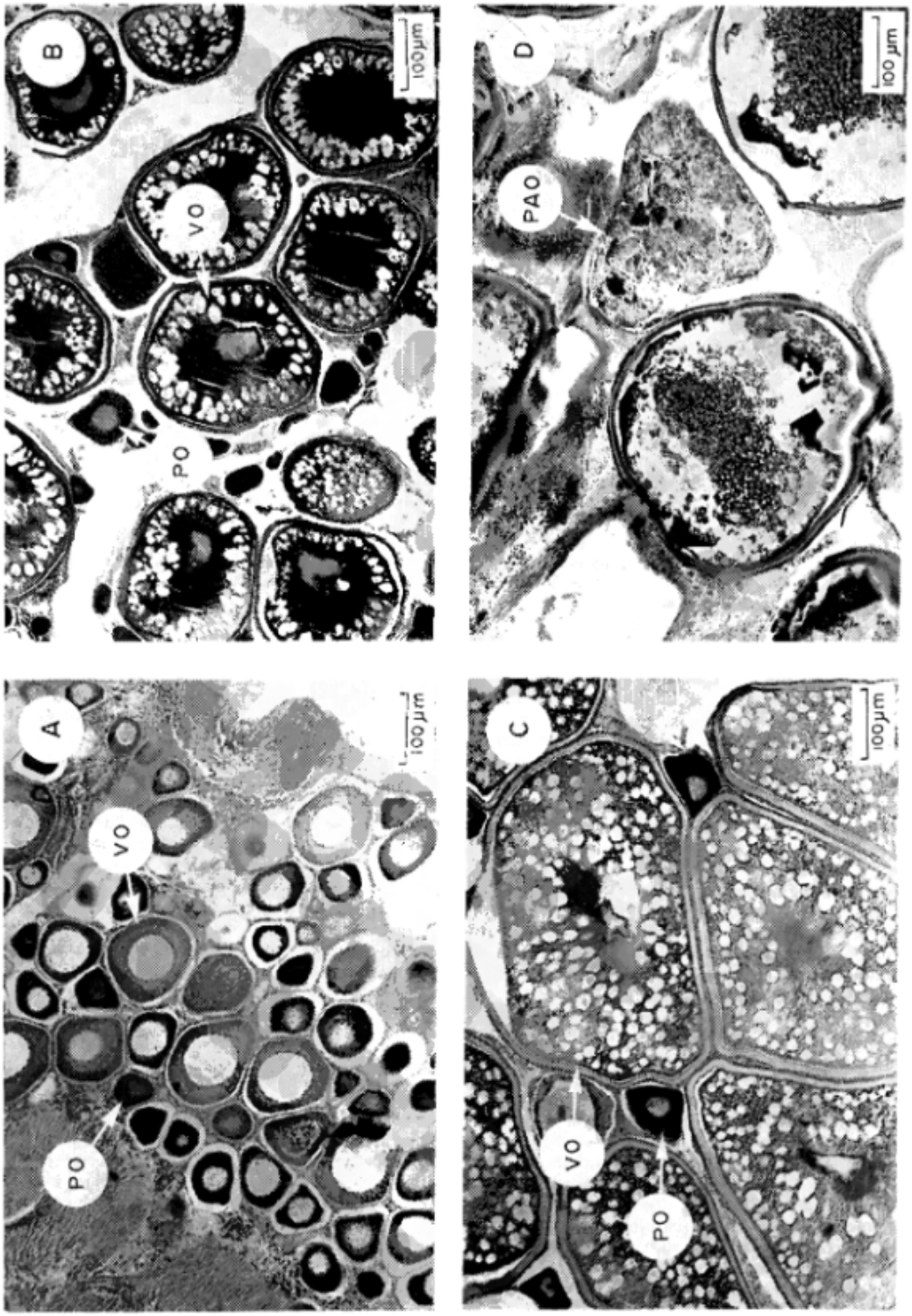


Figure 2: Microphotographs showing the distinction between pre-vitellogenic (PO) and vitellogenic (VO) oocytes and an example of pre-ovulatory atretic oocyte. (A) Corresponds to early stage 2 from the Hjort macroscopic scale: large oocytes are about 170 um and have small yolk vesicles. The distinction between pre-vitellogenic and vitellogenic oocytes is not clear in many instances. (B) Corresponds to late Stage 2: many yolk vesicles have accumulated and have reached the maximum diameter (30-35 um) and migrated towards the oocyte center. The distinction between pre-vitellogenic and vitellogenic oocytes is unequivocal. (C) Corresponds to stage 4: yolk granules fill the cytoplasm surrounding the yolk vesicles. The vitellogenic oocytes are 400-500 um in diameter. The pre-vitellogenic oocyte is about 120 um in diameter. (D) Corresponds to stage 4 showing a pre-ovulatory atretic oocyte (PAO). (from Hay et al. 1987).

Farley, J.H., Williams, A.J., Hoyle, S.D., Davies, C.R., Nicol, S.J. 2013. Reproductive dynamics and potential annual fecundity of South Pacific albacore tuna (*Thunnus alalunga*). PLoS ONE 8(4): e60577. doi:10.1371/journal.pone.0060577

Hay, D.E., Outram, D.N., McKeown, B.A., and Hurlburt, M. 1987. Ovarian development and oocyte diameter as maturation criteria in Pacific herring (Clupea harengus pallasii). Can. J. Fish. Aquat. Sci. 44: 1496-1502.

Also, the ability to detect age at first spawning from changes in growth rate in field-caught specimens would be a significant breakthrough. However, the proposal does not articulate how age at first spawning would be determined and validated from older fish that had already spawned more than once.

The annuli on herring scales provide the ecological history of an individual fish, where the narrow transparent rings represent the physiological winter, and the broader, less-transparent areas represent the physiological summer growth. For nearly a century, it has been understood that these annual rings are added relative to the size and therefore the growth and age of the individual fish (Dahl 1907; Geoffrey et al. 1916). Spawning is an energetically expensive process that affects the growth rate of fish. Consequently, a corresponding reduction in width of annual growth layers occurs on scales (Englehard et al. 2003, Runnstrom 1936). As the lifetime of a fish is reflected in their scale, further years in which spawning occurs can also be detected (Engelhard 2005).

Dahl, K. 1907. The scales of the herring as a means of determining age, growth, and migration. Report on Norwegian Fishery and Marine Investigations. Vol II, No. 6. 38p.

Engelhard, G.H. and Heino, M. 2005. Scale analysis suggests frequent skipping of the second reproductive season in Atlantic herring. Biol. Lett. 1: 172-175.

Engelhard, G.H., Dieckmann, U., Godo, O.R. 2003. Age at maturation predicted from routine scale measurements in Norwegian spring-spawing herring (Clupea harengus) using discriminant and newural network analyses. ICES J of Mar. Sci 60:304-313

Geoffrey, W., Paget, B.A., and Savage, R.E. 1916. The growth-rings on herring scales. Proceed. Royal Soc. Of London. Series B. 86(615): 258-260.

Runnstrom, S. 1936. A study on the life history and migrations of the Norwegian spring-spawning herring based on the analysis of the winter rings and summer zones of the scale. Fiskeridirektor-atets Skrifter, Serie Havundersokelser, 5(2): 1-103.

10. Budget: *See*, Reporting Policy at III (C) (10).

EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
PROGRAM 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	$ -
Travel	$4,000	$3,100	$0	$0	$0	$7,100.0	$ 2,256
Contractual	$38,000	$14,400	$0	$0	$0	$52,400.0	$ 54,980
Commodities	$3,500	$2,500	$0	$0	$0	$6,000.0	$ 6,200
Equipment	$0	$0	$0	$0	$0	$0.0	$ -
Indirect Costs (*will vary by proposer*)						$0.0	$ -
SUBTOTAL	$45,500.0	$20,000.0	$0.0	$0.0	$0.0	$65,500.0	$63,435.5
General Administration (9% of subtotal)	$4,095.0	$1,800.0	$0.0	$0.0	$0.0	$5,895.0	
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	$33,258.3

COMMENTS:
Travel expenses were less than anticipated in FY13 due to a change in venue for the PI meeting, which was moved from Cordova to Juneau. In-kind contributions include 3 weeks salary for Ron Heintz ($9.4K), 2 months salary for JJ Vollenweider ($20.6K), 1 week salary for Bonita Nelson for Bonita Nelson to do contracting paperwork ($2.7K), and maintenance costs for laboratory instruments at the Auke Bay Lab (balances, microphiche with pdf scanner, dissection equipment) ($0.5K).

ATTACHMENT C ***EVOSTC Annual Project Report Form***

Form Rev. 1.17.14

*Please refer to the Reporting Policy for all reporting, due date and technical submission requirements.

1. Project Number: *See*, Reporting Policy at III (C) (1).

13120111-L

2. Project Title: *See*, Reporting Policy at III (C) (2).

PWS Herring Program – Juvenile herring condition monitoring

3. Principal Investigator(s): *See*, Reporting Policy at III (C) (3).

Ron Heintz, W. Scott Pegau

4. Time Period Covered by the Report: *See*, Reporting Policy at III (C) (4).

1 February 2013 to 31 January 2014

5. Date of Report: *See*, Reporting Policy at III (C) (5).

14 February 2014

6. Project Website (if applicable): *See*, Reporting Policy at III (C) (6).

Http://pwssc.org/research/fish/pacific-herring/

7. Summary of Work Performed: *See*, Reporting Policy at III (C) (7).

This is a collaborative project between the Prince William Sound Science Center (PWSSC) and the Auke Bay Laboratory (ABL). This is the first full year of sampling within the Herring Research and Monitoring (HRM) program although the work is a continuation from similar efforts in the PWS Herring Survey program.

Collection of samples in March was completed as scheduled. Fish were sent to ABL in August for their processing The PWSSC processing of the fish to determine the energetic content remains underway. The fish were sent to the laboratory at the University of Alaska Fairbanks. We have been informed that they are having problems with their equipment, which is causing delays in the processing.

Collection of samples in November was completed as scheduled. A portion of those fish were sent to ABL in January 2014 for their processing. Processing at PWSSC of fish from the November 2013 cruise is underway.

The databases containing the condition information at PWSSC have been combined into a single spreadsheet for easier sharing and access by others.

A setback to the project occurred when one of the principal investigators (Dr. Thomas Kline) left the Prince William Sound Science Center (PWSSC) in June 2013. The Science Center is currently seeking a replacement for Dr. Kline and Dr. Pegau has taken responsibility for the project until a suitable replacement can be found. The gap in personnel has impacted the completion of the analysis of this project, however Dr. Pegau worked with Dr. Kline to ensure a smooth transition of materials and is in a

position to rapidly bring a new person up to speed. As of the time of this report two candidates were offered the position, but both declined it. The search is being renewed. Deliverables in the short term are related to work conducted by the project technician who remains working on the project. We don't anticipate any problems meeting the deliverables during the upcoming period.

There was an issue with the preservation of fish by the fishermen doing the collection in March. Our protocol was to put them on ice for the three days until the fishermen returned. This was not sufficient to prevent some damage so we purchased portable freezers to use in the future.

This project requires coordination of P.I.s at PWSSC and ABL. With the departure of Dr. Kline the initial focus was on working with Dr. Pegau to coordinate sample processing and handling. Data and samples have been shared between the two groups. We have reviewed and revised our sample sharing policy to allow more fish to be processed by both labs.

We processed samples using calorimeters in both laboratories to confirm that the results are comparable. We found that there was a bias in WBED between systems used of 0.16 kJ/g (Figure 1). The PWSSC recently bought a new calorimeter and we are currently bringing it on line to compare to the Auke Bay Laboratory (ABL) and older PWSSC calorimeters.

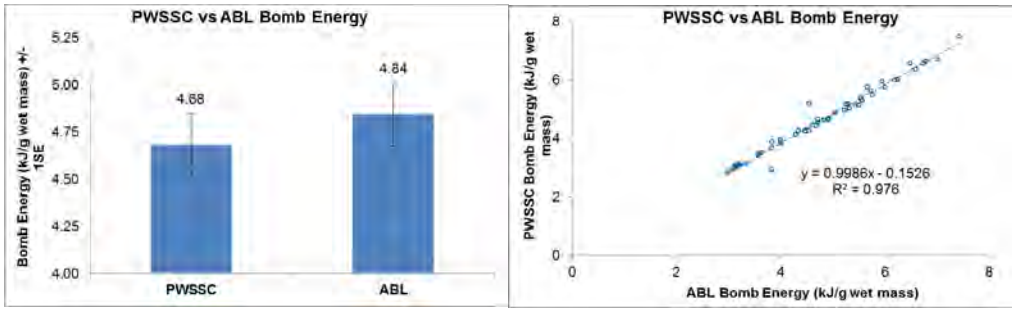


Figure 1. Results from calorimeter measurements by ABL and PWSSC on 50 fish.

Coordination efforts with other investigators has occurred during PI meetings in the spring and at AMSS. These provide opportunities for investigators to learn about the findings of others in the group and ensure sampling needs are met. We look to find ways to collect samples outside of the original proposal schedule to enable additional studies.

Dr. Pegau attended the GWA investigator meeting in November and presented on the finding of the HRM program. We are working with the zooplankton monitoring projects to examine the relationship between herring recruitment and fitness with the quantity and timing of phytoplankton and zooplankton.

This works with the Cordova District Fishermen United (CDFU) to arrange collection of fish in the spring. Training is provided to three fishing vessels that then sample at nine locations around Prince William Sound. We presented results of our observations at a CDFU Board meeting.

Table 1. Status of project deliverables for this reporting period

Deliverable/Milestone	**Status**
Annual PI meeting	Completed March 2013
March juvenile herring collection	Completed, March 2013. Heintz' component: samples received at ABL, August 2013. Biological processing completed, chemical processing in progress.
Submit FY 14 Work Plan for review	Work Plan was submitted in August 2013 to match the current EVOSTC reporting dates
Submit annual report	Mid-year project and program reports were submitted in August 2013.
Submit synthesis to EVOS Science Council	Delivery of this synthesis has been delayed until November 2014 by the EVOSTC.
November juvenile herring collection	Completed, November 2013
Alaska Marine Science Symposium	Attended and presented a poster about research findings

8. Information and Data Transfer: *See,* Reporting Policy at III (C) (8).

The updated PWSSC and ABL herring energetics databases have been uploaded to the workspace for sharing with other investigators.

9. Response to EVOSTC Review, Recommendations and Comments: *See,* Reporting Policy at III (C) (9).

Considerable concern was expressed about the departure of Dr. Kline and the panel endorses Pegau's expressed urgency in finding a suitable replacement. *PWSSC is continuing to search for a replacement for Dr. Kline.*

With respect to the 2013 proposals: no plan is evident to examine the relationship of the change in energy content to climate and oceanographic conditions during the pre-sampling and overwintering periods. If PIs are truly interested in determining whether the "constraints" are relaxed, then all constraints, including climate/ocean factors must be considered. As much as possible these projects must be integrated with oceanographic and biological data from LTM, especially because the causes for condition changes are crucial. *We are working with investigators in the Gulf Watch Alaska program to examine the relationship between condition and plankton numbers and types. We continue to look for relationships between condition and other environmental parameters.*

The project must also be integrated with the herring disease program. The panel suggests that condition be used in experiments with disease challenges including transmission mechanisms. *There have been these types of studies and we will examine how best to continue this type of work.*

10. Budget: *See*, Reporting Policy at III (C) (10).

PWSSC Budget

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 (*will vary by proposer*)	$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:
Existing laboratory equipment (drying oven, scales, calorimeter) worth approximately $35K were used to support this program.

Spending in the Personnel category is behind because of the departure of Dr. Kline and the technician being used by a new program through the summer. The stable isotope analysis processing first samples associated with this project were completed at the end of the fiscal year and the billing has not arrived for the contractual line. Other savings have occurred because of charges to a similar project in the PWS Herring Survey program.

ABL Budget

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	$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:

NOAA staff salaries, for training and oversight of labor for sample processing and administration	$38,180
NOAA instrument amortization, existing instrument use	$ 2,275
Total	$40,455

A portion of the funds to be spent on contracts and commodities in FY13 have shifted to FY14 due to acquiring samples late in FY13 and processing delays resulting from the federal government shutdown.

ATTACHMENT C ***EVOSTC Annual Project Report Form***

Form Rev. 1.17.14

*Please refer to the Reporting Policy for all reporting, due date and technical submission requirements.

1. Project Number: *See*, Reporting Policy at III (C) (1).

13120111-M

2. Project Title: *See*, Reporting Policy at III (C) (2).

PWS Herring Program – Juvenile herring intensive monitoring

3. Principal Investigator(s): *See*, Reporting Policy at III (C) (3).

W. Scott Pegau, Ron Heintz

4. Time Period Covered by the Report: *See*, Reporting Policy at III (C) (4).

1 February 2013 to 31 January 2014

5. Date of Report: *See*, Reporting Policy at III (C) (5).

14 February 2014

6. Project Website (if applicable): *See*, Reporting Policy at III (C) (6).

Http://pwssc.org/research/fish/pacific-herring/

7. Summary of Work Performed: *See*, Reporting Policy at III (C) (7).

The milestones of sample collection and processing for this project were completed as scheduled. During late winter the numbers of samples were limited as the fish became more difficult to locate. The analysis phase is in progress.

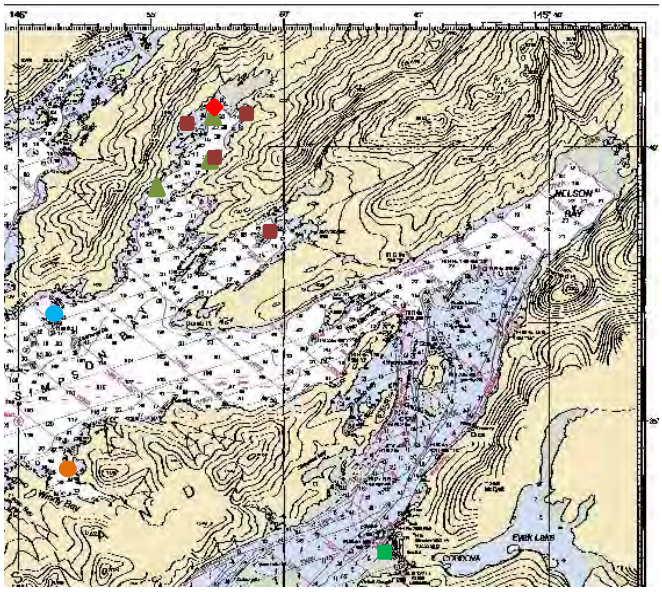


Figure 1. Sampling locations for this project. The red diamond represents the primary sampling location. The red squares are other locations sampled using a castnet. The green diamonds are locations sampled using the gill nets. Marks are also provided for the Alice Cove, Windy Bay, and Cordova Harbor locations.

Fish were sampled in Simpson Bay and surrounding waters. Fish were collected from September 2011 through June 2012 on a monthly basis. Most of the fish were collected in shallow waters at the head of the west arm of Simpson. Additionally fish were collected in Cordova harbor, Windy Bay, Alice Cove,

and other locations in Simpson Bay (Figure 1). Fish were captured using a 3/8 inch square mesh gill net and ¼ inch mesh cast nets.

Fish were shared between the Prince William Sound Science Center (PWSSC) and Auke Bay Laboratory (ABL). At PWSSC the fish were measured, weighed, then dried and ground for isotopic analysis. From the isotopic analysis we estimate the whole body energy density (WBED). We still need to process a portion of these fish through a calorimeter to confirm the relationship between the estimate based on the isotopic analysis and direct measure of energy content. We purchased a new calorimeter and are testing it prior to running samples. At ABL, herring were measured, weighed, and the RNA/DNA ratio and lipid content were determined using analytical chemistry techniques.

There is a clear difference in the size distribution of fish caught using the gill net and cast net that we reported previously (Figure 2). Smaller fish were observed to swim through the gill net and larger fish could evade the cast nets better, or the smaller fish were so numerous that we stopped sampling prior to catching a significant number of larger fish when using the cast nets. It is important to note that in November 2011 we caught primarily smaller fish using a cast net, but larger fish were in the same area as evidenced by the fish caught using the gill net.

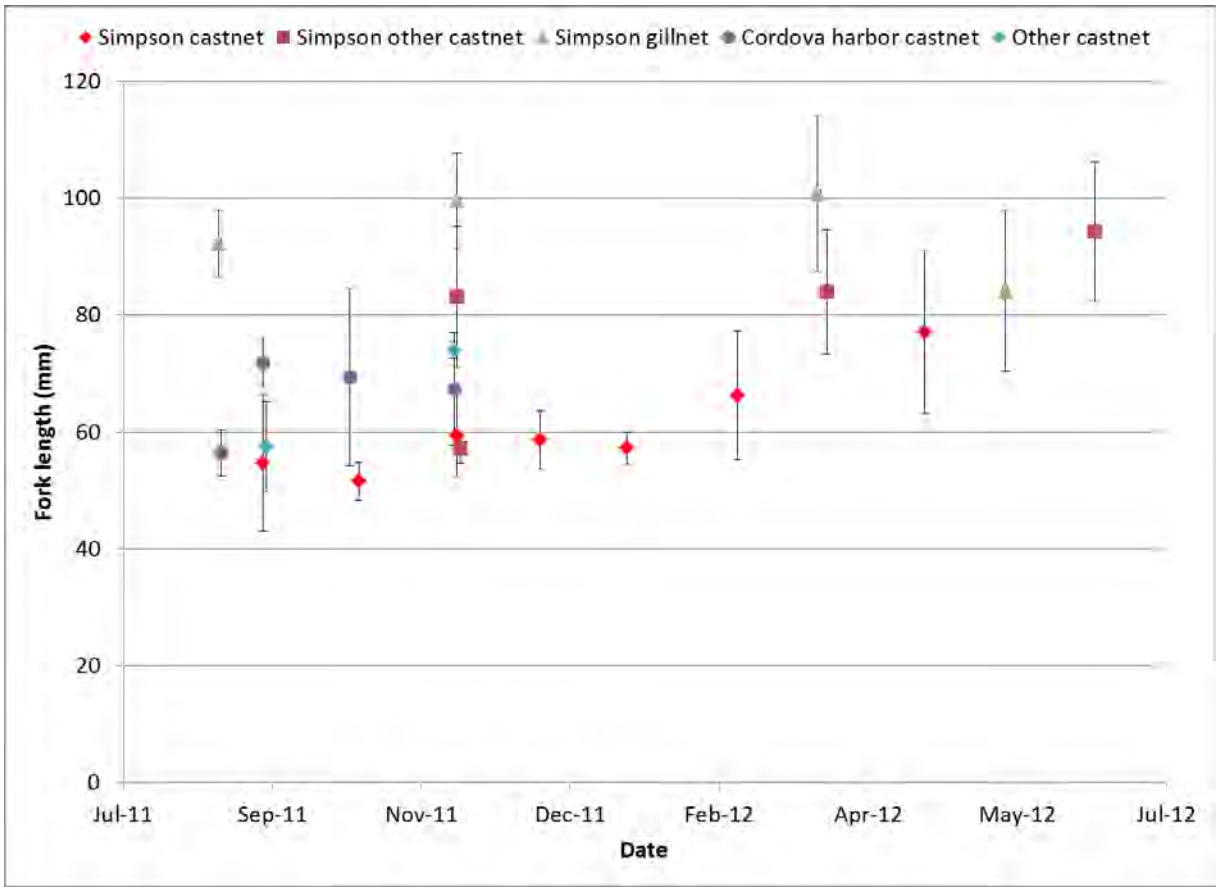


Figure 2. The fork length of fish with one standard deviation error bars.

The fish caught in Simpson Bay were generally a little smaller than caught using cast nets at other locations. Within Simpson Bay during November the fish caught in shallow water at the head of the east and west arms were of the same length. There were some fish caught in deeper waters that were

larger than those in the shallow waters. Beginning in February 2012 there was an increase in the mean length of fish caught using cast nets. This may be due size dependent mortality that reduced the number of smaller fish so we began capturing relatively more larger fish with the cast nets. Potentially there could have been immigration of larger fish into the area. The RNA/DNA ratio indicated that growth was not occurring during this time (Figure 3). Sometime after March it appears that the size distribution of fish caught using both techniques were similar.

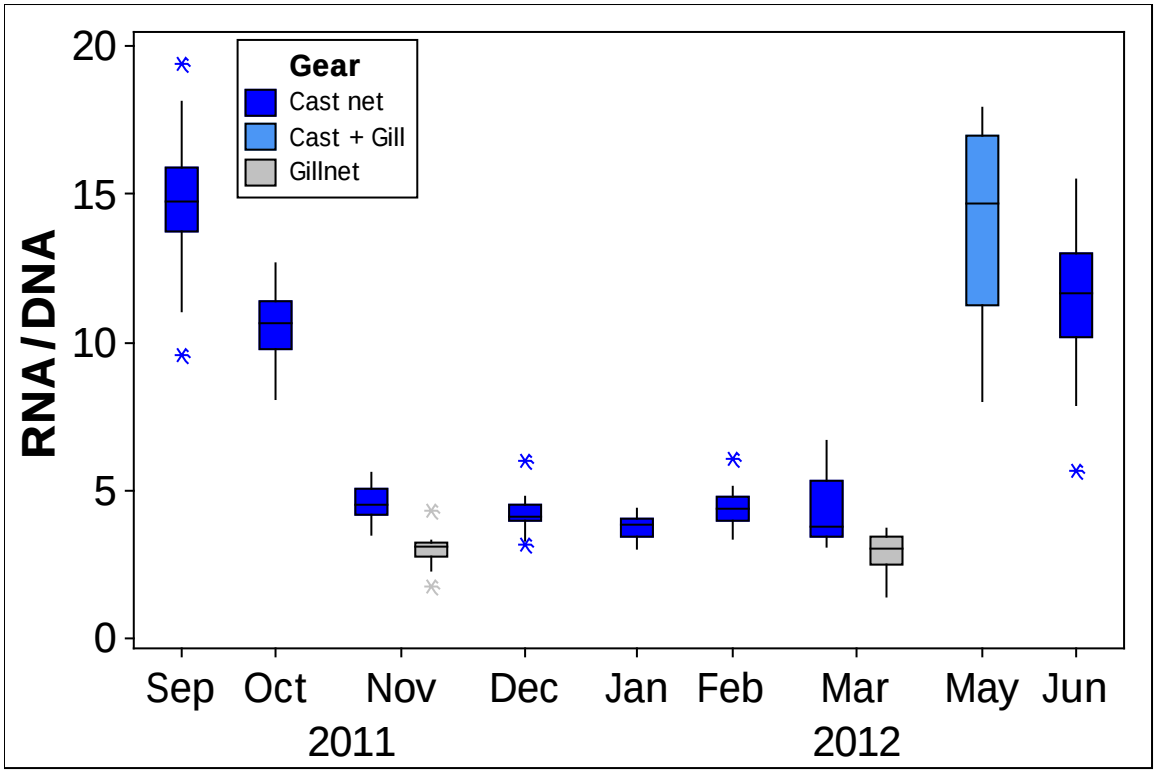


Figure 3. RNA/DNA ratio of YOY herring from Simpson Bay. Boxplots with whiskers extending to the adjacent value nearest 1.5 times the interquartile range (* = outlier).

The wet weight of fish caught at the locations was highly correlated to size. The WBED did not follow the same pattern as clearly (Figure 4). The herring from two sites in the west arm of Simpson Bay had the same WBED even though they were different in length and weight. The fish captured in the east arm had a lower WBED even though they had a similar length and weight of the fish captured at the primary location in the west arm. In November WBED in Simpson Bay was similar to that observed in the fish from the Cordova Harbor, but greater than the fish captured in Windy Bay. By March it appears that the WBED of fish caught using cast and gill nets were similar.

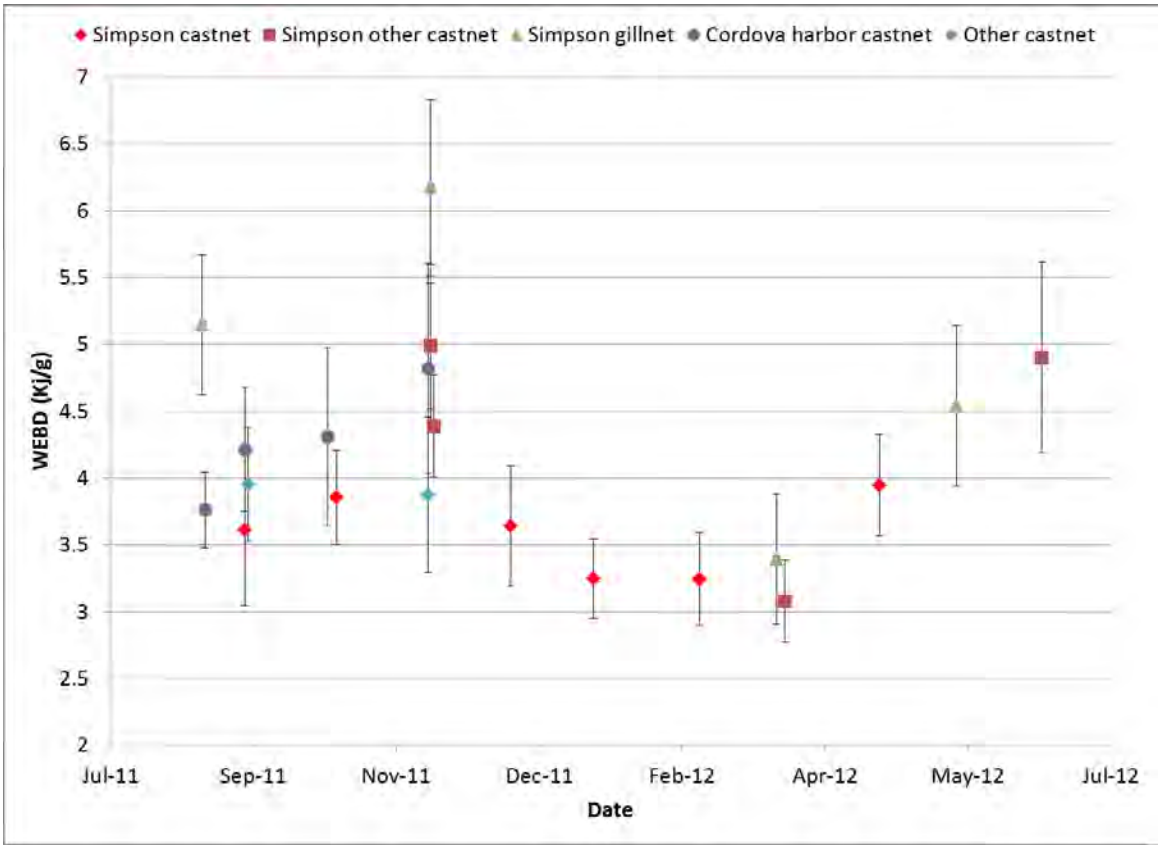


Figure 4. WBED of the age-0 herring sampled as determined using isotopic analysis.

Based on these results we feel that the best time series of the WBED can be derived using cast net samples from the primary location first, with cast net samples from nearby locations second, and gill net samples in the spring if necessary (Figure 5). The WBED peaked in November and then rapidly decreased until January. From January through March is remained constant and then began to increase in April. The increase beginning in April is believed to be a response to the fish beginning to feed. Stomach analysis showed that some feeding occurred in March, but it wasn't enough to increase the energetic content or activate growth.

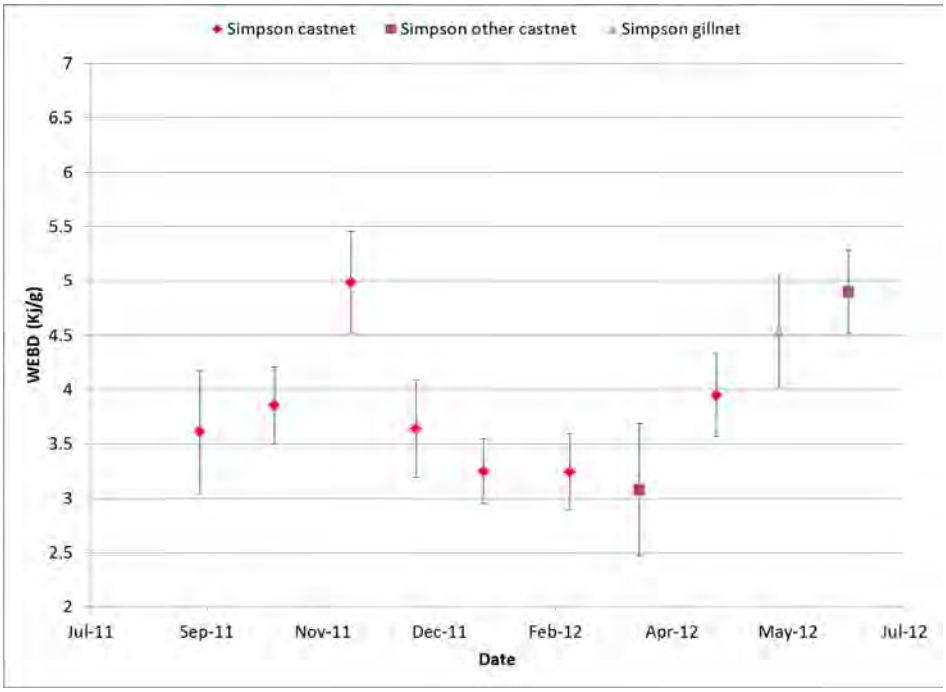


Figure 5. The best estimate of the WBED time series for age-0 herring collected in Simpson Bay. Error bars represent one standard deviation.

In the fall there appears to be a shift from growth to lipid storage between September and November (Figure 6). There is a decrease in the RNA/DNA ratio and an increase in WBED that appears to be largely a result of increasing lipid content. Unfortunately, the April 2012 samples were not sent to ABL for RNA/DNA analysis so we cannot determine if the increase in lipid content was synchronous with an increase in growth.

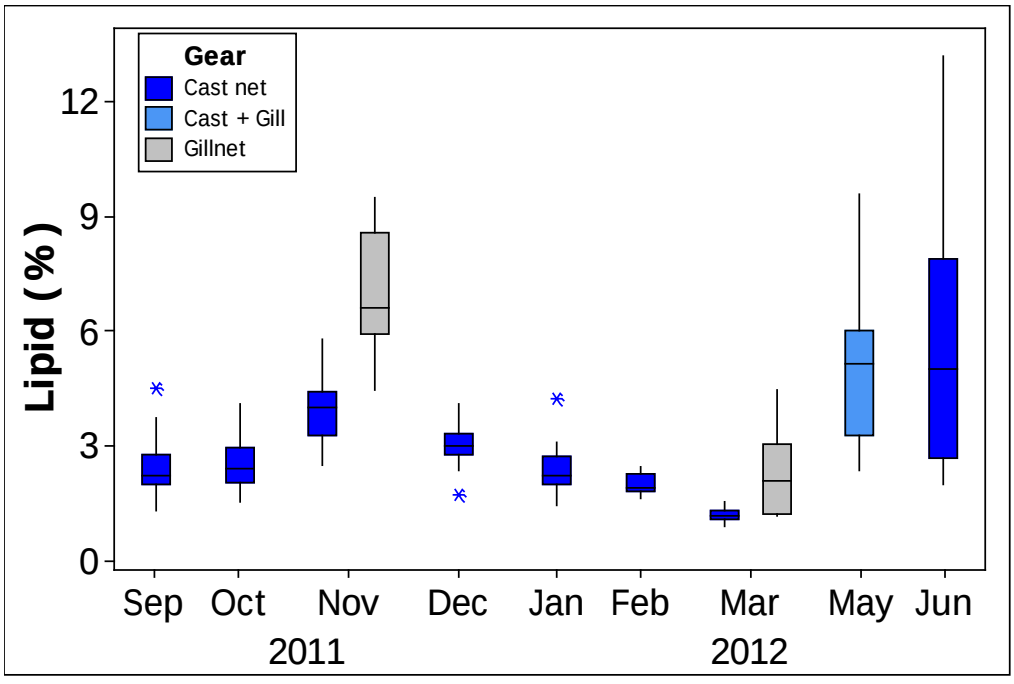


Figure 6. Lipid content (% wet tissue mass) of YOY herring from Simpson Bay. Boxplots with whiskers extending to the adjacent value nearest 1.5 times the interquartile range (* = outlier).

The purpose of collecting a time series was to determine if the November and March sampling periods were the most appropriate for studying overwintering energetics. Based on the WBED and RNA/DNA ratio it appears that the current sampling matches the peak and minimum in condition. The decrease in WBED from November to January is much steeper than predicted by the linear model that we have been using. It appears that from January through March the energy content is nearly constant near a minimum level. This energy density may be close to the minimum for survival and the constant level is due to the mortality of fish that fall below this level. The shift in size distribution at the same time may indicate that as smaller fish die we are capturing more larger fish that are now reaching the critical WBED level. The gillnet samples in the fall indicate that the larger fish start with a greater WBED.

Another aspect of this project was to examine fish from nearby waters to see how uniform the characteristics are. We sampled in five locations in September, November, and March. We only collected fish in three of those locations at the most. In November 2011 the two sets of fish collected in shallower waters were the same size, but were smaller than the one collection from deeper water. The two shallow locations had different WBED, although the shallow and deep sample from the western arm had similar WBED. While we did not collect fish at as many locations as planned, our sampling scheme has allowed for sampling in multiple locations within a week within the same bay. Using our full dataset we have 27 times when we caught fish using the same gear type within a week within the same bay. Each sample was required to have more than five fish to be considered. Of those twenty seven instances only three have lengths that are more than one standard deviation apart. All three of those samples came from Simpson Bay where it appears to regularly have multiple cohorts that include one with smaller fish. There are seventeen instances where we have multiple samples of WBED using a criteria of more than five fish analyzed. Only in once instance was the WBED not within one standard deviation. It was one of the sample sets from Simpson Bay that had different lengths. One of the other sets with different lengths is still under analysis for WBED and the third had WBED within one standard deviation although length was outside one stand deviation apart.

The results in Simpson Bay may be the result of multiple cohorts being recruited each year. There is a small spawning stock in Simpson Bay that spawns nearly two months after the primary spawn near Port Gravina. Recruitment of larval herring from the two spawn events could explain the different size fish that have been observed in Simpson Bay.

A setback to the project occurred when one of the principal investigators (Dr. Thomas Kline) left the Prince William Sound Science Center (PWSSC) in June 2013. The Science Center is currently seeking a replacement for Dr. Kline and Dr. Pegau has taken responsibility for the project until a suitable replacement can be found. The gap in personnel has impacted the completion of the analysis of this project, however Dr. Pegau worked with Dr. Kline to ensure a smooth transition of materials and is in a position to rapidly bring a new person up to speed. As of the time of this report two candidates were offered the position, but both declined it. The search is being renewed. The lack of a dedicated PI is delaying the final analysis, but we hope that we be able to still complete it by the end of FY14.

The PWSSC completed its isotope analysis of all samples. Considerable effort was put towards combining the several databases that contained parts of the energetics information into a single database that includes an explanation of all the columns. This effort simplified the ability to determine which

samples had been processed, identify samples of value to the time-series effort, and separate out effects of sampling gear and locations. It also makes them much easier to share with other investigators.

The PWSSC purchased a new calorimeter and are in the process of comparing the results with the older unit and the one at ABL. We expect to begin running samples through the new calorimeter in February 2012.

For Heintz' component of the project, biological data (lengths, weights) has been collected and RNA/DNA analysis completed on all YOY herring received at ABL from the PWS collections in September 2011 through June 2012. The RNA/DNA results were presented in a poster at the 2014 AMSS symposium in Anchorage.

This project requires coordination of P.I.s at PWSSC and ABL. With the departure of Dr. Kline the initial focus was on working with Dr. Pegau to coordinate sample processing and handling. Data and samples have been shared between the two groups. We have reviewed and revised our sample sharing policy to allow more fish to be processed by both labs.

We processed samples using calorimeters in both laboratories to confirm that the results are comparable. We found that there was a bias in WBED between systems used of 0.16 kJ/g (Figure 7). The PWSSC recently bought a new calorimeter and we are currently bringing it on line to compare to the Auke Bay Laboratory (ABL) and older PWSSC calorimeters.

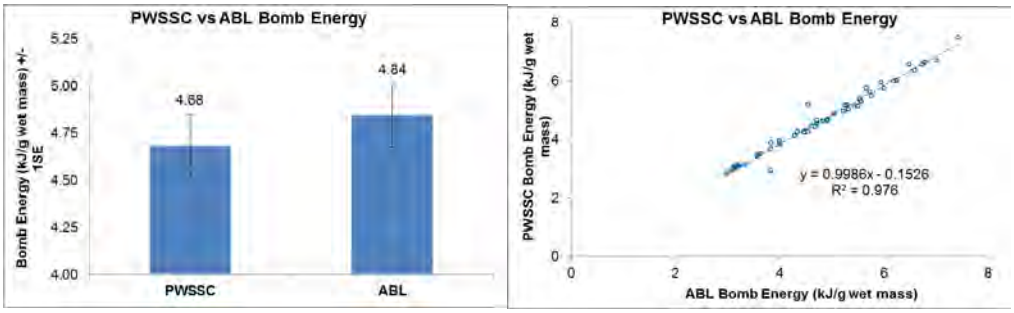


Figure 7. Results from calorimeter measurements by ABL and PWSSC on 50 fish.

Coordination efforts with other investigators has occurred during PI meetings in the spring and at AMSS. These provide opportunities for investigators to learn about the findings of others in the group and ensure sampling needs are met. We look to find ways to collect samples outside of the original proposal schedule to enable additional studies.

Dr. Pegau attended the GWA investigator meeting in November and presented on the finding of the HRM program. We are working closely with the forage fish component on sampling techniques and validation of the aerial survey data. We are working with the zooplankton monitoring projects to examine the relationship between herring recruitment and fitness with the quantity and timing of phytoplankton and zooplankton.

We are coordinating with the fishing fleet through providing findings at a CDFU Board meeting and through the spring sampling effort.

Table 1. Status of project deliverables for this reporting period

Deliverable/Milestone	**Status**
Annual PI meeting	Completed March 2013
Laboratory analysis complete	PWSSC portion completed in July; Heintz' RNA/DNA completed in August
Submit FY 14 Work Plan for review	Work Plan was submitted in August 2013 to match the current EVOSTC reporting dates
Submit annual report	Mid-year project and program reports were submitted in August 2013.
Submit synthesis to EVOS Science Council	Delivery of this synthesis has been delayed until November 2014 by the EVOSTC.
Data analysis completed	This deliverable has been delayed due to the departure of Tom Kline. Fletcher Sewall and Scott Pegau have worked on an initial analysis.
Alaska Marine Science Symposium	Attended and presented a poster about research findings

8. Information and Data Transfer: *See,* Reporting Policy at III (C) (8).

Presentations on the HRM research program including results of this project were given at the EVOSTC fall meeting, the Alaska chapter of the American Fisheries Society annual meeting, and to the Board of the Cordova District Fishermen United. A poster of the program was presented at the Alaska Marine Science Symposium in January 2014.

The updated PWSSC and ABL herring energetics databases have been uploaded to the workspace for sharing with other investigators.

9. Response to EVOSTC Review, Recommendations and Comments: *See,* Reporting Policy at III (C) (9).

No comments specific to this project have been provided.

10. Budget: *See,* Reporting Policy at III (C) (10).

PWSSC Budget

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 (*will vary by proposer*)	$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	N/A
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:
Existing laboratory equipment (drying oven, scales, calorimeter) worth approximately $35K were used to support this program.

Spending in the Personnel category is behind because of the departure of Dr. Kline and the technician being used by a new program through the summer.

ABL Budget

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	$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	$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:

NOAA staff salaries, for training and oversight of labor for sample processing and administration	$38,179
NOAA instrument amortization, existing instrument use	$ 2,275
Total	$40,454

Funds for FY13 were $11,841 in carryover from FY12. Travel expenses for FY12 were carried over to FY13 and were less than expected for attendance at the PI meeting in Cordova. Commodities expenses for FY12 were less than expected due to use of shared commodities from other projects. These resulted in lower than expected total project expenses.

ATTACHMENT C ***EVOSTC Annual Project Report Form***

Form Rev. 1.17.14

*Please refer to the Reporting Policy for all reporting, due date and technical submission requirements.

1. Project Number: *See*, Reporting Policy at III (C) (1).

13120111-N

2. Project Title: *See*, Reporting Policy at III (C) (2).

PWS Herring Program – Scales as growth history records

3. Principal Investigator(s): *See*, Reporting Policy at III (C) (3).

Steve Moffitt

4. Time Period Covered by the Report: *See*, Reporting Policy at III (C) (4).

1 February 2013 to 31 January 2014

5. Date of Report: *See*, Reporting Policy at III (C) (5).

14 February 2014

6. Project Website (if applicable): *See*, Reporting Policy at III (C) (6).

Http://pwssc.org/research/fish/pacific-herring/

7. Summary of Work Performed: *See*, Reporting Policy at III (C) (7).

During this reporting period, 2,512 production images (useable for measuring) were captured in a tagged image file format (TIFF) from random selections of Pacific herring scales from fish aged 4, 5, or 6. All scales were from fish collected during March, April, or May in 1985–1998 and 2013. This increased the total number of available production images to 5,112 from years 1985–2013. All 5,112 production images were measured for annual growth increments (Table 1) with image analysis software and a macro written for the Alaska Department of Fish and Game's Mark, Tag, and Age Laboratory in Juneau. Additionally, JPEG images were saved for each measured scale with an overlay indicating the scale focus, measurement axis, and each annulus (e.g., Figure 1). All growth increment data were imported into MS Excel and matched with age, sex, and size data. Data were examined for outliers using MS Excel data filtering tools and SAS line, scatter, and box plots (e.g., Figure 2, Figure 3, and Figure 4). Some scales were measured a second time based on the quality control work completed to date.

An additional 2,129 TIFF images were captured for scales that were not measured (Project total = 2,925 images). These scales were not imaged because 1) we didn't agree with the original age assigned or 2) the image quality would make measuring difficult or impossible. Most of these additional scales were acceptable for determination of total age, but were unsuitable for measuring growth increments for because of issues with scale, e.g., torn, folded, or unusual growth patterns along the measurement axis of the scale.

Growth measurement data from the first year of growth fit a normal distribution for all years combined (Figure 5). An examination of a few individual years by age indicated the hypothesis that the

measurement data were normally distributed could not be rejected. First year growth among scales aged 4, 5, and 6 were all positively correlated (Table 2).

Correlations with some biological and environmental indices were also examined. An visual examination of first year growth increments and biomass (metric tons) from the ADF&G age structured model would suggest that growth was negatively correlated with biomass until 2003 (e.g., Figure 6). The correlation among all years is very weak (Table 2); however, for years prior to 2003, first growth by age and biomass are all moderately correlated (-0.63 to -0.65) and significant ($p<0.002$). This suggests density dependent growth prior to 2003. However, after 2003 almost all of the herring spawn has occurred on the east side of Prince William Sound and almost all of our scales are from the east side. Density dependent growth could still be a factor if herring larvae from eastern PWS are rearing in a limited number of bays.

The first year growth by age showed weak positive correlations with the Pacific Decadal Oscillation (PDO) and weak negative correlations with the North Pacific Index (NPI) (Table 3). Other environmental indices will be examined for correlations with growth.

One of the original project objectives indicated we would determine the number of scales to measure based on a power analysis and our preliminary goal was 50 scales from 6 or 7 age classes per year. However, we had problems completing a hire at the beginning of the project; the setup, modification, and calibration of the scanner took longer than anticipated, and an examination of the number of scales available by age indicated that 60 scales per year (30 for each sex) for 3 age classes would be more likely to be completed in the time available.

Table 1. Count of Prince William Sound Pacific herring scale images that have had annual growth increments measurements completed through 31 January 2014. Counts are tallied by scale collection year, age at time of collection, and sex.

	Measurements Count						
	Age 4		Age 5		Age 6		
Collection Year	Male	Female	Male	Female	Male	Female	Total
2013	30	31	25	29	30	29	174
2012	18	20	30	30	23	21	142
2011	30	31	29	26	31	31	178
2010	30	30	29	30	30	30	179
2009	30	30	32	29	28	30	179
2008	30	30	30	30	29	30	179
2007	30	31	31	32	29	31	184
2006	30	30	30	31	31	30	182
2005	31	29	30	30	31	30	181
2004	29	30	35	31	20	20	165
2003	31	32	33	31	31	30	188
2002	30	30	29	29	30	32	180
2001	31	31	30	30	30	29	181
2000	32	29	30	31	31	31	184
1999	30	30	29	32	30	32	183

1998	29	30	30	31	30	32	182
1997	30	30	30	30	30	31	181
1996	32	31	30	28	31	30	182
1995	29	30	30	30	30	30	179
1994	29	30	30	32	30	31	182
1993	31	31	30	30	25	31	178
1992	31	30	30	29	12	21	153
1991	30	31	29	18	32	32	172
1990	7	11	30	30	29	30	137
1989	30	30	32	30	31	28	181
1988	31	29	32	29	31	32	184
1987	30	30	31	30	29	31	181
1986	29	31	31	33	31	30	185
1985	27	29	30	30	30	30	176
Totals	807	816	852	832	805	826	5,112

Table 2. Correlations among average first year scale growth measurements, prefishery biomass (metric tons), and number of age 3 recruits lagged back 3 years, 1985–2013. Biomass and age 3 recruit estimates are from the 2012 age structured assessment model output.

Pearson Correlation Coefficients
Prob > |r| under H0: Rho=0
Number of Observations

	Age4_Growth	Age5_Growth	Age6_Growth	Biomass	Recruits_lag3
Age4_Growth	1 29				
Age5_Growth	0.88567 <.0001 28	1 29			
Age6_Growth	0.82618 <.0001 27	0.82334 <.0001 28	1 29		
Biomass	-0.30825 0.1038 29	-0.24511 0.2 29	-0.28114 0.1473 28	1 33	
Recruits_lag3	-0.05446 0.7873 27	-0.21869 0.2831 26	-0.10061 0.6323 25	0.40404 0.0268 30	1 30

Table 3. Correlations among average first year scale growth measurements, Pacific Decadal Oscillation (PDO) index* averaged over May–August , and the North Pacific Index (NPI) anomalies** averaged over May and June, 1985–2013.

Pearson Correlation Coefficients
Prob > |r| under H0: Rho=0
Number of Observations

	Age4_Growth	Age5_Growth	Age6_Growth	PDO_MJJA	NPI_MJ
Age4_Growth	1 29				
Age5_Growth	0.88567 <.0001 28	1 29			
Age6_Growth	0.82618 <.0001 27	0.82334 <.0001 28	1 29		
PDO_MJJA	0.43458 0.0185 29	0.38641 0.0384 29	0.35201 0.0611 29	1 34	
NPI_MJ	-0.09881 0.6101 29	-0.30935 0.1025 29	-0.13267 0.4927 29	-0.36145 0.0357 34	1 34

*Mantua, N. J. (current as of 1-1-2014) PDO index data at: http://jisao.washington.edu/pdo/PDO.latest

**Hurrell, James & National Center for Atmospheric Research Staff (Eds). Last modified 20 Nov 2013. "The Climate Data Guide: North Pacific (NP) Index by Trenberth and Hurrell; monthly and winter." Retrieved from https://climatedataguide.ucar.edu/climate-data/north-pacific-np-index-trenberth-and-hurrell-monthly-and-winter.

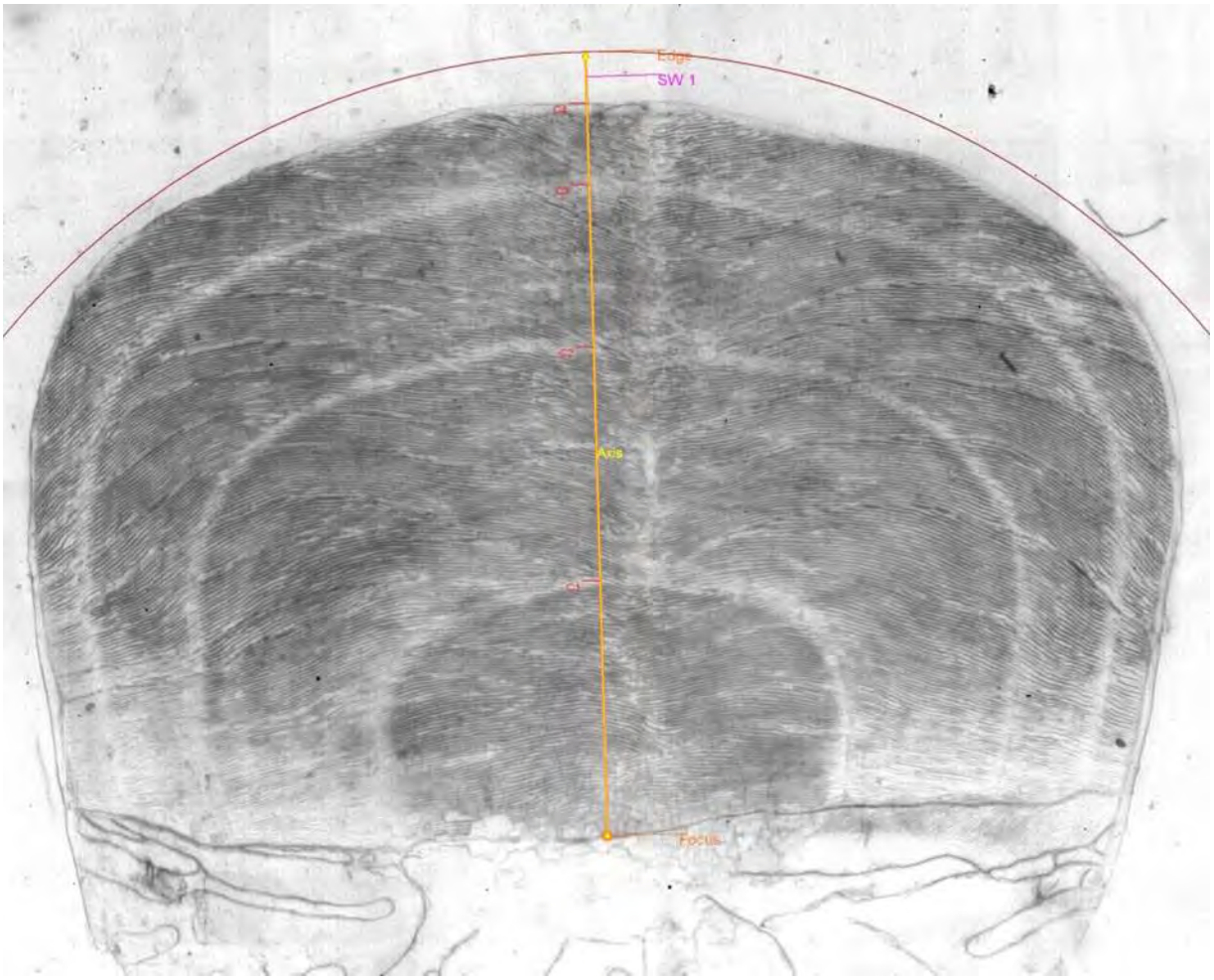


Figure 1. Example overlay from image analysis software with the focus, measurement axis, and each annuli marked.

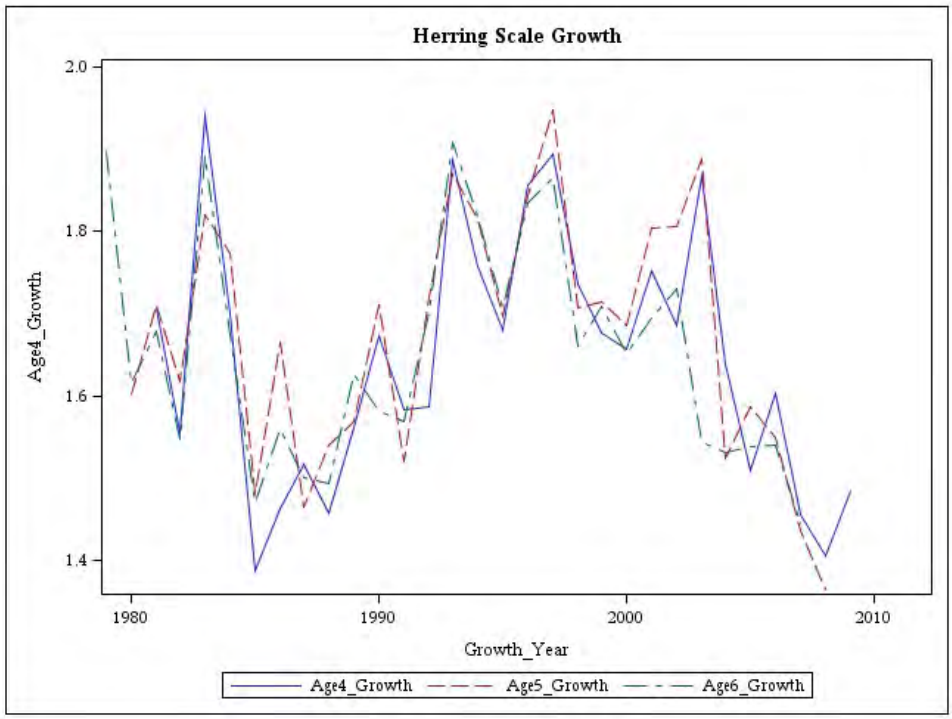


Figure 2. Average first year growth of Pacific herring aged 4, 5, and 6 during growth years 1979–2009.

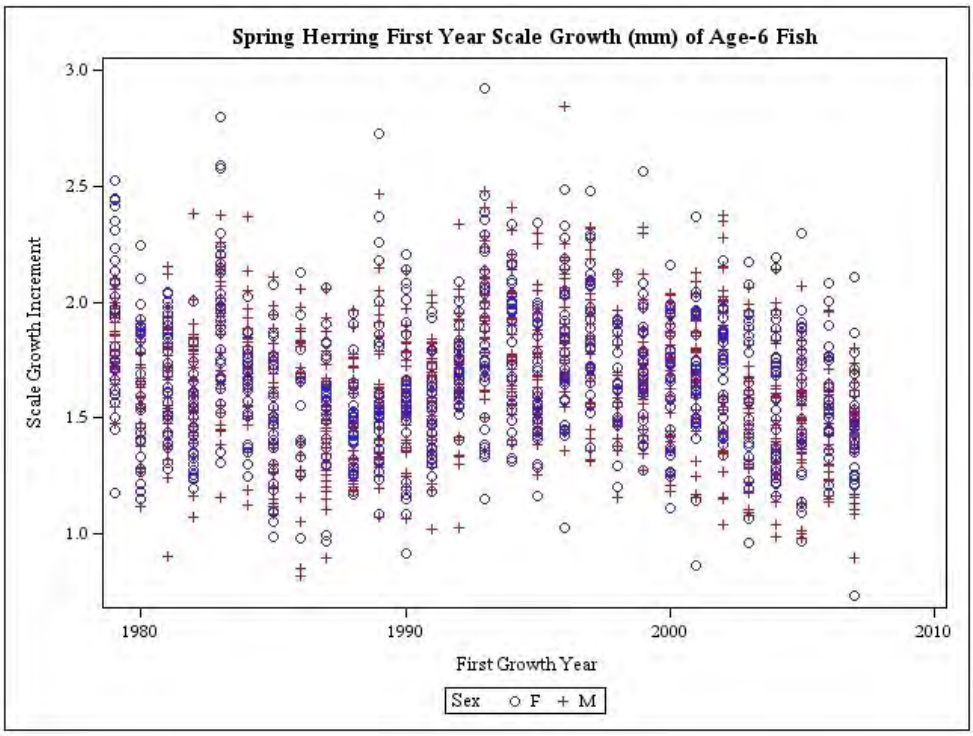


Figure 3. First year scale growth increments (mm) of fish captured at age 6 by sex and growth year.

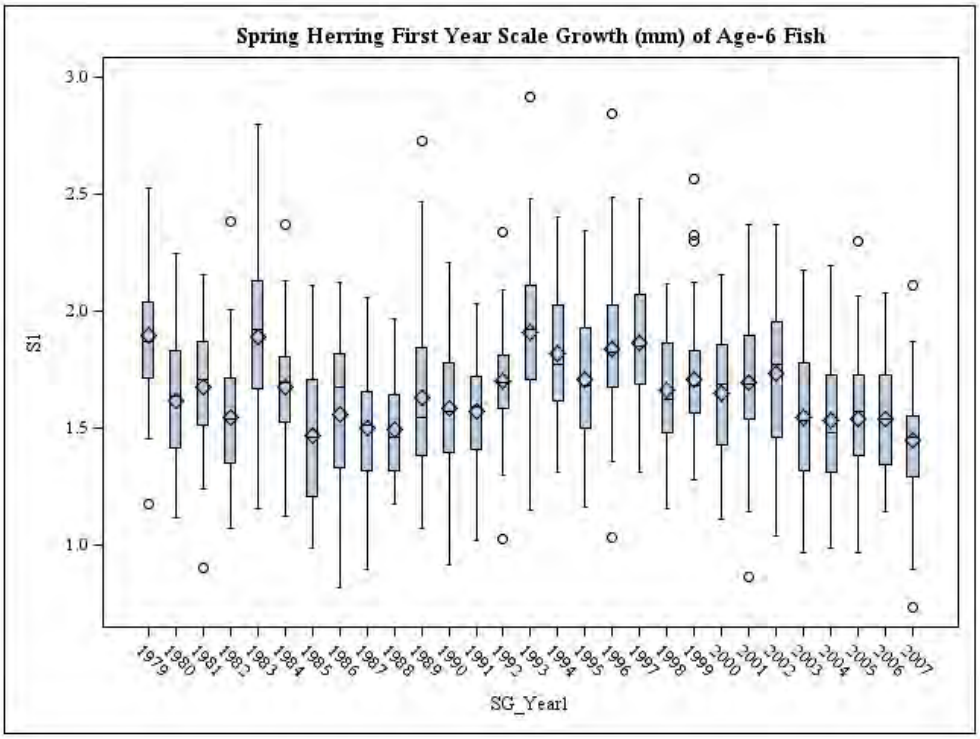


Figure 4. First year scale growth increments (mm) of fish captured at age 6 by sex and growth year.

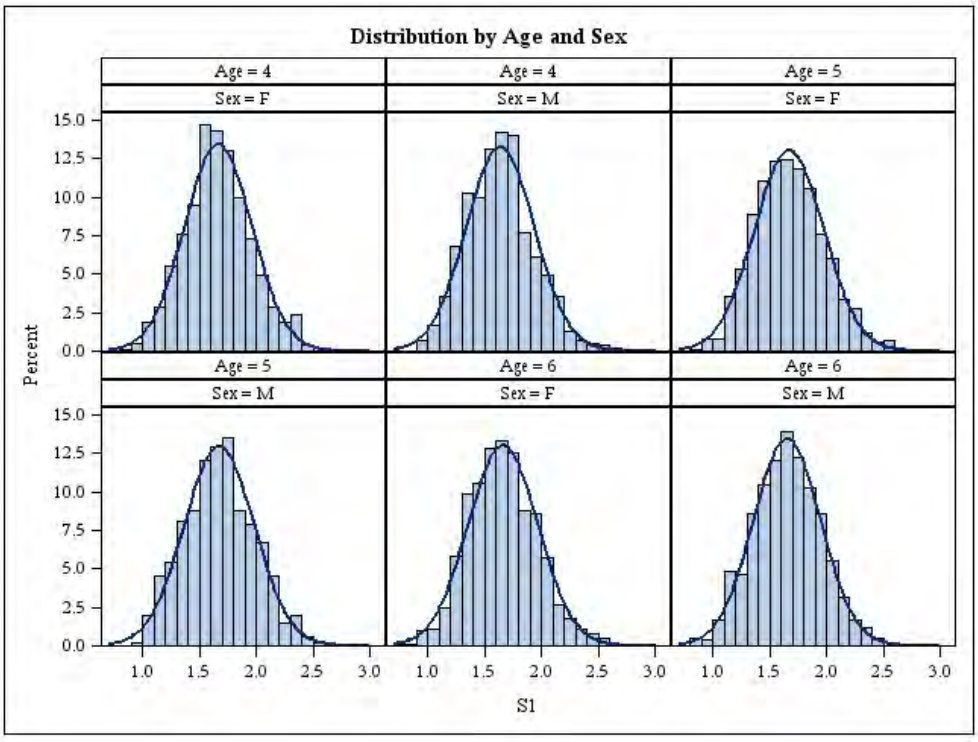


Figure 5. Distribution of scale measurements by sex and age, 1985–2013 combined.

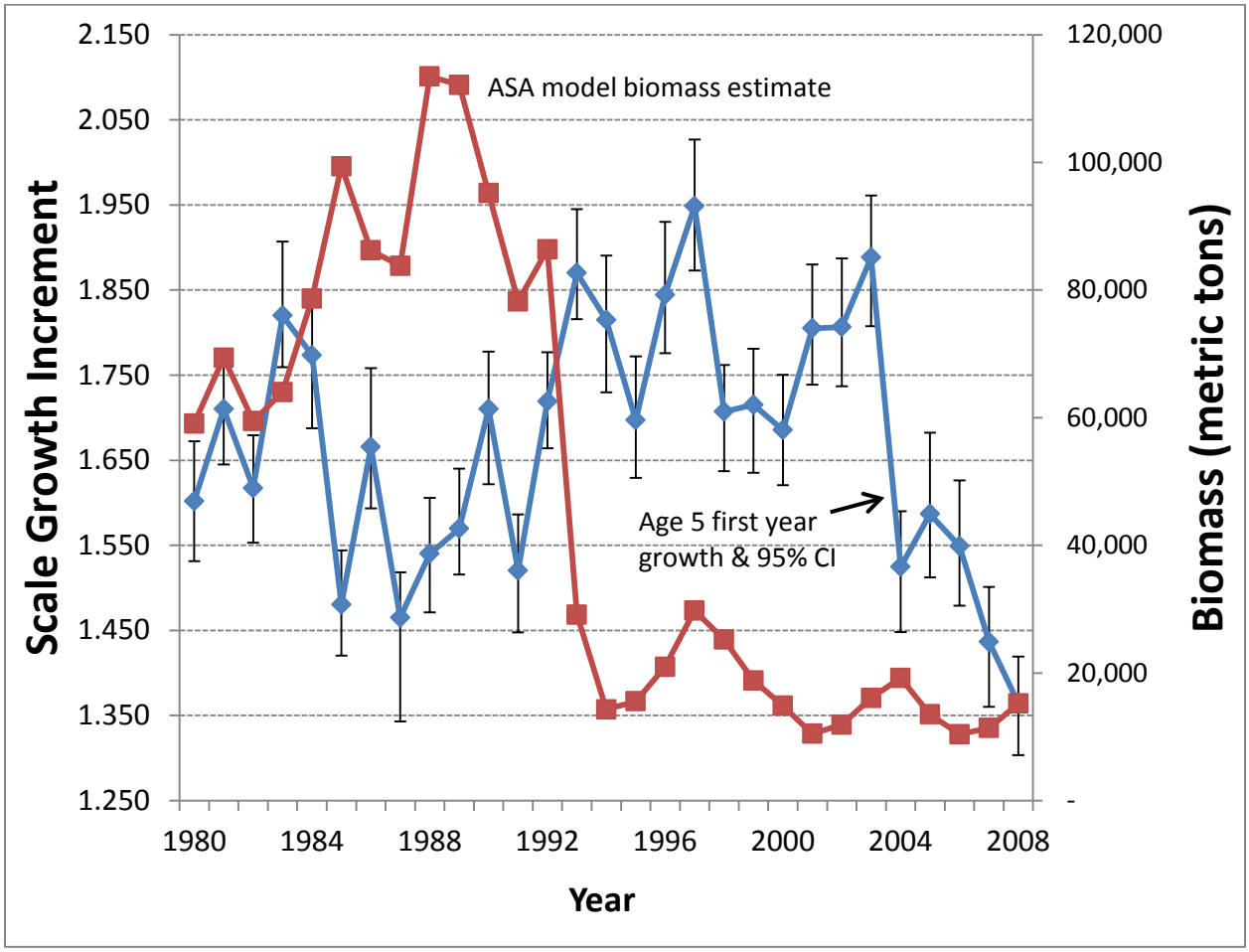


Figure 6. First year scale growth increments (focus to annulus) for fish captured at age 5 and age structured model estimates of prefishery run biomass (metric tons). The x axis (year) represents the year when the first year of growth occurred and the paired biomass estimate for that year.

We discussed the use of images and measurements with Vollenweider for use in the age at first spawn project. The data from this project was shared with them for their analysis. ADF&G also provided boat space for USGS program staff and assisted with herring collection for the disease research program.

Table 4. Status of project deliverables for this reporting period

Deliverable/Milestone	**Status**
Process representative scales for digitized image and growth measurements.	Greater than 5,110 scales have been imaged and measured from the years 1985–2013.
Present poster at Alaska Marine Science Symposium	Presented poster at January 2014 meeting. Poster is available on AOOS workspace.

8. Information and Data Transfer: *See,* Reporting Policy at III (C) (8).

- Project outline presented by program lead at public meetings in Cordova and Anchorage.
- Worked with NCEAS to provide legacy herring data sets.
- Attended meeting of principle investigators in April 2012 (Cordova), November 2012 (Anchorage), and at the Alaska Marine Science Symposium (January 2013).
- Attended the 2014 Alaska Marine Science Symposium (AMSS)
- Presented a poster at 2014 Alaska Marine Science Symposium titled "**Scales as growth history records for Pacific herring *Clupea pallasi* in Prince William Sound."**
- Uploaded AMSS poster and scale measurements data set to AOOS workspace for program.

9. Response to EVOSTC Review, Recommendations and Comments: *See,* Reporting Policy at III (C) (9).

It is probable that the results of this project will provide new perspective about the biological changes that occurred in PWS herring in the mid-1990's. It is essential that the PI develop and explain some quality control rules (and report on them) to ensure that mismatches between the archived scales and size data do not confound the data or results.

Each scale and matching data (collection date, collection location, age, sex, size, etc.) in the Alaska Department of Fish and Game's archive for 1985–2013 are matched by unique file name, slide number, and scale number on the slide (10 scales per slide). Data from prior to 1985 are matched by unique sample date, location, data sheet number, and scale number on the data sheet (still 10 scales per slide, but scales are numbered 1–80 over 8 slides). Unique file names are formatted as *YY##FGLL* (2 digit year, 2 digit unique sample log number for the year, Fishery code, gear code, and 2 letter location code). For example, file name 8501SPJB would represent a sample collected in 1985 (85), the first sample logged in 1985 (01), collected from a commercial sac roe harvest (S), by purse seine gear (P) in Jack Bay (JB). Each data sheet (1973–1988) or data file from an electronic fish measuring board (1989 to present) includes the file name. Each scale slide (1991–present) is labeled with the unique file name, collection date, collection location, gear, and fishery. The 1985–1990 scale slides do not include the file name, but are all labeled with collection date, collection location, gear, and fishery.

Random selections by age and sex were drawn from the archive to image and measure. Each image is named prior to saving with the format *YY##FGLL_S#F##_?#.tif*. The image name format includes the unique name described earlier (*YY##FGLL*), the Slide (1985–present) or data sheet number (*S#*), the fish scale number (*F##*), the sex of the fish (*?* Representing the choice of male = M or female = f) and the age of the fish (#).

Mismatches between scale images and paired data may occur 1) at the original time of collection of scales and data, 2) during the selection of the scales to image (incorrect slide or incorrect scale on the slide imaged), or 3) because the image was given the incorrect name when it was saved.

Given that background, the protocols and rules that we use to address possible mismatch of scale images and measurements with the corresponding age, sex, and size data include the following:

- To look for the possibility of mismatch at the time of collection, scatter plots of age and length and weight by sex are examined for outliers. Length and weight data by age and sex are also sorted to detect outliers. Scales from apparent outliers are examined for correct age interpretation. If the age appears correct, outlier data are marked for deletion.
- A color printed list and MS Excel spreadsheet of the randomly selected scales for each year is available for the technician to find and select the correct scales.
    - The list is sorted by filename, slide number, and scale number to reduce the switching among samples and slides.
    - File name cells have a color background that alternates between green and orange to reduce the possibility that an image will be selected from the wrong sample.
    - Row heights are increased from the MS Excel default of 15.75 to 30.0 to increase the clear space around the file name, slide number, fish number, and image name.
    - Lines are added for all row boundaries to increase the contrast between rows.
    - The image name font size is increased to 14 point to make it easier to read and reduce the possibility of incorrect image name entry.

Scale measurements are also examined for possible outliers using scatter plots, box plots, and filtering in spreadsheets. The scale images of outliers will be compared against the scale to ensure the image is the correct scale and measured a second time if necessary.

10. Budget: *See,* Reporting Policy at III (C) (10).

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	$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:

Non-EVOSTC funds used for this project since 31 January 2013 include: Salary for Ron Andersen to scan and measure scales: 4 mm at $15,447 from State General Funds, Salary for Steve Moffitt to randomly select scales, analyze data, present poster, and attend meetings: 0.5 mm at $6,040.00 from State General Funds.

We spent about $27.0 thousand less than proposed because we could not get someone hired as soon as we anticipated.

ATTACHMENT C ***EVOSTC Annual Project Report Form***

Form Rev. 1.17.14

*Please refer to the Reporting Policy for all reporting, due date and technical submission requirements.

1. Project Number: *See*, Reporting Policy at III (C) (1).

13120111-O

2. Project Title: *See*, Reporting Policy at III (C) (2).

PWS Herring Program – Coordination and Logistics

3. Principal Investigator(s): *See*, Reporting Policy at III (C) (3).

W. Scott Pegau

4. Time Period Covered by the Report: *See*, Reporting Policy at III (C) (4).

1 February 2013 to 31 January 2014

5. Date of Report: *See*, Reporting Policy at III (C) (5).

14 February 2014

6. Project Website (if applicable): *See*, Reporting Policy at III (C) (6).

Http://pwssc.org/research/fish/pacific-herring/

7. Summary of Work Performed: *See*, Reporting Policy at III (C) (7).

During this period we used the synthesis efforts of the EVOSTC funded PWS Herring Survey program as an opportunity to bring together investigators from that program and the Herring Research and Monitoring (HRM) program to ensure coordination both between programs and within the HRM program, thus contributing to the coordination objective of the project. We did not have a single meeting in May as originally scheduled, but met in January and March instead. Coordination between the HRM and Gulf Watch Alaska program (GWA, the EVOSTC long term monitoring effort) are described later in the document. We also continue to work with local fishermen to address their interests to the best of our ability.

Due to a scheduling change by the EVOSTC we did complete the synthesis objective as originally proposed. The synthesis developed by the PWS Herring Survey program and delivered in May 2013 will serve as the starting point for the HRM synthesis. A meeting of investigators during the Alaska Marine Science Symposium was used as an opportunity to begin the refinements to the synthesis due now in November 2014.

The objective for providing logistical support was addressed in many ways through the year.

The spring collection of juvenile herring is now contracted to Cordova District Fishermen's United. Three vessels collected fish at the same locations as the scientific sampling that occurs in the fall. Poor weather provided an opportunity to sample at least one additional location. This is the first year with even finer mesh gill nets than have been used in the past and the impression is that they are more

effective. Samples were kept on ice, which allowed them to degrade somewhat. We have purchased travel freezers and will have the fish frozen upon capture in the future.

Vessels were arranged for the expanded adult biomass survey and herring tagging studies. Both projects were able to conduct their work without any logistical issues. The very cold water this spring seemed to alter the spawning pattern making it difficult to find large aggregations of prespawn fish. The spawn was protracted and spatially broken up by the cold water. This did create an issue with finding additional spawning stocks for the expanded biomass survey and capture of different spawning stocks for the genetics work. We are examining the approach for collecting fish from remote spawning locations to better fulfil the sampling needs of the genetics project, which starts next fiscal year. We are looking to split up the timing of the adult herring survey to better match historic spawn timing at different locations. We will also try responding to reports of spawn by flying to the site and deploying a raft to try and collect fish. We were fortunate to have the opportunity to observe a large spawning event out on Kayak Island and were able to fly out and collect a couple hundred fish from there for the genetics study.

We established the capabilities of detecting herring spawn using satellite data. This came in response to a local request for being able to detect spawn at remote locations. Using the true-color MODIS imagery available from the Geographic Information Network of Alaska (GINA) we determined we could observe spawn if the sky was clear and the spawn extended for a few kilometers (Figure 1). This proved useful for detecting spawn at Kayak Island. Spawn was observed there in three images over a two week period. The last spawn event occurred nearly two weeks after the first two images were collected. A local pilot was able to use the image of the day to observe the spawn and fly out to verify the satellite image.

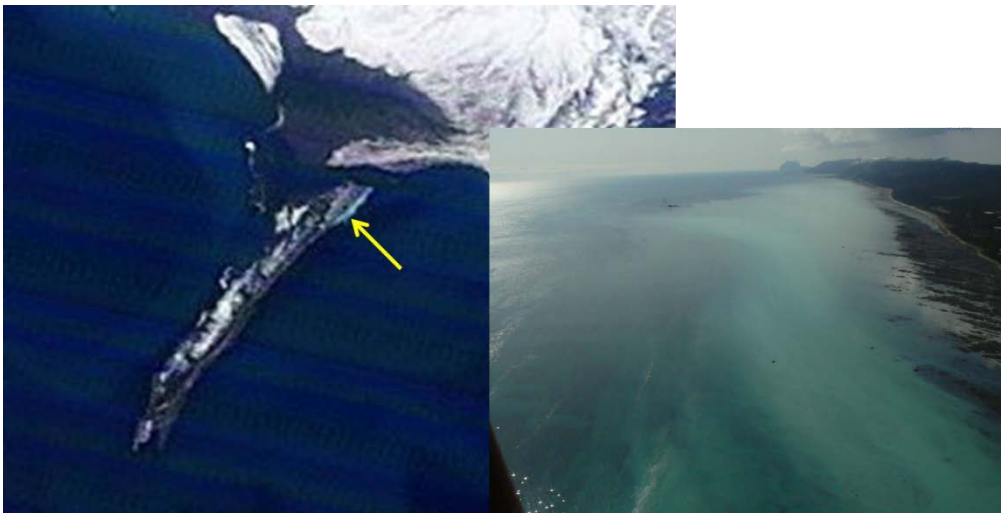


Figure 1. Spawn on the northern end of Kayak Island is observed in a MODIS satellite image (left) and verified by a spotter pilot (right).

We were able to use other funding to continue a simplified version of the aerial surveys of juvenile herring and other forage fish that were conducted during the PWS Herring Survey program. A survey of PWS was completed in June 2013. During this survey over 2100 schools of juvenile herring were observed. This compares to 579, 75, and 279 schools being detected during this period in the prior three years. Other observations including the numbers of age-0 pollock, returning pink salmon, and other

marine surveys suggest that 2012 may have been an unusually good year for marine survival and recruitment. The fish observed this year are not expected to recruit to the fishery for another two years, but recruitment of the first two years of observations suggests that the June survey is a good predictor of future recruitment to the spawning stock.

We also worked with the forage fish component of the Gulf Watch Alaska (GWA) project to provide four days of aerial survey support to assist in guiding sampling activities of the vessel. This provided an opportunity to provide ground truth of the aerial observations to the HRM program. The success of the aerial survey efforts for the HRM and Gulf Watch programs led to the submission of a supplemental funding request to support aerial survey efforts over the next two years.

A contract was established for the vessel for the juvenile herring acoustic survey intensive and the first four cruises were conducted. Three occurred in October and were spaced approximately two weeks apart. The fourth did not occur until the start of December because the normal fall survey occurred during November. Testing of the non-lethal sampling using an ROV and Didson sonar occurred during the intensive cruises. There were problems with the cable to the ROV that prevented going on one of the surveys, but the cable was fixed and a second boat chartered to allow testing of the system. The Didson was then taken off the ROV and fixed to the sled with the Biosonics sonar to get side-by-side data comparisons. The ROV has been returned to the manufacturer for more complete repairs than were possible in the field.

The contract for the November acoustic survey in PWS was established and the cruise was conducted. Eight bays were surveyed over a nine day period.

Dr. Pegau attended the GWA investigator meeting in November and presented on the finding of the HRM program. This provided an opportunity to tighten connections between the programs. We are working closely with the forage fish component on sampling techniques and validation of the aerial survey data. We are working with the zooplankton monitoring projects to examine the relationship between herring recruitment and fitness with the quantity and timing of phytoplankton and zooplankton.

We are coordinating with the fishing fleet through providing findings at a CDFU Board meeting and through the spring sampling effort. We work to be responsive to concepts of interest to the local people and the use of remote sensing data to detect herring spawn is an example of that effort.

A side meeting of the investigators was conducted during the Alaska Marine Science Symposium. The purpose of the meeting was to provide an opportunity for coordination, discuss direction for the synthesis effort, improve data sharing, and discuss future publications.

The biggest community issue on the horizon is knowing more about the herring that are spawning on Kayak Island. These fish are not commonly observed because they are outside the normal spawn survey effort. However, these fish are part of the PWS fishing region and may comprise a spawning biomass similar in size to that spawning within PWS. We were able to collect a sample of fish from a spawn event on Kayak Island this year. The fish were supplied to ADF&G for age-sex-length analysis and then shared with NOAA for genetic analysis.

We often meet with the herring fisheries managers that are also members of the HRM program. It is through these meetings that we keep track of the needs of the resource managers. We were also able to

meet with Sherri Dressler of ADF&G to discuss our findings and how they might be informed by herring research in other parts of the state.

Table 1. Status of project deliverables for this reporting period

Deliverable/Milestone	**Status**
Conduct spring juvenile herring collection	Completed March 2013
Conduct extended adult biomass cruise, collect samples for genetics & histology	Adult biomass cruise completed April 2013
Conduct annual PI meeting	Meeting conducted in conjunction with the PWS Herring Survey PI meeting in March 2013.
Submit FY 14 Work Plan for review	Work Plan was submitted in August 2013 to match the current EVOSTC reporting dates
Submit annual report	Mid-year project and program reports were submitted in August 2013.
Submit synthesis to EVOS Science Council	Delivery of this synthesis has been delayed until November 2014 by the EVOSTC. A synthesis describing factors affecting the first year of life was delivered by the PWS Herring Survey Program in May 2014.
Begin acoustic intensive study	The vessel charter was established and work began as scheduled in October 2013.
Conduct juvenile index survey, test non-lethal sampling systems	The vessel charter was established and the juvenile index survey was conducted as scheduled in November 2013. The testing of the non-lethal sampling system was shifted to the acoustic intensive study cruises because of the available bunk space.
Complete acoustic tagging project	Data from the listening array in Hinchinbrook Entrance and Montague Strait was downloaded in September 2013. Another visit to those arrays will be needed to determine the timing of fish that returned to PWS.
Alaska Marine Science Symposium	Attended and presented a poster about research findings of the HRM program

8. Information and Data Transfer: *See,* Reporting Policy at III (C) (8).

Presentations on the HRM research program were given at the EVOSTC fall meeting, the Alaska chapter of the American Fisheries Society annual meeting, and to the Board of the Cordova District

Fishermen United. A poster of the program was presented at the Alaska Marine Science Symposium in January 2014.

This project has assisted individual investigators to upload their data to the herring portion of the Ocean Workspace. Effort was also placed in helping the education and outreach component with developing project profiles describing the individual projects and getting them onto the new herring page on the PWSSC website.

9. Response to EVOSTC Review, Recommendations and Comments: *See*, Reporting Policy at III (C) (9).

No comments specific to this project have been provided. Programmatic and synthesis comments are addressed in the program summary report.

10. Budget: *See*, Reporting Policy at III (C) (10).

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	$332,288.0	$294,916.0	$243,657.0	$1,463,820.0	$ 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 (*will vary by proposer*)	$35,700	$56,130	$52,800	$51,800	$35,570	$232,000.0	$ 71,730
SUBTOTAL	$334,060.0	$468,129.0	$421,088.0	$376,016.0	$310,627.0	$1,909,920.0	$637,197.0
General Administration (9% of	$30,065.4	$42,131.6	$37,897.9	$33,841.4	$27,956.4	$171,892.8	N/A
PROJECT TOTAL	$364,125.4	$510,260.6	$458,985.9	$409,857.4	$338,583.4	$2,081,812.8	
Other Resources (Cost Share Funds)	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	

COMMENTS:
In FY13 the Oil Spill Recovery Institute provided approximately one month of salary for Pegau ($11,000). This funding covered coordination activities outside of the one month requested from the EVOSTC.

Spending in the Personnel category is $27K behind because we have not identified the person to assist me. The person we originally were going to have work on the project left to go back to graduate school. Travel is slightly ($4k) underspent because we have not had the full herring oversight committee available since Ted's death. Contractual is $124K underspent in part due to the time lag of getting bills from subcontractors and in part due to having several cruises that are scheduled in February and March. Commodities is 1.5K underspent, due to the lag in time for billing. Indirect is $20K underspent because of the other categories being underspent.

ATTACHMENT C ***EVOSTC Annual Project Report Form***

Form Rev. 1.17.14

*Please refer to the Reporting Policy for all reporting, due date and technical submission requirements.

1. Project Number: *See*, Reporting Policy at III (C) (1).

13120111-Q

2. Project Title: *See*, Reporting Policy at III (C) (2).

PWS Herring Program – Population dynamics modeling

3. Principal Investigator(s): *See*, Reporting Policy at III (C) (3).

Trevor A. Branch

4. Time Period Covered by the Report: *See*, Reporting Policy at III (C) (4).

1 February 2013 to 31 January 2014

5. Date of Report: *See*, Reporting Policy at III (C) (5).

14 February 2014

6. Project Website (if applicable): *See*, Reporting Policy at III (C) (6).

Http://pwssc.org/research/fish/pacific-herring/

7. Summary of Work Performed: *See*, Reporting Policy at III (C) (7).

Student Melissa Muradian has completely converted the ASA assessment model of PWS herring into a Bayesian model that runs in the high-performance software package AD Model Builder. Assessment results are being verified and checked, with an intended writeup in Feb-April 2014. Draft results were presented in poster format at the Alaska Marine Sciences Symposium in Anchorage in January 2014

Muradian also coauthored a paper (in press) in ICES Journal of Marine Science looking at the performance of stock assessment models under different data availability regimes (Ono et al. in press).

Examination of the performance of the model under different data availability is underway, with preliminary results completed as a class project in Bayesian Decision Analysis.

PI is interviewing students for the second half of the project (Muradian will graduate with a MS and leave), and will select a student to continue the annual stock assessment model work and move onto the global meta-analysis of herring stocks. That project is intended to ask how often herring population collapse, for how long, and how many years does it take before recovery. This will put the PWS herring program in perspective.

There are no deviations from the original project.

Table 1. Status of project deliverables for this reporting period

Deliverable/Milestone	**Status**
Preliminary herring model	Completed, November 2013

Student completes required coursework	One course needs retaking in Spring 2014
Preliminary examination of which datasets are most informative	Completed December 2013
Annual Marine Science Symposium	Student attended and presented poster of work, Jan 2014

8. Information and Data Transfer: *See*, Reporting Policy at III (C) (8).

Muradian has been corresponding with the relevant managers in ADF&G about the implications of the new and improved model for assessing PWS herring.

Publications:

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 in press. 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.

Poster presentations:

Muradian, M. L. & Branch, T. A. 2014. Exploring the potential for a Bayesian assessment of Prince William Sound herring. Poster presented to the Alaska Marine Science Symposium.

Presentations:

29 January 2014 Muradian, M.L. Presentation to the joint SAFS-NWFSC-AFSC Fisheries Think Tank on the PWS herring stock assessment.

Products developed:

Preliminary Bayesian model in AD Model Builder for PWS herring. Still being finalized before uploading to the workspace.

9. Response to EVOSTC Review, Recommendations and Comments: *See*, Reporting Policy at III (C) (9).

While this effort may be in the correct direction, the estimation of herring biomass is an integral and very important part of the herring program. Candidly, the Science Panel had expected more progress and more effort than the efforts of a graduate student to be directed at this issue. This comment should not be seen as a criticism of the student, but instead as a deficiency in the effort directed at this important issue.

There is no indication from the proposal that there is any dialogue between the PI and the other herring program PI's and if so, that is a problem that should be addressed. A specific concern is the extent to

which acoustic data, or acoustic indices, can be used, as a component of the annual assessments. Similar questions exist about the spawn data. It seems probable that some form of fisheries-independent index would be required to tune the age-structure (ASA) model. If not, then something else might be used, such as a spawn index and if so, that might require a reallocation of resources. Therefore a better understanding of the data requirements for practical development of the ASA model is required. To this end the modelers need to examine and evaluate the strengths and weaknesses of the available data, preferably in collaboration with other PI's in the herring program.

Response:

The original proposal for this program included funding for PI Branch (1-2 months per year) to supervise the modeling project, and five years of graduate student support for focused research on the project. All milestones have been met as proposed. With additional funding, we could add a post-doctoral researcher to the project although it may be difficult to recruit candidates given alternative full-time job opportunities for quantitative fisheries modelers.

PI Branch and graduate student Muradian are regularly in contact with the other PIs on the project, both attending PI meetings (next one is in March 2014 in Cordova), and presenting a poster and oral results at a PI meeting results at the AMSS (Muradian). Additionally, PI Branch contributed to development of a new approach to the overwintering energetics model. Those results are included in the final report by Dr. Kline from his PWS Herring Survey Project.

The efforts of the project have been devoted to estimating time series of herring biomass by incorporating all available information in a Bayesian framework to replace the current ASA stock assessment model. The Bayesian model is a substantial improvement over the ASA framework, as it allows for statistically rigorous weighting of different data sources (including the acoustic index, mile-days-of-milt, and spawn data), as well as the incorporation of additional information through informative priors. This first piece of work is complete and is being written up.

The second major component of the project is testing which datasets are most informative and cost-effective, and addresses the comments made above. Each data component collected for herring (including disease data, spawn index, ageing, acoustic indices, mile-days of milt, etc.) is simulation tested to see how much information is added to the herring biomass estimates by that dataset, relative to the cost of collecting the data. Simulation testing involves removing each data type, one at a time, and re-running the model to see how this affects the precision and bias in the biomass estimates. This work is being developed together with the other PIs in the project, and with ADF&G managers currently running the ASA model.

A second graduate student is being identified this week to be added to this project in 2014 to further extend the Bayesian modeling, and to complete the final proposed section of work. This last section includes a comprehensive meta-analysis to estimate the expected frequency and duration of collapses in herring populations throughout the world, and the estimated recovery time after collapse. This work will directly address whether the PWS herring population collapse was precipitated by causes specific to PWS, or are intrinsic characteristics of herring itself.

In conclusion, the modeling component is fully integrated in the PWS herring project, collaborative with the other aspects of the project, and is fulfilling each portion of the project as originally proposed.

10. Budget: *See*, Reporting Policy at III (C) (10).

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 (*will vary by proposer*)	$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	N/A
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:

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.

Spending is on track with the budget.

EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
PROGRAM 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	$201,500.0	$377,300.0	$535,700.0	$524,200.0	$518,000.0	$2,156,700.0	$249,301.0
Travel	$26,800.0	$31,500.0	$47,000.0	$49,700.0	$46,600.0	$201,600.0	$19,936.0
Contractual	$336,960.0	$544,799.0	$456,188.0	$417,616.0	$362,757.0	$2,118,320.0	$716,485.0
Commodities	$81,600.0	$33,700.0	$104,100.0	$100,300.0	$67,100.0	$386,800.0	$69,836.0
Equipment	$187,200.0	$0.0	$0.0	$0.0	$0.0	$187,200.0	$187,861.0
Indirect Costs (*will vary by proposer*)	$108,500.0	$173,030.0	$168,200.0	$161,100.0	$144,370.0	$755,200.0	$147,716.0
SUBTOTAL	$942,560.0	$1,160,329.0	$1,311,188.0	$1,252,916.0	$1,138,827.0	$5,805,820.0	$1,391,135.0
General Administration (9% of subtotal)	$84,830.4	$104,429.6	$118,006.9	$112,762.4	$102,494.4	$522,523.8	
PROJECT TOTAL	$1,027,390.4	$1,264,758.6	$1,429,194.9	$1,365,678.4	$1,241,321.4	$6,328,343.8	
Other Resources (Cost Share Funds)	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	N/A

COMMENTS:
This 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 program. 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

Program Title: Herring Research and Monitoring
Team Leader: W. Scott Pegau

FIVE-YEAR OVERVIEW

Date Prepared: xx/xx/xxxx

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	$332,288.0	$294,916.0	$243,657.0	$1,463,820.0	$ 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 (*will vary by proposer*)	$35,700	$56,130	$52,800	$51,800	$35,570	$232,000.0	$ 71,730
SUBTOTAL	$334,060.0	$468,129.0	$421,088.0	$376,016.0	$310,627.0	$1,909,920.0	$637,197.0
General Administration (9% of	$30,065.4	$42,131.6	$37,897.9	$33,841.4	$27,956.4	$171,892.8	N/A
PROJECT TOTAL	$364,125.4	$510,260.6	$458,985.9	$409,857.4	$338,583.4	$2,081,812.8	
Other Resources (Cost Share Funds)	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	

COMMENTS:
In FY13 the Oil Spill Recovery Institute provided approximately one month of salary for Pegau ($11,000). This funding covered coordination activities outside of the one month requested from the EVOSTC.

FY12-16

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

FORM 3A
NON-TRUSTEE AGENCY SUMMARY

Date Prepared:01/15/2014

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 (*will vary by proposer*)	$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	N/A
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:
In the past year approximately $8,000 was spent from various other sources to deliver herring related materials in the education projects.

FY12-16

Project Title: PWS Herring: Outreach and Education
Primary Investigator: Lindsay Butters

FORM 3A
NON-TRUSTEE AGENCY SUMMARY

Date Prepared:01/15/2014

***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 (*will vary by proposer*)	$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:
Existing laboratory equipment (drying oven, scales, calorimeter) worth approximately $35K were used to support this program.

FY12-16

Project Title: PWS Herring: Herring condition monitoring
Primary Investigator: Pegau

FORM 3A
NON-TRUSTEE AGENCY SUMMARY

Date Prepared:01/15/2014

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 (*will vary by proposer*)	$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	N/A
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:
Existing laboratory equipment (drying oven, scales, calorimeter) worth approximately $35K were used to support this program.

FY12-16

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

FORM 3A
NON-TRUSTEE AGENCY SUMMARY

Date Prepared:01/15/2014

***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 (*will vary by proposer*)	$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	N/A
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:
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: Validation of acoustics
Primary Investigator: Mary Anne Bishop

FORM 3A
NON-TRUSTEE AGENCY SUMMARY

Date Prepared:01/15/2014

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 (*will vary by proposer*)	$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	N/A
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:
Ocean Tracking Network: $337.2 in-kind equipment (6 acoustic arrays across major entrances Prince William Sound & Gulf of Alaska)
Ocean Tracking Network: $22.7 in boat time for uploading data in Sept 2013 & Feb 2014
Alaska Dept. Fish & Game: $12.0 for boat time (4 d@ $3.5/d to catch herring for tagging)
NOAA ~$10.0 for J. Eiler, in-kind personnel as collaborator on this projectl.

FY12-16

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

FORM 3A
NON-TRUSTEE AGENCY SUMMARY

Date Prepared:01/15/2014

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 (*will vary by proposer*)	$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	N/A
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:
No non-EVOSTC funds used on this project

FY12-16

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

FORM 3A
NON-TRUSTEE AGENCY SUMMARY

Date Prepared:01/15/2014

***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 (*will vary by proposer*)	$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	N/A
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:
No non-EVOS funding was used to support this project.

FY12-16

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

FORM 3A
NON-TRUSTEE AGENCY SUMMARY

Date Prepared:01/15/2014

***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 (*will vary by proposer*)	$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	N/A
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:
There are no non-EVOSTC funds associated with this project. Equipment used for this project was purchased using previous EVOSTC funds.

FY12-16

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

FORM 3A
NON-TRUSTEE AGENCY SUMMARY

Date Prepared:01/15/2014

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	$17,500.0	$0.0	$35,000.0	
Travel	$0.0	$0.0	$3,400.0	$5,800.0	$0.0	$9,200.0	
Contractual	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	
Commodities	$0.0	$0.0	$25,400.0	$25,400.0	$0.0	$50,800.0	
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. 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: Herring genetics
Primary Investigator: Guyon and Wildes
Agency: NOAA

FORM 4A
TRUSTEE AGENCY
SUMMARY

Date Prepared: 01/15/2014

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	$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:

NOAA staff salaries, for training and oversight of labor for sample processing and administration $38,179
NOAA instrument amortization, existing instrument use $ 2,275
Total $40,454

FY12-16

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

FORM 4A
TRUSTEE AGENCY SUMMARY

Date Prepared: 01/15/2014

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	$0.0
Travel	$0.0	$6,400.0	$0.0	$0.0	$0.0	$6,400.0	$0.0
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:

NOAA staff salaries, for training and oversight of labor for sample processing and administration $44,619
NOAA instrument amortization, existing instrument use $ 3,125
Total $47,744

FY12-16

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

FORM 4A
TRUSTEE AGENCY SUMMARY

Date Prepared: 01/15/2014

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. For years where funding is not requested, please leave zeroes. The EVOSTC fiscal year is February 1 - January 31.

FY12-16

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

FORM 4A
TRUSTEE AGENCY SUMMARY

Date Prepared: 01/15/2014

***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:

NOAA staff salaries, for training and oversight of labor for sample processing and administration $38,180
NOAA instrument amortization, existing instrument use $ 2,275
Total $40,455

FY12-16

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

FORM 4A
TRUSTEE AGENCY
SUMMARY

Date Prepared: 01/15/2014

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:
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: Herring Disease
Primary Investigator: Paul Hershberger
Agency: USGS

FORM 4A
TRUSTEE AGENCY
SUMMARY

Date Prepared: 01/15/2014

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:
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: Herring Disease
Primary Investigator: Hershberger
Agency: ADFG contract

FORM 4A
TRUSTEE AGENCY
SUMMARY

Date Prepared: 01/15/2014

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:

Non-EVOSTC funds used for this project since 31 January 2013 include: Salary for Ron Andersen to scan and measure scales: 4 mm at $15,447 from State General Funds, Salary for Steve Moffitt to randomly select scales, analyze data, present poster, and attend meetings: 0.5 mm at $6,040.00 from State General Funds.

FY12-16

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

FORM 4A
TRUSTEE AGENCY
SUMMARY

Date Prepared: 01/15/2014

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	N/A
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:
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FY12-16

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

FORM 3A
NON-TRUSTEE AGENCY SUMMARY

Date Prepared:01/15/2014

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 (*will vary by proposer*)		$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	N/A
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:
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FY12-16

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

FORM 3A
NON-TRUSTEE AGENCY SUMMARY

Date Prepared:01/15/2014

***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 (*will vary by proposer*)	$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	N/A
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:

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FY12-16

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

FORM 3A
NON-TRUSTEE AGENCY SUMMARY

Date Prepared:01/15/2014

***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 (*will vary by proposer*)							
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:
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FY12-16

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

FORM 3A
NON-TRUSTEE AGENCY SUMMARY

Date Prepared:01/15/2014