ATTACHMENT D *EVOSTC Annual Program Status Summary Form*

Form Rev. 9.14.17

*Please refer to the Reporting Policy for all reporting due dates and requirements.

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

17120111

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

Herring Research and Monitoring Program

3. Principal Lead Name(s): *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 2017 to 31 January 2018

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

February 2018

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

pwssc.org/herring-research-and-monitoring/

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

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

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

a) Progress toward addressing hypotheses and achieving goals.

We are addressing our first objective by expanding the age range used in the model. The model can now incorporate data from age-0 on. In the past the model only examined fish age-3 and older. This model expansion allows us to examine how data collected in the previous eight years can help inform our predictions. We completed a set of aerial surveys for forage fish, including age-1 herring in June. We are seeking further funding to maintain that dataset to provide a long enough time series to evaluate the value of the age-1 surveys on predicting the recruitment to the spawning stock.

The model was also run to provide an estimate of the PWS herring population.

The second objective was addressed through collection of age-weight-length data and aerial spawn surveys through project (17160111-F, Haught), acoustic spawning biomass surveys (17120111-G, Rand), disease prevalence measurements (17120111-E, Hershberger). Data from these projects were used as inputs to the Bayesian model of herring biomass run by Trever Branch (17120111-C).

The age-weight-length data showed that the spawning population was made up of primarily age-3 (53%) and 4 (22%) fish, with very few older age fish present. While it isn't unusual to have a large age class dominate the spawning stock, the lack of older fish in the spawning stock is unusual. There were only 9.5 mile days of spawn observed in 2017 even though the level of effort was greater than in recent years. This represents a near record

low in mile days observed (Figure 1). The area of spawning has contracted to a small portion of Port Gravina and Canoe Pass on Hawkins Island.

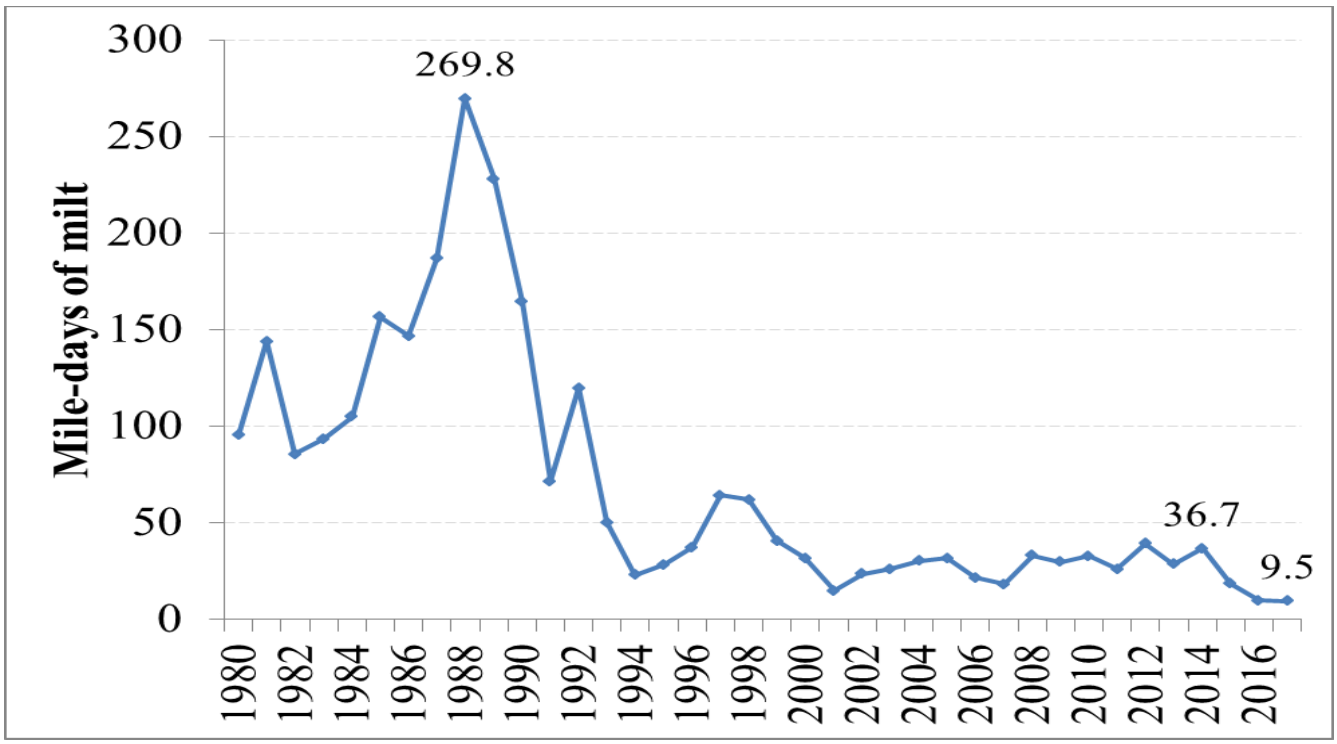

Figure 1. Mile-days-milt observed in Prince William Sound.

The acoustic surveys found a slight increase in the estimated spawning biomass in 2017 compared to 2016. The estimated spawning biomass was approximately 10,000 MT.

Disease prevalence measurements continue to record low levels of viral hemorrhagic septicemia (VHSV) and viral erythrocytic necrosis virus (VENV) in the spawning populations. The new approach developed in this program to detect the presence of VSHV antibodies provides a different result for the potential impact of VHSV on the PWS herring population (Figure 2). It shows that a large portion of the herring population has been exposed to VHSV, which has a very high mortality rate. The disease outbreak is likely to have passed through the population and just not been detectable during the prevalence sampling period.

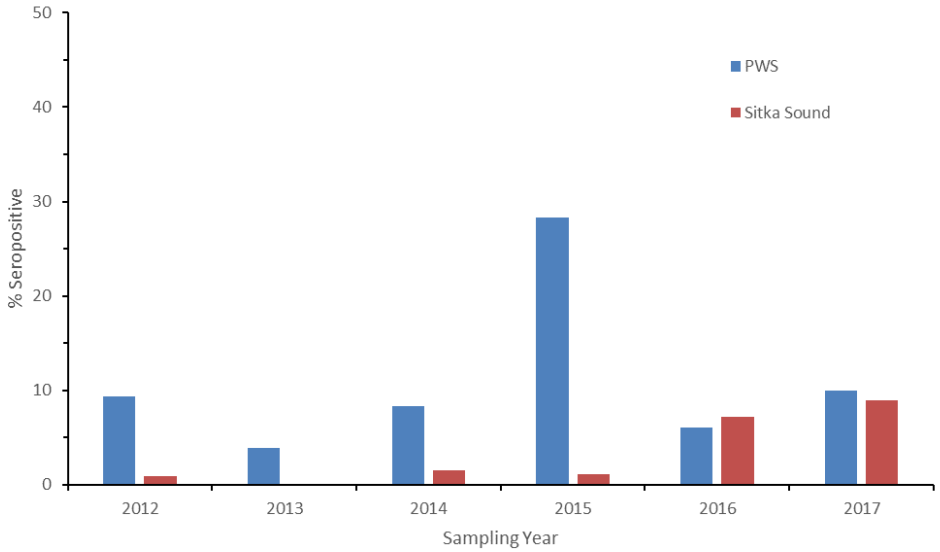

Figure 2. The presence of VHSV antibodies in herring collected in PWS and Sitka.

We addressed our third objective by examining the relationship in the crashes in PWS herring population to others around the globe. We found that the magnitude and duration of the low population levels currently observed are highly unusual (Figure 3). The global analysis is being used to help set the stage for examining the PWS herring population and their connection to other environmental conditions. A preliminary result of analysis of the global populations suggest that low biomass may be associated with sea surface temperature and sea surface height anomalies.

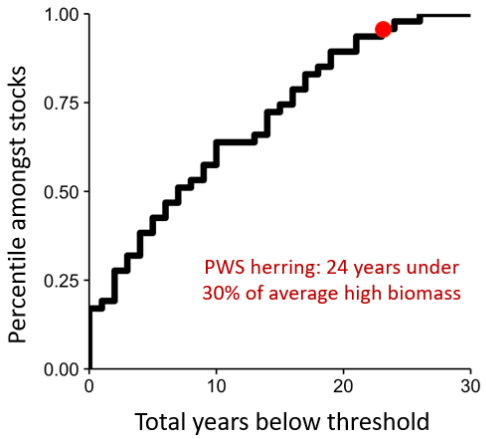

Figure 3. The red dot shows where Prince William Sound herring fall among global herring populations in terms of the duration of the current period of low biomass.

During the past year we identified two postdoctoral research projects that are designed to further address the objective. One project is designed to examine the linkages between diseases and environmental conditions. The other uses a broad suite of biotic and abiotic data to look for linkages to herring condition and recruitment through spatial and temporal analysis. These new researchers are joining the program in FY18. Dr. Maya Groner will lead the disease related project as part of the coordination project. Dr. David McGowan will lead the spatio-temporal analysis within the modeling project.

Our tagging project addresses both our third and fourth goal. We need to understand where the herring are through the year to connect them with the appropriate environmental conditions. Therefore, the tagging helps guide our efforts to connect the PWS herring population to environmental variables. The acoustic tags also represent a relatively new approach to monitoring the population. This past year we were able to tag 124 fish in nine batches. The fish were all from the Port Gravina area. We were able to detect 97% of the fish in Port Gravina and 58 of the fish were detected at one of the entrances by September. This is a lower percentage than what we achieved in the pilot project conducted earlier. The fish were smaller than in the past and we are noticing tilt issues with receivers that have been in place for over four years. Interestingly, we detected nine fish in the Port Gravina some five to six weeks post spawn (Figure 4). Eight of those nine were later detected at one of the entrances.

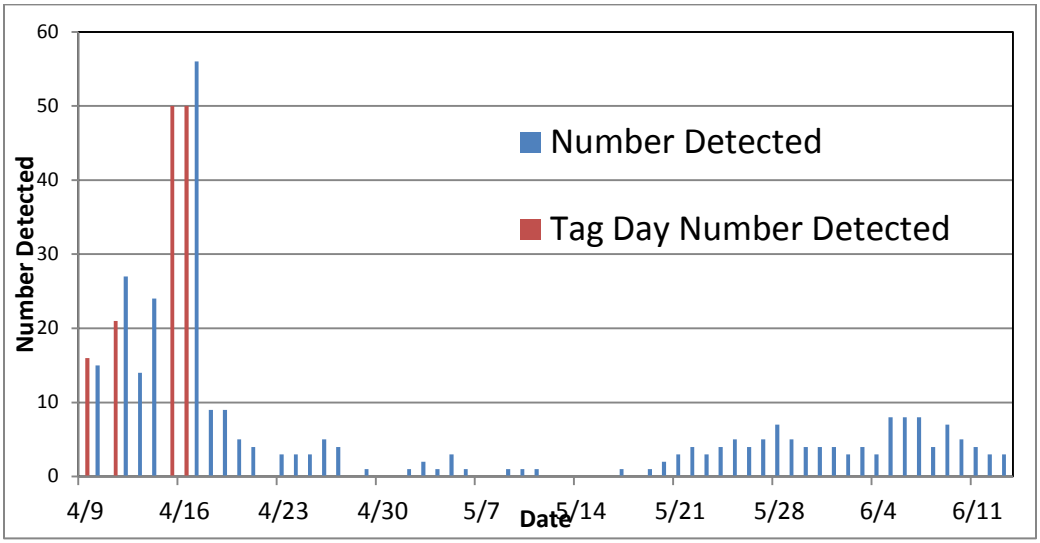

Figure 4. Number of tagged fish detected by day at Port Gravina. Spawning occurred in the area between 13 and 21 April. This is data based on three receivers that were retrieved from a ten-receiver array.

We also continued to make improvements in our ability to detect the exposure history of Pacific herring to viral hemorrhagic septicemia virus (Figure 2). It is through this effort that we are likely to be able to change how disease information is incorporated into the biomass model and provide better understanding of the impact of disease on the population.

Research on the influence of temperature on the efficacy of DNA vaccines against viral hemorrhagic septicemia in Pacific herring is providing insights in mechanisms that allow vaccination of fish in the laboratory environment.

The herring maturity project collected herring at several times through the year. Most of the effort this past year was in trying approaches to collect fish outside of the spawning season. We think we will be able to collect the required number of fish using jigs and gill nets provided we can locate the fish. Almost all fish sampled during the spawning season were found to be mature or maturing with the younger fish maturing more slowly. There was not evidence of a strong mix of mature and immature herring in the spawning stock samples, suggesting that if there is a large portion of immature fish, particularly at age-3, they are not in the schools preparing to spawn.

b) Highlights and noteworthy issues

The herring biomass may be increasing slightly from the minimum in 2016, but the mile-days-milt observed remained nearly the same due to the young age of the fish that make up the spawning population in 2017. The model captured the younger population structure but provided an unobserved increase in biomass in 2017 without inclusion of the acoustic biomass data. It is expected that inclusion of the acoustic biomass estimates would help constrain the model and remove the modeled increase.

All of our efforts indicated that the herring population is dominated by young fish with relatively few older fish. This happens when there are large recruitment events, but the numbers of age-3 fish in 2017 were not that unusual. Instead the lack of older herring made the age-3 fish a large percentage of the population.

Advances that allow us to examine the presence of antibodies to the VHS virus is providing a new perspective on that disease within PWS. The annual prevalence monitoring has not shown any unusual levels of disease during the spawning season. The antibodies are indicating that the PWS herring are being exposed to VHSV at a greater rate than in Sitka and had unusually high levels in 2015, which coincides with the start in the recent decline in observed herring biomass. It is through the use of antibodies that we can better understand if there may have been disease outbreaks at times we are not monitoring for prevalence. The antibody information that is likely to be a better measure of disease exposure for the model to estimate mortality from than the prevalence information that has been used in the past.

We were able to retrieve and refurbish nine acoustic receivers from an old array in Port Gravina. We are looking to deploy these receivers to cover critical areas and to increase the number of areas we can detect fish in PWS to better identify the seasonal movements of the herring.

c) Efforts to achieve community involvement/traditional ecological knowledge and resource management application

The Alaska Department of Fish and Game statewide herring coordinator serves on the HRM science oversight group and participated in the HRM PI meeting, so she was able to directly interact with all of the researchers in the HRM program. The local ADF&G fisheries biologist with responsibilities relating to herring is also a member of the HRM program and therefore directly connected to the various projects.

d) Problems and unusual developments

The small size of fish that were spawning and the limited amount of spawning made it difficult to collect the number of fish of a size appropriate to tag. Our plan for FY 18 is to tag fish from two spawning locations. We originally thought that they would be Port Gravina and Montague Island or Port Fildago. We are now looking to tag in Port Gravina and Canoe Pass.

Biofouling of the Offshore Tracking Network receivers appears to have caused some of the receivers to tilt over and be ineffective at detecting passing fish. We are looking to deploy new receivers at critical locations and retrieve and repair receivers that are not functioning properly.

We had difficulty finding and capturing adult herring during the summer. We have since shifted away from using the trawl system used during the summer and are now jigging and gillnetting herring. We expected that we would have to refine our sampling system during the first two years to ensure we were able to collect large enough samples at the most appropriate time of year. We added sampling effort through the fall and winter to refine our approach to give us a better chance of obtaining our desired samples in the upcoming year.

e) Other significant information

PWS Pacific herring populations remain at record low numbers. We believe that with the new information about the presence of antibodies to VHSV we have a likely explanation for the recent population decline, but are working to incorporate the disease information into the model to confirm the changes in herring numbers are within the expected range once accounting for disease mortality.

8. Coordination/Collaboration: *See*, Reporting Policy at III (D) (8).

This project works with all projects within the HRM program. Coordination is primarily through email and the annual PI meeting. Work with projects includes ensuring reporting is completed promptly and assisting the coordination of sampling logistics. Dr. Pegau works with individual projects to provide the samples needed and as a source of information about existing data and results.

Dr. Pegau serves as the primary contact for the HRM program with the GWA and Data Management (DM) programs. Coordination includes having the leads to all the programs on the HRM general mailing list, so everyone is aware of any information going out to the HRM PIs. We reached out and are working to include Dr. Whitehead, who has a herring related lingering oil project, to include him as possible. He was able to attend the HRM PI meeting remotely.

We anticipate greater connection with the GWA program as the new postdoc projects come on line. Those projects are dependent on the environmental data collected in the GWA program.

Sherri Dressel of Alaska Department of Fish and Game (ADF&G) is on the HRM scientific oversight group. Sherri, along with Stormy Haught of the Cordova office of ADF&G, are the primary contact points between the HRM program and the trustee agency with oversight of herring in PWS. The monitoring work of the HRM program provides the data necessary for ADF&G to monitor the Pacific herring population in PWS and determine if the population is at a fishable threshold. The exchange of information with ADF&G is important for being able to track similar research efforts ongoing at ADF&G and in the HRM program.

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

a) Publications

Aderhold, D. G. R., M. R. Lindeberg, K. Holderied, and W. S. Pegau, Spatial and temporal ecological variability in the northern Gulf of Alaska: What have we learned since the *Exxon Valdez* oil spill? In press, Deep Sea Research II. DOI 10.1016/j.dsr2.2017.11.015

Bishop, M.A. and J. H. Eiler. *in press.* Migration patterns of post-spawning Pacific herring in a subarctic sound. *Deep-Sea Research Part II.* http://dx.doi.org/10.1016/j.dsr2.2017.04.016

Gorman, K. B., T. C. Kline, M. E. Roberts, F. F. Sewall, R. A. Heintz, and W. S. Pegau, Spatio-temporal variation in stable carbon and nitrogen isotope signatures and condition of juvenile herring (*Clupea pallasii*) in Prince William Sound, Alaska: teleconnections with the Gulf of Alaska. in press Deep Sea Research II. DOI 10.1016/j.dsr2.2017.10.010

Hart, L.M., M.K. Purcell, R. Powers, A. MacKenzie, P.K. Hershberger. 2017. Optimization of a plaque neutralization test to identify the exposure history of Pacific Herring to viral hemorrhagic septicemia virus (VHSV). Journal of Aquatic Animal Health 29: 74-82.

Hart, L.M., N. Lorenzen, K. Einer-Jensen, M. Purcell, P.K. Hershberger. 2017. Influence of temperature on the efficacy of homologous and heterologous DNA vaccines against viral hemorrhagic septicemia (VHS) in Pacific herring. Journal of Aquatic Animal Health 29: 121-128.

Hershberger, P.K., J.L. Gregg, C. Dykstra. *Accepted*. High prevalence and low intensity *Ichthyophonus* infections in Pacific Halibut (*Hippoglossus stenolepis*). Journal of Aquatic Animal Health.

Muradian ML, Branch TA, Moffitt SD, Hulson P-JF (2017) Bayesian stock assessment of Pacific herring in Prince William Sound, Alaska. PLoS One 12:e0172153

Ward EJ, Adkison M, Couture J, Dressel SC, Litzow MA, Moffitt S, Hoem Neher T, Trochta J, Brenner R (2017) Evaluating signals of oil spill impacts, climate, and species interactions in Pacific herring and Pacific salmon populations in Prince William Sound and Copper River, Alaska. PLoS One 12:e0172898

b) Presentations/Workshops

Bishop, M.A., attended AOOS Animal Telemetry Workshop, Dec 5-6, 2017. Anchorage, Alaska

Hershberger, P.K. Invited Talk. July 5-6, 2017. Washington State Disease Co-Managers Meeting. Long term shedding of VHS virus from Pacific herring: Demonstration of a marine reservoir host. Olympia, WA.

Hershberger, P.K., A.H. MacKenzie, J.L. Gregg, M.D. Wilmot, R. Powers, M.K. Purcell. June 20-22, 2017. Platform. Long term shedding of viral hemorrhagic septicemia virus from Pacific herring. 58th Western Fish Disease Workshop. Suquamish, WA.

MacKenzie, A.H., J.L. Gregg, M.D. Wilmot, T. Sandell, D. Lowry, P.K. Hershberger. June 20-22, 2017. Poster. Temporal and spatial patterns of *Ichthyophonus* in Pacific herring throughout the southern Salish Sea. 58th Western Fish Disease Workshop. Suquamish, WA.

Pegau, W. S., et al., Prince William Sound Herring Research and Monitoring. Poster presentation. PICES Drivers of Dynamics of Small Pelagic Fish Resources, March 6-11, 2017.

Pegau, W. S., An update on the Herring Research and Monitoring program. Oral presentation. Prince William Sound Regional Citizens' Advisory Council, September 2017.

Sitkiewiz, S.E., B.P. Harris, P.K. Hershberger, N. Wolf. June 20-22, 2017. Poster. Effects of the parasite *Ichthyophonus* on groundfish growth and condition. 58th Western Fish Disease Workshop. Suquamish, WA.

Sitkiewicz, S., B. Harris, P. Hershberger, N. Wolf. March 19-23, 2017. Poster. Impacts of the Parasite *Ichthyophonus* (sp.) on Groundfish Growth and Condition. Joint Meeting of the American Fisheries Society, Alaska Chapter American Water Resources Association, Alaska Section. Fairbanks, AK.

Stinson, M.E., B.C. Hall, B.C. Stewart, P.K. Hershberger. June 20-22, 2017. Poster. Validation of improved *Listonella* (*Vibrio*) *anguillarum* vaccine in coho salmon. 58th Western Fish Disease Workshop. Suquamish, WA.

c) Information products

The HRM website (http://pwssc.org/research/?research_topic=herring) was updated with pages added for new projects and updated materials for continuing projects. Four Field Notes radio program/podcasts were developed. Several project profiles – print optimized versions of the project webpages – were constructed for sharing at the Alaska Marine Science Symposium.

d) Datasets

The data and logs from the aerial surveys were uploaded to the workspace. This includes the spreadsheet with the number of schools of age-1 herring and their size and the raw survey data.

The tagging project provided a tagging log with accompanying age, sex, and length of each herring tagged along with a unique tag ID number. These data were recorded in April 2017 and have been uploaded to the project workspace. Preliminary detection data were uploaded from receivers at Hinchinbrook Entrance and Montague Strait during September 2017. These files include detections of the unique tag ID numbers at each receiver with the accompanying time and date.

PI Gorman is currently finalizing an Access database to store the data collected as part of this project. It is anticipated that this database will be completed by the end of February 2018. In the meantime, data collected in 2017 are available on the AOOS Research Workspace for the HRM program.

PI Haught uploaded aerial survey (routes and biomass, spawn, bird, mammal observations) shapefiles and ASL 1973-2017 ASL data (.csv) to the research workspace.

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

The comments from the Science Panel are in black. Many of the comments were addressed in the final proposal that was submitted. The replies and actions taken are provided in blue text. I changed the order of Science Panel comments to try and gather comments on the same topic, such as the post-doctoral position.

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

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

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

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

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

There is a little confusion here. The Overall Program proposal (Appendix A) provides the three hypotheses listed above (Not Appendix C as the comments suggest). These represent the hypotheses that the collection of projects are designed to address. The program addresses more hypotheses than any individual project, but the wording of the hypotheses remains the same throughout the projects. For instance, the post-doctoral position described in Appendix C only refers to the second hypothesis.

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

We removed H1 from the program proposal. We feel it is important, but much of the work will be completed by the start of this program.

H3 (now H2) is based on several sets of observations; age-sex-length data from ADF&G, anecdotal observations of fishermen, and data from the forage fish project in the Gulf Watch Alaska program. These datasets and observations are now identified at the beginning of the hypothesis. One advantage of having a locally based project coordination is that we have access to data that are not found in the reports, but remain valid observations to base a hypothesis on. Fortunately, ADF&G is funded to update their herring databases so discovery of the information they have will become easier. I am still being amazed at bits and pieces of information that Steve has in some file on his computer. It is critical to get access to all of it before he retires. Information from the forage fish project should also be coming on-line very soon. This hypothesis is of particular importance to the herring tagging project to work towards not only understanding if the herring migrate, but look for differences that may lead to understanding why portions don't migrate. It also is tied to the analysis of how herring are connected to environmental conditions because the conditions on the shelf are different than inside PWS.

We removed the reference to the 7 years, and added a sentence describing the source of data used for H3. To improve the presentation we have identified the hypotheses that each project addresses within the program proposal.

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

**Incardona JP, Vines CA, Linbo TL, Myers MS, Sloan CA, Anulacion BF, et al. (2012) Potent Phototoxicity of Marine Bunker Oil to Translucent Herring Embryos after Prolonged Weathering. PLoS ONE 7(2): e30116. doi:10.1371/journal.pone.0030116*

I suspect that the surprise is in part due to an incomplete answer, and partially a lack of understanding of how much effort had been spent considering this concept before the discussion with the science panel. As for the incomplete answer, I stated that the data did not support the conclusion put forth in the paper. What I failed to do is identify which conclusion. The conclusion that the data does not support is that the presence of oil caused a failure in recruitment over several years that led to the decline of the herring population. A look at the age-composition data shows that the 1989 year class was severely impacted by the oil spill. The age-

composition in subsequent years was consistent with Sitka and does not support the hypothesis that the embryos were impacted by oil resulting in continued reduced recruitment. I fully agree with the other conclusions provided in the manuscript.

As for the question of continuing impacts, none of the long-term monitoring efforts in Prince William Sound are showing evidence of measurable hydrocarbon concentrations in the water column, and the location where eggs are being laid are not within the areas where lingering oil exists (Michel et al. 2016 Lingering oil report). I agree with the conclusions in chapter 1 of the Rice and Carls (2005) herring synthesis report to EVOS (project 050794) that there is no evidence of oil toxicity effects beyond the 1989 year class. While the Incardona paper shows dramatic effects on the physiology of herring eggs and larvae at very low levels of hydrocarbons in the water column there is no data available that suggests the eggs and early stage larvae are being exposed to hydrocarbons.

The other reason for my quick answer is that I spent significant time contemplating this work and how it might impact the herring program. The paper was well distributed through many scientific groups around PWS. I had the opportunity to meet with Dr. Incardona in December 2015 and talked with him about follow-on projects and what they would costs. They are currently working on how oil exposure at the egg and embryo stage effects lipid storage and growth during the first year. I have been looking at potential funding of the work through the Oil Spill Recovery Institute so I have descriptions of the work they are planning. We remain in contact with Dr. Incardona's group and are providing data and support as possible.

In the end, this work was judged as having no ability to help improve the population model since there is no evidence of continued oil exposure to eggs or embryos. That judgement may remain an area of disagreement between the Science Panel and the HRM research team.

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

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

Revision of Items 3-5 is strongly advised. Items 3-5 present a specific hypothesis that has already been examined in a number of papers for different herring populations. This comment does not mean to imply that the hypotheses are incorrect, or inappropriate, but it does unnecessarily restrict the scope of the postdoctoral position. Please see comments at the bottom regarding the scope. It may be simpler and more productive to limit the 'focus' to examining connections between herring recruitment and condition with the physical and biological environmental conditions. Here I am confused. The Pegau proposal that contains the description of the post-doctoral position states in several places "The focus of the postdoctoral research will be to examine connections between herring recruitment and condition with the physical and biological environmental conditions." This seems to be the same language you are suggesting as the simpler and more productive approach. The Panel also points out that a UAF doctoral student, Fletcher Sewall, located at NOAA's Ted Stevens Marine Research Institute with Ron Heintz, is examining potential relationships between PWS herring recruitment and environmental and ecological factors. Sewall's results may help jump start efforts by the post-doc and there may be possibilities of collaboration. I agree. I am aware of much of what Fletcher worked on for his thesis, but have found there are parts that I was unaware of until we realized we were working on the same topic independently. I now have a copy of his thesis to better understand the full breath of his work. I will make sure the person is in contact with Fletcher about the work to be done. David McGowan was informed about Fletchers work. Finally, the recruitment process for the post-doc

described on page 31 was confusing, but was explained by PI Pegau more clearly over the phone. The text should be clarified. The section on the recruitment process was revised in the Coordination proposal to outline the process in a manner similar to that described during the phone discussion. Hopefully the process worked in a manner that met the Science Panels approval.

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

We chose to focus the scope of the postdoctoral research position to fill a critical need in the program. Most of the projects provide information necessary to test H2 (H1 in the revised proposal), but only the postdoctoral fellow is dedicated to actually testing the hypothesis with help from the modeling group. As shown in figure 1 of the program proposal the postdoctoral researcher in one of two integrative components. To change the focus of the primary analysis person would drastically reduce the integration between projects and put additional burden on the program coordinator.

There is an additional benefit in that the focus area is one that the program lead can assist the researcher with. If the program lead is required to be their supervisor, it is better to focus on a topic that I can assist with. There is a lot of work that remains in the topic we proposed that will benefit our goal of improving the population model. Our preference is to keep the post-doctoral position as described as it represents connections between several projects and is an area of overlap between the HRM and GWA programs that will not necessarily exist with the suggested topics. While there is value in the topics suggested by the Science Panel, they do not provide the ties between projects that we are trying to achieve with this person. We expect that the topics suggested by the Science Panel will be considered in future proposals.

We modified the proposal to strengthen the discussion about why it is important that the researcher address H2 and objective 3.

The final result of the postdoc search was the selection of one researcher who will be focusing on the environmental connections to herring condition and recruitment and one researcher who will be focusing on the connection of herring diseases to environmental conditions. This worked out as a good compromise between the issue of providing the connectivity between projects and with the GWA program and addressing a more specific issue (disease) as suggested by the Science Panel.

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

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

Budget Category:	Proposed FY 17	Proposed FY 18	Proposed FY 19	Proposed FY 20	Proposed FY 21	TOTAL PROPOSED	ACTUAL CUMULATIVE
Personnel	$515.1	$741.7	$768.2	$786.7	$462.0	$3,273.8	$362.7
Travel	$37.1	$47.9	$42.8	$40.0	$36.4	$204.1	$19.3
Contractual	$198.7	$221.9	$203.4	$143.4	$134.0	$901.4	$117.1
Commodities	$192.6	$160.6	$87.5	$79.4	$78.6	$598.7	$94.8
Equipment	$5.9	$0.0	$0.0	$0.0	$14.4	$20.3	$17.1
Indirect Costs (*will vary by proposer*)	$200.1	$276.5	$254.9	$237.7	$110.5	$1,079.6	$382.5
SUBTOTAL	$1,149.5	$1,448.5	$1,356.8	$1,287.2	$835.9	$6,077.9	N/A
General Administration (9% of subtotal)	$103.5	$130.4	$122.1	$115.8	$75.2	$547.0	
PROJECT TOTAL	$1,252.9	$1,578.8	$1,478.9	$1,403.1	$911.1	$6,624.9	
Other Resources (Cost Share Funds)	$157.2	$159.7	$160.7	$162.7	$149.7	$790.0	N/A

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

The personnel line is underspent because funding to PWSSC did not arrive until May 2018, which required us to use funding from previous years to be able to support the major field season in April.

We appreciate your prompt submission
and thank you for your participation.