THE STATE of ALASKA
GOVERNOR BILL WALKER

Department of Fish and Game

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8-12-2016

Exxon Valdez Trustee Council
Anchorage, Alaska

Dear Sir or madam:

This letter will provide information relative to comments by the Exxon Valdez Trustee Science Panel related to Project 17120111-F (Herring Program – ASL Study & Aerial Milt Surveys) in the Draft Work Plan for Fiscal Year 2017 that was issued on May, 19, 2016. Science Panel comments are in italic font below followed by my response.

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

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

Response: I agree that evaluations of potential impacts of predators on spawning aggregations are worth monitoring and the interactions are of importance to both the populations of both prey and the predators. Reviews, e.g., Willson and Womble (2006), are what led to the Alaska Department of Fish and Game staff in Cordova to put more effort toward documenting the predator distribution and abundance during the spring spawning season of Pacific herring. Aggregations of predators have historically been used by fishermen (subsistence and commercial) and researchers to help locate herring and other forage fish schools. This proposal would continue the collection of distribution and abundance data, but does not propose to evaluate the potential impacts of the predator on Pacific herring. However, the monitoring data may be used in other studies to help evaluate the impacts.

2) *Aerial surveys. The Panel is aware of the discrepancy between results of past aerial surveys of milt and estimates made from SCUBA diver surveys, as discussed in the paper by Hulson et al (2008). Further, as explained in the Hulson paper, there was a substantial difference between aerial survey estimates of milt and estimates based on dive surveys.*

   In view of the importance of estimates of milt, and/or egg deposition for herring assessments, the Panel strongly recommends that some effort be made to 'ground-truth' the aerial surveys. Specifically, at least some of the aerial survey data should be checked by visits to the site to confirm the geographic distribution of eggs. This does not necessarily require quantitative SCUBA surveys to estimate total egg

counts (as was done by Willette et al. 1999). Simpler, less expensive approaches could be considered, such as site visits on small vessels, and use of grappling hooks to look for presence/absence of eggs. Regardless, some effort must be made to calibrate the aerial survey data on milt distribution.

Ideally, this effort such an effort at ground-truthing could even provide opportunities to provide some retrospective calibration of past milt surveys.

Response: I agree that a boat based survey to check the aerial survey documentation of miles of milt would be valuable. In the absence of a SCUBA spawn deposition survey, a small boat survey with underwater video or grappling hooks could provide this information. The Alaska Department of Fish and Game does not have a small boat appropriate for this type of survey and the R/V Solstice will be dedicated to other surveys. I would suggest a smaller research vessel that can range to Montague Island for this type of survey. Also, I would note that the ADF&G aerial surveys provide a documentation of the miles of milt rather than the miles of egg deposition. Large spawning events in some areas of the sound lead to milt drifting with the current for several kilometers from locations that historically contained egg deposition. As part of the aerial surveys protocol, milt is classified as active (light, medium, or heavy), drift, or dissipating. The drift is excluded from our kilometer-days of milt for use in our age-structured model.

3) *We note elsewhere (see comments on Gorman proposal) however, that an additional measurement of 'gonad weight' could provide very useful information related to 'age-at maturity'. Such an addition to the routine sampling would be relatively inexpensive.*

Although it was not included in the draft proposal, ADF&G has been collecting gonad weights (both sexes) from a subsample of prespawning fish since 1994. Currently we have approximately 8,500 gonad weights. ADF&G also collects gonad maturity index data from all fish, but gonad weights are only collected from a subsample of prespawning fish. Additional information about our gonad weight collections and methods are in the updated proposal.

4) *Acoustics surveys. The Panel notes the pivotal role of acoustics survey data in the assessment methodology. However, we also note that this is the only time-series data that have not been systematically examined to account or any variation attributable to varying survey designs or modification of equipment – which could include vessel types. Of course we are aware of the 2008 paper by Thorne et al. (written as a companion paper to the Hulson paper in the same journal). However, unlike aerial survey data (from which there is a large and readily accessible data base), and also unlike the ASL (age-sex-length) databases, there is no readily accessible database on the historical acoustics data. However, there should be such a database, especially if such data are used in support of vital biomass assessments. Therefore a recommendation from the Panel is for the development of a report on the acoustics data, as it is used, and has been used for herring assessments. Such a report should point out the strengths and limitations of such data, with emphasis on any methodological factors that might affect temporal trends in the data. Finally, to conform to normal protocols for assessments, we advise that the data, as it is used in the assessments, should be made accessible.*

Response: The Exxon Valdez Trustee Council has provided funding to assemble all the ADF&G acoustics data for Pacific herring in Prince William Sound. The funding will be used to complete the tasks as follows:

Acoustics coverage and biomass estimates

1. Design GIS shapefile (fields, data types, metadata).
2. Gather all historical acoustics data into Excel.
3. Preliminary error checking and quality control of historical data in Excel.
4. Bring Excel data into ArcMap shapefile and conduct final error checking.
5. Generate metadata for acoustics coverage.
6. Provide historical shapefile and metadata to EVOS researchers.

These tasks will be complete by 31 January 2017 and significant progress has been made to date. This will fall short of the Science Panel recommendation to have the data "...systematically examined to account or any variation attributable to varying survey designs or modification of equipment" and does not include the generation of a report documenting how the acoustics data has been used for herring assessments; however, it is a neeessary first step before the other tasks can be completed.

Sincerely,

Steve Moffitt

PWS/CR Area Research Biologist
Alaska Department of Fish and Game
Commercial Fisheries Division
Cordova, Alaska.

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

Project Title

Surveys and age, sex, and size collection and processing.

Primary Investigator(s) and Affiliation(s)

Steve Moffitt, Alaska Department of Fish and Game

Date Proposal Submitted

12 August 2016

Project Abstract

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

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

FY17	FY18	FY19	FY20	FY21	TOTAL
166.3	166.3	166.3	166.3	166.3	831.5

Non-EVOSTC Funding Available

FY17	FY18	FY19	FY20	FY21	TOTAL
54	54	54	54	54	270

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

1. Executive Summary

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

This project will be help to meet the overall goal to **improve predictive models of herring stocks through observations and research** by providing necessary inputs to the age-structured assessment models of ADF&G and the *PWS Herring Research and Monitoring Program – Population Modeling.*

There are no proposed hypotheses to be tested directly from this project; however, this project will continue long-term monitoring programs to 1) conduct aerial surveys to collect data associated with spring Pacific herring *Clupea pallasii* spawning events, 2) collect and process age, sex, and size (ASL) samples from prespawn and spawning aggregations of Pacific herring, and 3) provide vessel support for spring acoustics surveys, disease sampling, and collection and processing of age, sex, and size samples for target strength assessment.

Spring aerial survey data have been collected since 1972 (Funk 1994), and spring acoustics surveys have been consistently conducted since 1995 (Willette et al. 1999). ASL data are available since 1973 (Sandone 1988); however, collections of both data sets have been more extensive since the early 1980s. Herring age data were collected in 1971 and 1972 also, but only published frequency plots (no individual fish data) are available (Pirtle et al. 1973).

Aerial surveys were used to document spring herring biomass and were the primary management tool prior to the development of the first statistical catch-at-age model or age structured assessment model (ASA) in 1988 (Brady 1987, Funk and Sandone 1990). Biomass is estimated as school surface area converted to biomass from a few paired observations of aerial observers and vessel harvests (Brady 1987, Fried 1983, Funk and Sandone 1990). Surface area and biomass conversion methods are as described in Brady (1987) and Lebida and Whitmore (1985). Prior to 1988, the aerial survey program's primary objectives were to collect biomass data for an annual index, document the distribution and linear extent of milt, document herring temporal movements, and document the distribution of commercial fishing boats, fishing tender boats, and processor boats (Brady 1987). Additionally, the locations of large aggregations of Stellar sea lions *Eumetopias jubatus* and other marine mammals were often noted on paper maps.

Brady (1987) described how herring arrive on the spawning grounds over time and may be available to document on multiple aerial surveys. Therefore, the biomass over several days of surveys cannot be summed to estimate the total or peak biomass. Consequently, peak biomass was calculated as the largest biomass observed in all areas on a single survey (Brady 1987). Additional biomass with a discrete time separation would also be added, but these conservative methods were required to estimate the peak biomass because the amount of time herring were available to observation by aerial surveys was unknown and likely variable (Funk and Sandone 1990).

Brady (1987) also detailed how the variable bathymetry of herring spawning areas in Prince William Sound has a large influence on the observer's ability to see herring schools. Herring may spawn in shallow bays (e.g., Rocky Bay, Montague Island), shallow beaches (e.g. Hells Hole beach), or deep bays (e.g., Fairmont Bay on the North Shore). The influence of bathymetry on observer efficiency suggests a biomass index will probably not be comparable across years. Although Funk and Sandone (1990) indicated that peak biomass values may be a useful relative abundance, issues with biomass observations described by Brady (1987) and Funk and Sandone (1990) caused the department to investigate the use of an index of spawn from observations of milt.

Two indices considered for spawn documented from aerial surveys were 1) discrete miles of milt over the season and 2) the sum of miles of milt for all survey days (mile-days of milt). The advantages of milt observations compared to school biomass observations are 1) herring schools likely spawn a single time e.g., a single day, but a herring school may be observed for several days prior to, or after spawning, 2) milt is relatively easy to observe from the air and observation efficiency is generally not influenced by ocean bathymetry (Brady 1987).

Discrete miles of milt do not account for multiple spawning events in the same area, so are unlikely to be a good index of total abundance in areas with multiple days of spawning on the same beach (Brady 1987). Mile-days of milt probably provide a better index to abundance because they account for multiple spawning days on the same beach, but may be biased if the number of surveys varies significantly across years (Funk 1994). Additionally, although bathymetry probably will not influence observation of milt, it is likely one factor that will influence the biomass of spawning fish for each linear mile of milt observed. Willette et al. (1999) collected paired spawn deposition survey estimates from dive surveys and aerial survey estimates of miles of milt; the short tons (dive survey) per mile of milt (aerial survey) were much larger on Montague Island beaches when compared to short tons per mile of milt in northern or northeastern PWS beaches. Montague Island shoreline typically has large shallow, subtidal areas with complex kelp structure while the northern and northwestern beaches tend to have a steeper gradient to deep waters and less complex kelp structure.

Funk (1994) used the discrete miles of milt index in his ASA model rather than the mile-days of milt index because there were fewer surveys flown in the early years (1970s). However, subsequent runs of the ASA model have excluded the earlier years and use of the mile-days of mile index.

In 2008 the department began using a tablet computer and a geographic information system (GIS) application to collect aerial survey data (Bochenek 2010). Because digital maps are scalable and allow much more data to be added to a small area (contrast with the 25 paper maps used prior to 2008), and because of interest in herring predators distribution and abundance, additional effort was employed in documenting numbers and locations of predators such as Stellar sea lions, humpback whales *Megaptera novaeangliae*, killer whales *Orcinus orca*, Dall's porpoises *Phocoenoides dalli*, and bird aggregations (mostly gulls) associated with herring schools or spawn.

Age, sex, and size data from Pacific herring have been collected from commercial fisheries and fishery independent research projects since the early 1970s. The department currently has an archive containing approximately 210,000 scales paired with size and sex data (most of the archive has been collected since 1979). Summaries of many of these data have been published (e.g., Sandone 1987, Funk and Sandone

1990, Willette et al. 1999). Processing methods are similar those described by Baker et al. (1991); however, electronic fish measuring boards have been used to enter sample summary data and individual fish data (standard length in mm, whole body weight in grams, and sex) at the time of processing since 1989. Gonad weights have been collected from prespawning fish (both sexes) in most years since 1994 (n = 8,500).

Scales are used to estimate age for PWS collections rather than otoliths because they are much easier to collect and prepare for examination. Additionally, Chilton and Stocker (1987) reported that Chi-square tests of age compositions from paired otoliths and scales collected off the British Columbia coast could not refute the null hypothesis that they were from the same population. Interpretation of age from otoliths indicated that there were older fish than interpreted from scales; however, few fish older than age 10 are found in PWS, so fish interpreted at age 9 and older are combined into an age category 9+. No age validation or tests of paired age structures have been completed for PWS herring.

Aerial survey, acoustics estimates, and ASL data sets are essential parts of the current ASA model the Alaska Department of Fish and Game (ADF&G) uses to estimate the historical biomass and project pre-fishery run biomass a year ahead for management (e.g., Hulson et al. 2008). Additionally, the mile-days of milt and ASL data are part of the Bayesian formulation of the ASA model (Muridan 2015), and the scales collected from this archive were used in an EVOS funded project titled “PWS Herring Program - Scales as growth history records”.

This project will conduct aerial surveys to collect data related to spring herring spawning events, provide vessel support for acoustics surveys and disease sample collections; and capture and process herring to generate age, sex, and size summaries and mean target strength. The overall goal of the aerial survey, acoustics survey, and ASL project components is meet the overall program goal to **improve predictive models of herring stocks through observations and research**.

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2. Relevance to the Invitation for Proposals

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

This project will help address 3 areas of interest in the invitation for proposals as follows:

1) The aerial survey and acoustics survey support portions of this proposed project will address area of interest number 4. "A project for a comprehensive spawn assessment to be conducted at a minimum interval of every two years". The current ADF&G age-structured stock assessment model uses mile-days of milt from aerial surveys and acoustics biomass estimates to tune the model (Hulson et al. 2008), and will be conducted annually.
2) The acoustics survey support part of this proposed project will address area of interest number 6 "The continuation of the work to study the role of disease in herring recovery and the potential for developing tools to aid management agencies in the detection and management of disease outbreaks". This proposed project will provide the research platform (R/V Solstice) to capture fish and for the Disease Studies staff to process fish. Additionally, this proposed project will assist in collecting and processing Pacific herring scales so age data can be paired with the disease data.
3) The age, sex, and size part of this proposed project will address area of interest number 9 "A study to estimate and corroborate herring age at maturity with ASA model estimates". This proposed project would assist collecting and interpreting Pacific herring scales for age.

Data collected in this proposed project will help meet the overall *Herring Research and Monitoring Program* goal to **improve predictive models of herring stocks through observation and research** and would also address overall *Herring Research and Monitoring Program* objective number 2) Provide inputs to the stock assessment model. The overall goal and program objective 2 would be addressed by providing necessary inputs to the age-structured assessment models of ADF&G and the *PWS Herring Research and Monitoring Program – Population modeling.* These inputs would include the mile-days of spawn, target strength values used in the acoustics echo integration, and age, sex, and size of prespawn and spawning Pacific herring.

3. Project Personnel

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

- A list of professional and academic credentials, mailing address, and other contact information (including e-mail address)

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

Steven D. Moffitt

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Professional Background:

Prince William Sound/Copper River Research Project Leader, Alaska Department of Fish and Game, August 2000–2014. Duties: Develop, implement, and evaluate research projects on Pacific herring, Pacific salmon, and eulachon in Prince William Sound and the Copper River. Specific duties include directing salmon otolith laboratory, setting spawning escapement goals, preseason forecasts, evaluation of harvest policies, assessment of runs inseason, and local area network supervision (2000–2010). Directly supervised one full time Fishery Biologist II, two seasonal Fishery Biologist I positions, and two seasonal Fisheries Technician crew leaders (2000–2014). Currently supervise one seasonal Fishery Biologist I and two seasonal Fisheries Technician Crew leaders. Current supervisor: Dr. Jack Erickson, Regional Research Biologist.

Prince William Sound/Copper River Assistant Research Project Leader, Fishery Biologist II, Alaska Department of Fish and Game, November 1991 to August 2000. Duties: Responsible for sampling, compilation, and analysis of age, sex, size, and stock composition data; and salmon catch and escapement reporting. Responsible for assisting with inseason assessment of Pacific salmon and Pacific herring abundance. Supervised five seasonal employees and responsible for five project budgets. Supervisors: Mr. John Wilcock and Mr. Mark Willette, Area Research Biologists

Assistant Project Leader, Fishery Biologist II, Alaska Department of Fish and Game, July 1991 to November 1991. Planned work and supervised five employees in collecting and compiling pink and chum salmon fry/egg abundance and mortality data. Assisted with data analysis and damage assessment report writing. Supervisor: Mr. Sam Sharr, Area Research Biologist

Education:

B.S. Wildlife Management, University of Alaska Fairbanks, 1989.

Selected Publications:

Batten, S.D., S. Moffitt, W.S. Pegau, and R. Campbell. Plankton indices explain interannual variability in first year Prince William Sound herring growth. Fisheries Oceanography. *In press*.

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Recent collaborators:

Paul Hershberger – U.S. Geological Survey, Marrowstone Marine Laboratory
Peter-John Hulson – University of Alaska Fairbanks
Dr. Gary Marty – University of California Davis
Melissa Muradian – University of Washington
Scott Pegau – Oil Spill Recovery Institute and Prince William Sound Science Center
Dr. Terry Quinn – University of Alaska Fairbanks

4. Project Design

A. Objectives

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

These data will be collected to meet the overall goal to **improve predictive models of herring stocks through observations and research** by providing necessary inputs to the age-structured assessment models of ADF&G and the *PWS Herring Research and Monitoring Program – Population Modeling.* These data will add to data collected since 1972 (aerial surveys) and 1973 (age, sex, and size data).There are no proposed hypotheses to be tested directly from this project.

Objectives of this proposed project are as follows:

1.) Conduct spring aerial surveys to collect data on survey routes, location and linear extent of herring milt, classification of herring milt, herring school biomass; distribution and abundance of

sea lions, other marine mammals and bird aggregations associated with herring or herring spawn; and other relevant environmental or anthropogenic observations.

2.) Collect, process, summarize, and distribute age, sex, and size data from herring collected during acoustics surveys, spawning grounds surveys, *PWS Herring Research and Monitoring Program* disease surveys, or other relevant collections.

   a. Estimate age composition in each fishery and spawning escapements by gear type for time and area strata with sample sizes sufficient to simultaneously estimate all age proportions to within ± 5% at the 90% level of precision.

   b. Estimate mean standard length and whole body weight for each fishery and spawning escapements by gear type for time and area strata with sample sizes such that the relative error is ±5% at the 95% level of precision.

   c. Estimate the mean gonad weight of prespawning fish for time and area strata with sample sizes such that the relative error is ±5% at the 95% level of precision.

   d. Estimate sex composition of each fishery and spawning escapements by gear type for time and area strata with sample sizes sufficient to estimate proportions to within ±5% at the 95% level of precision.

3.) Provide a vessel (R/V Solstice) as a research platform for an adult acoustics survey, disease sampling, and collection of pre-spawn and spawning Pacific herring samples. Mean length from pre-spawn samples will be used to estimate Pacific herring target strength for the acoustics work.

B. Procedural and Scientific Methods

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

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

I. Objective 1: Aerial surveys

Aerial surveys generally begin in mid to late March or earlier if there are reports of herring aggregations, spawn, or large predator aggregations. The first survey usually covers the eastern side of Prince William Sound because the spawn timing is generally earlier on the east side (Port Gravina and Port Fidalgo). However, the first survey may be expanded based on boat or pilot reports from other areas. Surveys then continue once or twice a week until herring schools or spawn are detected by a survey flight or reported by other pilots or boats. Once spawning begins, surveys will be conducted daily in the area where spawn

was detected if weather conditions are appropriate. Surveys will be expanded to other portions of the Prince William Sound area (North shore, Naked Island, Montague Island, and Kayak Island) in April or based on pilot or boat reports. Survey interval, duration, and area are adjusted inseason to allow available funding to last until approximately mid-May.

Aerial survey methods are similar to those described in Brady (1987), Baker et al. (1991), and Lebida and Whitmore (1985), but many aspects have been updated with newer technology. Surveys are generally conducted in a float equipped, fixed-wing aircraft flying at a standard elevation of ~1,200 feet if possible with existing weather conditions. Two observers will be used if possible for each flight. The primary observer sits in the back seat and uses a Tablet computer to enter survey metadata in a spreadsheet and georeferenced survey data in an ESRI ArcPad application connected to a Bluetooth GPS (Bochenek 2010). The primary observer also attaches a GoPro camera on the back window (inside) to collect either video or a still image every 1 or 2 seconds (either video or still images work…images are higher quality, but take more processing time to create a time lapse movie). A sighting tube described by Lebida and Whitmore (1985; Appendix III) is used to calibrate the surface area for a few schools at the beginning of each survey, but it usually is not possible to use it on each herring school observation.

The secondary observer sits in the front passenger seat and reports observations to the primary observer, collects observations on paper maps, deploys a handheld GPS as a backup to the Bluetooth capable GPS, and takes photos with a Digital Single Lens Reflex (DSLR) camera and fast lens (F2.8) of spawning events, large biomass aggregations, and large sea lion groups. Photos are georeferenced to the GPS track using software to match up the time-date stamps. This requires a photo of the GPS with the date and time on the GPS screen. During large spawning events, several passes are necessary to map all of the observation data.

After each survey, Arcpad data are transferred from the tablet to the local ADF&G network for processing with ESRI ArcMap and DSLR photos are transferred to the local network and edited with Adobe photo editing software. Observations on paper maps are examined for complete survey information and stored for use in post-season processing.

The handheld GPS is downloaded with DNRGarmin software, videos or images are downloaded from the GoPro camera, and DSLR images are georeferenced with the GPS data. At the end of the survey season, the milt locations and lengths are adjusted by comparing data collected on the GIS application to the GoPro imagery. The wide angle format that makes the imagery so useful for documenting milt locations makes the imagery much less useful for school observations or sea lion pod counts.

Aerial Survey Measurements

Measurements made during the survey include 1) estimating the linear extent of milt, 2) estimating the biomass of herring schools from surface area, 3) estimating the number of sea lions, and 4) estimating the number of birds at a location.

Estimates of the linear extent of milt with the GIS application on the tablet computer are probably ± 20% although this has not been tested. Estimates of linear extent of milt adjusted with synoptic imagery are probably ±10%. Biggs and Funk (1988) found that skiff measurements of spawn were often larger

than the aerial estimates of milt, but they attributed this to additional spawn after the survey or multiple days between surveys (full citation in Executive Summary).

Estimates of individual herring school biomass in short tons are likely at ±50%. Biomass is estimated in the field from a surface area to short tons conversion based on a limited number of observations that were captured by seine vessels. A sighting tube is used to calibrate the primary observer on a few schools at the beginning of each survey. However, the sighting tube is difficult to use on a fixed-wing plane and larger schools fill the field of view. Also the depth of schools is difficult to estimate from plane. Photos with known focal length, elevation, and angle may be used to check surface areas after the survey; however, this assessment has not been evaluated. Very few tests of observer estimates have been completed by capturing a school with purse seine gear after an aerial estimate (Fried 1983, Lebida and Whitmore 1985; ADF&G unpublished). ADF&G has less confidence in our ability to estimate school size in short tons than the linear extent of milt along a beach.

Estimates of sea lion pod counts are likely ±5% if the pod is <50 animals. An examination of paired observer estimates and photo counts from a few large pods (>50 animals) indicated most observers underestimated by 100%, i.e., photo counts of sea lion pods of 150 animals were estimated during a survey at 75 animals. Other studies have also documented that observer counts estimate a smaller proportion of the total count as abundance increases (e.g., Jones et al. 1998). However, these data are not used as part of our current herring assessment model, so all counts in our GIS data files are currently unadjusted survey estimates.

Estimates of whales are likely ±100% or more given the duration of dives by foraging humpback whales described by Dolphin, 1988. Estimates of harbor seals at haul outs are most likely ±30% although there are a few locations with groups of ~100 individuals and the estimates are probably larger. Some paired photos and aerial observer estimates are available to examine, but these data are not used as part of our current herring assessment model, so all counts in our GIS data files are unadjusted survey estimates.

Given the size of many of the bird aggregations (gulls mostly), the uncertainty in our survey estimates is likely ±100% or more. Similar to sea lions and harbor seals, we have paired survey photos and survey observer estimates for comparison, but these data are not used as part of our current herring assessment model, so all counts in our GIS data files are unadjusted survey estimates.

ADF&G considered conducting helicopter surveys because a more stable platform would allow longer duration, fixed location observations of areas with many herring schools and predator aggregations; however, there is no helicopter service in Cordova and the cost for chartering a helicopter out of Valdez or Girdwood would be almost double the current fixed-wing charter costs.

II. Objective 2: Age, sex, and size sampling

Methods are mostly outlined in Baker et al. (1991). The overall goal of the ASL sampling program in the PWS areas is to provide the age, sex, and size composition of the herring catches and spawning escapements. To design a sampling program to provide this information, two questions should be addressed as follows:

1) Do we need to be concerned about temporal or spatial changes in the age, sex, or size composition, and if so, how should the samples be stratified to detect them?

2) How many samples are necessary to achieve desired levels of precision and accuracy?

The question of whether temporal or spatial changes occur in the age, sex, or size composition of a population is area specific. However, because the PWS herring fisheries and spawning escapements have varied greatly on temporal and spatial scales (e.g., Biggs et al. 1992), criteria applied have been as follows:

1) Spatially separated spawning populations should be sampled separately and, unless there are no demonstrable differences in the age composition among catches in management units within an area, those units should be sampled separately;

2) The duration of the sampling effort should cover the times when approximately 75%–85% of the catches are made or escapements occur;

3) The more rapidly the age composition changes the more time strata are necessary.

These criteria help ensure that time and area specific trends are represented in manageable portions of a population within an area, and at the same time help to minimize the variance around estimates of the age, sex, and size composition of the population as a whole.

Because PWS herring fisheries and spawn timing varies greatly on both temporal and spatial scales and because other areas have found changes in age composition through time (Ware and Tanasichuk, 1989), general sampling guidelines are followed rather than a fixed stratified sampling scheme. Samples are collected from as many spatially discrete prespawn and spawning aggregations as possible. Additionally, if spawning activity extends over multiple days in a single location, multiple samples are collected if possible.

Random samples from each fishery type or spawning escapements are stratified by area, time, and gear. Sample size (n=450) is set to simultaneously estimate the proportion of each age class to within ±5% of the true proportion 90% of the time (Thompson 1992). This sample size represents the worst case where there are 3 age classes of equal proportions; no more than 10% of the scales are unreadable, and no finite population correction is necessary because n is small relative to N. This sample size is also sufficient to estimate the overall proportion of each sex to within ±5% of the true proportion at >95% of the time (Thompson 1992). Additionally, this sample size is sufficient to estimate the mean standard length and mean whole body and gonad weights to within a relative error of ±5% of the true proportion at >95% of the time (Cochran 1977, Thompson 1992). The sample size to evaluate the mean standard length and weight was evaluated by examining the coefficient of variation (CV) of all spatially and temporally stratified samples collected in 2010–2015. The CV of 79 whole body weight samples was normally distributed with a mean of 0.27. Only 1 sample in 79 had a large enough CV such that a sample size of 450 would be insufficient to provide an estimate within a relative error of ±5% of the true proportion 95% of the time (Cochran 1977).

Samples of whole fish are collected in the field and frozen in large 6 mm plastic bags with labels inside the bag that document date, time, location, gear, samplers, and the number of bags. Other information including the approximate coordinates of the sample location are collected and added to a sample log.

Often more than 450 fish are collected such that an equal number of fish are randomly selected from each bag prior to processing to meet the sample goal of 450. From the fish selected for processing, 10 fish are place on a tray and their standard length measured to the nearest mm (standard length, tip of snout to hypural plate), whole weight to the nearest gram and gonad weight to the nearest 0.01 grams (both sexes) are measured with an electronic balance; sex determined from examination of the gonads (1=male, 2=female, 3= unknown), and gonad maturity estimated from examination of the gonads. Gonad maturity is determined according to the maturity scale of ICES (Anonymous 1962; scale of 1, undeveloped, to 8, recovering from spawning). This maturity scale covers the complete development cycle and is somewhat subjective; however, because most of our collections are in the spring, only a few of the categories are used consistently. All data are entered or captured with an electronic fish measuring board. The precision of length measurements collected on our previous electronic fish measuring boards were tested and were within ±1 mm; the new boards have not been tested yet. Whole body and gonad weights are collected with an electronic balance that is checked with calibration weights (and recalibrated if necessary) prior to each sampling event.

A scale is collected from the left side of the fish from a preferred area if possible. The preferred area is above the lateral line and 3-4 rows of scales back from the operculum. This area generally has symmetrical growth patterns and distinct annuli. Scales are cleaned and placed on a pre-labeled glass microscope slide after dipping in a solution of 1:10 mucilage glue to water. A single scale from each of 10 fish is placed as two rows of 5 scales on each slide. Scales are viewed on a microfiche to ensure they are readable for age (not regenerated or illegible for other reasons) and useable for measuring growth increments. If they are not useable to interpret age or measure growth increments, another scale is collected and examined. After all scales are placed on a glass slide and checked they are covered with a second slide and taped together at the label end of the slide. All slides are stored in a labeled box or cabinet tray until examination to interpret the age.

Once a sample is complete, data are downloaded from the electronic fish measuring board into an MS Excel spreadsheet. Scales are examined to interpret the age on a microfiche by 2 or 3 readers. Ages are interpreted independently and then the committee discusses any differences before agreeing on an age by consensus. The crew leader spot checks all samples to reduce the chance of reader drift in age interpretation.

Overall age compositions in PWS are in general agreement with observations from large recruitments, i.e., proportions from a large recruitment event can be tracked across years; however, Kimura et al. (1992) found that when readers were aware of the strong year class they tend to make the strong year class more predominate by assigning ages to the strong year class. Because there are no known-age scales in our collection, our readers cannot be tested for accuracy; however, readers can be tested for reader agreement with tests of symmetry (Bowker 1948) or Cohen's Kappa (Cohen 1960). With sufficient training and experience, readers of Pacific herring scales are likely very precise with interpreting age of scales up to age 9. Growth increments are much smaller after age 9 and variability in age assignments probably increases.

ADF&G has considered using structures other than scales for age interpretation (e.g., otoliths, fin rays, or vertebrae), but the increased difficulty in collection and processing does not appear to be an efficient

use of available resources. Additionally, as mentioned earlier, Chilton and Stocker (1987) examined paired herring scales and otolith ages and could not reject the hypothesis that they produced age compositions from the same population.

III. Objective 3: Provide research platform for acoustics, pre-spawn ASL, disease sampling, and spawning escapement sampling for ASL.

This objective will be met using the Alaska Department of Fish and Game vessel R/V Solstice. The Solstice will deploy in late March or early April depending on the weather and pilot or boat reports. Onboard will be ADF&G staff to collect ASL samples, assist with processing disease samples (scale collections), and assist with the acoustics survey. Herring Research and Monitoring staff from the Prince William Sound Science Center (PWSSC) and United States Geological Survey Division will also be onboard to direct the adult acoustics survey and process disease samples.

During the acoustics data collection portion of the survey, a 20 m or 35-m deep anchovy purse seine (stretch mesh 1.5 cm) will be the primary herring capture gear. Onboard the R/V Solstice will be additional gear types to allow the capture of fish if necessary. These will include various sized cast nets, a variable mesh gillnet, and fishing rods with herring jigs. Generally, the anchovy purse seine gear will be deployed at night just prior to beginning acoustics transects. Herring schools are usually too deep to capture during the day, but rise toward the surface at dusk. Herring schools will be located with the vessel sounder and search light sonar. Marine mammal avoidance protocols will used for the spring survey prior to any purse seine deployment as follows:

A. Pre-survey information gathering and research staff briefing:
    1. Research staff will make a concerted attempt to contact local persons in specific areas they anticipate sampling. Air taxi pilots who have recently flown over those areas should be contacted. This information can be used to determine if there have been marine mammals in anticipated sampling areas.
    2. Research staff and vessel crew will familiarize themselves with the Marine Mammal Interaction handbook before or shortly after departure. Anyone onboard not familiar with the survey will be instructed in marine mammal avoidance protocol while deploying and hauling back the seine.
B. On site:
    1. If at all possible the vessel will arrive at the area to be sampled during daylight hours. This will allow time to transit the survey area and quantify marine mammal presence. All available persons on board must be looking and listening for marine mammals, especially whales during these transits. A hydrophone (a device used to detect sounds transmitted through the water) will potentially be used prior to making sets if available.

    2. Because these sets are made at night when the target species, Pacific herring, are closer to the surface, restricted visibility is an issue. After a possible herring school has been targeted acoustically, mark the position and carefully survey the surrounding area at a slow speed. During this survey all crew/staff should be looking and listening for marine mammal activity. One person should be on the bow as far forward from vessel noise as

possible, 1 person should be looking on the forward looking infrared (FLIR) camera, and 1 people should be aft on the main deck. An additional person will be placed in the seine skiff as a lookout. All persons serving as lookouts must have a radio or suitable communication device, capable of contacting the vessel operator. Ten to twenty minutes should be allowed for this marine mammal assessment and all lookouts must be focused on looking and listening. If any marine mammal activity is detected or suspected in the area where the set is to be made this information must be relayed to the vessel captain. If there is any possibility of conflict with marine mammals, especially whales, after the initial assessment has been made the seine will not be deployed.

3. Environmental conditions:
   Inclement weather conditions, e.g., wind, rain, snow, or fog that restrict visibility and auditory conditions, as well as sea state (sea & swell) should be subject to careful evaluation. If you can't see or hear, it will make it especially difficult to detect marine mammals in the sampling area. A decision to set the seine must be made jointly by both the vessel captain and the project leader, if either objects the net should not be deployed.

4. Electronic devices:
   All available equipment on board the vessel, except lights (lights may cause herring to dive), will be used to detect marine mammals in the sampling area. The vessel sonar if not tracking fish can be adjusted to detect targets near the surface. A forward looking infrared camera (FLIR) was installed on the Solstice in late 2007. Except in heavy rain or fog, the unit displays a clear picture of the shoreline, mountain tops, low lying rocks and islands in total darkness. Also visible are logs, sea ducks, gulls, otters, and whales out to about 0.5 miles. Whale spouts show up clearly, but for a short amount of time.

When the net is set, a waypoint is captured on a handheld GPS to collect the location, time, and date. After the net pursed sufficiently to concentrate the fish, dip nets are used to collect a random sample of sufficient numbers of fish for an ASL sample (450+) and also for disease sampling (60+). Several totes will be filled with sea water for the disease sample prior to bringing fish onboard. After sufficient numbers of fish are randomly selected, the end of the purse seine is released and pushed away from the vessel to allow the remaining fish to escape. The ASL sample is then placed in 6 mm plastic bags (6 or 7 for each 450 fish sample) and grease pencils are used to labeled each bag with vessel name, date, time, nearest headland, and bag number (e.g., 1 of 6). The bags are placed in freezer for storage and the deck is cleaned to prepare for the next set. If a disease sample is collected, ADF&G staff will help to organize the sample for processing and prepare labeled slides for scale collection. ADF&G staff will also help prepare for deploying the acoustics gear. After each set, a spreadsheet log is updated with information about the sample matching that on the bag labels and captured on the GPS.

The vessel will also be used to access areas with spawning Pacific herring. When an area with active spawn is located, a raft with 2 crew members will be deployed to capture fish for an ASL sample. Required gear will include fuel tank, tool kit, oars, rain gear and gloves, personal floatation devices, a VHF radio, a handheld GPS, 2 or 3 cast nets, 6 each 4 gallon buckets, and a 20 gallon fish tote. Cast nets will be thrown from the raft or shore into the milt to capture fish. This will often require an hour or more of cast net throws to capture a full sample. The mean time and approximate centroid of the area covered are used to describe the time and location of capture. Once a full sample is assured or another location

must be evaluated, the sample is returned to the R/V Solstice and bagged, labeled, and logged as described for purse seine samples.

A trawl net has also been considered for capture of fish on pre-spawn surveys. A trawl net can be fished deeper such that captures could be made if herring were not rising to shallow enough depths (10–15 fathoms of the surface) to capture with the anchovy seine. However, the disadvantages are that we have 20 years of samples from an anchovy seine, it would be more difficult to limit the amount of capture mortality, and marine mammal interactions would be even more difficult to avoid.

We have also considered alternative gear to capture spawning herring (other than cast nets). These could include variable mesh gillnets or a small half purse that could be deployed from a skiff. Both of these gears were used in the early to mid-1990s, but each had disadvantages that caused us to begin using cast nets. Gillnets caused significant scale loss such that we were collecting scales that were asymmetrical and difficult to interpret for age. The skiff and half purse required a shallow draft skiff, so our seine skiff could not be used and at least 3 crew members to operate.

C. Data Analysis and Statistical Methods

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

Aerial survey estimates of linear extent of Pacific herring milt, herring school biomass, sea lion counts, other marine mammal counts, and sea bird counts are saved directly in GIS shape files and a MS Excel spreadsheet is used to capture survey metadata. Once a survey is complete, shape files, the Excel metadata log file, GPS route files, GoPro video/image files, and DSLR photos are copied to the ADF&G Cordova file server. Survey metadata are entered into a yearly log file, and shape files, GPS route files, photos and videos are saved into an aerial survey subdirectory by survey date. Shape file data are viewed in ArcMap and attribute tables are examined for errors and adjusted as necessary.

After all surveys are complete, copies of the GIS miles of milt files will be compared to GoPro video or still images and the location and classification of milt will be adjusted if necessary. This is the highest priority as these data are used to tune the ASA model. If possible, biomass, sea lion counts and bird estimates will be compared against available georeferenced images.

After adjustments are complete, the individual survey GIS data will be combined into shape files for the year and then added to the historical GIS shape files. These historical shape files will allow comparison across all years for milt observations (1973–2015), survey routes (1997–2015), sea lion location and abundance (currently 2008–2015), other marine mammals (currently 2008–2015), and birds (currently 2008–2015). These data could be compared to other areas if they have similar data sets.

Appendix C

The ability to detect a change in mile-days of milt among years depends on the frequency of surveys and the completeness of the survey coverage. Similar to most years since 1973, this project will begin surveys in mid to late March on the east side of PWS to examine fish and sea lion distribution and fly daily surveys once spawning begins in the areas with significant fish, sea lion, or whale counts. Surveys will be extended to the Kayak Island area, North Shore, Naked Island, and Montague Island areas. Additionally, pilot reports of herring or spawn from other areas will be considered in flight route planning.

Standard length, weight, and sex data are collected directly into an electronic fish measuring board. At the completion of a sampling event, data are downloaded from the fish measuring board to the ADF&G Cordova file server. Data are reformatted into an Excel spreadsheet using a VBA application. Age is interpreted from scales and keyed into the Excel spreadsheet. A VBA application is used to generate age, sex, and size composition summaries that include sample size and percentage by age class and sex, mean and standard deviation by age class and sex for weight and standard length. Currently, historical data (1973–present) are summarized in an Excel spreadsheet; however, data are in the process of being organized for inclusion in a database that could be used by other herring research efforts.

Detecting a change in the sex, age, or size composition among spatial or temporal strata will depend on sample size; however, sample sizes of 450 should allow the use of Chi-square methods to detect difference in age composition. Age interpretations have been compared across areas in past, e.g., Brannian (1988).

D. Description of Study Area

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

The study area will include all of Prince William Sound and Copper River/Bering River coastal areas between Cape Suckling to the east and Cape Puget to the west. The bounding coordinates are 61.300 N, -144.00 W and 59.750 N, -148.760 W.

5. Coordination and Collaboration

Within the Program

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

1) *PWS Herring Research and Monitoring Program –Acoustics Survey*.

This proposed project will share the R/V Solstice vessel research platform with a Prince William Sound Science Center staff member to conduct the adult acoustics survey. ADF&G acoustics equipment will be shared with the Acoustics Survey project if necessary. This proposed project will also capture and process age, sex, and size samples to calculate mean target strength by time or area strata for use in acoustics echo integration. Aerial surveys conducted by this proposed project will provide additional location information on herring aggregation for acoustics surveys.

2) *PWS Herring Research and Monitoring Program – Outreach and Education.*

This proposed project will assist public outreach through public presentations of methods and results.

3) *PWS Herring Research and Monitoring Program – Herring Disease Studies*

This proposed project will provide research platform vessel support (R/V Solstice) for Herring Disease Studies staff to capture and process adult herring for disease sampling similar to past years. Additionally, this project will help collect scales for fish age and interpret the scales for age.

4) *PWS Herring Research and Monitoring Program – Age at Maturity*

This proposed project will assist with collection and processing of herring scales for the proposed age at maturity project.

5) *PWS Herring Research and Monitoring Program – Population modeling*

This proposed project will collect mile-days of milt, provide vessel support for the acoustics survey, and provide age, sex, and size data to update the time series of data required for the Bayesian population dynamics model.

With Other EVOSTC-funded Programs and Projects

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

Data Management Program

This proposed project will provide additional herring aerial survey and herring age, sex, and size data for use by other PWS Herring Program projects. Past funding and ADF&G funding has allowed us to provide aerial survey GIS data files for linear extent of spawn (1973–2015), survey routes (1997–2015), sea lion distribution and abundance (2008–2015), other marine mammals distribution and abundance (2008–2015), and bird aggregations (2008–2015).

With Trustee or Management Agencies

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

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

With Native and Local Communities

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

Text

6. Schedule

Appendix C

Program Milestones

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

Objective 1.

Complete all aerial surveys of spring herring assessment.

To be met by June of each year 2017–2021

Summarize, edit, and combine all spring 2016 aerial survey shape files into yearly totals.

To be met by August each year 2017–2021

Provide all raw and summarized data and metadata to AOOS Workspace.

To be met by June of following year 2018–2021

Objective 2.

Finish processing all herring samples for age, sex, and size

To be met by August each year 2017–2021

Distribute final age data and summaries.

To be met by August each year 2017–2021

Provide all raw and summarized data and metadata to AOOS Workspace

To be met by June of following year 2018–2021

Objective 3.

Complete spring acoustics, disease vessel support trip

To be met by June each year 2017–2021

Complete spawning ASL collection trip

To be met by June each year 2017–2021

Distribute final age data and summaries for acoustics target strength and disease sampling

To be met by August each year 2017–2021

Provide all raw and summarized data and metadata to AOOS Workspace

To be met by June of following year 2018–2021

Measurable Program Tasks

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

FY 17, 1st quarter (February 1, 2017 - April 31, 2017)

March:	*Start Aerial surveys*
March or early April:	*Start Acoustics and disease support survey*
April:	*Start herring ASL sample processing*

FY 17, 2nd quarter (May 1, 2017-July 30, 2017)

May:	*Finish Aerial surveys*
June:	*Provide previous years data and metadata to workspace*
June:	*Quality control work on ASL data*
July:	*Quality control and editing of aerial shape files.*

FY 17, 3rd quarter (August 1, 2017 – October 31, 2017)

August: *Finish analysis of aerial survey data.*
August: *Combine aerial survey shape files into historical version*
August: *Finish herring ASL sample processing*
August: *Finish ASL analysis and distribute ASL sample summaries*
1 September: *Submit proposal Request for FY18*

FY 17, 4th quarter (November 1, 2017- January 31, 2018)
November: *PIs meeting with Gulf Watch Alaska*
January: *Write summary reports.*

FY 18, 1st quarter (February 1, 2018 - April 31, 2018)
1 March: *Annual Report due*
March: *Start Aerial surveys*
March or early April: *Start Acoustics and disease support survey*
April: *Start herring ASL sample processing*

FY 18, 2nd quarter (May 1, 2018-July 30, 2018)
May: *Finish Aerial surveys*
June: *Provide previous years data and metadata to workspace*
June: *Quality control work on ASL data*
July: *Quality control and editing of aerial shape files*

FY 18, 3rd quarter (August 1, 2018 – October 31, 2018)
August: *Finish analysis of aerial survey data.*
August: *Combine aerial survey shape files into historical version*
August: *Finish herring ASL sample processing*
August: *Finish ASL analysis and distribute ASL sample summaries*
1 September: *Submit proposal Request for FY18*

FY 18, 4th quarter (November 1, 2018- January 31, 2019)
November: *PIs meeting with Gulf Watch Alaska*
January: *Write summary reports.*

FY 19, 1st quarter (February 1, 2019 - April 31, 2019)
1 March: *Annual Report due*
March: *Start Aerial surveys*
March or early April: *Start Acoustics and disease support survey*
April: *Start herring ASL sample processing*

FY 19, 2nd quarter (May 1, 2019-July 30, 2019)
May: *Finish Aerial surveys*
June: *Provide previous years data and metadata to workspace*
June: *Quality control work on ASL data*
July: *Quality control and editing of aerial shape files*

FY 19, 3rd quarter (August 1, 2019 – October 31, 2019)
August: *Finish analysis of aerial survey data.*
August: *Combine aerial survey shape files into historical version*
August: *Finish herring ASL sample processing*

August:	*Finish ASL analysis and distribute ASL sample summaries*
1 September:	*Submit proposal Request for FY18*

FY 19, 4th quarter (November 1, 2019- January 31, 2020)

November:	*PIs meeting with Gulf Watch Alaska*
January:	*Write summary reports.*

FY 20, 1st quarter (February 1, 2020 - April 31, 2020)

1 March:	*Annual Report due*
March:	*Start Aerial surveys*
March or early April:	*Start Acoustics and disease support survey*
April:	*Start herring ASL sample processing*

FY 19, 2nd quarter (May 1, 2020-July 30, 2020)

May:	*Finish Aerial surveys*
June:	*Provide previous years data and metadata to workspace*
June:	*Quality control work on ASL data*
July:	*Quality control and editing of aerial shape files*

FY 19, 3rd quarter (August 1, 2020 – October 31, 2020)

August:	*Finish analysis of aerial survey data*
August:	*Combine aerial survey shape files into historical version*
August:	*Finish herring ASL sample processing*
August:	*Finish ASL analysis and distribute ASL sample summaries*
1 September:	*Submit proposal Request for FY18*

FY 19, 4th quarter (November 1, 2020- January 31, 2021)

November:	*PIs meeting with Gulf Watch Alaska*
January:	*Write summary reports.*

FY 21, 1st quarter (February 1, 2021 - April 31, 2021)

1 March:	*Annual Report due*
March:	*Start Aerial surveys*
March or early April:	*Start Acoustics and disease support survey*
April:	*Start herring ASL sample processing*

FY 21, 2nd quarter (May 1, 2021-July 30, 2021)

May:	*Finish Aerial surveys*
June:	*Provide previous years data and metadata to workspace*
June:	*Quality control work on ASL data*
July:	*Quality control and editing of aerial shape files*

FY 21, 3rd quarter (August 1, 2021 – October 31, 2021)

August:	*Finish analysis of aerial survey data*
August:	*Combine aerial survey shape files into historical version*
August:	*Finish herring ASL sample processing*
August:	*Finish ASL analysis and distribute ASL sample summaries*
1 September:	*Submit proposal Request for FY18*

Appendix C

FY 21, 4th quarter (November 1, 2021- January 31, 2022)

November: *PIs meeting with Gulf Watch Alaska*

January: *Write summary reports; provide final data to workspace*

7. Budget

Budget Forms (Attached)

Please provide completed budget forms. Please note that the following items will not be considered for funding:

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

Sources of Additional Funding

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

IV. BUDGET JUSTIFICATION: Fiscal Year: 2017–2021

Personnel:

Funds are requested ($6.8 K) to support an ADF&G Fishery Biologist (FB) III in Prince William Sound. This will cover premium pay (sea duty and hazard pay) for boat and aerial surveys (*Objectives 1 –3*).

Funds are requested ($3.9 K) to support an ADF&G Fishery Biologist (FB) II in Prince William Sound. This will cover premium pay (sea duty and hazard pay) for boat and aerial surveys (*Objectives 1 –3*).

Funds are requested ($32.4 K) to support an ADF&G Fishery Biologist (FB) I position in Prince William Sound (4.5 months or 0.375 FTE). The FB I will complete preseason preparation for herring surveys (equipment setup and testing), schedule and collect data on many of the aerial surveys, process aerial survey data after each survey, combine data into historical GIS coverage, and assist with report writing (*Objectives 1*). The FB I will also assist with processing herring for age, sex, and size related data and summarizing the data (*Objectives 2*).

Funds are requested ($6.0 K) to support an ADF&G Fish and Wildlife Technician (FWT) III position in Prince William Sound (1 months or 0.08 FTE). The technician will lead the setup, organization, processing, and summary of age, sex, size related data from herring collected on surveys (*Objective 2).*

Funds are requested ($5.4 K) to support an ADF&G Fish and Wildlife Technician (FWT) II position in Prince William Sound (1 months or 0.08 FTE). The technician will lead assist with the organization, processing, and summary of age, sex, size related data from herring collected on surveys (*Objective 2*).

ADF&G will provide an in-kind contribution of 2.4 months (0.17 FTE) of Fishery Biologist III time ($33.4 K) to provide overall supervision of the project, conduct boat and aerial surveys, analyze data,

provide data to other program projects, and write reports. ADF&G will provide and in-kind contribution of 2.1 months (0.18 FTE) of Fishery Biologist II time ($20.7 K) to supervise FB I, FWT III, and FWT II, conduct boat and aerial survey, analyze data, provide data to other program projects, and write reports (*Objectives 1–3*).

Travel:

Funds are requested for 2 round trips and per diem ($1.4 K) to meet with Herring Research and Monitoring and Gulf Watch Alaska program principle investigators (*Objectives 1–3).*

Contractual:

Funds are requested to fund survey trips on the R/V Solstice including a 9 day ($37.4 K) acoustics and age, sex, size sampling trip and a 5 days ($20.8 K) trip to sample spawning Pacific herring for age, sex, and size. Funds are also requested to fund aerial survey charters ($35.6 K) to collect data on the distribution and amount of Pacific herring spring biomass, mile-days of milt, sea lions, other marine mammals, and birds. Additionally, funds are requested for hotel ($0.6 K) and rental car ($0.3 K) for 2 meetings (*Objectives 1–3*).

Commodities:

Funds are requested to purchase commodities for boat surveys including rain gear ($0.2 K); sample totes, dip nets, and sample gloves ($0.5 K); and cast nets and variable mesh gillnets ($0.5 K). Funds are also requested for age, sex, and size processing including glass slides, glue, and slide boxes ($0.5 K); and miscellaneous office or field supplies ($0.4 K) (*Objectives 1–3*).

Equipment: None

Indirect:

The indirect for the Trustee Agency costs were calculated at 9% ($13.7K).

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

Budget Category:	Proposed FY 17	Proposed FY 18	Proposed FY 19	Proposed FY 20	Proposed FY 21	TOTAL PROPOSED	ACTUAL CUMULATIVE
Personnel	$54.5	$54.5	$54.5	$54.5	$54.5	$272.5	
Travel	$1.4	$1.4	$1.4	$1.4	$1.4	$6.8	
Contractual	$94.6	$94.6	$94.6	$94.6	$94.6	$473.0	
Commodities	$2.1	$2.1	$2.1	$2.1	$2.1	$10.5	
Equipment	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	
SUBTOTAL	$152.6	$152.6	$152.6	$152.6	$152.6	$762.8	
General Administration (9% of subtotal)	$13.7	$13.7	$13.7	$13.7	$13.7	$68.7	N/A
PROJECT TOTAL	$166.3	$166.3	$166.3	$166.3	$166.3	$831.5	
Other Resources (Cost Share Funds)	$54.5	$54.5	$54.5	$54.5	$54.5	$272.5	

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

FY17-21

Project Title: Surveys and age, sex, and size collection and processing.
Primary Investigator: Steve Moffitt
Agency: Alaska Department of Fish and Game

TRUSTEE AGENCY SUMMARY PAGE

Date Prepared: 08/24/2016

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

Personnel Costs:		Months	Monthly		Personnel
Name	Project Title	Budgeted	Costs	Overtime	Sum
Vacant FB I	Surveys and age,sex, size collection and proce	4.5	7.2	0.0	32.4
Vacant FWT III	Surveys and age,sex, size collection and proce	1.0	6.0	0.0	6.0
Cheng Xiong	Surveys and age,sex, size collection and proce	1.0	5.4	0.0	5.4
Steve Moffitt (sea duty and harzard)	Surveys and age,sex, size collection and proce	0.5	13.6	0.0	6.8
Stormy Haught (sea duty and hazard)	Surveys and age,sex, size collection and proce	0.5	7.8	0.0	3.9
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
		Subtotal	40.0	0.0	
				Personnel Total	$54.5

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
Meeting with HRMP PI's and GWA PI's	0.5	2	6	0.1	1.4
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$1.4

FY17

Project Title: Surveys and age, sex, and size collection and processing.
Primary Investigator: Steve Moffitt
Agency: Alaska Department of Fish and Game

FORM 4B
PERSONNEL & TRAVEL DETAIL

Date Prepared: 08/24/2016

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

Contractual Costs: Description	Contract Sum
Acoustics survey - R/V Solstice @ $4,150/day (9 days)	37.4
Age, sex, size collections of spawning herring @ $4,150/day (5 days)	20.8
Air Charters for spring surveys (66 hours at $540)	35.6
Hotel for meetings (6 days at $100)	0.6
Rental car for meeting (6 days at $50)	0.3
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	$94.6

Commodities Costs: Description	Commodities Sum
Rain gear for surveys (2 @ $100)	0.2
Sample totes, nets, gloves ($500)	0.5
Age, sex, size processing supplies (glass slides, glue, slide boxes)	0.5
Cast nets and variable mesh gillnets	0.5
Misc supplies	0.4
Commodities Total	$2.1

FY17

Project Title: Surveys and age, sex, and size collection and processing.
Primary Investigator: Steve Moffitt
Agency: Alaska Department of Fish and Game

FORM 4B
CONTRACTUAL & COMMODITIES DETAIL

Date Prepared: 08/24/2016

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

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$0.0

Existing Equipment Usage: Description	Number of Units	Inventory Agency

FY17

Project Title: Surveys and age, sex, and size collection and processing.
Primary Investigator: Steve Moffitt
Agency: Alaska Department of Fish and Game

FORM 4B
EQUIPMENT DETAIL

Date Prepared: 08/24/2016

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

Personnel Costs:		Months	Monthly		Personnel
Name	Project Title	Budgeted	Costs	Overtime	Sum
Vacant FB I	Surveys and age,sex, size collection and proce	4.5	7.2	0.0	32.4
Vacant FWT III	Surveys and age,sex, size collection and proce	1.0	6.0	0.0	6.0
Cheng Xiong	Surveys and age,sex, size collection and proce	1.0	5.4	0.0	5.4
Steve Moffitt (sea duty and harzard)	Surveys and age,sex, size collection and proce	0.5	13.6	0.0	6.8
Stormy Haught (sea duty and hazard)	Surveys and age,sex, size collection and proce	0.5	7.8	0.0	3.9
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
		Subtotal	40.0	0.0	
				Personnel Total	$54.5

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
Meeting with HRMP PI's and GWA PI's	0.5	2	6	0.1	1.4
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$1.4

FY18

Project Title: Surveys and age, sex, and size collection and processing.
Primary Investigator: Steve Moffitt
Agency: Alaska Department of Fish and Game

FORM 4B
PERSONNEL & TRAVEL DETAIL

Date Prepared: 08/24/2016

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

Contractual Costs: Description	Contract Sum
Acoustics survey - R/V Solstice @ $4,150/day (9 days)	37.4
Age, sex, size collections of spawning herring @ $4,150/day (5 days)	20.8
Air Charters for spring surveys (66 hours at $540)	35.6
Hotel for meetings (6 days at $100)	0.6
Rental car for meeting (6 days at $50)	0.3
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	$94.6

Commodities Costs: Description	Commodities Sum
Rain gear for surveys (2 @ $100)	0.2
Sample totes, nets, gloves ($500)	0.5
Age, sex, size processing supplies (glass slides, glue, slide boxes)	0.5
Cast nets and variable mesh gillnets	0.5
Misc supplies	0.4
Commodities Total	$2.1

FY18

Project Title: Surveys and age, sex, and size collection and processing.
Primary Investigator: Steve Moffitt
Agency: Alaska Department of Fish and Game

FORM 4B
CONTRACTUAL & COMMODITIES DETAIL

Date Prepared: 08/24/2016

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

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$0.0

Existing Equipment Usage: Description	Number of Units	Inventory Agency

FY18

Project Title: Surveys and age, sex, and size collection and processing.
Primary Investigator: Steve Moffitt
Agency: Alaska Department of Fish and Game

FORM 4B
EQUIPMENT DETAIL

Date Prepared: 08/24/2016

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

Personnel Costs:		Months	Monthly		Personnel
Name	Project Title	Budgeted	Costs	Overtime	Sum
Vacant FB I	Surveys and age,sex, size collection and proce	4.5	7.2	0.0	32.4
Vacant FWT III	Surveys and age,sex, size collection and proce	1.0	6.0	0.0	6.0
Cheng Xiong	Surveys and age,sex, size collection and proce	1.0	5.4	0.0	5.4
Steve Moffitt (sea duty and harzard)	Surveys and age,sex, size collection and proce	0.5	13.6	0.0	6.8
Stormy Haught (sea duty and hazard)	Surveys and age,sex, size collection and proce	0.5	7.8	0.0	3.9
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
		Subtotal	40.0	0.0	
				Personnel Total	$54.5

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
Meeting with HRMP PI's and GWA PI's	0.5	2	6	0.1	1.4
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$1.4

FY19

Project Title: Surveys and age, sex, and size collection and processing.
Primary Investigator: Steve Moffitt
Agency: Alaska Department of Fish and Game

FORM 4B
PERSONNEL & TRAVEL DETAIL

Date Prepared: 08/24/2016

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

Contractual Costs: Description	Contract Sum
Acoustics survey - R/V Solstice @ $4,150/day (9 days)	37.4
Age, sex, size collections of spawning herring @ $4,150/day (5 days)	20.8
Air Charters for spring surveys (66 hours at $540)	35.6
Hotel for meetings (6 days at $100)	0.6
Rental car for meeting (6 days at $50)	0.3
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	$94.6

Commodities Costs: Description	Commodities Sum
Rain gear for surveys (2 @ $100)	0.2
Sample totes, nets, gloves ($500)	0.5
Age, sex, size processing supplies (glass slides, glue, slide boxes)	0.5
Cast nets and variable mesh gillnets	0.5
Misc supplies	0.4
Commodities Total	$2.1

FY19

Project Title: Surveys and age, sex, and size collection and processing.
Primary Investigator: Steve Moffitt
Agency: Alaska Department of Fish and Game

FORM 4B
CONTRACTUAL & COMMODITIES DETAIL

Date Prepared: 08/24/2016

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

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$0.0

Existing Equipment Usage: Description	Number of Units	Inventory Agency

FY19

Project Title: Surveys and age, sex, and size collection and processing.
Primary Investigator: Steve Moffitt
Agency: Alaska Department of Fish and Game

FORM 4B
EQUIPMENT DETAIL

Date Prepared: 08/24/2016

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

Personnel Costs:		Months	Monthly		Personnel
Name	Project Title	Budgeted	Costs	Overtime	Sum
Vacant FB I	Surveys and age,sex, size collection and proce	4.5	7.2	0.0	32.4
Vacant FWT III	Surveys and age,sex, size collection and proce	1.0	6.0	0.0	6.0
Cheng Xiong	Surveys and age,sex, size collection and proce	1.0	5.4	0.0	5.4
Steve Moffitt (sea duty and harzard)	Surveys and age,sex, size collection and proce	0.5	13.6	0.0	6.8
Stormy Haught (sea duty and hazard)	Surveys and age,sex, size collection and proce	0.5	7.8	0.0	3.9
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
		Subtotal	40.0	0.0	
				Personnel Total	$54.5

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
Meeting with HRMP PI's and GWA PI's	0.5	2	6	0.1	1.4
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$1.4

FY20

Project Title: Surveys and age, sex, and size collection and processing.
Primary Investigator: Steve Moffitt
Agency: Alaska Department of Fish and Game

FORM 4B
PERSONNEL & TRAVEL DETAIL

Date Prepared: 08/24/2016

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

Contractual Costs: Description	Contract Sum
Acoustics survey - R/V Solstice @ $4,150/day (9 days)	37.4
Age, sex, size collections of spawning herring @ $4,150/day (5 days)	20.8
Air Charters for spring surveys (66 hours at $540)	35.6
Hotel for meetings (6 days at $100)	0.6
Rental car for meeting (6 days at $50)	0.3
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	$94.6

Commodities Costs: Description	Commodities Sum
Rain gear for surveys (2 @ $100)	0.2
Sample totes, nets, gloves ($500)	0.5
Age, sex, size processing supplies (glass slides, glue, slide boxes)	0.5
Cast nets and variable mesh gillnets	0.5
Misc supplies	0.4
Commodities Total	$2.1

FY20

Project Title: Surveys and age, sex, and size collection and processing.
Primary Investigator: Steve Moffitt
Agency: Alaska Department of Fish and Game

FORM 4B
CONTRACTUAL & COMMODITIES DETAIL

Date Prepared: 08/24/2016

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

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$0.0

Existing Equipment Usage: Description	Number of Units	Inventory Agency

FY20

Project Title: Surveys and age, sex, and size collection and processing.
Primary Investigator: Steve Moffitt
Agency: Alaska Department of Fish and Game

FORM 4B
EQUIPMENT DETAIL

Date Prepared: 08/24/2016

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

Personnel Costs:		Months	Monthly		Personnel
Name	Project Title	Budgeted	Costs	Overtime	Sum
Vacant FB I	Surveys and age,sex, size collection and proce	4.5	7.2	0.0	32.4
Vacant FWT III	Surveys and age,sex, size collection and proce	1.0	6.0	0.0	6.0
Cheng Xiong	Surveys and age,sex, size collection and proce	1.0	5.4	0.0	5.4
Steve Moffitt (sea duty and harzard)	Surveys and age,sex, size collection and proce	0.5	13.6	0.0	6.8
Stormy Haught (sea duty and hazard)	Surveys and age,sex, size collection and proce	0.5	7.8	0.0	3.9
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
		Subtotal	40.0	0.0	
				Personnel Total	$54.5

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
Meeting with HRMP PI's and GWA PI's	0.5	2	6	0.1	1.4
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$1.4

FY21

Project Title: Surveys and age, sex, and size collection and processing.
Primary Investigator: Steve Moffitt
Agency: Alaska Department of Fish and Game

FORM 4B
PERSONNEL & TRAVEL DETAIL

Date Prepared: 08/24/2016

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

Contractual Costs: Description	Contract Sum
Acoustics survey - R/V Solstice @ $4,150/day (9 days)	37.4
Age, sex, size collections of spawning herring @ $4,150/day (5 days)	20.8
Air Charters for spring surveys (66 hours at $540)	35.6
Hotel for meetings (6 days at $100)	0.6
Rental car for meeting (6 days at $50)	0.3
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	$94.6

Commodities Costs: Description	Commodities Sum
Rain gear for surveys (2 @ $100)	0.2
Sample totes, nets, gloves ($500)	0.5
Age, sex, size processing supplies (glass slides, glue, slide boxes)	0.5
Cast nets and variable mesh gillnets	0.5
Misc supplies	0.4
Commodities Total	$2.1

FY21

Project Title: Surveys and age, sex, and size collection and processing.
Primary Investigator: Steve Moffitt
Agency: Alaska Department of Fish and Game

FORM 4B
CONTRACTUAL & COMMODITIES DETAIL

Date Prepared: 08/24/2016

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

New Equipment Purchases: Description	Number of Units	Unit Price	Equipment Sum
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$0.0

Existing Equipment Usage: Description	Number of Units	Inventory Agency

FY21

Project Title: Surveys and age, sex, and size collection and processing.
Primary Investigator: Steve Moffitt
Agency: Alaska Department of Fish and Game

FORM 4B
EQUIPMENT DETAIL

Date Prepared: 08/24/2016