ANNUAL PROGRAM STATUS SUMMARY

a) Program Number: 12120111

b) Program Title: Herring Research and Monitoring

c) Team Lead(s) Submitting the Report: W. Scott Pegau

d) Time period covered: 1 February 2012 to 31 January 2013

e) Date of Report: February 2013

f) Program website (if applicable): http://www.pwssc.org/herring/

g) Program status:

The program began this year and much of the effort has been focused on getting the individual projects underway and coordination among investigators as well as with other research efforts in the region. By working with the PWS herring survey program we were able to maintain our original science time line in spite of the change in the anticipated start date of the program from October to February. At this point it looks like the funding and scientific deliverables have been synchronized and we are completing our tasks as scheduled. We met both project and program milestones in the collection of data and setting up oversight of the program.

The program goals and objectives are:

HRM Goal: To improve predictive models of herring stocks through observations and research.

HRM Objectives

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

Noteworthy results:

As this was the first year of the program most of the projects are just getting underway and do not have results to contribute to the synthesis. Individual project reports are provided separately. Not all projects of this program have started and the report only covers those projects active during the reporting year.

There are some important results to discuss in this report. The intensive study of age-0 herring condition allowed us to better understand the energetic loss rates through the winter. Instead of having a single measure of condition in the fall and spring, the monthly sampling allowed us to determine when minimum maximum energy density occurred. This is important to objective three in that it ensures future sampling provides a good measure of the overwinter energy loss. Not all the samples have been processed, but we were able to confirm that our sampling in November is near the peak in condition of the fish. The results from fish collected in March are not available yet, but based on the data from fish collected in April we know that the minimum in condition occurs between February and April. These results confirmed that our scheduled sampling time is appropriate for answering questions related to energetic condition.

The herring tagging study led by Dr. Mary Anne Bishop was able to tag fish and monitor them over several days before the fish left the tagging area. Based on the results from the first year we modified the tagging work schedule. Originally we tried to tag fish in November, but met with difficulties in obtaining larger fish because they were too deep for the seine to reach. We found by waiting until

spring we could collect the fish as they were preparing to spawn. This allowed us to use less invasive means to collect the fish and we were able to collect larger fish, which are better able to handle the acoustic tags. This project addresses objective four.

A pilot study was conducted to determine if histology of herring ovaries could be used to determine if a fish had spawned. Initial results are positive that this approach can be used and we are planning collection of additional fish to be able to establish the maturation function that is an input into the Age-Structure-Analysis model as described in objective one.

The upcoming year will include most of the planned projects and we will begin to see more results from the first year's effort. Disease and adult biomass surveys provide direct input to the ASA model used by ADF&G. We will be testing assumptions about our acoustic measurements of juvenile herring to ensure the sampling design is appropriate. We expect to have our data management system fully in place and have completed collection of appropriate historical data. The student working on the modeling aspect of the program should begin to examine the inputs to the ASA model to determine which have the greatest value. Coordination of sampling requirements has already occurred and we are not anticipating any major issues with the program design.

h) Summary of Work Performed:

The projects this year that addressed objective one include: expanded adult surveys by Buckhorn, juvenile abundance index by Buckhorn, direct capture by Bishop, age at first spawn by Heintz, and population dynamics modeling by Branch. Of these projects the work on the expanded adult surveys was limited to the purchase of new equipment. The juvenile abundance index and associated direct capture sampled in November as planned. By connecting the juvenile condition and the juvenile index work we hope to be able to predict the recruitment of age-3 herring. The population dynamics modeling focused on selecting a graduate student to start the effort and their coursework. The modeling effort will be focusing on evaluating the value of inputs to the ASA model and connecting field measurements to a modeling structure. The age at first spawn project is the furthest towards completion. Preliminary results indicate that histology of the ovaries can provide an indication if a fish had previously spawned. By collecting fish during the summer after the older juveniles recruit with the adult population we hope to establish the maturation function that is an input to the ASA model. Collection of fish for that project is scheduled in 2013.

Addressing objective two are the data management project of Bochenek and the scale analysis of Moffitt. The data management project has established a workspace designed for the herring researchers to share results, back up data, help with meta data, and make data accessible through the herring portal. The PI worked with ADF&G to obtain the data necessary to update the herring portal. All PIs have been working with the National Center for Ecological Analysis and Synthesis to recover historic data that are not within the herring portal. The scale analysis project has begun scanning in a selection of the very large scale library in Cordova. Results from this project are expected to allow us to connect year-class strength to growth parameters. This provides a different approach to answering the question about the role of condition in survival. The scales are also connect to the age of first spawning in that it is hypothesized that fish that don't spawn will have a different growth characteristic than fish that do. By using the historical record we can determine if there are changes in the maturation function over time.

Projects addressing objective three are the juvenile herring condition intensive study of Kline and Heintz, the fatty acid analysis of Heintz, and intensive juvenile herring surveys of Buckhorn. Effort on the last project was limited to purchase and testing of equipment for use during the scheduled field season in 2013. Results from the juvenile herring condition intensive are still coming in. We have

enough results to see the fall peak in condition and when condition begins to improve in the spring. Using this information we can ensure our sampling design will meet the needs of the program. Samples from the juvenile condition intensive were also to be used for the fatty acid analysis. We were not able to find fish in as many locations as desired so we are using existing samples from other efforts to fill out the sample needs to achieve the objectives of that project. These samples are still being processed.

The project addressing objective four over the past year is the herring tagging project by Bishop. This project successfully tagged and detected herring over a several day period. A design change in the project was necessary because we were not able to obtain the larger herring needed in the fall we resampled during the spawning season. Our success in the spawning season has led us to alter the tagging effort from the fall to the spring. This change also allows for an expansion of the detector array that is being funded by other sources.

The coordination and outreach projects address aspects of all objectives. For outreach we have been transitioning materials into a new herring and research monitoring website that will replace the PWS herring survey website. New project profiles were developed describing the program. The coordination efforts have included two meetings with the principal investigators including one in conjunction with the EVOSTC funded Gulf Watch Alaska program. All scheduled cruises occurred.

We did have one area of difficulty worth commenting on. The direct capture for validating the acoustic measurements was designed around the use of a mid-water trawl. Originally we planned to use an existing net, but it was lost at sea before the project started. This caused us to purchase a new net instead of the trawl monitoring system that we had proposed. The trawl and associated winch system were received a couple days before the November cruise so we were unable to test the systems as planned. We could not use the trawl system during that cruise because of issues related to the valve system on the winch. We extended the cruise and had the ship come back to Cordova twice in an effort to troubleshoot and fix the system. Since we were unable to fix the system we resorted to our backup plan of using variable mesh gill nets in the manner we have in the past. New smaller mesh nets were also deployed to ensure collection of samples for the energetics and disease projects. The gill nets are of limited use for acoustic validation purposes. We believe we have identified the necessary repairs to the winch system and will be testing them in the spring of 2013.

Please see the individual project reports provided in the appendix for more details.

i) Summary of Future Work to be Performed:

We are on schedule with the original proposal. The one schedule change is in the tagging of herring that is occurring in six months later than originally proposed because we are able to get better samples and will be able to take advantage of advances in the detection array that are being funded by other sources.

j) Coordination/Collaboration:

During the reporting year we had two PI meetings. The first meeting was in April in Cordova to provide the local people an opportunity to learn of the planned work. The second meeting was in November and in conjunction with the PI meeting of the EVOSTC funded Gulf Watch Alaska program. This allowed investigators from both programs an opportunity to find means to collaborate. A small oversight group was established and invited to the PI meetings to allow them to see what worked had been done and what had been planned. Unfortunately Ted Cooney, who was a member of that group, passed away in early 2013. His guidance will be missed.

The success in maintaining the original sampling schedule is in large part due to collaboration with the EVOSTC sponsored PWS Herring Survey program that is wrapping up.

Significant collaboration occurred between individual projects as opportunities were identified for one project to collect samples for another. The direct capture and outreach projects assisted several other projects within the program.

k) Community Involvement/TEK and Resource Management Applications:

The primary community involvement piece of this program was not scheduled to start until year two. It involves the collection of herring by local fishermen. Dr. Pegau held a community presentation in Cordova about the research to be done to allow feedback from the community.

The resource management application this program is focused on is the population model used by ADF&G. We speak often with the local fisheries biologist to keep them aware of our work and to learn about their needs. Some of the projects when completed will fit directly into supporting their efforts and some will take some time to provide a measure that can be used for management.

l) Information Transfer:

As this was the first year of the program there has been little opportunity to complete the research to a level appropriate for information transfer. We did present the research program to the community in Cordova and at the Alaska Forum on the environment. A little over thirty people attended both presentations. We also presented an overview of the program at the Ocean Fest in Cordova in September 2012 with approximately 300 people in attendance.

We completed a project profile of the HRM program and worked on completing others. A description of the program for the public was included in the Delta Sound Connection science newspaper published annually by the Prince William Sound Science Center. Ten thousand copies of that document were distributed to various locations around the Sound.

m) Budget :

A summary of the program spending to January 31, 2013 is provided below. We are a little behind the anticipated spending schedule. This is largely due to billing for samples collected this year have not been received. It is also a natural lag in the starting of a program.

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
ANNUAL PROGRAM REPORT YEAR 1

Budget Category:	Proposed Year 1	Actual Year 1	TOTAL Difference
Personnel	201469	84544	$116,925
Travel	26800	12583	$14,217
Contractual	331860	252153	$79,707
Commodities	81000	20344	$60,656
Equipment	187200	179751	$7,449
Indirect Costs (*will vary by proposer*)	114231	52316	$61,915
SUBTOTAL	$942,560	$601,691	$340,869
General Administration (9% of subtotal)	$84,830	$54,152	$30,678
PROJECT TOTAL	$1,027,390	$655,843	$371,547
Other Resources (Cost Share Funds)	$0	$0	$0

COMMENTS:

FY12

Program Title: Herring Research and Monitoring
Team Leader: Pegau

SUMMARY

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

Appendix 1. Individual project reports

Project Number: 12120111A

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

Principal Investigator: Dr. Mary Anne Bishop

Report prepared by: Mary Anne Bishop and Megan McKinzie

Time Period Covered by the Report –February 1, 2012 – January 31, 2013.

Date of Report: February 10, 2013

Summary of Work Performed

Acoustic surveys provide a low-cost, remote sensing tool to estimate species specific fish biomass and abundance as well as distribution of pelagic fish and zooplankton. To ground truth acoustic data, pelagic trawls provide the primary *in situ* method to validate species composition, help facilitate the estimation of acoustic biomass and collect additional biological data such as length-frequency distribution and age. Pelagic trawl data also can aid in the interpretation of previously collected acoustic data from other surveys conducted within the Prince William Sound (PWS).

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

1) Improve capture methods used to validate acoustic surveys.

2) Increase the sample size for identification, quantification, and measurement of juvenile (0+, 1+, 2+) and adult (3+ and older) herring schools as well as other fish schools in survey areas.

3) Provide data on species composition and length frequency to aid in the interpretation of current and historical acoustic surveys.

4) Provide adult herring samples to Alaska Department of Fish and Game for the adult herring age-structure-analyses model.

5) Provide juvenile herring samples to researchers investigating juvenile herring fitness and disease.

The first direct capture study, *HRM: A High Temporal and Spatial Resolution Study to Validate the Separate Herring Condition Monitoring Program* (PI's Kline and Heintz) began in August 2011 (pre-award) and was completed in June 2012. Personnel from this study assisted with the monthly direct capture on several occasions, under the direction of HRM project leader Scott Pegau.

Our first multi-project direct capture effort was scheduled for November 2012 in conjunction with the *HRM study: Juvenile Herring Abundance Index*. Prior to that juvenile herring survey and to ensure that our validation methods would be appropriate for our study area and goals,

Megan McKinzie, the project's fisheries biologist, participated in the EVOS Gulfwatch study: *Monitoring long-term changes in forage fish distribution, abundance, and body condition in Prince William Sound* (USGS Alaska Science Center, PI's Piatt and Armitsu). From July 20-26, 2012 McKinzie was onboard the *R/V* Alaskan Gyre with other scientists assisting with data collection. This cruise conducted diurnal, concurrent acoustic and mid-water trawl surveys in northern Prince William Sound. The cruise also collected oceanographic measurements, zooplankton samples, and conducted beach seines. In addition to acquiring experience fishing the mid-water trawl, the forage fish cruise has provided critical information to determine the appropriate net and mesh size required for our herring validation surveys.

Methods. When we originally wrote the proposal for this project we planned to use Dr. Rob Campbell's trawl (12.8 m (L) x 7.6 m (W) x 9.1 m (H)). Unfortunately, Campbell lost this trawl during field work, forcing us to purchase a new trawl. Based on our sampling objectives, desired species and age classes it was determined that a sweeper mid-water trawl would be the most effective net design. The net has an approximately 154 m^2 mouth (14 m x 11m) and is 22 m long. Mesh size diminishes from 38 mm at the mouth to 12 mm at the cod end (Innovative Net Systems, Inc.). The net is held open by two 0.4 m^2, series 2000 steel mid-water trawl doors (Nor 'Eastern, Inc.); each weighing approximately 76 lbs. The net and doors are deployed via dual winches with enough 3/8" dynema line to fish to a maximum depth of about 70 m. Target depth for juvenile herring capture is 15-25 m. The unexpected cost of purchasing the trawl, doors, as well as higher than expected costs for the reel and winches prevented us from purchasing a trawlmaster. Therefore, in lieu of a trawlmaster, we elected to use a SBE37 Microcat (MCat) attached to the floatline to record trawl depth as well as time, salinity, temperature and sound velocity.

However, due to hydraulic compatibility issues between our reel/winches and the charter vessel during the initial November 2012 survey we were unable to obtain sufficient power to successfully deploy and haul our mid-water sweeper trawl, despite several attempts at system modifications and replumbing. Therefore, within each survey bay (Fig. 1) large gillnets (160' X 16'; 1/4, 3/8, 1/2, and 3/4 sq. in mesh) were deployed and allowed to soak overnight in areas of high acoustic signature as an alternative validation method (Table 1). All fish captured were identified to species, separated and measured for total length and weight.

We supplemented our validation efforts with a small mesh gillnet (60' X 16'; 1/4, 5/16, and 3/8 sq. in) and cast nets to provide samples to the juvenile herring and disease projects conducted concurrently with the acoustic surveys. All fishing was done opportunistically while at anchor (Table 2) .All captured fish were identified to species and herring samples were separated by project (Table 3).

Preliminary Data. During the November 2012 cruise, large gillnet efforts used for acoustic validation collected a total of 34 fish representing nine species (Table 4). Pacific herring were captured in highest abundance and within five of the seven bays (Fig. 2). Small mesh gillnets and cast net efforts collected a total of 1,837 individuals from 14 different species. Due to sampling objectives and fishing methods utilized, age-0 and age-1 juvenile herring; our target species, was captured in highest abundance across all bays (Fig. 3). Overall, Eaglek Bay had the highest species richness (n = 8) followed by Port Gravina and Whale Bays (n =7, respectively).

Eaglek Bay also had the highest species diversity (H' = 1.7) followed by Lower Herring and Simpson Bays (H' = 0.9, respectively) (Figure 4).

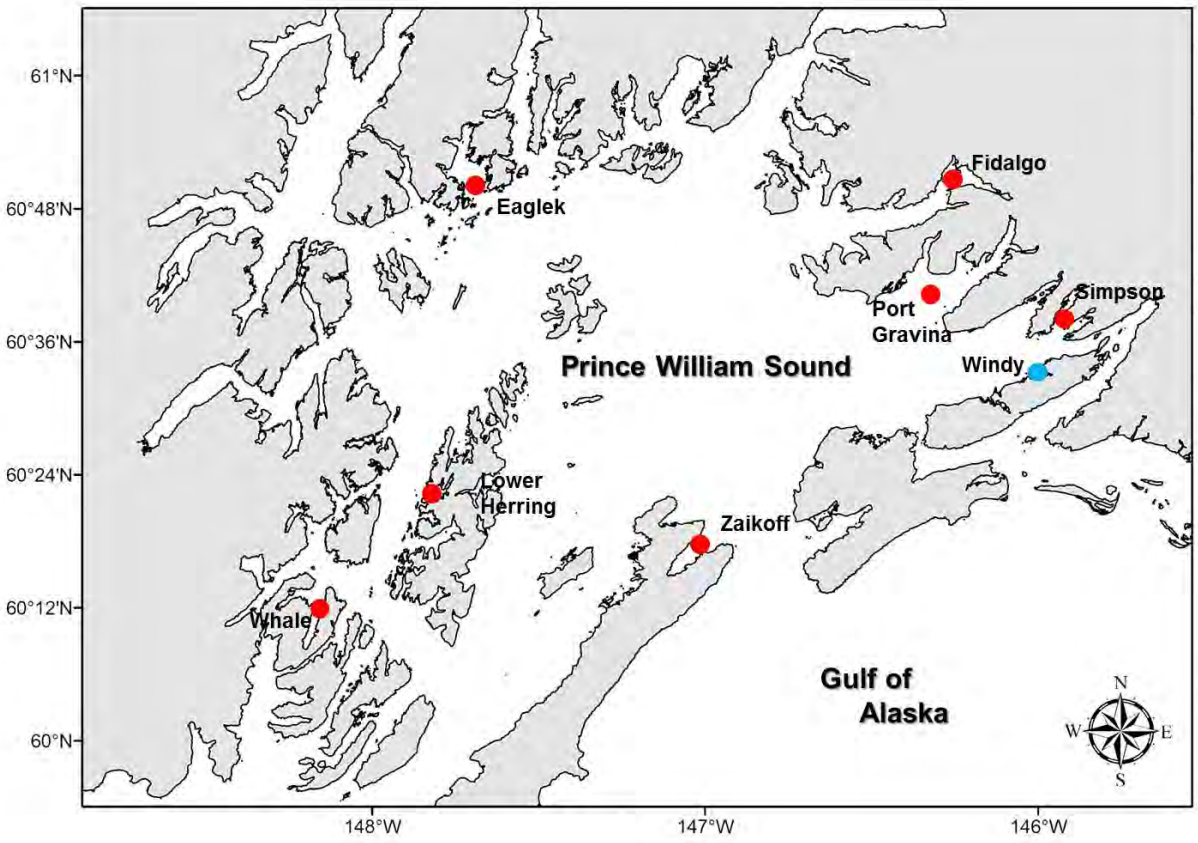

Figure 1. Location of acoustic surveys for juvenile herring and corresponding validation sampling. Red circles represented bays sampled during the November 2012 survey and blue circles represents bays that will be added in subsequent years.

Table 1. Summary of acoustic validation fishing effort and number of fish collected via large gillnets by bay for the November 2012 cruise.

	Large gillnet		
Site	Reps	Total time (h:mm)	# Fish
Eaglek	2	10:26	6
Fidalgo	2	17:52	1
Lower Herring	2	27:18	5
Port Gravina	1	8:20	2
Simpson Bay	1	9:11	1
Whale	2	18:03	7
Zaikoff	2	16:36	12

Table 2. Summary of effort for energetics and disease projects sampling by bay and method.

	Small gillnet			Cast net		
Site	Reps	Total time (h:mm)	# Fish	Reps	Total time (h:mm)	# Fish
Eaglek	2	7:29	59	3	3:40	40
Fidalgo	1	2:00	164	1	0:30	0
Lower Herring	2	4:30	18	2	6:00	108
Port Gravina	3	4:05	5	3	4:30	193*
Simpson Bay	0	0:00	0	2	5:30	65
Whale	1	7:15	835	1	1:00	9
Zaikoff	1	1:28	23	1	1:30	318

*an additional 1000 post-larval capelin were also collected but not included in analyses

Table 3. Breakdown of the number of juvenile herring samples retained by bay and project.

	PWSSC	USGS	NOAA
Site	Energetics	Disease	Energetics
Eaglek	42	0	0
Fidalgo	70	0	61
Lower Herring	41	30	37
Port Gravina	71	60	64
Simpson Bay	35	0	30
Whale	529	0	100
Zaikoff	117	60	50

Table 4. Number and lengths (mm, $\bar{x} \pm se$) of fish caught by large gillnets used for acoustic validation during the November 2012 cruise.

		Nov 2012 Acoustic Validation	
		Total length (mm)	
Species	**N**	**$\bar{x}$ ± SE**	**Range**
capelin	5	121 ± 2	116-128
Pacific cod	3	183 ± 76	101-335
Pacific halibut	1	239	
Pacific herring	19**	158 ± 15	86-237
saffron cod	1	209	
sculpin*	1	111	
slender eelblenny	2	113 ± 4	109-117
sturgeon poacher	1	74	
walleye pollock	1	131	

*spp unknown; **only 13 measured

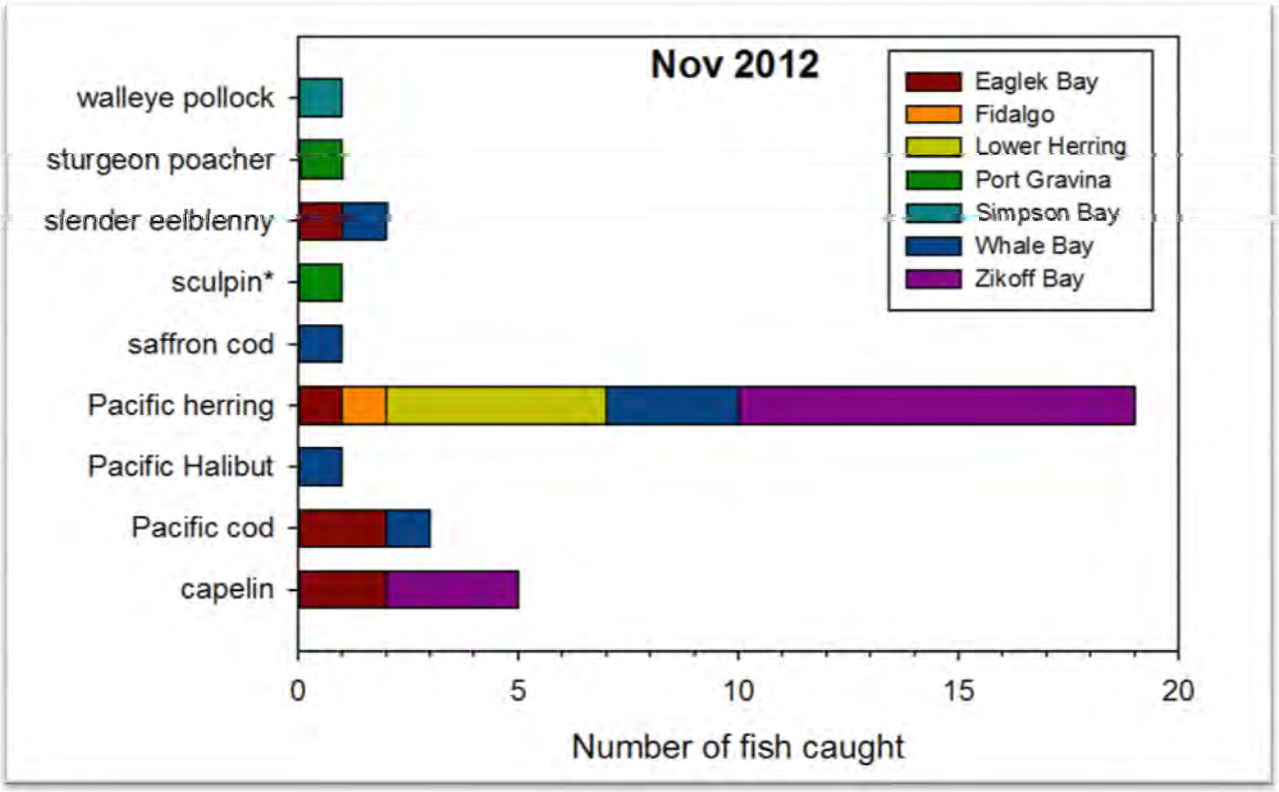

Figure 2. Number and species of fish caught by bay via the large gillnets used for acoustic validation, November 2012.

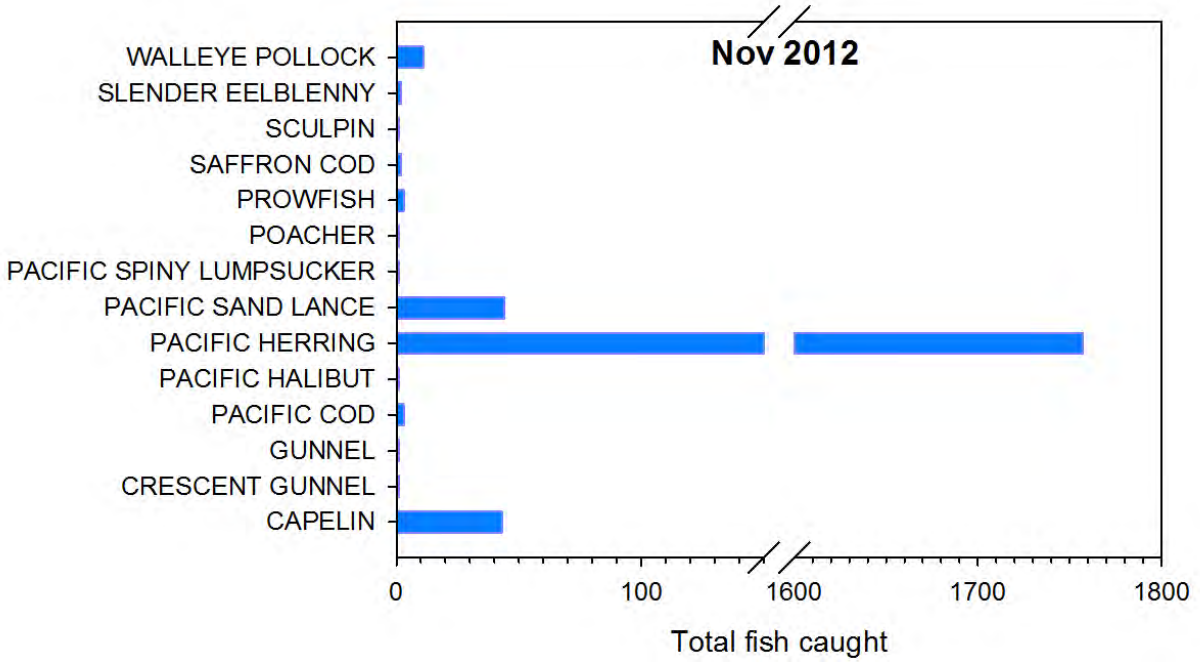

Figure 3. Total number of fish collected by species across all bays and sampling methods used for validation, disease and energetics projects during the November 2012 cruise.

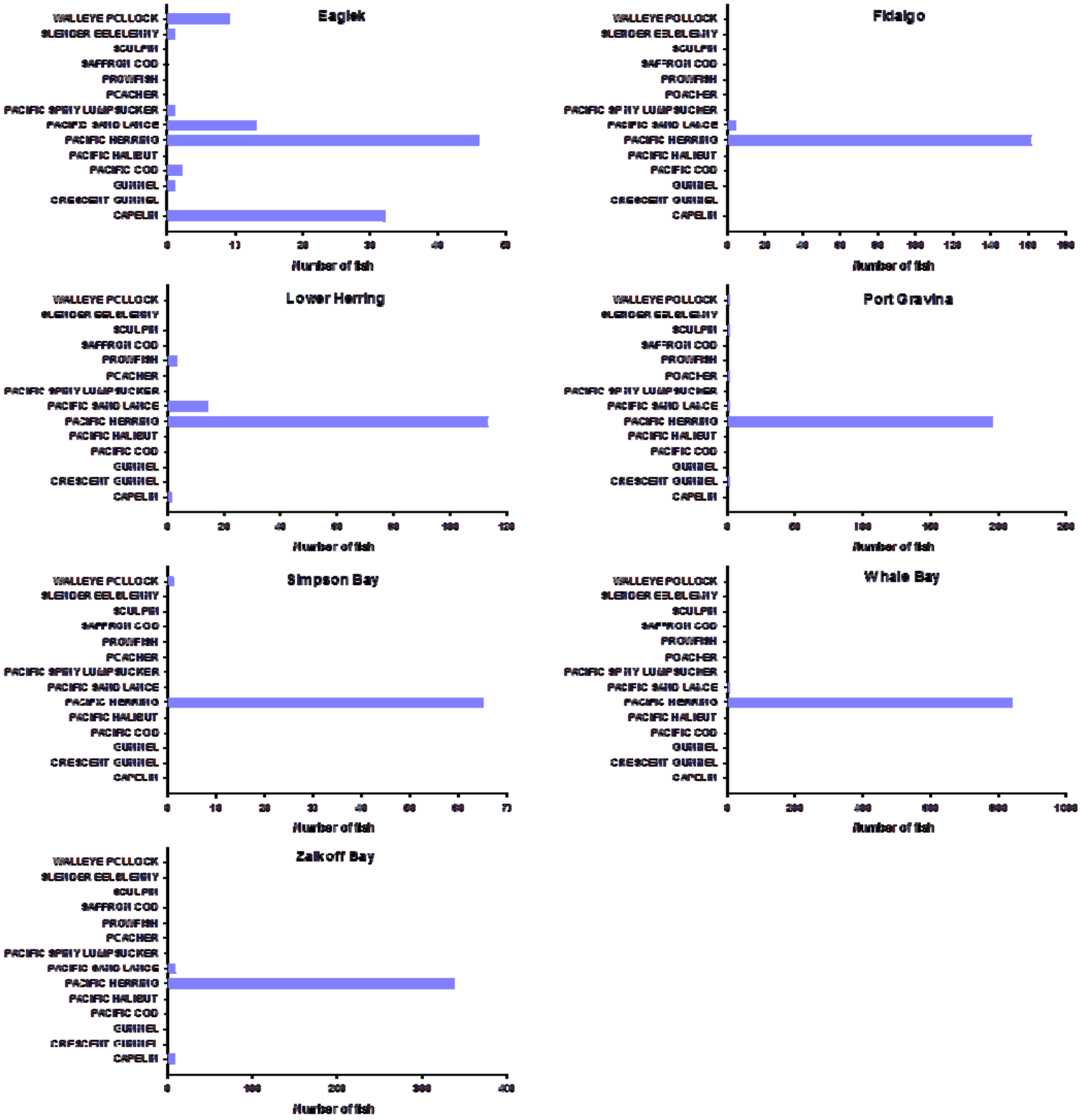

Figure 4. Number and species of fish caught by bay using all gear types (large and small gillnets and cast net) during the November 2012 cruise. Species list represents all species caught at all locations through the study period.

Summary of Future Work to be Performed –

In January 2013 we submitted and received the Alaska Department of Fish and Game permit for all 2013 herring collections. We have also submitted a collecting protocol to the Prince William Sound Institutional Animal Care and Use Committee (IACUC). Protocols are often a requirement in the methods section for publication.

In mid-March 2013 we will conduct a trial run to test the modified reel and winches to ensure all hydraulic issues have been resolved. In November 2013, we will again validate juvenile herring acoustic surveys in conjunction with the *PWS Herring Research and Monitoring Juvenile Herring Abundance Index*. For acoustic validation fishing efforts we will use the sweeper mid-water trawls as previously planned for this project. Large gillnets and a box trawl will be used as the primary back-up methods for validation if necessary. We will also continue to collect herring samples for the disease and energetics projects.

Two projects will begin within the next 12 months. One of the new projects in Year 2 is the *Expanded Adult Herring Surveys*, which will be comprised of a cruise or cruises in late March/early April 2013. For acoustic validation and for the genetics study that is part of the Herring HRM, we will be collecting fish primarily using jigs and gillnets, and to a lesser extent cast nets. We will not be using the mid-water trawl for validation because of ADFG concerns that too many adult herring would be captured. During the spring surveys, we have also been asked to collect Pacific cod to see if stomach contents contain herring for the HRM disease study (PI Hershberger). The second new project, *Juvenile Herring Intensive Acoustic & Validation Surveys,* begins in October 2013. For this project, we will sample Simpson Bay and an adjacent eastern PWS Bay approximately every two weeks. We will use the midwater trawl as our principal means to collect fish, and supplement it with gillnets and cast nets.

Coordination/Collaboration –

Our project is part of the Prince William Sound Herring Research and Monitoring Group. Field work is conducted concurrent with acoustic herring surveys, and EVOS Gulfwatch seabird winter observations. As part of our effort, we make collections for the two HRM herring fitness studies (PI Kline and PI Heintz) and the HRM herring disease study (PI Hirschberger) and we assisted with direct capture for the High Temporal and Spatial Resolution Study to Validate the Separate Herring Condition Monitoring Program (completed June 2012). Principal investigator Bishop attended the April 2012 EVOS Herring meeting in Cordova. In addition, Principal investigator Bishop presented research findings at a November 2012 EVOS Herring Research and Monitoring meeting in Anchorage. We also collaborated with Gulfwatch PI's Piatt and Armitsu in July 2012. From July 20-26, 2012 McKinzie, biologist for this project was onboard the *R/V* Alaskan Gyre with other scientists assisting with diurnal, concurrent acoustic and mid-water trawl surveys in northern Prince William Sound.

Community Involvement/TEK and Resource Management Applications –
While this project does not have a community involvement component, we consulted with local fisher experts about reel and winch design and modifications.

Information Transfer –

Popular Press:

A picture of the new reel with a caption was published in the Fall 2012 Breakwater, the newsletter of the Prince William Sound Science Center.

Budget –

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
ANNUAL PROGRAM REPORT YEAR 1

Budget Category:	Proposed Year 1	Actual Year 1	TOTAL Difference
Personnel	$32,469	$224	$32,245
Travel	$1,000	$12	$988
Contractual	$900	$340	$560
Commodities	$5,400	$676	$4,724
Equipment	$10,700	$17,071	($6,371)
Indirect Costs (*will vary by proposer*)	$11,931	$375	$11,556
SUBTOTAL	$62,400	$18,698	$43,702
General Administration (9% of subtotal)	$5,616	$1,683	$3,933
PROJECT TOTAL	$68,016	$20,381	$47,635
Other Resources (Cost Share Funds)	$0	$0	$0

COMMENTS:

FY12	**Program Title: HRM Validation of Acoustic Surveys** **Team Leader: Bishop**	**SUMMARY**

Equipment in year 1 was overspent because the trawl net we intended to use was lost at sea and we needed to replace it.

Project Number: 12120111B

Project Title: PWS Herring Research and Monitoring: Tracking Seasonal Movements of Adult Pacific Herring in Prince William Sound

Principal Investigators: Dr. Mary Anne Bishop and Dr. Sean Powers

Report prepared by: Mary Anne Bishop and Megan McKinzie

Time Period Covered by the Report –February 1, 2012 – January 31, 2013.

Date of Report: February 10, 2013

Summary of Work Performed

Adult Pacific herring in Prince William Sound disperse after spawning, but their movements are poorly understood. Observations from fishers suggest that they migrate out of PWS and onto the shelf. The objective of this project is to acoustically tag and passively monitor PWS herring to document post-spawning movements. From 18-22 November 2011 we sampled and tagged adult herring in collaboration with the Alaska Department of Fish and Game (ADFG) herring bait surveys. ADFG had difficulty catching herring due to fish being too deep for their seine net, whales in proximity to the net, and bad weather conditions. Attempts to sample adult fish were made around Port Fidalgo, Port Gravina, and Simpson Bay. On the final sampling night (21 November), two sets yielded fish and we were provided a sample from the second (final) set. Except for two herring, fish were too small to hold and tag. We used this opportunity to refine our techniques with MS-222 dosages, recovery times, and surgical procedures. We were able to insert two dummy tags. These fish were held for >24h to determine their response to the anesthesia and the dummy tags. Upon completion, all fish were sacrificed.

From 8-11 April 2012 we went to Port Gravina on the *MV Montague* in to tag adult herring. Compared with November, fish were much larger and were of sufficient size to hold an acoustic tag. Initially, we had planned to tag herring after they had spawned, however, during our 4-day cruise, no fish spawned in the area. We practiced tagging pre-spawning adults and based on our observations and experienced gained on pre-spawners, on our final day (11 April) we jigged 38 adult herring >19 cm TL. We surgically implanted 25 adult herring with coded acoustic transmitters (V9-2L/2H, 69kHz). While a few fish appeared to have spawned, most fish had not yet spawned. The 25 tagged fish and 13 controls (untagged fish) were released simultaneously near the capture site in 25 m of water at ~ 1600h on 11 April (Figs. 1, 2). A singleVR2W receiver (60.68885, -146.39118) was retrieved from 17 m of water on 19 May 2012 to upload the detection data.

This was the first time that wild herring have been tagged with acoustic transmitters. The VR2W receiver near our point of release detected 23 (92%) of the tagged individuals multiple times (≤ 227 detections) on one or more days (≤ 5 d) post release at (Fig. 3). Only 1 of the 25 herring was never detected, and one fish exhibited signs of post-tagging mortality (a significantly high number of detections through May). At the time of the 11 April release,

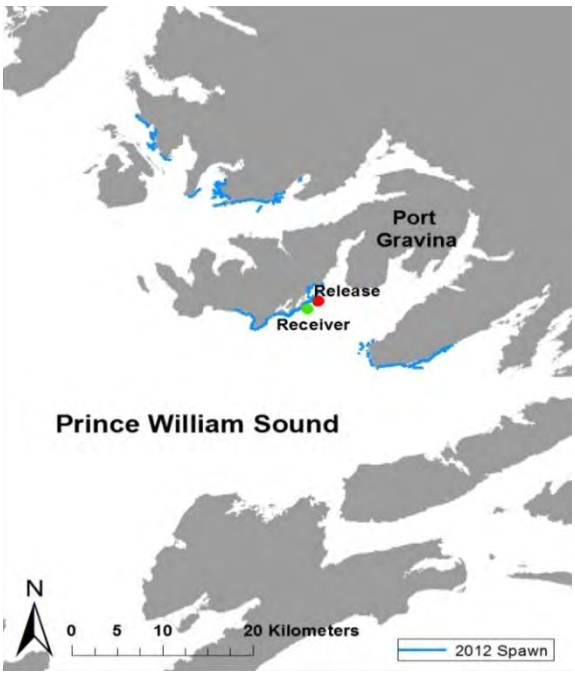

Fig 1. A VR2W receiver positioned near the release site (600 m from shore) was configured to detect and record tagged fish within reception range. Spawn occurred in the study area vicinity from 13-18 April.

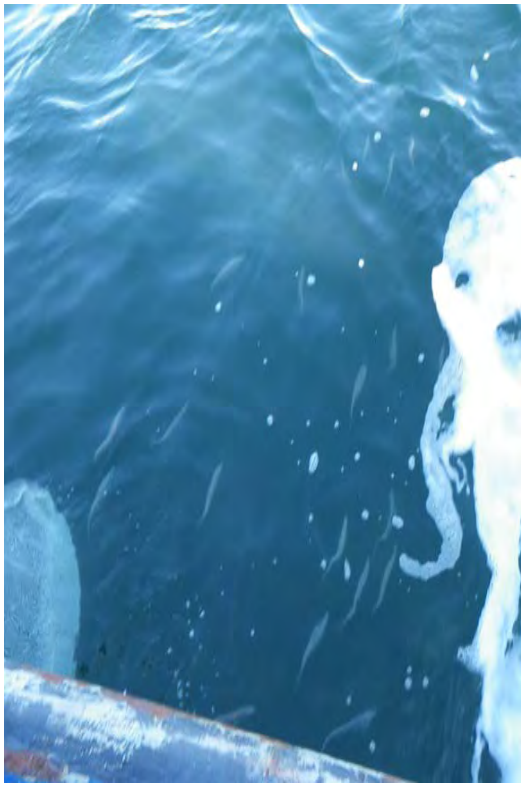

Fig 2. A school of both tagged (n = 25) and untagged (n = 18) herring were released near capture site in 25 m of water on 11 April.

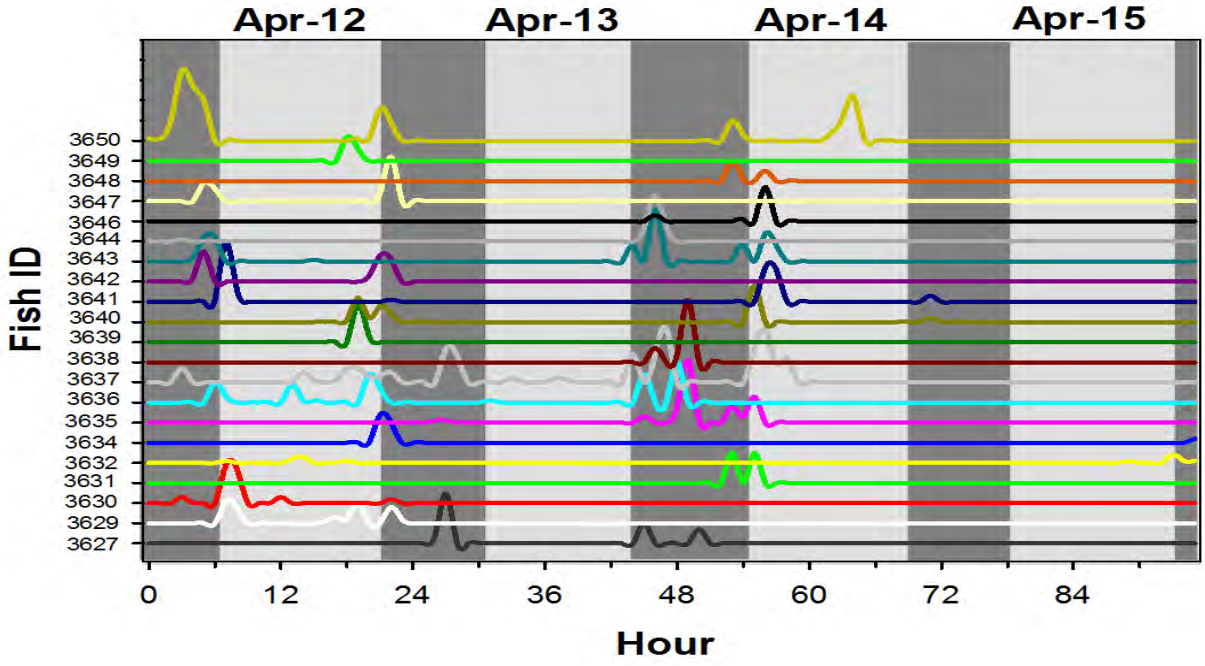

Fig. 3. Detections of acoustic-tagged herring by hour of day. All detections from a VR2W receiver located near the point of release.

no spawning had yet occurred in this area. Spawning was observed in NW Port Gravina on 12-14 April and 16-17 April (Fig. 1). Final detections of tagged fish by 15 April coincided with a cessation of spawning in the immediate area suggesting that fish departed from Port Gravina and did not return.

Fish detections generally exhibited a diel pattern, with most observations at dawn and dusk (Fig. 4) although this relationship was not significant (Kruskal-Wallis, H = 15.72, p = 0.87). When fish were present, they were detected in groups 43% of the time (Fig. 5). Observed schooling behavior was defined as $\geq$2 fish detected within a 3 min interval, with up to six fish detected simultaneously. Detections were clearly absent during low tide, with the greatest number of aggregations observed around high and falling tides.

The biggest limitation of our spring 2012 field season was our inability to detect acoustic tagged fish outside of the one, VR2W receiver. Due to a change in technology, the underwater VR2 and VR3 receivers in the array that curtains Port Gravina were not able to detect our tags. In addition, the Ocean Tracking Network arrays planned for Hinchinbrook Entrance, Montague Strait, and four major passages in southwest Prince William Sound had not yet been deployed, preventing detections of fish leaving the Sound.

2. Summary of Future Work to be Performed –

Response exhibited by herring to the handling and tagging suggests that additional acoustic tagging studies on herring are feasible and can be used to elucidate post-spawning migration behavior. In April 2013 we will conduct our second field season and tag up to 75 herring. Because the Port Gravina VR3 acoustic receiver line cannot detect the model of acoustic tag being used, we will be installing a temporary array of VR2W receivers. By April 2013 the new Ocean Tracking Network array will be in place in Montague Strait, Hinchinbrook Entrance, and four passages in southwest PWS. These receiver arrays will potentially detect the date and time of any acoustic-tagged herring exiting and returning to Prince William Sound. Data from the Ocean Tracking Network will be uploaded no later than March 2014, one year after the initial deployment.

3. Coordination/Collaboration –

Our project is part of the Prince William Sound Herring Research and Monitoring Group. Our project collaborators include John Eiler (NMFS, AFSC, Auke Bay Laboratories). We work closely with ADFG herring spawn surveys in spring in order to locate the adult herring schools.

4. Community Involvement/TEK and Resource Management Applications –

Principal investigator Bishop and research assistant Jordan Watson attended the April 2012 EVOS Herring meeting in Cordova. This meeting was open to the public. In addition, Principal investigator Bishop presented research findings at a November 2012 EVOS Herring Research and Monitoring meeting in Anchorage.

***5.* Information Transfer –**

Bishop, M.A., M. McKinzie, J. Eiler, B. Reynolds, and S. Powers. Using acoustic telemetry to monitor Pacific herring during spring spawning. Alaska Marine Science Symposium, Anchorage 2013. (Poster)

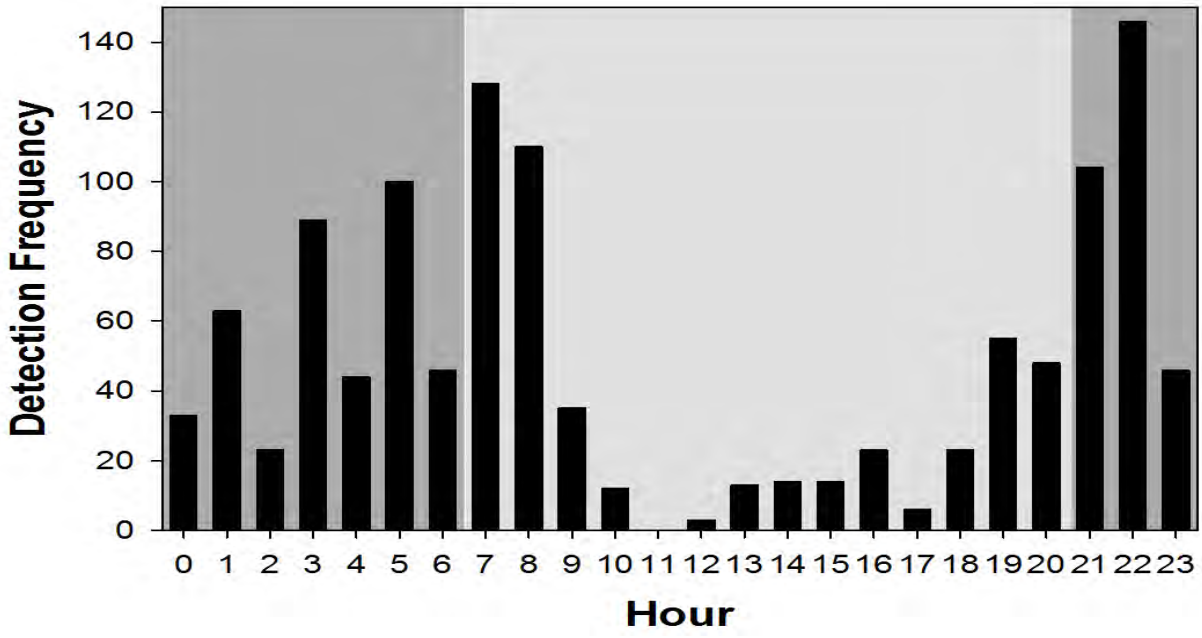

Fig. 4. Detection frequency by hour of day for acoustic tagged herring, 12-15 April, 2012.

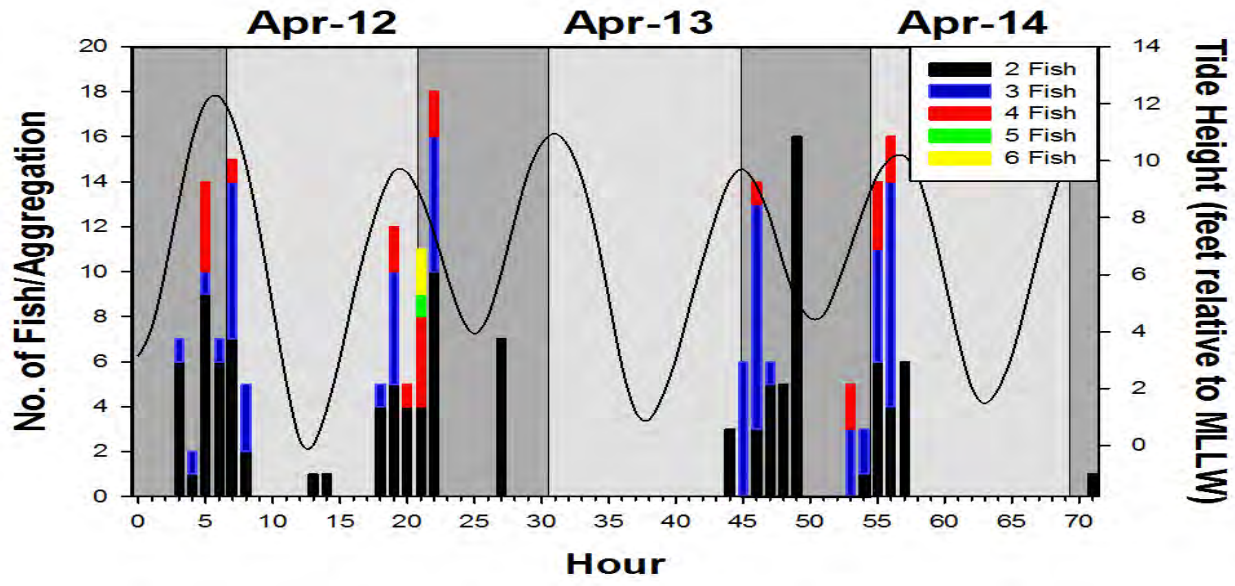

Fig. 5. Aggregation behavior by acoustictagged herring by day and tide height. Aggregation behavior defined as detections of ≥ 2 individuals coinciding within a 3 min period.

6. Budget –

EXXON VALDEZ **OIL SPILL TRUSTEE COUNCIL**
ANNUAL PROGRAM REPORT YEAR 1

Budget Category:	Proposed Year 1	Actual Year 1	TOTAL Difference
Personnel	$7,323	$3,721	$3,602
Travel	$5,100	$186	$4,914
Contractual	$400	$10,859	($10,459)
Commodities	$37,100		$37,100
Equipment			$0
Indirect Costs (*will vary by proposer*)	$14,977	$4,391	$10,586
SUBTOTAL	$64,900	$19,157	$45,743
General Administration (9% of subtotal)	$5,841	$1,724	$4,117
PROJECT TOTAL	$70,741	$20,881	$49,860
Other Resources (Cost Share Funds)	$0	$0	$0

COMMENTS:

FY12	**Program Title: HRM Tracking Seasonal Movements** **Team Leader: Bishop**	**SUMMARY**

Because of the delayed start date relative to the desired work schedule we had to cover costs associated with the cruise from this budget and overspent the contractual line item. The purchase of the tags were in turned covered by Pegau to allow us to receive them in time for the November 2012 cruise.

Project Number: 12120111C

Project Title: PWS Herring Program – Data Management

PI Names: Rob Bochenek

Time period covered: 02/01/12 – 02/01/13

Date of Report: 15 February 2013

Report prepared by: Rob Bochenek

Project website (if applicable): http://data.aoos.org/maps/pwsherring/

Work Performed:

During the first year of the EVOS Herring Program Data Management project investigators have been focused on establishing protocols for data transfer, metadata requirements and initiating the data salvage effort. The AOOS ocean workspace has been rolled out to PIs and their user and group profiles have been created. Investigators have been meeting via webex periodically with Matt Jones and other NCEAS staff to coordinate activities. PIs have participated in several PI meetings and are coordinating activities between the Herring and LTM programs. In addition, several training seminars have been held via webinars and PIs are beginning to use the system to organize and consolidate their project level data. Software engineers at Axiom have also been working to support the workspace, resolving bugs and implementing new functionality in response to user feedback. The data salvage effort has begun with prioritization from Scott Pegau and engagement of the Cordova Alaska Department of Fish & Game.

Specifically, investigators have addressed the objectives of the original proposal in the following ways.

Objective 1: Provide data management oversight and services for EVOS IHRP project team data centric activities which include data structure optimization, metadata generation, and transfer of data between project teams.

- Deployed, configured and facilitated the use of a web based data management and scientific collaboration tool (AOOS Ocean Workspace) to support data submission, metadata generation and foster integration between PWS Herring Program Investigators.
- Collaboration and coordination with NCEAS staff on historical data salvage for data synthesis efforts. Establishment of EVOS Historic Data Salvage group in AOOS Ocean Workspace.

- Data transfer from PIs has initiated with review by data management staff.

Figure 1. Screenshot of PWS Herring Program Workspace group and interface.

Objective 2: Consolidate, standardize and provide access to study area data sets that are critical for retrospective analysis, synthesis and model development.

- Re-established data exchange relationship with ADF&G and created an ADF&G dedicated AOOS Ocean Workspace Group for the secure sharing of data with PWS Herring Program Investigators. New updated Herring Spawn data has been recently submitted by Steve Moffitt with other data sets to follow.
- Updated PWS Herring Portal by integrating it with the AOOS Ocean Portal Framework and deploying it to the AOOS website.
- Several baseline observational data sets and GIS resources have been consolidated and integrated into the AOOS data system to be exposed through the PWS Herring Portal.

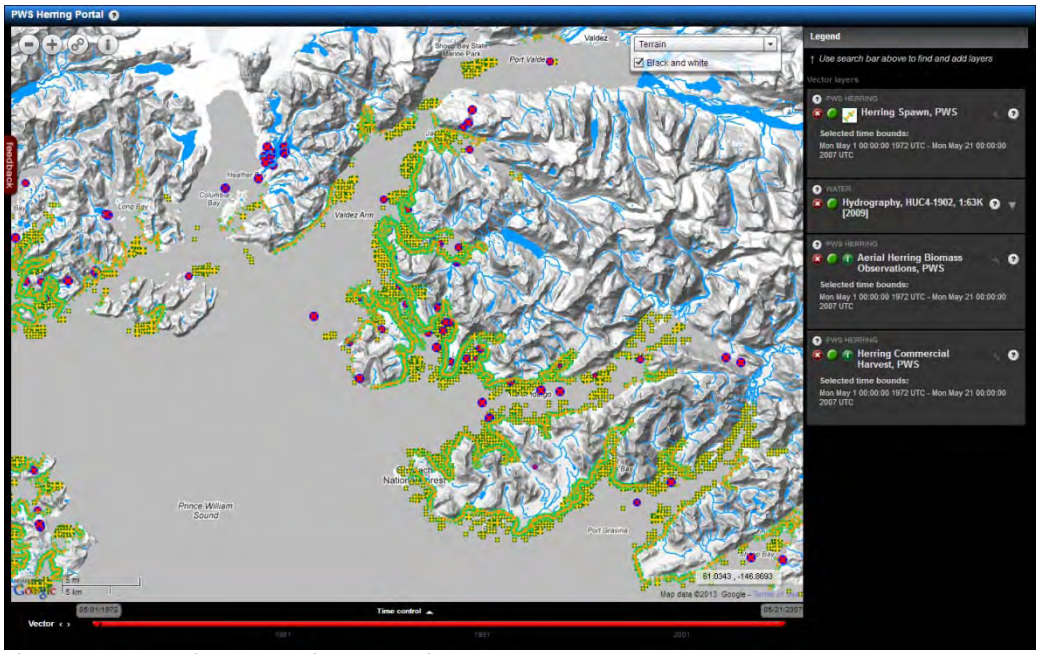

Figure 2. Herring Portal screenshot.

Objective 3: Integrate all data, metadata and information products produced from this effort into the AOOS data management system for long term storage and public use.

- AOOS has provisioned capacity and storage space for archiving all PWS Herring Program datasets and electronic materials.
- AOOS is working to develop methods to publish and make publicly available datasets and metadata that have been staged in the AOOS Ocean Workspace.

Future Work:

Investigators will continue work on the schedule outlined in the original proposal. Specifically, this will focus on facilitating the transfer, documentation and review of year 1 sampling activities, coordinating with NCEAS staff on the historical data salvage and upgrading the PWS Herring Portal with updated herring data sets from ADF&G Cordova.

Coordination/Collaboration:

This project is focused on providing a framework for cross disciplinary integration through the facilitated use of a web based data management tool (AOOS Ocean Workspace). This platform will provide scientists and administrators increased transparency and improved access to PWS Herring Program data sets and other

contextual information. NCEAS has also used the workspace to stage data for their synthesis effort and data salvage activities.

Community Involvement/TEK & Resource Management Applications:

Several presentations were made to various community and research groups during the last year (CIRCAC, GOAIERP, and Arctic Eis) discussing the approach and results of this project.

Information Transfer:

No new data sets were produced from this effort but a large number of retrospective and historic datasets have been aggregated and staged on the AOOS Ocean Workspace in coordination with NCEAS. The ultimate goal being to increase information transfer between PWS Herring Program investigators to increase integration and support synthesis.

Budget:

No differences or problems with previous or out year budgets.

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
ANNUAL PROGRAM REPORT YEAR 1

Budget Category:	Proposed Year 1	Actual Year 1	TOTAL Difference
Personnel	$94,400	$89,627	$4,773
Travel			$0
Contractual			$0
Commodities			$0
Equipment	$3,900		$3,900
Indirect Costs (*will vary by proposer*)	$21,700	$19,676	$2,024
SUBTOTAL	$120,000	$109,303	$10,697
General Administration (9% of subtotal)	$10,800	$9,837	$963
PROJECT TOTAL	$130,800	$119,140	$11,660
Other Resources (Cost Share Funds)	$0	$0	$0

COMMENTS: This project is listed as a subcontract in Pegau. Spending shown here represents billing to PWSSC as of January 31, 2013.

FY12	**Program Title: HRM Data Management Support** **Team Leader: Bochenek**	**SUMMARY**

1. **Project Number:** 12120111-E

2. **Project Title:** PWS Herring Program - Expanded Adult Herring Surveys

3. **Principal Investigator(s) Name: Michele Buckhorn and Dick Thorne**

4. **Time Period Covered by the Report** – For projects not in a Trustee Council funded-program, and for those within a Trustee Council-funded program, the semi-annual report will report on the prior six month's work. *See,* Reporting Policy at III (C) (1) (d). February 2012-February 2013

5. **Date of Report: February 15, 2013**

6. **Summary of Work Performed –** This brief summary shall describe work to be performed during the upcoming reporting period, including any results available to date and their relationship to the original project objectives. Any deviation from the original project objectives, procedures or statistical methods, study area, or schedule shall be included. Any known problems or unusual developments, and any other significant information pertinent to the project, shall also be described. *See,* Reporting Policy at III (C) (1) (f).

   This project objective is to conduct expanded acoustic surveys of adult herring spawning areas to enhance Alaska Department of Fish & Game survey efforts. This project is scheduled to begin in March 2013.

7. **Summary of Future Work to be Performed** – This brief summary shall describe work to be performed during the upcoming reporting period, if changed from the original proposal. A description of any proposed changes in project objectives, procedures or statistical methods, study area, or schedule shall be included. *See,* Reporting Policy at III (C) (1) (g).

There are no changes from the original proposal; surveys will begin in March 2013.

8. **Coordination/Collaboration** – This section shall describe efforts undertaken during the reporting period to achieve the coordination and collaboration provisions of the proposal, if applicable. *See,* Reporting Policy at III (C) (1) (h).

Collaboration will be between the Alaska Department of Fish and Game.

9. **Community Involvement/TEK and Resource Management Applications -** This section shall describe efforts undertaken during the reporting period to achieve the community involvement/TEK and resource management application provisions of the proposal, if applicable. *See,* Reporting Policy at III (C) (1) (i).

N/A at this point

10. **Information Transfer** – This section shall list (1) publications produced during the reporting period, (2) conference and workshop presentations and attendance during the reporting period, and (3) data and/or information products developed during the reporting period. *See,* Reporting Policy at III (C) (1) (j).

N/A at this point

11. **Budget –** This section should provide a detailed accounting of the spending during the time period covered by the report and a comparison of the actual funds spent versus those originally requested. Any discrepancies should be clearly noted and a brief reason provided for the change. A column for actual expenditures should be added to the original budget spreadsheet that was submitted with your

proposal. An example is attached. Any new information regarding in-kind, matching funds or other funds from non-Trustee Council sources for the project shall be included. *See*, Reporting Policy at III (C) (1) (k).

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
ANNUAL PROGRAM REPORT YEAR 1

Budget Category:	Proposed Year 1	Actual Year 1	TOTAL Difference
Personnel			$0
Travel			$0
Contractual			$0
Commodities		$994	($994)
Equipment	$46,000	$41,831	$4,169
Indirect Costs (*will vary by proposer*)			$0
SUBTOTAL	$46,000	$42,825	$3,175
General Administration (9% of subtotal)	$4,140	$3,854	$286
PROJECT TOTAL	$50,140	$46,679	$3,461
Other Resources (Cost Share Funds)	$0	$0	$0

COMMENTS:

FY12	**Program Title: HRM Intensive Survey of Juvenile Herring** **Team Leader: Buckhorn**	**SUMMARY**

1. **Project Number:** 12120111-F

2. **Project Title:** PWS Herring Program - Juvenile Herring Abundance Index

3. **Principal Investigator(s) Name: Michele Buckhorn and Dick Thorne**

4. **Time Period Covered by the Report** – For projects not in a Trustee Council funded-program, and for those within a Trustee Council-funded program, the semi-annual report will report on the prior six month's work. *See,* Reporting Policy at III (C) (1) (d). February 2012-February 2013

5. **Date of Report: February 15, 2013**

6. **Summary of Work Performed –** This brief summary shall describe work to be performed during the upcoming reporting period, including any results available to date and their relationship to the original project objectives. Any deviation from the original project objectives, procedures or statistical methods, study area, or schedule shall be included. Any known problems or unusual developments, and any other significant information pertinent to the project, shall also be described. *See,* Reporting Policy at III (C) (1) (f).

   This project objective is to provide information to improve input to the age-structure-analysis (ASA) model, or test assumptions within the ASA model. This is objective is being met by conducting annual surveys of juvenile herring to create an index of future recruitment and to groundtruth species and size composition of fish ensonified during acoustic transects.

   In November 2012, the first survey associated with this project was conducted aboard the R/V Montague. The bays sampled were: Simpson, Port Gravina, Port Fidalgo, Eaglek, Zaikof, East and West Arm of Whale, and Lower Herring. An eighth bay was planned (Windy) but was precluded due to weather.

   The following sampling activities occurred in each bay: CTD casts, hydroacoustic transects, and fish capture. The intention of the project was to deploy a midwater trawl in each bay to groundtruth species composition and size classes ensonified during the 3-4 of the acoustic transects but were unable to due to mechanical issues. Since the energetics and disease projects rely on the acoustic surveys for fish samples, fish capture was still carried out using gillnets and castnets (see Bishop report).

   The hydroacoustic surveys were conducted using the recently purchased 120 kHz split-beam system. A calibration of the equipment was performed before all the transects were conducted and there were no problems running the system during the transects. The raw transect data are currently being post-processed (Figure 1) for use in data analysis.

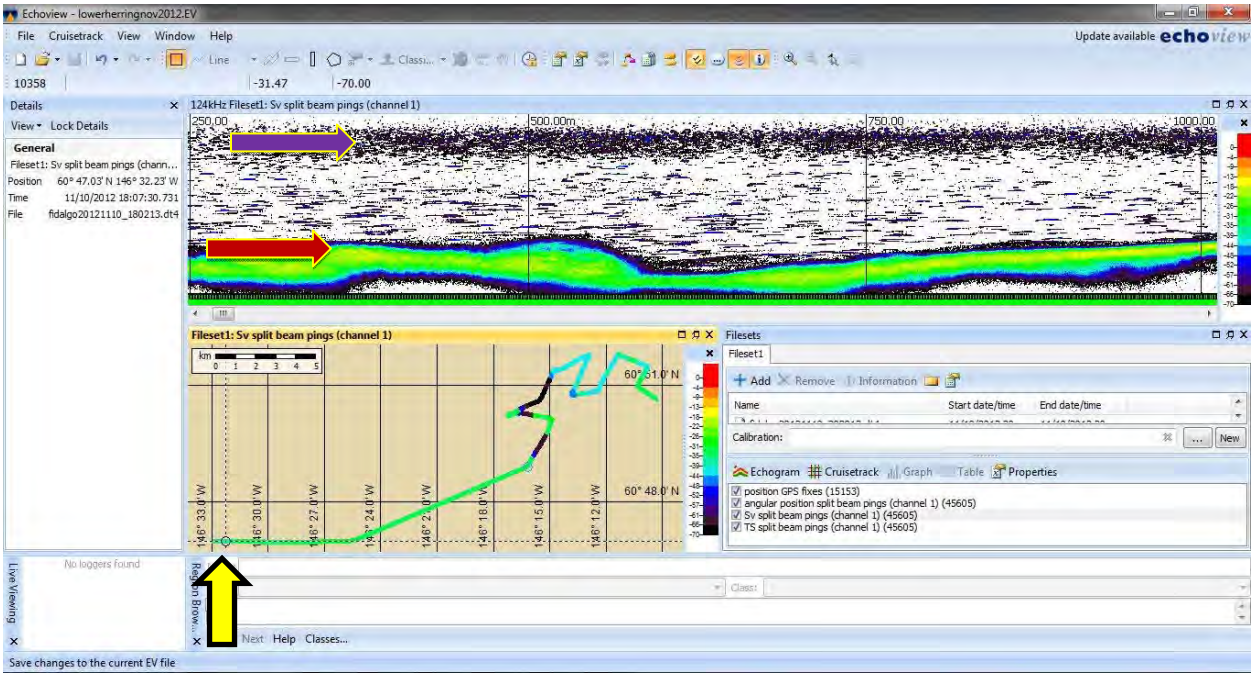

Figure 1. Screen shot of post-processing raw acoustic data using the new program Echoview. The lower left portion of the screen is the entire track for the bay survey (Fidalgo). The upper third shows a portion of the echogram highlighted by the circle on the track (above the yellow arrow). The orientation of the echogram is a "sideview" of the water column from the surface (top) to depth (bottom). The red arrow indicates a layer of biomass near the water's surface and the red arrow indicates where the program has identified bottom.

7. **Summary of Future Work to be Performed** – This brief summary shall describe work to be performed during the upcoming reporting period, if changed from the original proposal. A description of any proposed changes in project objectives, procedures or statistical methods, study area, or schedule shall be included. *See*, Reporting Policy at III (C) (1) (g).

There are no changes from the original proposal; surveys will continue in November 2013 and 2014.

8. **Coordination/Collaboration** – This section shall describe efforts undertaken during the reporting period to achieve the coordination and collaboration provisions of the proposal, if applicable. *See*, Reporting Policy at III (C) (1) (h).

Collaboration between the energetics and disease projects (HRM) was in the form of providing samples from bays within the Sound and seabird surveys (LTM).

9. **Community Involvement/TEK and Resource Management Applications -** This section shall describe efforts undertaken during the reporting period to achieve the community involvement/TEK and resource management application provisions of the proposal, if applicable. *See*, Reporting Policy at III (C) (1) (i).

N/A at this point

10. **Information Transfer** – This section shall list (1) publications produced during the reporting period, (2) conference and workshop presentations and attendance during the reporting period, and (3) data and/or information products developed during the reporting period. *See*, Reporting Policy at III (C) (1) (j).

N/A at this point

11. Budget – This section should provide a detailed accounting of the spending during the time period covered by the report and a comparison of the actual funds spent versus those originally requested. Any discrepancies should be clearly noted and a brief reason provided for the change. A column for actual expenditures should be added to the original budget spreadsheet that was submitted with your proposal. An example is attached. Any new information regarding in-kind, matching funds or other funds from non-Trustee Council sources for the project shall be included. *See*, Reporting Policy at III (C) (1) (k).

Some of the categories were budgeted for FY13, which normally would have started in October of 2012. Those funds are now in there are and the deficits from FY12 no longer exist.

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
ANNUAL PROGRAM REPORT YEAR 1

Budget Category:	Proposed Year 1	Actual Year 1	TOTAL Difference
Personnel	$16,231	$8,859	$7,372
Travel	$0	$912	($912)
Contractual	$500	$3,758	($3,258)
Commodities	$1,500	$349	$1,151
Equipment	$59,000	$53,206	$5,794
Indirect Costs (*will vary by proposer*)	$5,469	$4,153	$1,316
SUBTOTAL	$82,700	$71,237	$11,463
General Administration (9% of subtotal)	$7,443	$6,411	$1,032
PROJECT TOTAL	$90,143	$77,648	$12,495
Other Resources (Cost Share Funds)	$0	$0	$0

COMMENTS:

FY12	**Program Title: HRM Juvenile Abundance Index** **Team Leader: Buckhorn**	**SUMMARY**

1. **Project Number:** 12120111-G

2. **Project Title:** PWS Herring Program - Intensive surveys of juvenile herring

3. **Principal Investigator(s) Name: Michele Buckhorn and Dick Thorne**

4. **Time Period Covered by the Report** – For projects not in a Trustee Council funded-program, and for those within a Trustee Council-funded program, the semi-annual report will report on the prior six month's work. *See,* Reporting Policy at III (C) (1) (d). February 2012-February 2013

5. **Date of Report: February 15, 2013**

6. **Summary of Work Performed –** This brief summary shall describe work to be performed during the upcoming reporting period, including any results available to date and their relationship to the original project objectives. Any deviation from the original project objectives, procedures or statistical methods, study area, or schedule shall be included. Any known problems or unusual developments, and any other significant information pertinent to the project, shall also be described. *See,* Reporting Policy at III (C) (1) (f).

   This project objective is to conduct intensive acoustic surveys for juvenile herring before and after winter to ascertain immigration/emigration and mortality rates during their overwintering period. This project is scheduled to begin in October 2013.

7. **Summary of Future Work to be Performed** – This brief summary shall describe work to be performed during the upcoming reporting period, if changed from the original proposal. A description of any proposed changes in project objectives, procedures or statistical methods, study area, or schedule shall be included. *See,* Reporting Policy at III (C) (1) (g).

There are no changes from the original proposal; surveys will begin in October 2013.

8. **Coordination/Collaboration** – This section shall describe efforts undertaken during the reporting period to achieve the coordination and collaboration provisions of the proposal, if applicable. *See,* Reporting Policy at III (C) (1) (h).

Collaboration will be between the energetics and disease projects (HRM) was in the form of providing samples from bays within the Sound and seabird surveys (LTM).

9. **Community Involvement/TEK and Resource Management Applications -** This section shall describe efforts undertaken during the reporting period to achieve the community involvement/TEK and resource management application provisions of the proposal, if applicable. *See,* Reporting Policy at III (C) (1) (i).

N/A at this point

10. **Information Transfer** – This section shall list (1) publications produced during the reporting period, (2) conference and workshop presentations and attendance during the reporting period, and (3) data and/or information products developed during the reporting period. *See,* Reporting Policy at III (C) (1) (j).

N/A at this point

11. **Budget –** This section should provide a detailed accounting of the spending during the time period covered by the report and a comparison of the actual funds spent versus those originally requested. Any discrepancies should be clearly noted and a brief reason provided for the change. A column for

actual expenditures should be added to the original budget spreadsheet that was submitted with your proposal. An example is attached. Any new information regarding in-kind, matching funds or other funds from non-Trustee Council sources for the project shall be included. *See*, Reporting Policy at III (C) (1) (k).

Some of the categories were budgeted for FY13, which normally would have started in October of 2012. Those funds are now in there are and the deficits from FY12 no longer exist.

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
ANNUAL PROGRAM REPORT YEAR 1

Budget Category:	Proposed Year 1	Actual Year 1	TOTAL Difference
Personnel			$0
Travel			$0
Contractual			$0
Commodities		$994	($994)
Equipment	$46,000	$41,831	$4,169
Indirect Costs (*will vary by proposer*)			$0
SUBTOTAL	$46,000	$42,825	$3,175
General Administration (9% of subtotal)	$4,140	$3,854	$286
PROJECT TOTAL	$50,140	$46,679	$3,461
Other Resources (Cost Share Funds)	$0	$0	$0

COMMENTS:

FY12	**Program Title: HRM Intensive Survey of Juvenile Herring** **Team Leader: Buckhorn**	**SUMMARY**

Project Number: **12120111-I**

Project Title: **PWS Herring Research and Monitoring - Fatty Acid Analysis as Evidence for Winter Migration of Age-0 Herring in Prince William Sound**

PI Names: Ron Heintz, Johanna Vollenweider

Time Period Covered: September 1, 2012 – March 1, 2013

Date of Report: February 14, 2013

Report Prepared By: R. Heintz, F. Sewall

Work Performed:

1. Field samples collected in fall 2012 from PWS Herring Monitoring program were received in December 2012.
2. Lipid extraction, preparation and analysis of fatty acid samples of samples from lab study and fieldwork continued. Due to limited sample availability from the high temporal and spatial resolution study in 2012, sample sources from herring collections in PWS in support of the Herring Survey program were identified and analysis of these samples is ongoing.

Future Work:

Spring samples from the herring monitoring program are expected in late March 2013. Lipid extraction, preparation and analysis of fatty acid samples will continue and all analysis is expected to be completed by September 2013, as proposed.

Coordination/Collaboration:

In addition to local collection of herring completed by Auke Bay Laboratories personnel, herring collections for this project rely on the sampling conducted and organized by the Prince William Sound Science Center (PWSSC). Field samples from fall 2010, spring 2011, fall 2011, and spring 2012 were obtained from chartered cruises conducted by the PWSSC. Samples analyzed here for fatty acid composition are subsamples from greater catches that have been apportioned for other analyses, including energy content by T. Kline, and disease prevalence by P. Hershberger, and growth and energy storage by Heintz & Vollenweder. Our field samples are derived under the 3-year Prince William Sound Herring Survey, which is a collaborative effort integrating a host of additional parameters, including herring abundance estimates (D. Thorne), oceanographic parameters (S. Gaye), zooplankton abundance (R. Campbell), predator abundance (M. Bishop).

Community Involvement/TEK & Resource Management Applications:

Spring 2011 and 2012 field samples were obtained from the spring “blitz” effort in which Cordova community members aided PWSSC in collections throughout the Sound.

Information Transfer:

Preliminary results are to be presented at the AK Marine Science Symposium, Anchorage, AK in January 2014, and future meetings of PI's for the Herring Research and Monitoring program. Results were insufficient for presentation at 2013 AMSS.

Budget:

Budget expenditures are proceeding as per projections.

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
ANNUAL PROGRAM REPORT YEAR 1

Budget Category:	Proposed Year 1	Actual Year 1	TOTAL Difference
Personnel			$0
Travel			$0
Contractual	$15,000	$12,500	$2,500
Commodities	$1,900	$4,400	($2,500)
Equipment			$0
Indirect Costs (*will vary by proposer*)			$0
SUBTOTAL	$16,900	$16,900	$0
General Administration (9% of subtotal)	$1,521	$1,521	$0
PROJECT TOTAL	$18,421	$18,421	$0
Other Resources (Cost Share Funds)	$0	$0	$0

COMMENTS:

FY12	**Program Title: HRM Fatty Acid Analysis** **Team Leader: Heintz**	**SUMMARY**

Project Number: **12120111-J**
Project Title: **PWS Herring Program - What is the age at first spawning for female herring in PWS?**
PI Names: Ron Heintz, JJ Vollenweider
Time Period Covered: February 1, 2012 - February 15, 2013
Date of Report: February 15, 2013
Report Prepared By: R. Heintz, J. Vollenweider
Project Website: N/A

Work Performed:
Work is on schedule as planned.

Histological examination of lab gonad samples were completed by Dr. Gary Marty in July (See Appendix for report). Among the 177 gonads collected from post-spawned fish in the laboratory, 113 were ovaries that had features consistent with previous mature egg development, three were testis that had features consistent with previous sperm development, and one was an ovary that had follicle development (i.e., it probably would have spawned next year) but no good evidence of previous mature egg development (this was diagnosed as an immature female; alternatively, it might be a female that spawned but no longer has microscopic evidence of having spawned).

Ovarian microscopic features most useful for assessing whether the fish had spawned include postovulatory follicles and postovulatory eggs. Other findings that might be useful include (*i*) pigmented macrophage aggregates and (*ii*) nonspecific inflammation. In my experience, ovaries that have not spawned usually do not have either pigmented macrophage aggregates or nonspecific inflammation. In contrast, ovaries that have spawned might have nonspecific inflammation longer than obvious postovulatory follicles. The sensitivity and specificity of "nonspecific inflammation" as a biomarker of previous spawning needs to be validated under controlled conditions.

Scales and gonads were collected from ~200 herring in PWS in July 2012. The gonad samples have been sent to Dr. Gary Marty for histological analysis. Scale analysis will commence in early October. Scale aging and growth increment measurements from laboratory and field collections will be compared to histological results to determine if scales can be used to detect age-at first spawn and skip spawning in Pacific herring.

Future Work:
We are currently in the process of histological analysis & scale examination of the herring samples caught in July 2012 in Prince William Sound. Upon completion, we will relate histological results to scale growth increments. The final sample collection will be made from herring spawning aggregations in PWS this spring, and a scale analysis contract will be put in place for their examination to occur, including aging and measurement of growth increments.

Coordination/Collaboration:
Summer 2012 field collections were made with the collaboration of many, including 1) Rob Campbell and the PWSSC for vessel support, 2) Evelyn Brown for locating herring schools during aerial surveys (we also ground-truthed several fish schools for the aerial surveys), 3) Yumi Arimatsu (USGS) for sharing herring school locations and catching opportunistic herring samples while conducting LTM acoustic-trawl surveys, 4) Rich Brenner and Steve Moffit (ADF&G) for sharing whale and herring school locations, and 5) Dave Janka (M/V Aukelet) for sharing whale and herring school locations.

Additionally, while catching herring samples, we collected photo-ID's of humpback whales for the LTM humpback study, which constitutes one of only a few summer observations across PWS.

Community Involvement/TEK & Resource Management Applications:
The results from this study have significant implications for resource management. The goal of this study is to determine the age when herring first spawn in PWS. The predictive capabilities of the ASA population model for herring in PWS may be improved by validating the assumption that herring first spawn at age three. Knowing the proportion of fish in each age class that spawn and the proportion of primiparous individuals in each age class will provide a means for adjusting estimates of the total post-spawning biomass in the ASA by estimating the proportion of each age class that was not on the spawning grounds in the previous year. Data regarding the proportions of spawners by age class would improve the accuracy of model estimates of spawning stock biomass.

Information Transfer:
Preliminary results will be presented at the AK Marine Science Symposium in January 2013. Final results will be published in a journal.

Budget:
Budget expenditures are proceeding as per projections.

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
ANNUAL PROGRAM REPORT YEAR 1

Budget Category:	Proposed Year 1	Actual Year 1	TOTAL Difference
Personnel			$0
Travel	$4,000	$4,741	($741)
Contractual	$38,000	$39,790	($1,790)
Commodities	$3,500		$3,500
Equipment			$0
Indirect Costs (*will vary by proposer*)			$0
SUBTOTAL	$45,500	$44,531	$969
General Administration (9% of subtotal)	$4,095	$4,008	$87
PROJECT TOTAL	$49,595	$48,539	$1,056
Other Resources (Cost Share Funds)	$0	$0	$0

COMMENTS:

FY12	**Program Title: HRM Age at First Spawn** **Team Leader: Heintz**	**SUMMARY**

APPENDIX 1.

Interim Histopathology Report

2011 Pacific Herring Ovarian Development Study - NOAA Auke Bay Laboratory

Pathologist: Gary D. Marty, DVM, Ph.D., Diplomate, A.C.V.P.

Date: July 12, 2012

Diagnoses: For details of the diagnoses, see the spreadsheet included with the report <2011ABL_Herring_histopath-INTERIM.xlsx >.

Interim Comment: Among the 177 gonads received, 113 are ovaries that have features consistent with previous mature egg development, three are testis that have features consistent with previous sperm development, and one is an ovary that has follicle development (i.e., it probably would have spawned next year) but no good evidence of previous mature egg development (this was diagnosed as an immature female; alternatively, it might be a female that spawned but no longer has microscopic evidence of having spawned).

Ovarian microscopic features most useful for assessing whether the fish had spawned include postovulatory follicles and postovulatory eggs. Other findings that might be useful include (*i*) pigmented macrophage aggregates and (*ii*) nonspecific inflammation. In my experience, ovaries that have not spawned usually do not have either pigmented macrophage aggregates or nonspecific inflammation. In contrast, ovaries that have spawned might have nonspecific inflammation longer than obvious postovulatory follicles. The sensitivity and specificity of "nonspecific inflammation" as a biomarker of previous spawning needs to be validated under controlled conditions.

This report has been written without knowledge about the actual exposure history of the fish. This report will be revised after the history of each fish is revealed.

Histopathology: Cassetted gonads from 117 Pacific herring (*Clupea pallasii*) fixed in formalin were received on 5 May 2012 by the British Columbia Animal Health Centre for routine processing to H&E slides. The 117 cassettes have labels progressing discontinuously from 311001 through 314267 (see spreadsheet <2011ABL_Herring_histopath-INTERIM.xlsx> for details). After the gonads were processed routinely into paraffin, each was transected once near the cut edge. The transected piece was embedded transversely to the original piece, yielding one sagittal and one transverse section through each gonad. Slide labels are the same as the original cassette labels. The paraffin blocks from which these tissues were sectioned are retained by the BC Animal Health Centre and filed under the Animal Health Centre's case number 2012-1956; therefore, any requests for recuts need to include the Animal Health Centre's case number. After the analysis contract was awarded on 5 July 2012, the slides were transferred to me (Dr. Gary Marty, Fish Pathology Services).

I examined each slide in ascending numerical order by slide number (= original Auke Bay number) without knowledge of the history of the fish (i.e., blinded study). All gonads were completely scanned using a 4× objective lens, with scans at higher magnification as needed. Each gonad was assessed for maturity and sex, quality control variables, and microscopic findings. Variables were either assigned a category (male vs. female, immature vs. mature, absent "0" vs. present "1"), a number (e.g., # of postovulatory eggs in the section), or a semiquantitative score selected from none (0), mild/small numbers (1), moderate (2), or severe/abundant (3). Good examples or "Type Specimens" for each variable are summarized (Table 1). Abbreviation and case definitions for each are described in Appendix 1, and the results are in spreadsheet <2011ABL_Herring_histopath-INTERIM.xlsx>.

The scientific literature contains different terms used for stages of ovarian development in herring. I use the following, in order of developmental stage (Bucholtz et al. 2008):

Oogonia – the smallest and least developed of the oocytes, they range from 30 - 100 µm in diameter, with a central nucleus (pale, eosinophilic, oval, and slightly foamy) that is surrounded by deeply basophilic cytoplasm. The diameter of the nucleus is about half of the diameter of the oocyte.

Primary oocyte – morphologic features are similar to oogonia except that they are larger, up to 160 µm in diameter. Primary oocytes are the earliest stage of ovarian maturation, and they do not occur in juvenile fish.

Secondary oocyte, cortical alveoli stage (see slide 314262) – With continued growth of the oocyte (200 - 300 µm diameter), the cytoplasm develops peripheral vacuoles that are up to 30 µm in diameter. The margin of the nucleus is more angular and the nucleoplasm is more homogenous and dull-eosinophilic. Nuclear diameter is slightly larger than in oogonia, but is comprises only 25 - 33% of total oocyte diameter.

Secondary oocyte, yolk granule stage (no examples in these samples) – With continued growth of the oocyte (>300 µm in diameter), the oocyte cytoplasm develops brightly eosinophilic yolk granules between the nucleus and the cortical alveoli.

Other terms – structures scored for each ovary include postovulatory follicles, postovulatory eggs, and oocyte/follicular atresia; they are described in Appendix 1.

Quality Control: Tissue autolysis (a measure of decomposition after the fish dies) is "none" for all 117 gonads. Preservation and staining quality are excellent for two groups of gonads (311001 - 311092, 42 fish; and, 314238 - 314267, 30 fish) but of marginal quality for another group of gonads (311093 - 314237, 45 fish). Among the marginally preserved gonads, the deeply basophilic contents of immature (nonyolked) follicles are displaced by large oval to bilobed vacuoles. The vacuoles are most pronounced at the periphery of the ovaries (i.e., central regions of large ovaries have minimal artifact). No other cell types are vacuolated. In affected slides, erythrocyte cytoplasm stains poorly, and sometimes the nuclei of the immature eggs stains pale basophilic instead of deeply basophilic (e.g., slide 314216). This is probably a specific type of artifact that might be a result of exposure to an incorrect chemical during fixation. For example, transfer of tissues from formalin to alcohol and then back to formalin often decolorizes erythrocyte cytoplasm; however, I am not aware that this transfer causes vacuoles in immature ovarian follicles. If the tissues were air lifted before they were preserved, the artifacts might be air vacuoles resulting from decreased pressure during transfer; however, the lack of vacuoles within vessels makes this possibility unlikely. This problem can probably be avoided by ensuring the tissues are immersed 24 hours in only 10% neutral buffered formalin for fixation. After tissues are preserved; they can be safely transferred to tap water for transport to the histology laboratory.

Most slides have mild artifact (tissue folds and splits), as expected with paraffin sections. Tissues have no acid hematin deposits and no postfixation dehydration.

Literature Cited:

Bucholtz, R.H., Tomkiewicz, J. & Dalskov, J. (2008) Manual to determine gonadal maturity of herring (*Clupea harengus* L.). DTU Aqua-report 197-08, Charlottenlund: National Institute of Aquatic Resources. 45 p.

Table 1. Summary of type specimens for variables in Pacific herring gonads.

Abbreviation[1]	None
	Score = 0
		Mild/small #s
		Score = 1
			Moderate
			Score = 2
				Severe/abundant
				Score = 3

Atly	311001	none	none	none
ART	311001, 314262	311004	none	none
VIF	311001	none	none	311093
PFD	311001	none	none	none
AHT	311001	none	none	none
POF	314238	311033, 314246	not applicable	
MPE	311001		311067	
ICH	311001	311062	314244	314257
ANI	311001	311011	none	none
GGR	311001	311004	311087	none
EGC	310079	311064	311047	311001
NSI	none	314262	311029, 311078	311080, 311091
GMA	311001	311047	none	none
HVW	311001	311004	none	none
OAI	311001	311065	314241	314258
OAM	311001	311069	none of quality	none
RCF	311001	none	none	none
TIP	none	311002	none	none

[1]For explanation of abbreviations, see case definitions in Appendix 1.

Appendix 1. Case definitions for each variable related to Pacific herring gonad histopathology.

Maturity:

Juvenile - juvenile ovaries have no oocytes developed beyond oogonia, and they have no evidence that oocytes had ever developed beyond oogonia.

Developing - developing ovaries have developing oocytes but no evidence that follicles ever developed mature eggs. Ovaries in this category have no postovulatory follicles (POF), no postovulatory eggs in the section (POE), and no oocyte atresia of mature follicles (OAM).

Postspawning - postspawning ovaries have evidence that follicles have developed mature eggs, and postspawning testis have evidence that seminiferous tubules have developed mature sperm. Ovaries in this category have at least one score greater than zero for postovulatory follicles (POF), postovulatory eggs in the section (POE), or oocyte atresia of mature follicles (OAM).

Quality control:

1) Atly = Autolysis. Changes in membrane integrity begin immediately after death.

Score = 0; no membrane changes, erythrocytes stain intensely.

Score = 1; loss of membrane integrity; erythrocytes are pale.

Score = 2; none are moderate.

Score = 3; none are severe.

2) ART = Artifact. Tissue changes that are not inherent in the tissue sampled. Sources of artifact included handling at necropsy, processing, sectioning, and staining. Artifact is scored on the basis that it impeded interpretation of tissue morphology. Examples of artifact include splits, bubbles, folds, or knife marks. During spawning, eggs are nearly free within the ovary; therefore, representative cross sections are nearly impossible to obtain and artifact is often severe.

Score = 0; sections have no tissue alterations that would impede analysis or photography of any part of the sections.

Score = 1; tissue alterations are present, but most areas could still be photographed without artifact, and analysis for lesions is unaffected.

Score = 2; tissue alteration prevented analysis for lesions in some areas and photography would be unacceptable anywhere.

Score = 3; tissue alterations are too extensive for histopathologic analysis.

3) VOC = vacuolation of oocyte cytoplasm. In affected oocytes, the deeply basophilic cytoplasm is displaced by a single vacuole that is oval to bilobed and usually larger than the nucleus. These vacuoles are different from the multiple, small vacuoles that occur normally at the periphery of the cytoplasm in secondary oocytes, cortical alveoli stage. No other cell types are vacuolated. Another change in affected slides, erythrocyte cytoplasm stains poorly, and sometimes the cytoplasm of primary oocytes stains pale basophilic instead of deeply basophilic (e.g., slide 314216). This is a specific type of artifact. I do not know the cause, but it might be a result of exposure to an incorrect chemical during fixation. For example, transfer of tissues from formalin to alcohol and then back to formalin often decolorizes erythrocyte cytoplasm; however, I am not aware that this transfer causes vacuoles in oocyte cytoplasm.

Score = 0; the section has no vacuoles in oocyte cytoplasm.

Score = 1; the section has vacuoles, but ≤10% of the oocytes are affected.

Score = 2; 10% - 33% of the oocytes are vacuolated.

Score = 3; >33% of oocytes are vacuolated.

4) PFD = postfixation dehydration. This is a specific type of artifact. The margins of affected organs have evidence of dehydration after fixation (e.g., nuclei stain dull blue; erythrocyte cytoplasm stains yellow instead of red; cytoplasm of other cells stains pale blue or not at all). The most common cause is removal of tissues from liquid for more than a few minutes (e.g., during shipment or trimming). Other possible causes include fixation in formalin that is too concentrated (e.g., 100% formalin instead of 10% formalin), or transfer to ethanol that is too concentrated (e.g., >70% ethanol) before processing to paraffin, or immersion in hypertonic saltwater formalin.

Score = 0; no postfixation dehydration.

Score = 1; postfixation dehydration limited to total sectional area less than 500 µm in diameter.

Score = 2; total sectional area of postfixation dehydration >500 µm, but no 10× objective-lens field is completely affected by PFD.

Score = 3; total sectional area of postfixation dehydration fills at least one 10× objective-lens field.

5) AHT = Acid hematin. This is a specific type of artifact. Acid hematin is a granular brown pigment that accumulates when tissues are not fixed in neutral buffered fixative

and when tissues become acidic during fixation. Acid hematin is birefringent under polarized light; the primary differential, melanin granules, are not birefringent under polarized light. Acid hematin granules are most common where erythrocytes accumulate (e.g., anywhere in the spleen, and around congested blood vessels in the liver). In cases of decreased blood flow, acid hematin can be a "useful artifact" (i.e., consistent with lactic acid as a result of decreased perfusion).

a) Score = 0; no acid hematin deposits.

b) Score = 1; acid hematin deposits are limited to total sectional area <500 µm in diameter.

c) Score = 2; total sectional area of acid hematin deposits >500 µm, but deposits do not prevent analysis of tissues for lesions.

d) Score = 3; extensive acid hematin deposits impair analysis of tissues for lesions.

Microscopic findings:

I. POF = postovulatory follicle. Postovulatory follicles are what remain of the follicle after the egg is released. Recent ovulation is sometimes associated with vascular congestion. After the egg is released from the follicle, the follicular epithelium contracts and the lumen eventually disappears. Follicular cells tend to have foamy cytoplasm and postovulatory follicles are surrounded by an irregular thin band of collagen. Granulomatous inflammation commonly occurs with postovulatory follicles; the inflammation can be sterile, and it is scored separately in the GGR category.
   A. Score = 0; no postovulatory follicles.
   B. Score = 1; postovulatory follicles are present.
   C. Score = 2; not applicable.
   D. Score = 3; not applicable.

II. POE = # of postovulatory eggs in the section. This score is used for eggs that have been released from their follicle but not spawned. The chorion might be present, but many these eggs have rupture and are being cleaned up by inflammatory cells.
   A. Score = 0; no postovulatory eggs in the section.
   B. Score = ≥1; the number of postovulatory eggs in the section (any sections with more than 10 eggs are designated as ">10").

III. ICH = gonadal *Ichthyophonus hoferi*. *Ichthyophonus hoferi* is a primitive parasite associated with chronic systemic disease and mortality in Pacific herring (Marty et al. 2010). The gonad is the least common organ to be infected (Marty et al. 1998); therefore,

any occurrence in the gonad is evidence of much greater prevalence in the population.

A. Score = 0; sections have no *Ichthyophonus hoferi*.
B. Score = 1; *Ichthyophonus* present, but <1 per 10× objective-lens field and minimal inflammation.
C. Score = 2; ≥1 and <3 *Ichthyophonus hoferi* per 10× objective-lens field, but minimal inflammatory reaction, or <1 per 10× objective-lens field with moderate to abundant inflammation.
D. Score = 3; ≥1 *Ichthyophonus hoferi* per 10× objective-lens field, with prominent granulomatous inflammation, or ≥3 *Ichthyophonus hoferi* foci per 10× objective-lens field, regardless of amount of inflammation.

IV. ANI = *Anisakis*. A nematode parasite common in the visceral cavity of Pacific herring.

A. Score = 0; no *Anisakis* in the slide.
B. Score = 1; the slide contains 1-8 sections of *Anisakis*.
C. Score = 2; the slide contains 9-15 sections of *Anisakis*.
D. Score = 3; the slide contains >15 sections of *Anisakis*.

V. GGR = gonadal granulomas (or focal granulomatous inflammation). Foci of granulomatous inflammation are distributed throughout the interstitium. GGRs occasionally contain eosinophilic granular cells (EGCs). This lesion does NOT include inflammation scored as part of the *Ichthyophonus* score.

A. Score = 0; no granulomatous inflammation in sections examined.
B. Score = 1; sections have <1 focus of granulomatous inflammation per 10× objective-lens field.
C. Score = 2; sections have ≥1 but <3 foci of granulomatous inflammation per 10× objective-lens field.
D. Score = 3; sections have ≥3 foci of granulomatous inflammation per 10× objective-lens field.

VI. EGC = eosinophilic granular cells. EGCs are a type of inflammatory cell that are often scattered throughout the ovary in low numbers (i.e., a score of 1 might be normal), but sometimes they occur in higher numbers. With a similar appearance, follicular cells with eosinophilic granules are considered normal and are NOT scored as EGCs. EGCs associated with ICH or GGR are incorporated into the ICH or GGR scores and are NOT included in the EGC score. EGCs are not directly associated with any foreign material/body, although that might be responding to something outside of the plane of section examined.

A. Score = 0; ≤2 (and usually zero) EGCs in every 40× objective-lens field.
B. Score = 1; >2 EGCs in at least one 40× objective-lens field scored, but ≤25 in all 40× objective-lens fields.
C. Score = 2; 15 - 25 EGCs in several 40× objective-lens fields, with an occasional f40× objective-lens with >25 EGCs.
D. Score = 3; >25 EGCs in several 40× objective-lens fields.

VII. NSI = nonspecific inflammation. Postspawning ovaries commonly have a range of inflammatory changes that can include proteinaceous edema, lymphocytes, and histiocytes. A few cases have focal inflammation that forms a lattice-like structure that is about the size of a mature egg (e.g., slides 311061 and 314250); these structures have no remnants of yolk, so they might not be of egg origin. Most of this inflammation is probably related to previous spawning. Along with pigmented macrophage aggregates, this inflammation is probably the most persistent evidence of previous spawning (i.e., it remains longer that postovulatory follicles or postovulatory eggs). This lesion does NOT include inflammation scored as part of ICH, ANI, GGR, or EGC.

A. Score = 0; no nonspecific inflammation.
B. Score = 1; nonspecific inflammation comprises <5% of the volume of the section.
C. Score = 2; nonspecific inflammation comprises 5 – 20% of the volume of the section.
D. Score = 3; nonspecific inflammation comprises >20% of the volume of the section.

VIII. GMA = gonadal pigmented macrophage aggregates. Macrophage aggregates are pigmented yellow-brown to green-brown, and occasionally contain lymphocytes and EGCs. They are probably a good marker of previous follicle maturation and spawning. Fish that have not matured eggs are less likely to have gonadal macrophage aggregates, but massive atresia of immature follicles might lead to accumulation of pigmented macrophage aggregates.

A. Score = 0; no pigmented macrophage aggregates.
B. Score = 1; sections have ≤2 GMAs > 60 µm in diameter per 10× objective-lens field.
C. Score = 2; sections have >2 but ≤5 GMAs > 60 µm in diameter per 10× objective-lens field.
D. Score = 3; sections have >5 GMAs > 60 µm in diameter per 10× objective-lens field.

IX. HVW = hyalinized vessel walls. Vessel walls are thickened with dull, amorphous, eosinophilic material. Hyalinization is usually limited to ovaries immediately postspawning.

A. Score = 0; no hyalinization of vessel walls.
B. Score = 1; at least one vessel wall is hyalinized and the wall is ≤40 µm thick.
C. Score = 2; at least one vessel wall is hyalinized and the wall is >40 µm but <80 µm thick.
D. Score = 3; none are severe.

X. OAI = atresia of unyolked (immature) follicles; a change/lesion in ovaries based on the estimated average number of atretic follicles per 10× objective-lens field. Initial stages of "immature" atretic follicles have irregularities and breaks in the outer margin of the oocyte. Advanced stages have complete fragmentation of the oocyte cytoplasm. Final stages of atresia have marked shrinkage, complete fragmentation of nucleus, and variable infiltration with macrophages.

A. Score = 0; no atretic unyolked follicles in the section.
B. Score = 1; <1 atretic unyolked follicle per 10× objective-lens field.
C. Score = 2; 1-3 atretic unyolked follicles per 10× objective-lens field.
D. Score = 3; >3 atretic unyolked follicles per 10× objective-lens field.

XI. OAM = atresia of yolked (maturing or mature) follicles; a change/lesion in ovaries based on the estimated average number of mature atretic follicles per 4× objective-lens field. Initial stages of "mature" atretic follicles have irregularities and breaks in the chorion and disruption of the cytoplasmic membrane. Advanced stages have complete fragmentation of the chorion, degeneration of lipid vacuoles and yolk protein droplets, increased cytoplasmic eosinophilia, and complete dissolution of the nucleus. Final stages of atresia have marked shrinkage, complete fragmentation of both chorion and nucleus, replacement of the cytoplasm by granular, eosinophilic necrotic debris, and variable infiltration with macrophages.

A. Score = 0; no atretic follicles in the section.
B. Score = 1; <1 atretic follicle per 4× objective-lens field.
C. Score = 2; 1-3 atretic follicles per 4× objective-lens field.
D. Score = 3; >3 atretic follicles per 4× objective-lens field.

XII. RCF = rupture/collapse of yolked follicles; a change/lesion in ovaries based on the estimated average number of ruptured follicles per 4× objective-lens field. Unlike atretic follicles, where individual fragments are usually <10 µm in diameter, the zona radiata of ruptured follicles is broken in only a few spots. The fragments, often >100 µm long, are folded and surrounded by variables numbers of macrophages and EGCs.

A. Score = 0; no ruptured follicles in the section.
B. Score = 1; <1 ruptured follicle per 4× objective-lens field.
C. Score = 2; 1-3 ruptured follicles per 4× objective-lens × field.
D. Score = 3; >3 ruptured follicles per 4× objective-lens field.

XIII. TIP = testicular intratubular protozoan. Protozoa are usually first identified as a 60-µm-diameter clear space within seminiferous tubules. The clear space sometimes contains sporulated on unsporulated oocysts of *Eimeria sardinae*. Females = NA.

A. Score = 0; no coccidians within seminiferous tubules.
B. Score = 1; <5 coccidia per 10× objective-lens field.
C. Score = 2; ≥5 but <15 coccidia per 10× objective-lens field.
D. Score = 3; ≥15 coccidia per 10× objective-lens field.

Literature Cited:

Marty, G.D., E.F. Freiberg, T.R. Meyers, J. Wilcock, T.B. Farver, and D.E. Hinton. 1998. Viral hemorrhagic septicemia virus, *Ichthyophonus hoferi*, and other causes of morbidity in Pacific herring *Clupea pallasi* spawning in Prince William Sound, Alaska, USA. Dis. Aquat. Org. 32:15-40.

Marty, G.D., P.-J.F. Hulson, S.E. Miller, T.J. Quinn II, S.D. Moffitt, and R.A. Merizon. 2010. Failure of population recovery in relation to disease in Pacific herring. Dis. Aquat. Org. 90:1-14. doi:10.3354/dao02210

Project Number: 12120111-M

Project Title: PWS Herring Program - A High Temporal and Spatial Resolution Study to Validate the Separate Herring Condition Monitoring Program

PI Names: Thomas C. Kline, Jr., Ph. D., Ron Heintz, Ph. D.

Time period covered: 2012

Date of Report: 15 February 2013

Report prepared by: Dr. Tom Kline

Project website (if applicable): http://www.pwssc.org/herringsurvey/

Work Performed: Summarize work performed during the reporting period, including any results available to date and their relationship to the original project objectives. Explain deviations from the original project objectives, procedural or statistical methods, study area or schedule. Also describe any known problems or unusual developments, and whether and how they have been or can be overcome. Include any other significant information pertinent to the project.

Conducted Fall Sampling Cruise (November 2012)
Processed Samples (Preliminary Laboratory Processing for C/N Analysis for samples collected through June 2012 Complete)
Dr. Heintz' lab received samples from collections for the high resolution study through June 2012. Processing has been delayed slightly due to prioritizing processing needs for other herring projects (herring growth and condition, herring fatty acid study), but contract labor and supplies have been procured and sample analysis is expected to be completed by fall of 2013.
Processed Data (Preliminary Results from Intensive Study)
Interpreted Data (Data up to Preliminary Results of Intensive Study)
Reported on Data and Interpretations at P.I. workshop in November
Submitted an abstract titled "Estimating Overwinter Mortality of Age-0 Pacific Herring Based on Loss of Energy and Implications for Recruitment" to the 2013 AMSS
Submitted an abstract titled "High-Latitude Pelagic Food Web Shifts Inferred from Stable Isotope Analysis at Seasonal, Inter-Annual, and Inter-Decadal Time Scales" to the 2013 Aquatic Sciences Meeting

Preliminary results from intensive study (C/N samples) of Simpson Bay age-0 herring from the Intensive Study shown in figure below. Note that these are incomplete and thus preliminary.

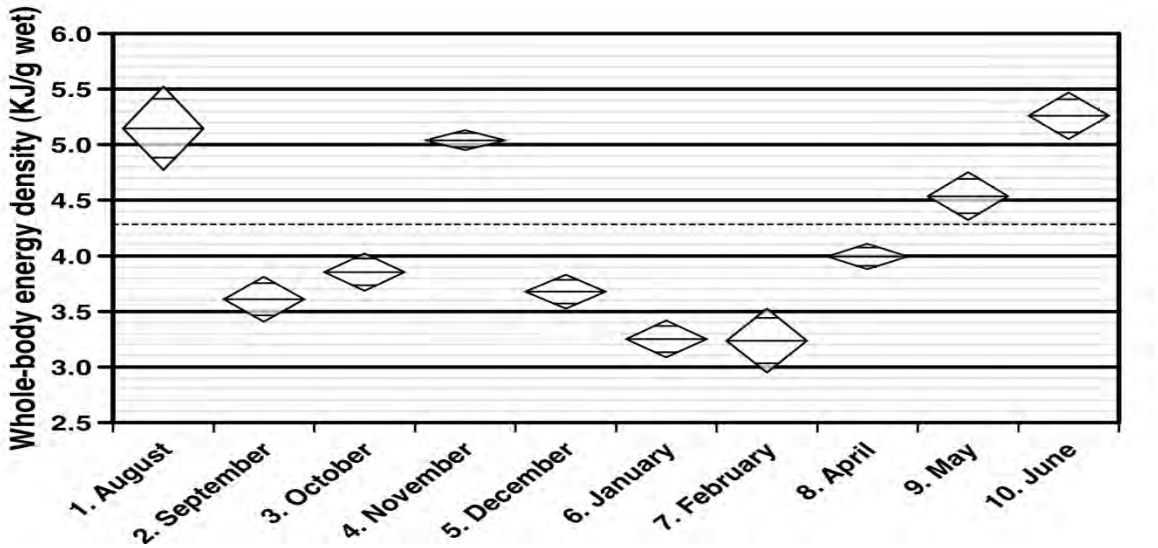

Figure 1. <u>Preliminary</u> results of intensive study of age-0 herring sampled from Simpson Bay from August 2011 to June 2012. Values of whole-body energy density in KJ/g wet mass are shown as diamond mean plots (http://www.gigawiz.com/diamond.htm). The data suggest that herring reach a maximum in November before losing energy over winter and that recovery can begin as soon as April. The August sample was very small (N = 10) and may not be representative.

Future Work: Summarize work to be performed during the upcoming year, if different from the original proposal. Describe any proposed changes in objectives, procedural or statistical methods, study area or schedule. *NOTE: Significant changes in a project's objectives, methods, schedule or budget require submittal of a new proposal subject to the standard process of proposal submittal, technical review and Trustee Council approval.*

• No difference

Coordination/Collaboration: Describe efforts undertaken during the reporting period to achieve the coordination and collaboration provisions of the proposal, if applicable.

Samples collected sent to colleagues in Juneau and Washington State
Exchange of preliminary results with collaborators at meetings (PI workshop and AMSS)

Community Involvement/TEK & Resource Management Applications: Describe efforts undertaken during the reporting period to achieve the community involvement/TEK and resource management application provisions of the proposal, if applicable.

CDFU sampled herring for Project in March
Preliminary results of project presented to resource managers in attendance at P.I. workshops

Information Transfer: List (a) publications produced during the reporting period, (b) conference and workshop presentations and attendance during the reporting period, and (c) data and/or information products developed during the reporting period. *NOTE: Lack of compliance with the Trustee Council's data policy and/or the project's data management plan will result in withholding of additional project funds, cancellation of the project, or denial of funding for future projects.*

Preliminary results of project presented to public in attendance at meetings in Cordova and Anchorage
P.I. worked with NCEAS to archive legacy herring data

Budget: Explain any differences and/or problems between actual and budgeted expenditures, including any substantial changes in the allocation of funds among line items on the budget form. Also provide any new information regarding matching funds or funds from non-EVOS sources for the project.

NOTE: Any request for an increased or supplemental budget must be submitted as a new proposal that will be subject to the standard process of proposal submittal, technical review, and Trustee Council approval.

No differences or problems.

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
ANNUAL PROGRAM REPORT YEAR 1

Budget Category:	Proposed Year 1	Actual Year 1	TOTAL Difference
Personnel	$64,800	$43,670	$21,130
Travel	$2,700	$1,573	$1,127
Contractual	$41,600	$1,308	$40,292
Commodities	$13,900	$1,216	$12,684
Equipment			$0
Indirect Costs (*will vary by proposer*)	$36,900	$14,279	$22,621
SUBTOTAL	$159,900	$62,046	$97,854
General Administration (9% of subtotal)	$14,391	$5,584	$8,807
PROJECT TOTAL	$174,291	$67,630	$106,661
Other Resources (Cost Share Funds)	$0	$0	$0

COMMENTS:

FY12	**Program Title: HRM Juvenile Herring Intensive Monitoring** **Team Leader: Kline**	**SUMMARY**

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
ANNUAL PROGRAM REPORT YEAR 1

Budget Category:	Proposed Year 1	Actual Year 1	TOTAL Difference
Personnel			$0
Travel	$2,000		$2,000
Contractual	$23,000	$15,100	$7,900
Commodities	$5,000	$3,000	$2,000
Equipment			$0
Indirect Costs (*will vary by proposer*)			$0
SUBTOTAL	$30,000	$18,100	$11,900
General Administration (9% of subtotal)	$2,700	$1,629	$1,071
PROJECT TOTAL	$32,700	$19,729	$12,971
Other Resources (Cost Share Funds)	$0	$0	$0

COMMENTS:

FY12	**Program Title: HRM Juvenile Herring Intensive Monitoring** **Team Leader: Heintz**	**SUMMARY**

1. **Project Number: 12120111N**

2. **Project Title: PWS Herring Program – Scales as growth history records.**

3. **Principal Investigator(s) Name: Steve Moffitt; Team lead is Scott Pegau**

4. **Time Period Covered by the Report** – For projects not in a Trustee Council funded-program, and for those within a Trustee Council-funded program, the semi-annual report will report on the prior six month's work. *See,* Reporting Policy at III (C) (1) (d). **1 February 2012 through 31 January 2013**

5. **Date of Report: 15 February 2013**

6. **Summary of Work Performed –** This brief summary shall describe work to be performed during the upcoming reporting period, including any results available to date and their relationship to the original project objectives. Any deviation from the original project objectives, procedures or statistical methods, study area, or schedule shall be included. Any known problems or unusual developments, and any other significant information pertinent to the project, shall also be described. *See,* Reporting Policy at III (C) (1) (f).

   Created Excel database of all historical herring scale data and completed significant amount of editing (January 2012 to present).

   Traveled to Juneau (November 2012) to meet with staff at Department of Fish and Game Mark-Tag-Age Laboratory.
   - **Reviewed scale interpretive criteria,**
   - **Reviewed procedures for use of Image Pro Analysis software for semi-automated measuring of scale annulus increments**

   Set up process to make random selections of scales to image and measure by age, sex, collection season, and year.

   Began scanning images of 30 scales for male and female fish of age 4, 5, and 6 collected in March, April, or May of each year. After reviewing the database collections, we have focused imaging to date on the age classes with 30 or more scales for each sex in the majority of the data collection years. Once these are finished, we can add additional scales to the collection.

   Through 31 January, approximately 2,600 scales have been imaged (36 Gigabytes) from collections between 1999 and 2012.

7. **Summary of Future Work to be Performed** – This brief summary shall describe work to be performed during the upcoming reporting period, if changed from the original proposal. A description of any proposed changes in project objectives, procedures or statistical methods, study area, or schedule shall be included. *See,* Reporting Policy at III (C) (1) (g).

   - **Image initial group of scales collected between 1973 and 1998.**
   - **Measure growth increments of all imaged scales.**

- **Examine preliminary growth increment data to determine final sample size goals. The original proposal had this task completed earlier; however, we need to make changes to the Image Pro Analysis macro to efficiently collect the growth increment data.**

8. **Coordination/Collaboration** – This section shall describe efforts undertaken during the reporting period to achieve the coordination and collaboration provisions of the proposal, if applicable. *See*, Reporting Policy at III (C) (1) (h).

   Discussed ages to image and measure with program P.I. conducting the examination of age at first spawn.

9. **Community Involvement/TEK and Resource Management Applications -** This section shall describe efforts undertaken during the reporting period to achieve the community involvement/TEK and resource management application provisions of the proposal, if applicable. *See*, Reporting Policy at III (C) (1) (i).

10. **Information Transfer** – This section shall list (1) publications produced during the reporting period, (2) conference and workshop presentations and attendance during the reporting period, and (3) data and/or information products developed during the reporting period. *See*, Reporting Policy at III (C) (1) (j).

    - **Project outline presented by program lead at public meetings in Cordova and Anchorage.**
    - **Worked with NCEAS to provide legacy herring data sets.**
    - **Attended meeting of principle investigators in April 2012 (Cordova), November 2012 (Anchorage), and at the Alaska Marine Science Symposium (January 2013).**

11. **Budget –** This section should provide a detailed accounting of the spending during the time period covered by the report and a comparison of the actual funds spent versus those originally requested. Any discrepancies should be clearly noted and a brief reason provided for the change. A column for actual expenditures should be added to the original budget spreadsheet that was submitted with your proposal. An example is attached. Any new information regarding in-kind, matching funds or other funds from non-Trustee Council sources for the project shall be included. *See*, Reporting Policy at III (C) (1) (k).

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
ANNUAL PROGRAM REPORT YEAR 1

Budget Category:	Proposed Year 1	Actual Year 1	TOTAL Difference
Personnel	$58,800	$19,800	$39,000
Travel	$1,100	$2,200	($1,100)
Contractual	$200		$200
Commodities	$4,000	$7,700	($3,700)
Equipment	$15,000	$9,500	$5,500
Indirect Costs (*will vary by proposer*)			$0
SUBTOTAL	$79,100	$39,200	$39,900
General Administration (9% of subtotal)	$7,119	$3,528	$3,591
PROJECT TOTAL	$86,219	$42,728	$43,491
Other Resources (Cost Share Funds)	$0	$0	$0

COMMENTS:

FY12	**Program Title: HRM Scales as Growth History Records** **Team Leader: Moffitt**	**SUMMARY**

1. **Project Number:** 12120111 - O
2. **Project Title:** Coordination and logistics, Outreach
3. **Principal Investigator(s) Name:** W. Scott Pegau, Lindsay Butters
4. **Time Period Covered by the Report** –1 February 2012 to 31 January 2013.
5. **Date of Report:** 12 February 2013
6. **Summary of Work Performed –** Work has proceeded as originally scheduled. There was a shift from the original October 1, 2011 start date to February 1, 2012 to accommodate NOAA's administrative process. Fortunately the work slated during the gap was fairly light and was able to be accommodated by working with the PWS Herring Survey program.

   During the past year we held to meetings of the principal investigators (PI). The first was in April 2012 for investigators from both herring programs. The second was in November 2012 and was together with the EVOSTC Gulf Watch Alaska principal investigator meeting. This allowed improved collaboration between programs. An oversight group was established and they were invited to the PI meetings to come up to date with work that has occurred.

   During this past year we scheduled ships for collection of herring associated with several of the Herring Research and Monitoring (HRM) projects. This included collecting samples for the juvenile condition intensive, annual juvenile condition measurements, fatty acid analysis, disease research, and acoustic validation program. Problems were encountered in the annual November cruise in that the new trawl winch could not be operated using the vessel hydraulic system. After several attempts to isolate the issue we chose to use the gill nets and cast nets to collect the needed samples instead of using the trawl system.

   A semi-annual report was provided to both EVOSTC and NOAA as required in August. We continue to work with EVOSTC staff to establish reporting requirements that meet the needs of the EVOSTC and reduce the need for developing separate reports for NOAA.

   Dr. Pegau attended the Alaska Marine Science Symposium in 2013. The focus of his presentation wsa on results from the PWS Herring Survey program, but many of the HRM investigators were at the meeting so we took the opportunity to get together and review results and upcoming logistical needs.

   The remotely operated vehicle (ROV) was purchased for use in the non-lethal sampling project. Dr. Pegau began training in the operation of the vehicle. Drs. Pegau and Boswell have begun coordination to prepare the system for deployment in 2013.

   Outreach activities were led by Lindsay Butters of the Prince William Sound Science Center. In FY12 the outreach activities were listed under the coordination and logistics program on the EVOSTC website so we are including the outreach component within this report. Purchasing of outreach infrastructure materials began, a project profile for the HRM program was developed, and new website materials were put together. Lindsay was on maternity leave for the last quarter of the reporting year so we have not completed all the purchases we planned.

7. **Summary of Future Work to be Performed** –

   No changes in deliverables are expected for the upcoming year. The community fishermen are scheduled to sample juvenile herring around PWS in March. A vessel has been contracted for herring tagging operations, testing the trawl system, and testing the ROV system this spring. A vessel will be contracted for the spring adult and fall juvenile herring surveys. A PI meeting will be scheduled for April or May.

8. **Coordination/Collaboration** – During the past year there have been three opportunities for PIs involved in this project to meet with each other. There have also been opportunities for collaboration with PIs from the PWS Herring Survey program and the Gulf Watch Alaska program. Coordination with the PWS Herring Survey Program has allowed us to maintain the original science schedule even with a delayed start in funding.

9. **Community Involvement/TEK and Resource Management Applications –** The primary community involvement component of this program was not scheduled to start until the second year of the program. That is the involvement of local fishermen in the collection of juvenile herring for analysis. That component was covered under the PWS Herring Survey program during the reporting year.

10. **Information Transfer** – Dr. Pegau attended the Alaska Marine Science Symposium where he discussed the herring research programs. He also presented at the Alaska Forum on the Environment about how to connect the information being collected to spill response.

11. **Budget –** Please see the following budget table. Budget savings in FY 12 in personnel and contractual are due to coordination with the PWS Herring Survey Program. Additional ship time requests in FY 13 by program PIs will expend those savings.

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
ANNUAL PROGRAM REPORT FY 12

Budget Category:	Proposed FY 12	Actual FY 12	TOTAL Difference
Personnel	$19,031	$6,149	$12,882
Travel	$9,500	$2,959	$6,541
Contractual	$211,860	$167,764	$44,096
Commodities	$1,700	$509	$1,191
Equipment	$50,500	$52,143	($1,643)
Indirect Costs (*will vary by proposer*)	$41,469	$27,812	$13,657
SUBTOTAL	$334,060	$257,336	$76,724
General Administration (9% of subtotal)	$30,065	$23,160	$6,905
PROJECT TOTAL	$364,125	$280,496	$83,629
Other Resources (Cost Share Funds)	$0	$0	$0

COMMENTS: The contractual section includes the subcontracts for Axiom Consulting and the University of Washington. The budget details for those projects are provided separately.

FY12	**Program Title: HRM Coordination and Logistics** **Team Leader: Pegau**	**SUMMARY**

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
ANNUAL PROGRAM REPORT FY 12

Budget Category:	Proposed FY 12	Actual FY 12	TOTAL Difference
Personnel	$2,815	$2,121	$694
Travel	$1,400		$1,400
Contractual	$400	$734	($334)
Commodities	$7,000	$1,500	$5,500
Equipment			$0
Indirect Costs (*will vary by proposer*)	$3,485	$1,306	$2,179
SUBTOTAL	$15,100	$5,661	$9,439
General Administration (9% of subtotal)	$1,359	$509	$850
PROJECT TOTAL	$16,459	$6,170	$10,289
Other Resources (Cost Share Funds)	$0	$0	$0

COMMENTS:

FY12	**Program Title: HRM Outreach and Coordination** **Team Leader: Butters**	**SUMMARY**

Project Number: 12120111-Q

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

PI Names: Trevor A. Branch

Time period covered: 2012

Date of Report: 15 February 2013

Report prepared by: Prof. Trevor A. Branch

Project website (if applicable): N/A

Work Performed: Summarize work performed during the reporting period, including any results available to date and their relationship to the original project objectives. Explain deviations from the original project objectives, procedural or statistical methods, study area or schedule. Also describe any known problems or unusual developments, and whether and how they have been or can be overcome. Include any other significant information pertinent to the project.

Took on MS student Melissa Muradian from the QERM program at the University of Washington, who has a highly quantitative and statistical background, in summer 2012. She has been taking required courses in fisheries population dynamics modeling. She has converted the ASA model into the statistical programming language AD Model Builder (Fournier et al. 2011), and is changing the model from one that minimizes simple sums of squares to a Bayesian model. The key advantages are the ability to weight different data types in a statistically rigorous manner, to obtain estimates of model uncertainty (Bayesian posteriors), and to be able (in the future) to incorporate data from other sources through the Bayesian priors for each parameter.

References

Fournier, D. A., H. J. Skaug, J. Ancheta, J. Ianelli, A. Magnusson, M. N. Maunder, A. Nielsen, and J. Sibert. 2011. AD Model Builder: using automatic differentiation for statistical inference of highly parameterized complex nonlinear models. Optimization Methods & Software 2011, doi: 10.1080/10556788.2011.597854:1-17.

Future Work: Summarize work to be performed during the upcoming year, if different from the original proposal. Describe any proposed changes in objectives, procedural or statistical methods, study area or schedule. *NOTE: Significant changes in a project's objectives, methods, schedule or budget require submittal of a new proposal subject to the standard process of proposal submittal, technical review and Trustee Council approval.*

- No difference

Coordination/Collaboration: Describe efforts undertaken during the reporting period to achieve the coordination and collaboration provisions of the proposal, if applicable.

Exchange of preliminary results with collaborators at the PI workshop in Anchorage in November 2012.

Community Involvement/TEK & Resource Management Applications: Describe efforts undertaken during the reporting period to achieve the community involvement/TEK and resource management application provisions of the proposal, if applicable.

Not applicable.

Information Transfer: List (a) publications produced during the reporting period, (b) conference and workshop presentations and attendance during the reporting period, and (c) data and/or information products developed during the reporting period. *NOTE: Lack of compliance with the Trustee Council's data policy and/or the project's data management plan will result in withholding of additional project funds, cancellation of the project, or denial of funding for future projects.*

None so far.

Budget: Explain any differences and/or problems between actual and budgeted expenditures, including any substantial changes in the allocation of funds among line items on the budget form. Also provide any new information regarding matching funds or funds from non-EVOS sources for the project.

NOTE: Any request for an increased or supplemental budget must be submitted as a new proposal that will be subject to the standard process of proposal submittal, technical review, and Trustee Council approval.

Some of the salary budget initially allocated to PI Branch was reallocated to student Melissa Muradian for the summer months. Originally it was anticipated that a student would start in October 2012, but the QERM program has 3 quarters of biostatistics followed by a summer quarter, so she started in the summer quarter following the initial coursework.

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
ANNUAL PROGRAM REPORT YEAR 1

Budget Category:	Proposed Year 1	Actual Year 1	TOTAL Difference
Personnel	$20,734	$14,743	$5,991
Travel	$982	$1,164	($182)
Contractual			$0
Commodities	$200	$339	($139)
Equipment		$2,420	($2,420)
Indirect Costs (*will vary by proposer*)	$11,944	$6,454	$5,490
SUBTOTAL	$33,860	$25,120	$8,740
General Administration (9% of subtotal)	$3,047	$2,261	$787
PROJECT TOTAL	$36,907	$27,381	$9,527
Other Resources (Cost Share Funds)	$0	$0	$0

COMMENTS: This project is listed as a subcontract in Pegau. Expenditures reported here are what PWSSC has been billed for by January 31, 2013. This may be less than actual project expeditures if billing to PWSSC is delayed.

12.

FY12	**Program Title: HRM Population Dynamics Modeling** **Team Leader: Branch**	**SUMMARY**

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
ANNUAL PROGRAM REPORT YEAR 1

Budget Category:	Proposed Year 1	Actual Year 1	TOTAL Difference
Personnel	201469	84544	$116,925
Travel	26800	12583	$14,217
Contractual	331860	252153	$79,707
Commodities	81000	20344	$60,656
Equipment	187200	179751	$7,449
Indirect Costs (*will vary by proposer*)	114231	52316	$61,915
SUBTOTAL	$942,560	$601,691	$340,869
General Administration (9% of subtotal)	$84,830	$54,152	$30,678
PROJECT TOTAL	$1,027,390	$655,843	$371,547
Other Resources (Cost Share Funds)	$0	$0	$0

COMMENTS:

FY12

Program Title: Herring Research and Monitoring
Team Leader: Pegau

SUMMARY

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
ANNUAL PROGRAM REPORT YEAR 1

Budget Category:	Proposed Year 1	Actual Year 1	TOTAL Difference
Personnel	$32,469	$224	$32,245
Travel	$1,000	$12	$988
Contractual	$900	$340	$560
Commodities	$5,400	$676	$4,724
Equipment	$10,700	$17,071	($6,371)
Indirect Costs (*will vary by proposer*)	$11,931	$375	$11,556
SUBTOTAL	$62,400	$18,698	$43,702
General Administration (9% of subtotal)	$5,616	$1,683	$3,933
PROJECT TOTAL	$68,016	$20,381	$47,635
Other Resources (Cost Share Funds)	$0	$0	$0

COMMENTS:

FY12

Program Title: HRM Validation of Acoustic Surveys
Team Leader: Bishop

SUMMARY

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
ANNUAL PROGRAM REPORT YEAR 1

Budget Category:	Proposed Year 1	Actual Year 1	TOTAL Difference
Personnel	$7,323	$3,721	$3,602
Travel	$5,100	$186	$4,914
Contractual	$400	$10,859	($10,459)
Commodities	$37,100		$37,100
Equipment			$0
Indirect Costs (*will vary by proposer*)	$14,977	$4,391	$10,586
SUBTOTAL	$64,900	$19,157	$45,743
General Administration (9% of subtotal)	$5,841	$1,724	$4,117
PROJECT TOTAL	$70,741	$20,881	$49,860
Other Resources (Cost Share Funds)	$0	$0	$0

COMMENTS:

FY12

Program Title: HRM Tracking Seasonal Movements
Team Leader: Bishop

SUMMARY

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
ANNUAL PROGRAM REPORT YEAR 1

Budget Category:	Proposed Year 1	Actual Year 1	TOTAL Difference
Personnel	$16,231	$8,859	$7,372
Travel	$0	$912	($912)
Contractual	$500	$3,758	($3,258)
Commodities	$1,500	$349	$1,151
Equipment	$59,000	$53,206	$5,794
Indirect Costs (*will vary by proposer*)	$5,469	$4,153	$1,316
SUBTOTAL	$82,700	$71,237	$11,463
General Administration (9% of subtotal)	$7,443	$6,411	$1,032
PROJECT TOTAL	$90,143	$77,648	$12,495
Other Resources (Cost Share Funds)	$0	$0	$0

COMMENTS:

FY12

Program Title: HRM Juvenile Abundance Index
Team Leader: Buckhorn

SUMMARY

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
ANNUAL PROGRAM REPORT YEAR 1

Budget Category:	Proposed Year 1	Actual Year 1	TOTAL Difference
Personnel			$0
Travel			$0
Contractual			$0
Commodities		$994	($994)
Equipment	$46,000	$41,831	$4,169
Indirect Costs (*will vary by proposer*)			$0
SUBTOTAL	$46,000	$42,825	$3,175
General Administration (9% of subtotal)	$4,140	$3,854	$286
PROJECT TOTAL	$50,140	$46,679	$3,461
Other Resources (Cost Share Funds)	$0	$0	$0

COMMENTS:

FY12

Program Title: HRM Intensive Survey of Juvenile Herring
Team Leader: Buckhorn

SUMMARY

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
ANNUAL PROGRAM REPORT YEAR 1

Budget Category:	Proposed Year 1	Actual Year 1	TOTAL Difference
Personnel			$0
Travel			$0
Contractual			$0
Commodities			$0
Equipment	$6,000	$6,000	$0
Indirect Costs (*will vary by proposer*)			$0
SUBTOTAL	$6,000	$6,000	$0
General Administration (9% of subtotal)	$540	$540	$0
PROJECT TOTAL	$6,540	$6,540	$0
Other Resources (Cost Share Funds)	$0	$0	$0

COMMENTS:

FY12

Program Title: HRM Expanded Adult Herring Surveys
Team Leader: Buckhorn

SUMMARY

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
ANNUAL PROGRAM REPORT YEAR 1

Budget Category:	Proposed Year 1	Actual Year 1	TOTAL Difference
Personnel	$2,815	$2,121	$694
Travel	$1,400		$1,400
Contractual	$400	$734	($334)
Commodities	$7,000	$1,500	$5,500
Equipment			$0
Indirect Costs (*will vary by proposer*)	$3,485	$1,306	$2,179
SUBTOTAL	$15,100	$5,661	$9,439
General Administration (9% of subtotal)	$1,359	$509	$850
PROJECT TOTAL	$16,459	$6,170	$10,289
Other Resources (Cost Share Funds)	$0	$0	$0

COMMENTS:

FY12

Program Title: HRM Outreach and Coordination
Team Leader: Butters

SUMMARY

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
ANNUAL PROGRAM REPORT YEAR 1

Budget Category:	Proposed Year 1	Actual Year 1	TOTAL Difference
Personnel			$0
Travel			$0
Contractual	$15,000	$12,500	$2,500
Commodities	$1,900	$4,400	($2,500)
Equipment			$0
Indirect Costs (*will vary by proposer*)			$0
SUBTOTAL	$16,900	$16,900	$0
General Administration (9% of subtotal)	$1,521	$1,521	$0
PROJECT TOTAL	$18,421	$18,421	$0
Other Resources (Cost Share Funds)	$0	$0	$0

COMMENTS:

FY12

Program Title: HRM Fatty Acid Analysis
Team Leader: Heintz

SUMMARY

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
ANNUAL PROGRAM REPORT YEAR 1

Budget Category:	Proposed Year 1	Actual Year 1	TOTAL Difference
Personnel			$0
Travel	$4,000	$4,741	($741)
Contractual	$38,000	$39,790	($1,790)
Commodities	$3,500		$3,500
Equipment			$0
Indirect Costs (*will vary by proposer*)			$0
SUBTOTAL	$45,500	$44,531	$969
General Administration (9% of subtotal)	$4,095	$4,008	$87
PROJECT TOTAL	$49,595	$48,539	$1,056
Other Resources (Cost Share Funds)	$0	$0	$0

COMMENTS:

FY12

Program Title: HRM Age at First Spawn
Team Leader: Heintz

SUMMARY

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
ANNUAL PROGRAM REPORT YEAR 1

Budget Category:	Proposed Year 1	Actual Year 1	TOTAL Difference
Personnel			$0
Travel	$2,000		$2,000
Contractual	$23,000	$15,100	$7,900
Commodities	$5,000	$3,000	$2,000
Equipment			$0
Indirect Costs (*will vary by proposer*)			$0
SUBTOTAL	$30,000	$18,100	$11,900
General Administration (9% of subtotal)	$2,700	$1,629	$1,071
PROJECT TOTAL	$32,700	$19,729	$12,971
Other Resources (Cost Share Funds)	$0	$0	$0

COMMENTS:

FY12

Program Title: HRM Juvenile Herring Intensive Monitoring
Team Leader: Heintz

SUMMARY

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
ANNUAL PROGRAM REPORT YEAR 1

Budget Category:	Proposed Year 1	Actual Year 1	TOTAL Difference
Personnel	$64,800	$43,670	$21,130
Travel	$2,700	$1,573	$1,127
Contractual	$41,600	$1,308	$40,292
Commodities	$13,900	$1,216	$12,684
Equipment			$0
Indirect Costs (*will vary by proposer*)	$36,900	$14,279	$22,621
SUBTOTAL	$159,900	$62,046	$97,854
General Administration (9% of subtotal)	$14,391	$5,584	$8,807
PROJECT TOTAL	$174,291	$67,630	$106,661
Other Resources (Cost Share Funds)	$0	$0	$0

COMMENTS:

FY12

Program Title: HRM Juvenile Herring Intensive Monitoring
Team Leader: Kline

SUMMARY

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
ANNUAL PROGRAM REPORT YEAR 1

Budget Category:	Proposed Year 1	Actual Year 1	TOTAL Difference
Personnel	$58,800	$19,800	$39,000
Travel	$1,100	$2,200	($1,100)
Contractual	$200		$200
Commodities	$4,000	$7,700	($3,700)
Equipment	$15,000	$9,500	$5,500
Indirect Costs (*will vary by proposer*)			$0
SUBTOTAL	$79,100	$39,200	$39,900
General Administration (9% of subtotal)	$7,119	$3,528	$3,591
PROJECT TOTAL	$86,219	$42,728	$43,491
Other Resources (Cost Share Funds)	$0	$0	$0

COMMENTS:

FY12

Program Title: HRM Scales as Growth History Records
Team Leader: Moffitt

SUMMARY

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
ANNUAL PROGRAM REPORT YEAR 1

Budget Category:	Proposed Year 1	Actual Year 1	TOTAL Difference
Personnel	$19,031	$6,149	$12,882
Travel	$9,500	$2,959	$6,541
Contractual	$211,860	$167,764	$44,096
Commodities	$1,700	$509	$1,191
Equipment	$50,500	$52,143	($1,643)
Indirect Costs (*will vary by proposer*)	$41,469	$27,812	$13,657
SUBTOTAL	$334,060	$257,336	$76,724
General Administration (9% of subtotal)	$30,065	$23,160	$6,905
PROJECT TOTAL	$364,125	$280,496	$83,629
Other Resources (Cost Share Funds)	$0	$0	$0

COMMENTS: The contractual section includes the subcontracts for Axiom Consulting and the University of Washington. The budget details for those projects are provided separately.

FY12

Program Title: HRM Coordination and Logistics
Team Leader: Pegau

SUMMARY

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
ANNUAL PROGRAM REPORT YEAR 1

Budget Category:	Proposed Year 1	Actual Year 1	TOTAL Difference
Personnel	$94,400	$89,627	$4,773
Travel			$0
Contractual			$0
Commodities			$0
Equipment	$3,900		$3,900
Indirect Costs (*will vary by proposer*)	$21,700	$19,676	$2,024
SUBTOTAL	$120,000	$109,303	$10,697
General Administration (9% of subtotal)	$10,800	$9,837	$963
PROJECT TOTAL	$130,800	$119,140	$11,660
Other Resources (Cost Share Funds)	$0	$0	$0

COMMENTS: This project is listed as a subcontract in Pegau. Spending shown here represents billing to PWSSC as of January 31, 2013.

FY12

Program Title: HRM Data Management Support
Team Leader: Bochenek

SUMMARY

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 12-FY16

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
ANNUAL PROGRAM REPORT YEAR 1

Budget Category:	Proposed Year 1	Actual Year 1	TOTAL Difference
Personnel	$20,734	$14,743	$5,991
Travel	$982	$1,164	($182)
Contractual			$0
Commodities	$200	$339	($139)
Equipment		$2,420	($2,420)
Indirect Costs (*will vary by proposer*)	$11,944	$6,454	$5,490
SUBTOTAL	$33,860	$25,120	$8,740
General Administration (9% of subtotal)	$3,047	$2,261	$787
PROJECT TOTAL	$36,907	$27,381	$9,527
Other Resources (Cost Share Funds)	$0	$0	$0

COMMENTS: This project is listed as a subcontract in Pegau. Expenditures reported here are what PWSSC has been billed for by January 31, 2013. This may be less than actual project expeditures if billing to PWSSC is delayed.

FY12

Program Title: HRM Population Dynamics Modeling
Team Leader: Branch

SUMMARY