# *EVOSTC PROJECT REPORT*

***Project Number: ..... 12120111***

***Project Title: ..... Herring Research and Monitoring Program***

***Team Lead Name: ..... W. Scott Pegau***

***Time period covered: ..... February 2012 thru July 2012***

***Date of Report: ..... August 30, 2012***

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

## B. Project Summary

The Herring Research and Monitoring (HRM) program is led by the PWSSC in collaboration with state and federal agencies. Pacific herring (Clupea pallasii) is of particular importance to the Prince William Sound (PWS) ecosystem and economy. The herring population collapsed a few years after the Exxon Valdez oil spill and has not recovered after nearly twenty years, leading the EVOSTC to develop a herring restoration plan that identified the lack of understanding of the factors limiting natural recovery. The goal of the work proposed here is to improve predictive models of herring stocks by combining monitoring components along with process studies to better understand and model the factors important to the recovery of herring. The monitoring components are designed to supplement the work performed by the Alaska Department of Fish and Game, the state agency with management responsibility for herring. The process studies examine assumptions in the existing herring population model and measurements, develop new monitoring approaches, and inform a required synthesis effort.

**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.

This component includes projects associated with coordination and oversight, outreach and community involvement, data management, population dynamics modeling, expanded adult herring surveys, juvenile herring abundance monitoring, herring condition monitoring, juvenile herring condition intensive study, juvenile herring abundance intensive, validation of acoustic survey, tracking seasonal movements, and development of non-lethal sampling techniques.

## C. Summary of Progress and Results

*1) Milestones for the reporting period*

**HRM**

FY12 2nd Quarter

| | |
|---|---|
| February | Begin funding of non-trustee agency projects.<br>Begin juvenile condition intensive<br>Advertise for a graduate student to be associated with the modeling work |
| March | Conduct trial scale processing, finalize scale processing design<br>Obtain samples for fatty acid analysis, end fasting study, complete laboratory histological analysis<br>Get investigators accounts in AOOS Ocean Workbench data management system<br>Prioritize data sets to be recovered and begin identifying data available for modeling |
| April | Set up oversight group |
| May | Conduct annual PI meeting |
| June | Submit FY13 work plan for review |
| June | Collect histology samples (timing depends on results of laboratory study) |
| June | Download acoustic array data, complete sampling for juvenile intensive |
| July | Complete ordering acoustic, Trawl, and ROV equipment |
| August | Submit semi-annual report |

*2) Work completed.*

Much of the effort to date has involved in getting the funding in place and adjusting the timeline within this first six months to reflect the February start date of many of the projects. The non-EVOS trustee component is led by the Prince William Sound Science Center, which established funding through NOAA in February 2012. The subcontracts to Axiom consulting and the University of Washington were sent out once funding to PWSSC was established. Despite the mixed funding start dates most of the projects are on schedule with their deliverables. All projects are new and do not have specific results to share at this time.

*Coordination and logistics* - Pegau
The focus of this component has been in establishing the funding for the non-trustee agency lead components. A small group for external oversight of the HRM program was established, and work with the Trustee Council staff established the reporting requirements for the HRM program.

In addition to coordination efforts the project set up meetings for herring researchers at the Alaska Marine Science Symposium and a principal investigator (PI) meeting with the PWS Herring Survey Program that occurred in April 2012. All investigators attended the PI meeting either in person or through teleconference. Vessel time was obtained to collect the samples needed by the herring condition intensive project. The remotely operated vehicle was ordered for the non-lethal sampling program.

*Outreach* - Butters
All outreach deliverables have been met. The revised herring *Discovery Room* activities focused on fifth grades students that worked on ocean monitoring and connecting the ocean conditions with herring characteristics. This included working with ADFG to allow the students to examine herring scales for growth. They also dissected herring to better understand the organism being studied. Evaluation of the herring portion of the activities is currently underway.

Other outreach activities include the development of *Field Notes* radio programs, creation of three project profiles, articles on herring research and the HRM program published in the *Delta Sound Connections*, an article about engagement with local fishermen in the PWSSC *Breakwater*, and participation in the principal investigator meeting.

*Expanded adult herrring surveys* – Buckhorn
This year's effort is limited to ordering equipment in conjunction with the hydroacoustic validation project. The equipment has not been ordered yet because we want to work with the forage fish component of the LTM program before establishing the exact protocols to be used in the future. We observed the forage fish sampling in July and are ordering equipment that we believe will meet the needs of the program.

*Juvenile herring abundance index* – Buckhorn
The split beam acoustic system was ordered and received. We are waiting to order the trawl winches until the exact net to be used is identified. The focus of efforts has been on establishing the exact locations for the surveys and the survey patterns. Eight bays have been identified (Simpson, Windy, Port Fildago, Eaglek, Lower Herring, both arms of Whale, and Zaikof) for sampling. On this set transect lines will be used to collect fish in conjunction with the validation surveys.

*Population dynamics modeling* – Branch
The focus of effort to date has been in getting a graduate student in place to work on this project. The opportunity was advertised and a student selected. Other work included examining and participating in a discussion of the ASA model currently being used by ADF&G.

*Data management support* – Bochenek
The *Ocean Workbench* has been released and all investigators have gained access to the system. Several training seminars have been held via webinars and the PIs are beginning to use the system to organize and consolidate their project level data. Work continues on the system to provide a tool for investigators to add their metadata along with the data they are housing. Other modifications are underway based on input from the initial users of the system.

The process of identifying important data sets to recover and include in the system is underway. The initial focus is in ensuring the data for the PWS Herring Survey program are captured and archived. Other important data sets are also being identified. The speed of this effort is largely determined by the input from the individual investigators.

This effort is being coordinated with the work planned by the National Center for Ecological Analysis and Synthesis in the LTM program.

*Juvenile herring intensive monitoring* – Kline and Heintz
This project is on schedule. Working with the PWS Herring Survey program it was possible to begin collection of juvenile herring beginning in September. Spatial sampling was conducted in November and March as planned. Very limited numbers of fish were collected outside of the heads of the bay selected (Simpson Bay). Monthly sampling of juvenile herring was conducted through June. Finding fish has been difficult through the spring, but adequate samples have been collected. Laboratory analysis of the fish is just beginning.

*Intensive surveys of juvenile herring* - Buckhorn
The effort in this year is limited to the purchase of new processing software for the acoustic measurements. That software was purchased.

*Validation of acoustic surveys* – Bishop
Personnel were provided for sampling related to the *herring condition intensive* project. To ensure the proposed methods are appropriate for our study area and goals, Megan McKinzie, the project's fisheries biologist, participated in in the EVOS Long-term monitoring 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 RV Alaskan Gyre with other scientists assisting with data collection. This cruise conducted diurnal, concurrent hydroacoustic 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 with the mid-water trawl, the forage fish cruise has provided critical information to determine the appropriate net and mesh size required for herring validation. Our hydroacoustic surveys and trawls will commence November 2012.

*Tracking seasonal movements* – Bishop
Our first tagging effort took place from 18-22 November 2011 in conjunction with the Alaska

Department of Fish and Game (ADFG) herring bait surveys. We chartered the MV Alaganik as our tagging laboratory and the MV Cape Fear as the fish transport boat. Field work was conducted in Port Gravina every day except 10 November, when seining by ADFG took place at Simpson Bay. Field efforts by ADFG to purse seine were stymied by poor weather conditions (exceptionally cold, or high winds), whales in and around herring schools, and herring schools remaining deeper than the seine. Three purse seines attempts captured fish, including one with juveniles (ages 0+ and 1+) at Simpson Bay that were immediately released by ADFG. In Port Gravina, ADFG's first successful purse seine catch was very small, and all captured herring were terminally sampled by ADFG and USGS for herring disease.

ADFG's final set in the early morning of 22 November (around 0 130h) was successful. We took a sample of approximately 70 fish, and of those subsampled 20 herring for tagging. Fish ranged in age from 2.5 to 3+, and were smaller than our pre-determined size restriction for tagging and release. Of the 20 herring sampled, only 5 were deemed potentially large enough to have tags inserted (FL >180 mm ), and we randomly selected 3 of these fish for tagging. Of the remaining 17 fish, 10 fish were treated as controls for the surgical procedure, and seven fish had surgery (incision and sutures, but no tags). In all 18 surviving fish including two with tags, were held for behavioral observations in the recovery tank for 24 hours before being sacrificed.

Our second tagging cruise took place from 8-11 April 2012. Our goal was to tag fish post-spawn in the vicinity of the Port Gravina acoustic array however herring did not spawn in Port Gravina until 13 April, two days after our departure. During our cruise, we practiced surgery techniques on pre-spawned fish on 9 April (n = 21) and 10 April (n = 16), inserting dummy tags in 8 fish (9 April) and 3 fish (10 April). Fish were held in aerated tanks for 12-24 hours and then sacrificed.

On 11 April, a total of 25 adult herring were jigged, and held in an aerated tank before and after being surgically implanted with coded transmitters (Vemco, V9-2x, 69 KHz). Most of these herring had not yet spawned. All individuals were successfully tagged and released into Port Gravina north of the POST array in 25 m of water on 11 April at 1600h. Detection patterns on 2 of the 25 tagged fish indicated post-tagging mortality. The remaining 23 fish were detected multiple times for up to 4 days post-tagging. No herring were detected after 15 April 2012. All detections occurred at receiver VR2-2 near the Hell's Hole area. We were unable to recover an adjacent receiver (#VR2-3), which may contain additional detections. The initial tagging was deemed a success, therefore; additional adult Pacific herring will be tagged at overwintering areas in November 2012 and again at Port Gravina during spawning in 2013.

*Non-lethal sampling* - Pegau, Boswell
Work on this project was limited to the purchase of a remotely operated vehicle (ROV) for use by PWSSC and FIU. The ROV is on order and we are expecting delivery in fall 2012.

*Age at first spawn* – Heintz
There were some delays in getting the project operating, but it is mostly on schedule now. The live herring were collected and laboratory studies completed. The histological sampling was completed in June. The delay in getting the histological work started was associated with the delay in funding becoming available.

*Fatty acid analysis* - Heintz
This project was heavily dependent on fish collected as part of the spatial sampling for the previous project. Due to limited fish collected during the spatial sampling the project is using fish collected during previous efforts.

The laboratory component of this research has progressed further. The collection and laboratory trials are currently underway and the experimental phase is completed. The chemical analysis of the samples is expected to be completed as scheduled.

*Scales as growth history records* – Moffitt
This project is slightly behind schedule due to a late start in funding. The equipment needed has been ordered and delivered. A technician has been hired to conduct the work starting in September. The trial processing and finalizing processing design will occur once all equipment and the technician have arrived.

*Disease monitoring and research* – Hershberger
No activities were scheduled under the HRM program this year.

*Herring condition monitoring* – Kline, Heintz
No activities were scheduled under the HRM program this year.

*Herring genetics* - Guyon
No activities were scheduled under the HRM program this year.

3) *If there were changes to the project objectives or tasks during the reporting period, detail the circumstance and nature of each change.*

No changes in objectives or tasks occurred.

5) *Describe results and/or specific products (e.g., publications, data, technology, web site updates) prepared during the reporting period. Attach copies of publications or research products completed during the period.*

No products were developed during this period. Since this is the first six months of the program we were not expecting products to be developed yet.

## D. Problems

1) *Explain circumstances or problems that prevented completion of any one or more of the project objectives or tasks. Please provide a separate response for each objective or task not completed.*

We are behind in ordering of some equipment. We decided to participate with other investigators efforts to identify if and how we can best use similar protocols between

components. This delayed the ordering of sampling nets and equipment until after July 31st.

Delays in funding and hiring at ADF&G made it so the person dedicated to the scale analysis wasn't available as soon as planned.

Low numbers of fish caught in the portion of the juvenile intensive that focused on the spatial distribution is limiting the ability to achieve some of the objectives of the Fatty Acid research.

2) *Describe what actions will be taken to resolve the above problem(s) for each project objective or task not completed. Please provide a separate response for each objective or task.*

The equipment has been identified and is expected to be ordered by the middle of September.

The ADF&G person has been hired and the project is expected to get back on schedule in the next six months.

We are sorting through the existing samples to determine if we have the ones needed to meet the objectives of the research. If we don't, we will look to do some additional sampling to meet those objectives.

3) *Explain any significant differences between budgeted and actual expenditures and/or line item transfers.*

There haven't been significant differences between budgeted and expenditures.