

EVOSTC GULF WATCH ALASKA SEMI-ANNUAL PROGRESS REPORT

Project Number: 12120114 and 12120120

***Project Title: Long-term Monitoring of Marine Conditions
and Injured Resources and Services***

Team Lead Name: Molly McCammon

Time period covered: October 2011 thru August 2012

Date of Report: August 31, 2012

***Report prepared by: Katrina Hoffman, Molly McCammon
and Kris Holderied***

Project website (if applicable): <http://www.aos.org/EVOS-LTM/>

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.

WORK PERFORMED

The overarching goal of the long-term monitoring (LTM) program is to provide sound scientific data and products that inform management agencies and the public of changes in the environment and the impacts of these changes on *Exxon Valdez* oil spill (EVOS) injured resources and services. To accomplish this goal we are conducting a five-year ecosystem monitoring program in the spill-affected region, which is anticipated to be the beginning of a twenty year effort. The program includes: 1) four monitoring components (environmental drivers, benthic, pelagic, lingering oil); 2) data management services; 3) integrated syntheses of our monitoring program data; 4) data recovery and syntheses of historical data; and 5) science outreach. The long-term monitoring program has six main objectives.

- Sustain and build upon existing time series in Prince William Sound, lower Cook Inlet and adjacent Gulf of Alaska coast.
- Provide scientific data, data products and outreach to management agencies and a wide variety of users.
- Develop improved monitoring for certain species and ecosystems.
- Develop science synthesis products to assist management actions, inform the public and guide the evolution of monitoring priorities for the next 20 years.
- Enhance connections between and integration of monitoring projects and between the LTM and Herring Research and Monitoring (HRM) program.
- Leverage partnerships with outside agencies and groups to integrate data from a broader monitoring effort than that funded by the Trustee Council.

All projects are listed below, as well as the organizations involved for each one. The LTM program is composed of integrated program management, data services, science synthesis, and outreach efforts (five projects), as well as the 14 ecosystem monitoring projects. Most projects will occur every year, with a note provided below for those projects that will not occur every year.

- A. Integrated program management, data services, outreach and science synthesis
 - 1. A. Program coordination and logistics – Prince William Sound Science Center (PWSSC) and Alaska Ocean Observing System (AOOS)
 - 1.B. Outreach - AOOS
 - 2. Data management –AOOS/Axiom Consulting
 - 3. Historical data management and synthesis – National Center for Ecological Assessment and Synthesis (NCEAS) – EVOS TC Project# 12120120
 - 4. Science coordination and synthesis – NOAA Kasitsna Bay Laboratory (KBL)
 - 5. Conceptual ecological modeling– Alaska Sea Life Center (ASLC)

- B. Environmental drivers monitoring component
 - 6. Gulf of Alaska mooring (GAK1) monitoring – University of Alaska Fairbanks (UAF)
 - 7. Seward line monitoring – UAF
 - 8. Oceanographic conditions in Prince William Sound – PWSSC
 - 9. Oceanographic monitoring in Cook Inlet – Alaska Department of Fish and Game (ADFG) / Kachemak Bay Research Reserve (KBRR)/ KBL
 - 10. Continuous plankton recorder –Sir Alister Hardy Foundation for Ocean Science (SAHFOS)

- C. Pelagic monitoring component
 - 11. Ability to detect trends in nearshore marine birds – USNPS Southwest Alaska inventory and monitoring Network (SWAN) – year 1 (no year 2 funding)
 - 12. Long-term killer whale monitoring – North Gulf Oceanic Society (NGOS)
 - 13. Humpback whale predation on herring – NOAA National Marine Fisheries Service (NMFS) Auke Bay Laboratory
 - 14. Forage fish distribution and abundance – U. S. Geological Survey (USGS) Alaska Science Center
 - 15. Prince William Sound marine bird surveys – U.S. Fish and Wildlife Service (USFWS)

- D. Benthic monitoring component
 - 16. Nearshore benthic systems in the Gulf of Alaska – USGS Alaska Science Center/ USNPS SWAN, Coastal Resources Associates
 - 17. Ecological Communities in Kachemak Bay – UAF

E. Lingering oil component

18. EVOS oil exposure of harlequin ducks and sea otters – USGS Alaska Science Center

19. Oil level and weathering tracking – NOAA/NMFS Auke Bay Laboratory

The fiscal year for the overall program, as determined by the *Exxon Valdez* Oil Spill Trustee Council (EVOSTC), runs from February 1 to January 31 each year. Many agencies have a fiscal year that runs from October 1 to September 30. The Program Management Team and principal investigators are working to accommodate differences in budget years and align with the EVOSTC budget year dates.

PROGRESS TO DATE

A substantial part of the efforts in the beginning of Year 1 were to get the funding in place for the overall program and the individual projects. The date that funding began has differed between the trustee agency participants and the non-trustee agency participants. The non-trustee agency component is led by the Prince William Sound Science Center (PWSSC), which established a cooperative agreement with NOAA in March 2012. The subawards to the Alaska Ocean Observing System (AOOS), Axiom Consulting (Axiom), National Center for Ecological Assessment and Synthesis (NCEAS), University of Alaska Fairbanks (UAF), Alaska Sea Life Center (ASLC), Sir Alister Hardy Foundation for Ocean Science (SAHFOS), and North Gulf Oceanic Society (NGOS) were established once the NOAA agreement with the PWSSC was finalized. Administrative differences among institutions led to varied contract execution dates. EVOSTC funding for Trustee agencies was received at different times, from approximately December 2011 to April 2012. Despite the variable funding start and contract execution dates, most of the projects are on schedule with their milestones, and year 2 activities and budgets are not expected to be impacted.

As described in detail below, sampling and acquisition of new equipment, where needed, has started as scheduled for most of the monitoring projects. The hiring of a science coordinator by NOAA under the Science Coordination and Synthesis Project (#3) has been delayed since funding for the contract personnel hiring action was not available until late May 2012. There has been coordination on how to most effectively integrate the data management and historical data recovery and synthesis efforts of AOOS/Axiom and NCEAS, with details provided below. Within the pelagic monitoring component, we requested approval to replace the PI for the Prince William Sound marine bird survey project (David Irons) with Kathy Kuletz from the same USFWS office, due to his expected retirement during year 2 of our program.

1. Integrated program management, data services, science synthesis & outreach (Leads – McCammon, Holderied and Hoffman)

Program Coordination and Logistics—Katrina Hoffman (replacing Nancy Bird as Administrative Lead, Prince William Sound Science Center)

The program administrative lead established the funding contracts for the non-trustee agency principal investigators (PIs). This involved revising the proposal in the format needed for submission to NOAA for the establishment of a cooperative agreement. The

Program Management Team has met regularly and coordinated with investigators, Trustee Council staff and NOAA contract officers. We established the reporting requirements and developed a Program Management Plan for the LTM program. The LTM Program Management Plan was finalized in May 2012 and all Program PIs are expected to sign and follow it. In addition, all PIs are expected to post copies of their sampling protocols to the Program administrative website.

An LTM PI meeting was held at the January 2012 Alaska Marine Science Symposium in anticipation of the program launch. Most PIs attended in person. A second PI meeting was hosted by teleconference on May 22, 2012 to check in on year 1 progress and address year 2 planning and other issues. The Program Management Team convened a data management and synthesis and modeling coordination meeting on June 6th, 2012 that included data management, synthesis and modeling PIs, the Program Management Team, ecosystem component leads (Rice, Ballachey, Hopcroft) and the HRM Program Lead (Pegau). A PI teleconference has been scheduled for October 4th, 2012, to be followed by a full PI meeting on November 29th and 30th, 2012.

Hoffman has regularly attended and contributed to Gulf Watch Alaska Outreach Team meetings and will assist with program representation at the first public outreach event, Ocean Fest, to be held in Cordova and Valdez on September 15th and 21st, respectively. She coordinated the submission of Year 2 work plans, budgets and a courtesy progress update in June 2012 and this semi-annual report, due September 1st, 2012.

Outreach and Community Involvement - McCammon (AOOS)

Project title: Outreach and Community Involvement

The Outreach and Community Involvement Steering Committee was formed and has met five times. The Committee includes key outreach staff from AOOS, the PWS Science Center (PWSSC), Kachemak Bay Research Reserve, Alaska Sealife, Center, North Pacific Research Board, COSEE Alaska, NOAA and USGS. AOOS staff developed a basic project website to use until a more sophisticated site can be developed: www.aos.org/evos-ltm/. AOOS and PWSSC staff also prepared materials for a 2-page insert included in the summer 2012 Delta Connections newspaper that is printed and circulated by the PWSSC throughout PWS. The Committee identified the primary tasks to be accomplished in the first half of Year 1. These include development of a basic suite of outreach materials for the program: website, logo, powerpoint and poster templates, pop-up displays, brochures, project profiles, etc. The Committee agreed that AOOS would oversee a contract for development of these materials, with the committee reviewing content. Those materials are currently under development with the first suite of products expected in mid-September. The Committee has also adopted a shorter name for the program for branding purposes: *Gulf Watch Alaska, The Long-term Monitoring program of the Exxon Valdez Oil Spill Trustee Council*. The EVOSTC Public Advisory Committee was briefed on these activities at their meeting in July.

Data Management - McCammon/Bochenek (AOOS/Axiom)

Project title: EVOS LTM Program Data Management

During the first six months of the EVOS Long Term Monitoring (LTM) Program Data Management project investigators have focused on establishing protocols for data transfer, metadata requirements and initiating the data salvage effort. Investigators have met via

WebEx weekly with Matt Jones and other NCEAS staff to coordinate activities. PIs participated in several PI meetings and are coordinating activities between the Herring and LTM programs. In addition, the AOS Ocean Workspace has been rolled out to PIs and their user and group profiles created. Several training seminars were held via webinars, and PIs are beginning to use the system to organize and consolidate their project level data. AOS software engineers have also been supporting the Workspace by resolving bugs and implementing new functionality in response to user feedback. They are now working to deploy functionality that will allow program PIs to author metadata documents through the Workspace user interface in addition to tagging projects with keywords to allow filtering and organization. The data salvage effort has begun in collaboration with NCEAS staff.

Historical data management and synthesis – Jones (NCEAS)

Project title: Collaborative Data Management and Holistic Synthesis of Impacts and Recovery Status Associated with the Exxon Valdez Oil Spill

Project work is proceeding on schedule on both the historical data salvage effort and the design of data management tools for the project. Work on this project was started in June 2012 with the hire of Sarah Clark as the project's Data Coordinator and in July 2012 with the beginning of design activities between NCEAS and Axiom. We will be hiring 2 students to assist in the historic data salvage efforts starting in September, and an engineer will start work in September. NCEAS and Axiom project participants meet roughly weekly on Tuesdays for status updates, to address barriers, and for design discussions.

We have completed all milestones for the year 1 first and second quarters. M. Jones attended the kickoff LTM PI meeting in Anchorage, M. Jones and R. Bochenek began a series of design discussions to plan research data management infrastructure for the project (meeting roughly every other week on Tuesdays by video conference since last fall), and M. Jones and R. Bochenek planned and created several project management tools, including shared mailing lists, web sites, publication sharing sites, and issue tracking sites. Tracking of data set collation is occurring through a ticketing system used to keep track of all project activities¹.

Notable progress has included the creation of a historic data manifest² listing all EVOSTC-funded projects and some of the data sets associated with those projects. Salvaging efforts have uncovered 386 relevant research projects funded by the Exxon Valdez Oil Spill Trustee Council since 1989, covering various time spans, and within these projects 176 potential data sets have currently been identified; many more will be identified as we contact investigators. Twenty Primary Investigators have been contacted regarding their projects and five of those contacted have provided data (Dennis Lees, Brenda Ballachey, Scott Pegau, Mark Carls and Gary Marty). The large number of projects, and the long-time period since many were funded, will prevent us from salvaging all of the EVOSTC data, so we have started a prioritization activity to determine what the high priority data sets are to

¹ <https://projects.nceas.ucsb.edu/evos/projects/lrm-hrm/issues>

² https://docs.google.com/spreadsheet/ccc?key=0Aj_fajgYv6y6dGhlykEyamp5Xzk1WFBIVk9vZU93cVE#gid=16

salvage. We have contacted LTM steering committee members via email to discuss priorities, but thus far have only gotten feedback from B. Ballachey. Based on this, our current priorities for the first pass are to focus on 1) data that constitute a long time series and so are valuable from a historical perspective, 2) data that are at risk of loss due to retirement or other factors, and 3) data that are easily accessible. One major challenge that we are experiencing (and was expected) is lack of response from contacted investigators, and resistance from those that we do reach to devoting time (in most cases, uncompensated) to providing historical data .

Design work on the use of DataONE infrastructure to link various AOS providers and to provide for off-site data replication for preservation has begun, resulting in a design to create a DataONE Member Node interface for the AOS Ocean Workspace. Implementation on this component will begin in September.

Science Coordination and Synthesis – Holderied (NOAA KBL)

Project title: Science Coordination and Synthesis for the Long Term Monitoring Program

The program science lead (Holderied) met routinely with the long-term monitoring (LTM) program management team for overall program planning and coordination. A principal investigator (PI) meeting for the LTM program was held in Anchorage in November 2011, with a second, shorter meeting held with PIs, NOAA contract staff and EVOS Trustee Council staff at the Alaska Marine Science Symposium in January 2012. A third PI meeting was held via teleconference in May 2012, during which PIs approved a final Program Management Plan which they all are required to sign. All investigators attended the PI meetings either in person or through teleconference. PI meeting agendas, summaries and other materials are posted on the LTM Program website. The LTM Program's Science Coordinating Committee has met via teleconference on several occasions, in addition to the PI meetings, to plan PI meetings, develop the LTM Program Management Plan, provide input on data management services and historical data synthesis, and identify potential members for the LTM Science Technical Oversight Committee.

The contract for a science coordinator position has been established under a Blanket Purchase Agreement (BPA) between JHT, Inc. and NOAA's National Centers for Coastal Ocean Science. Candidates are being reviewed, with a start date expected between September 2012 and January 2013. To ensure consistency in the monitoring program over time, the PIs have prepared written sampling protocols for each monitoring project and the protocols are available to all program PIs via the Ocean Workspace. Planning for science synthesis is being coordinated with the data management team (AOS-Axiom), the historical data synthesis team (NCEAS) and the conceptual ecological modeling group (Hollmen), in preparation for the November PI meeting.

One early benefit of the integrated monitoring program has been to increase collaboration between the PIs of different monitoring projects. For example, PIs with the Prince William Sound (PWS)/Gulf of Alaska (Ballachey) and Kachemak Bay (Konar/Iken) benthic monitoring projects have closely coordinated to develop comparable nearshore monitoring protocols. One of the Kachemak Bay project PIs (Doroff) was able to participate in benthic

monitoring fieldwork with the PWS group. A USFWS seabird observer was able to participate in the July Cook Inlet oceanography survey (Doroff/Holderied). Plankton sampling protocols have been closely coordinated between the PWS (Campbell) and Cook Inlet (Doroff/Holderied) oceanographic monitoring projects and zooplankton analysis for the Cook Inlet project is being conducted by Campbell's group. Such collaborations help the integrated team to compare monitoring results between different regions and leverage other agency efforts to collect additional data beyond that funded directly by the EVOS Trustee Council under the long-term monitoring program.

Conceptual Ecological Modeling – Hollmen (ASLC)

Project title: Conceptual Ecological Modeling

The PI attended the project PI meeting in November 2011 and participated in additional conference calls to coordinate modeling efforts. Contracts were in place on April 13, 2012, and the core modeling team involving a part-time postdoctoral researcher is being established. Literature review and compilation of previous conceptual modeling efforts in the Gulf of Alaska are underway. The development of draft conceptual models has begun and review of data and information from existing projects by program PIs is in progress to develop a draft framework for the November PI meeting. The development of data visualization tools also has started, and a 3d landscape rendering software that will be used to create a likeness of the Gulf of Alaska and the ecological linkages of the research therein has been acquired.

2. Environmental Drivers Monitoring Component (lead – Weingartner & Hopcroft)

Gulf of Alaska mooring (GAK1) monitoring – Weingartner (UAF)

Project title: Long-term Monitoring of Oceanographic Conditions in the Alaska Coastal Current from Hydrographic Station GAK 1.

We have successfully recovered and re-deployed the GAK 1 mooring in March 2012. We are working up the data recovered from that mooring and have added some of it to a paper that we recently submitted to the Journal of Geophysical Research for peer-review. The title of that paper is: Air-sea and oceanic heat flux contributions to the heat budget of the northern Gulf of Alaska shelf, by Markus A. Janout, Thomas J. Weingartner, and Phyllis J. Staben.

Seward line monitoring – Hopcroft (UAF)

Project title: The Seward Line: Marine Ecosystem monitoring in the Northern Gulf of Alaska.

Cruises are executed early each May and in mid-September collecting data or samples to address all planned objectives each cruise. Products associated with each objective are subsequently posted graphically to the project's website (<http://www.sfos.uaf.edu/sewardline/>) at various intervals reflecting the degree of post-processing required. Final datasets are released annually.

The May 2012 cruise was successfully conducted. All sampling objectives were accomplished except that a series of storms prevented multinet collections at GAK3 & GAK4, and zooplankton growth experiments were not conducted. Data analysis remains underway with plans firmly in place for the September cruise. A graduate student has begun working on the project in conjunction with NPRB's Gulf of Alaska project.

Oceanographic conditions in Prince William Sound – Campbell (PWSSC)

Project title: Long term monitoring of oceanographic conditions in Prince William Sound

Year 1 of this project is largely a development year, with field activities covered under an ongoing EVOSTC project that is part of the PWS Herring Survey. Most of the equipment to be purchased has arrived. An Agilent 7100 Capillary Electrophoresis unit has been purchased and is operational; development of the protocols for the analysis of macronutrients is ongoing. The WETLabs Autonomous Moored Profiler (AMP) arrived the week of July 16th, and is expected to be deployed in September, which is the earliest that WETLabs staff were available to travel to Cordova to complete onsite assembly. The development of the AMP has taken longer than expected; it is a semi-custom system and required extensive testing before deployment in a remote region. Zooplankton samples from the first Lower Cook Inlet cruise (conducted in May) arrived in late June. Analysis of the samples is complete and the database forwarded to Angela Doroff at the Kachemak Bay Research Reserve.

Oceanographic monitoring in Cook Inlet – Doroff (ADFG KBRR) and Holderied (NOAA KBL)

Project title: Long-term monitoring of oceanographic conditions in Cook Inlet/Kachemak Bay to understand recovery and restoration of injured near-shore species

We conducted monthly CTD and plankton sampling along the Homer Spit Transect (#9, see figure) from April-July 2012. We completed seasonal CTD and plankton sampling of lower Cook Inlet/outer Kachemak Bay transects (#3, 4, 6, & 7) in early May and late July 2012. High sea state conditions in Cook Inlet in May and July 2012 reduced the number of CTD stations we were able to sample along Transect 7, but we do not expect these data gaps to adversely affect our analysis. Zooplankton sample volume was lower than expected in May due to the equipment we had available to conduct the sampling. In June we purchased a bongo-style net and mechanical flow-meter to standardize protocols with those used by the Prince William Sound Science Center (PWSSC) EVOSTC-funded project. Zooplankton samples from May and June sampling (#9, 3, 4, 6 & 7) were analyzed by Dr. Rob Campbell at PWSSC. The remaining zooplankton samples will be shipped to PWSSC for analysis during the next reporting period. In July, we were able to accommodate a seabird biologist from the At Sea Seabird Monitoring Program (funded by Dr. Kathy Kuletz, USFWS) during our lower Cook Inlet/outer Kachemak Bay sampling; this worked very well. We have secured ship charter services for the next two lower Cook Inlet surveys and hope to accommodate a seabird biologist on these upcoming cruises. Database structure and delivery are being coordinated with the Alaska Ocean Observing System (AOOS) data management team.

Leveraging funds among this grant and two existing ongoing studies at Kachemak Bay Research Reserve, we purchased a moored buoy system and deployed a YSI data sonde to monitor water quality in Bear Cove. In June, the system was deployed and is now operational. Monthly instrument calibration and nutrient sampling will occur throughout the ice-free months. The system is to be telemetered in the near future so that researchers, managers, and local oyster farmers will have unlimited access to the water quality data. We are working with the AOOS data management team to make the data available through their web-based portal.

Additional project leveraging:

1. NOAA Kasitsna Bay Lab Kachemak Bay oceanography project: Kasitsna Bay Lab is leveraging funding from AOOS (NOAA's Integrated Ocean Observing System,-Alaska) to collect additional oceanography and ocean acidification data. At the lower Cook Inlet plankton stations, we also collected water samples for ocean acidification analysis. Kasitsna Bay Lab contributed staff, boat and boat charter time to conduct additional surveys along Kachemak Bay transects (#4, 9) during high and low tide cycles to assess spatial variability in oceanography and plankton. These data are still being processed.
2. Kachemak Bay Research Reserve leveraged additional funding from the State of Alaska's Wildlife Grant program (monitoring for marine invasive species and harmful algal blooms in Kachemak Bay) and programmatic support from the National Estuarine Reserve System to purchase and deploy chlorophyll probes for continuous monitoring of chlorophyll-a at all surface stations as part of the KBRR System-Wide Monitoring Program (SWMP). These partnerships also contributed to financing the water quality monitoring buoy in Bear Cove.

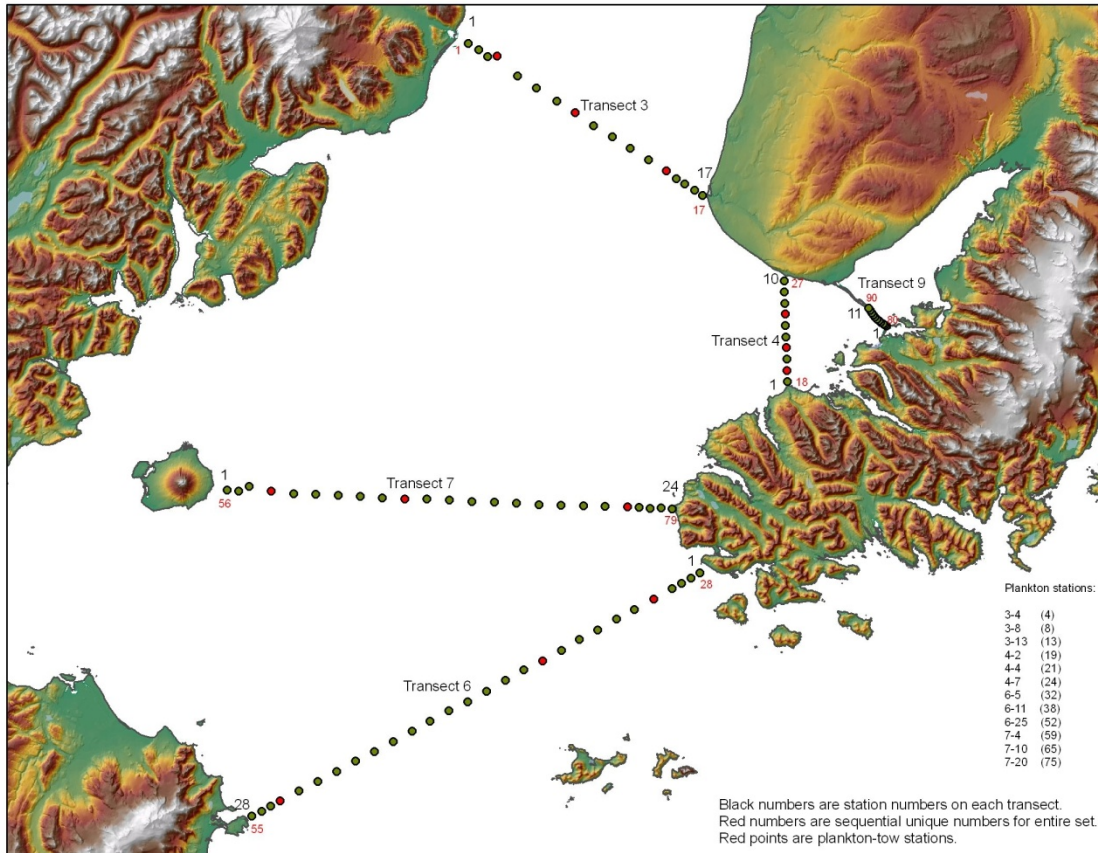


Figure 1. Lower Cook Inlet oceanographic sampling transect locations.

Continuous plankton recorder – Batten (SAHFOS)

Project title: Continuous Plankton Recorder sampling

Note: in FY 2011/12 funding has been provided under EVOSTC project 10100624, not the LTM project.

As described above, although not funded by the LTM project in 2012, CPR sampling is being maintained under a previous EVOSTC contract and data from 2012 will be available for the LTM project and participants. Sampling for 2012 commenced in April with 4 of the 6 scheduled transects completed to date: April 7-10, May 10-13, June 9-12 and July 12-14. The remaining transects are scheduled for mid-August and mid-September. Provisional data from the first two transects is currently available (a sub-set of samples has been processed though quality control has to wait until all samples have been processed) and samples from the 3rd and 4th transects are currently being processed. Data is too preliminary for a thorough analysis, but no surprises have been found so far. Underway temperature data was also collected on each transects and is available.

Late last week the CPR was lost from the Horizon Kodiak mid-way along its tow. The crew photographed the remaining tow wire and the best guess from our technicians is that it hit debris that was below the surface, something like a submerged container that's neutrally

buoyant at about 5m, and which sheared the towing cable. The first of the 3 cassettes had been towed and was on board (the leg closest to Tacoma) but the tow body with the second cassette and temperature logger was lost. And of course the third leg into Cook Inlet could not be towed as the tow body was lost. SAHFOS is dispatching a replacement tow body (hopefully with a spare temperature logger too), tow wire and another cassette. It should arrive before the end of the month, freighters willing, and we will re-tow the transect hopefully on the next north-bound leg, 31st Aug-4th September. The final transect will then be in early October. We will achieve the full set of tows this year (unless the ship sinks next time or some other catastrophe intervenes.....) but there will be a longer gap than normal between the mid-July tow and the next one, and we'll tow a little later in the year to complete the set.

3. Pelagic Monitoring Component (lead – Rice)

Ability to detect trends in nearshore marine birds – Coletti (USNPS SWAN)

Collaborators: David Irons, James Bodkin, Brenda Ballachey, Tom Dean

Project title: Data synthesis, analysis and recommendations for sampling frequency and intensity of nearshore marine bird surveys to detect trends utilizing existing data from the Prince William Sound, Katmai and Kenai Fjords coastlines.

Year 1 primarily dealt with developing the project as a “request for proposals” through contracting. Several alternative approaches for data synthesis and analysis have been identified and available survey data for Katmai and Kenai Fjords has been compiled (collected over the period 2006– 2012). Available data for this type of analysis is still being identified and compiled for Prince William Sound. In mid-September we will meet with subject matter experts to refine approaches and finalize the proposal for the bid process. In the original planning process, the subject matter experts meeting was to take place in June 2012, allowing for the proposal to go out to bid in late June or early July, but because the meeting has been delayed, we decided it best to carry over the funds into the next federal fiscal year. It is our intent to put a proposal out for bid and allocate the funds by the end of December 2012, and that work will be completed by September 30, 2013 (Year2 of the project).

Long-term killer whale monitoring – Matkin (NGOS)

Project title: Long-term killer whale monitoring in Prince William Sound/ Kenai Fjords

Field work that began on May 24, 2012 is on schedule. As of July 31, we have spent a total of 23 days in the field and recorded 17 encounters with killer whales, 13 with residents, 3 with transients, and 1 with offshores. Of these resident pods we have photo-documented all of AJ pod (54 whales) and AB25 pod (18 whales) which are key groups in the monitoring program. We have not encountered AB pod, but expect to later in the season. We have also completely photo-documented the AD8, AD11, and AD16, AK2 and AE pods. The remaining seven AT1 transients have also been photographed; no births and no deaths in that group. We had a problem in the programming of our new time depth tags and could not deploy any on the last trip, but that has been remedied and they will be available on the next trip (in August). We did place one location only tag this season on an offshore whale. Most of our

tagging effort is planned for our late trip (October) to examine late fall and winter movements. Biopsy samples were taken from five AJ pod males with the aim of resampling these individuals on our last trip (October) to examine changes in fatty acid/lipids in blubber that should be reflective of observed changes in feeding habits over the course of the season. Our next scheduled 10 day trip begins on 6 August.

Note: The only funds coming from the FY2012 LTM will be for satellite tags and fuel to be used later in our season.

Humpback whale predation on herring—Moran (NOAA) and Straley (UAS)
Project title: Long-term monitoring of humpback whale predation on Pacific herring in Prince William Sound

The following activities were completed:

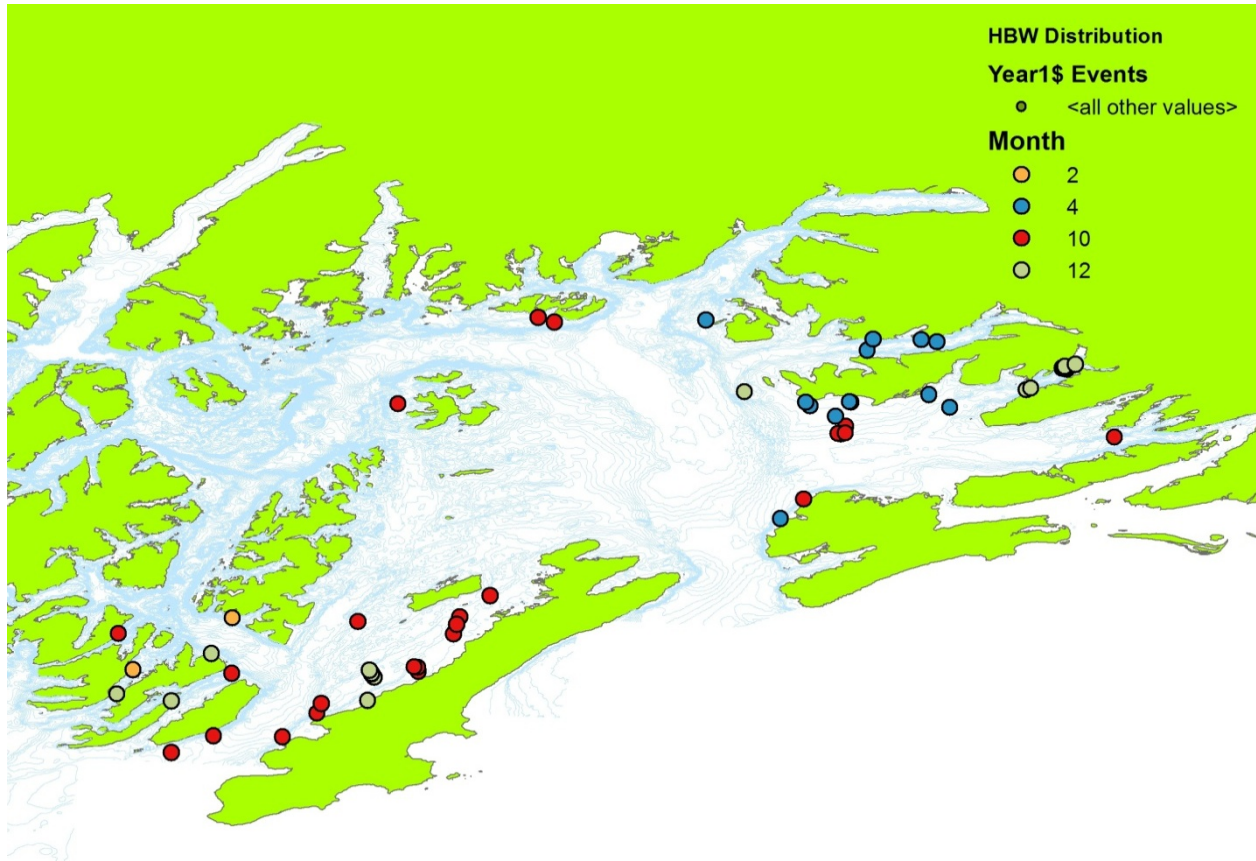
1. Straley finally received EVOSLTM funding through NOAA in late June. Processing has begun for data collected during the previous fall and winter.
2. Straley and Moran were invited to Honolulu by the West Pacific Fisheries Management Council to provide information on humpback whale predation in Alaska. Straley presented to the Council's Advisory Panel in May and Moran gave presentations to the Advisory Panel, Council, and the Fishers Forum (public) in June.
3. The collaboration with Auke Bay Lab Ocean Acidification program will continue and a joint survey is scheduled for mid-August.
4. Charters have been secured for the upcoming field season (October, December, and April). We do not anticipate any changes to the schedule or budget.

Between October 2011 and April 2012, we completed two humpback whale surveys of PWS (October 2011, December 2011) prior to initiation of the project so we would not lose a year of data, when the highest winter abundance of whales were present. On year 1 funding, we completed two surveys so far (Feb and April), with two more scheduled later in the year (Oct and Dec). The February 2012 trip was cut short due to weather. An additional partial (4 day) survey of the herring spawning grounds was completed in mid-April by combining the remaining days from the February survey with an Auke Bay Laboratory ocean acidification water sampling cruise. This allowed us to evaluate whale predation on herring staging for spawning.

Although poor weather dominated the first three surveys, we saw a pattern in humpback whale distribution and diet similar to previous years. Counts of whales were lower than previous years, likely the result of poor conditions. We have not made an abundance estimate for this field season, so comparisons between years cannot be made at this time. Raw counts of humpback whales for the first three surveys were: 61 in Oct 2011, 38 in Dec and 3 in Feb 2012.

During our first whale survey during herring spawning we made three noteworthy observations. (1) 29 humpback whales associated with spawning herring; (2) A gray whale feeding on herring spawn or herring at Hell's Hole. A single gray had been reported in

previous years and efforts will be made to determine if this is the same animal. Similar behavior from gray whales has been reported in Sitka Sound. (3)The observation of over 150 harbor porpoises off Knowles Head associated with spawning herring. This species was infrequently encountered as singles or in pairs in our previous 11 whale surveys in PWS.



Humpback whale distribution by month from Year 1 of the EVOS-LTM. (2= Feb 2012, 4=April 2012, 10=Oct 2011, 12= Dec2011)

Coordination: We have provided killer whale photos to Craig Matkin from each survey. Bobby Hsu from the PWSSC was present on the Oct, Dec, and Feb surveys as a seabird observer. We provided brand resights and haulout photos of northern sea lions to ADF&G.

Forage fish distribution and abundance – USGS Alaska Science Center
Project title: Detecting long-term changes in forage fish populations in Prince William Sound

We attended PI planning meetings in November 2011 and January 2012. Most of our effort during the winter was to complete our first objective in the original study proposal: to identify robust indices for detecting change in forage fish populations over time and devise a sampling strategy for long-term monitoring of those indices. This work included meetings with fisheries scientists and statisticians familiar with past and current monitoring efforts, the target species, and/or the study area (we contacted a total of 19 different individuals).

We also met with EVOS PWS herring assessment and NPRB Gulf of Alaska Integrated Ecosystem Program scientists. During spring we completed a study plan for monitoring long-term changes of forage fish. This included a design for systematic hydroacoustic surveys coupled with mid-water trawls and collection of ancillary environmental data throughout Prince William Sound. The overall design is based on theoretical concepts of hydroacoustic-trawl monitoring for fisheries research (Simmonds and MacLennan 2005), practical guidance for operating procedures of acoustic surveys (Parker-Stetter et al. 2009) and considerable experience conducting forage fish surveys in coastal Alaska (Piatt 2002; Robards et al. 1999; Abookire & Piatt 2005; Arimitsu et al. 2012).

We have just completed our pilot study in the first field season of 2012, with a focus on testing our design to ensure that our methods are appropriate for achieving the statistical objectives of monitoring long-term population changes. Preliminary results suggest that our overall survey methods are sound, however we will implement some changes during the next field season. Our new Simrad hydroacoustic system (EK60, split beam dual frequency) functioned well, and the mid-water trawl and new net-monitoring system also performed well, but we may need to modify the sampling protocol to include more shallow, coastal habitat in 2013. Although the majority of habitat available for sampling in Prince William Sound is deep, offshore water, we found little forage during July in this zone besides juvenile walleye pollock and saffron cod. We may also implement new tools for ground-truthing acoustic backscatter in untrawlable areas (i.e., near the seafloor) and surface sampling. In the fjords during July, trawl catches contained euphausiids, capelin, eulachon, and juvenile and adult Pacific herring. Beach seine catches consisted primarily of juvenile saffron cod and Pacific cod, and relatively fewer young of the year lingcod and other greenlings also occurred frequently. We collected Pacific sand lance of varying size classes near Glacier Island and Naked Island. Based on historical studies and similar work elsewhere, we anticipated higher and more diverse catches in trawl and seine sets, but a more thorough analysis of results during fall 2012 will reveal whether our results were unusual. Following that, we will re-evaluate our sample design and decide whether to modify sampling protocols or methods of fish collection.

Prince William Sound marine bird surveys – Irons/Kuletz (USFWS Alaska Region)
Project title: Continuing the Legacy: Prince William Sound Marine Bird Population Trends.

We have just completed our three week survey of marine birds in PWS in July. We hired a project leader and 8 other observers to conduct the fieldwork. The boats were taken out of storage and prepared for the survey. Contracts were put into place for fuel and housing. This summer the weather was more like winter weather and we had several weather days, with the survey taking about five days longer than planned. However we completed the survey successfully. One interesting sighting we had this year was that about 10 Kittlitz's Murrelets were observed near Cordova. This is somewhat unusual because the majority of these birds are associated with tidewater glaciers in PWS. In general the crew thought that the number of birds this summer seemed low, but we will have the real answer after the data are analyzed this fall. We also had several equipment breakdowns this summer requiring days of repair to our aging fleet of Boston Whalers.

Seabird abundance in fall and winter – Bishop (PWSSC)

Project Title: Long-term monitoring of seabird abundance and habitat associations during late fall and winter in Prince William Sound.

A seabird observer participated in the LTM Humpback Whale cruises for October and December 2011, as well as the February 2012 survey. Although the October and December cruises were pre-award, we felt it was important to not miss our data collection opportunity that had been part of our original proposal. Our bird observer during the humpback whale cruises, Mr. Bobby Hsu, has left the project as of May 2012 in order to go to graduate school. For future whale cruises, we will use an observer who is skilled at both seabird and whale observations. In fall 2012, the long-term herring program will begin. A seabird observer will be onboard the juvenile herring surveys in November 2012 and the expanded adult herring surveys scheduled for late March/early spring 2013.

4. Benthic Monitoring Component (lead – Ballachey)

Nearshore benthic systems in the Gulf of Alaska – Ballachey (USGS Alaska Science Center), Coletti (USNPS SWAN) and Dean (Coastal Resources Associates)

Collaborators: K. Kloecker, M. Shephard, A. Doroff, M. Lindeberg, B. Konar, K. Iken
Project title: Long-term monitoring: Nearshore Benthic Ecosystems in the Gulf of Alaska

Our field work plan for year 1 has been completed with no problems or concerns. We conducted 7 field trips between March and late July, including 2 to Katmai National Park, 1 to Kenai Fjords National Park, 2 to western PWS, and 2 to eastern PWS. At Katmai, Kenai Fjords and WPWS, we visited sites that were established in previous years, and in EPWS, we established new sampling sites. We also did preliminary work at two sites in northern PWS to be sampled next summer. Work completed included monitoring of rocky intertidal, soft sediment and mussel sites, eelgrass beds, and black oystercatcher nests as well as collection of sea otter forage data (all areas), a winter bird survey at Katmai, summer bird surveys in Katmai and Kenai Fjords, sea otter carcass collections in WPWS, Katmai and Kenai Fjords, and aerial surveys of sea otters at Katmai and in WPWS. We continue to coordinate our monitoring efforts with the intertidal work being done in Kachemak Bay (K. Iken and B. Konar), and hope to complete an aerial survey of sea otters in Kachemak Bay before the end of August. Mussels were sampled at 9 locations in PWS and 2 locations in Kachemak Bay, and have been submitted to NOAA for contaminant analyses as part of their Mussel Watch program. A report entitled "*Intertidal Invertebrate and Algae Monitoring: Power to Detect Temporal Trends*" was submitted to NPS by WEST, Inc. and is in review; we anticipate further work on these statistical analyses with WEST in year 2 (funding for this component provided by NPS). We expanded collections of nearshore species for stable isotope analyses (initially mussels) to establish priorities for future stable isotope sampling (additional funding provided by USGS), and sampled a suite of nearshore species in all locations. Analyses of stable isotopes (carbon and nitrogen) in these samples are underway in the laboratory of Dr. S. Newsome at the University of Wyoming. In addition, we have initiated exploratory analyses on gene expression and physiological status of mussels, as a potential tool for monitoring long-term health of the nearshore; this work is

being conducted in collaboration with Drs. L. Bowen and K. Miles (USGS-WERC) and T. Hollmen (AK SeaLife Center).

Ecological Communities in Kachemak Bay – Iken and Konar (UAF); Co-Investigator Doroff

Project title: Long-term monitoring of Ecological Communities in Kachemak Bay: a comparison and control for Prince William Sound

Fieldwork for year 1 (2012) in Kachemak Bay was conducted 4-9 May, with some follow-up work during 3-7 June 2012. Five rocky sites were monitored for rocky intertidal composition along the high, mid, low and -1m tidal elevations. These sites were Outside Beach, Port Graham, Cohen Island, Bishop's Beach and Bluff Point. At all sites, limpet (*Lottia spp.*) size frequency was also determined. At three of these rocky sites (Outside Beach, Port Graham and Cohen Island), we also monitored a mussel bed for area coverage, size-frequency distribution and density. No mussel beds were found at or close to the other two rocky beaches. Permanent elevation markers were put in place at all rocky sites in May. In June, these sites were revisited to deploy temperature loggers at the low strata. During the June sampling, we also collected samples for stable isotope analysis for a collaborative project of Seth Newsome with the PWS benthic monitoring group. In addition, we collected mussels for contaminant analyses at Outside Beach and Cohen Island for a collaborative contaminant project.

Four seagrass sites were monitored, conducting shoot counts and percent cover estimates along 50 m transects through the seagrass bed. These beds were at Jakolof Bay, Herring Island, Petersen Bay and at the Homer Spit. Three beds (Jakolof Bay, Herring Island, Petersen Bay) were also measured for area of the seagrass bed. A challenge was encountered at the Homer Spit seagrass bed, which is too extensive to feasibly monitor its extent. Therefore, its size was not measured. A challenge was also encountered with the density measurements of the mussel beds. Mussel beds are sparse in Kachemak Bay and mussels are small in size, hence the originally proposed design of one small core and a variable quadrat sample did not produce meaningful data. We adjusted the sampling design to measure all mussels (density and size frequency) in a 0.0625 m² area at 10 random locations along the mussel bed transect. This will still produce comparable data to those collected in PWS.

Monitoring sea otter abundance and foraging—Doroff (ADF&G KBRR)

We met with USGS and FWS to arrange an aerial-based survey for this summer (funded by FWS and conducted by USGS). We received the standard protocols for monitoring sea otter foraging behavior from NPS and discussed data handling and storage with USGS. For this, we participated in a week of observation with USGS in EPWS. We continued to collect sea otter scat at one long-term monitoring site in Kachemak Bay (information has not been processed), and sites in Kachemak Bay are being monitored for potential foragers in KBay. Parts have been ordered for the tripod for compatibility with the existing questar scope.

5. Lingering Oil Monitoring Component (lead – Ballachey)

EVOS oil exposure of harlequin ducks and sea otters—Ballachey (USGS Alaska Science Center)

Project title: Lingerin Oil: Monitoring Shorelines and Nearshore Vertebrates in Prince William Sound. Part II: Evaluating the chronic exposure of harlequin ducks and sea otters to lingerin Exxon Valdez oil in western Prince William Sound.

The goal of this study is to evaluate the recovery status of harlequin ducks and sea otters in PWS using biomarker assays to assess continuing exposure to lingerin oil. We captured sea otters (n = 60) in western PWS in July 2012, and collected blood for biomarker and health assays (using gene expression analyses), and body measurements to assess condition. Harlequin ducks were last sampled in March 2011 (under EVOS Restoration Project 11100808) and, at that time, elevated biomarker levels (cytochrome P4501A) were observed to persist in ducks from oiled areas, relative to those from unoiled areas. Thus we determined to defer sampling of harlequin ducks until March 2013 (year 2). Decisions on a schedule for subsequent samplings will be made based on results from years 1 (sea otters) & 2 (harlequin ducks). Analyses of samples collected in years 1 & 2 (gene expression on blood from sea otters, cytochrome P450 on liver from harlequin ducks) will be done during year 2.

Oil level and weathering tracking - Carls (NOAA/NMFS Auke Bay Laboratory)

Project title: Long-term monitoring: lingerin oil

Progress in this project includes 1) measurement and modeling of geochemical biomarkers in Exxon Valdez source oil and in a few beaches 22 years after the Exxon Valdez oil spill, 2) assistance to field groups active in Prince William Sound or the Gulf of Alaska, including lingerin oil research by Gail Irvine (USGS), a bioremediation study (Boufadel et al), and a Long-Term Environmental Program (LTEMP, PWSRCAC), 3) hydrocarbon database updates, maintenance, and quality assurance in preparation for release for ERMA mapping and AOS. We have had no specific analysis requests from other project collaborators. Of the biomarkers, hopanes have excellent promise in source oil identification; samples collected 22 years after the spill can be definitively identified, demonstrating both the usefulness of this analytical approach and the environmental stability of these compounds. Bioremediation sample collection is ongoing and first year data are under discussion. The LTEMP data generally indicate very low levels of hydrocarbons; analyses of additional LTEMP and Gulf of Alaska samples will be completed later this year.

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