ATTACHMENT D *EVOSTC ANNUAL PROGRAM STATUS SUMMARY FORM*

Form Rev. 9.14.17

1. Program Number:

17120114

2. Program Title:

Gulf Watch Alaska

3. Program Lead Name(s):

Mandy Lindeberg, NOAA Fisheries, Alaska Fisheries Science Center, Auke Bay Laboratories
Katrina Hoffman, Prince William Sound Science Center

4. Time Period Covered by the Summary:

February 1, 2017 to January 31, 2018

5. Date of Summary:

March 2018

6. Program Website (if applicable):

www.gulfwatchalaska.org

7. Overview of Work Performed during the Reporting Period:

Program Introduction

This report summarizes Gulf Watch Alaska (GWA) program progress and achievements for FY17, monitoring year 6. The overarching goal of GWA 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 injured resources. The program has five primary objectives: (1) sustain and build upon existing time series in the *Exxon Valdez* oil spill (EVOS)-affected regions of the Gulf of Alaska (GOA); (2) provide scientific data, data products and outreach to management agencies and a wide variety of users; (3) develop science synthesis products to assist management actions, inform the public, and guide monitoring priorities for the next 15 years; (4) continue to build on collaborations between the GWA and Herring Research and Monitoring (HRM) programs, as well as other Trustee program focus areas, including the data management program and lingering oil; and 5) leverage partnerships with outside agencies and groups to integrate data and expand capacity through collaborative efforts. Program and project operations have not changed and continue to add to the legacy of our long-term monitoring (LTM) datasets and expanding our knowledge of the GOA ecosystem and its changing conditions.

A. Progress toward objectives and achieving goals

The GWA program made substantive progress towards our objectives in FY17 (year 6), as noted in the brief summaries presented below.

1. Sustain and build upon existing time series in the EVOS-affected regions of the GOA

- All GWA monitoring projects successfully completed their planned surveys and added another year of data to their time series. One exception to this is the Prince William Sound (PWS) summer marine bird survey (project 17120114-M) which includes field data collection every other year. This project is on task for field surveys in FY18.

2. Provide scientific data, data products, and outreach to management agencies and a wide variety of users

- GWA project datasets from the first five years of the program were successfully published to DataONE with the aid of the Trustee-funded Data Management program. All data are now discoverable globally, machine to machine, in compliance with agency standards. All program datasets are also available through the Alaska Ocean Observing System (AOOS) Catalog through the Gulf of Alaska Data Portal.
- GWA project data collected in FY17 (year 6) are on track for submission to the AOOS Gulf of Alaska data portal based on project requirements.
- GWA worked with National Oceanographic and Atmospheric Administration (NOAA) Fisheries to include GWA time series as indicators in the 2017 GOA ecosystem assessments and reports to the North Pacific Fisheries Management Council. GWA is continuing to work with NOAA Fisheries and others to develop new time series indicators.
- GWA also time series to the North Pacific Marine Science Organization's (PICES) 3rd North Pacific Ecosystem Status Report, 2009-2016.
- An outcome of a special marine bird workshop held at the GWA fall 2017 PI meeting in Cordova was to incorporate our published marine bird survey data into the North Pacific Pelagic Seabird Database (NPPSD). Incorporation of our data into NPPSD, along with all GWA and other marine bird survey data will allow for larger scale analyses of marine bird trends throughout the GOA over time.
- GWA's public website has been updated and is now the primary location for users to find information about the program, recent activities, and access to datasets, reports, publications, news feeds, educational materials, monitoring projects, scientist profiles, and contacts.

3. Develop science synthesis products to assist management actions, inform the public, and guide monitoring priorities for the future

- The GWA and HRM programs completed work on a special issue on Gulf of Alaska ecology in the scientific journal *Deep-Sea Research II*, which went into production at the journal in December 2017. Completion of the special issue is a foundational product that the

program's scientists and their peers will rely on for monitoring and future decision-making.

- GWA's Science Coordinator is leading the effort in planning science synthesis for the current five-year funding period including a workshop in year 8 and longer-term planning for the second ten years of GWA.
- Science synthesis during the current funding cycle will focus on at least one overarching publication focused on *Biological Responses to the Marine Heatwave in the Gulf of Alaska*, which all contributors and collaborators agree that GWA is uniquely positioned to address.
- Several cross-component publications will feed into this larger synthetic publication: Two currently underway are: i) environmental drivers and declines in prey abundance and condition leading up to the 2015-16 murre die-off in the GOA and ii) coherence in sea surface temperatures from intertidal to oceanic domains in the northern GOA. These are initial step towards understanding environmental drivers of biological productivity locally, regionally, and across ecosystems.
- Planning for longer term syntheses for years 10-20 includes two additional efforts: i) developing time series indicators for the GOA ecosystem and stakeholder interests, and ii) designing a GWA ecosystem modeling component.

4. Enhance connections between GWA and HRM programs as well as other Trustee focus areas

- GWA program management team and PIs worked collaboratively on monitoring activities including sharing of data, vessel time, and aerial survey time between GWA and HRM projects.
- The GWA and HRM programs worked jointly to produce a peer reviewed special issue in *Deep-Sea Research II* (see above). This included sharing of editorial services, soliciting reviewers, tracking revisions, and planning for open access and printing costs.
- The GWA program management team worked closely with the HRM Program Lead to plan and host a joint program annual meeting and quarterly meeting associated with the Alaska Marine Science Symposium.

5. Leverage partnerships with outside agencies and groups to integrate data from broader efforts

- A significant highlight of acquiring additional funding has been within the Environmental Drivers Component for projects GAK1 (18120114-I) and the Seward Line (18120114-L). The new National Science Foundation (NSF)-funded GOA Long-term Ecological Research (LTER) program (awarded in spring of 2017, after submission of FY17-21 EVOS Trustee Council (EVOSTC) proposal; $1,127K/year, plus ship time) leverages, complements, and enhances the GWA program activities. The LTER program will provide many years of additional significant research activities that will naturally blend and add value to the GWA program.
- The GWA program management team reached out to NOAA Fisheries scientists and North Pacific Research Board (NPRB) management to share information and address parallel goals associated with the GOA integrated ecosystem research program. This led to using

GWA resources to help plan and contribute to a GOA workshop and special session during the February 2018 Ocean Sciences meeting in Portland, Oregon.

All GWA program-level measureable tasks have been completed for FY17 (year 6; Table 1).

Table 1. Measurable GWA program tasks completed in FY17.

FY17 Measurable Program Tasks	Status
Conduct quarterly program teleconference	Completed
Submit 5-year program status summary and special issue manuscripts	19 Final Reports were submitted June 1, 2017 *Deep-Sea Research II* accepted 19 papers, Oct. 2017
Submit annual program work plans	Completed and submitted August 23, 2017
Annual PI meeting and program review	Completed Nov. 15-18, Cordova
Presentation of GWA projects at Alaska Marine Science Symposium	Completed. PIs presented 5 oral presentations and 17 posters, January 2018

B. Noteworthy issues and findings within the GWA program and projects

This section provides brief project-level highlights. Please refer to FY17 project annual reports for more detail. Projects are listed by component (administration, environmental drivers, pelagic, and nearshore).

Integrated Program Management and Administration

Program coordination & science synthesis (17120114-A) (Program Management I; or PMI)
Mandy Lindeberg, Rob Suryan, and Donna Aderhold, NOAA Auke Bay Laboratories

Program administration, logistics, & outreach (17120114-B) (Program Management II; or PMII)
Katrina Hoffman, Prince William Sound Science Center (PWSSC)

- As suggested by the EVOSTC Science Panel these two administrative projects are now reported together as one project. In the future, these combined projects will be referred to as the "Integrated Program Management and Administration project (17120114-A and B)". We may use previous labels to qualify or reduce possible confusion as needed. Budgets for these two projects will remain separate to facilitate the money's final destinations and usage. The four individuals responsible for PMI and PMII are collectively referred to as the Program Management Team (PMT).
- The GWA program team held quarterly meetings throughout the fiscal year. Two were by teleconference and two were in person (in Cordova and Anchorage).
- PMII held the annual audit and the results are forthcoming.
- All subawards to non-Trustee Agencies were contracted and administered by PWSSC after the funding mechanism was established by NOAA. NOAA did not approve the proposal until May 2018, which is one reason there is a spending delay on some non-Trustee Agency projects. PWSSC spends considerable time and effort fulfilling the federal grantor's information requirements and assisting with the launch of the new five-year grant.

- All outreach activities were coordinated and tracked by the PMT and outreach coordinator, and details thereof are available in the project report. The major accomplishment was the production of a special issue of *Deep-Sea Research II*, titled "Spatial and Temporal Ecological Variability in the Northern Gulf of Alaska: What Have We Learned Since the *Exxon Valdez* Oil Spill?" Various members of the PMT invested a substantial amount of time into communications with the publisher of the special issue.
- Program PIs presented five oral presentations and seventeen posters at the January 2018 Alaska Marine Science Symposium. One oral presenter had to cancel due to a federal government shutdown that resulted in cancelled travel for numerous GWA scientists.
- We made considerable updates and revisions to the program web site, which is a main venue through which the public and resource managers can access information about GWA or pursue further inquiries.
- The GWA PMT ensured there was regular, frequent communication with the HRM Program Lead to ensure ease of coordination and synthesis between the two programs.

Environmental Drivers Component

GOA mooring (GAK1) (17120114-I)

Seth Danielson and Tom Weingartner, University of Alaska Fairbanks (UAF)

- Analysis of data from the 2016-2017 GAK1 mooring shows that the surface waters are warming faster than waters near the seafloor. The surface is freshening and the waters near the seafloor have an opposite trend, but the latter is not significantly different than zero. These trends show that the water column is progressively stratifying over time.
- The GAK1 project is working in partnership with the new NSF-funded LTER program to increase the inter-disciplinary, temporal, and spatial coverage of high-resolution continuous data collections in the northern GOA. This partnership along with GWA has enabled leveraging of additional funding sources for a replacement of the Seward-based coastal research vessel and we hope to have a delivery date by early 2019.

Seward line (17120114-L)

Russ Hopcroft, Seth Danielson, and Kenneth Coyle, UAF

- Although May temperatures in the upper 100 m have returned to their long-term mean, remnants of warm water from "The Blob"/El Niño remained at depth. After a series of warm years, September temperatures in the upper 100 m averaged across the Seward line were at the long-term climatological mean, although a warm spot existed mid-shelf and cool waters occurred below the thermocline offshore.
- Phytoplankton biomass on the Seward line was relatively low (compared to potential spring bloom levels) during the May 2017 sampling period, although most of the cells on the mid and outer line were >20 μm. This contrasts strongly with the recent warm years (2015-16), when spring chlorophyll increases were mainly in the form of small (<20 μm) cells. The September 2017 Seward line sampling encountered the highest fall chlorophyll concentrations seen at least since 2012. Many, if not most, of the >20 μm cells in this fall bloom were dinoflagellates, although diatoms were present as well.

- During May, seabird surveys covered 786 km during which we recorded 3,062 individuals of 41 bird species, with 11 additional species observed off-transect. Seabird surveys in September covered 1,202 km. On-transect, we observed 1,666 individual birds of 34 species, with an additional 17 species observed off-transect during surveys or while at stations. As is typical in both spring and fall, the most abundant species was the black-legged kittiwake.

Oceanographic conditions in PWS (17120114-G)

Rob Campbell, PWSSC

- Temperatures in central PWS have been above average since late 2013, as has been observed elsewhere in the GOA and Seward line. It appears that PWS exhibited the same "warm Blob" anomaly seen throughout the Gulf with approximately the same timing, although PWS remains slightly above average.
- The 2017 time series from the profiler shows the annual cycle of stratification and productivity at very fine scales. Thermal stratification began in late May and was very strong into late July/August. The profiler recorded the pre-bloom conditions in March and the onset of the spring bloom in mid-April, which was approximately on schedule. Following the onset of the seasonal pycnocline in June-July, productivity was centered on the nitricline, at approximately 20 m depth. The breakdown of stability in October-November coincided with a modest autumn bloom near the surface.
- The plankton camera collected 531,950 images during the 2017 deployment, occupying just under 20 gigabytes on disk. The highest particle concentrations were during the spring bloom in late April, and there were a large number of particles in the surface mixed layer in late June/early July. The highest particle concentrations were in the near-surface mixed layer into autumn when stability broke down. Pronounced diel differences were also notable, with "banding" (i.e., alternating bright and dark coloring in adjacent profiles) evident from profile to profile, particularly in May-June and mid-July–August. The banding effect was caused by diel differences in the number of plankton in the surface layer, with more plankton observed during profiles done during the solar minimum.

Oceanographic conditions in Lower Cook Inlet/ Kachemak Bay (17120114-J)

Kris Holderied and Jessica Shepherd, NOAA Kasitsna Bay Laboratory and University of Alaska Anchorage (UAA)/Kachemak Bay National Estuarine Research Reserve (KBNERR)

- Waters in Kachemak Bay were cooler and saltier in 2017, differing from the warming/freshening pattern that began in 2013 and persisted through 2016.
- Phytoplankton samples from Kachemak Bay/ Lower Cook Inlet were generally dominated by diatoms, usually *Chaetoceros* spp*.,* except for a few fall samples that were dominated by dinoflagellates. Spring and summer samples also showed high abundances of diatoms, including *Pseudo-nitzschia* spp*., Rhizosolenia* spp., and *Thalassiosira* spp. There were no apparent patterns of abundances among years or transects.
- Zooplankton density was highest in spring or summer at all sampling locations and lowest in fall or winter. Early spring periods were characterized by ostracods, cumacea, and the copepod *Scolechithricella minor*. Late spring months were primarily identified by the

concurrent presence of all three species of *Neocalanus* in more than 60% of samples; fish eggs were also an important factor of this group. The summer period included one copepod, *Tortanus discaudatus*, as the defining species. Species that categorized the late fall were dominated by copepods including *Mesocalanus tenuicornis*, *Calanus pacificus*, and *Clausocalanus* sp.

- Harmful algal bloom research showed that in 2016, *Alexandrium* spp. were present in all of the sub-bays examined, although abundances spatially and temporally, with the highest abundances observed in early September. The lowest toxicities were observed in Seldovia Bay and increased along a gradient into the bay with the highest toxicities found at Sadie Cove, where along Jakolof Bay we observed toxicities over 200 micrograms of saxitoxin per 100 grams of tissue – more than double the regulatory limit of 80 micrograms per 100 grams of tissue.

Continuous plankton recorder (CPR) (17120114-D)

Sonia Batten, Sir Alister Hardy Foundation for Ocean Science (SAHFOS) and Robin Brown, North Pacific Marine Science Organization

- Although fully quality controlled data for 2017 are not yet available, we noted during the provisional sample analysis that pteropods appeared to be abundant in 2017. Numbers generally reach a peak in summer, but numbers in summer 2016 were noticeably high, and in 2017 look likely to be even higher. This may be a response to the anomalous warming that occurred in recent years, or it may be simple interannual variability, but once all the data are available it can be examined more closely.
- Seasonal progression was evident in temperature and salinity, with cooler and saltier water in April and generally warmer and fresher water in July, although there is regional variation. The relative fluorescence shows that highest values were found in lower Cook Inlet in October, and this agrees with high diatom counts from the CPR samples, too. High fluorescence was also seen off the shelf in October, though we do not yet have the matching cell counts. However, while the relative fluorescence in lower Cook Inlet and across the shelf was low in both April and July, cell counts were higher in April, suggesting that the high October chlorophyll fluorescence may also have been from cells other than large diatoms. Zooplankton abundance was highest in July so it is possible that the organisms had grazed down the phytoplankton. Abundance of zooplankton generally declined from north to south.

Pelagic Component

Long-term killer whale surveys (17120114-N)

Craig Matkin, North Gulf Oceanic Society

- We had 31 encounters with resident ecotype killer whales, 5 encounters with transient ecotype killer whales, and 2 encounters with offshore ecotype killer whales. A total of 157 individual resident whales, 13 GOA transients, and 7 AT1 transients were identified.
- The number of unique resident killer whales identified by year has declined in 2016 and in 2017 and may be related to changes in fish distribution leading to changes in distributions of whales in areas and times where our surveys occur. AB pod was not completely

photographed in 2017. None of the three matrilines that contain all adult males and their mothers (AB14, AB17, AB22) were encountered. These trends may be a result, in some part, of changes in prey availability associated with the recent warm water period ("The Blob").

- Our remote hydrophone project is proceeding forward with four Soundtrap recording devices currently deployed. One is on the mid-Sound oceanographic buoy, one in Hinchinbrook Entrance, one in Montague Strait, and one in outer Resurrection Bay. The first digital recordings were recovered from three of these sites in fall 2017. They contain killer whale calls and we are in the process of analysis.

PWS marine bird surveys (17120114-M)

Kathy Kuletz and Robert Kaler, U.S. Fish and Wildlife Service (USFWS)

- This project had no fieldwork scheduled in 2017. Progress was made on project data processing and analysis to better streamline data transfer, updating metadata, and summarizing of project results and reporting. This includes opportunities to integrate marine bird data across component projects.

Forage fish distribution and relative abundance (17120114-C)

Mayumi Arimitsu and John Piatt, U. S. Geological Survey (USGS) Alaska Science Center

- Catches of walleye pollock and Pacific herring suggest these forage fish species dominated the forage fish community during this survey. We observed whales and feeding flocks of birds near schools of age-0 herring in Montague Strait, but we did not observe any shoals of adult herring in that sub-region. We did encounter small, scattered adult herring sign. Krill catches were composed primarily of *Thysanoessa spinifera* and *Euphausia pacifica*. An unusual observation included the collection of five Pacific saury, typically an offshore species, near the north end of Latouche Island.
- Seabird diet samples at Middleton Island were collected April through August 2017. For black-legged kittiwakes this included 509 diet samples, and for rhinoceros auklets this included 328 diet samples. Briefly, kittiwake diets in April and May 2017 were composed primarily of invertebrates, which was similar to early season diets observed in 2015 and 2016 but different from 2012-14 when spring diets were composed mainly of fish. During summer, kittiwake diets (June-August) and rhinoceros auklet chick diets (July-August) indicate greater composition of herring than in previous years. Capelin and sand lance frequency of occurrence in kittiwake diets remained relatively low in 2017, compared to previous years, although sand lance proportion of biomass in rhinoceros auklet chick diets increased in 2016-17 after several years of relatively low biomass that began in 2011.

Humpback whale predation on herring (17120114-O)

John Moran and Jan Straley, NOAA National Marine Fisheries Service (NMFS) Auke Bay Laboratory and University of Alaska Southeast (UAS)

- We completed the fall Integrated Marine Predator Prey (IMPP) survey with the marine bird and forage fish projects and a winter whale-prey survey in early December. September 2017 was our seventh fall survey, with the lowest number of whales observed since the project began.
- We expanded our coverage in September to include the waters outside of Montague Entrance but failed to locate any whales.
- In December 2017, whales were encountered feeding on a shoal of adult herring off the north end of Montague Island. In collaboration with the forage fish project, we estimated herring biomass at 7,435 (95% CI: 5845-9025) metric tonnes within a 2.5 nmi^2 area. We have not observed large shoals of overwintering herring and whales in this area during our previous surveys. Although we have no data on the duration of the feeding event at Montague, if we assume that 12 whales feeding for three months on the shoal, they would consume 4% to 9% of the herring biomass.
- In May 2017, there were 5 reports of stranded humpback whales in the waters in and around PWS. Although the cause of death was not determined for these animals, we were able to collect baleen from three of the whales. Previous studies in other baleen whale populations have shown an oscillating pattern of nitrogen isotope (15N) enrichment and depletion along the length of individual baleen plates corresponding to the fasting and feeding states or changes in resource use associated with whales' migratory and reproductive feeding behavior. The collected baleen plates from PWS whales were sampled at 1 cm intervals following the axis of the longest individual baleen filament for carbon and nitrogen stable isotope analysis. All of the baleen plates analyzed had a general oscillating pattern of 15N enrichment and depletion occurring at roughly 12-20 cm intervals, within the bounds of previous estimates of annual baleen growth rates.

Fall and winter habitat use and distribution of seabirds in PWS (17120114-E)

Mary Anne Bishop (PWSSC)

- During FY17, one observer performed four marine bird surveys in PWS, covering 1,241 km. During the IMPP surveys, marine bird observations are recorded concurrent with hydroacoustic fish and krill surveys along fixed transect lines for over 134.5 km of effort. Five foraging flocks were recorded. One humpback whale was associated with a flock of 46 birds (42 black-legged kittiwakes and 4 marbled murrelets) located off Gravina Point. The whale surfaced in the middle of the foraging flock, after which the group of birds quickly dispersed.
- *Common murre die-off*: During "The Blob" warming event, we observed higher densities of common murres within PWS throughout the non-breeding season, in contrast to years before and after the event. Common murres are typically scarce in PWS during early winter but become the most abundant birds by late winter (March). Since the end of the warm water period, murre densities appear to have decreased to levels below recent historical

averages. The increased use of PWS by murres throughout the non-breeding season may have signaled a change in food availability in the GOA due to the unusually warm water temperatures. Murres may have used PWS as a refuge from poor conditions in the GOA.

Nearshore Monitoring Component

Nearshore systems in the GOA (17120114-H)

Heather Coletti, Daniel Esler, Kim Kloecker, Dan Monson, Ben Weitzman, Brenda Konar, and Katrin Iken, National Park Service (NPS), U.S. Geological Survey (USGS) Alaska Science Center, and UAF

- *Nearshore water temperature anomalies through 2017*: Intertidal water temperature anomalies confirm that "The Blob" washed ashore in May of 2014 across the northern GOA with temperature sensors showing a similar magnitude of warming in all blocks. Also, intertidal water temperatures had greater diel variability, but appeared to track trends in pelagic water temperature fairly closely.
- *Sea star declines and potential recovery across the GOA*: Analyses demonstrated high spatial and temporal variability in sea star densities in all surveyed blocks and diversity and dominance of individual species varied greatly among blocks. A decline in sea star numbers, most likely attributable to sea star wasting, was observed across all blocks in recent years. In 2017, recruitment was evident in western PWS (WPWS) and Kenai Fjords (KEFJ), but not in Kachemak Bay (KBAY) or Katmai (KATM). In 2014, sea star wasting expanded north from California and reached the GOA, where numerous sea stars were found exhibiting symptoms of this disease in KBAY and PWS. This is the first time a disease has been recognized as impacting sea star populations in Alaska waters. It is also the longest it has lasted in the North Pacific.
- *Clam biomass estimates across the GOA*: 2017 marked one decade of biannual monitoring efforts on mixed-sediment beaches across the GOA. Data summaries show changes in mean biomass among blocks (KATM, KBAY, KEFJ, WPWS), through time (2007-2017), as an integrator of changes in both size and abundance. In 2017, total clam biomass was greatest in KBAY, followed by KATM, WPWS, and KEFJ; however, these 4 blocks have varied greatly through time. We also examined taxa-specific changes in mean biomass of *Macoma* spp., *Saxidomus gigantea*, and *Leukoma staminea*.
- *Variation in selected mussel metrics across the GOA*: We estimated the abundance of mussels at 21 sites across the four sampling blocks (KATM, KEFJ, WPWS, and KBAY). Densities of all mussels vary by block, with KEFJ averaging densities of 25,000/m^2, KATM and KBAY averaging about 9,000/m^2, and WPWS about 3,000/m^2. We see high annual variation in all mussel densities, with maximum densities in all blocks except WPWS occurring in 2014, and a trend toward declining densities of all mussels through 2017.
- *Sea otter abundance and density estimates across all four regions in the GOA*: Based on aerial surveys in 2012 and 2015, sea otter abundance in KATM appears to have stabilized following more than a decade of population growth. In KEFJ, three surveys between 2002 and 2010 suggest a stable sea otter population. Sea otter abundance in WPWS increased at 3% per year from 2007-2013 but declined in 2017, although not significantly. Abundance

estimates for KBAY have increased since 2002, with an apparent stabilization in abundance estimates between 2012 and 2017. Density estimates show similar patterns with relatively low densities in KEFJ and WPWS and higher densities in KATM and KBAY.

C. Efforts to achieve community involvement/TEK and resource management application provisions

The GWA program in FY17 has been working on plans for a local and traditional ecological roundtable-type symposium in spill-affected native communities in FY18 and FY20 where both scientists and native community members exchange information about different ways of knowing, as well as changes they have observed in the systems. Ideally, across the current five-year period, the program will engage with communities in both PWS and the Kachemak Bay/Kenai Peninsula area. For example, we would engage with Chenega Bay or Tatitlek in one year and Nanwalek in the alternate year, should those communities be open to such an experience. Residents of Port Graham will be invited to attend any events held with Nanwalek residents in order to strengthen the opportunity for information exchange.

D. Any known problems, unusual developments or other information

The GWA program is moving forward as planned. Transition of the new program management team and returning PIs into the second five-year increment of monitoring (years 6-10) has gone smoothly. As expected, final deliverables for the first five years of the program have spilled into FY17 (year 6). Scientific products for the *Deep-Sea Research II* special issue and 5-year Final Reports to the Trustees were timely but the process of dealing with journals and peer reviews are notoriously slow. A good portion of the program management team's time has gone towards editorial reviews and facilitating revisions for a large body of work produced in the first 5 years. However, we see this as a good problem and worth the effort as these quality products are now being finalized.

8. Coordination and Collaboration:

A. Projects Within a Trustee Council-funded program

1. Within the Program

Several targeted efforts are underway in the program to coordinate and collaborate with projects within and across components. The nearshore component has begun to work closely with the environmental drivers component (projects 17120114-G, I, J, and L) to examine trends in water temperature over space and time. A special marine bird workshop was held during the annual GWA PI meeting in November 2017 for cross-component bird data integration and synthesis (projects 17120114-C, E, H, L, M, and O). All parties had data summaries to discuss and determine how we may look at trends over time, changes in distribution, and integration with data from other components, including environmental drivers. An outcome of this workshop was to incorporate our published marine bird survey data into the NPPSD. Incorporation of our data into NPPSD, along with all GWA and other marine bird survey data, will allow for larger scale analyses of marine bird trends throughout the GOA over time.

2. **Across Programs**

a. Herring Research and Monitoring

The GWA PMT had frequent coordination and collaboration with the HRM Program Lead while putting together the *Deep-Sea Research II* special issue and facilitating the review process. Our science coordinator was on the selection committee for the HRM post-doctoral candidates. The HRM Program Lead was included on all GWA PI general correspondence. Likewise, the GWA PMT is included in all HRM general correspondence. In addition, The HRM Program Lead was invited to all PI teleconferences and meetings and given an opportunity to hear GWA PI updates and provide HRM updates to PIs. In addition, data from GWA projects is provided to the HRM program for their use and analysis upon request prior to data publication. To single out one cross-program collaboration example, the humpback whale project arranged for a HRM PI to join their fall survey to enable additional sampling to meet their needs for herring.

b. Data Management

The GWA management team has been working closely with AOOS and Axiom data management staff to provide user feedback on the Research Workspace and metadata generation tools. The management team is also working with all project PIs within the program to ensure new data are loaded to the portal, have undergone quality assurance and quality control measures, and have appropriate metadata available for public access.

c. Lingering Oil

While GWA projects do not collaborate with the EVOSTC Lingering Oil program, some (e.g., Nearshore 17120114-H, PWS summer bird surveys 17120114-M, PWS winter bird surveys 17120114-E) contribute to population trends and long-term assessment of previously injured resources in nearshore ecosystems. The GWA program welcomes future collaborations with this program.

B. Projects not within a Trustee Council-funded program

Currently there are few projects outside of EVOSTC programs to coordinate and collaborate with but where appropriate and applicable we are willing to help. Data, reports, and publications from GWA projects and the PMT are available to other project principal investigators. Recent efforts included:

- GWA's PMT coordinated with field crews from the pigeon guillemot restoration study (project 17100853) on Naked Island to collect additional forage fish samples to maintain pelagic component time series and share seabird diet data. In addition, locating a stranded humpback whale on Naked Island and acquiring samples was successfully accomplished between projects.

C. With Trustee or Management Agencies

The GWA program integrates ecosystem monitoring activities with NOAA, USFWS, USGS, Bureau of Ocean Energy Management (BOEM), and NPS. We also coordinate with Alaska

Department of Fish and Game researchers and managers through coordination of synthesis activities with the HRM program. Our lower Cook Inlet/Kachemak Bay oceanographic project (17120114-J) coordinates with the Alaska Department of Environmental Conservation related to harmful algal blooms documented in Kachemak Bay.

The GWA program coordinated and collaborated with the following groups in FY17:

- GWA program managers made arrangements for a last-minute staffing of a seabird/mammal observer on the first leg of NOAA's GOA Survey, which covers the majority of the GWA study area (Janet Duffy-Anderson, NOAA Fisheries Alaska Fisheries Science Center (AFSC) Resource Assessment and Conservation Engineering Division, Recruitment Processes Alliance - EcoFOCI program).
- GWA worked with NOAA to develop and include GWA time series as indicators in ecosystem assessments and reports to the North Pacific Fisheries Management Council (Stephani Zador, NMFS AFSC Resource Ecology and Fisheries Management (REFM) Division, Resource Ecology and Ecosystem Modeling Program).
- The GWA PMT is collaborating with the North Pacific Research Board (NPRB) GOA Integrated Ecosystem Research Program (GOAIERP) synthesis and planning efforts (Olav Ormseth and Jamal Moss NOAA Fisheries AFSC - Status of Stocks and Multispecies Assessment Program; Auke Bay Laboratories - Ecosystem Monitoring and Assessment program), including planning a GOA-focused workshop at the 2018 Ocean Sciences Meeting.
- The GWA PMT met with NOAA Alaska Region Protected Resources Division (Kate Savage and Sadie Wright) this year to coordinate reporting and sampling of marine mammal carcasses during GWA field operations. This coordination resulted in GWA PIs helping NOAA's marine mammal stranding network locate and obtain samples from four humpback whale carcasses.

9. Information and Data Transfer:

The following lists program level products. Please refer to individual project annual reports for listing of relevant publications, presentations, and data products. The list is unusually long this year as products were finalized from the first 5 years of the program.

A. Publications Produced During the Reporting Period

Aderhold, D. R., D. Esler, R. A. Heintz, R. R. Hopcroft, M. R. Lindeberg, W. W. Pegau. Editors. Spatial and Temporal Ecological Variability in the Northern Gulf of Alaska: What have we learned since the *Exxon Valdez* Oil Spill? Deep Sea Research Part II: Topical Studies in Oceanography, Volume 147, Pages 1-202, ISSN 0967-0645. January 2017. https://www.sciencedirect.com/journal/deep-sea-research-part-ii-topical-studies-in-oceanography/vol/147/suppl/C.

Arimitsu, M. L., J. F. Piatt, B. Heflin, V. von Biela, S. K. Schoen. 2018. Monitoring long-term changes in forage fish distribution, abundance and body condition. *Exxon Valdez* Oil Spill Restoration Project Final Report (Restoration Project 16120114-O). *Exxon Valdez* Oil Spill Trustee Council, Anchorage, Alaska.

Batten, S.D. 2017. Continuous Plankton Recorder Data from the Northeast Pacific: Lower Trophic Levels in 2016. Contribution in the 2017 NOAA Ecosystems Considerations Report to the North Pacific Fisheries Management Council.

Batten, S.D., and Brown, R. 2018. Long-term Monitoring of plankton populations on the Alaskan Shelf and in the Gulf of Alaska using Continuous Plankton Recorders. *Exxon Valdez* Oil Spill Restoration Project Final Report (Restoration Project 16120114-A). *Exxon Valdez* Oil Spill Trustee Council, Anchorage, Alaska.

Batten, S.D., Raitsos, D.E., Danielson, S.,Hopcroft, R.R., Coyle, K. and McQuatters-Gollop, A. 2018. Interannual variability in lower trophic levels on the Alaskan Shelf. Deep-Sea Research Part II. http://dx.doi.org/10.1016/j.dsr2.2017.04.023.

Bishop, M. A. 2018. Long-term monitoring of seabird abundance and habitat associations during late fall and winter in Prince William Sound. *Exxon Valdez* Oil Spill Restoration Project Final Report (Project 16120114-C). *Exxon Valdez* Oil Spill Trustee Council, Anchorage, Alaska.

Bodkin, J.L., H.A. Coletti, B.E. Ballachey, D. Monson, D. Esler, and T.A. Dean. 2017. Spatial and temporal variation in Pacific blue mussel, Mytilus trossulus, abundance in the northern Gulf of Alaska, 2006-2015. Deep Sea Research Part II: https://doi.org/10.1016/j.dsr2.2017.04.008

Bowen, L., A.K. Miles, B.E. Ballachey, S. Waters, J.L. Bodkin, M. Lindeberg, and D. Esler. 2017. Gene transcription patterns in response to low level petroleum contaminants in Mytilus trossulus from field sites and harbors in southcentral Alaska. Deep Sea Research Part II: https://doi.org/10.1016/j.dsr2.2017.08.007

Campbell, R. W. 2018. Long term monitoring of oceanographic conditions in Prince William Sound. *Exxon Valdez* Oil Spill Restoration Project Final Report (Restoration Project 16120114-E). *Exxon Valdez* Oil Spill Trustee Council, Anchorage, Alaska.

Campbell, R.W. 2018. Hydrographic trends in Prince William Sound, Alaska, 1960–2016. Deep-Sea Res II. doi:10.1016/j.dsr2.2017.08.014

Coletti, H., D. Esler, B. Ballachey, J. Bodkin, G. Esslinger, K. Kloecker, D. Monson, B. Robinson, B. Weitzman, T. Dean, and M. Lindeberg. 2018. Gulf Watch Alaska: Nearshore Benthic Systems in the Gulf of Alaska. *Exxon Valdez* Oil Spill Restoration Project Final Report (Restoration Project 16120114-R). *Exxon Valdez* Oil Spill Trustee Council, Anchorage, Alaska.

Crusius, J., A.W. Schroth, J.A. Resing, J. Cullen, and R.W. Campbell. 2017. Seasonal and spatial variabilities in the northern Gulf of Alaska surface water iron concentrations driven by shelf sediment resuspension, glacial meltwater, a Yakutat eddy, and dust. Global Biogeochemical Cycles. doi:10.1002/2016GB005493

Cushing, D., D. Roby, D. Irons. 2017. Pattern of distribution, abundance, and change over time in a subarctic marine bird community. Deep Sea Research II. DOI: http://dx.doi.org/10.1016/j.dsr2.2017.07.012

Danielson, S. L. *In review*. Glacier Bay Oceanographic Monitoring Program Analysis of Observations, 1993-2016. Natural Resource Technical Report NPS/XXXX/NRTR—20XX/XXX. National Park Service, Fort Collins, Colorado.

Doroff, A., and K. Holderied. 2018. Long-term monitoring of oceanographic conditions in Cook Inlet/Kachemak Bay to understand recovery and restoration of injured near-shore species. *Exxon Valdez* Oil Spill Restoration Project Final Report (Restoration Project 16120114-G). *Exxon Valdez* Oil Spill Trustee Council, Anchorage, Alaska.

Doroff, A., M. Johnson, and G. Gibson. 2017. Ocean Circulation Mapping to Aid Monitoring Programs for Harmful Algal Blooms and Marine Invasive Transport in South-central, Alaska. State Wildlife Grant, Alaska Dept. of Fish and Game. Annual Report. 41pgs.

Esler, D., B. E. Ballachey, C. O. Matkin, D. Cushing, R. Kaler, J. Bodkin, D. Monson, G. G. Esslinger, and K. Kloecker. 2017. Timelines and mechanisms of wildlife population recovery following the *Exxon Valdez* oil spill. Deep Sea Research Part II: https://doi.org/10.1016/j.dsr2.2017.04.007

Hopcroft, R. R., S. L. Danielson, and S. L. Strom. 2018. The Seward Line: Marine ecosystem monitoring in the Northern Gulf of Alaska. *Exxon Valdez* Oil Spill Restoration Project Final Report (Restoration Project 16120114-J). *Exxon Valdez* Oil Spill Trustee Council, Anchorage, Alaska.

Kaler, R., E. Labunski, and K. J. Kuletz. 2018. Prince William Sound Marine Bird Surveys. *Exxon Valdez* Oil Spill Restoration Project Final Report (Restoration Project 16120114-K). *Exxon Valdez* Oil Spill Trustee Council, Anchorage, Alaska.

Konar, B. and K. Iken. 2017. The use of unmanned aerial vehicle imagery in intertidal monitoring. Deep Sea Research Part II: https://doi.org/10.1016/j.dsr2.2017.04.010

Konar B., K. Iken, and A. Doroff. 218. Long-term monitoring: nearshore benthic ecosystems in Kachemak Bay. *Exxon Valdez* Oil Spill Restoration Project Final Report (Restoration Project 16120114-L). *Exxon Valdez* Oil Spill Trustee Council, Anchorage, Alaska.

Matkin, C., D. Olsen, G. Ellis, G. Ylitalo, R. Andrews. 2017. Long-term killer whale monitoring in Prince William Sound/ Kenai Fjords. *Exxon Valdez* Oil Spill Restoration Project Final Report (Restoration Project 16120114-M). *Exxon Valdez* Oil Spill Trustee Council, Anchorage, Alaska.

McCammon, M., K. Hoffman, K. Holderied. D. R. Aderhold, and T. H. Neher. 2018. Long-term monitoring of marine conditions and injured resources and services. *Exxon Valdez* Oil Spill Restoration Project Final Report (Restoration Project 16120114). *Exxon Valdez* Oil Spill Trustee Council, Anchorage, Alaska.

McKinstry, C.A.E., and R.W. Campbell. 2018. Seasonal variation of zooplankton abundance and community structure in Prince William Sound, Alaska, 2009–2016. Deep-Sea Res II. doi:10.1016/j.dsr2.2017.08.016.

Moran, J. R., R. A. Heintz, J. M. Straley, and J. J. Vollenweider. 2017. Regional variation in the intensity of humpback whale predation on Pacific herring in the Gulf of Alaska. Deep Sea Research Part II. DOI: http://dx.doi.org/10.1016/j.dsr2.2017.07.010.

Moran, J., M. O'Dell, M. Arimitsu, J. Straley, D. Dickenson**.** 2017. Seasonal distribution of Dall's porpoise in Prince William Sound. Deep Sea Research II. https://doi.org/10.1016/j.dsr2.2017.11.002.

Moran, J. R., and J. M. Straley. 2018. Long-term monitoring of humpback whale predation on Pacific herring in Prince William Sound. *Exxon Valdez* Oil Spill Restoration Project

Final Report (Restoration Project: 16120114-N). *Exxon Valdez* Oil Spill Trustee Council, Anchorage, Alaska.

Olsen, Daniel W., C. O. Matkin, R. D. Andrews, S. Atkinson. 2017. "Seasonal and pod-specific differences in core use areas by resident killer whales in the Northern Gulf of Alaska." Deep Sea Research Part II: Topical Studies in Oceanography (2017). https://doi.org/10.1016/j.dsr2.2017.10.009.

Roncallia, V., Cieslak, M.C., Sommer, S.A., Hopcroft, R.R. & Lenz, P.H. In press. De novo transcriptome assembly of the calanoid copepod Neocalanus flemingeri: A new resource for emergence from diapause. Mar. Gen. DOI:10.1016/j.dsr2.2017.04.023.

Schroth, A.W., J. Crusius, S. Gassó, C.M. Moy, N.J. Buck, J.A. Resing, and R.W. Campbell. 2017. Aleutian Low position drives dramatic inter-annual variability in atmospheric transport of glacial iron to the Gulf of Alaska. Geophys. Res. Lett. 44. doi:10.1002/2017GL073565.

Stocking, J. S., M. A. Bishop, and A. Arab. 2017. Spatio-temporal distributions of piscivorous birds in a subarctic sound during the nonbreeding season. Deep-Sea Research II. http://dx.doi.org/10.1016/j.dsr2.2017.07.017.

Straley, J. M., J. R. Moran, K. M. Boswell, R. A. Heintz, T. J. Quinn II, B. Witteveen, and S. D. Rice. 2017. Seasonal presence and potential influence of foraging humpback whales upon Pacific herring wintering in the Gulf of Alaska. Deep Sea Research Part II. DOI: http://dx.doi.org/10.1016/j.dsr2.2017.08.008.

Walsh, J.R., R. Thoman, U.S. Bhatt, P.A. Bieniek, B. BrettsChneider, M. Brubaker, S. Danielson, R. Lader, F. Fetterer, K. Holderied, K. Iken, A. Mahoney, M. McCammon, and J. Partain. 2018. The high latitude marine heat wave of 2016 and its impacts on Alaska [in "Explaining Extreme Events of 2016 from a Climate Perspective"]. Bull. Amer. Meteor. Soc. 99 (1). S39-43. doi:10.1175/BAMS-D-17-0105.1

Weingartner, T. J. and S. L. Danielson. 2018. Long-term monitoring of oceanographic conditions in the Alaska Coastal Current from hydrographic station GAK1 over 1970-2016. *Exxon Valdez* Oil Spill Restoration Project Final Report (Restoration Project 16120114-P). *Exxon Valdez* Oil Spill Trustee Council, Anchorage, Alaska.

Weitzman, B. P., J. L. Bodkin, K. A. Kloecker and H. A. Coletti. 2017. SOP for monitoring intertidal bivalves on mixed-sediment beaches — version 2.0: Southwest Alaska Inventory and Monitoring Network. Natural Resource Report NPS/SWAN/NRR—2017/1443. National Park Service, Fort Collins, Colorado.

B. Dates and Locations of any Conference or Workshop Presentations where EVOSTC-funded Work was Presented

Below is a list of the more than 50 oral and poster presentations by GWA program scientists during FY17 (Year 6) and other outreach activities. These may also be found in the individual project annual reports.

Aderhold, D. 2017. Gulf Watch Alaska monitors ecosystem health. **Article**. Delta Sound Connections 2017-18. 16 pp. http://pwssc.org/wp-content/uploads/2017/06/DSC-2017-web2.pdf.

Arimitsu, M., M. A. Bishop, d. Cushing, S. Hatch, B. Heflin, R. Kaler, K. Kuletz, C. Matkin, J. Moran, D. Olsen, J. Piatt, A. Schaefer, and J. Straley. 2018. Changes in marine predator and prey populations in the aftermath of the North Pacific Heat Wave: Gulf Watch Alaska Pelagic update 2017. **Poster presentation**. Alaska Marine Science Symposium, Jan 23-26, 2018, Anchorage, AK.

Arimitsu, M., J. Piatt, B. Heflin, and S. Schoen. 2017. Jellyfish blooms in warm water may signal trouble for forage fish in a warming climate. **Poster presentation**. ICES/PICES Drivers of Dynamics of Small Pelagic Fish Resources, Mar 6-11, 2017, Victoria, BC.

Arimitsu, M.L., J.F. Piatt, S.K. Schoen, and B. Heflin. 2017. Forage fish in hot water contribute to seabird die-off. **Article**. Delta Sound Connections. http://pwssc.org/wp-content/uploads/2017/06/DSC-2017-web2.pdf.

Arimitsu, M., J. Piatt, S. Schoen, B. Heflin, V. von Biela, and S. Hatch. 2018. Changes in forage fish during the winter 2015-16 seabird die-off and the North Pacific marine heat wave. **Oral presentation**. Alaska Marine Science Symposium, Jan 23-26, 2018, Anchorage, AK.

Bodkin, J.L., B.E. Ballachey, G.E. Esslinger, B.P. Weitzman, A.M. Burdin, L. Nichol and H.A. Coletti. 2017. A century of sea otter science and conservation in National Parks. X Sea Otter Conservation Workshop, 17-19 March 2017, Seattle Aquarium. Seattle WA. **Oral Presentation**.

Bodkin, J., H. Coletti, B. Ballachey, D. Monson, T. Dean, D. Esler, G. Esslinger, K. Iken, K. Kloecker, B. Konar, M. Lindeberg, and B. Weitzman. Detecting and inferring cause of change in Alaska nearshore marine ecosystem: An approach using sea otters as a component of the nearshore benthic food web. **Oral Presentation** the Alaska Marine Science Symposium, Anchorage Alaska. January 21-25 2018.

Campbell, R. 2018. A profiling observatory for high resolution oceanographic, biogeochemical, and plankton observations in Prince William Sound. Alaska Marine Science Symposium, Anchorage. **Oral Presentation**.

Coletti, H., D. Esler, B. Ballachey, J. Bodkin, T. Dean, G. Esslinger, K. Iken, K. Kloecker, B. Konar, M. Lindeberg, D. Monson, B. Robinson, and B. Weitzman. 2018. A decade's worth of data: Key metrics from a large-scale, trophic web based long term monitoring program in the northern Gulf of Alaska. **Poster Presentation** the Alaska Marine Science Symposium, Anchorage Alaska. January 21-25 2018.

Cushing, D., K. Kuletz, R. Hopcroft, S. Danielson, and E. Labunski. 2017. Shifts in cross-shelf distribution of seabirds in the northern Gulf of Alaska under different temperature regimes, 2007-2015. **Poster Presentation**. The 44th Meeting of the Pacific Seabird Group, Tacoma, WA. 21-25 February 2017.

Danielson, S. 2017. UAF-IMS seminar: Marine heatwaves in the North Pacific and Arctic, 2013-2017, Fairbanks AK, 22 November 2017. **Oral Presentation**.

Danielson, S. 2017. UAF Site Review: Northern Gulf of Alaska Marine Ecosystem Monitoring, M.J. Murdock Charitable Trust, 10 August 2017. **Oral Presentation**.

Esler, D. 2017. Sea ducks as indicators of nearshore marine conditions. 6th International Sea Duck Conference, San Francisco. **Oral Presentation**.

Esler, D. 2017. Sea Duck Traits: Their Influence on Oil Spill Vulnerability and Restoration Potential. 6th International Sea Duck Conference, San Francisco. **Oral Presentation**.

Esslinger, G.G., H.A. Coletti, J.L. Bodkin, D.H. Monson, B.E. Ballachey, T.A. Dean, and D. Esler. 2017. Contrasting demography and behavior among sea otter populations in the northern Gulf of Alaska. Alaska Chapter of The Wildlife Society Annual Meeting, Fairbanks. **Oral Presentation**.

Esslinger, G.G., H.A. Coletti, J.L. Bodkin, D.H. Monson, B.E. Ballachey, T.A. Dean, and D. Esler. 2017. Trends and equilibrium density vary among sea otter populations in the northern Gulf of Alaska. Sea Otter Conservation Workshop, Seattle. **Oral Presentation**.

Holderied, K., D. Hondolero, S. Kibler, M. Vandersea, A. Doroff, J. Schloemer, and S. Buckelew. 2017. Using coastal Alaska marine responses to the 2014-2016 Pacific Warm Anomaly to improve risk assessment for climate-driven increases in paralytic shellfish poisoning events. **Oral presentation** at Climate Predictions Applications Science Workshop. Anchorage AK. May 2017.

Holderied, K. and E. Ammann. 2017. Improving shellfish restoration and habitat assessment in coastal Alaska: Kachemak Bay Habitat Focus Area. **Oral presentation** at Coastal and Estuarine Research Federation conference. Providence, RI. Nov 2017.

Holderied, K., K. Powell, S. Baird, and J. Schloemer. 2018. Variability in estuarine salinity and stratification in Kachemak Bay, Alaska from 2012-2017. **Poster presentation** at Alaska Marine Science Symposium, Anchorage AK. Jan 2018.

Hopcroft. 2017. Latest observations and collections made along the Seward Line, Alaska. **Oral presentation**. International Conference on Copepoda, Los Angeles. June.

Hopcroft, Coyle, Danielson, Danielson. The Seward Line - 2017. **Poster Presentation**. AMSS January 2018

Hopcroft, Coyle, Danielson & Strom. Twenty Years of Observations Along the Gulf of Alaska's Seward Line: Impact of Continued Warm Conditions. **Oral Presentation**. Kodiak Marine Science Symposium, Kodiak, April 2017

Hopcroft et al. Oceanography in the Northern Gulf of Alaska: the Seward Line. **Public Presentation** for Osher Lifelong Learning Institute, Fairbanks, December 2017.

Hopcroft, Strom, Coyle & Danielson: Three in a row: continued warm conditions along the Gulf of Alaska's Seward Line. **Oral Presentation**. ASLO, Honolulu - March 2017

Kaler, R., K. Kuletz, D. Dragoo, and H. Renner. 2017. Unusual observations of seabirds in the Gulf of Alaska following the 2015-2016 mass die-off. **Article**. Delta Sound Connections. http://pwssc.org/wp-content/uploads/2017/06/DSC-2017-web2.pdf.

Iken, K. and B. Konar. 2018. Freezing in a warming climate? Poster Presentation the Alaska Marine Science Symposium, Anchorage Alaska. January 21-25 2018.

Kloecker, K.A., D. H. Monson, B. Robinson, H. A. Coletti, B. E. Ballachey, and D. Esler. 2017. Correlates between sea otter diet and prey energetics in a mussel-specialist population. Sea Otter Conservation Workshop, Seattle. **Oral Presentation**.

Konar, B., K. Iken, H. Coletti, T. Dean, D. Esler, K. Kloecker, M. Lindeberg, B. Pister, and B. Weitzman. 2018. Trends in intertidal sea star abundance and diversity across the Gulf of Alaska: effects of sea star wasting. **Poster Presentation** the Alaska Marine Science Symposium, Anchorage Alaska. January 21-25 2018.

Lenz, Roncalli, Hartline, Germano, Cieslak, Strom, & Hopcroft. The physiological ecology of the calanid copepod, *Neocalanus flemingeri* in the northern Gulf of Alaska. **Oral Presentation**. AMSS January 2018

Lindeberg, M. 2017. The Long-Term Monitoring Program of the *Exxon Valdez* Trustee Council. **Oral Presentation**. Briefing to the EVOSTC Trustees, Nov. 14, 2017.

Lindeberg, M. 2017. We are Watching – the long-term monitoring program of the *Exxon Valdez* Oil Spill Trustee Council. **Oral Presentation**. PWS RCAC Science Night. December.

Lindeberg, M., K. Hoffman, R. Suryan, and D. Aderhold. 2017. GWA Quarterly Currents. Newsletter. Volume 1.1: spring quarter. Link on gulfwatchalaska.org.

Lindeberg, M., K. Hoffman, R. Suryan, and D. Aderhold. 2017. GWA Quarterly Currents. Newsletter. Volume 1.2: summer quarter. Link on gulfwatchalaska.org.

Lindeberg, M., K. Hoffman, R. Suryan, and D. Aderhold. 2017. GWA Quarterly Currents. Newsletter. Volume 1.3: fall quarter. Link on gulfwatchalaska.org.

Lindeberg, M., K. Hoffman, R. Suryan, and D. Aderhold. 2017. GWA Quarterly Currents. Newsletter. Volume 1.4: winter quarter. Link on gulfwatchalaska.org.

Lindeberg, M., K. Holderied, D. Aderhold, K. Hoffman, M. Arimitsu, H. Coletti, and R. Hopcroft. 2017. Gulf Watch Alaska: Results from five years of ecosystem monitoring in the northern GOA. **Oral Presentation**. 2017 NMFS Alaska Fisheries Science Center mini symposium.

Martyn, P., D. Monson, H. Coletti, A. Miller, and D Esler. Using Small Unmanned Aircraft Systems (sUAS) to map intertidal topography in Katmai National Park and Preserve, Alaska. **Poster Presentation** the Alaska Marine Science Symposium, Anchorage Alaska. January 21-25 2018.

Matkin, C. O. 2017. Kenai Fjords National Park Interpretive guide training. **Oral Presentation**. May 5, 2017.

Matkin, C. O. 2017. Killer whales. **Oral Presentation**. Seward public science night, Resurrect Art Coffee House. May 16, 2017.

Matkin, C. O. 2017. Tracking whales with hydrophones. **Article**. Delta Sound Connections, PWS Science Center. March 10, 2017.

Matkin, C.O. et al. 2018. Southern Alaska resident killer whales may be dependent on more than Alaska salmon: some initial stream of origin genetic data from prey samples. **Poster** Alaska Marine Science Symposium, Anchorage Alaska. January 2018.

McKinstry, C., and R. Campbell. 2018. Zooplankton community structure and seasonal abundance in Prince William Sound. Alaska Marine Science Symposium, Anchorage. **Poster Presentation**.

Mearns, A, D. Janka, P. Marloff, R. Campbell, S. Pegau, and D. Esler. 2018. Twenty-eight years of intertidal biological variability based on volunteer visits to photo sites in Western

Prince William Sound. Alaska Marine Science Symposium, Anchorage. **Poster Presentation**.

Monson, D., K. Holderied, R. Campbell, S. Danielson, R. Hopcroft, B. Ballachey, J. Bodkin, H. Coletti, T. Dean, K. Iken, K. Kloecker, B. Konar, M. Lindeberg, B. Robinson, B. Weitzman, and R. Suryan. 2018. Congruence of intertidal and pelagic water and air temperatures during an anomalously warm period in the northern Gulf of Alaska; the "Blob" washes ashore. Alaska Marine Science Symposium, Anchorage. **Poster Presentation**.

Monson, D.H., B.P. Weitzman, K.A. Kloecker, D. Esler, L.A. Sztukowsi, S.A. Sethi, H.A. Coletti, and T. Hollmen. 2017. Understanding Trophic Relationships of Sea Otters and Their Effects on Demographic Attributes. Sea Otter Conservation Workshop, Seattle. **Oral Presentation**.

Moran, J., K. Boswell, and J. Straley. 2017. Humpback whales ruin a perfectly good overwintering strategy for Pacific herring in Alaska. ICES/PICES Victoria BC, February. **Poster Presentation**.

Olsen et al. 2017. Behavioral Changes During Multi-pod Aggregations of Southern Alaska Resident Killer Whales (*Orcinus orca*). **Oral Presentation**. Society of Marine Mammalogy Conference, Halifax, Nova Scotia, November 2017.

Piatt, J., T. Jones, K. Kuletz, H. Renner, J. Parrish, R. Corcoran, S. Schoen, B. Bodenstein, R. Kaler, M. Garcia-Reyes, H. Coletti, M. Arimitsu, R. Duerr, K. Lindquist, J. Lindsey, and W. Sydeman. 2018. Unprecedented scale of seabird mortality in the NE Pacific during the 2015-2016 marine heat wave. **Oral Presentation**. Alaska Marine Science Symposium, Anchorage, AK. 22-26 January 2018.

Powell, K., J. Schloemer, K. Holderied and A. Doroff. 2018. Oceanographic characteristics associated with spring zooplankton community structure in Kachemak Bay, Alaska from 2012 to 2016. **Poster presentation** at Alaska Marine Science Symposium, Anchorage AK. Jan 2018.

Renner, M., K. Holderied, K. Powell, D. Hondolero, J. Schloemer, A. Doroff, and K. Kuletz. 2018. Ecosystem variability in lower Cook Inlet across trophic levels, space, seasons, and climate regimes. **Oral presentation** at Alaska Marine Science Symposium, Anchorage, AK. Jan 2018.

Roncalli, Mathews, Cieslark, Hopcroft, Hopcroft, & Lenz. Physiological changes in *Neocalanus flemingeri* females during the transition from diapause to reproduction. **Oral Presentation**. ASLO - Feb 2017

Schaefer, A. L., M. A. Bishop, and R. Thorne. 2018. Non-breeding marine bird response to forage fish schools in Prince William Sound, Alaska. **Poster Presentation**. Alaska Marine Science Symposium, January 2018, Anchorage, AK.

Sethi, S., K. Iken, B. Konar, and H. Coletti. 2018. Regional and local drivers combine to structure mussel growth and mortality. **Poster Presentation** the Alaska Marine Science Symposium, Anchorage Alaska. January 21-25 2018.

Siegert, D., K. Iken, B. Konar, S. Saupe, and M. Lindeberg. 2018. Nearshore food web structure in two contrasting regions of Cook Inlet. **Poster Presentation** the Alaska Marine Science Symposium, Anchorage Alaska. January 21-25 2018.

Straley, J., and J. Moran. 2018. Have Gulf Of Alaska Humpback Whales Reached Carrying Capacity or has the Blob made the Food Web Screwy? Alaska Marine Science Symposium, Anchorage, January. **Oral Presentation**.

Suryan, R., M. Lindeberg, D. Aderhold, K. Hoffman, M. Arimitsu, H. Coletti, and R. Hopcroft. 2018. Gulf Watch Alaska: taking the pulse of the northern Gulf of Alaska. **Poster presentation**. Alaska Marine Science Symposium, Jan 23-26, 2018, Anchorage, AK.

Vandersea, M., P. Tester, K. Holderied, D. Hondolero, S. Kibler, K. Powell, S. Baird, A. Doroff and W. Litaker. 2018. Distribution and abundance of *Alexandrium catenella* in Kachemak Bay and lower Cook Inlet, Alaska. **Poster presentation** at Alaska Marine Science Symposium, Anchorage, AK. Jan 2018.

Weiss, C., J. Moran, T. Miller, and M. Rogers. 2018. Fine-scale trophic ecology and bioenergetics of euphausiids in Prince William Sound, Alaska. Alaska Marine Science Symposium, Anchorage, January. **Poster Presentation**.

Weitzman, B. 2017. Unhappy as a clam? **Article**. Delta Sound Connections. http://pwssc.org/wp-content/uploads/2017/06/DSC-2017-web2.pdf.

YouTube Video highlighting the common murre die-off. 2017. Cooperative efforts between NPS, USFWS, USGS and GWA. https://www.youtube.com/watch?v=Nhji4H5u65M

C. Data and/or Information Products Developed During the Reporting Period, if Applicable

GWA projects completed and finalized the publication of 45 datasets through the AOOS Research Workstation to DataONE. These datasets reflect information gathered during monitoring years 1-5 (2012-2016) or prior. Citations have been provided in each project annual report in section 9.C.

D. Data Sets and Associated Metadata that have been Uploaded to the Program's Data Portal

All projects are on schedule for having data posted one year after collection. Please see individual FY17 annual project reports section 9.D for listing of data and metadata.

10. Response to EVOSTC Review, Recommendations and Comments:

Science Panel Comments and Responses on Revised FY17-21 Proposal, September 2016

Program specific comments by EVOSTC Science Panel September 2016: The Panel appreciated the thorough and organized responses to our comments. The responsiveness of the program to Panel concerns was very much appreciated. Project specific comments for each proposal are included on each proposal's individual page below.

PI response: Thank you for the comment. Responses to specific comments for each proposal are included with project FY17 annual reports.

Science Panel Comments and Responses on FY18 Work Plans, September 2017

Program specific comments by EVOSTC Science Panel September 2017: The Panel is very pleased with Mandy's role in coordinating logistics and synthesizing results. The Panel is pleased about the hiring of Rob and Donna as the Science Coordinator and Program Coordinator,

respectively, and looks forward to working with them. The quality of this proposal has improved greatly compared to previous years. The Panel is encouraged to see data presented and the evaluation of past years data to determine what the projects should do in the future. This Program has published many papers, which is a positive development and the panel is excited about the Long-Term Ecological Research funding (National Science Foundation) awarded to some of the projects. The Panel was encouraged and about Rob's plans for synthesis products including an analysis and publication(s) on biological impacts of the recent environmental changes.

PI response: Thank you for the comment.

11. Budget:

Please see provided GWA program workbook. Table 2 provides a summary of spending to date by project, comparing proposed spending for FY17 (year 6) with actual spending for the year.

Table 2. Spending summary by project, comparing proposed FY17 (year 6) to actual spending for the year. All numbers are in thousands.

Project Number	PI	Project Title	FY17 Proposed	Cumulative Total
Environmental Drivers				
17120114-D	Batten	CPR	$70.2	$70.2
17120114-G	Campbell	PWS Ocean	$200.6	$133.9
17120114-I	Danielson	GAK1	$134.6	$62.6
17120114-J	Holderied/Shepherd	LCI/KBay Ocean	$155.7	$111.7
17120114-L	Hopcroft	Seward Line	$121.8	$56.3
Pelagic				
17120114-C	Arimitsu/Piatt	Forage Fish	$182.4	$182.8
17120114-E	Bishop	Wintering Birds	$82.7	$53.8
17120114-M	Kuletz/Kaler	PWS Marine Birds	$22.9	$22.9
17120114-N	Matkin	Killer Whales	$140.15	$123.3
17120114-O	Moran/Straley	Humpback Whales	$148.5	$90.0
Nearshore				
17120114-H	Coletti et al.	Nearshore	$368.7	$325.6
Integrated Program Management and Administration				
17120114-A	Lindeberg	Synthesis/Coord	$208.1	$194.0
17120114-B	Hoffman	Admin/Outreach	$254.2	$198.7
			$2,090.6	$1,625.8

Many of the projects are underspent for FY17 (year 6). Below is a brief explanation for deviations greater than 10% by project.

- 17120114-B: Delays in establishing the NOAA grant contract until May 2017 reduced the ability to spend funds on the project for more than 3 months. Travel was not as high as anticipated because SRP members did not attend 2018 AMSS on behalf of GWA and

Hoffman's travel was reduced. There were delays in invoicing by subawardees and some contractual work occurred later than planned. Computer hardware and software planned for purchase in FY17 will occur in 2018.

- 17120114-C: Reporting accounts lagged behind actual expenses, there are inconsistencies between federal and EVOSTC fiscal year start dates, and the USGS budget system categories differ from those shown on the EVOSTC budget form. All expenditures are within our planned budget. For example, in FY17 we went over budget on equipment because we needed to purchase licensing for acoustic data processing software to analyze the data we collected during this project. These costs will even out over time and we expect to spend the total proposed budget amount by the end of the project.
- 17120114-E: Personnel for this project was underspent in FY17 because projects nearing completion had salary funding that needed to be spent down first.
- 17120114-G: Spending is slightly behind schedule, more of Campbell's time than expected was occupied by other projects in FY17. Nutrient analysis also did not begin until January 2018 because the nutrient technician was not available until then. Salary and supplies funds for those analyses will be billed in Q1 of FY18.
- 17120114-H: The University of Alaska Fairbanks portion of the budget is underspent because of salaries and services not yet rendered. An unscheduled family trip by one PI resulted in the stable isotope analysis getting behind schedule and the inability for the PI to attend the November 2017 PI meeting. We anticipate services and salary to be fully spent in subsequent years.
- 17120114-I: Personnel spending is below anticipated because the NOAA grant was established in late April, which was later than anticipated. The anticipated FY17 equipment purchase was delayed until FY18 to take advantage of matching funds from the M.J. Murdock Charitable Trust. Contractual expenditures are higher than anticipated because a more expensive vessel was chartered after the *M/V Little Dipper* had engine troubles; this expenditure will continue to be higher until a replacement vessel is available.
- 17120114-J: Both organizations experienced obligation delays in 2017 that we expect to resolve in 2018. NOAA Kasitsna Bay Laboratory was delayed in fully obligating FY17 (year 6) funds by January 2018, primarily due to issues with delays of the award of a NOAA multi-year labor services contract. We prioritized contractor efforts to be able to complete all FY17 oceanographic field sampling efforts and expect to complete additional data analyses and get back on track for project spending within FY18 (year 7). KBNERR experienced obligation delays due to the departure of Research Coordinator, Angie Doroff, in July (halfway through the budget year). All field sampling tasks were met by remaining staff on the project and Jessica Shepherd (acting Manager and Education Coordinator) stepped in as the co-PI. A new Research Coordinator is expected to be hired in the coming months and we expect to be able to maintain our sampling schedule, complete additional data analyses and get back on track for spending within FY18.

- 17120114-L: While compiling the FY17 cumulative budget spent for the Seward Line project we discovered internal accounting discrepancies for FY17. The accounting is in review and the discrepancies will be rectified in FY18.
- 17120114-N: Budget is on track except for shortfall in commodities as we wait for Soundtrap recorders with improved battery performance and updated software. Monies for these purchases will be rolled over into FY 18. A small amount of contract work was not completed in this (FY17) fiscal year and this amount will be used in FY18.
- 17120114-M: The planned March 2018 survey will use FY17 funds because there is a lag in receiving FY18 funds. NOAA funds were used to secure vessel time for additional surveys (December 2017 and March 2018); however, NOAA funds are exclusively for vessel cost. Cost for logistics (travel, shipping, overtime) and data processing are covered by GWA funds.