Exxon Valdez **Oil Spill Trustee Council**

Long-Term Research and Monitoring, Mariculture, Education and Outreach

Annual Program Reporting Form

Program Number: 2522LTRM

Program Title: Gulf Watch Alaska Long-Term Research and Monitoring of Marine Conditions and Injured Resources

Principal Investigator(s): Rob Suryan, National Oceanic and Atmospheric Administration, Auke Bay Laboratories, and Katrina Hoffman, Prince William Sound Science Center

Reporting Period: February 1, 2025 – January 31, 2026

Submission Date: June 23, 2026

Program Website: https://gulfwatchalaska.org/

Please check all the boxes that apply to the current reporting period.

☒ **Program progress is on schedule.**
Overall, the program is on schedule; however, several non-Trustee organization-led projects experienced significant delays due to delayed distribution of FY24 grant funding from the National Oceanic and Atmospheric Administration (NOAA). In addition, federal agency staffing, travel, and procurement disruptions in 2025 affected the ability of some projects to complete data collection in FY25.

☒ **Program progress is delayed.**
The program has experienced several delays outside of our control. First, there was a delay in the release of funds and establishment of the NOAA grant to the non-Trustee organization projects, leading to a four-month offset between the *Exxon Valdez* Oil Spill Trustee Council (EVOSTC) fiscal year (February-January) and the NOAA grant fiscal year (June-May). Second, a change in Department of Commerce financial software delayed federal contracting so that non-Trustee partners did not receive FY24 funds until mid-January 2025. All federal contracting was severely restricted in FY25, although the contract for non-Trustee partners was delayed, it was successfully established within the fiscal year.

On behalf of the projects, the program requests a one-year extension to complete delayed field work and final reports for the FY22-26 funding period.

ED note: A 1-year extension was approved, revising the due date for project final reports to March 1, 2028, and the due date for the program report to April 1, 2028.

☒ **Budget reallocation request.**
We appreciate the no-cost extension we received for FY23 and FY24 funds. On behalf of the projects, the program now requests a no-cost extension to spend project funds through FY27, so projects can expend any unspent funds for the current funding cycle and complete final reports for the FY22-26 funding period.

Following the annual reporting period, the program and several projects will submit a separate budget reallocation request related to the changes in principal investigators that occurred in 2025.

☒ **Personnel changes.**
Program Lead Mandy Lindeberg retired from NOAA in 2025. Science Lead Rob Suryan picked up her duties. Because the program management team (PMT) is small (four people reduced to three), losing a key team member resulted in the PMT selecting the most important aspects of leadership duties to maintain during the year.

1. Summary of Work Performed:

This report serves as the fiscal year 2025 (FY25) annual report for the program management project (2522LTRM) and the program annual report for the Gulf Watch Alaska Long-Term Research and Monitoring (GWA-LTRM) program. The report is organized by the overarching GWA-LTRM program goals presented in our FY22-31 proposal to the *Exxon Valdez* Oil Spill Trustee Council (EVOSTC):

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, synthesis products, and outreach to management agencies and other users.
3. Provide information that can be used by the Education and Outreach and Mariculture programs.
4. Leverage partnerships with outside agencies and groups to integrate data and expand capacity through collaborative efforts.
5. Ensure data are properly archived so that they can be accessed beyond the life of this program.

Summaries of work performed by each of the monitoring and research projects within the Nearshore, Environmental Drivers, Pelagic, Herring Research and Monitoring (HRM), and Lingering Oil components are predominantly presented in goal 1. Updates on research projects

(HRM projects) are also included in this section. We have also included a section on Program Management to summarize work that is not included in the five primary goals of the GWA-LTRM program.

2025 was a disruptive year for the PMT and many of the GWA-LTRM projects, and the disruptions affected our ability to meet all our goals. Principal investigators (PIs) and team members at numerous federal agencies retired early and unexpectedly and others left federal service. Remaining federal team members stepped in to cover the work of those who departed federal service, but many routine operations were curtailed or complicated and a hiring freeze limited their ability to hire seasonal biologists to complete field work. One project lost the ability to complete a substantial portion of their planned field work, which impacted another project that typically collects data in tandem. Project and program related disruptions are discussed below and in project annual reports.

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

The primary focuses of the GWA-LTRM program are to monitor the intertidal and marine environments and species affected by EVOS and conduct research into the lack of recovery of injured resources in Prince William Sound (PWS) and the oil spill affected area. Monitoring projects collect data annually in the same locations and on the same environments and species, leading to long-term time series that allow for comparisons across years and environmental patterns. Research projects conduct specific studies that do not necessarily result in time series. The results of data collection and time series development for projects through FY25 for each project are reported here by component.

Nearshore Ecosystem Component (25120114-H)

The Nearshore Component (project 25120114-H, PIs Coletti et al.) conducted intertidal monitoring in four regions within the spill-affected area of the northern GOA: western PWS, Kenai Fjords National Park, Kachemak Bay, and Katmai National Park and Preserve. The nearshore monitoring program focuses on sampling numerous ecosystem components in the GOA that are both numerically and functionally important, including kelps (and other marine algae), seagrasses, marine intertidal invertebrates, marine birds, black oystercatchers, sea otters, and physical properties.

FY25 brought significant personnel changes to this component. Four permanent principal investigators (Dan Esler, Mandy Lindeberg, Dan Monson, and Ben Weitzman) from the

Nearshore Component left federal service prior to the start of the field season. Federal hiring freezes (both for permanent and terms) to replace these positions continue into FY26. Staff shortages resulted in changes to operations in FY25. In addition to the recent losses, the team has not been able to hire a U. S. Geological Survey (USGS) term biologist since the departure of Brian Robinson in 2023. The team used a combination of existing PIs, temporary staff, and university partners to complete tasks in 2025. With Dan Esler's departure, Sarah Traiger is now the USGS co-lead for the Nearshore Component.

In 2025, team members completed all aspects of the nearshore monitoring component across three of the four regions. Due to staffing shortages and logistical constraints, the full suite of nearshore sampling did not occur in Kenai Fjords National Park (KEFJ). However, the marine bird and mammal surveys were completed in 2025 in KEFJ. This project maintains multiple time series for the species and habitats monitored. As examples, Fig. 1 shows monthly intertidal water temperature anomalies indicating that water temperatures were warming again in 2025 and Fig. 2 shows percent cover of macroalgae, mussels (*Mytilus trossulus*), and barnacles at 0.5 m mean lower low water are trending back toward patterns driven by more local-scale conditions at the four study regions compared to the large-scale effect of the Pacific marine heatwave (PMH).

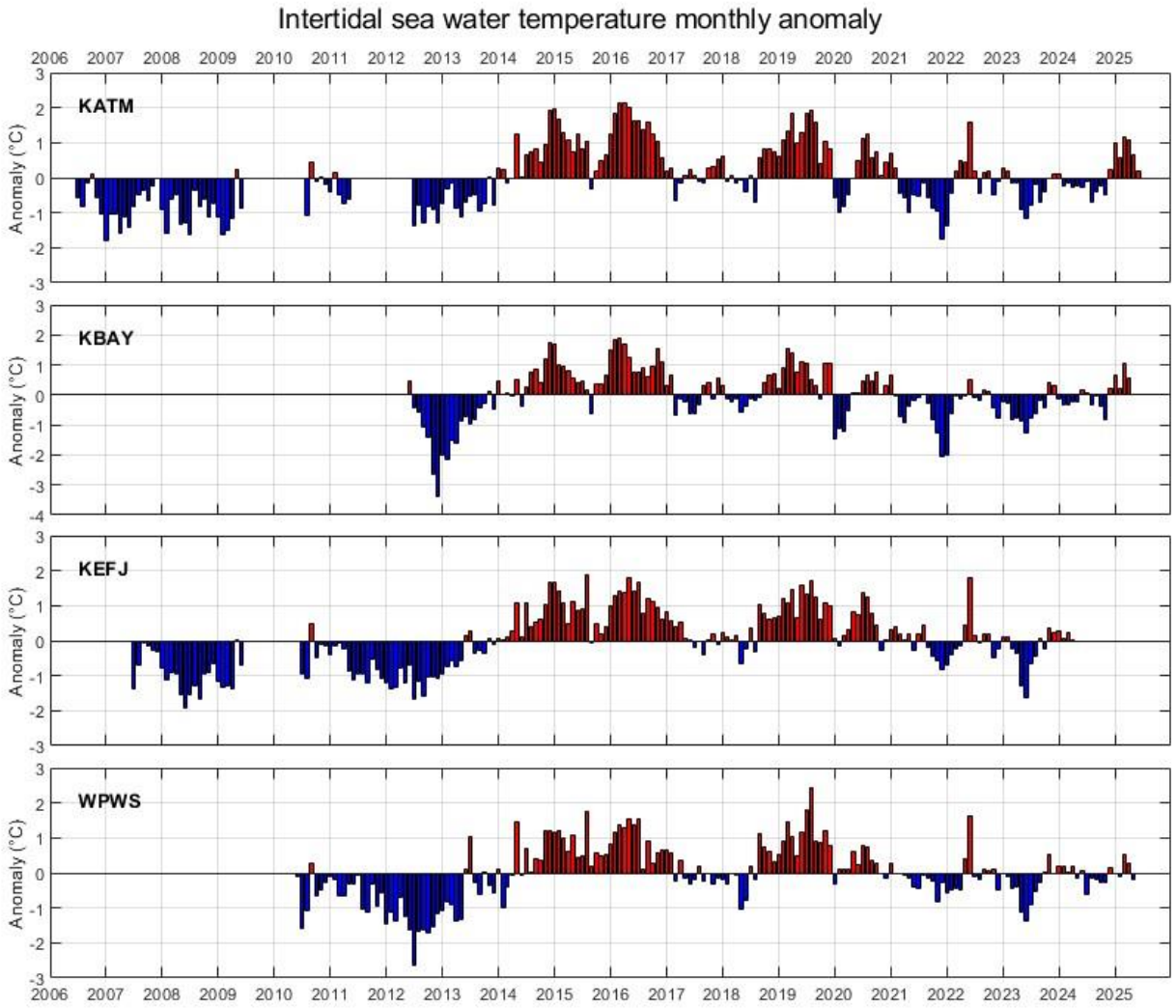

Figure 1. Monthly intertidal water temperature anomalies at the 0.5 m tide level four regions of the western Gulf of Alaska (west of 144°W), western Prince William Sound (WPWS; 2011-2025), Kenai Fjords National Park (KEFJ; 2008-2024), Kachemak Bay (KBAY; 2013-2025), and Katmai National Park adjacent to Shelikof Strait (KATM; 2006-2025). Tick marks indicate the start of the calendar year (January). Data sources are listed below under the Products section.

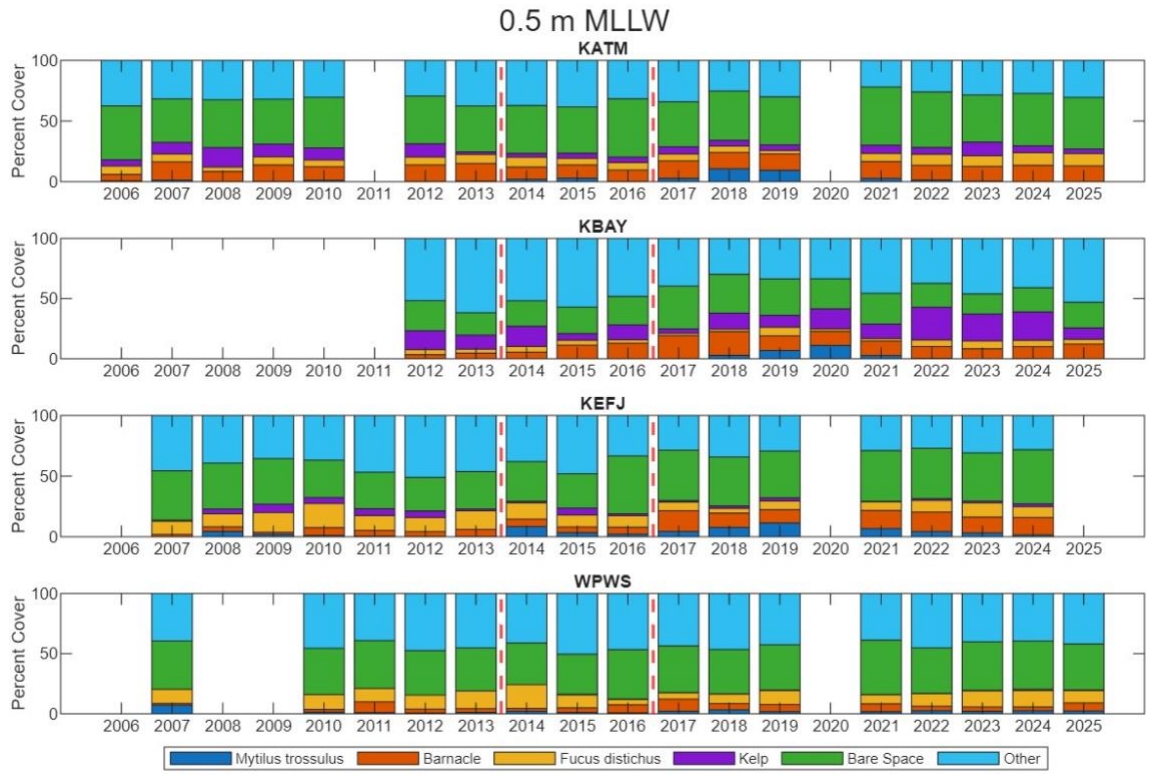

Figure 2. Percent cover of Mytilus trossulus, barnacles, Fucus distichus, kelps, bare substrate, and all other taxa at the 0.5 m tidal elevation across the four Gulf Watch Alaska regions: Katmai National Park and Preserve (KATM), Kachemak Bay (KBAY), Kenai Fjords National Park (KEFJ), and Western Prince William Sound (WPWS), 2006-2025. "Other" includes all other macroalgae and sessile invertebrates. Dashed red line indicates the sampling years that fall within the Pacific marine heatwave. Note: 2020 intertidal was not sampled in all regions except KBAY because of the global pandemic. KEFJ was not sampled in 2025. Data sources are listed below under the Products section.

Environmental Drivers

Continuous Plankton Recorders (25120114-D)

All 2025 Continuous Plankton Recorder (CPR; project 25120114-D, PIs Ostle and Batten) tows were completed as planned. The CPR was deployed on six transects in 2025, monthly from March through August. Although only some of the data are available at this time (March-June 2025), preliminary analyses suggest that in the plankton there was a higher proportion of large-

round diatoms in the phytoplankton, and high numbers of small copepods compared to previous years (Fig. 3). There were low numbers of pteropods and large copepods and no euphausiids recorded.

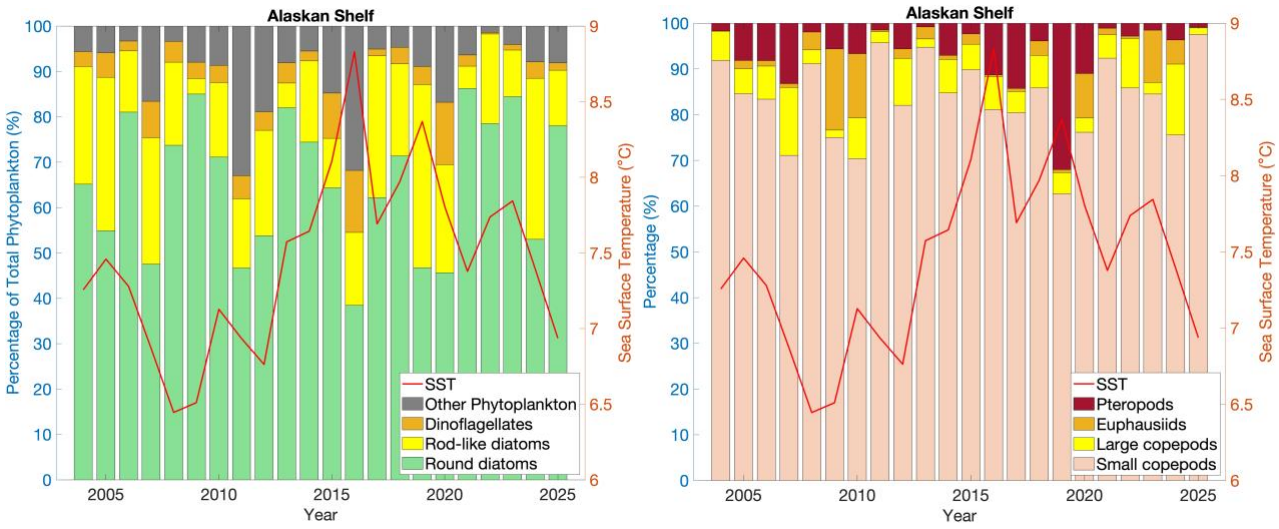

Figure 3. Left panel shows the mean annual percentage of the total phytoplankton (green=round diatoms, yellow=rod-like diatoms, orange=dinoflagellates, grey=all other phytoplankton). Right panel shows the mean annual percentage of the total zooplankton (pink = small copepods, yellow = large copepods, orange = Euphausiids, dark red = Pteropods). 2025 only includes data from March and June and are preliminary. Red line is the annual Sea Surface Temperature within the Alaskan Shelf region from 2004 to 2025, obtained from the International Comprehensive Ocean-Atmosphere Data Set (ICOADS). ***Please note as of writing this report the ICOADS Sea Surface Temperature dataset (https://downloads.psl.noaa.gov/Datasets/icoads/1degree/global/std/) has not been updated beyond July 2025 so this is not a complete year of sea surface temperatures.***

Oceanographic Conditions of PWS (25120114-G)

The planned oceanographic surveys of PWS (project 25120114-G, PI Campbell) were conducted during the reporting period, but only a partial survey was conducted in September when a catastrophic failure of one of the engines in the Prince William Sound Science Center (PWSSC) R/V *New Wave* occurred. Following a short early deployment, the PWS profiler developed power system problems that the project team was unable to remedy quickly. They are currently working with the Ocean Observatories Initiative group at Oregon State University to obtain some

of their spare parts; uncertainty about the National Science Foundation funding underpinning that project has led to their ceasing all profiler deployments.

All conductivity and temperature at depth (CTD) data collected to date have been processed, and seasonally detrended anomalies of near-surface temperature and salinity, and average mixed layer depth are shown in Fig. 4 (top panel). Temperatures in central PWS were mostly above average since late 2013, as has been observed elsewhere in the GOA (see Seward Line [25120114-L] and GAK1 [25120114-I] projects), and late 2013 to 2016 has been labelled a basin scale marine heatwave (Gentemann et al. 2017), the PMH.

All zooplankton samples up to the end of 2024 have been analyzed (zooplankton samples are time consuming to process and take about a year to complete). Analysis of the 2010 to 2024 samples shows a shift in zooplankton taxa in PWS during the marine heatwave years.

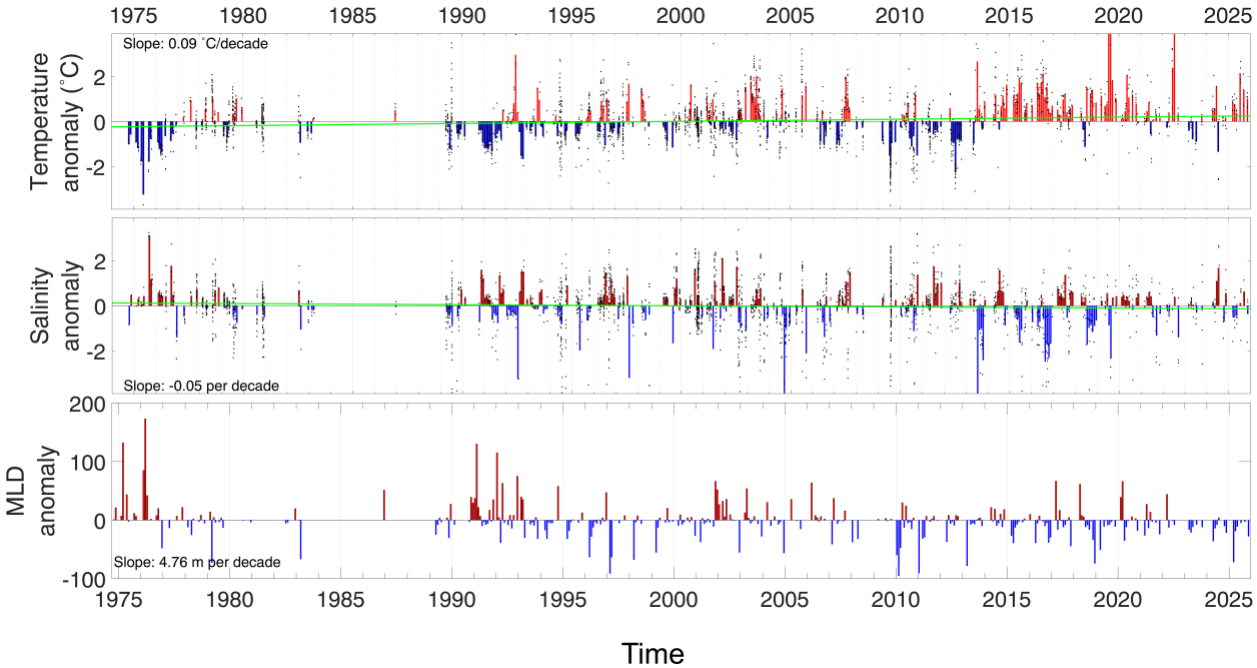

Figure 4. Top panel: Biweekly near surface temperature anomalies in central Prince William Sound. Anomalies were calculated as the residual to a second order cosine curve fit to all years data (to remove seasonality [Campbell 2018]). Black points are observations, bars are biweekly averages, and the green line indicates the linear trend. Middle panel: near surface salinity anomalies calculated with the same method. Bottom panel: Monthly mixed layer depth

anomalies. Mixed layer depth was estimated as the depth of the maximum Brunt–Väisälä frequency.

GAK1 (25120114-I)

Project activities in 2025 extended the GAK1 (project 25120114-I, PI Danielson) coastal monitoring measurement time series through its 56th consecutive year with nominally monthly surface-to-seafloor hydrographic profiles. The field work was accomplished through monthly visits to the GAK1 site on project-chartered day trips aboard R/V *Nanuq* from the University of Alaska Fairbanks' (UAF's) Seward Marine Center, as well as leveraged cruises of opportunity aboard R/V *Sikuliaq* and R/V *Tiglax* in association with the Seward Line project. Continuing a project initiative begun in 2024, the team made additional improvements in their data handling procedures, further decreasing the amount of time between data collection and when the data are available to other GWA-LTRM researchers and the public. Sensor data from the monthly hydrographic profiles on R/V *Nanuq* are downloaded from the CTD right after the cruise (same day) and now subjected to initial data extraction and processing procedures. Both Level 0 raw and Level 1 processed data are then uploaded to the Research Workspace, where they are immediately available to all GWA-LTRM partners (now reliably within one day of the cast) and is also staged for Level 2 final processing. Pending staff availability, final processed data are now normally available within a week of data collection.

To summarize analyses of monthly to interannual anomalies, the team finds that while the coastal GOA warmed over the period of record, the freshwater content of the whole water column remained steady because surface freshening has been balanced by seafloor salinization. The temperature and salinity trends are seasonally non-uniform (Danielson et al. 2024) such that stratification is increasing more rapidly in late winter and spring months than at other times of year. The salinity and temperature fields exhibit short (2-3 month) and long (4-16 month) decorrelation time scales, respectively, suggesting contrasting dynamical controls and unequal time scales for ecosystem impacts of the two parameters.

Annual averages of the GAK1 monthly anomalies show the 5-decade trends in hydrographic properties (Fig. 5) that have been previously documented with shorter records (Royer 2005, Kelley 2015, Danielson et al. 2022). Least-squares linear fits to these records show warming across the water column (larger at the surface than at the seafloor), freshening near the surface and salinization near the seafloor. The upper 100 m of the water column is warming at a rate of about 0.2°C per decade and the trend accounts for about 10% of the total variance over the

record. Below 100 m depth, the rate of warming linearly decreases to about 0.13°C per decade near the seafloor.

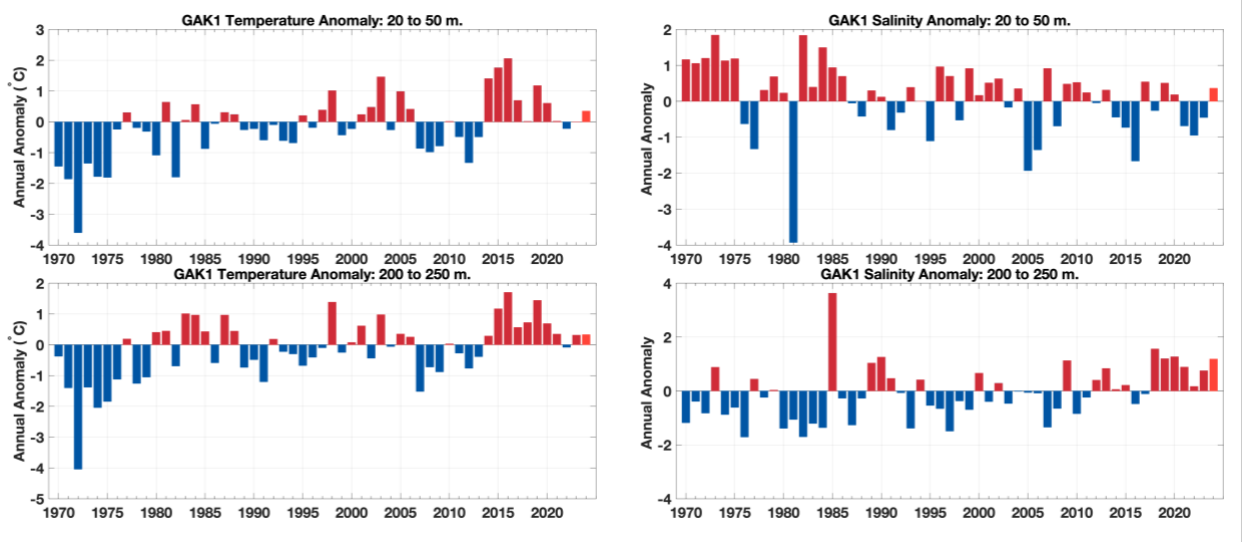

Figure 5. Annual averages of the monthly GAK1 anomalies. Note that 1981 and 1985 each have only two months sampled within the year.

Seward Line (25120114-L)

The Seward Line (project 25120114-L, PIs Hopcroft and Danielson) was sampled in early May and mid-September of 2025. Processing of samples continues year-round, and descriptive aspects evolve as more data become available.

During May, the surface temperature was 6-6.5°C, with the average temperature of the upper 100m along the Seward Line nearly 0.5°C above the long-term mean (Fig. 6). During September, the average upper 100 m temperature was slightly over 1.0°C above the long-term mean and represented the warmest fall in time-series. This was somewhat unexpected because both the Pacific Decadal Oscillation (PDO) and El Niño Southern Oscillation (ENSO) indices were negative throughout the year. Surprisingly, there has been little public awareness of this protracted heatwave.

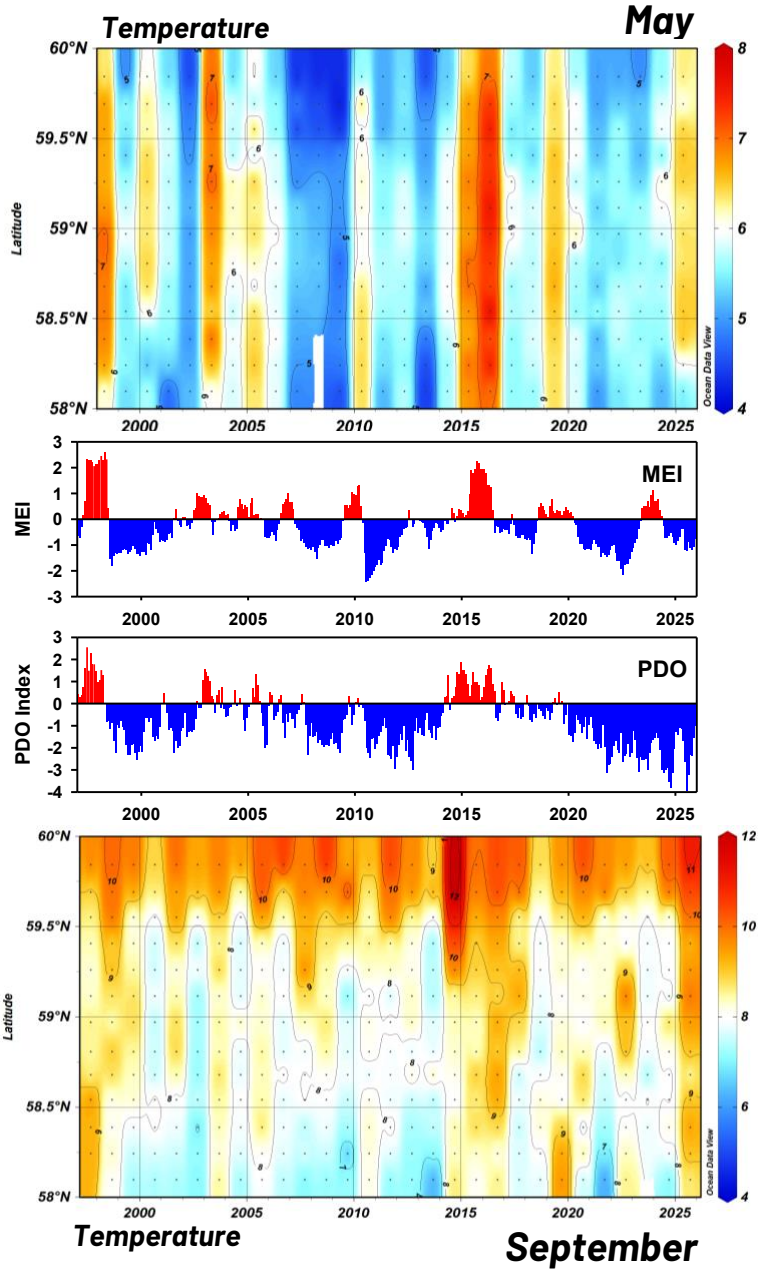

Figure 6. Average temperature of the upper 100 m along the Seward Line during May (upper) and September (lower)oceanographic cruises. The monthly Multivariate El Niño/Southern Oscillation Index (MEI) and Pacific Decadal Oscillation (PDO) are aligned to the same time scale. Warm years match the MEI phase, and to a lesser extent the PDO, but these associations weakened after the 2014-2016 heatwave.

During spring 2025, there was relatively modest chlorophyll in the surface layer with highest concentrations observed on the outer shelf and the community dominated by small cells that do not favor the transfer of primary production to zooplankton. During spring, *Neocalanus* biomass appeared to be below normal (Fig. 7), with development somewhat delayed. This developmental pattern was somewhat anomalous based on water temperatures, but consistent with observations of low chlorophyl that would suggest potential food limitation. About a third of the variability in large copepods during spring is positively associated with the PDO. In contrast, biomass of the euphausiid community is negatively correlated with the PDO. Neither group is well correlated to the multivariate El Niño/Southern Oscillation Index (MEI) or temperature.

The fall cruise saw lower chlorophyll, with limited suggestion of a fall bloom being underway. The abundance of small copepods was low (Fig. 7), and there was limited contribution from warm-water taxa that have been a significant component of the fall community when ocean conditions are warm. The abundance of warm water copepods species is positively correlated to the PDO (r^2~0.5), not to temperature per se. The positive phase of PDO results in increased advective transport in coastal waters, bringing these California species northward to the Seward Line rather than arising from local production. This explains the low abundance of warm-water copepods in 2025 when temperatures should have been favorable to them. In contrast, euphausiids appeared to do well in spring and qualitative observations suggest they were above average during fall.

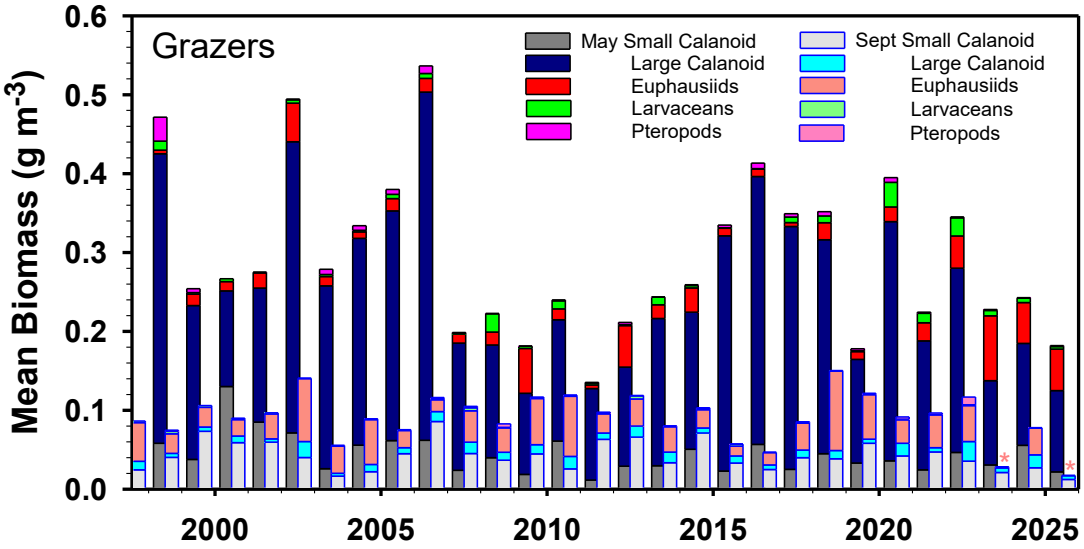

Figure 7. Average zooplankton wet-weight biomass along the Seward Line for major crustacean component. Data from 2023-2025 are preliminary, based on a subset of the stations sampled. Fall 2023 lacks euphausiid data due to equipment failures, fall 2025 euphausiid data are not yet ready to report upon.

Continuation and Expansion of Ocean Acidification Monitoring in the Spill Area (25220202)

The ocean acidification project (25220202, PI Hauri) collected water samples for total alkalinity, dissolved inorganic carbon, and pH during the spring, summer, and fall 2025 cruises along the Seward and Kodiak lines and in PWS.

Analysis results include fully analyzed data through 2023 and preliminary data for 2024. Data collected in 2025 continue to be processed. Under optimal conditions, 8–10 samples can be processed per day. Periodically, however, instruments require multi-day reconditioning. Consequently, a subset of the water sample analyses remains in progress. Once all analyses are complete, the team will proceed with QA/QC, which can only be conducted after the associated temperature, salinity, and nutrient data are available.

The 2024 preliminary data illustrated in Fig. 8 continue to show the general pattern observed in prior years of high pH (lower dissolved inorganic carbon [DIC]) in the surface layer in spring because of primary production, and a visible freshwater dissolution effect on DIC and total alkalinity (TA) in fall, leading to a somewhat lower pH compared to spring.

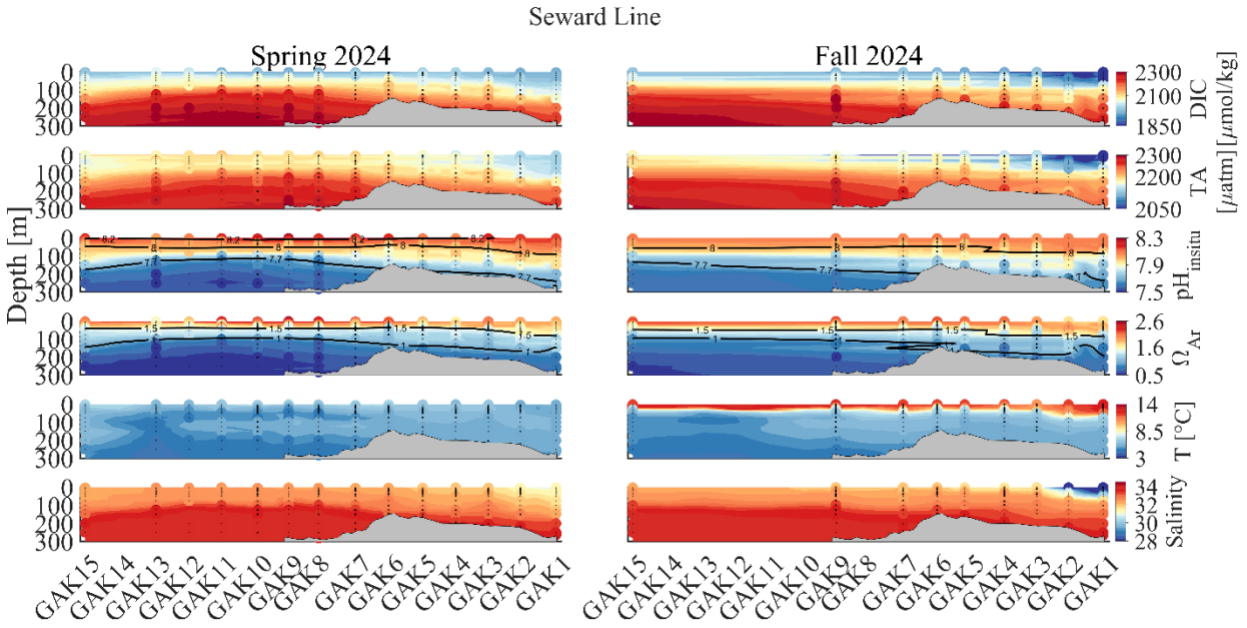

Figure 8. 2024 Seward Line Transects. Data from the Gulf Watch Alaska Long-Term Research and Monitoring and Northern Gulf of Alaska-Long Term Ecological Research program spring and fall 2024 cruises from inshore to offshore (right to left). Panels (top to bottom) are dissolved inorganic carbon (DIC; µmol kg⁻¹), total alkalinity (TA; µmol kg⁻¹), in situ pH, aragonite saturation state (Ω_{arag}), temperature (T; °C), and salinity (S) for each cruise. Black crosses show stations and depths where discrete samples were collected. Temperature and salinity contours are from full conductivity and temperature at depth profiles (Danielson & Dobbins 2025). Colored circles are included to remind the reader that contoured transect plots do not represent actual data values. Solid black lines highlight specific contour levels (e.g., situ pH = 8.0 or Ω_{arag} = 1). Bathymetry is shown in gray.

DIC observations along the Seward Line (2008–2024) provide a 17-year perspective on surface and bottom water variability. Over this period, no statistically significant trends were detected in spring, either at the surface or near the bottom.

Pelagic Ecosystem

Monitoring Long-term Changes in Forage Fish in PWS and the Northern GOA (25120114-C)

The lead PI (Arimitsu) of the forage fish project (25120114-C) left her position with USGS in April 2025 due to restructuring of the workforce and shifting priorities in the federal government. By summer 2025, three more USGS employees and an Alaska Sea Grant Fellow working on the forage fish project had also moved on to other jobs. Although contractual work was accomplished, and certain datasets were maintained (i.e., aerial survey [funded through PWSSC's program management project 2522LTRM-B], summer forage fish collections, and Middleton Island seabird diet sampling), the USGS no longer had the capacity to conduct the Integrated Predator Prey survey acoustic-trawl forage fish surveys planned during September 2025. Moving forward this project will be administered with the other non-Trustee organizations through the PWSSC.

During 2025, the Middleton Island seabird diet sampling was conducted by the Institute for Seabird Research and Conservation scientific team according to schedule. Working with partners at the U. S. Fish and Wildlife Service (USFWS) Alaska Maritime National Wildlife Refuge and the National Marine Fisheries Service (NMFS), the team prepared seabird diet datasets for reporting as part of NOAA's 2025 Gulf of Alaska Ecosystem Status Report (Cushing et al. 2026) to provide local- to basin-scale inference from seabird diet monitoring efforts at Middleton, St. Lazaria (eastern GOA), Chowiet and Suklik (western GOA), and Aiktak (western GOA or eastern Aleutians) islands. This work aims to provide context for the Middleton samples, as requested by the North Pacific Fisheries Management Council's Science and Statistical Committee for decision making. The team updated the Middleton Island Seabird Diet Data USGS data release according to schedule (Arimitsu et al. 2017 ver. 5 update May 2025).

Seabird diet samples at Middleton Island were collected from April to August 2025. This included a total of 1169 diet samples from black-legged kittiwakes (*Rissa tridactyla*) and 365 diet samples from rhinoceros auklets (*Cerohinca monocerata*).

Spring and summer kittiwake diets were composed mainly of capelin (*Mallotus villosus*; Fig. 9). Additionally, capelin indices increased in rhinoceros auklet chick diets during 2024 and 2025 (Fig. 10), which, along with increasing trends in capelin in seabird diets at other colonies around the GOA (Arimitsu et al. 2024) and acoustic surveys in their core area around Kodiak (McGowan et al. 2024), suggest that capelin continue to recover in the region following population collapse during the Pacific marine heatwave of 2014-2016 (Arimitsu et al. 2021, McGowan et al. 2024).

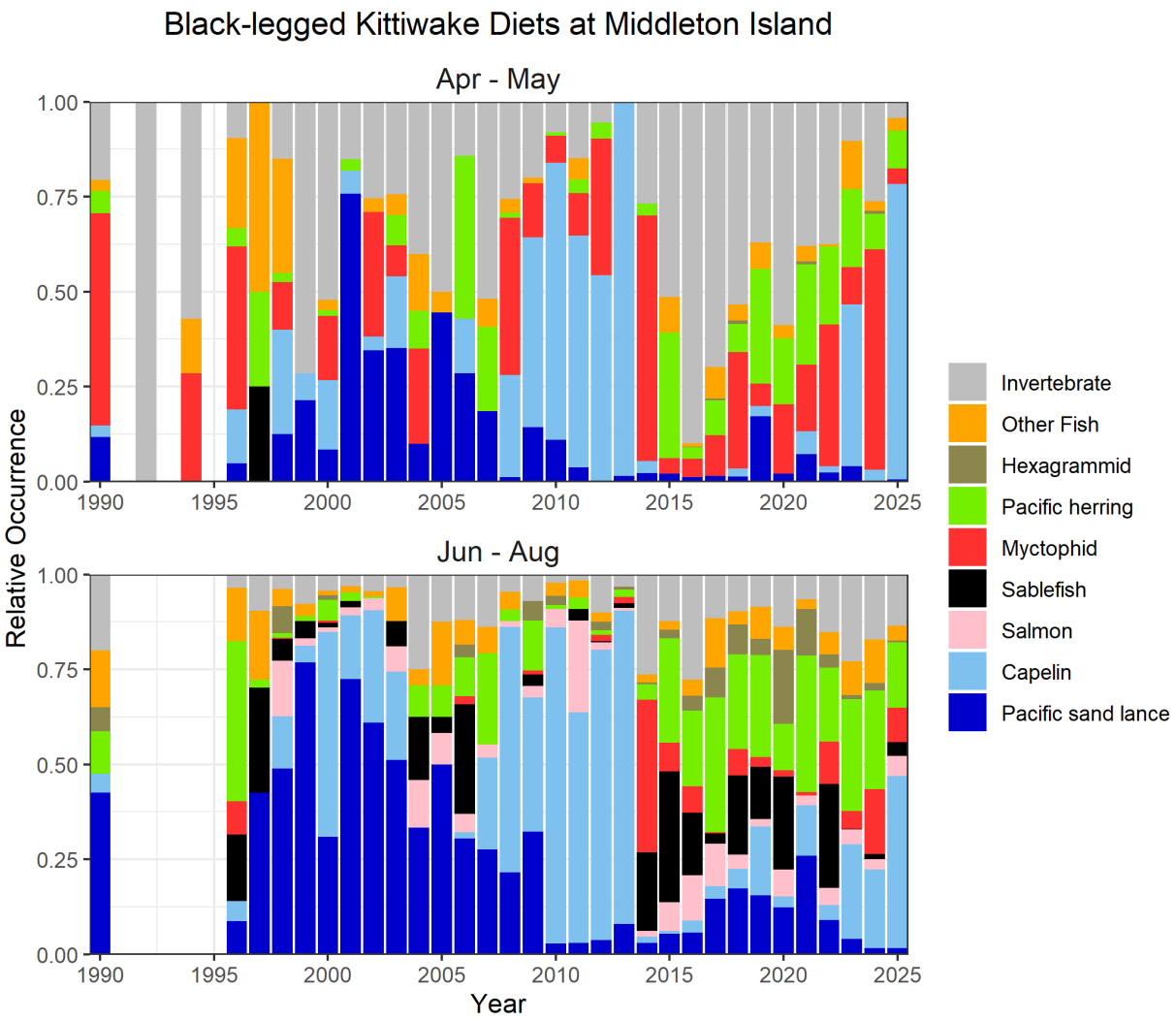

Figure 9. Interannual variation in diet composition of black-legged kittiwakes during spring (top) and summer (bottom) on Middleton Island.

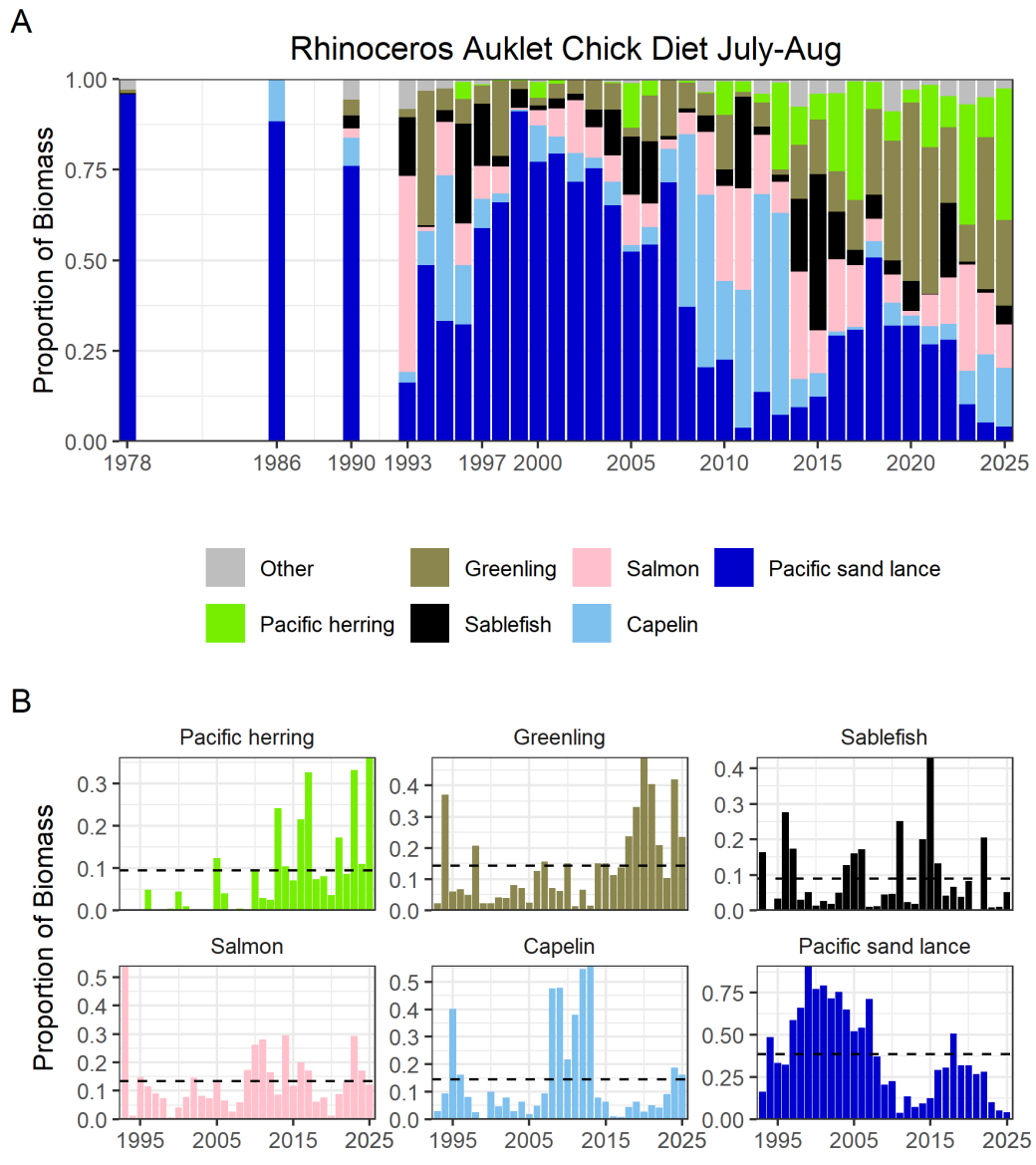

Figure 10. Interannual variation in rhinoceros auklet chick diets by species (color) at Middleton Island. (A) Stacked bars show relative proportions and importance of different prey types, and (B) Species-specific bar plots over time, note y-axis scale differences across panels.

PWS and Northern GOA Marine Bird Surveys (25120114-M)

In 2025, the marine bird survey project (25120114-M, PI Kaler) continued two linked efforts: the July PWS survey and the seasonal Seward Line surveys. Together, these projects track the abundance and distribution of marine birds in oil spill regions of PWS and the GOA, how they respond to environmental change, and help identify drivers of population trends following EVOS and recent marine heatwaves.

The PWS summer bird survey was conducted as scheduled in 2025. Preliminary results from this survey indicate that while lingering oil effects on marine birds appear to have dissipated, marine bird populations show disparate trends over the past 20 years, with piscivorous pelagic foraging species stable or declining and nearshore benthivorous species stable or increasing in PWS (Fig. 11).

The offshore GOA surveys along the Seward Line and additional oceanographic lines are especially useful because seabird communities in the northern GOA change strongly with season, with spring migration, summer breeding concentrations, and high fall abundance in some species groups. The resulting data help describe cross-shelf patterns and ecological responses to changing marine conditions in the GOA adjacent to PWS. Some consistent patterns from these surveys in recent years include reduced abundance of alcids (murres, rhinocerous auklets, puffins, primarily piscivores) and changes in cross-shelf distribution of various species post-heatwaves (Fig. 12)

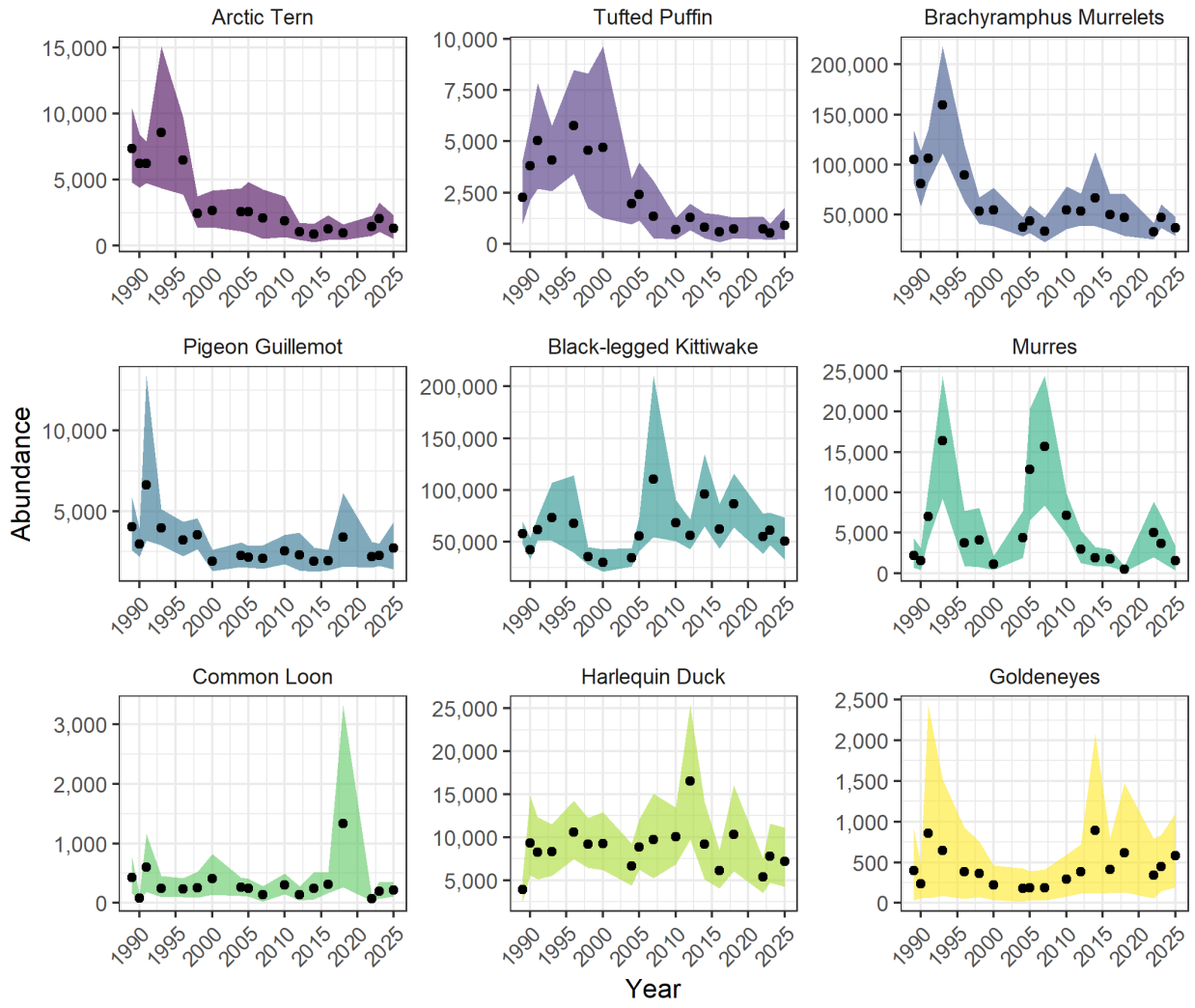

Figure 11. July population estimates of selected marine bird species in Prince William Sound, Alaska, 1989-2025.

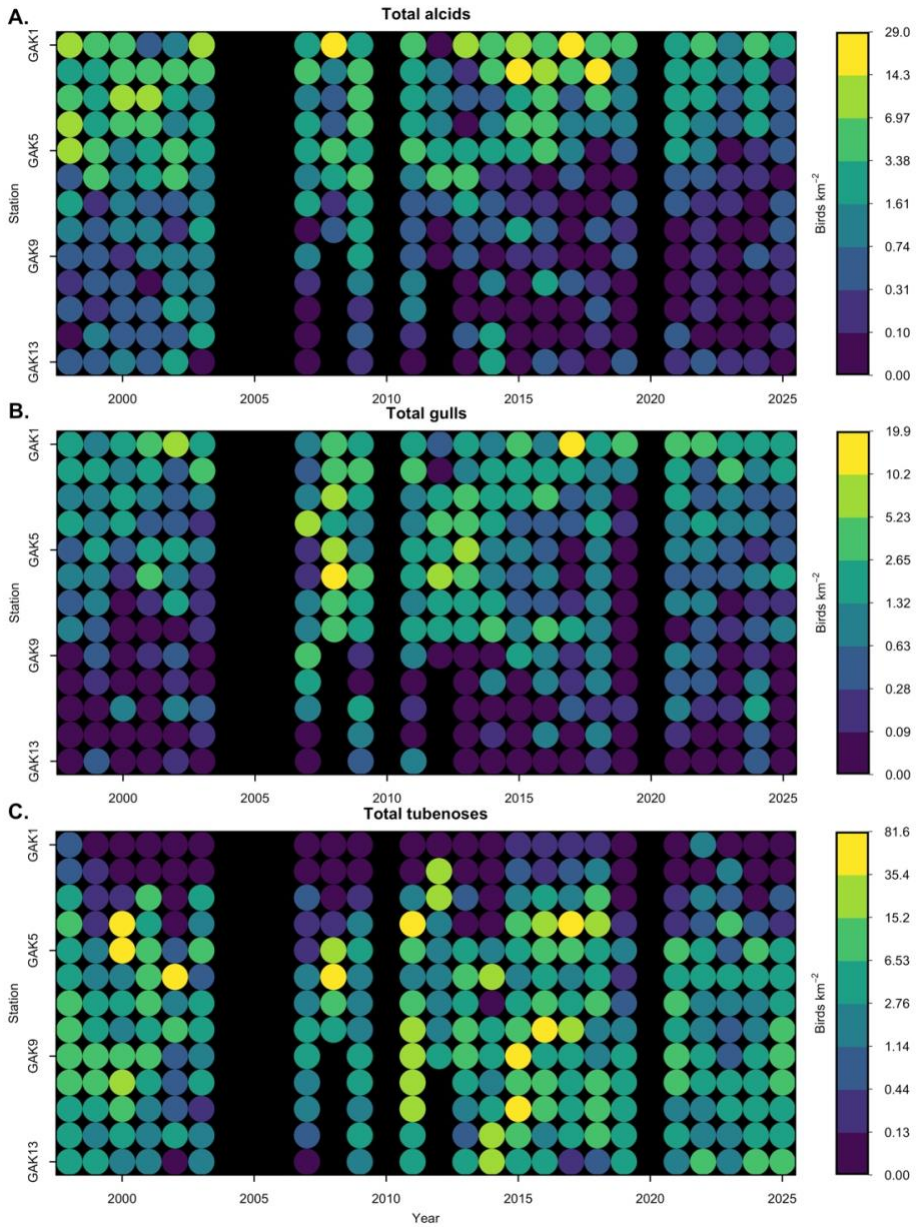

Figure 12. At-sea densities (birds km^{-2}) of numerically-dominant seabird taxonomic groups along the Seward Line, May 1998–2025. Black indicates no seabird surveys were conducted. Density values are averaged from all surveys within 10 km of each of the 13 sampling stations that compose the Seward Line.

Long-term Monitoring of Humpback Whale Predation on Pacific Herring in PWS (25120114-O)

The humpback whale (*Megaptera novaeangliae*) team (project 25120114-O, PIs Moran and Wild) completed April and September 2025 humpback whale (*Megaptera novaeangliae*) surveys as planned. As in 2024, the April 2025 survey was conducted under suboptimal conditions. Snow, rain, and wind (peak gust of 83 mph) proved challenging for visual observations. Only one humpback whale was identified (P295) during this survey. Small schools of adult herring (*Clupea pallasii*) were seen but no active spawn was recorded during the survey. In Unakwik Bay we biopsied and identified a sperm whale (*Physeter macrocephalus*) that was last sighted in PWS in 2023. Team members were trained on new tablet-based data collection software during the April survey to and they continued work on merging the PWS and Southeast Alaska databases. Conditions were more favorable for our primary population monitoring survey in September.

Whale populations within PWS remained at post-heatwave low abundance during the September 2025 survey. No significant concentrations of whales or their prey were observed. Humpback whales primarily targeted krill and small, mobile schools of juvenile herring; adult herring were not located during this survey. Marine bird foraging flocks, largely targeted juvenile herring, frequently humpback whale would cue in on the activity and consume the school. A significant highlight was the resighting of a humpback whale freed from shrimp gear near Valdez in July 2024; the individual appeared healthy and free of gear.

Due to the Department of Government Efficiency related personnel reductions, the fall 2025 survey was unable to collaborate with the forage fish team for the annual predator-prey interactions survey.

The team continues to monitor the steep decline of the local humpback whale population in PWS following the 2014-2016 PMH. Prior to the PMH, humpback whales in PWS fed primarily on adult herring, especially when herring aggregated in large shoals during the spring, fall, and winter. Following the PMH, juvenile herring and euphausiids have become more common in the diet of whales. The team used the unique marking of the flukes to identify and “photographically mark” individual whales. Annual and seasonal population estimates from 2007-2024 were derived using both closed and open mark/recapture models based on recaptures from 2024 (Fig. 13). Recaptures made during 2025 are used to estimate whale abundance in 2024.

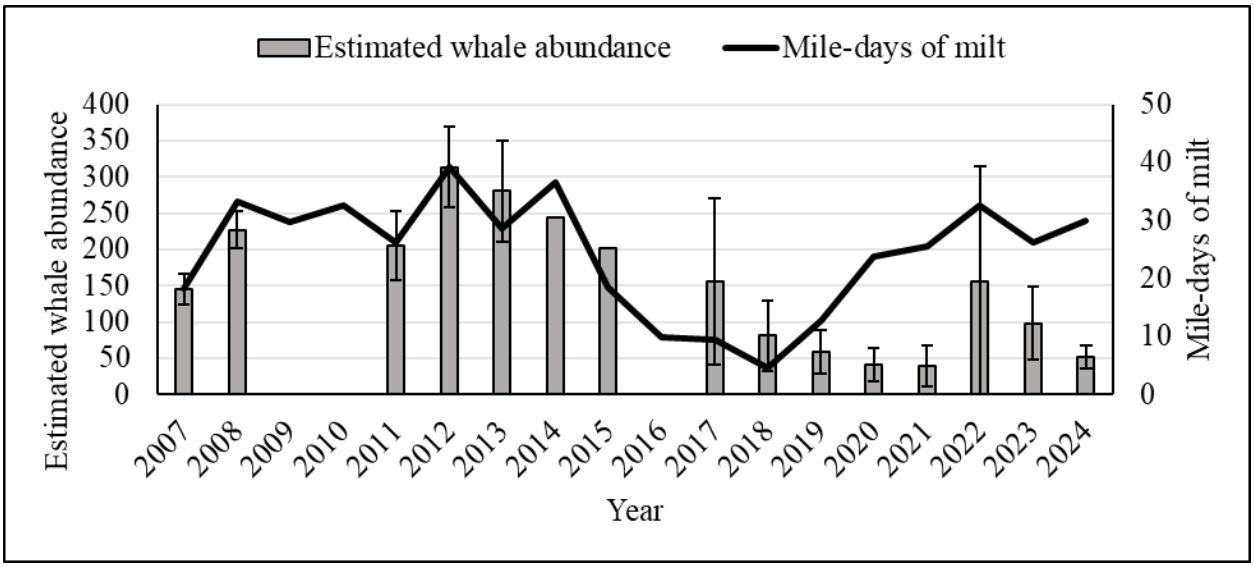

Figure 13. The abundance of humpback whales derived from Chapmanized-Petersen estimates and herring mile-days of milt (an index of spawning population size) from Prince William Sound, Alaska. Note there is no 2016 survey so the observed data in 2015 are used for 2017 and none of the whales captured in 2021 were recaptured in 2022, hence the large error bars.

HRM

Herring Surveys and Age, Sex, and Size Collection and Processing (25170111-F)

During 2025, the herring survey project (25170111-F, PI Morella) was severely impacted by anomalously poor weather conditions (high winds and precipitation), which prevented flights during key spawning events. Consequently, the 2025 mile-days-of-milt estimate should be considered incomplete. We conducted 39.25 hours of aerial surveys over 15 flights between March 23 and May 20, 2025, and observed 10.5 mile-days-of-milt (Fig. 14). Both the number of flights and total flight hours were below the 2005–2024 averages. Observations from PWS communities and the commercial open pound fishery confirmed extensive missed spawning events while flights were grounded. For example, community members from Tatitlek provided drone footage of active spawning, and the commercial open pound fishery reported significant egg deposition on kelp blades during periods when flights could not occur due to weather.

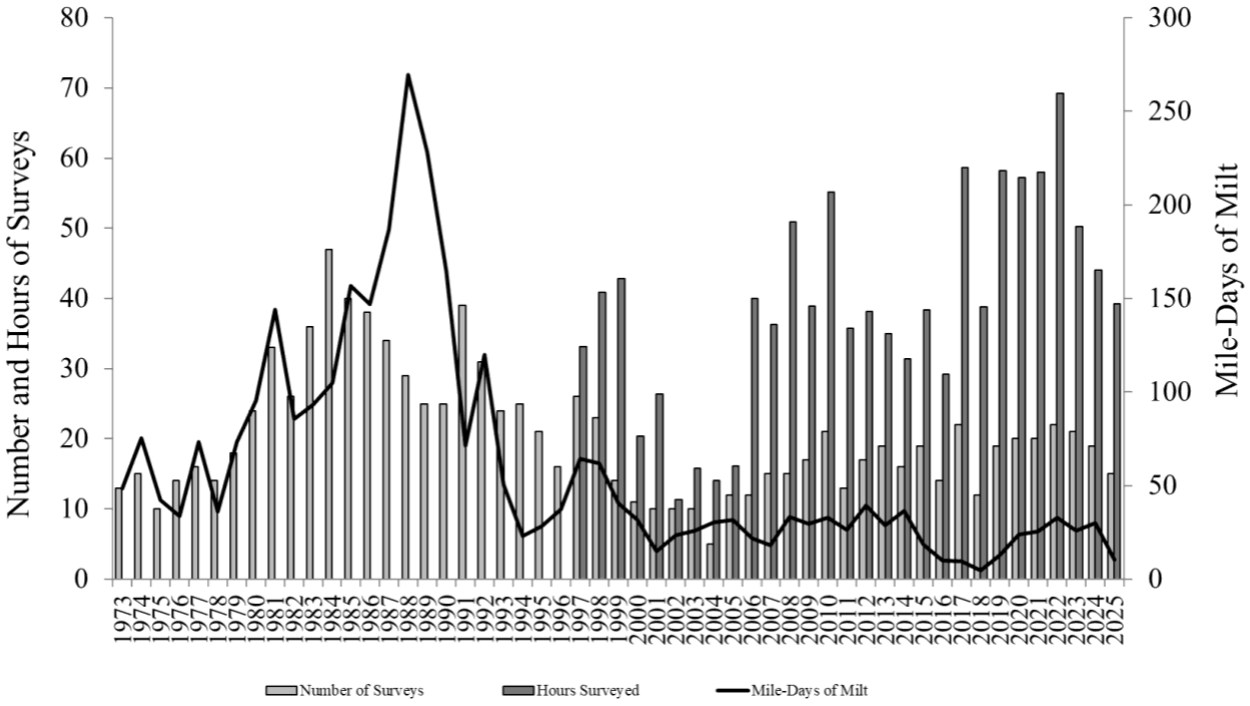

Figure 14. Prince William Sound herring aerial surveys, 1973-2025. Bars indicate the number and hours of surveys (left axis) and the line indicates mile-days of milt (right axis).

The Alaska Department of Fish and Game (ADF&G) met several times with the modeling and stock assessment project team to determine how best to handle incomplete mile-days-of-milt estimates in biomass calculations. The Bayesian age-structured assessment (BASA) model estimates used by ADF&G were fit without an observation from the 2025 aerial milt survey. A sensitivity analysis was conducted with low (25 md) and high (30 md) aerial milt survey scenarios to ensure that model outputs were robust to missing a year of aerial survey milt data, results are presented in their report.

Modeling and Stock Assessment of PWS Herring (25120111-C)

The herring modeling project (25120111-C, PI Branch) includes eight original goals and two new goals. The status of select goals are detailed below. As a modeling project, this project does not contribute to time series aside from fitting the model to data collected as part of project 25170111-F.

Goal 1: Conduct annual stock assessments of PWS herring using the BASA model, described in Muradian et al. (2017). A draft version of the 2025 stock assessment was completed at the end of January 2026 (Roberts and Branch 2026), incorporating the catch data, catch at age, mile-days-of-milt survey, and aerial age-1 survey. The new stock assessment format has been revised so that it conforms more closely to the ADF&G format for stock assessments, expanded to include more extensive tables and figures, and now includes the complete model formulation in a new appendix. It also includes new material explaining how the pre-season forecasts are obtained for the following year, which is especially important given the potential fisheries in spring and fall on this stock. Fishing on herring was reopened in 2024 (399 [metric tons] mt) and 2025 (429 mt) for the first time since 1999.

In 2025, the mile-days-of-milt aerial survey was substantially impacted by poor weather resulting in far fewer survey days. Only 10.5 mile-days were observed but it was estimated that roughly 25 to 30 mile-days would have been observed (J. Morella pers. comm.), and therefore this data point was omitted from the model fitting process. However, sensitivity tests assuming 25 or 30 mile-days for 2025 resulted in very similar stock assessment predictions.

The estimated spawning biomass for the spring pre-fishery forecast is 25,662 mt, which is above the management threshold for opening the fishery (19,958 mt or 22,000 short tons), and there is a 78% probability of being above this threshold (Fig. 15). Spawning biomass has been remarkably stable (between 25,600 and 27,400 mt) since 2021. Four separate age classes are present: ages 3 to 6 all represent more than 10% of the stock, while the strong 2016 year class is now largely absent. However, the stock remains far below the levels in the 1980s and early 1990s before the stock collapse.

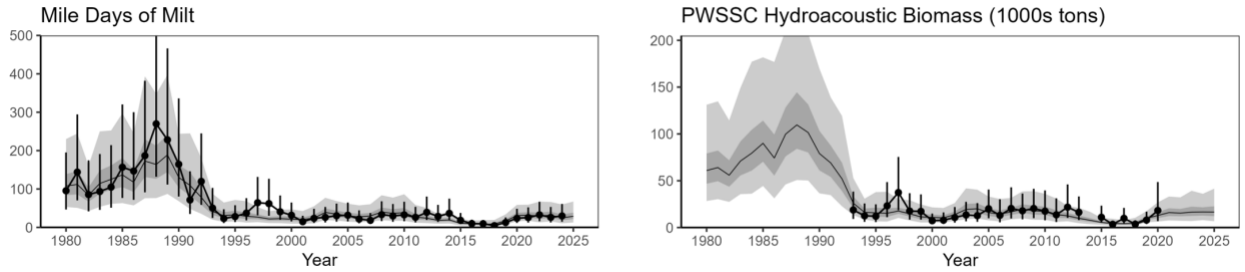

Figure 15. Estimated spawning biomass of Prince William Sound herring from the Bayesian age-structured assessment model fitted to the aerial mile-days-of-milt survey and the long-term hydroacoustic survey that ended in 2020.

Goal 5: Evaluate tradeoffs between cost and frequency of surveys and other data collected. In our previous work we assessed the tradeoff between the cost and value of different data sources for assessing PWS herring (Muradian et al. 2019). However, this does not address the value of future data collection, nor was it embedded in a management strategy evaluation (MSE) to determine how availability and cost of data influence stock assessment precision, management advice, and the tradeoff between average catch and stock depletion. Work is underway on this goal as part of C.L. Roberts's PhD dissertation.

Goal 6: Test the robustness of the management process to misspecification in the model. In addition to the model misspecification involved in the new goal 9 below (relation between Kayak Island and PWS spawning herring locations), work is also underway to examine how well the assessment and harvest control rule perform when the model is misspecified in terms of natural mortality and recruitment assumptions. M. de Barros has adapted the MSE framework to assess the impact how the process performs when the true natural mortality is lower or higher than assumed in the model, and the impact of time-varying natural mortality in a variety of configurations. Additional scenarios include alternative assumptions about recruitment form and fluctuations in recruitment. Generally, the model remains fairly robust to incorrect assumptions, but these can lead to incorrect management decisions.

Goal 8: Create a model of intermediate complexity that captures key interactions between humpback whales, pink salmon, Alaskan pollock, and herring. Preliminary work is ongoing for this model by M. de Barros, but no results are yet available.

New goal 9: Implications of Kayak Island herring spawn aggregation on PWS herring. A major issue that has arisen and been highlighted by ADF&G is the large mile-days of milt observed at Kayak Island during the aerial surveys in recent years, often as large as the total recorded inside PWS. In this project, C.L. Roberts will assess the performance of the stock assessment model under different scenarios of mixing between Kayak Island and PWS. Preliminary results show that the stock assessment produces biased estimates of biomass, with positive bias when movement rates are low and negative bias when movement rates are high.

New goal 10: Develop a framework for probabilistic harvest control rules. The primary advantage of using a Bayesian stock assessment is that it provides a statistically sound framework for estimating uncertainty in biomass. However, the default harvest control rule is still based only on median biomass, which differs little from a maximum likelihood or least-squares framework. The team is investigating whether a probabilistic harvest control rule would be a better tool for directly including uncertainty in decision making, as a general framework for

fisheries management (not aimed specifically at PWS herring). The idea is to create a harvest control rule that is based on a lower percentile of biomass, e.g., the 20th percentile of current biomass as estimated by a Bayesian stock assessment. Then, if more data are collected, the uncertainty would be narrower, and the 20th percentile would be higher *even if* the median biomass is unchanged. This would result in higher catches when there is less uncertainty in the model, and lower catches when uncertainty increases. This work is in a planning stage.

Herring Disease Program (25120111-E)

The herring disease program (project 25120111-E, PIs Hershberger and Paez) collected Pacific herring from three sites in PWS, Alaska during the spring pre-spawn period from March 27-30, 2025, to test for viral hemorrhagic septicemia virus (VHSV), viral erythrocytic necrosis (VEN), and *Ichthyophonus* prevalence. *Ichthyophonus* was detected in 39% (68/175) of heart cultures from all sites combined. An inverted pattern of decreasing *Ichthyophonus* infection prevalence with size started around 2019 and continued through 2024, but the typical trend of increasing infection prevalence with herring size appears to be reestablishing in 2025 (Fig. 16). VHSV was isolated from one fish collected from Humphries Hole. The isolation was at a very low titer and was detectable only after blind passage. Neutralizing antibodies to VHSV were detected in 6.3% (24/378) of PWS herring in 2025, reflecting a gradual increase in seropositives over the past four years (Fig. 17). Erythrocytic inclusions indicative of VEN were detected 1/180 adult herring from PWS (n =180) in 2025. Samples were not collected from Kayak Island.

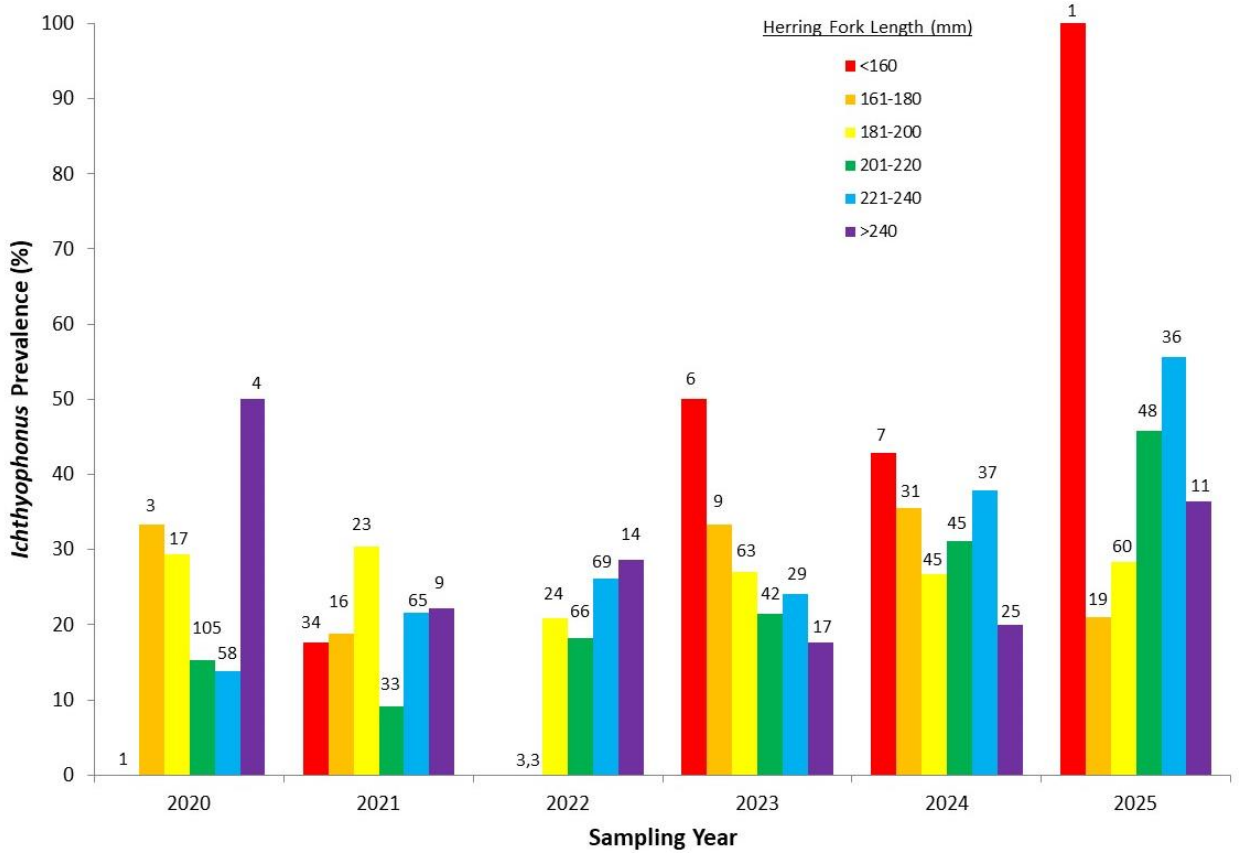

Figure 16. Temporal trend in Ichthyophonus infection prevalence in each size class of Prince William Sound herring. Numerals above each bar indicate sample size (n). Numerals immediately above the horizontal axis indicate the sample size for each size class with 0% infection prevalence.

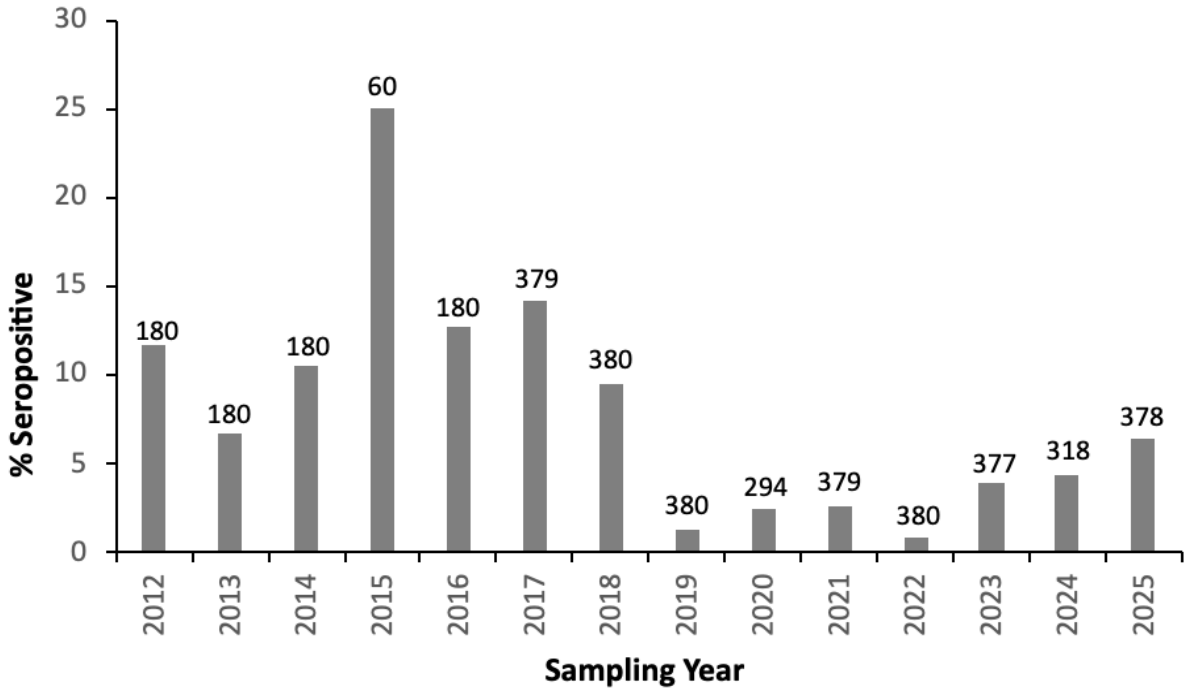

Figure 17. Annual prevalence of neutralizing antibodies against viral hemorrhagic septicemia virus in Prince William Sound herring. Numerals above the bars indicate the sample size (n).

Laboratory diagnostics were provided for the PWS pink salmon (*Oncorhynchus gorbuscha*) / herring interactions project (25220111-I, PIs Rand et al.). Pacific herring and pink salmon were sampled from PWS during May – July 2025 and analyzed for the prevalence of VEN in blood films that were dried, methanol-fixed, and Diff-Quick-stained. A VEN epizootic, characterized by high infection prevalences of fish demonstrating high VEN intensity levels, was detected among juvenile Pacific herring in numerous locations during the sampling period, including Shelter Bay (72%), Fox Farm Bay (84%), Squire Point (100%), Simpson Bay (84%), and Sheep Bay (100%). The epizootic was confined to juvenile herring cohorts, as VEN inclusions were not detected in any adult herring, pink salmon, or chum salmon juveniles.

Ecological Interactions between Pacific herring and Pacific salmon in Prince William Sound (25220111-I)

The herring-salmon interactions project (25220111-I, PIs Rand et al.) has successfully completed a third field season during 2025. They continue to make progress processing lab samples at

affiliated labs. At PWSSC, the team is identifying and quantifying plankton and nekton from their towed bongo net and identifying prey in gut contents and carrying out calorimetry to measure energy content of juvenile salmon. At UAF laboratories, they are measuring energy content of herring and carrying out stable isotope analyses of herring and salmon. They have also executed contracts and agreements to process samples at collaborating labs (ADF&G [otolith removal and hatchery- or wild-origin determination], NOAA [DNA metabarcoding of gut contents], and USGS [VEN prevalence]) during 2023-2025. While it is difficult to make robust inferences from the data after three years (i.e., two odd-year returns and one even-year return for pink salmon) of a planned six-year field campaign (i.e., three odd- and three even-year pink salmon returns), the team presents some key research findings to date that demonstrate our progress in meeting our overall study objectives:

- Predation

Adult and juvenile herring are consuming pink salmon fry - While they have not found any evidence of predation on juvenile pink salmon based on their visual examination of herring diets and results from stable carbon and nitrogen isotope analyses, DNA metabarcoding results from 2023 and 2024 support the hypothesis that herring rely on early life stages of pink salmon as a prey resource.

Juvenile pink salmon are consuming herring larvae - Gut content analyses (2023-2025) and DNA metabarcoding results (2023, 2024) have revealed that outmigrating pink salmon smolts consume herring larvae and consumption of herring larvae is more likely during some periods (early June) and in some years (2024).

Stable isotope analysis suggests that if adult herring are consuming pink salmon fry, it is likely to be a minor contributor to their diet given that adult herring appear isotopically distinct from outmigrating pink salmon smolts. The team is producing stable isotope data for herring larvae directly that will relate to the isotope values of pink salmon to quantitatively estimate the proportion herring larvae contribute to the diet of pink salmon.

- Competition

The team has generated paired data on herring and juvenile pink salmon dietary habits and prey availability across a network of sites in May, June, and July during 2025 that complements our results described in previous annual reports (2023-2024). They have carried out prey counts

across 17 different taxonomic groups. These data will allow the team to evaluate prey selectivity, dietary overlap, and potential competition for shared prey resources between these two species.

Overlap in isotopic signatures measured in 2023 of juvenile pink salmon sampled during May-July and juvenile herring sampled in September indicate that these two species potentially share diets, and this overlap may be regionally specific. They are awaiting the 2024 and 2025 salmon isotope data to further evaluate this relationship. Wild juvenile pink salmon may have a more diverse diet than their hatchery conspecifics given the variability the team observed in their isotopic signatures. Isotope values between age-0 herring sampled in 2023 and 2024 appear shifted between these two years, perhaps in response to the larger outmigration of salmon smolts in 2024. These isotope data will be coupled with our data on consumed prey and prey availability to better understand relationships between prey switching and age-0 herring condition.

- Disease

VEN sampling is on-going, and the team is finding highly variable temporal and spatial patterns in VEN prevalence in herring. 2025 sampling has revealed a much higher prevalence of VEN during May in herring compared to the two previous years. They have only detected one VEN positive juvenile pink salmon (collected by beach seine in Sheep Bay in June 2025), so based on sampling the prevalence of VEN for this species is very low.

- Pink Salmon Trawl catch per unit effort (CPUE), development of survival/fishery forecast model

The team has extended the times series on CPUE for juvenile pink salmon to include year 2025. They have carried out preliminary analysis of abundance patterns during 2023-2025 and combined these data with previous catch data from an earlier ADF&G trawl survey. Taken together, these data reveal an even/odd year pattern, indicating a strong run of pink salmon smolts in even years, a pattern expected given the strong adult pink salmon returns observed in PWS in odd years. They found a significantly higher contribution of hatchery-origin pink salmon in our surface trawl catches in 2023 (73.2%) compared to the two subsequent years (62.2% in 2024; 59.8% in 2025). Additional years of data on trawl catches will allow them to describe patterns of abundance of even and odd brood years of juvenile wild- and hatchery-origin pink salmon.

After adding data collected during 2025, the team has begun to explore patterns in body size and energy density of juvenile pink salmon smolts that may help explain interannual patterns of

marine survival. Preliminary analyses suggest only subtle differences between wild- and hatchery-origin smolts (e.g., hatchery-origin smolts tend to be only marginally larger in body mass), but specific hatchery populations appear to be responding differently across years (2023-2025) that may be related to changes in hatchery operations (e.g., release timing) or differences in rearing conditions experienced by fry prior to release (e.g., interannual changes in sea surface temperatures in net pens managed by the different hatchery programs). Continued sampling in future years will help better describe these dynamics and help develop a fishery forecast model.

Lingering Oil (25200114-P)

During 2025, PIs Esler (USGS) and Lindeberg (NOAA) retired. The project will be completed by PIs Coletti (NPS) and Suryan (NOAA).

During FY25, the lingering oil component project (25200114-P, PIs Coletti and Suryan) inventoried all sediment samples collected at the end of the last 5-yr funding cycle (2021, n = 20 samples) and during this 5-yr funding cycle (2024, n = 2 samples) and sent samples to the contracted lab for analysis. Biological tissue samples that were collected in 2024 were sent to the lab for analyses following collection in the fall of 2024. NOAA established a contract for the analysis of all these samples. In addition to lab analyses, the NPS attempted to create an inter-agency agreement with NOAA to summarize all results similar to a report published by Rider et al. (2020). Due to federal financial restrictions in place in federal fiscal year 2025, the team was unable to process the agreement. However, the PIs have identified an alternative inter-agency agreement option within NOAA to complete the report in FY26.

As background, during FY24, an amended proposal was submitted for this project, which was approved in July 2024. Although overall objectives remained the same, the emphasis on different parts of the proposed work changed, as did the timing. As a result, field sampling was conducted in September 2024 instead of the originally proposed schedule of summer 2025. It is well understood that a small proportion of spilled *Exxon Valdez* oil remains sequestered in intertidal sediments at a few locations in Prince William Sound with certain physiographic characteristics. Lingering oil monitoring has demonstrated that occurrence and weathering state has not changed markedly through time (e.g., Michel et al. 2016, Lindeberg et al. 2018). This conclusion was confirmed most recently by Heintz et al. (2023), based on sampling in 2021.

GOAL 2: Provide scientific data, data products, synthesis products, and outreach to management agencies and other users

As part of studying and monitoring the spill-affected region, the GWA-LTRM employs multiple mechanisms to ensure the projects produce publicly available findings that contribute to the scientific and public understanding of the northern GOA and factors affecting the potential recovery of EVOS injured resources more than 30 years after the spill. These mechanisms include publishing in peer-reviewed journals; collaborating on a synthesis report for EVOSTC during each five-year funding cycle and outreach that synthesize findings among projects; preparing reports for EVOSTC, management agencies, and others; presenting at scientific and public conferences and symposia; writing articles for general audiences and sitting for interviews with journalists and others; maintaining the program website (https://www.gulfwatchalaska.org); and publishing data and metadata on the GOA data portal (https://gulf-of-alaska.portal.aoos.org) and DataONE (https://search.dataone.org/portals/RW).

The results of these efforts are presented in Section 2 (Products) of the project and program annual reports. Here we highlight several specific programmatic efforts to accomplish this goal: the EVOSTC science synthesis report, the NOAA ecosystem status report, the Alaska Marine Science Symposium (AMSS), and PWSSC's annual publication *Delta Sound Connections* (https://pwssc.org/education/delta-sound-connections/).

Science synthesis

Science synthesis activities for FY25 included updating analyses and revisions of three of the five chapters and the executive summary for the science synthesis report. This report is over a year delayed, but we are finally close to having a full draft for EVOSTC review. Major additions during FY25 included further exploration into drivers of spatial-temporal variability in salinity and the effects on water column structure, mixing regimes, and nutrient availability in the GOA, final analyses of GWA's first integration of zooplankton time series across all collection platforms to assess community response to heatwaves, and updates to the Ecopath/Ecosim model to assess the PWS ecosystem post oil spill and the subsequent effect of heatwaves on the PWS food web.

The contents of the science synthesis report include the following:

- Executive Summary. Aftermath of the Pacific marine heatwave: What has changed following a major ecosystem perturbation in the Gulf of Alaska (Suryan et al.)

- Ch 1. Salinity drivers, structure, and time variability in the northern Gulf of Alaska (Danielson et al.)
- Ch 2. Zooplankton community response to multiple marine heatwaves: A comparison of four time-series from the sub-polar northern Gulf of Alaska (2012 – 2021) (Questel et al.)
- Ch 3. Planktonic to sessile: drivers of spatial and temporal variability across barnacle life stages and indirect effects of the Pacific marine heatwave (Traiger et al. 2024, published in the Journal of Plankton Research)
- Ch 4. Differential response of seabird species to warm- and cold-water events (Cushing et al. 2024, published in Marine Ecology Progress Series)
- Ch 5. Food web structure persists despite non-uniform changes in coastal vs. pelagic communities of Prince William Sound following major ecosystem perturbations (Dias et al.)

A unique feature to highlight from the science synthesis effort is a re-evaluation of the status of EVOS resources that were classified as "recovering" or "not recovering" soon after GWA began. The most recent evaluation of EVOS injured resources was completed in 2014, two years after GWA started and just before the marine heatwaves in the GOA. GWA-LTRM studies include all 10 taxa and two of three habitats that were not listed as recovering in 2014. After a decade since the initial heatwave, 5 of 9 taxa showed significant changes in abundance that were coincident with the marine heatwaves. Three taxa had increasing trends in abundance (black oystercatchers [*Haematopus bachmani*], Barrow's goldeneye [*Bucephala islandica*], Pacific mussels), one species had a decreasing trend (AB pod killer whales [*Orcinus orca*]), one species declined and returned to pre-heatwave levels (Pacific herring), and four taxa had no significant change in trends (clams, AT1 pod killer whales, pigeon guillemots [*Cepphus columba*], murrelets [*Brachyramphus* spp.]; Fig. 18). Rocky intertidal habitat had significant changes in community structure during heatwave years, whereas lingering oil in sediments appeared unchanged. Our results demonstrate that marine heatwaves in the GOA significantly affected recovery trajectories of resources still listed as injured 30 years after the EVOS. In the science synthesis report, we address our current understanding of drivers of these disparate recovery trajectories.

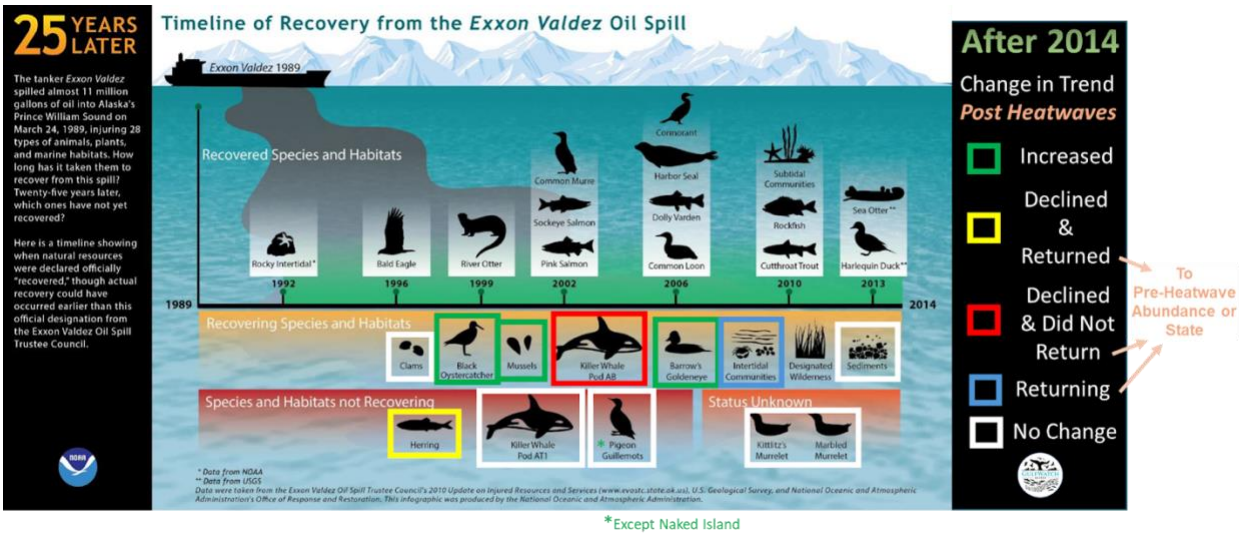

Figure 18. Status of Exxon Valdez *oil spill injured species in 2014, prior to marine heatwaves in the Gulf of Alaska and after 2014 for those resources not listed as recovered in 2014. Colored boxes indicate directional changes in abundance (species) or state (habitats) since 2014, a period including three heatwave years (2014-2016, and 2019), two interim years between heatwaves (2017-2018) and four post-heatwave years (2020-2023).*

NOAA ecosystem status report

Each year, NOAA publishes ecosystem status reports for the GOA, Bering Sea, and Aleutian Islands (https://www.fisheries.noaa.gov/alaska/ecosystems/ecosystem-status-reports-gulf-alaska-bering-sea-and-aleutian-islands). The reports are produced for the North Pacific Fishery Management Council (NPFMC) and are made available to the public. The 2025 ecosystem status reports were scheduled for publication in October when the federal government shut down due to lack of funding from Congress. An abbreviated report was produced for the February NPFMC meeting (Ferris 2026). GWA-LTRM project teams submitted data and environmental summaries for the GOA ecosystem status report before October and many of the contributions were included in the abbreviated report (Table 1). Contributions that were submitted to NOAA for the report but were not included are shown in Table 2. Citations for the GWA-LTRM contributions may be found in Section 2 (Products: Reports).

Table 1. Gulf Watch Alaska Long-Term Research and Monitoring Program contributions to the 2025 National Oceanic and Atmospheric Administration Gulf of Alaska ecosystem status report that was delayed until February 2026 because of the federal government shutdown.

Author/Affiliation	Title	Project
Tyler Hennon and Seth Danielson/University of Alaska Fairbanks (UAF)	Predicted ocean temperatures in northern Gulf of Alaska	GAK-1
Clare Ostle/Marine Biological Association and Sonia Batten/PICES	Continuous plankton recorder CPR) data from the northeast Pacific, 2002-2024	CPR
Russell R. Hopcroft/UAF	Spring and fall large copepod and euphausiid biomass: Seward Line	Seward Line
Shannon Whelan and Scott Hatch/Institute for Seabird Research and Conservation (ISRC) (among coauthors)	Seabird diets in the Gulf of Alaska 1978 – 2024	Forage Fish
Daniel Cushing/UAF, Scott Hatch and Shannon Whelan/ISRC, Robert Kaler and Elizabeth Labunski/U. S. Fish and Wildlife Service (USFWS), John Piatt/U. S. Geological Survey (USGS), (among coauthors)	Seabird synthesis	Forage Fish Prince William Sound and Seward Line Marine Bird Surveys
Heather Coletti, James Bodkin, and Brenda Ballachey/National Park Service, Sarah Traiger and Kim Kloecker /USGS Alaska Science Center, Brenda Konar/UAF, and	Intertidal ecosystem indicators in the northern Gulf of Alaska	Nearshore

Author/Affiliation	Title	Project
Robert Suryan/National Oceanic and Atmospheric Administration (NOAA)		

Table 2. Gulf Watch Alaska Long-Term Research and Monitoring Program contributions submitted to the 2025 National Oceanic and Atmospheric Administration Gulf of Alaska ecosystem status report but not included in the February 2026 abbreviated publication because of the federal government shutdown.

Author/Affiliation	Title	Project
Seth Danielson and Russell Hopcroft/UAF (among many co-authors)	Ocean temperatures: Synthesis	Seward Line
Seth Danielson/UAF	Oceanography at the nearshore GAK-1 mooring	GAK-1
Seth Danielson, Hank Statscewich, Tyler Hennon, and Russ Hopcroft/UAF	Seward Line spring oceanography	Seward Line
Jennifer Morella/Alaska Department of Fish and Game, W. Scott Pegau/Prince William Sound Science Center, and C. L. Roberts /University of Washington	Prince William Sound herring	Herring Surveys and Age, Sex, and Size Modeling and Stock Assessment of Prince William Sound Herring
John Moran/NOAA and Janice Straley/University of Alaska Southeast	Fall surveys of humpback whales in Prince William Sound	Humpback whales

Alaska Marine Science Symposium

GWA-LTRM team members attend and present findings at numerous conferences each year, updating scientists in their fields with information on the status of the northern Gulf of Alaska. Team members make a concerted effort to attend the Alaska Marine Science Symposium (AMSS) in Anchorage each January to give oral and poster presentations, attend side meetings, and collaborate with other Alaskan scientists. GWA-LTRM presentations from the 2026 AMSS are listed in Table 3. Citations may be found in Section 2 (Products: Conferences and Workshops).

Table 3. Gulf Watch Alaska Long-Term Research and Monitoring program contributions to the Alaska Marine Science Symposium held January 2026.

Author/Affiliation	Presentation title	Oral or poster presentation
C. Hauri, R. Pages, and B. Irving/University of Alaska Fairbanks (UAF), S. Lloyd/Alutiiq Pride Marine Institute, Carol Conant/Chugach Regional Resources Commission, Bridget Ferriss/National Oceanic and Atmospheric Administration (NOAA), and Darcy Dugan/Alaska Ocean Observing System	Building Gulf of Alaska ocean forecasts through co-production	Poster
C. L. Roberts, T. A. Branch, and M. de Barros/University of Washington (UW)	Effects of model specification on a fished herring population in Prince William Sound, Alaska	Oral
D. Cushing and Seth Danielson/UAF, M. Arimitsu/Ocean Bight LLC, S. Hatch and S. Whelan/Institute for Seabird Research and Conservation, R. Kaler	Seabird distributions and diets reflect ecosystem integration of climate forcing	Oral

Author/Affiliation	Presentation title	Oral or poster presentation
and E. Labunski/U. S. Fish and Wildlife Service, and R. Suryan/NOAA		
H. Myers, P. Westley, A. Seitz, K. Oke, and C. Cunningham/UAF, D. Olsen and C. Matkin/North Gulf Oceanic Society	Killer whales appear to respond to, rather than drive, the decline of Chinook salmon age at maturity	Oral
K. Lawlor, C. Ostle, M. Brunetta, D. Johns, and R. F. Stern/Marine Biological Associates (MBA), S. D. Batten/North Pacific Marine Science Organization, and F. Loro and A. Sastri, Fisheries and Oceans Canada	Using the continuous plankton recorder to monitor *Alexandrium catenella* in the Pacific-Arctic region	Oral
H. Statscewich, S. L. Danielson, T. Hennon, T. Klenz, I. Reister, J. Grischuk, K. Hedstrom, and L. Sgouros/UAF	Lessons learned from a year of operating underwater gliders in the northern Gulf of Alaska	Poster
Z. Vayder, L. Horstman, and K. Iken/UAF, and H. Coletti/National Park Service (NPS)	Physiological effects of water temperature on recovery after low tide exposure in Pacific blue mussels (*Mytilus trossulus*)	Poster
R. Hopcroft, C. Smoot, and A. Poje/UAF	Zooplankton communities in the northern Gulf of Alaska: Seward Line observations through 2025	Poster
R. Campbell/Prince William Sound Science Center (PWSSC), and R. Ertz/UAF	Automating salmon scale aging with machine vision	Poster

Author/Affiliation	Presentation title	Oral or poster presentation
A. Borsky, K. Gorman, and K. Iken/UAF, P. Rand/PWSSC, and R. Heintz/Sitka Sound Science Center (SSSC)	Evaluating interactions between Pacific herring and ping salmon using spatio-temporal models	Poster
S. Pegau/PWSSC, CL Roberts/UW, and C. Ostle/MBA	Conditions affecting Pacific herring recruitment in the Gulf of Alaska	Poster
P. Rand/PWSSC, K. B. Gorman/UAF, and W. Larson/NOAA	Larval Pacific herring as a food resource for juvenile pin salmon in Prince William Sound, Alaska	Poster
K. B. Gorman/UAF, P. S. Rand/PWSSC, and R. Heintz/SSSC	Isotopic perspectives on ecological interactions between herring and salmon	Poster
H. Coletti/NPS, S. Traiger, J. Bodkin, G. G. Esslinger, and K. Kloecker/U. S. Geological Survey (USGS), K. Iken and B. Konar/UAF, and R. Suryan/NOAA	Gulf Watch Alaska continues to document changes in marine ecosystems: Nearshore component 2025 update	Poster
J. Straley, L. Wild, and H. Riley/University of Alaska Southeast, John Moran, and J. Maselko/NOAA, and B. Witteveen/UAF	Failure to recover: Long-term monitoring of humpback whales in Prince William Sound, Alaska	Poster
S. B. Traiger and D. Esler/ USGS, H. Coletti/NPS, M. J. Hughes/Alaska Sea Grant, and K. Iken and B. Konar/UAF	Are we there yet? Sea star assemblage recovery from sea star wasting in the Gulf of Alaska	Poster

Delta Sound Connections

Each year, the GWA-LTRM program sponsors a 2-page spread in PWSSC's annual spring publication *Delta Sound Connections* that highlights research and education programs taking place in the northern GOA and Copper River watershed. Copies are distributed to visitors and residents of southcentral Alaska at the Anchorage airport, Begich-Boggs Visitor Center at Portage Glacier, Cordova airport, Valdez Visitors Center, and elsewhere. Because 2025 was a disruptive year for many GWA-LTRM PIs related to NOAA grant funding delays and federal agency retirements and hiring freezes, the PMT wrote one two-page article summarizing responses to recent marine heatwaves by some of the species GWA-LTRM projects study (Hoover et al. 2025).

GOAL 3: Provide information that can be used by the Education and Outreach and Mariculture programs

As part of the GWA-LTRM program's efforts to distribute information about our monitoring and research, we collaborate with other EVOSTC-funded programs, in particular the Community Organized Restoration and Learning (CORaL) Network, and the Mariculture Research and Restoration Consortium (Mar ReCon) program, both of which were first funded in 2022.

Collaborating with the CORaL Network team allows the GWA-LTRM program to expand its education outreach to communities in the spill-affected region through professional science educators. This collaboration expands GWA-LTRM's reach to Alaska Native and local communities in the spill-affected area. An educator with the CORaL Network is on the GWA-LTRM email distribution list and at least one member of the CORaL Network attends GWA-LTRM PI quarterly and annual PI meetings and presents on current and upcoming CORaL Network activities. The Chugach Regional Resources Commission (CRRC) is a member of the CORaL network; program manager Aderhold attended CRRC's annual gathering in March 2025 and participated in a panel during which she presented an overview of the GWA-LTRM program.

Most of the collaboration between GWA-LTRM and Mar ReCon occurs at the project level. The programs have overlapping staff (e.g., Katrina Hoffman, Anne Schaefer, and Brenda Konar), which aids in coordination. During the first years of the Mar ReCon program, the GWA-LTRM program team invited the Mar ReCon team to attend GWA-LTRM quarterly meetings held at AMSS. Since then, GWA-LTRM program management team members have been invited to attend Mar ReCon annual PI meetings to provide program updates; in January 2026, program

coordinator Aderhold presented during the Mar ReCon annual meeting. Not all GWA-LTRM projects collect data of interest to Mar ReCon, but those that do willingly share data and information. Working in the intertidal zone, the nearshore project team has the most interaction with the Mar ReCon program. Within Kachemak Bay, Mar ReCon and nearshore PIs share logistics and field crews.

GOAL 4: Leverage partnerships with outside agencies and groups to integrate data and expand capacity through collaborative efforts

The GWA-LTRM program has a well-established and extensive network of collaborations among federal, state, university, and non-governmental partners that are conducting research and managing resources in the GOA. Examples of the partnerships that program projects, PIs, and leadership have developed include the following:

- Annual contributions to NOAA's GOA Ecosystem Status Report (ESR): Each year, NOAA prepares Ecosystem Status Reports for the GOA, Bering Sea, and Aleutian Islands which are used by the North Pacific Fishery Management Council in decision-making (see above). The report pulls together trends from multiple agency and organization sources related to physical and biological components that, combined, tell a story of ecosystem health. Multiple GWA-LTRM PIs and projects contribute data annually to the report. Publication of the 2025 ESR was disrupted by the federal government shutdown in October 2025. An abbreviated report was provided to the NPFMC in January 2026 (Ferriss 2026). Table 1 provides the sections of the abbreviated report that were submitted by GWA-LTRM program project teams; Table 2 provides a list of contributions submitted by GWA-LTRM program project teams that were not included in the abbreviated report.
- Leadership in establishing and continuing the NGA-LTER: Seward Line (project 25210114-L) PI Russ Hopcroft is the lead PI for the NGA-LTER, funded by the National Science Foundation. The NGA-LTER incorporates the Seward Line and GAK1 (project 25120114-I, PI Danielson) into a larger GOA sampling effort examining oceanography, hydrography, organic and inorganic carbon and nutrient systems and cycling, plankton ecology, seabirds, underwater acoustics, among other disciplines. The program also includes education and outreach components. The multi-disciplinary team includes scientists from multiple universities, small businesses, and the USFWS. GWA-LTRM team members within and outside of the NGA-LTER program regularly collaborate on

publications and outreach that contribute to better scientific understanding of the GOA ecosystem.

- The Nearshore project (25120114-H) team includes PIs from multiple federal agencies and organizations, and the group participates in multiple partnerships, including the following:
    - Nearshore PIs work with the National Park Service (NPS) and others to examine linkages between terrestrial and marine ecosystems, funded by the National Park Foundation. Field work was initiated in July 2015 with in-kind support from the GWA-LTRM vessel charter. National parks in Southwest Alaska are facing a myriad of management concerns that were previously unknown for these remote coasts, including increasing visitation, expanded commercial and industrial development, and environmental changes due to natural and anthropogenic forces. These are concerns because of their potential to significantly degrade and impair resources in coastal systems.
    - Nearshore PIs work closely with USGS PIs on an Alaska Science Center Nearshore Marine Ecosystems project funded by the Bureau of Ocean Energy Management that conducted sea otter research in Cook Inlet. This Cook Inlet sea otter research project focused on quantifying sea otter abundance, distribution and habitat use in lower Cook Inlet.
    - The Nearshore component contributed sea otter abundance data to USFWS, Marine Mammals Management for incorporation into updated Stock Assessment Reports for the Southcentral and Southeast Alaska stocks of northern sea otters. The updated stock assessments provide managers with minimum population estimates and suggested harvest management limits of sea otters, based on the population status and regional harvest patterns over recent history.
- The humpback whale project (25120114-O) contributes data and reports to NOAA and other agencies and organizations, including the NOAA National Centers for Coastal Ocean Science Protected Resources Division/Alaska Fisheries Science Center data layers for the Alaska-focused Aquaculture Opportunity Areas Atlas, North Pacific humpback whale abundance model based on public efforts associated with the North Pacific Humpback Whale Photo-ID collaboration, and photographs of sea lion haulouts and brands to ADF&G.

- In addition to the NOAA GOA Ecosystem Status Report, the forage fish project (25120114-C) contributes to the related Sablefish Ecosystem and Socioeconomic Profile. The forage fish work is also complementary to a related USGS outer continental shelf and Bureau of Ocean Energy Management funded study of forage fish and seabird trends in areas of oil and gas development in Cook Inlet. This continued coordination and collaboration with GWA-LTRM PIs and other researchers with USFWS and NOAA in Cook Inlet and Kachemak Bay increases the scope of ecosystem monitoring in the northern GOA. The forage fish team also works with Chugach Alaska Corporation regarding information and sample collection and spawning capelin observations in Port Etches and continues to build relationships with members of the Chugach Regional Resources Commission leading towards future information sharing.
- The science synthesis report is a highly collaborative effort. GWA-LTRM team members from different components collaborated to write chapters of the report. In addition, the chapter leads reached to agency and organization personnel with pertinent expertise to co-author chapters.

GOAL 5: Ensure data are properly archived so that they can be accessed beyond the life of this program

This goal appears to overlap with the goal to provide scientific data, data products, synthesis products, and outreach to management agencies and other users. However, this goal is specific to the GWA-LTRM team's coordination with the Data Management program. The GWA-LTRM program management team and project PIs work closely with the Data Management team to ensure that data for each project are made publicly available within required timeframes, have appropriate metadata to describe the data, and have been reviewed for quality assurance and quality control (QA/QC). Project data are uploaded to the Gulf of Alaska data portal annually and are published with a digital object identifier (doi) at the end of each 5-year funding cycle. Some projects that have additional funding from the National Science Foundation publish portions of their data annually. Citations for datasets may be found in Section 2 (Products: Data sets and associated data).

For FY25, GWA-LTRM projects are 88% compliant with data submissions and 77% compliant with metadata submissions to the Data Management program. Some project data continue to be behind in their data submissions because of the delay in the issuance of the FY24 NOAA grant until January 2025. The Data Management team is working with project teams to catch up on submissions.

Program Management

While program management is not a stated goal in the GWA-LTRM proposal for FY22-31, the program does not function without program oversight. Until 2025, the PMT consisted of the program lead, science lead, administrative lead, and the program coordinator. Longtime program lead Mandy Lindeberg retired in March 2025. Science lead Rob Suryan took on the additional role of program lead, along with non-GWA-LTRM EVOSTC related duties previously performed by Mandy.

The program and science lead is a NOAA employee, and the administrative lead and program coordinator are PWSSC employees. Program management consists of fiscal administration and program coordination. Some aspects of program coordination are integral to program goals and are reported above. Here we report on additional program management activities.

Because the proposed PMT was small (four people), losing one key team member resulted in the PMT selecting the most important aspects of leadership duties to maintain during the year. The PMT continued to maintain oversight of all projects that are part of the GWA-LTRM program, provided oversight of the NOAA grant to non-Trustee organizations, assisted projects with funding change requests and closeouts with EVOSTC, held GWA-LTRM PI meetings, coordinated with the GWA-LTRM science review panel (SRP), and coordinated with other EVOSTC-funded programs and projects. Summaries of these activities are described in the subsections below. In addition, PMT members spent a substantial amount of time working with project team members affected by the loss of federal team members to ensure accomplishment of all program goals.

Fiscal Administration

The PWSSC continued its role as the fiscal agent for non-Trustee organizations working on EVOSTC long-term monitoring projects through the NOAA grant to PWSSC. The NOAA grant includes non-Trustee organizations with projects included in the GWA-LTRM program and the Data Management program. The NOAA grant runs from June 1 through May 30 each year and is offset from the EVOSTC fiscal year for the FY22-FY26 funding cycle. PWSSC maintained its fiscal obligations under the NOAA grant, including paying invoices from subawardees and submitting semi-annual reports (both programmatic and fiscal). PWSSC coordinated and paid for the annual GWA-LTRM principal investigator meeting. Further, PWSSC conducted an annual audit including a federal single audit, with field testing occurring in December 2024. The results were a clean audit.

The PMT continued to work with individual projects on budget adjustments within their projects. As the point of contact with EVOSTC staff, the PMT coordinated between project PIs and EVOSTC on individual budget adjustments as needed throughout the year.

Reporting

FY24 annual reporting during FY25 was delayed because of the long delay in the release of NOAA grant funds (FY24 funds were not received by PWSSC until January 2025) and because of disruptions that occurred at federal agencies that participate in the GWA-LTRM program. The unexpected early retirements of program PIs and team members, remaining PIs taking on additional duties associated with the retirements and other reductions in force, and uncertainties for remaining federal PIs and team members resulted in delays in writing and reviewing annual reports. Throughout the course of FY25, the PMT reviewed the FY24 annual reports and prepared the program annual report. All reports were reviewed by EVOSTC staff, revised, and accepted by EVOSTC. Reports are available from the EVOSTC and Gulf Watch Alaska websites.

Meetings

The PMT held three videoconferences and one in-person PI meeting during FY25. The spring videoconference was held on April 23, and the summer videoconference was held on August 25. GWA-LTRM typically holds a multi-day in-person meeting in the fall, but for FY25, we planned a videoconference in October because state and federal agencies were under budget-related travel restrictions. The fall videoconference was postponed until December 15 because of the federal government shutdown that lasted from October 1 to November 12, 2025. The team met in person on January 28, 2026, for its winter meeting that coincided with the Alaska Marine Science Symposium.

Outreach

The program website (https://gulfwatchalaska.org) and HRM website (https://pwssc.org/herring/) both received updates to project and program pages based on FY24 annual reports approved by EVOSTC.

We continued providing content to the PWSSC annual publication *Delta Sound Connections*, discussed in greater detail above. The 2024 article is listed in Section 2 (Products: Popular articles). PWSSC also sponsors a Facebook page on PWS herring, posting year-round, but primarily during the spawning season (Fig. 19). In addition, PWSSC staff recorded six Field Notes episodes in 2025, three focused on GWA-LTRM project activities, including one on the

response of barnacles to the PMH, one on herring recruitment, and one on killer whale ecotypes (https://pwssc.org/education/field-notes/). Field notes are aired on PWS area radio stations and hosted on the PWSSC website at the link above. The program coordinator attended the CRRC Annual Gathering on March 26, 2025, to participate on a panel to present information about the GWA-LTRM program, answer questions, and engage with tribal members.

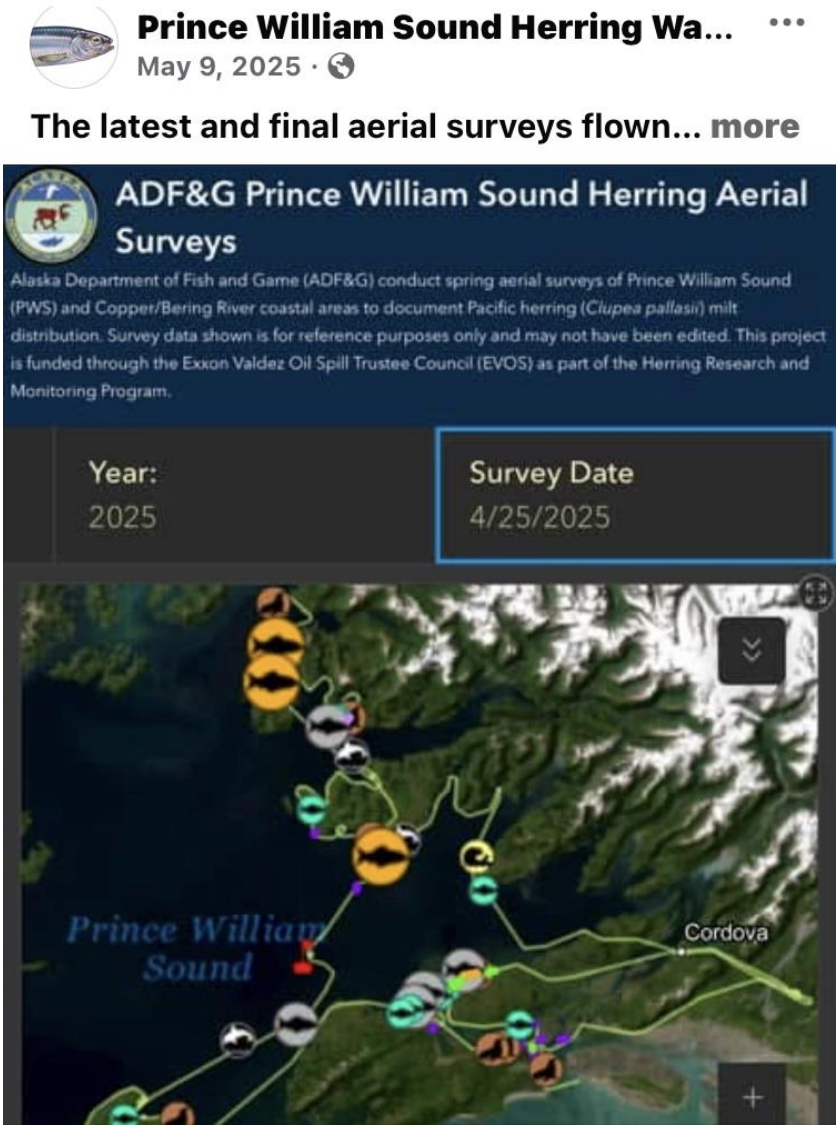

Figure 19. Prince William Sound Herring Watch Facebook post on herring spawn aerial surveys conducted by the Alaska Department of Fish and Game posted on May 9, 2025.

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Rankin, C., L. Ware, B. H. Robinson, D. Esler, H. Coletti, M. Maftei, J. M. Hipfner, and D. J. Green. In review. Evaluating effects of tracking device attachment methods on black oystercatcher (*Haematopus bachmani*). Wader Study.

In prep

Danielson, S. L, T. D. Hennon, T. Klenz, K. McMonigal, and T. J. Weingartner. In prep. Wind and climate-mediated variability in a 50-year coastal hydrographic time series.

Hennon, T. D., S. L. Danielson, A. Aguilar Islas, I. Reister, and R. A. Potter. In prep. Salinity Structure, Drivers, and Time Variability in the Northern Gulf of Alaska.

Pegau S., C. L. Roberts, and C. Ostle. *In prep.* Conditions affecting Pacific herring recruitment in the Gulf of Alaska.

Traiger, S. B., H. A. Coletti, M. Douglas, D. Esler, K. Gavenus, M. Hughes, K. Iken and B. Konar. In Prep. Are we there yet? Sea star assemblage recovery from sea star wasting in Alaska.

Reports:

Ciafro, C. 2025. From Burrow to Sea: Tufted puffins (*Fratercula cirrhata*) as indicators of forage fish populations in the Gulf of Alaska. Thesis. McGill University, Montreal, Canada.

Coletti, H., S. Traiger, K. Iken, J. Bodkin, B. Ballachey, G. Esslinger, K. Kloecker, B. Konar, and R. Suryan. 2026. Intertidal Ecosystem Indicators in the Northern Gulf of Alaska in Ferriss, B. Ecosystem Status Report 2025: Gulf of Alaska, Stock Assessment and Fishery Evaluation Report, North Pacific Fishery Management Council, 1007 West Third, Suite 400, Anchorage, Alaska 99501.

Cushing, D., B. Drummond, S. Hatch, R. Kaler, E. Labunski, J. F. Piatt, H. Renner, F. Sullivan, and S. Whelan. 2026. Seabird synthesis. Pages 160-173 *in* B. E. Ferriss, editor. Abbreviated Ecosystem Status Report 2025: Gulf of Alaska, Stock Assessment and Fishery Evaluation Report. North Pacific Fishery Management Council, 1007 West Third, Suite 400, Anchorage, Alaska 99501.

Hennon, T. D., and S. L. Danielson. 2026. Predicted ocean temperatures in Northern Gulf of Alaska. In: Ferriss, B. E., editor. Ecosystem Status Report 2025: Gulf of Alaska, Stock Assessment and Fishery Evaluation Report, North Pacific Fishery Management Council, 1007 West Third, Suite 400, Anchorage, Alaska 99501.

Hopcroft, R. R. 2026. Spring and fall large copepod and euphausiid biomass: Seward Line. *In* B. E. Ferriss, editor, Abbreviated Ecosystem Status Report 2025: Gulf of Alaska, Stock

Assessment and Fishery Evaluation Report for the Groundfish Resources of the Gulf of Alaska, North Pacific Fishery Management Council, 1007 West Third, Suite 400, Anchorage, Alaska 99501.

MONITOR Committee report for PICES on the North Pacific Continuous Plankton Recorder Survey. 2025 https://meetings.pices.int/publications/annual-reports/2025/2025-MONITOR.pdf.

Monson, D. M., K. Kloecker, N. LaRoche, C. Power, L. Geissinger, E. Hasan, T. Jones T and B. Weitzman. 2025. Quantifying Sea Otter Abundance, Distribution, Habitat Use, and Foraging Intake in Lower Cook Inlet, Alaska. Anchorage, AK: U.S. Department of the Interior, Bureau of Ocean Energy Management. Report No.: OCS Study BOEM 2025-019. Contract No.: M20PG00007. https://espis.boem.gov/final%20reports/BOEM_2025-019.pdf.

Ortega, E. 2025. Dissolved and particulate nutrient dynamics in the Northern Gulf of Alaska: A productive subarctic shelf ecosystem. Dissertation, University of Alaska Fairbanks, Fairbanks, Alaska. http://hdl.handle.net/11122/16260.

Ostle, C., and S. Batten. 2026. Continuous plankton recorder data from the Northeast Pacific, 2022-2024. Pages 69-71 *in* B. E. Ferriss, editor. Abbreviated Ecosystem Status Report 2025: Gulf of Alaska, Stock Assessment and Fishery Evaluation Report for the Groundfish Resources of the Gulf of Alaska, North Pacific Fishery Management Council, 1007 West Third, Suite 400, Anchorage, Alaska 99501.

Questel, J. M., R. R. Hopcroft, R. W. Campbell, and C. Ostle. In review. Decadal variability in zooplankton communities: Comparison of four zooplankton time-series from the Northern Gulf of Alaska (2012-2021). Synthesis report for EVOSTC.

Reister, I. 2025 Perspectives on Northern Gulf of Alaska freshwater pathways, wind, and linkages to phytoplankton biomass. Dissertation, University of Alaska Fairbanks, Fairbanks, Alaska. http://hdl.handle.net/11122/16270.

Solmon, P. 2025. Effects of environmental conditions on life-history traits of rhinoceros auklets *(Cerorhinca monocerata)* during the breeding season over two decades. Thesis. University of Burgundy, Dijon, France.

Popular articles:

Campbell, R. W. 2025. Counting plankton with cameras. Delta Sound Connections 2023-2024. https://pwssc.org/wp-content/uploads/2025/05/DSC-2025-FINAL_WEB.pdf.

Clynes, T., and M. Heim. 2025. Extreme birding at the edge of the world. August 2025 issue of National Geographic.

Ferlazzo, M. 2025. Seabirds as Sentinels: Bucknell Researchers Make 'National Geographic'. Bucknell University. Bucknell University, July 10. https://www.bucknell.edu/news/seabirds-sentinels-bucknell-researchers-make-national-geographic.

Hoover, H., R. Suryan, and D. Aderhold. 2025. Are Prince William Sound and Gulf of Alaska species showing signs of renewal post heatwaves. 2025-2026 Delta Sound Connections. Prince William Sound Science Center. https://pwssc.org/wp-content/uploads/2025/05/DSC-2025-FINAL_WEB.pdf.

Lupynis, E. 2025. Small fish, big data: How Drax is helping biodiversity researchers. Drax: https://www.drax.com/ca/opinion/small-fish-big-data-how-drax-is-helping-biodiversity-researchers/.

Ostle, C. 2025. Global marine research boosted by MV *Kaying*'s role in the Continuous Plankton Recorder Survey. Marine Biological Association.

Conferences and workshops:

Atkinson, S., J. Moran, S. Teerlink, D. DeMaster, K. Mashburn, V. Melica, H. Pearson. 2026. From changing oceans to confused physiology: Endocrine adaptations in marine mammal populations. Oral presentation, Society for Integrative and Comparative Biology Annual Meeting, Portland, Oregon, January.

Belcher, S., and A. Aguilar-Islas. 2026. Seasonal particulate phosphorus dynamics in the northern Gulf of Alaska. Poster presentation, Alaska Marine Science Symposium, Anchorage, Alaska, January.

Cabanelas, A., J. Conroy, M. Décima, B. Dias, G. Hennon, R. R. Hopcroft, T. Kelly, M. Ohman, O. Schofield, D. Steinberg, M. Stukel, and H. Sosik. 2025. Latitudinal variability and long-term responses of pelagic community structure to climate forcing across four marine

LTER sites. Oral presentation, Association of Sciences of Limnology and Oceanography Aquatic Sciences Meeting, Charlotte, North Carolina, March.

Campbell, R.W., and R. Ertz. 2026. Automating salmon scale aging with machine vision. Poster presentation, Alaska Marine Science Symposium, Anchorage, Alaska, January. [extension of the neural network plankton identification programs developed under this project].

Coletti, H., S. Traiger, K. Iken, B. Konar, B. Ballachey, J. Bodkin, D. Esler, G. Esslinger, K. Kloecker, M. Lindeberg, D. Monson, R. Suryan, and B. Weitzman. 2026. Gulf Watch Alaska Nearshore Component 2025 update: Monitoring species and processes to detect change and infer cause. Poster presentation, Alaska Marine Science Symposium, Anchorage, Alaska, January.

Cushing, D. 2025. An application of Dynamic Factor Analysis to at-sea seabird abundance time-series in the northern Gulf of Alaska. Invited virtual seminar, Farallon Institute, Petaluma, California, February.

Cushing, D., M. Arimitsu, S. Danielson, S. Hatch, R. Kaler, E. Labunski, S Whelan, and R. Suryan. 2026. Seabird distributions and diets reflect ecosystem integration of climate forcing. Oral presentation, Alaska Marine Science Symposium, Anchorage, Alaska, January.

Danielson, S. L. 2025. Seward Line and Oceanographic Station GAK1 updates. NOAA Preview of Ecosystem and Economic Conditions, online presentation, May.

Danielson, S. 2025. NGA LTER lightning talk. Oral presentation, Northern Gulf of Alaska LTER All-Hands Meeting, Fairbanks, Alaska, March.

Danielson, S. 2025. Northern Gulf of Alaska LTER data nuggets presentation. Online presentation, February.

Ferguson, J. A., P. K. Hershberger, J. Murphy, N. Wolf, K. Herron, and Z. W. Liller. 2025. Investigating the impacts of *Ichthyophonus* of Yukon River Chinook salmon. Oral presentation, 64th Western Fish Disease Workshop, Bozeman, Montana, June.

Harsha, M. L., Y. Salas-Ortiz, A. Cypher, E. Osborn, E. Turcios Valle, J. L. Gregg, P. K. Hershberger, P. Zito, M. A. Tarr, P. L. Tomco, and D. C. Podgorski. 2025. Unresolved complex mixtures from crude oil: Hidden toxicity to Pacific herring embryos. Oral presentation, PacifiChem, Honolulu, Hawaii, December.

Hennon, G. M. M., M. Brauner, B. R. Briggs, E. Bruch, J. Cohen, and J. Fellman. 2026. Co-occurrence networks across the Gulf of Alaska suggest variability in ecosystem resilience. Poster presentation, Alaska Marine Science Symposium, Anchorage, Alaska, January.

Hennon, T., S. L. Danielson, T. Klenz, and C. Murdoch. 2025. Assessing drivers of thermohaline variability in Glacier Bay with over three decades of hydrography. Oral presentation, National Park Service Technical Workshop, Juneau, Alaska, December.

Hennon, T., S. L. Danielson, T. Klenz, and C. Murdoch. 2026. Assessing drivers of thermohaline variability in Glacier Bay with over three decades of hydrography. Oral presentation, Alaska Marine Science Symposium, Anchorage, Alaska, January.

Hershberger, P. K., J. L. Gregg, C. A. Grady, S. S. Ferreiro-Luce, V. L. Herron, and D. J. Páez. 2025. Effects of viral erythrocytic necrosis on the swimming performance of Pacific herring. Poster presentation, Alaska Marine Science Symposium, Anchorage, Alaska, Anchorage.

Holmes, J., M. P. Buil, and J. Fiechter. 2025. Exploring drivers of low frequency variability of the Northeast Pacific boundary currents. Poster presentation, University of California Santa Cruz Ocean Sciences Undergraduate Research Symposium, Santa Cruz, California, Spring.

Hopcroft, R. R., C. A. Smoot, and A. Poje. 2025. Patterning of zooplankton communities as revealed by 25 years of observations along the Seward Line in the Northern Gulf of Alaska. Oral presentation, Association of Sciences of Limnology and Oceanography Aquatic Sciences Meeting, Charlotte, North Carolina, March.

Hopcroft, R., C. Smoot, and A. Poje. 2026. Zooplankton communities in the northern Gulf of Alaska: Seward Line observations through 2025. Poster presentation, Alaska Marine Science Symposium, Anchorage, Alaska, January.

Loeher, M., D. Paez, J. Mihaljevic, N. Wolf, and P. Hershberger. 2025. Sentinel cage studies indicate that VHS virus transmission persists for extended periods after natural epizootics in Pacific herring have completely waned. Oral presentation, 64th Western Fish Disease Workshop, Bozeman, Montana, June.

Marsteller, C., C. Reo, M. Arimitsu, L. Bien, K. McNett, S. Schoen, K. Gravenus, C. Conant. 2026. Making science murre accessible: A collaborative approach to science

communication. Poster presentation, Alaska Marine Science Symposium, Anchorage, Alaska, January.

Meier, A., K. McMonigal, S. L. Danielson, and A. Aguilar-Islas. 2026. Quantifying the relationship between nutrient fluxes and turbulence in the northern Gulf of Alaska. Poster presentation, Alaska Marine Science Symposium, Anchorage, Alaska, January.

Moran, J., J. Straley, L. Wild, B. Witteveen, J. Maselko, and H. Riley. 2026. Failure to recover: long-term monitoring of humpback whales in Prince William Sound, Alaska. Poster presentation, Alaska Marine Science Symposium, Anchorage, Alaska, January.

Ostle, C. S. Batten, L. Kléparski, F. Loro and A. Sastri. 2025. Update on the North Pacific CPR survey. Oral presentation, North Pacific Marine Science Organization (PICES) Monitor Technical Committee annual meeting, Yokohama, Japan, November.

Pegau, W. S., A. Mearns, R. W. Campbell, V. Chu, M. Wheeler, and D. Janka. 2026. 36th year of repeated photo monitoring of rocky intertidal sites in western Prince William Sound. Poster presentation, Alaska Marine Science Symposium, Anchorage, Alaska, January.

Roberts, C. L., T. A. Branch, and M. de Barros. 2026. Effects of model misspecification on a fished herring population in Prince William Sound, Alaska. Oral presentation, Alaska Marine Science Symposium, Anchorage, Alaska, January.

Roth-Monzón, A. J., W. Daniel, C. D. Raines, M. E. Neilson, P. K. Hershberger, M. K. Purcell, and J. Lovy. 2025. Building AquaDePTH: A national repository for sharing aquatic animal health data. Oral presentation, 155th Annual Meeting of the American Fisheries Society, San Antonio, Texas, August.

Sriwanayos, P., B. Torrevillas, A. Hassan, P. Hershberger, and T. Waltzek. 2025. Phylogenomic characterization of erythrocytic necrosis virus (ENV) from Pacific Herring (*Clupea pallasii*). Poster presentation, Diverse Minds, Diverse Microbes Symposium, American Society for Microbiology, Pullman, Washington, April.

Sriwanayos, P., B. Torrevillas, A. Hassan, P. Hershberger, and T. Waltzek. 2025. Phylogenomic characterization of erythrocytic necrosis virus (ENV) from Pacific Herring (*Clupea pallasii*). Oral presentation, 64th Western Fish Disease Workshop, Bozeman, Montana, June.

Steinberg, D., J. Conroy, A. Cabanelas, M. Décima, B. Dias, G. Hennon, R. R. Hopcroft, T. Kelly, M. Ohman, O. Schofield, H. Sosik, and M. Stukel. 2025. Marine plankton size

spectra and trophic transfer efficiency at pelagic Long-term Ecological Research (LTER) sites across a latitudinal gradient. Oral presentation, Association of Sciences of Limnology and Oceanography Aquatic Sciences Meeting, Charlotte, North Carolina, March.

Stukel, M., A. Cabanelas, J. Conroy, M. Décima, B. Dias, G. Hennon, R. R. Hopcroft, T. Kelly, M. Ohman, O., Schofield, H. Sosik, and D. Steinberg. 2025. Investigating trophic amplification at long-term marine time-series sites. Oral presentation, Association of Sciences of Limnology and Oceanography Aquatic Sciences Meeting, Charlotte, North Carolina, March.

Traiger, S., H. Coletti, D. Esler, M. Hughes, K. Iken, B. Konar. 2026. Are we there yet? Sea star assemblage recovery from sea star wasting in the Gulf of Alaska. Poster Presentation, Alaska Marine Science Symposium, Anchorage, Alaska, January.

Vayder, Z., L. Horstmann, H. Coletti and K. Iken. 2026. Physiological effects of water temperature on recovery after low tide in Pacific blue mussels *(Mytilus trossulus*). Poster presentation, Alaska Marine Science Symposium, Anchorage, Alaska, January.

Williamson, S., P. Hershberger, D. Paez, N. Wolf, M. Loher, and C. Grady. June 25-26, 2025. In vitro and in vivo insights into the effects of temperature on VHS virus. Oral presentation, 64th Western Fish Disease Workshop, Bozeman, Montana, June.

Wells, K., S. L. Danielson, K. McMonigal, H. Statscewich, and R. Hopcroft. 2026. Developing techniques to reveal turbulence in the northern Gulf of Alaska with shadowgraph imaging. Poster presentation, Alaska Marine Science Symposium, Anchorage, Alaska, January.

Public presentations:

Arimitsu. M. 2025. Seabirds and forage fish as ocean sentinels; Overview of USGS research to understand mechanisms underlying seabird die-offs and forage fish response to marine heatwaves in the Gulf of Alaska. Invited community-oriented lecture, Mendenhall Glacier Visitor Center Fireside Lecture Series, Juneau, Alaska, March.

Danielson, S. 2025. Links between changing climate and Alaska's marine ecosystems. Oral presentation, UAF Earth System Science seminar series, Fairbanks, Alaska, September.

Danielson, S. 2025. A photo tour of Alaska's ocean. Oral presentation, Stroudwater Lodge, Westbrook, Maine, December.

Moran, J. 2025. Using seabirds (and other clues) to identify whale prey: How to make an educated guess. Juneau Marine Naturalist training, Juneau, Alaska, May.

Whelan, S. 2025. Black-legged kittiwake diets. Invited presentation, Alaska Fisheries Science Center Preview of Ecosystem and Economic Conditions (PEEC) virtual workshop, May.

Data and/or information products developed during the reporting period:

In addition to publishing data through the Alaska Ocean Observing System GOA Data Portal (see section below) and DataONE, projects that are part of the GWA-LTRM program regularly publish data to other permanent and publicly available databases, share data with researchers outside the GWA-LTRM program, and interpret data in various ways. Below are some examples from individual projects:

- CPR data have been included in the International Group for Marine Ecological Time Series (IGMETS) effort led by the Intergovernmental Oceanographic Commission of UNESCO (IOC), the International Ocean Carbon Coordination Project (IOCCP) and the Ocean Carbon and Biogeochemistry Program (OCB) which seeks to integrate a suite of in situ biogeochemical variables from time-series stations, together with satellite-derived information, to look at holistic changes within different ocean regions. The website https://www.ioc.unesco.org/en/international-group-marine-ecological-time-series has a Time Series Explorer which allows the user to construct time series of available variables and investigate trends. North. Pacific CPR data provide much of the plankton information for the region. The data are also stored in the Ocean Biodiversity Information System (OBIS): https://obis.org/dataset/e981eab6-f849-4891-8fac-495852829456.
- The neural network plankton identification programs developed under the PWS oceanography project have been applied to aging salmon scales. This process was presented as a poster at the Alaska Marine Science Symposium (see Conferences and Workshops, above).
- ADF&G continues to update its ArcGIS database of Prince William Sound herring surveys: https://experience.arcgis.com/experience/53d54699cbf54e72aa1a4daf405076b7. This provides in season reports of observations from the survey flights.
- The herring disease project is developing a nation-wide database for Aquatic Disease and Pathogens (AquaDepth). This USGS-hosted effort will serve as a repository for pathogen and disease surveillance data for freshwater and marine fish pathogens. The database infrastructure is currently being developed, and all the surveillance data from the past 15

years of the herring disease program are at the top of the queue for inclusion. The team anticipates that the database and the associated herring disease surveillance data will be public facing in late 2026.

- The GAK-1 project timeseries is served as a "Signature Data Set" on the NGA LTER program's website. This can be accessed at: https://nga.lternet.edu/data-overview/signature-datasets/.

Data sets and associated metadata:

Aguilar-Islas, A., and M. Kaufmann. 2025. Dissolved inorganic nutrient data from stations sampled on NGA-LTER seasonal cruises, 2018-2023. Research Workspace. 10.24431/rw1k586.

Arimitsu, M. L., J. F. Piatt, B. M. Heflin, and C. E. Marsteller. 2017. Gulf Watch Alaska - Pelagic Ecosystems Forage Fish Component - data from Prince William Sound: distribution, abundance, and morphology of fish, zooplankton, and predators and oceanographic conditions (ver 5, May 2025): U. S. Geological Survey data release, https://doi.org/10.5066/F74J0C9Z.

Arimitsu, M., J. Piatt, and C. Marsteller. 2025. Pelagic: Forage fish distribution, abundance, and body condition. Gulf of Alaska Data Portal: https://gulf-of-alaska.portal.aoos.org/#metadata/3ca497e2-3421-4fa4-a550-f4d397a73c07/project.

Campbell, R. 2025. Environmental drivers: Oceanographic conditions in Prince William Sound. Gulf of Alaska Data Portal: https://gulf-of-alaska.portal.aoos.org/#metadata/fc5b0956-ef7c-49df-b261-c8e2713887fc/project.

Branch, T. A. 2025. Bayesian age-structured-analysis (ASA) model and results for herring population dynamics in Prince William Sound, EVOS herring program. Gulf of Alaska data portal: https://gulf-of-alaska.portal.aoos.org/#metadata/4aaecfe2-de4b-4b6b-ba8e-bb715d26c6f1/project/folder_metadata/41873621.

Coletti, H., D. Esler, K. Iken, B. Konar, B. Ballachey, J. Bodkin, T. Dean, G. Esslinger, K. Kloecker, M. Lindeberg, D. Monson, and B. Robinson. 2025. GWA nearshore component posted data. Gulf of Alaska Data Portal: https://gulf-of-alaska.portal.aoos.org/#metadata/7867a791-8b05-4a8c-8065-eb6e1b425f5f/project.

Danielson, S. L. 2025. CTD profile time series data from the GAK1 site in the Northern Gulf of Alaska, 1970-2025. https://researchworkspace.com/project/23194/folder/45516095/level_3

Danielson, S.L., 2025. Oceanographic mooring time series data from the GAK1 site in the Northern Gulf of Alaska, 1998-2025. https://researchworkspace.com/project/23194/folder/44883729/mooring-data

Danielson, S. L. 2025. Water columns properties measured by CTD sensors during seasonal cruises in the Gulf of Alaska for the Northern Gulf of Alaska LTER project, 2018-2024. Research Workspace. https://doi.org/10.24431/rw1k459.

Danielson, S. L. 2025. CTD profile time series data from the GAK1 site in the Northern Gulf of Alaska, 1970-2025. https://research.cfos.uaf.edu/gak1/data/TimeSeries/

Danielson, S. L. 2025. Oceanographic mooring time series data from the GAK1 site in the Northern Gulf of Alaska, 1998-2025. https://research.cfos.uaf.edu/gak1/data/Mooring/

Donnelly, D. S., M. L. Arimitsu, S. Whelan, S. A. Hatch, S. K. Schoen. 2026. Natal origin of juvenile salmon collected on Middleton Island, Alaska, 2010-2024: U. S. Geological Survey data release, https://doi.org/10.5066/P1C48YQZ.

Hatch, S., M. Arimitsu, J. Piatt, S. Whelan, and C. E. Marsteller. 2023. Seabird diet data collected on Middleton Island, Gulf of Alaska (ver 3.0, February 2025): U.S. Geological Survey data release, https://doi.org/10.5066/P93I0P67.

Hershberger, P. 2024. Herring disease program. Gulf of Alaska Data Portal: https://gulf-of-alaska.portal.aoos.org/#metadata/61b4ec5a-f15c-4347-b0ba-8a25ad763675/project

Iken, K. 2024. Stable carbon and nitrogen isotope data of nearshore producers and consumers in four regions of the Gulf of Alaska, 2014-2024. https://doi.org/10.24431/rw1k8e2.

Iken, K. 2024. Growth measurements of mussels and fish in the Gulf of Alaska, 2014-2021. https://doi.org/10.24431/rw1k8e3.

Hauri, C. B. Irving, and A. Norgaard. 2025. Inorganic Carbon data from water samples collected during CTD casts at stations during the Northern Gulf of Alaska LTER seasonal cruises, 2018-2023. Research Workspace. 10.24431/rw1k45g, version: 10.24431_rw1k45g_20250218T205742Z.

Hauri, C, B. Irving, and S. Danielson. 2024. pCO2 time series measurements from the Gulf of Alaska Ecosystem Observatory GEO2 mooring deployed around 22-33 meter depth in

the Gulf of Alaska 2019-2021. Research Workspace. 10.24431/rw1k8ed, version: 10.24431_rw1k8ed_20240620T204501Z.

Hauri, C, B. Irving, and S. Danielson. 2024. pH, temperature, salinity, and oxygen time series measurements from the Gulf of Alaska Ecosystem Observatory GEO2 mooring deployed at approximately 32 meter depth in the Gulf of Alaska 2020-2021. Research Workspace. 10.24431/rw1k8ee, version: 10.24431_rw1k8ee_20240508T182847Z.

Hennon, G., A. Piatt, and K. Dilliplaine. 2025. Picoplankton and nanophytoplankton concentrations as determined from flow cytometry analyses on water samples collected on Northern Gulf of Alaska LTER site seasonal cruises, 2019-2023. Research Workspace. 10.24431/rw1k8f2.

Hopcroft, R. 2025. Environmental drivers: Seward Line. Gulf of Alaska data portal: https://gulf-of-alaska.portal.aoos.org/#metadata/e25fe1f2-1c98-44f6-856f-5d61c87c0384/project.

Hopcroft, R. R. 2025. Gelatinous zooplankton abundance and wet weight biomass observations from research cruises for the Northern Gulf of Alaska (NGA) LTER site, 2018-2023. Research Workspace. 10.24431/rw1k58z.

Hopcroft, R. R. 2025. Zooplankton abundance and biomass observations determined traditional microscopy, from Multinet samples collected during research cruises for the Northern Gulf of Alaska LTER site, 2018-2023. Research Workspace. 10.24431/rw1k591.

Hopcroft, R. R. 2025. Zooplankton abundance and biomass observations obtained from the QuadNet, as analyzed by traditional microscopy, during NGA LTER seasonal cruises in the Northern Gulf of Alaska, 2018-2023 Research Workspace. 10.24431/rw1k587.

Moran, J., and J. Straley. 2025. CastAway CTD data: 2017-2019 and 2022-2024 Gulf Watch Alaska pelagic component, long-term monitoring of humpback whale predation on Pacific herring in Prince William Sound. Gulf of Alaska Data Portal: https://gulf-of-alaska.portal.aoos.org/#metadata/54adceab-74cb-4419-b02c-bacb6d2acb8b/project/folder_metadata/41844522.

Morella, J. 2025. Aerial survey observations of Pacific herring biomass, marine birds, and marine mammals in Prince William Sound, Alaska, 2008-2021. Gulf of Alaska Data Portal: https://gulf-of-alaska.portal.aoos.org/#metadata/35fd35d8-f6f1-4762-9cf0-8e2e970755c4/project/folder_metadata/41851163.

Morella, J. 2025. Age-sex-length-weight data for Pacific herring in Prince William Sound, Alaska, 2014-2021. Gulf of Alaska Data Portal: https://gulf-of-alaska.portal.aoos.org/#metadata/35fd35d8-f6f1-4762-9cf0-8e2e970755c4/project/folder_metadata/41851174.

Morella, J. 2025. Herring: ADFG surveys—aerial survey routes, biomass, age sex length, and spawn. Gulf of Alaska Data Portal: https://gulf-of-alaska.portal.aoos.org/#metadata/35fd35d8-f6f1-4762-9cf0-8e2e970755c4/project.

Ostle, C. 2025. Environmental Drivers: Continuous Plankton Recorders. Gulf of Alaska Data Portal: https://workspace.nprb.org/file/45354720/CPR_Plankton_Data_GWA_2024.csv.

Straley, J., and J. Moran. 2025. Dall's and harbor porpoise survey data, Prince William Sound, Alaska: 2007-2008, 2011-2015, and 2017-2024, Gulf Watch Alaska pelagic component. Gulf of Alaska Data Portal: https://gulf-of-alaska.portal.aoos.org/#metadata/54adceab-74cb-4419-b02c-bacb6d2acb8b/project/folder_metadata/2514142.

Straley, J., and J. Moran. 2025. Lipid analyses for Pacific herring, invertebrates and humpback whales in the Gulf of Alaska, 2012-2021 and 2022-2024, Gulf Watch Alaska pelagic component. Gulf of Alaska Data Portal: https://gulf-of-alaska.portal.aoos.org/#metadata/54adceab-74cb-4419-b02c-bacb6d2acb8b/project/folder_metadata/2510153.

U. S. Geological Survey - Alaska Science Center, National Park Service - Southwest Alaska Inventory and Monitoring Network, and University of Alaska Fairbanks - College of Fisheries and Ocean Sciences. 2017. Black Oystercatcher nest and diet data from Kachemak Bay, Katmai National Park and Preserve, Kenai Fjords National Park, and Prince William Sound (ver. 4.0, September 2025): U. S. Geological Survey data release, https://doi.org/10.5066/F7WH2N5Q.

U. S. Geological Survey - Alaska Science Center, National Park Service - Southwest Alaska Inventory and Monitoring Network, and University of Alaska Fairbanks - College of Fisheries and Ocean Sciences. 2016. Intertidal temperature data from Kachemak Bay, Prince William Sound, Katmai National Park and Preserve, and Kenai Fjords National Park (ver 7.0, December 2025): U. S. Geological Survey data release, https://doi.org/10.5066/F7WH2N3T.

U. S. Geological Survey - Alaska Science Center, and National Park Service - Southwest Alaska Inventory and Monitoring Network. 2017. Marine bird and mammal survey data from

Kachemak Bay, Katmai National Park and Preserve, and Kenai Fjords National Park (ver 2.0, July 2024): U. S. Geological Survey data release, https://doi.org/10.5066/F7416V6H.

U. S. Geological Survey - Alaska Science Center, and National Park Service - Southwest Alaska Inventory and Monitoring Network. 2016. Intertidal mussel (Mytilus) data from Prince William Sound, Katmai National Park and Preserve, and Kenai Fjords National Park (ver 6.0, September 2025): U. S. Geological Survey data release, https://doi.org/10.5066/F7FN1498.

U. S. Geological Survey - Alaska Science Center, and National Park Service - Southwest Alaska Inventory and Monitoring Network. 2022. Rocky intertidal data from Prince William Sound, Katmai National Park and Preserve, and Kenai Fjords National Park (ver 4.0, December 2025): U. S. Geological Survey data release, https://doi.org/10.5066/F7513WCB.

U. S. Geological Survey - Alaska Science Center, National Park Service - Southwest Alaska Inventory and Monitoring Network, and University of Alaska Fairbanks - College of Fisheries and Ocean Sciences. 2022. Sea otter spraint data from Kachemak Bay, Katmai National Park and Preserve, Kenai Fjords National Park and Prince William Sound (ver 4.0, August 2024): U. S. Geological Survey data release, https://doi.org/10.5066/P9EDM6NL.

U. S. Geological Survey - Alaska Science Center, National Park Service - Southwest Alaska Inventory and Monitoring Network, and University of Alaska Fairbanks. 2018. Intertidal soft-sediment bivalves from Prince William Sound, Kachemak Bay, Katmai National Park and Preserve, and Kenai Fjords National Park (ver 4.0, August 2025): U. S. Geological Survey data release, https://doi.org/10.5066/F71834N0.

U. S. Geological Survey - Alaska Science Center, and National Park Service - Southwest Alaska Inventory and Monitoring Network. 2017. Sea otter forage observations from Kachemak Bay, Katmai National Park and Preserve, Kenai Fjords National Park and Prince William Sound (ver. 2.0, November 2024): U. S. Geological Survey data release, https://doi.org/10.5066/F7N29V4R.

U. S. Geological Survey - Alaska Science Center, and National Park Service - Southwest Alaska Inventory and Monitoring Network. 2024. Eelgrass (*Zostera marina*) percent cover data from Katmai National Park and Preserve, Kenai Fjords National Park, and Prince

William Sound, Alaska: U. S. Geological Survey data release, https://doi.org/10.5066/F7RV0KV9.

Additional products not listed above:

The humpback whale project (25120114-O) completed its 5-year NMFS Marine Mammal Research permit (#24378) and submitted a new 10-year NMFS Marine Mammal Research permit (29418), pending approval by NMFS. This permit, issued to the University of Alaska Southeast (PIs Straley and Wild) allows the project team to conduct the marine mammal research for this and other projects, including takes and approaches for photo-ID, tissue sampling, and other activities.

The herring disease program project (25120111-E) is developing a feature length documentary, entitled "Tiny Fish" that describes the herring disease program and other associated projects. Anticipated release is in late 2027; until then, the trailer can be viewed at https://www.impactmedialab.com/film.

Owing to the highly labor-intensive process of screening blood films for the presence of VEN, the herring disease program project (25120111-E) acquired additional funds to develop machine learning software that can analyze stained blood films for the detection of VEN inclusion bodies. The software is now largely developed, and the project team is fine tuning the machine reads to reduce read errors on the 2025 blood films. The completed software is expected to be available by October 1, 2026.

3. Coordination and Collaboration:

The Alaska SeaLife Center or Prince William Sound Science Center

PWSSC co-leads the GWA-LTRM program with NOAA and is the fiscal agent for non-Trustee organizations through a NOAA grant. PWSSC PIs also lead or co-lead projects that are part of the GWA-LTRM program. PWSSC coordinates with all team members within the GWA-LTRM program and facilitates collaboration among the projects and components. GWA-LTRM collaborates with the Alaska SeaLife Center via the CORaL Network.

EVOSTC Long-Term Research and Monitoring Projects

The GWA-LTRM program is EVOSTC's Long-Term Research and Monitoring program. Beginning in FY22, GWA incorporated the HRM program; both programs were initiated in 2012. Throughout the course of these programs, the PMT has encouraged and facilitated coordination and collaboration among individual projects and between the components. The project teams are now highly integrated and will continue working collaboratively through the current funding period. For specifics on project coordination and collaboration, see individual project annual reports.

EVOSTC Mariculture Projects

The GWA-LTRM and Mar ReCon program have some overlapping PIs and have key organizations in common (i.e., PWSSC, UAF). Individual project PIs have working relationships including sharing ship time, equipment, logistics, and field crews with the Mar ReCon program. The GWA-LTRM program coordinator and select other team members attended the Mar ReCon PI meeting in January 2026. See Section 1 (Summary of Work Performed: Provide information that can be used by the Education and Outreach and Mariculture programs) above for more details.

EVOSTC Education and Outreach Projects

Education and outreach within the spill affected area is an important component of the GWA-LTRM program. The primary education and outreach project that our program works with is the CORaL Network. CORaL Network team members have attended numerous GWA-LTRM meetings, most recently our January 2026 PI meeting held at AMSS. See Section 1 (Summary of Work Performed: Provide information that can be used by the Education and Outreach and Mariculture programs) above for more details.

In addition to working with the CORaL Network, individual projects conduct a wide variety of other education and outreach activities. Please see individual project annual reports for a complete description of these activities.

Individual EVOSTC Projects

The GWA-LTRM program has an ongoing collaborative working relationship with the Data Management program. We rely on the Research Workspace data sharing platform developed by Axiom Data Science and the GOA data portal developed by Axiom Data Science and hosted by

the Alaska Ocean Observing System, both of whom make up the data management team. The PMT and project PIs are dedicated to meeting data quality and publication requirements established by EVOSTC through the Data Management program. In addition, PWSSC serves as the fiscal agent for the Data Management program. See Section 1 (Summary of Work Performed: Ensure data are properly archived so that they can be accessed beyond the life of this program) above for more details.

Trustee or Management Agencies

The GWA-LTRM program collaborates regularly with Trustee and Management Agencies. Many of our PIs work for Trustee Agencies (ADF&G, NOAA, and Department of Interior agencies including NPS, USGS, and USFWS).

Many GWA-LTRM projects annually provide data to NOAA for its Gulf of Alaska Ecosystem Status Report and Socio-economic Profiles. PIs also conduct studies for and provide information to the Bureau of Ocean Energy Management for possible oil and gas lease sales in lower Cook Inlet. Individual projects and PIs also provide important data to ADF&G, NOAA, NPS, USGS, and other agencies to meet agency management objectives. See Section 1 (Summary of Work Performed: Leverage partnerships with outside agencies and groups to integrate data and expand capacity through collaborative efforts) above for more details. For specifics on project coordination and collaboration, see individual project annual reports.

Native and Local Communities

While outreach and education within the spill affected area are generally important, coordination with Native and local communities is a particular focus of the GWA-LTRM program. The program coordinator participated in the CRRC annual subsistence memorial gathering in March 2025. Programmatically we are coordinating with the CORaL Network to facilitate collaborative efforts that introduce PIs to local communities and community members.

Individual projects are strengthening ties with Chugach Alaska Corporation and CRRC on data collection and information sharing, and PIs are collaborating with Alaska Native and local communities and individuals in mentoring and other activities. Please see individual project annual reports for details.

4. Response to EVOSTC Review, Recommendations and Comments:

No review, recommendations, or comments were provided in 2025. This project responded to comments in the FY24 annual report.

5. Budget:

This section includes several summary-level cumulative spending budgets and cumulative spending for the NOAA and PWSSC portions of the program management project.

Table 4 and the budget screenshot below show FY22 – FY25 cumulative spending relative to what was proposed for each project in the GWA-LTRM program. Note that most projects are behind in their intended spending for the three-year funding period due to (1) a time lag in when NOAA grants were initiated for non-Trustee Agency partners in FY22 and (2) the long delay in NOAA releasing funds for non-Trustee partners in FY24. The time lag from February to June for NOAA to issue the grant was described in the FY22 annual report. NOAA typically releases grant funds to PWSSC in the month before the grant fiscal year begins (May); however, because of internal NOAA issues, the agency did not release FY24 funds to PWSSC until mid-January 2025, almost the end of the EVOSTC fiscal year. This caused projects to run low or out of EVOSTC funds and pause some or all work.

Table 4. Proposed FY22-FY25 cumulative spending, actual FY22-FY25 cumulative spending, the proposed total spending for the five-year period, and the difference (carry-over) between proposed and actual spending for each project in the Gulf Watch Alaska Long-Term Research and Monitoring program. The carry-over amount matches the no-cost extension request for each of the projects with carry-over funds.

Project title/ number	Proposed FY22-FY25 spending	Actual FY22-FY25 spending	Proposed total 5-year spending	Carry-over
PM NOAA/ 2522LTRM	295,819	291,280	312,085	4,539
PM PWSSC/ 2522LTRM	2,172,380	1,537,101	2,759,682	635,279
CPR/ 25120114-D	326,061	283,778	412,737	42,283
PWS Oceanography/ 25120114-G	951,508	720,300	1,204,437	283,209
GAK-1/ 25120114-I	594,004	310,023	787,129	283,981
Seward Line/ 25120114-L	899,486	638,290	1,111,494	261,196
Ocean Acidification/ 25220202	495,333	344,425	611,107	150,909
Forage Fish/ 25120114-C	1,227,856	1,111,299	1,549,494	116,557
Marine Birds/ 25120114-M	854,523	776,024	948,135	78,499

Project title/ number	Proposed FY22-FY25 spending	Actual FY22-FY25 spending	Proposed total 5-year spending	Carry-over
Killer Whales/ 24120114-O	311,245[a]	310,164[a]	311,245[a]	1,081[a]
Humpback Whales/ 25120114-O	754,164	579,307	931,779	165,857
Herring Modeling/ 25120111-C	551,199	416,388	702,327	134,811
Herring Disease/ 25120111-E	1,290,283	934,424	1,652,357	355,859
Herring Surveys/ 25120111-F	743,083	499,588	906,209	243,496
Herring/Salmon Int./ 25220111-I	1,285,884	909,711	1,593,773	376,174
Nearshore/ 25120114-H	2,481,814	1,523,996	3,038,947	957,818
Lingering Oil/ 25200114-P	113,800	113,520	113,800	280
Totals	**15,492,088**	**11,452,2611**	**19,099,383**	**4,038,746**

[a] The killer whale project was not funded in FY25 and carry-over funds are not included in the total.

Exxon Valdez Oil Spill Trustee Council

Long-Term Research and Monitoring, Mariculture, Education and Outreach

Annual Program Reporting Form

2022-2026 Gulf Watch Alaska LTRM Program Budget

Principal Investigators and Affiliation	Activity - short project title	FY 22	FY 23	FY 24	FY 25	FY 26	5 Yr proposed TOTAL	Actual Cumulative
Coordination, Synthesis, Outreach, & Administration								
Lindeberg & Suryan, NOAA	Program Management A	$162,981	$115,261	$17,577	$0	$16,265	$312,085	$291,280
Hoffman, PWSSC	Program Management B	$487,250	$546,818	$561,784	$576,528	$587,302	$2,759,682	$1,537,101
Coordination, Synthesis, Outreach, & Administration Total		**$650,231**	**$662,079**	**$579,361**	**$576,528**	**$603,567**	**$3,071,767**	**$1,828,381**
Environmental Drivers								
Ostle, MBA, & Batten, PICES	CPR in the GOA	$78,502	$80,492	$82,503	$84,564	$86,676	$412,737	$283,778
Campbell, PWSSC	PWS Oceanographic	$229,140	$234,870	$240,740	$246,758	$252,929	$1,204,437	$720,300
Danielson, UAF	GAK-1 Mooring	$125,080	$141,301	$139,882	$187,741	$193,126	$787,129	$310,023
Hopcroft & Danielson, UAF	Seward Line	$216,613	$222,026	$227,577	$233,269	$212,008	$1,111,494	$638,290
Hauri, UAF	Ocean Acidification	$144,042	$127,311	$110,858	$113,123	$115,774	$611,108	$344,425
Environmental Drivers Total		**$793,376**	**$806,001**	**$801,560**	**$865,456**	**$860,513**	**$4,126,906**	**$2,296,816**
Pelagic Monitoring								
Arimitsu & Piatt, USGS	Forage Fish Monitoring	$319,226	$293,863	$302,757	$312,010	$321,639	$1,549,494	$1,111,299
Kaler, USFWS	PWS/LTER Marine Bird Surveys	$88,075	$376,519	$85,764	$304,165	$93,612	$948,135	$776,024
Durban & Matkin, NGOS	Killer Whale Monitoring	$195,690	$115,555	$0	$0	$0	$311,245	$310,164
Moran, NOAA, & Wild, UAS	Humpback Whale Monitoring	$187,806	$186,633	$183,260	$187,465	$186,616	$931,779	$579,307
Pelagic Monitoring Total		**$790,796**	**$972,570**	**$571,781**	**$803,640**	**$601,866**	**$3,740,653**	**$2,776,794**
Herring Research & Monitoring								
Branch, UW	Herring Modeling	$130,016	$130,573	$144,082	$146,528	$151,128	$702,327	$416,388
Hershberger & Paez, USGS	Herring Disease	$315,826	$389,456	$288,712	$296,288	$362,074	$1,652,357	$934,424
Morella, ADF&G	Spawning Surveys & ASL	$143,686	$208,590	$207,432	$183,375	$163,125	$906,209	$499,588
Rand, Campbell, PWSSC, Gorman, UAF, Heintz, SSSC	Salmon-Herring Interactions	$231,033	$364,711	$371,613	$318,527	$307,888	$1,593,773	$909,711
Rhea-Fournier, ADF&G, Rand, PWSSC, Hershberger, UW	Pollock-Herring Interactions	$152,645	$0	$0	$0	$0	$152,645	$152,645
Herring Research & Monitoring Total		**$973,206**	**$1,093,331**	**$1,011,839**	**$944,718**	**$984,216**	**$5,007,310**	**$2,912,755**
Nearshore Monitoring								
Coletti, NPS, Esler, USGS, Konar & Iken, UAF	Nearshore Monitoring	$613,497	$642,629	$673,842	$551,847	$557,133	$3,038,947	$1,523,996
Nearshore Monitoring Total		**$613,497**	**$642,629**	**$673,842**	**$551,847**	**$557,133**	**$3,038,947**	**$1,523,996**
Lingering Oil								
Esler, USGS, & Lindeberg, NOAA	Lingering Oil	$0	$0	$0	$113,800	$0	$113,800	$113,520
Lingering Oil Total		**$0**	**$0**	**$0**	**$113,800**	**$0**	**$113,800**	**$113,520**
	Program Total Cost	**$3,821,107**	**$4,176,610**	**$3,638,383**	**$3,855,988**	**$3,607,295**	**$19,099,383**	**$11,452,261**
FY 22-26 Total all Program projects including 9% GA		**$4,165,006**	**$4,552,505**	**$3,965,838**	**$4,203,027**	**$3,931,952**	**$20,818,328**	**$12,482,965**

The budget below shows FY22 – FY25 cumulative spending relative to spending categories. Similar to the project spending, this budget indicates that spending by category is below proposed spending for reasons described above.

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

Budget Category:	Proposed FY 22	Proposed FY 23	Proposed FY 24	Proposed FY 25	Proposed FY 26	5-YR TOTAL PROPOSED	ACTUAL CUMULATIVE
Personnel	$1,943,839	$2,160,804	$2,078,258	$2,125,644	$2,105,592	$10,414,137	$5,873,305
Travel	$129,780	$157,534	$131,254	$139,456	$140,551	$698,574	$436,765
Contractual	$1,022,084	$1,020,129	$838,514	$1,001,356	$825,934	$4,708,018	$3,097,442
Commodities	$233,564	$256,439	$200,690	$207,390	$183,546	$1,081,628	$802,575
Equipment	$263,027	$344,953	$178,837	$171,432	$136,772	$1,055,021	$606,824
Indirect Costs (rate will vary by project)	$228,812	$236,751	$210,830	$210,711	$214,902	$1,027,784	$635,350
SUBTOTAL	$3,821,107	$4,176,610	$3,638,383	$3,855,988	$3,607,295	$19,099,383	$11,452,261
General Administration (9% of subtotal)	$343,900	$375,895	$327,454	$347,039	$324,657	$1,718,944	N/A
PROGRAM TOTAL	**$4,165,006**	**$4,552,505**	**$3,965,838**	**$4,203,027**	**$3,931,952**	**$20,818,328**	
Other Resources (In-Kind Funds)	**$1,921,954**	**$1,988,772**	**$1,947,543**	**$1,977,340**	**$1,475,599**	**$9,311,208**	

COMMENTS:
The GWA-LTRM program budget represents multiple agencies and organizations. Indirect rates and exemptions from indirect rates vary by proposer. This sheet summarizes all proposed project expenses by category. Please see individual project budgets for detail.

Most projects in the program are behind on their spending for FY22 and FY23. The delay in release of FY22 funds and delay in issuance of the NOAA grant for non-Trustee projects is the primary reason for the spending lag. Please see individual project budgets for specific reasons.

FY22-26	Program Number: 2522LTRM ProgramTitle: Gulf Watch Alaska-LTRM	SUMMARY TABLE

The spreadsheet below shows spending that individual projects would like to carry over from FY22-FY24 to FY25. The primary reason for the underspending for the funding cycle is the delay in the release of funds by EVOSTC that led to delays in agency funding release and a delay in issuance of the NOAA grant for non-Trustee organizations. This serves as a no-cost extension request for FY25.

Project Number	Project Title	Lead PI(s)	FY25 Carry Over to FY26 (based on FY22-25 cumulative spending)
Program Management			
2522LTRM-A	GWA-LTRM Program (NOAA)	Lindeberg & Suryan	$4,539
2522LTRM-B	GWA-LTRM Program (PWSSC)	Hoffman	$635,279
Environmental Drivers			
25120114-D	CPR	Ostle & Batten	$42,283
25120114-G	PWS Oceanographic	Campbell	$231,209
25120114-I	GAK-1	Danielson	$283,981
25120114-L	Seward Line	Hopcroft & Danielson	$261,196
25220202	Ocean Acidification	Hauri	$150,909
Pelagic			
25120114-C	Forage Fish	Arimitsu	$116,557
25120114-M	PWS Marine Bird Surveys	Kaler	$78,499
~~23120114-N~~	~~Killer Whales~~	~~Durban & Matkin~~	~~$0~~
25120114-O	Humpback Whales	Moran & Wild	$165,857
Herring Research & Monitoring			
25220111-C	Herring Modeling	Branch	$134,811
25220111-E	Herring Disease	Hershberger & Paez	$355,859
25170111-F	Herring Surveys	Morella	$243,496
25120111-I	Herring/Salmon Interactions	Rand et al.	$376,174
~~23220203~~	~~Pollock/Herring Interactions~~	~~Rhea-Fournier et al.~~	~~$0~~
Nearshore			
25120114-H	Nearshore	Coletti et al.	$957,818
Lingering Oil			
25120114-P	Lingering Oil	Coletti & Suryan	$280
Total Carry Over			**$4,038,746**

Below is the cumulative spending budget for the NOAA portion of the program management project. This budget reflects modifications after the EVOSTC approval to redistribute some LTRM-A funds and decision to return and exclude additional funds described earlier in the report.

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

Budget Category:	Proposed FY 22	Proposed FY 23	Proposed FY 24	Proposed FY 25	Proposed FY 26	5- YR TOTAL PROPOSED	ACTUAL CUMULATIVE
Personnel	$0	$0	$0	$0	$0	$0	$0
Travel	$11,694	$12,279	$12,893	$0	$13,569	$50,436	$30,985
Contractual	$140,000	$65,307	$0	$0	$0	$205,307	$219,985
Commodities	$11,287	$37,675	$4,684	$0	$2,696	$56,342	$40,310
Equipment	$0	$0	$0	$0	$0	$0	$0
Indirect Costs Rate = 0%	$0	$0	$0	$0	$0	$0	$0
SUBTOTAL	$162,981	$115,261	$17,577	$0	$16,265	$312,085	$291,280
General Administration (9% of subtotal)	$14,668	$10,374	$1,582	$0	$1,464	$28,088	N/A
PROJECT TOTAL	$177,649	$125,635	$19,159	$0	$17,729	$340,172	
Other Resources (In-Kind Funds)	$89,375	$91,609	$93,899	$96,247	$98,653	$469,783	

COMMENTS:
NOAA: In Kind Labor: Total = $531.5K for 5 years, Program Lead: Lindeberg = $441.2K (25 mos for 5 years) & Program Science Lead: Suryan = $90.3K (5 mos for 5 years)

Budget modified per Trustee Council approval (Jan 2024) to fund contract biologist instead of Science Coordinator to conduct synthesis analysis and to redistribute funds to PWSSC (project 2422LTRM-B) for seabird observations and forage fish aerial surveys to support integrated predator-prey surveys (project 24120114-C). $309,090 requested to continue killer whale project (23120114-N) from FY24-26 funds was not approved;this amount will be retained in the EVOSTC Research Fund. Of the $309,090, $100,000 for FY24 was already allocated to NOAA by EVOSTC. Rather than returning those funds to EVOSTC (complex and inefficient, but also because EVOSTC also now owes Data Management additional funds), NOAA LTRM-A will realocate the $100,000 from FY24 to the increased costs of the Data Management budget to support additional IPP seabird observations and aerial forage fish survey data management ($24,125 [+$13,137 underfunded from AFO] for FY24, $24,878 for FY25, $25,624 for FY26). Funding to LTRM-A was not changed from the original request until FY25 and FY26.

FY22-26	**Project Number: 2522LTRM-A** **Project Title: Program Management A** **PI(s): Suryan (NOAA)**	**TRUSTEE AGENCY SUMMARY PAGE**

Below is the cumulative spending budget for the PWSSC portion of the program management project. Underspending is related to (1) a time lag in when NOAA grants were initiated for non-Trustee Agency partners in FY22 and (2) the long delay in NOAA releasing funds for non-Trustee partners in FY24. Additionally, PI Hoffman went on sabbatical for one third of a year and did not draw on personnel costs during that time.

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

Budget Category:	Proposed FY 22	Proposed FY 23	Proposed FY 24	Proposed FY 25	Proposed FY 26	5- YR TOTAL PROPOSED	ACTUAL CUMULATIVE
Personnel	$343,050	$369,868	$380,974	$392,410	$400,547	$1,886,849	$1,012,575
Travel	$12,400	$12,400	$12,690	$13,390	$13,390	$64,270	$25,060
Contractual	$121,800	$154,550	$158,120	$160,728	$163,365	$758,563	$473,021
Commodities	$10,000	$10,000	$10,000	$10,000	$10,000	$50,000	$26,444
Equipment	$0	$0	$0	$0	$0	$0	$0
Indirect Costs Rate = 0%	$0	$0	$0	$0	$0	$0	$0
Indirect waived							
SUBTOTAL	$487,250	$546,818	$561,784	$576,528	$587,302	$2,759,682	$1,537,101
General Administration (9% of subtotal)	$43,853	$49,214	$50,561	$51,888	$52,857	$248,371	N/A
PROJECT TOTAL	$531,103	$596,032	$612,345	$628,416	$640,159	$3,008,053	
Other Resources (In-Kind Funds)						$0	

COMMENTS:
Spending continues to be lower than anticipated because the EVOSTC and NOAA grant fiscal years are out of sync by 4 months and because work slowed down in fall 2024 when the transfer of FY24 NOAA grant funds was delayed until late January 2025.

EVOS Trustees approved moving funds from the NOAA PM budget to PWSSC for avian observations and forage fish aerial surveys to support the USGS forage fish project (24120114-C).

PWSSC is waiving its 35% indirect rate on projects and is directly budgeting salary for administrative staff, contractual items for operating PWSSC, and supplies to support the program. This approach reduces administrative costs for the program.

FY22-26	**Project Number: 2522LTRM-B** **Project Title: Program Management B** **Primary Investigator: Hoffman (PWSSC)**	**NON-TRUSTEE AGENCY SUMMARY PAGE**