Exxon Valdez **Oil Spill Trustee Council**

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

Annual Program Reporting Form

Program Number: 2422LTRM

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

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

Reporting Period: February 1, 2024 – January 31, 2025

Submission Date: September 19, 2025

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 delays in the distribution of FY24 grant funding from the National Oceanic and Atmospheric Administration (NOAA).

☒ **Program progress is delayed.**
The program has experienced two delays outside of our control. First, NOAA delayed the initiation of the NOAA grant that funds the non-Trustee organization projects in FY22, 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, because of internal NOAA issues, FY24 grant funds were not released to Prince William Sound Science Center (the NOAA grant administrator) until mid-January 2025. This caused some projects to pause or stop work temporarily when they ran low on funds. Most notably at the program level, annual reports were submitted late (after March 1). More information may be found in Section 5 (Budget) and in individual project reports regarding the effect of delayed funding.

☒ **Budget reallocation request.**
On behalf of the projects, the program requests a no-cost extension for FY23 and FY24 funds that remain unspent because of the delay in funding allocation and long delay in NOAA releasing FY24 funds. More information may be found in Section 5 (Budget) and in individual project reports regarding the effect of delayed funding.

The EVOSTC met on January 26, 2024, to approve a budget reallocation of $69,189 for seabird surveys during the Integrated Predator-Prey study and $129,692 for aerial juvenile fish surveys from LTRM-A to LTRM-B. The EVOSTC did not approve the $309,090 reallocation from LTRM-A to the Killer Whale study and requested the FY24 portion ($100,000) of those funds to be returned to the EVOSTC and the FY25-FY26 portions be withheld from LTRM-A. Because of difficulties with returning funds, the NOAA EVOSTC Liaison and the EVOSTC Executive Director decided to adjust future GWA funding allocations to spend down the $100,000 from LTRM-A in FY25 and FY26.

☒ **Personnel changes.**

Program Lead Mandy Lindeberg was on medical leave for much of FY24. Science Lead Rob Suryan picked up many of her duties. In addition, Administrative Lead Katrina Hoffman was on sabbatical from August to December 2024. Because the PMT is small (four people), losing key team members 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 2024 (FY24) annual report for the program management project (2422LTRM) 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.

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 Pacific herring (*Clupea pallasii*) in Prince William Sound (PWS). 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 FY24 for each project are reported here by component.

Nearshore Ecosystem Component (24120114-H)

The Nearshore Component project (24120114-H, PIs Coletti et al.) conduct 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.

In 2024, team members completed all aspects of the nearshore monitoring component across all four regions. For the FY24 annual report, they reported on intertidal water temperature and rocky intertidal community structure. This project maintains multiple time series for the species and habitats they monitor. As examples, Fig. 1 shows seasonal intertidal water temperature anomalies and Fig. 2 shows percent cover of macroalgae, mussels (*Mytilus trossulus*), and barnacles at 0.5 m mean lower low water at the four regions within the GWA-LTRM area.

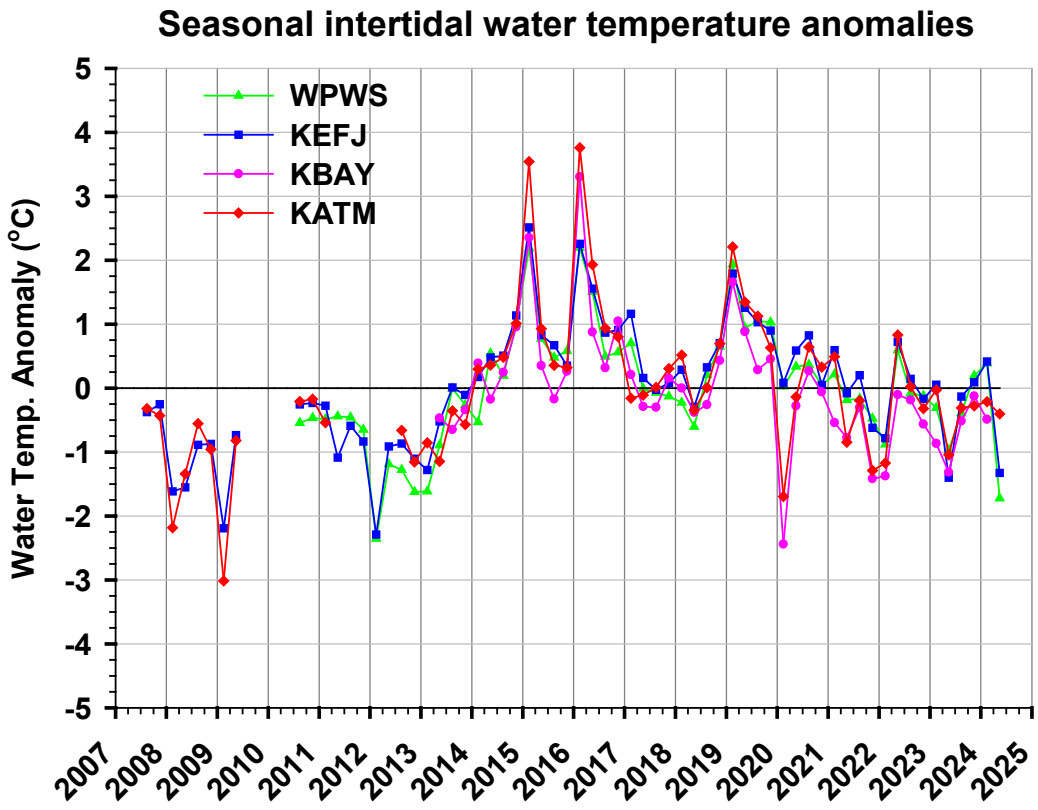


Figure 1. Seasonal intertidal water temperature anomalies at the 0.5 m tide level four regions of the western Gulf of Alaska (west of 144°W), western Prince William Sound (WPWS; 2011-2024), Kenai Fjords National Park (KEFJ; 2008-2024), Kachemak Bay (KBAY; 2013-2024), and Katmai National Park adjacent to Shelikof Strait (KATM; 2006-2024). Long tick marks indicate the start of the calendar year (January) while short tick marks are quarterly divisions within the year (April, July, October).

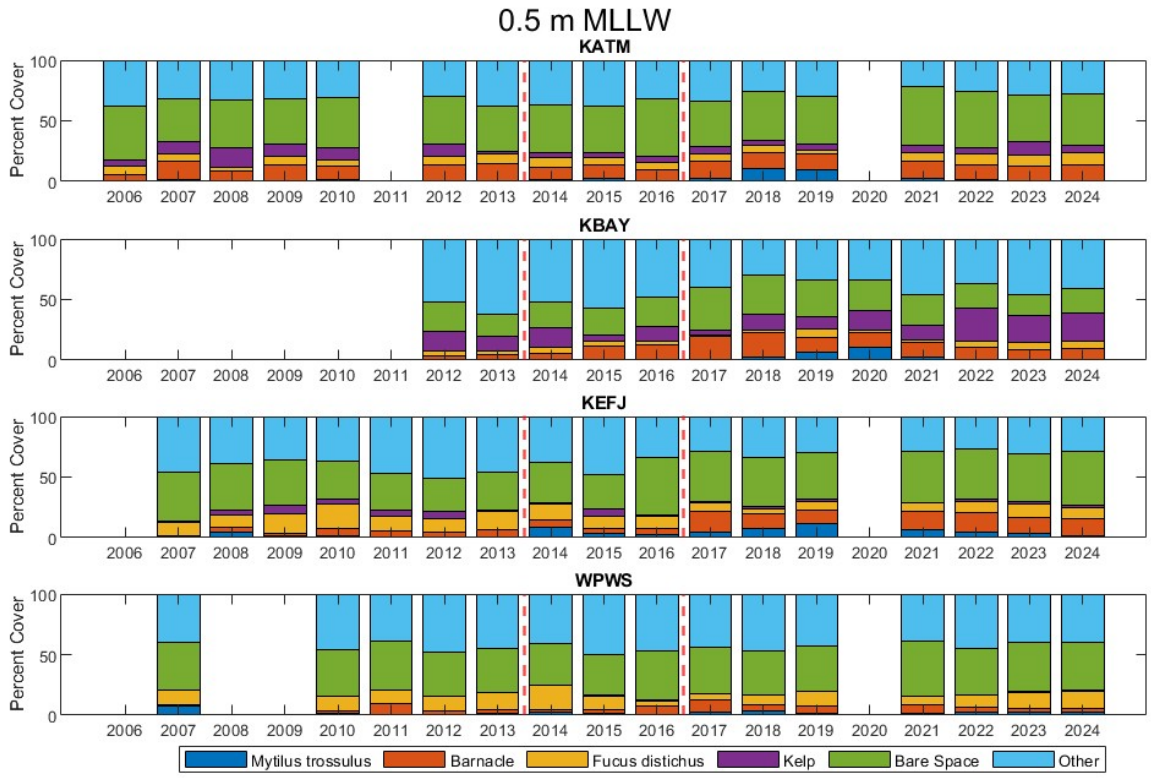


Figure 2. Percent cover of Mytilus trossulus, barnacles, Fucus distichus, kelps, and bare substrate at the 0.5 m tidal elevation, mean lower low water (MLLW) *across the four Gulf Watch Alaska regions: Katmai National Park and Preserve (KATM), Kachemak Bay (KBAY), Kenai Fjords National Park (KEFJ), and Western Prince William Sound (WPWS), 2006-2024. "Other" includes all other macroalgae and sessile invertebrates. Dashed red line indicates the start and end of the Pacific marine heatwave.*

Environmental Drivers

Continuous Plankton Recorders (24120114-D)

All 2024 Continuous Plankton Recorder (CPR; 24120114-D, PIs Ostle and Batten) tows were completed as planned. The CPR was deployed on six transects in 2024, monthly from April through July and September through October. The July sample collections were unsuccessful due to a jam in the mesh transportation of the internal CPR mechanism. The remaining five months were successfully sampled. In 2024, annual sea surface temperatures were cooler than the long-

term average (2004–2024), as indicated by z-score analysis. They were also lower compared to recent years, especially the heatwave years of 2016 and 2019 (red lines in Fig. 3).

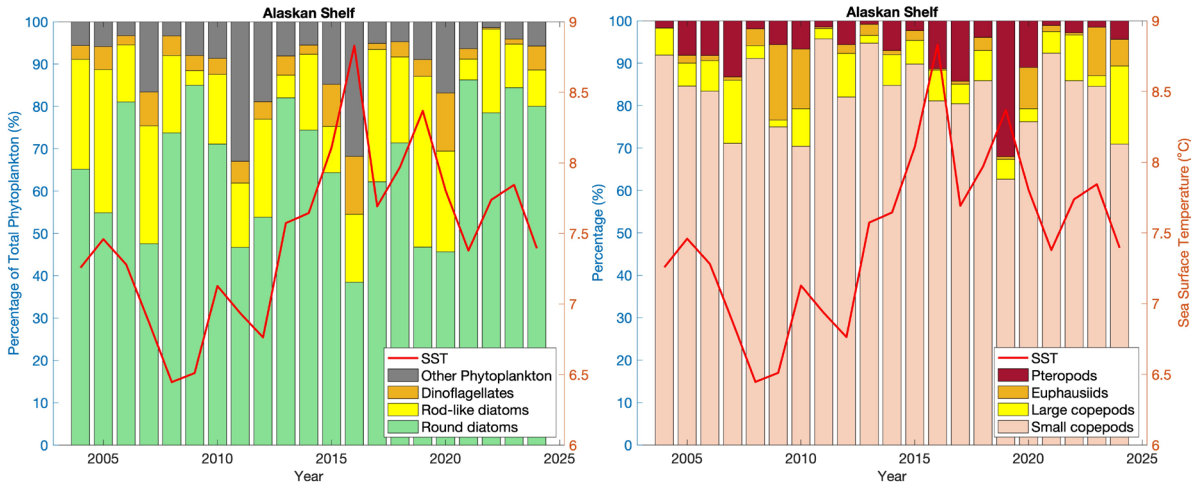


Figure 3. Left panel shows the mean annual percentage of the total phytoplankton (green=round diatoms, yellow=rod-like diatoms, orange=dinoflagellates, grey=all other phytoplankton). Right panel shows the mean annual percentage of the total zooplankton (pink = small copepods, yellow = large copepods, orange = euphausiids, dark red = pteropods). 2024 only includes data from May and June and are preliminary. Red line is the annual Sea Surface Temperature within the Alaskan Shelf region from 2004 to 2024, obtained from the International Comprehensive Ocean-Atmosphere Data Set (ICOADS).

Although only some of the data are available at this time (May-June 2024), preliminary analyses suggest that since 2020, plankton have continued to return to levels that were more similar to those found during pre-heatwave conditions (Fig. 3). There was a higher proportion of large-round diatoms in the phytoplankton, and fewer small copepods and a higher proportion of large copepods and euphausiids in the zooplankton in 2024, than previous years.

Oceanographic Conditions of PWS (24120114-G)

The planned oceanographic surveys of PWS (project 24120114-G, PI Campbell) were conducted during the reporting period. All conductivity and temperature at depth (CTD) data collected to date have been processed, and seasonally detrended anomalies of temperature at selected depths in central PWS 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 [24120114-L] and GAK-1 [24120114-I] projects), and late 2013 to 2016 has been labelled a

basin scale marine heatwave. Following a weak cooling trend into early 2018 and a brief period of negative anomalies, anomalies again trended warmer than average, which corresponded to basin-wide increases in sea surface temperature observed in 2019. Near-surface temperature anomalies in 2019 exceeded those observed during the 2013-2016 marine heatwave. Anomalies again trended towards much warmer than average in 2022 but switched to negative anomalies in 2023. The GOA experienced an unprecedented "triple-dip" La Niña from 2020 to 2023 which eventually led to lower near-surface temperatures basin-wide, and temperature anomalies have oscillated around the long term mean since then. Although highly variable, the depth of the seasonal mixed layer appears to be on a long-term thinning trend, likely driven by warming of near-surface waters, as well as enhanced freshwater inputs from melting ice.

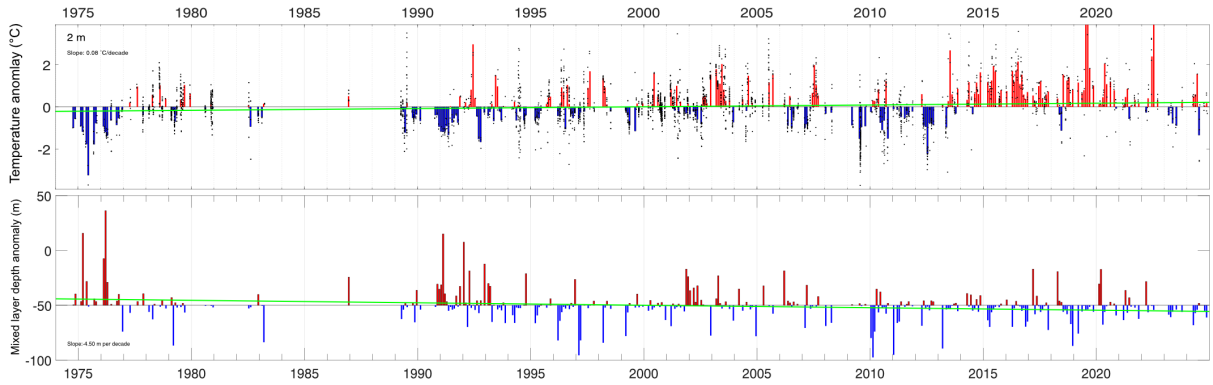


Figure 4. Top panel: Biweekly near surface temperature anomalies in central Prince William Sound. Anomalies were calculated as the residual to a second order cosine curve fit to all data to remove seasonality. Black points are observations, bars are biweekly averages, and the green line indicates the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

All zooplankton samples up to the end of 2023 have been analyzed (zooplankton samples are time consuming to process and take about a year to complete). Analysis of the 2010 to 2023 samples shows a shift in zooplankton taxa in PWS during the marine heatwave years (Fig. 5). Although changes in overall zooplankton abundance have been relatively small (note the different axes scaling in the panels of Fig. 5), abundances of "warm" water copepod species increased, while that of the canonical "cool" water subarctic copepod species decreased during heatwave years. A shift back towards increased cool water species and decreased warm water species occurred in 2018 but may have switched again in late 2019 following the second heatwave; cool water species have become much less common recently. A lag of 1-2 years

between the onset of warmer conditions (Fig. 4) and changes in the zooplankton composition (Fig. 5) is apparent. The lag can be attributable to both transport (i.e., the advection of taxa more common to the California Current to the north), and/or enhanced productivity of warm-preferring taxa in place. No studies showing changes in transport during the marine heatwave years have been published yet, and the warm water species used here have been observed in the PWS region previously, which supports the latter hypothesis. More recently, zooplankton abundance anomalies have trended towards lower than average, particularly in 2022, this could be a manifestation of the aforementioned potential for lower trophic level productivity and will bear further observation.

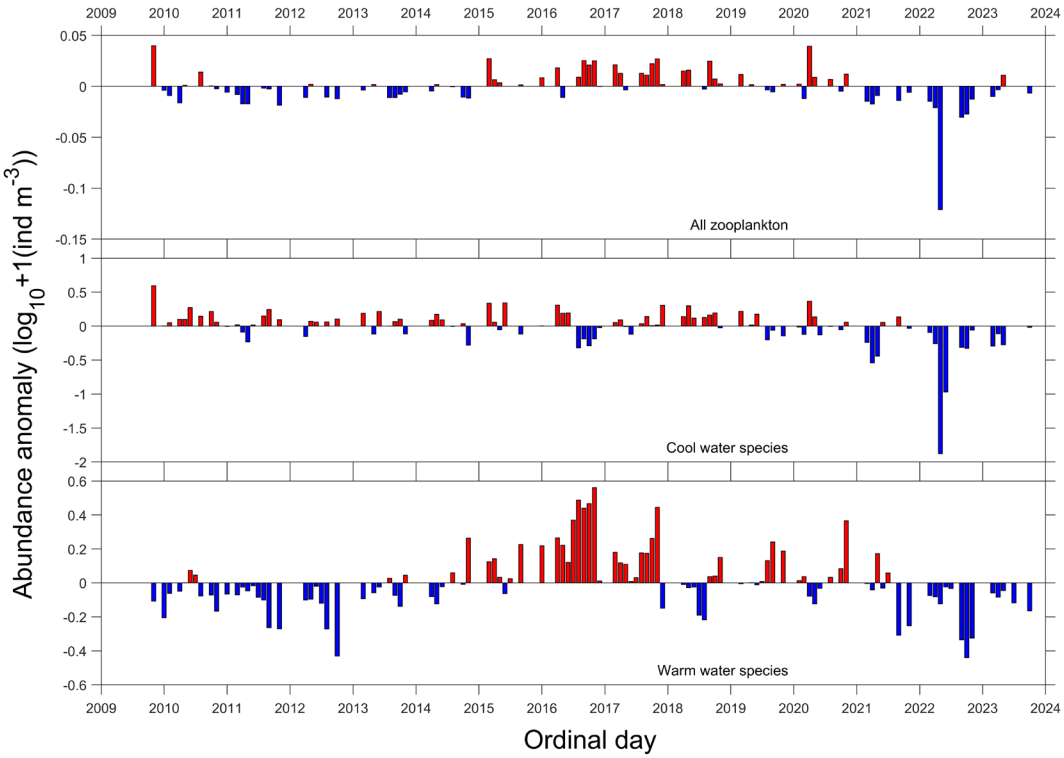


Figure 5. Time series of zooplankton anomalies in Prince William Sound, 2010-2023. Zooplankton were divided into "warm" and "cool" water copepod species and average anomalies calculated across groups. Warm water species were Calanus pacificus, Clausocalanus sp., Corycaeus anglicus, Ctenocalanus vanus, Mesocalanus tenuicornis and Paracalanus parvus. Cool water species were Acartia longiremis, Calanus marshallae, Oithona similus, and Pseudocalanus sp. Abundances were log10+1 transformed prior to calculating anomalies. Note that the scaling of the ordinate varies among panels.

GAK-1 (24120114-I)

The GAK-1 project (24120114-I, PI Danielson) logged numerous successes in FY24 including the May 2024 recovery of the 2023 GAK-1 mooring and its redeployment. The team recovered data from all mooring sensor deployment depths (nominal depths of 20, 30, 60, 100, 150, 200, and 250 m). A programming error resulted in only a partial dataset being collected by the 250 m CTD datalogger, but a full data record at that depth was salvaged because the University of Alaska Fairbanks' (UAF's) Ocean Acidification Research Center had also deployed an instrument near to that depth level and kindly made the data available to us. They also collected CTD profiles from R/V *Nanuq* and R/V *Sikuliaq*. During this reporting period the team also undertook a major revision to our data processing flow and have redistributed some of the workload, allowing us to more quickly update the GAK-1 time series for public and agency use.

As part of the GWA-LTRM data synthesis efforts, two major data analyses were advanced over the fall and winter of 2023-2024. The first is the GWA-LTRM salinity synthesis, undertaken by PI Danielson and Dr. Tyler Hennon of UAF. The second is a GAK-1 time series reanalysis that assesses thermal and haline variability across the entire length of the 55-year time series. This effort examines trends, seasonality, seasonality of trends, and the relationship between wind forcing and coastal conditions.

Both monthly anomalies and annual averages of the monthly salinity anomaly recorded at coastal station GAK-1 show opposite trends in the near-surface and near-bottom layers (Figs. 6 and 7). The trends account for only about 10% of the total variance, but both are significant at the 95% confidence level. In the surface layer, waters are freshening ($p \sim 0.01$) at a rate of -0.06 (monthly anomalies) to -0.04 (annual averages) per decade and near the seafloor the rate of salinization is +0.035 to 0.040 per decade. The annual trends exist even with the inclusion of two potential outliers in the salinity data record that potentially suffer from having only two months sampled during the calendar year. These stand out as the largest positive anomaly for near-surface waters in 1981 and the largest negative anomaly in near-bottom water in 1985 (Fig. 6).

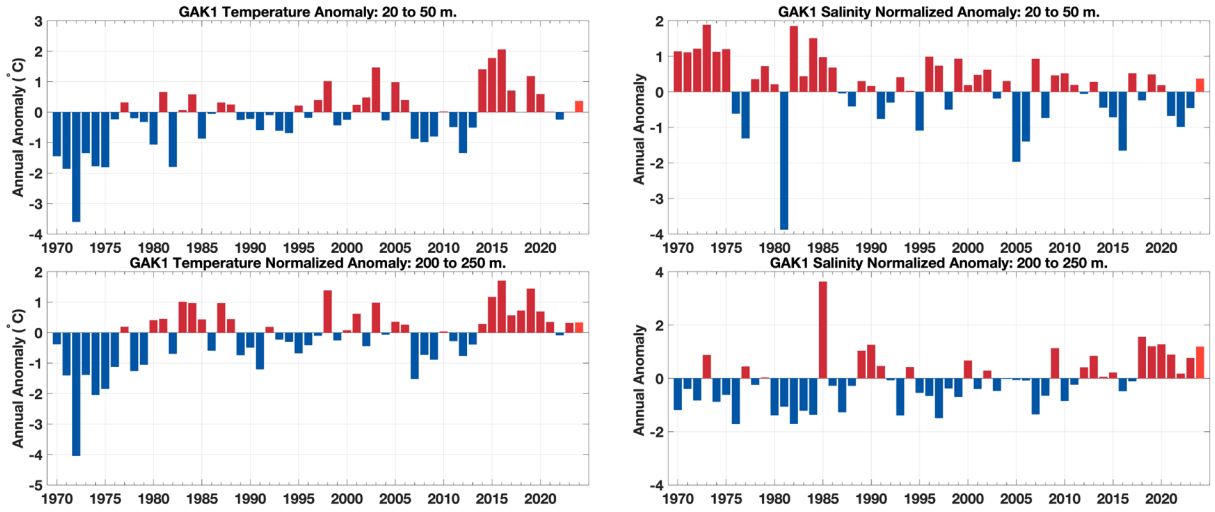


Figure 6. Annual averages over 1970 to 2024 of the GAK-1 monthly temperature (left) and salinity anomaly (right) for near surface (20-50 m, top) and near bottom (200-250 m, bottom) depth layers. Years with fewer than three months sampled are 1981 and 1985.

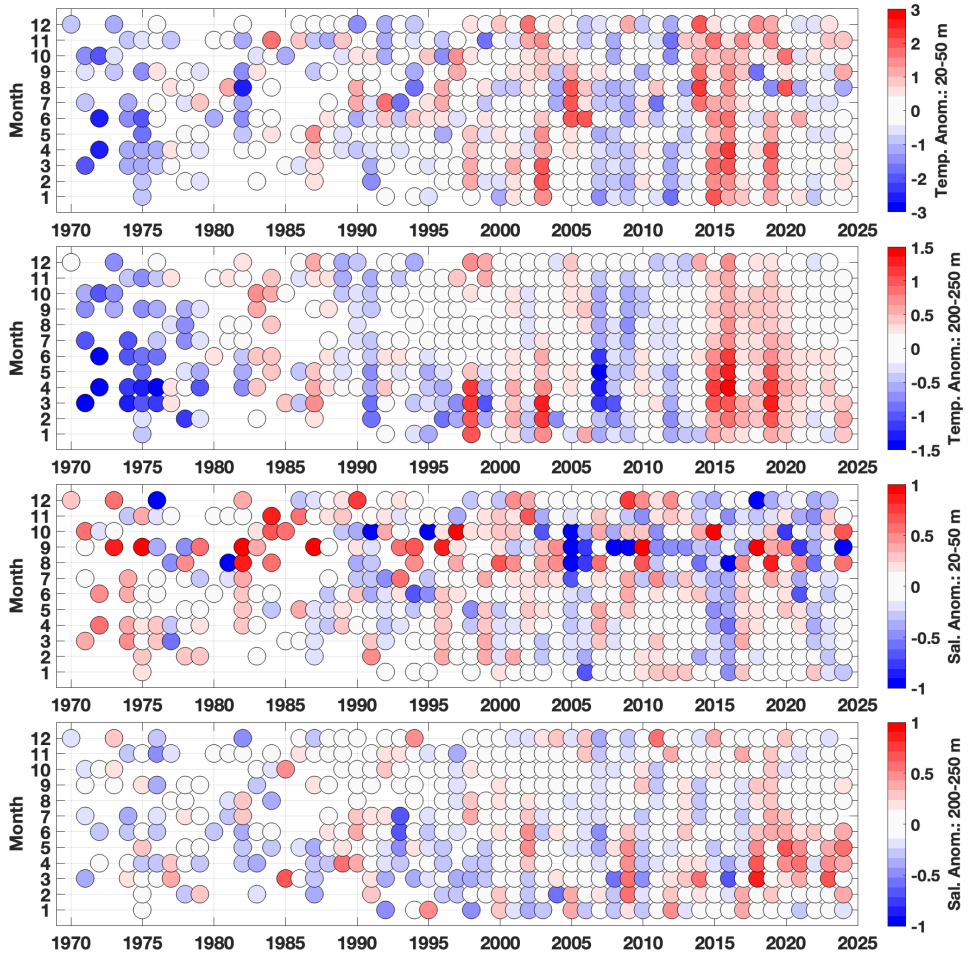


Figure 7. Monthly anomalies of temperature (top two panels) and salinity (bottom two panels) for near surface and near seafloor depth layers over 1970 to 2024, as marked. Note different color scale ranges for the temperature panels.

Seward Line (24120114-L)

The Seward Line (project 24120114-L, PIs Hopcroft and Danielson) was sampled in early May and mid-September of 2024. Processing of samples continues year-round, and descriptive aspects evolve as more data becomes available.

Mean temperatures in the upper 100 m during May were slightly below (-0.1°C) the 27-year Seward Line spring average (Fig. 8), but not significantly so. Chlorophyll was high at nearly all

Seward Line stations, which is consistent for May, but the peak of the bloom had passed in Prince William Sound, although large cells dominated in both domains. The 2024 May bloom ranks as relatively high on the Seward Line Phytoplankton Size Index and was composed of primarily large chain-forming centric diatoms that are captured on the 20 µm mesh such as *Thalassiosira, Leptocylindrus, Rhizosolenia,* and *Ditylum*. Large copepod abundance and biomass seemed to be below average (Fig. 9), and their development appeared to be delayed.

Mean temperatures in the upper 100 m during September were still slightly below (-0.1°C) the 28-year Seward Line fall average, but not significantly so. A fall phytoplankton bloom appeared to be underway, particularly at offshore stations, but chlorophyll concentration was low as is typical for fall. Zooplankton community composition appeared to be typical for fall, albeit 2024 continued a string of low biomass for small copepods during September that began with cooler years in 2020.

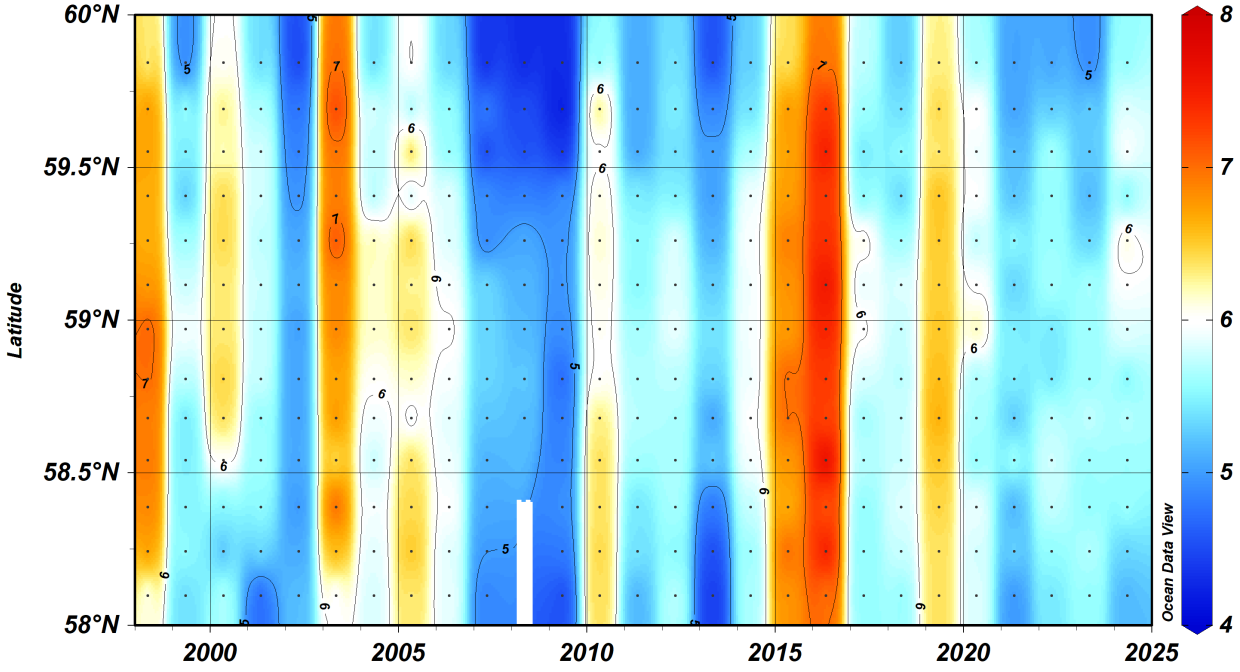


Figure 8. Average temperature in the upper 100 m of the Seward Line during May oceanographic cruises.

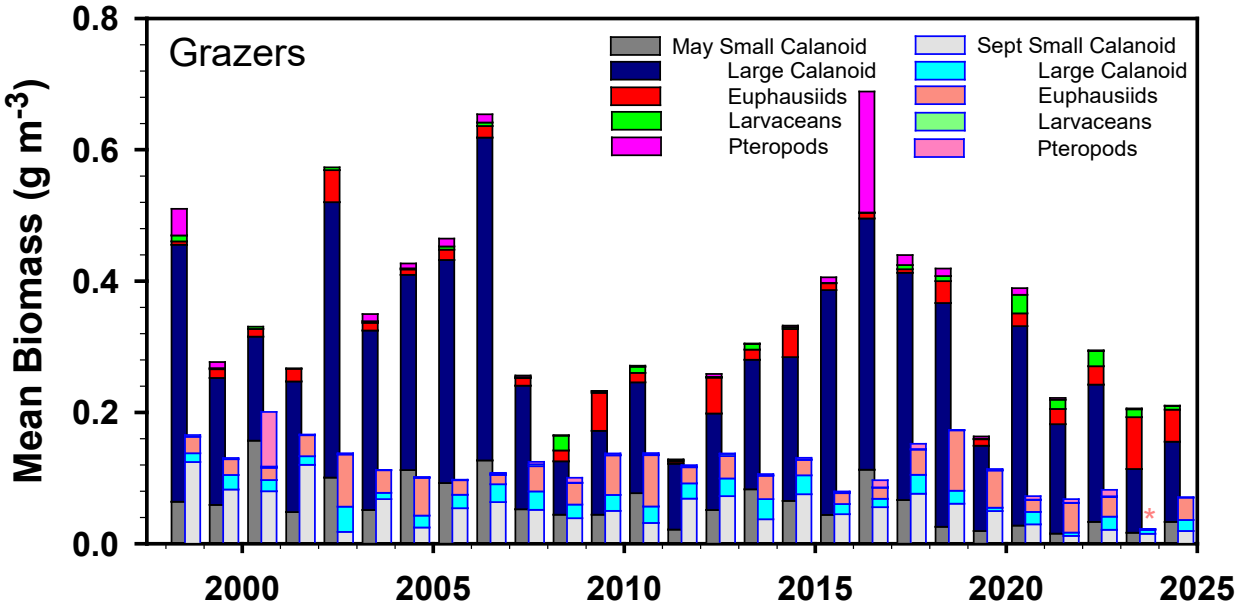


Figure 9. Average zooplankton wet-weight biomass along the Seward Line for major crustacean component. Data from 2022-2024 are preliminary, based on a subset of the stations sampled. Fall 2023 lacks euphausiid data due to equipment failures.

Continuation and Expansion of Ocean Acidification Monitoring in the Spill Area (24220202)

The ocean acidification project (24220202, PI Hauri) collected water samples for total alkalinity, dissolved inorganic carbon, and pH during the spring (401 samples) and fall (214 samples) 2024 GWA-LTRM and Northern Gulf of Alaska Long-term Ecological Research (NGA-LTER) cruises along the Seward and Kodiak lines and in PWS. The PI and her team finalized the laboratory analysis of all samples, and the spring and summer data have been post-processed. They are currently working on the final quality control. As a new project to the GWA-LTRM program, the project has been expanding collections and calibrations to provide input for the PIs spatially explicit model producing multi-decadal hindcasts and forecasts of carbon, oxygen, hydrogen, aragonite saturation, and other metrics that identify low oxygen and acidification events in the GOA and are potentially link to observed ecosystem changes.

Pelagic Ecosystem

Monitoring Long-term Changes in Forage Fish in PWS and the Northern GOA (24120114-C)

The forage fish project (24120114-C, PI Arimitsu) has three main components including continuation of the longest time series on forage fish availability to seabirds in the GOA, ship-based surveys including the Integrated Predator Prey (IPP) survey in PWS conducted in collaboration with the humpback whale study (project 24120114-O) and summer forage fish sampling.

Middleton Island seabird diet sampling was conducted by the Institute for Seabird Research and Conservation scientific team according to schedule. Seabird diet information from Middleton Island integrates forage fish species composition and availability over broad areas of the northern GOA. Seabird diet samples at Middleton Island were collected from 6 April to 18 August 2024. This included a total of 1181 diet samples from black-legged kittiwakes (*Rissa tridactyla*) and 311 diet samples from rhinoceros auklets (*Cerorhinca monocerata*). The time series of black-legged kittiwake diets on Middleton Island is shown in Fig. 10.

The fall IPP survey occurred on schedule during the second half of September. The crews conducted acoustic transects, trawls, and habitat sampling in Bainbridge Passage, Montague Strait, and Port Gravina as planned (Fig. 11). Acoustic indices of capelin on transects in Montague and Port Gravina increased during 2024 compared to previous years, and in Port Gravina juvenile walleye pollock (*Gadus chalcogrammus*) acoustic indices were higher than usual. However, acoustic backscatter of euphausiids was lower in 2024 in all regions compared to 2023, juvenile and adult herring biomass indices were lower than previous years. The project team did not encounter sand lance on surveys in any region during IPP surveys in 2024.

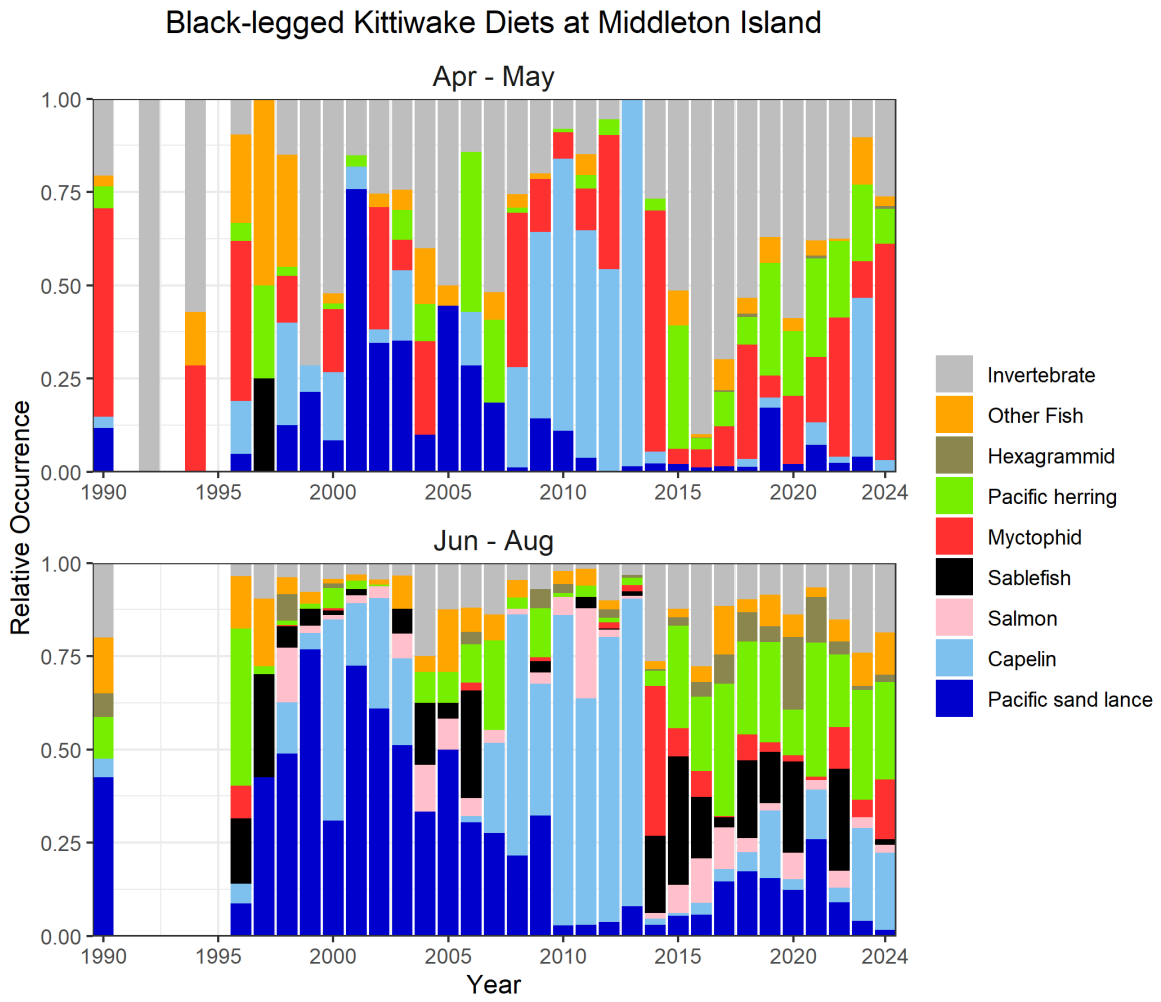


Figure 10. Interannual variation in diet composition of black-legged kittiwakes during spring (top) and summer (bottom) on Middleton Island.

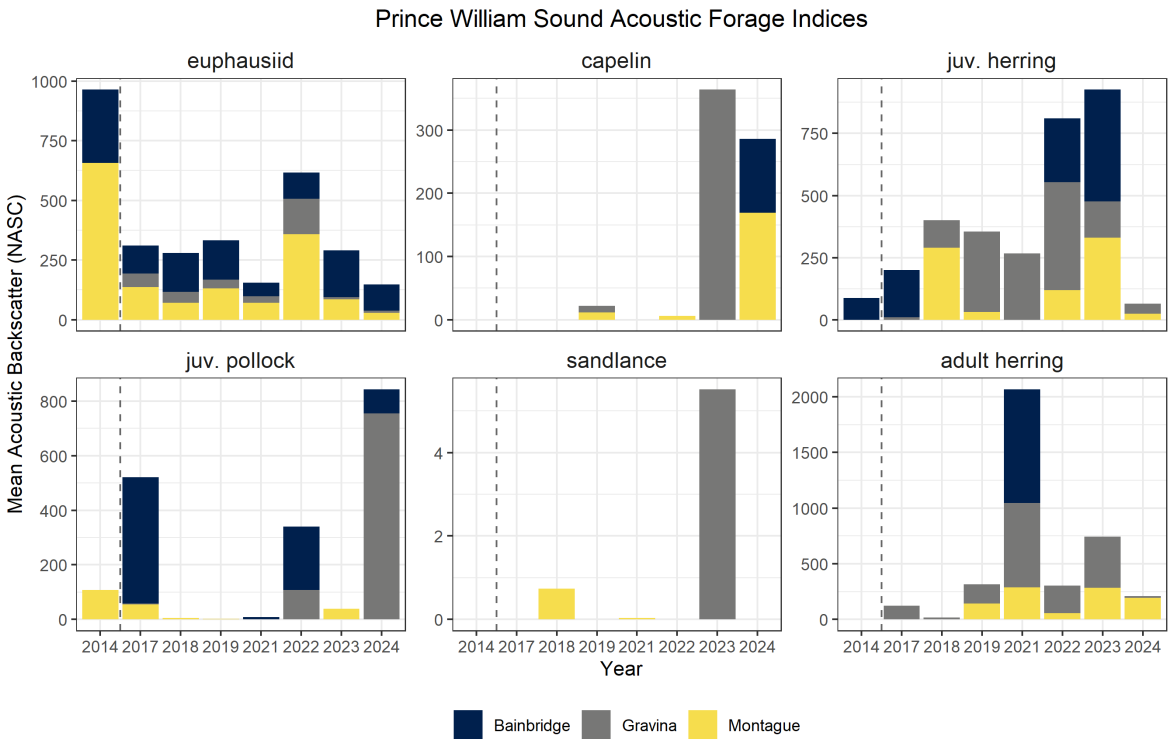


Figure 11. Interannual variability of acoustic backscatter indices by forage species (panels). Acoustic indices derived from Integrated Predator-Prey surveys in three regions (color) within Prince William Sound. In 2014 pilot surveys were conducted over a reduced area in Bainbridge and Montague, but no surveys were conducted in Bainbridge that year.

Marine bird surveys conducted in conjunction with the acoustic surveys on IPP surveys in PWS found higher densities of seabirds during 2024 compared to 2023, a pattern that was driven by high densities of kittiwakes in Bainbridge and Port Gravina, while average seabird densities were observed in Montague during 2024 (Fig. 12). Despite higher densities of some species on transects, we observed less foraging activity on the IPP survey than in previous years during 2024.

Validation surveys were conducted from Cordova, Alaska in support of the continuing GWA-LTRM aerial forage fish surveys during the second week of June when aerial surveys were conducted.

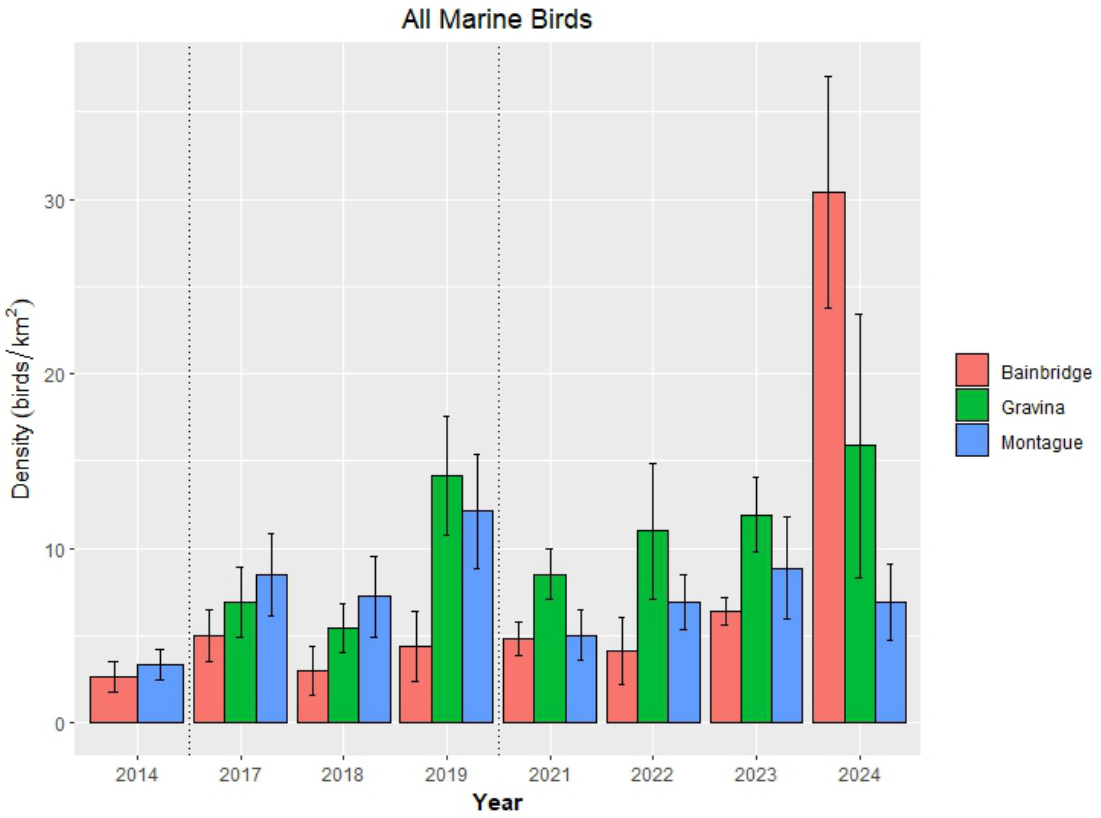
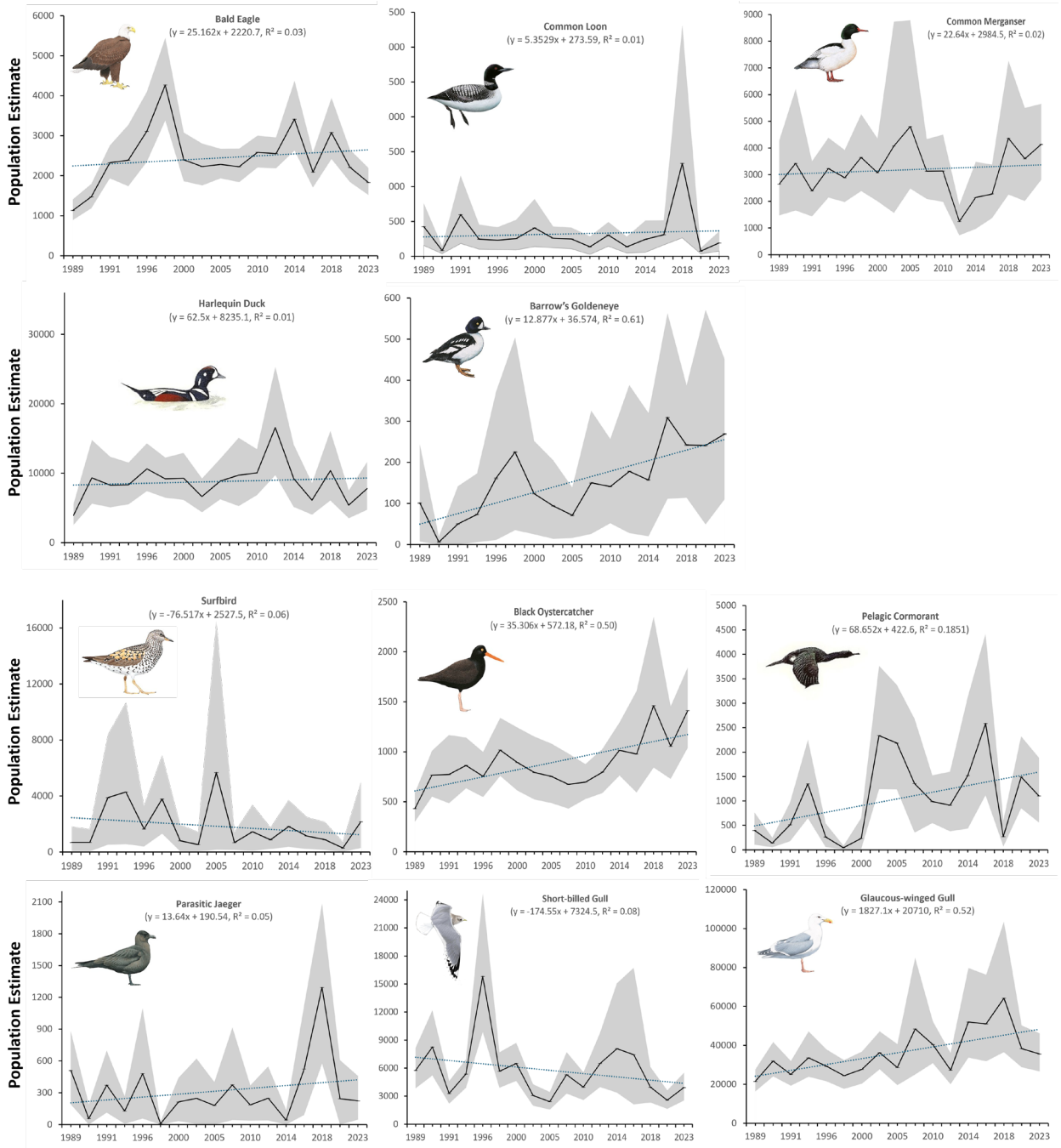


Figure 12. Interannual variability of marine bird densities by region (color) during the Integrated Predator-Prey survey transects in Prince William Sound. Graphic credit: Anne Schaefer, Prince William Sound Science Center.

PWS and Northern GOA Marine Bird Surveys (24120114-M)

Boat based marine bird surveys in PWS (project 24120114-M, PI Kaler) are conducted in alternating years (2023, 2025). No surveys were conducted in 2024. Data collected during the 2023 surveys were analyzed in 2024. To detrend the time-series, the team fits linear regressions to log-transformed abundances, using generalized least squares with variance-covariance matrices that incorporated continuous first-order autoregressive structure (Fig. 13). The time series with significant trends (declines) were tufted puffins (*Fratercula cirrhata*) in PWS. There were no other significant trends.


Bald Eagle
(y = 25.162x + 2220.7, R² = 0.03)
Common Loon
(y = 5.3529x + 273.59, R² = 0.01)
Common Merganser
(y = 22.64x + 2984.5, R² = 0.02)
Harlequin Duck
(y = 62.5x + 8235.1, R² = 0.01)
Barrow's Goldeneye
(y = 12.877x + 36.574, R² = 0.61)
Surfbird
(y = -76.517x + 2527.5, R² = 0.06)
Black Oystercatcher
(y = 35.306x + 572.18, R² = 0.50)
Pelagic Cormorant
(y = 68.652x + 422.6, R² = 0.1851)
Parasitic Jaeger
(y = 13.64x + 190.54, R² = 0.05)
Short-billed Gull
(y = -174.55x + 7324.5, R² = 0.08)
Glaucous-winged Gull
(y = 1827.1x + 20710, R² = 0.52)
Population Estimate

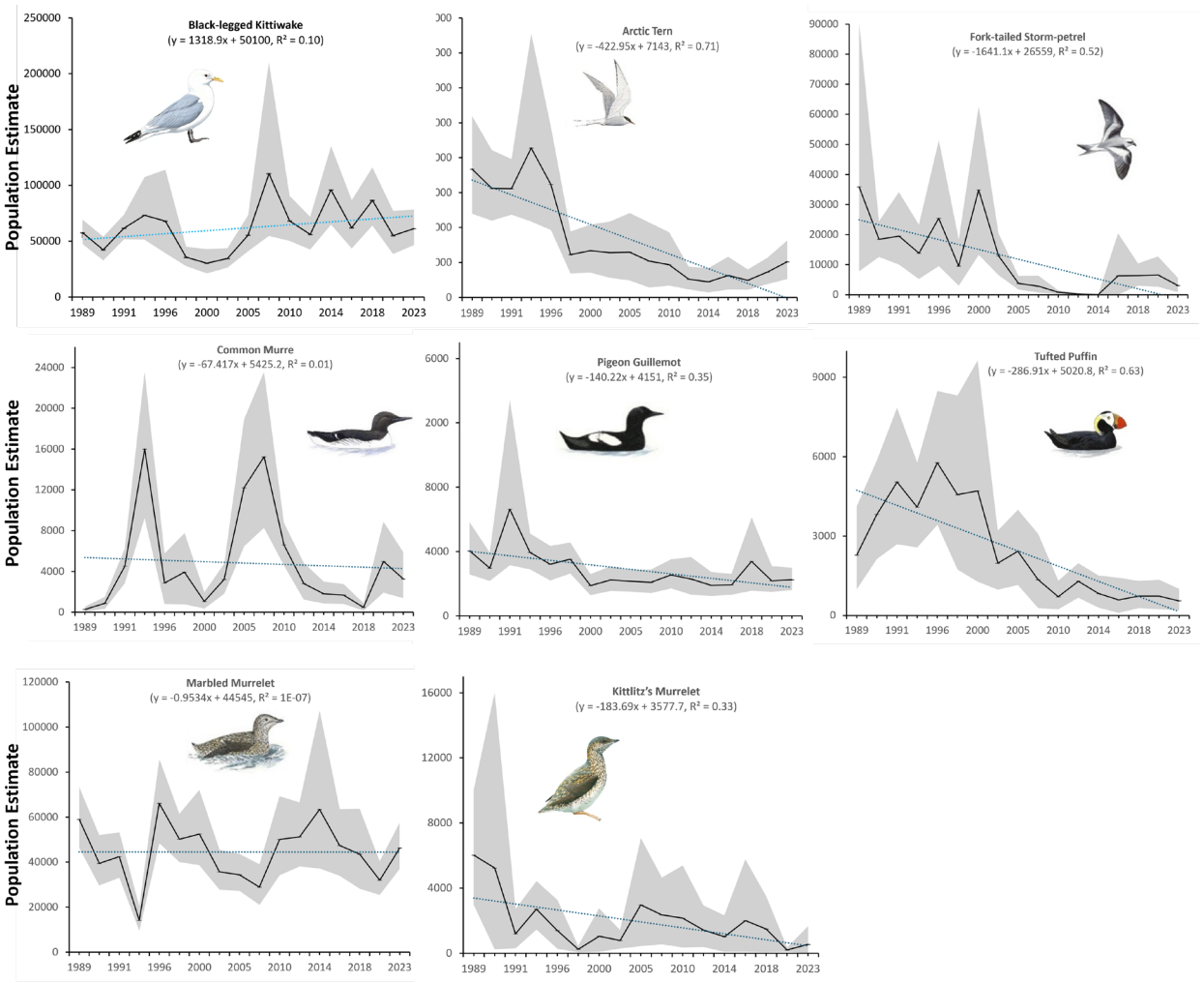


Figure 13. July population estimates and linear regression analysis of selected marine birds in Prince William Sound, Alaska, 1989-2023.

For the GOA component, at-sea seabird surveys were conducted in spring and fall (no summer cruise was conducted in 2024) in collaboration with the multi-disciplinary Seward Line oceanographic survey project and assess how seabird abundance and distribution respond to environmental drivers and lower trophic level changes.

During 2024, the team conducted a total of 2,280 linear km of marine bird surveys during two Seward Line and NGA-LTER cruises: April 24 – May 10, and September 10 – 20. During

spring, the mean density of marine birds was 8.7 birds/km^2, while the mean density during fall was 6.4 birds/km^2.

Long-term Monitoring of Humpback Whale Predation on Pacific Herring in PWS (24120114-O)

The humpback whale (*Megaptera novaeangliae*) team (project 24120114-O, PIs Moran and Wild) completed April and September 2024 humpback whale surveys as planned. The April survey was under poor weather conditions. Snow, rain, and wind proved challenging for visual observations. Only one humpback whale was identified. During the September survey, humpback whale numbers were slightly up in the Sound compared to 2020-2023 with 38 individual whales seen during the cruise, including five calves. Observers did not locate any large concentrations of whales or prey. Five mother calf pairs were identified. Prey identified included euphausiids in Whale Bay and adult herring southwest of Glacier Island, while most other locations were likely juvenile herring. Foraging flocks of marine birds were disrupted by whales less than previous years.

This project continues to monitor the steep decline and lack of recovery of the local humpback whale population in PWS following the 2014-2016 northeast Pacific marine heatwave (Fig. 14). Prior to the heatwave, humpback whales in PWS fed primarily on adult Pacific herring, especially when herring aggregated in large shoals during the spring, fall, and winter. Following the heatwave, juvenile herring and euphausiids are 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 2007-2023 were derived using both closed and open mark/recapture models based on recaptures from 2024. Recaptures made during 2024 are used to estimate whale abundance in 2023. They identified a decrease in the annual and fall abundance estimates during 2023; however, the 2023 spring estimate was similar to the previous three years.

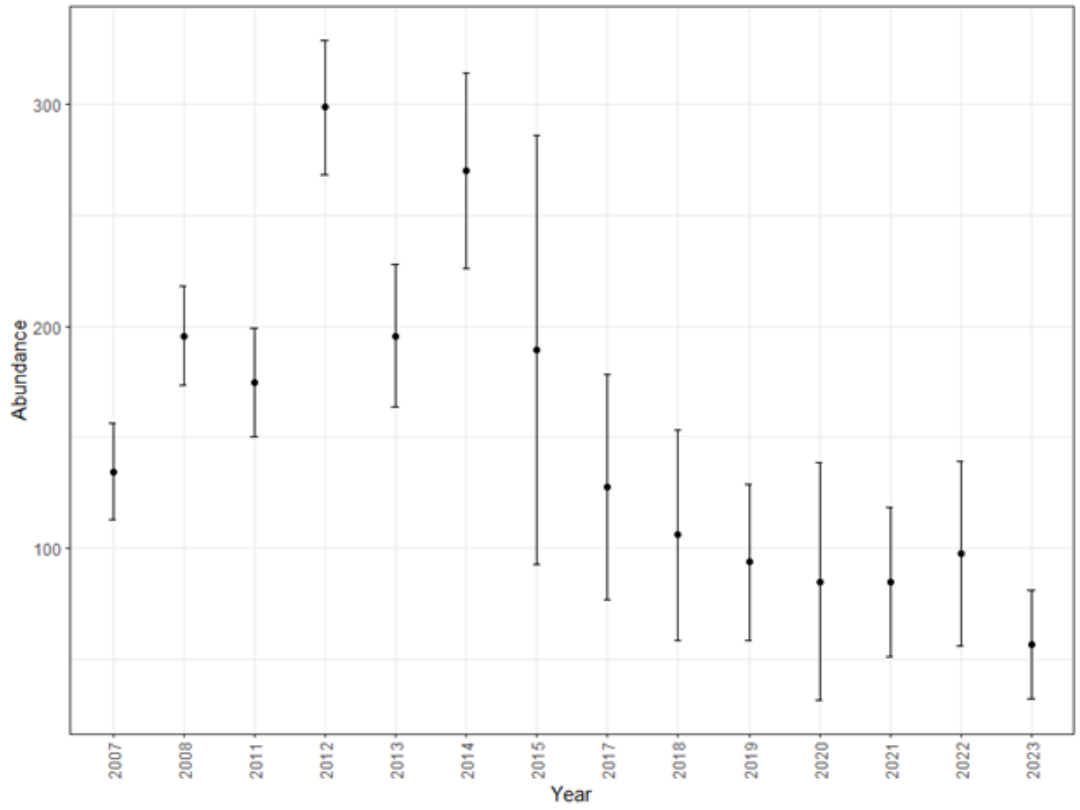


Figure 14. Estimated annual humpback whale abundance in Prince William Sound, Alaska using the using the Rcapture package and Jolly-Seber-Cormack estimator with 95% confidence intervals.

Long-term Killer Whale Monitoring in Prince William Sound/Kenai Fjords (24120114-N)

The killer whale project (24120114-N, PIs Durban, Matkin, and Olsen) was not funded in 2024 and used FY23 carryover funds to analyze data for their final report. This project continued a time series of photo-identification studies to extend an assessment of changes in killer whale populations both before and following EVOS in 1989. Both the resident AB pod and the AT1 transient population suffered significant losses following the spill and neither has recovered. The AT1 population numbered 22 animals prior to the spill but dropped to half of this abundance by the early 1990s (Fig. 15). During this reported period their abundance dropped from seven to just six whales, with the loss of the youngest remaining whale. This population is headed toward extinction because the four remaining females are likely beyond reproductive ages. After

declining from 26 to16 whales following the oil spill, AB pod had been slowly recovering to a post-spill high of 22 whales in 2015 (Fig. 15). However, AB pod declined precipitously to its lowest recorded abundance of just 14 whales in 2017, and has since been slowly growing, increasing to 18 in 2024. This latest decline came at the end of a marine heatwave during 2014-2016 that has had acute and prolonged impacts on the GOA ecosystem and apparently erased 30 years of post-spill recovery for the AB pod. New population dynamics modelling showed that this was driven by both acute declines in survival and delayed declines in fecundity. These data demonstrate that the impacts of environmental variation can permeate up through the marine food web to these long-lived top predators and further demonstrates the need for continued monitoring to understand how environmental variation will affect recovery potential. By collecting and analyzing photogrammetry data on individual size the PIs also revealed additional sub-lethal effects that will likely lead to prolonged impacts, specifically declines female length, suggesting that reduced nutritional condition of young whales likely constrained early growth. We further estimated a high probability ($p = 0.98$) of a positive relationship between asymptotic length and the probability of calving. Smaller body sizes confer reduced energy stores to support pregnancies and lactation. As such, we anticipate the impacts of the heatwave to be prolonged, particularly if females face the challenge of reproduction during future periods of nutritional limitation.

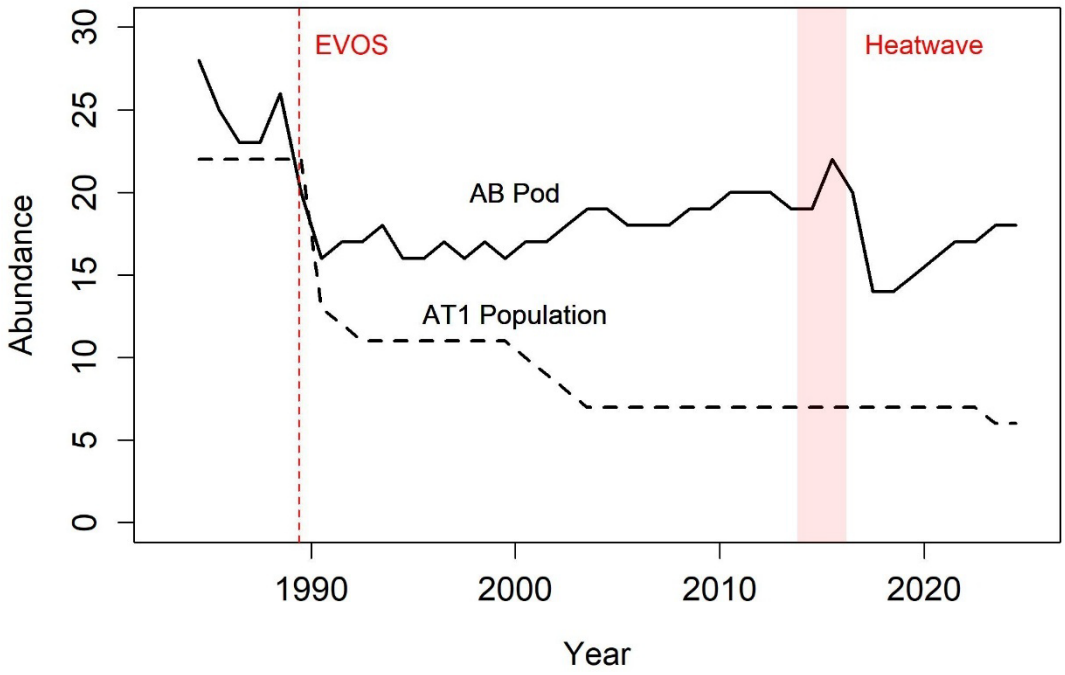


Figure 15. Number of killer whales (Abundance) in the AB pod and AT1 population from 1984 to 2024. The timing of the Exxon Valdez Oil Spill (EVOS) and the northeast Pacific marine heatwave are indicated in red.

Herring Research and Monitoring

Herring Surveys and Age, Sex, and Size Collection and Processing (24170111-F)

During 2024, the herring survey project (24170111-F, PI Morella) conducted 44 hours of spring aerial surveys of PWS during 19 flights from March 28 to May 1, 2024. The number of survey flights and total flight hours flown in 2024 were near the 2004-2023 averages of 42 hours and 20 flights. Herring data collected included location and linear extent of herring milt by flight, classification of herring milt (intensity), and herring school biomass. The 2024 PWS aerial spawn estimate of 29.9 statute mile-days-of-milt is an increase from the 2023 estimate and 49.5% above the 10-year average (2014–2023) of 20.0 mile-days-of-milt. Mile-days-of-milt in 2024 remain well below levels observed in the 1980s and early 1990s (Fig. 16). The team conducted vessel-based herring sampling surveys in 2024 and collected age, sex, and length (ASL) samples from Humphries Hole, Canoe Pass, Port Etches, Canoe Point, Port Etches, and

Double Bay. The weighted age composition from 2,200 ages for the 2024 PWS spawning biomass was 10% age-3, 37% age-4, 31% age-5, 6% age-6, 5% age-7, 10% age-8, and <1% age-9+.

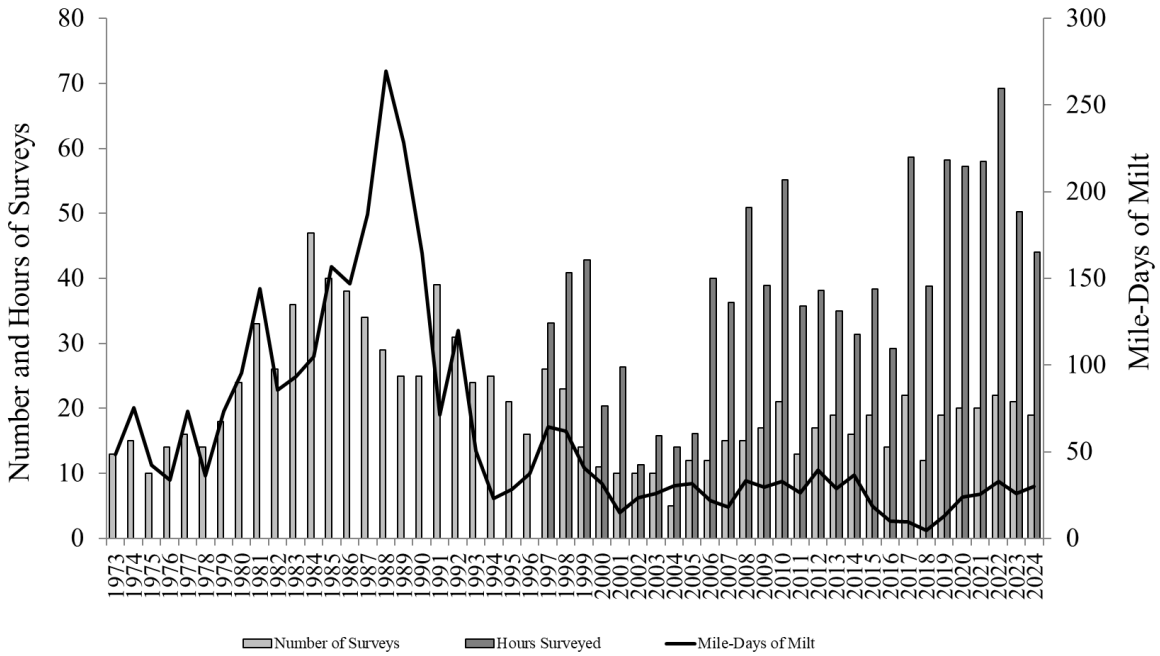


Figure 16. Prince William Sound herring aerial surveys, 1973-2023. Bars indicate the number and hours of surveys (left axis) and the line indicates mile-days of milt (right axis).

Modeling and Stock Assessment of PWS Herring (24120111-C)

The herring modeling project (24120111-C, PI Branch) includes eight goals. The status of each goal is 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 24170111-F.

Goal 1: Conduct annual stock assessments of PWS herring using the Bayesian age-structured assessment model (BASA). The stock assessment for the 2024 season was completed in early October 2024 (Roberts et al. 2024). The early assessment timeline was possible because of extra work to complete the herring ageing by the Alaska Department of Fish and Game (ADF&G) in 2024, but in future years the assessment will likely only be ready in January or February of each year. The assessment shows another slight increase in spawning biomass to a median of 29,402

metric tons (t) at the start of 2025, above the management threshold for fishery reopening (19,958 t), with only a 5% probability of being below this threshold (Fig. 16). Biomass is still driven by the relatively higher 2019 and 2020, and recovery towards biomass levels in the mid-2000s.

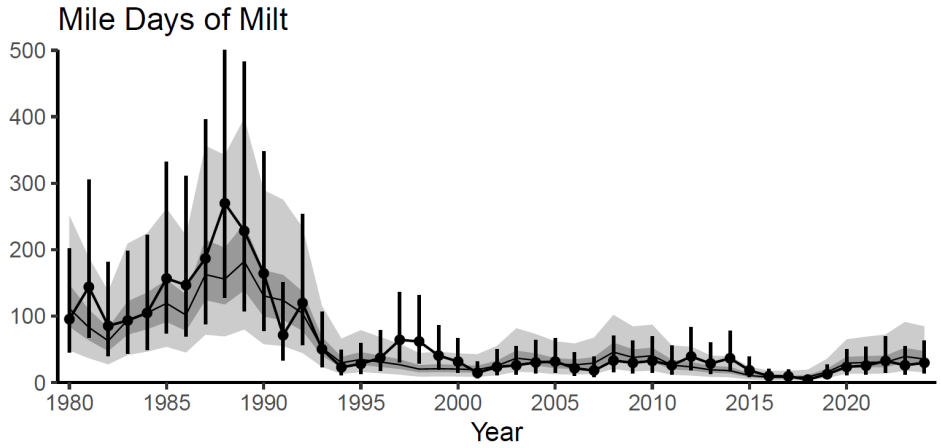


Figure 17. Estimated spawning biomass of Prince William Sound herring from the Bayesian age-structured assessment model fitted to the aerial mile-days-of-milt survey. No model fits are shown to the hydroacoustic surveys because no new surveys have been conducted since funding was halted in 2020.

Goal 2: Review best practices globally for managing highly variable fish populations. This project was completed in 2023 as part of J. Zahner's M.S. thesis (Zahner 2023) but has not yet been submitted for peer-reviewed publication. In brief, the results show that the default harvest control rule used for PWS herring is consistent with global best practices.

Goal 3: Create an MSE framework for PWS herring. The framework for management strategy evaluations (MSEs) was developed as part of J. Zahner's M.S. thesis (Zahner 2023) and is prepared for use in addressing the original Goals 4-6 of this proposal.

Goal 4: Evaluate alternative harvest control rules for setting herring catches. This task has been completed using the MSE framework in Goal 3, with the results published in the ICES Journal of Marine Science (Zahner and Branch 2024).

Goal 5: Evaluate tradeoffs between cost and frequency of surveys and other data collected. This is planned as part of the PhD dissertation of C.L. Roberts.

Goal 6: Test the robustness of the management process to misspecification in the model. This is planned as part of the PhD dissertation of Matheus de Barros.

Goal 7: Create a spatial model of PWS herring. This was planned for years 7-10 of EVOSTC funding but given the end of funding of the tagging project, it may no longer be possible to complete. Instead, a more general project is planned as part of the PhD dissertation of Matheus de Barros: using the MSE to examine bias that might result in the stock assessment from overlooking spatial stock structure.

Goal 8: Create a model of intermediate complexity (MICE) that captures key interactions between humpback whales, pink salmon, Alaskan pollock, and herring. This is planned as part of the PhD project of Matheus de Barros.

Herring Disease Program (24120111-E)

The herring disease program (project 24120111-E, PIs Hershberger and Paez) conducted field sampling to collect pre-spawn adult herring in PWS, Sitka Sound, and Puget Sound and tested for viral hemorrhagic septicemia virus (VHSV), *Ichthyophonus*, and viral erythrocytic necrosis (VEN) prevalence. Ichthyophonus was detected in 33% of heart cultures from all sites combined. For PWS, an inverted pattern of decreasing Ichthyophonus infection prevalence with size started around 2019 and continued through 2024. Neutralizing antibodies to VHSV were detected in 4.4% of PWS herring in 2024, continuing a pattern of relatively low prevalence since 2019. (Fig. 18). In Sitka Sound and Puget Sound, VHSV antibodies were only detected in 1% - 4% of plasma samples and VEN was not detected. A pilot study in Puget Sound indicated that herring captured by a predator, rhinoceros auklets, did not have higher Ichthyophonus prevalence than baseline population levels. Additionally, this project provided laboratory diagnostics for the PWS pink salmon (*Oncorhynchus gorbuscha*) / herring interactions project (project 24220111-I). VEN was not detected in any pink salmon samples throughout the study period; however, pink salmon samples were rarely collected from locations containing herring with VEN. Collection of sympatric samples will be a point of emphasis in future study years. Laboratory studies indicated that herring with Ichthyophonus had higher thiaminase activity compared to uninfected fish and levels of thiamine were lower among infected herring compared to their uninfected wild cohort. These levels fall within ranges that could contribute to thiamine deficiency complex in predatory fish. Laboratory studies of the effects of ocean acidification indicated that VHS susceptibility and bioenergetics of larval and post-metamorphic Pacific herring are not affected by near-future ocean acidification predicted for coastal systems of the North Pacific. However, increased

susceptibility to VHS in fish reared under 3,000 µatm pCO_2 indicates potential health and fitness consequences to extreme acidification.

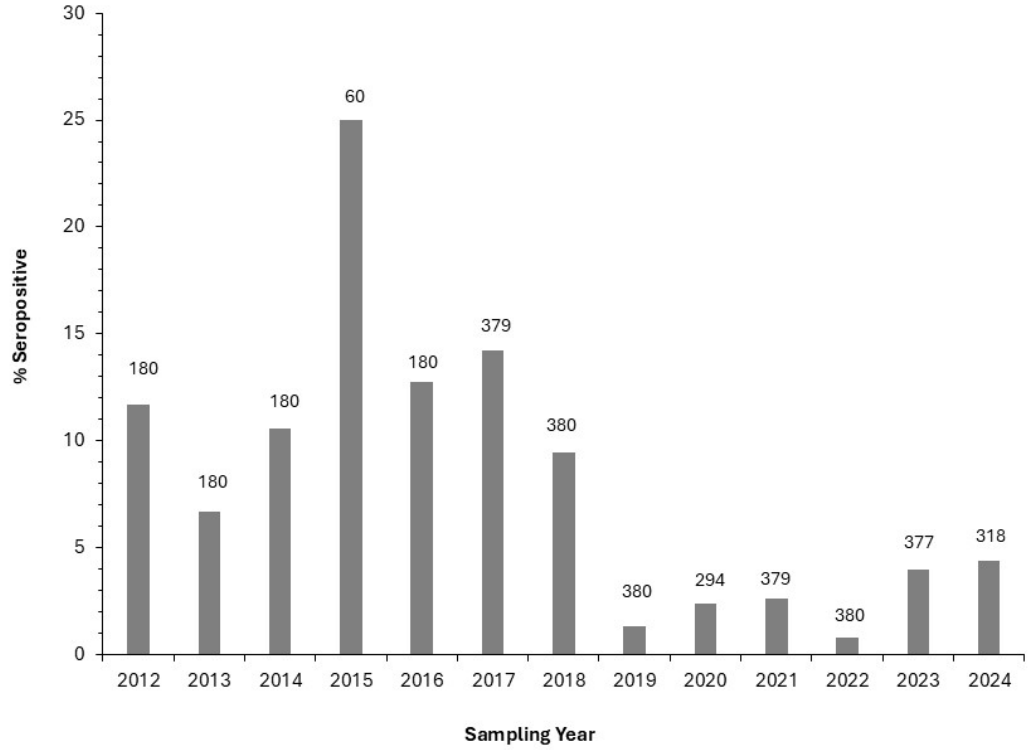


Figure 18. Annual prevalence of neutralizing antibodies against viral hemorrhagic septicemia virus in Prince William Sound herring. Numerals above the bars indicate the sample size.

Ecological Interactions between Pacific herring and Pacific salmon in Prince William Sound (24220111-I)

The focus of the herring-salmon interactions project (24220111-I, PIs Rand et al.) is in the southwestern region of PWS, an area important as a major migratory corridor for juvenile salmon produced throughout PWS and an area thought to serve as important habitat for different life stages of herring. During FY24 they conducted five research cruises during May, June (two trawl cruises), July, and September 2024. This is a research project initiated in 2022 and does not contribute time series information.

The team identified and summarized historical catch data for PWS herring and salmon, currently focusing on early life history stages. They initially focused on developing preliminary maps of spatial and temporal overlap in the life history-specific distributions of herring and pink salmon based on the currently identified datasets. They are now working to quantitatively explore distributional overlaps between herring and pink salmon in PWS. Results from this analysis may lead to some adjustments in the field study sampling, they anticipate the addition of any potential new sites outside the southwestern region of PWS to be included during the second half of the study (years 4-6).

The team continued to conduct field sampling to determine current probabilities of co-occurrence of herring and juvenile pink salmon in near-shore and off-shore habitats of PWS. These field data will be compared with the retrospective analysis above.

Sampling in 2023 and 2024 from May-July when salmon (*Onchorhynchus* spp.) fry are still in PWS, indicate that 44% of sets include the co-occurrence of herring and salmon (Fig. 19).

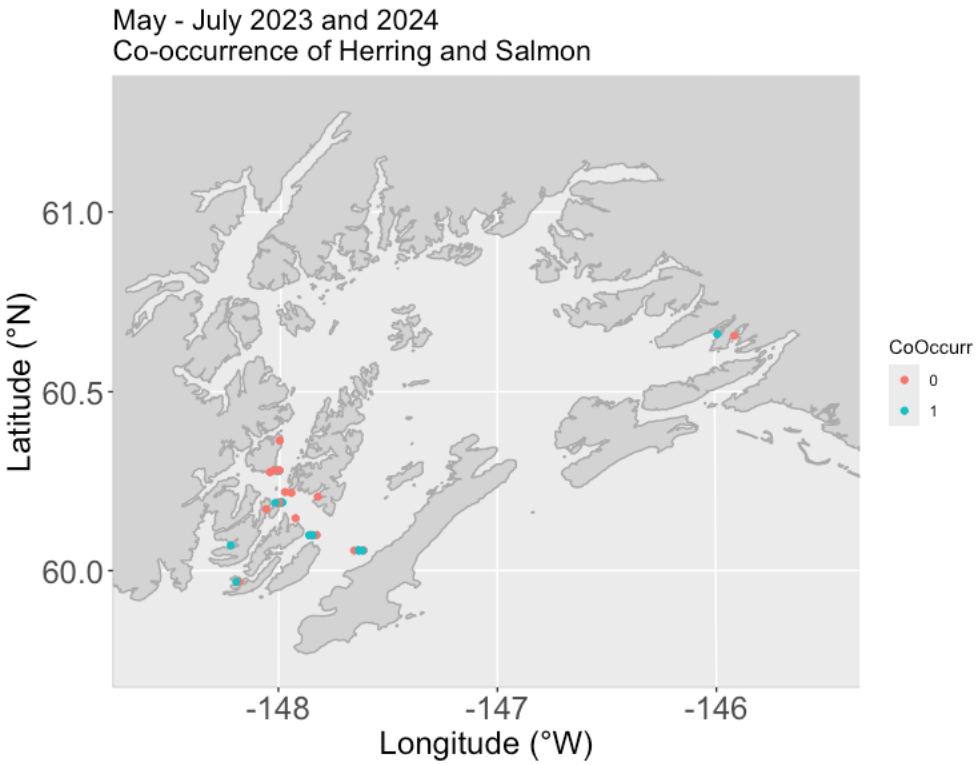


Figure 19. Co-occurrence of herring (adults or larvae) and salmon (fry) in sets conducted May – July 2023 and 2024 in Prince William Sound, Alaska. Green locations indicate co-occurrence, pink locations are sets that did not include both species.

The team has not observed any prey fishes in the diets of herring captured during late May cruises in 2023 (n = 72 examined stomachs) and 2024 (n = 27 examined stomachs). They are microscopically examining additional herring stomachs from 2024 to increase the sample size to be more comparable to their effort in 2023. Diets of herring have been composed mostly of copepods, euphausiids, and pteropods. DNA meta-barcoding (National Oceanic and Atmospheric Administration [NOAA] lab) has revealed a low prevalence of salmon DNA in herring captured in 2023 (4 out of a total of 52 individuals, or 7.7%) suggesting that there may be cases where herring are feeding on young salmon fry. They are awaiting meta-barcoding results from herring collected in 2024. Stable isotope analysis results suggest that adult herring and salmon fry are isotopically distinct, suggesting little reliance by adult herring on young salmon.

They observed larval fishes in diets of juvenile salmon in early and late June surveys in 2024 but not in 2023, likely owing in part to an earlier-timed cruise in 2024 (they had a late start to surface trawl sampling in 2023, late June). They estimated the mean number of herring larvae per pink salmon (*O. gorbuscha*) stomach from 0.2 to 1.6 in early June (up to 7 individual herring larvae observed in a single stomach). The prevalence of herring larvae in pink salmon stomachs declined by late June and they observed no larval herring in their diet in July. Herring are metamorphosing by late June therefore they may become less available as prey to salmon fry later in the season when they are settling into nearshore habitats.

DNA meta-barcoding of diet contents of juvenile salmon collected in 2023 revealed a moderate prevalence of herring DNA (7 out of 20 individuals, or 35%). However, fish larvae were not observed in the stomachs of pink salmon in 2023. They are awaiting results of DNA metabarcoding for pink salmon collected in 2024 and anticipate this DNA approach may provide a more reliable measure of the importance of herring larvae in the diets of these juvenile pink salmon due to the difficulty of identifying all larvae to species given the degraded and fragmented state of a majority of the consumed fish larvae.

They completed counts of diet composition of juvenile pink salmon and age-0 herring collected in 2023 and 2024. The dominant prey item was small copepods for both species, but diet composition appeared to vary markedly by site. Fig. 20 shows results for 2024 for pink salmon. Although copepods were generally the most common prey item, the contribution of larger size prey items (e.g., euphausiids and larval fishes) to total mass or energy is likely to be much more important. The bioenergetic model synthesis will better quantify the relative contribution of the different prey items to the overall energy budget of the consumers in our study.

Figure 20. Composition of prey items in diets of juvenile pink salmon captured in 2024. Prince of Wales = POW.

Lingering Oil (24200114-P)

During 2024, the lingering oil component project (24200114-P, PIs Esler and Lindeberg) submitted an amended proposal, 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. Following the recommendations from the previous funding cycle, the team modified sampling activities, with the intent of minimizing sediment excavation and focusing on use of mussels as biological samplers of contaminants.

The team successfully dug pits and collected mussels from all five sites in September 2024. With minimal excavation (no more than 4 pits per site), they detected oil at both sites on Eleanor Island. They collected oiled sediment for subsequent chemical analysis of weathering state; those samples are currently archived at the U.S. Geological Survey (USGS). The mussels collected at lingering oil sites, as well as those collected at nearshore component intertidal monitoring sites across the northern GOA, have been shipped to the lab for inclusion in Mussel Watch analyses. Oiled sediment samples will be shipped to a lab during 2025 for polycyclic aromatic hydrocarbon analysis.

This project contributes to the long-term lingering oil time series, but frequency of data collection was reduced to once during a 5-year period because of lack of variability in results and to minimize disturbance of sediments where residual oil is sequestered and not bioavailable unless disturbed by excavation, or otherwise. Time series information will be updated when data are analyzed.

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 effects of EVOS and other perturbations 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 producing peer-reviewed publications and outreach that synthesize findings among projects; preparing reports for EVOSTC, management agencies, and various partners and groups; presenting at scientific and public conferences and symposia; writing articles for general audiences and participating in interviews with journalists and other audiences; 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 Prince William Sound Science Center's (PWSSC's) annual publication *Delta Sound Connections* (https://pwssc.org/education/delta-sound-connections/).

Science synthesis

Science synthesis activities for 2024 included final revision of the Ecopath/Ecosim model to assess the effects of heatwaves on the PWS food web and compiling the first draft of the science synthesis report. The Ecopath/Ecosim model for PWS indicated that the food web structure persisted with little change through major events of the past 30 years. Loss of biomass production, however, was considerable and greatest five years after EVOS, followed by a similar number of years following major heatwave events (Fig. 21). Taxa exhibiting biomass loss during this period were primarily pelagic, highly mobile, upper-trophic level species, in contrast to taxa exhibiting gains that included nearshore, lower-trophic level species with limited mobility.

Science synthesis efforts included completing the drafts of the executive summary plus three of the five chapters that included new analyses (two of the chapters are complete and published). 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 (Hennon et al.)
- Ch 2. Decadal variability in zooplankton communities: Comparison of four zooplankton time series from the Northern Gulf of Alaska (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. Ecosystem effects of marine heatwaves in Prince William Sound, Alaska (Dias et al.)

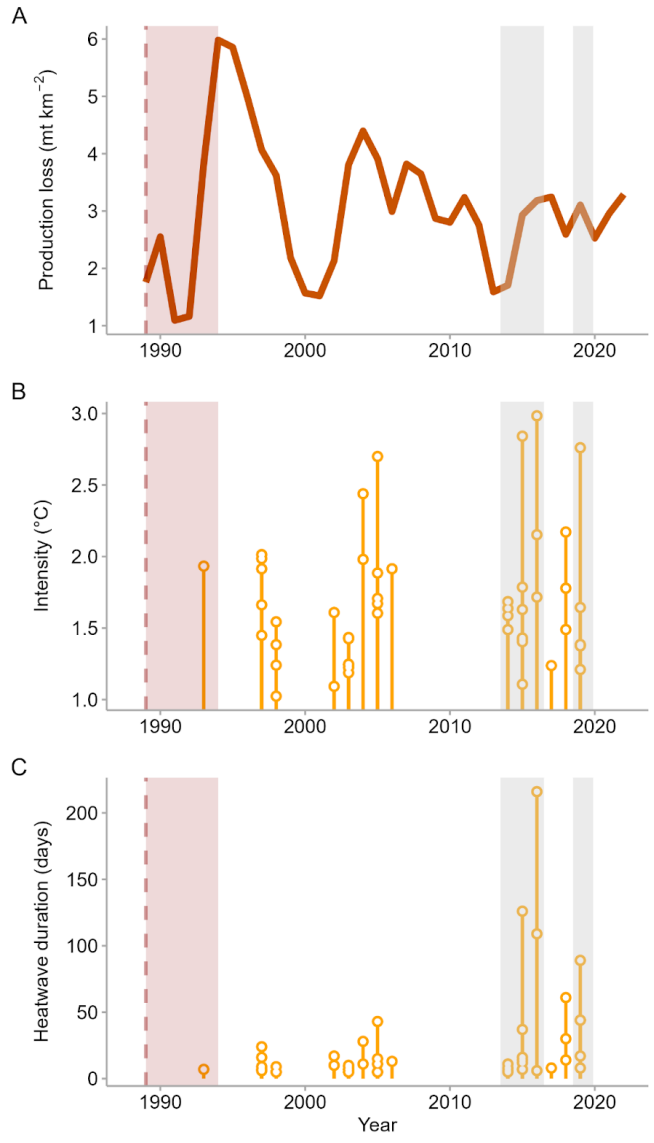


Figure 21. Production loss and marine heatwaves in Prince William Sound marine ecosystem over three decades. A) production loss; B) heatwave intensity in Celsius; C) heatwave duration in days. Dashed red line represents the 1989 T/V Exxon Valdez oil spill, red shaded area the 5 years following the oil spill. Grey shaded areas represent the two most recent marine heatwaves (2014-2016 and 2019).

We also led the production of the final two magazine articles of the four-part series in the publication Open Access Government (https://www.openaccessgovernment.org/) focused on GWA and various aspects of our studies addressing climate change in the GOA:

- Pegau et al. 2024, Forage fish: Pacific herring in Alaska.
- Bien et al. 2024, Seabirds and humpback whales give early warning to marine heatwaves

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 and are made available to the public. GWA-LTRM project teams submit data and environmental summaries for the GOA ecosystem status report (Table 1). 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 2024 National Oceanic and Atmospheric Administration Gulf of Alaska ecosystem status report.

Author/Affiliation	Title	Project
Tyler Hennon and Seth Danielson/University of Alaska Fairbanks (UAF)	Predicted ocean temperatures in northern Gulf of Alaska	GAK-1
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
Clare Ostle/Marine Biological Association and Sonia Batten/PICES	Continuous plankton recorder data from the	Continuous Plankton Recorder (CPR)

Author/Affiliation	Title	Project
	northeast Pacific, 2002-2023	
Russell R. Hopcroft/UAF	Spring and fall large copepod and euphausiid biomass: Seward Line	Seward Line
Mayumi Arimitsu/U. S. Geological Survey (USGS) Alaska Science Center, Scott Hatch and Shannon Whelan/Institute for Seabird Research and Conservation (ISRC) (among coauthors)	Seabird diets in the Gulf of Alaska 1978 – 2024	Forage Fish
Mayumi Arimitsu and John Piatt/USGS Alaska Science Center, Dan Cushing/Pole Star Ecological Research, Scott Hatch and Shannon Whelan/ISRC, Robert Kaler and Elizabeth Labunski/U. S. Fish and Wildlife Service (USFWS) (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, Daniel Esler, Kim Kloecker, Daniel Monson, and Brian Robinson/USGS Alaska Science Center, Brenda Konar/UAF, Mandy Lindeberg and Robert Suryan/National Oceanic and Atmospheric Administration (NOAA), and Benjamin Weitzman/USFWS	Intertidal ecosystem indicators in the northern Gulf of Alaska	Nearshore

Author/Affiliation	Title	Project
Jennifer Morella/Alaska Department of Fish and Game, W. Scott Pegau/Prince William Sound Science Center, and C. L. Roberts and Joshua Zahner/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 around the world 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 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 2025 AMSS are listed in Table 2. Citations may be found in Section 2 (Products: Conferences and Workshops).

Table 2. Gulf Watch Alaska Long-Term Research and Monitoring program contributions to the Alaska Marine Science Symposium held January 2025.

Author/Affiliation	Presentation title	Oral or poster presentation
M. Brauner/University of Alaska Fairbanks (UAF)	Iron fertilization effects on microbial communities and interactions in the northern Gulf of Alaska	Poster

Author/Affiliation	Presentation title	Oral or poster presentation
T. Hennon and S. L. Danielson/ UAF	Spatiotemporal modes of temperature and salinity variability in the northern Gulf of Alaska	Poster
I. Reister, S. L. Danielson, T. D. Hennon, H. Statscewich, and K. Ballantine/UAF	Controls of the northern Gulf of Alaska spring bloom over coastal and mid shelf waters	Poster
R. R. Hopcroft/UAF	Zooplankton communities in the northern Gulf of Alaska: Seward Line observations through 2024	Poster
R. Campbell/Prince William Sound Science Center (PWSSC)	High frequency temporal and spatial variability in PWS zooplankton populations	Poster
C. Ostle C. and L. Kléparski/Marine Biological Association, S. Batten/PICES, and coauthors	25 years of the North Pacific Continuous Plankton Recorder survey	Poster
S. B. Traiger, K. Kloecker, and D. Monson/U. S. Geological Survey (USGS), J. Bodkin and H. Coletti/ National Park Service (NPS), K. Iken and B. Konar/UAF, and B. Weitzman/U. S. Fish and Wildlife Service (USFWS)	Effects of site-specific characteristics on northern Gulf of Alaska clam assemblages	Poster
Z. Vayder and K. Iken/UAF, and H. Coletti/ NPS	Temperate effects on Pacific blue mussels (*Mytilus trossulus*)	Poster

Author/Affiliation	Presentation title	Oral or poster presentation
M. Hughes, K. Iken, and B. Konar/UAF, S. Traiger/USGS, H. Coletti/NPS	Direct and cascading effect of sea star wasting on rocky intertidal communities	Oral
W. S. Pegau, R. W. Campbell/PWSSC, D. Esler/USGS, and coauthors	Repeated volunteer photos continue at rocky intertidal sites in Prince William Sound	Poster
C. Marsteller, C., M. Arimitsu, and J. Piatt/USGS, and coauthors	The little fish with big impacts: Signals of environmental change in spawning capelin throughout its Pacific range	Oral
A. Borsky, K. Gorman, and K. Iken/UAF, and P. Rand/PWSSC	Spatio-temporal distributions of Pacific herring and pink salmon in Prince William Sound, Alaska	Poster
R. Ertz and R. W. Campbell/PWSSC	Inter-reader variability in age estimates of Alaska sockeye salmon scales	Poster
D. Cushing/ Pole Star Ecological Research, R. Kaler and E. Labunski/USFWS, and R. Suryan/ National Oceanic and Atmospheric Administration (NOAA)	Common trends in seabird abundance time-series on the northern Gulf of Alaska shelf	Poster
J. Moran/NOAA and coauthors	A summary of 2023 large whale entanglements in Alaskan waters	Poster

Author/Affiliation	Presentation title	Oral or poster presentation
J. Moran/NOAA, J. Straley and L. Wild/University of Alaska Southeast, S. Whelan/ Institute for Seabird Research and Conservation, M. Arimitsu/USGS, and coauthors	Humpback whale birth rates reflect a recovering food supply in the Gulf of Alaska	Oral
H. Coletti, B. Ballachey, and J. Bodkin/NPS, D. Esler, G. Esslinger, K. Kloecker, D. Monson, and S. Traiger/USGS, K. Iken and B. Konar/UAF, M. Lindeberg/ NOAA, and B. Weitzman/USFWS	Gulf Watch Alaska Nearshore Component 2024 update: Monitoring species and processes to detect change and infer cause	Poster
H. Statscewich, S. L. Danielson/UAF, and coauthors	Extending autonomous underwater glider-based ecosystem monitoring across multiple trophic levels	Oral

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. Table 3 lists the GWA-LTRM contributed articles in the 2024 edition of the publication. Citations may be found in Section 2 (Products: Popular articles).

Table 3. Delta Sound Connections articles contributed by Gulf Watch Alaska Long-Term Research and Monitoring program team members in 2024.

Author/affiliation	Article title
Rob Suryan/National Oceanic and Atmospheric Administration	Gulf Watch Alaska – Making connections across the Gulf of Alaska
Mary Anne Bishop/Prince William Sound Science Center (PWSSC)	Skip spawners or Kayak Island herring spawners?
Mayumi Arimitsu, Caitlin Marsteller, and John Piatt/U. S. Geological Survey (USGS) Alaska Science Center and Scott Hatch and Shannon Whelan/Institute of Seabird Research and Conservation	Capelin on the rebound: Using seabird diets to track trends in forage fish populations
Dan Esler/USGS Alaska Science Center	Winged connections: Tracking the black oystercatcher migration
Heather Coletti/National Park Service and Brian Robinson/USGS Alaska Science Center	The Pacific marine heatwave wasn't bad news for some nearshore species
Pete Rand/PWSSC and Kristen Gorman/University of Alaska Fairbanks	Who's eating who in Prince William Sound?

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 seek to 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 largest collaborative event between the CORaL Network and GWA-LTRM in FY24 was the Ocean Sciences Festival at the Cordova High School gym on October 18, 2024, organized by CORaL Network team members, in conjunction with the GWA-LTRM annual PI meeting. GWA-LTRM project teams presented educational materials at a variety of booths (Fig. 22).

GWA-LTRM and CORaL Network team members also worked together to publish an article on seabirds and whales for the online journal Open Access Government (Bien et al. 2024). Project teams coordinated with the CORaL Network on educational kiosks planned for spill-affected communities, outreach materials, and science exploration programs associated with underwater soundscapes.

Most of the collaboration between GWA-LTRM and Mar ReCon occurs at the project level. The programs share 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. 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. In addition, GWA-LTRM team members and U.S. Fish and Wildlife Service (USFWS) participated in coordination and logistics planning with Mike Rehberg (ADF&G) and Anne Schaefer (PWSSC) to ensure comparability with GWA-LTRM and to build collaborative engagement.

Figure 22. Gulf Watch Alaska Long-Term Research and Monitoring team members participating in the Ocean Sciences Festival organized by the Community Organized Restoration and Learning Network at Cordova High School on October 18, 2024.

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: 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 (Table 1).
- Leadership in establishing and continuing the NGA-LTRM: Seward Line PI Russ Hopcroft is the lead PI for the NGA-LTER, funded by the National Science Foundation. The NGA-LTRM incorporates the Seward Line and GAK1 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-LTRM program regularly collaborate on publications and outreach that contribute to better scientific understanding of the GOA ecosystem.
- The Nearshore project (24120114-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 is conducting sea otter research in Cook Inlet. This Cook Inlet

Sea Otter research project focuses 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 (24120114-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, NOAA Pacific and Arctic Marine Mammal Climate Vulnerability Assessment, 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 (24120114-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.

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 FY24, some project data are behind in their data submissions because of the delay in the issuance of the 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. The PMT consists of the program lead, science lead, administrative lead, and the program coordinator. The program and science leads are NOAA employees, 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.

Program Lead Mandy Lindeberg was on medical leave for much of FY24. Science Lead Rob Suryan picked up many of her duties. In addition, Administrative Lead Katrina Hoffman was on sabbatical from August to December 2024. Because the PMT is small (four people), losing one or two key team members 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.

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). Further, PWSSC conducted an annual audit including a federal single audit, with field testing occurring in December 2024. The results were a clean audit. Due to internal issues within NOAA, FY24 grant funding was not issued until January 2025 which caused project delays (discussed in greater detail elsewhere in this report) as projects ran low on funds.

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

At the beginning of FY24, the PMT reviewed the FY23 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 two videoconferences and one in person PI meeting during FY24. The spring and summer quarter videoconferences were held via GoTo Meeting and included updates from the PMT and field observations from project PIs. A multi-day PI meeting was held at the Cordova Center in Cordova, Alaska, October 16-17, 2024. The meeting incorporated remote participation through GoTo Meeting videoconferencing. The meeting included an overview of the current program and required deliverables, data management, presentations from projects within each of the components, synthesis activities, and outreach requirements, including a presentation by the CORaL Network. The PMT canceled the planned PI meeting to be held during AMSS in January 2025 because many projects funded through the NOAA grant were running out of funds and would be unable to attend. Instead, the program team members who were able to attend AMSS met informally to discuss collaboration efforts. In addition, the Data Management team held meetings with project PIs as needed during the week.

Outreach

The program website (https://gulfwatchalaska.org) and HRM website (https://pwssc.org/herring/) both received substantial updates of project pages and findings based on FY23 annual reports approved by EVOSTC.

We continued providing articles to the PWSSC annual publication *Delta Sound Connections*, discussed in greater detail above. The articles are 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. 23). In addition, PWSSC staff recorded several Field Notes episodes in 2024, two focused on GWA-LTRM project activities related to climate change and killer whales (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.

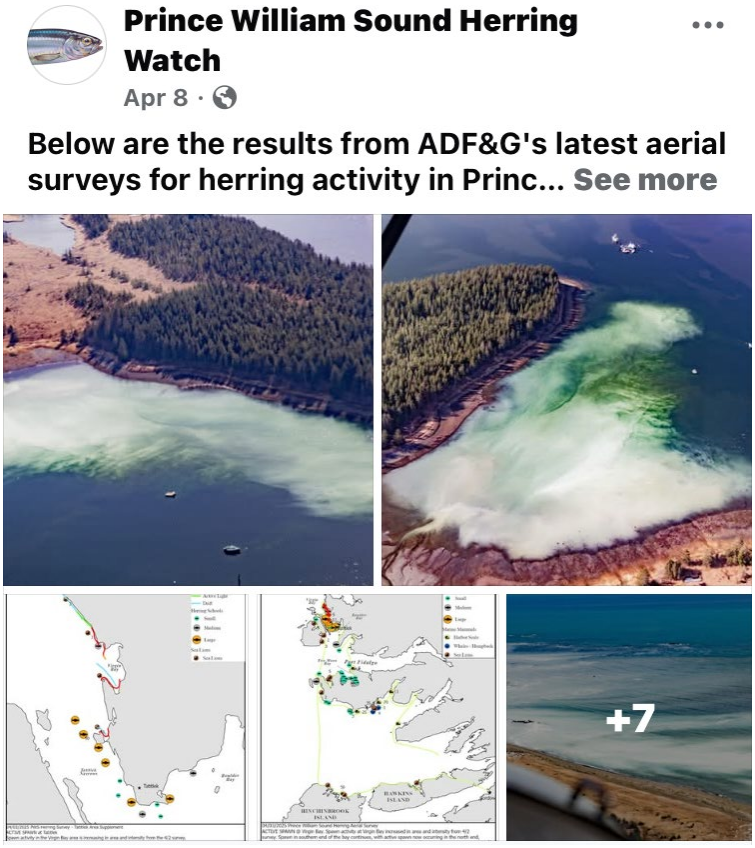


Figure 23. Prince William Sound Herring Watch Facebook post on herring spawning posted on April 8, 2024.

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Jones, N. 2024. Researchers parse the future of plankton in an ever-warmer world. Yale Environment 360. PI Dr. Clare Ostle was interviewed for Yale Environment 360, which features areas of this project: https://e360.yale.edu/features/plankton-climate-change.

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Nixey, C. 2024. Plankton are much more interesting than you might think. The Economist. PI Dr. Clare Ostle was interviewed for the article, in which many aspects of CPR activities were discussed, including areas of this project. https://www.economist.com/britain/2024/08/08/plankton-are-much-more-interesting-than-you-might-think.

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Sagal, K., and K. LaBounty. 2024. Sitka Nature Show #325 – Lauren Wild. KCAW radio interview with Lauren Wild on whale research around the Gulf of Alaska, including increase in crude birth rates seen in Southeast Alaska and Prince William Sound. https://www.sitkanature.org/photojournal/2024/10/06/sitka-nature-show-325-lauren-wild/.

Sommer, L. 2024. Humpback whales make custom fishing nets – out of bubbles. Interview with John Moran on NPR All Things Considered. https://www.npr.org/2024/09/06/nx-s1-5087900/humpback-whales-krill-bubble-net-feeding.

Suryan, R. M. 2024. Gulf Watch Alaska – Making Connections. Delta Sound Connections 2024-2025. https://pwssc.org/wp-content/uploads/2024/05/DSC-2024_FINAL-WEB.pdf.

Conferences and workshops:

Arimitsu, M., H. Murphy, J. Piatt, V. von Biela, C. Marsteller, K. Ressel, J. Bell, T. Sutton. 2024. Capelin response to thermal habitat and large-scale ocean circulation in the North Atlantic and Pacific Oceans. Oral presentation, ESSAS meeting, St. John's, Newfoundland, Canada, June.

Arimitsu, M., C. Cunningham, B. Drummond, B. Ferriss, D. Goethal, S. Hatch, K. Oke, J. Piatt, H. Renner, N. Rojek, K. Shotwell, W. Strassburger, L. Turner, S. Whelan. 2024. Puffin diets provide annual forage fish indices to inform ecosystem-based fisheries management in Alaska. Oral presentation, PICES meeting, Honolulu, Hawaii, October.

Arimitsu, M., S. Schoen, C. Marsteller, D. Donnelly, S. Stark, N. Bargmann, J. Piatt. 2024. Impacts of marine heatwaves of seabirds and forage fish. Oral presentation, EcoLunch Seminar, Anchorage, Alaska. December.

Atkinson-DeMaster, S., V. Melica, S. Teerlink, J. Moran, D. DeMaster, K. Mashburn, and H. Pearson. 2024. Surviving with change: Pregnancy, calving and annual population growth rates of humpback whales in Alaska. Oral presentation, 25th Biennial Society for Marine Mammalogy Conference on the Biology of Marine Mammals, Perth, Australia. November.

Ballantine, K. 2024. Investigating physical drivers of phytoplankton bloom initiation in the Northern Gulf of Alaska. Poster presentation, Ocean Sciences Meeting, New Orleans, Louisiana, February.

Blais, J. 2024. Overlooked marine protists: The unique role of Rhizaria in northern Gulf of Alaska food webs. Poster presented at the Ocean Sciences Meeting, New Orleans, LA.

Borsky, A., K. Gorman, P. Rand, and K. Iken. 2025. Spatio-temporal distributions of Pacific herring and pink salmon in Prince William Sound, Alaska. Poster presentation, Alaska Marine Science Symposium, Anchorage, Alaska, January.

Brauner, M. 2024. Co-occurrence networks of marine microbes in the Northern Gulf of Alaska. Poster presentation, Ocean Sciences Meeting, New Orleans, Louisiana, February.

Brauner, M. 2025. Iron fertilization effects on microbial communities and interactions in the northern Gulf of Alaska. Poster presentation, Alaska Marine Science Symposium, Anchorage, Alaska, January.

Campbell, R. W. 2024. Recent changes in the near-surface oceanography and productivity of Prince William Sound. Oral presentation, Optimizing Ocean Observing Networks for Detecting the Coastal Climate Signal Workshop, Boulder, Colorado, September.

Campbell, R. W. 2025. High frequency temporal and spatial variability in PWS zooplankton populations. Poster presentation, Alaska Marine Science Symposium, Anchorage, Alaska, January.

Cheeseman, T., J. Barlow, J. M. Acebes, K. Audley, L. Bejder, C. Birdsall, O. S. Bracamontes, A. L. Bradford, J. Byington, J. Calambokidis, R. Cartwright, J. Cedarleaf, A. J. Garcia Chavez, J. Currie, R. C. De Castro, J. De Weerdt, N. Doe, T. Doniol-Valcroze, K. Dracott, O. Filatova, R. Finn, K. R. Flynn, J. Hildering, M. C. Hill, J. K. Jacobsen, M. E. Jiménez-López, M. Jones, N. Kobayashi, M. Lammers, E. Lyman, M. Malleson, E. Mamaev, P. Martínez Loustalot, A. Masterman, C. O. Matkin, C. McMillan, J. Moore, J. Moran, J. L. Neilson, H. Newell, H. Okabe, M. Olio, C. D. Ortega-Ortiz, A. A. Pack, D. M. Palacios, H. Pearson, E. Quintana-Rizzo, R. Ramírez Barragán, N. Ransome, H. Rosales-Nanduca, F. Sharpe, T. Shaw, K. Southerland, S. Stack, I. Staniland, J. Straley, A. Szabo, S. Teerlink, O. Titova, J. Urban-Ramirez, M. van Aswegen, M. Vinicius, O. von Ziegesar, B. Witteveen, J. Wray, K. Yano, I. Yegin, D. Zeifelhofer, and P. Clapham. 2024. Bellwethers of change: population modeling of North Pacific humpback whales from 2002 through 2021 reveals shift from recovery to climate response. Oral presentation, 25th Biennial Society for Marine Mammalogy Conference on the Biology of Marine Mammals, Perth, Australia November.

Coletti, H., D. Esler, K. Iken, B. Konar, S, Traiger, B. Ballachey, J. Bodkin, G. Esslinger, K. Kloecker, M. Lindeberg, D. Monson, B. Robinson, R. Suryan, and B. Weitzman. 2024. Long-term monitoring documents change in nearshore ecosystems of the Gulf of Alaska. Poster presentation, Kachemak Bay Science Conference, Homer, Alaska, March.

Coletti, H., D. Esler, G. Esslinger, B. Weitzman, P. Schuette, J. Eisaguirre, and others. 2024. Gulf Watch Alaska Nearshore monitoring of sea otters and their habitats. Oral presentations, Chugach Imaq Research Collaborative Workshop, Cordova, Alaska, September.

Coletti, H., D. Esler, K. Iken, B. Konar, B. Ballachey, J. Bodkin, G. Esslinger, K. Kloecker, M. Lindeberg, D. Monson, S. Traiger, and B. Weitzman. 2025. Gulf Watch Alaska Nearshore Component 2024 update: Monitoring species and processes to detect change and infer cause. Poster Presentation, Alaska Marine Science Symposium, Anchorage, Alaska, January.

Cushing D., E. Labunksi, R. Kaler, and R. Suryan. 2025. Seabird community responses to changes in ocean temperatures in the northern Gulf of Alaska. Oral presentation, Joint meeting of the Pacific Seabird Group and The Waterbird Society, San Jose, Costa Rica, January.

Cushing, D., R. Kaler, E. Labunski, and R. Suryan. 2025. Common trends in seabird abundance time-series on the northern Gulf of Alaska shelf. Poster presentation, Alaska Marine Science Symposium, Anchorage, Alaska, January.

Danielson, S. 2025. Northern Gulf of Alaska Long Term Ecological Research Lightning Talk. Oral presentation, Northern Gulf of Alaska Long Term Ecological Research All-Hands Meeting, Fairbanks, Alaska, March.

Danielson, S. 2025. Northern Gulf of Alaska Long Term Ecological Research Data Nuggets Presentation. Online presentation to Northern Gulf of Alaska Long Term Ecological Research team and collaborators, February.

Danielson, S. 2024. GAK1 project updates. Online presentation, *Exxon Valdez* Oil Spill Trustee Council Public Advisory Committee Meeting, October.

Danielson, S. L. 2024. Seward Line and oceanographic station GAK1 updates. Online presentation, National Oceanic and Atmospheric Administration Preview of Ecosystem and Economic Conditions, May.

Dias, B., T. Okey, R. Suryan, R. Hopcroft. 2024. Prince William Sound marine ecosystem under different heatwave scenarios. Oral presentation, Ecopath 40 Years conference, Ostend, Belgium, June.

Dutro, M., S. Wright, J. Moran, F. Sharpe, S. Teerlink, J. Neilson, C. Gabriele, K. McKeehan, D. Winters, E. Lyman, D. Gann, and S. Neilson. 2025. A summary of 2023 large whale entanglements in Alaskan waters. Poster presentation, Alaska Marine Science Symposium. Anchorage, Alaska, January.

Ertz, R., and R. W. Campbell. 2025. Inter-reader variability in age estimates of Alaska sockeye salmon scales. Poster presentation, Alaska Marine Science Symposium, Anchorage, Alaska, January.

Hennon, T. D., and S. L. Danielson. 2025. Spatiotemporal modes of temperature and salinity variability in the northern Gulf of Alaska. Poster presentation, Alaska Marine Science Symposium, January, Anchorage, Alaska.

Hopcroft, R. R. 2024. Quantification of gelatinous zooplankton along the Seward Line in the Northern Gulf of Alaska. Oral presentation, Zooplankton Production Symposium, Hobart, Tasmania, Australia, March.

Hopcroft, R. R. 2025. Zooplankton communities in the northern Gulf of Alaska: Seward Line observations through 2024. Poster presentation, Alaska Marine Science Symposium, Anchorage, Alaska, January.

Hughes, M., K. Iken, S. Traiger, H. Coletti, and B. Konar. 2025. Direct and cascading effect of sea star wasting on rocky intertidal communities. Oral presentation, Alaska Marine Science Symposium, Anchorage, Alaska, January.

Lindeberg, M., R. Suryan, D. Aderhold, K. Hoffman, S. Pegau, M. Arimitsu, H. Coletti, and R. Hopcroft. 2024. Gulf Watch Alaska: Taking the pulse of the northern Gulf of Alaska. Poster presentation, Seward Science Symposium, Seward, Alaska, September.

Lovy, J., W. M. Daniel, C. D. Raines, M. E. Neilson, M. Purcell, and P. K. Hershberger. 2024. AquaDePTH, building a national repository for the sharing and tracking of aquatic animal health data. Virtual presentation, 46th Annual Eastern Fish Health Workshop, Atlantic Beach, North Carolina, March.

Kaler, R. 2024. Prince William Sound marine bird population trends, 1989-2022. Poster presentation, 51st Annual Pacific Seabird Group meeting, Seattle, Washington, February.

Kepner, H. E. 2024. Fine-scale spatial patterns of gelatinous zooplankton in the Northern Gulf of Alaska. Oral presentation, Zooplankton Production Symposium, Hobart, Tasmania, Australia, March.

Marsteller, C., M. Arimitsu, J. Piatt, V. von Biela, A. Stanek, C. Murdoch, E. Munk, and J. Tanguay. 2025. The little fish with big impacts: Signals of environmental change in spawning capelin throughout its Pacific range. Oral presentation, Alaska Marine Science Symposium, Anchorage, Alaska, January.

Marvy, A. 2024. Diversity in light:growth optimums may occur within not between phytoplankton types in the Northern Gulf of Alaska. Poster presentation, Ocean Sciences Meeting, New Orleans, Louisiana, February.

Moran, J., S. Neilson, C. Gabriele, J. Straley, B. Witteveen, L. Wild, S. Whelan, Y. Arimitsu, H. Riley, E. Fergusson, and B. Drummond. 2025. Humpback whale birth rates reflect a recovering food supply in the Gulf of Alaska. Oral presentation, Alaska Marine Science Symposium. Anchorage, Alaska, January.

Moran, J., J. Straley, J. Maselko, S. Teerlink, O. von Ziegesar, and L. Wild. 2024.The rise and fall of humpback whales and Pacific herring in Prince William Sound, Alaska: a 45 year

perspective. Poster presentation, 25th Biennial Society for Marine Mammalogy Conference on the Biology of Marine Mammals, Perth, Australia November.

Morella, J. 2024. Prince William Sound herring spawn and ASL, 2024. Oral presentation, Herring Research and Monitoring 2024 PI meeting, online, October 15, 2024.

Ostle C., S. Batten, M. Brunetta, L. Gregory, D. Johns, L Kléparski, G. Lawley, F. Loro, R. J. Nelson, A. Sastri, and C. Taylor. 2025. 25 years of the North Pacific Continuous Plankton Recorder survey. Poster presentation, Alaska Marine Science Symposium, Anchorage, Alaska, January.

Ostle, C. S. Batten, L. Kléparski, F. Loro, and A. Sastri. 2024. Update on the North pacific CPR survey. Oral presentation, North Pacific Marine Science Organization (PICES) Monitor Technical Committee annual meeting, Victoria British Columbia, Canada, September.

Paez, D. J., J. Gregg, and P. K. Hershberger. 2024. Platform. Prolonged impacts of VHSV infection on the swimming performance of Pacific herring. Virtual presentation, Ecology and Evolution of Infectious Diseases Conference, Stanford University, Palo Alto, California, June.

Páez, D. J., J. L. Gregg, A. H. MacKenzie, S. A. Hall, and P. K. Hershberger. 2024. Poster. Characteristics of a sea louse (C*aligus clemensi*) epizootic in wild Pacific herring (*Clupea pallasii*). Poster presentation, Alaska Marine Science Symposium, Anchorage, Alaska, January.

Paez, D. J., J. Lovy, J. Gregg, and P. K. Hershberger. 2024. Platform. Prolonged sublethal impacts of viral hemorrhagic septicemia virus infection on the swimming performance of Pacific herring. Virtual presentation, 2024 Ecology and Evolution of Infectious Diseases Conference, Palo Alto, California, June.

Paez, D. P., J, Lovy, J. L. Gregg, and P. K. Hershberger. 2024. Prolonged sublethal impacts of viral hemorrhagic septicemia on the swimming performance of Pacific herring. Poster presentation, Western Fish Disease Workshop, Boise, Idaho, July.

Pearson, H., S. Atkinson DeMaster, J. Maselko, K. Mashburn, V. Melica, J. Moran, and S. Teerlink. 2024. When the ocean went quiet: Assessing the response of humpback whales in Juneau, AK to a dramatic decrease in whale watching during the COVID-19 pandemic. Oral presentation, 25th Biennial Society for Marine Mammalogy Conference on the Biology of Marine Mammals, Perth, Australia November.

Pegau, W. S., D. Janka, B. Lydon, D. Esler, R. W. Campbell, and A. Mearns. 2025. Repeated volunteer photos continue at rocky intertidal sites in Prince William Sound. Poster presentation, Alaska Marine Science Symposium, Anchorage, Alaska, January.

Poje, A. 2024. Depth-related patterns of zooplankton within the epipelagic zone of Northern Gulf of Alaska. Oral presentation, Zooplankton Production Symposium, Hobart, Tasmania, Australia, March.

Rand, P. 2024. Larval Fish Identification Workshop. NOAA Auke Bay Labs, Juneau, Alaska, October.

Rand, P. 2024. Zooplankton Identification Workshop. Organized by PWSSC and UAF, Homer, Alaska, November.

Reister, I. 2024. Salinity field structure and freshwater pathways over the Gulf of Alaska continental shelf reflects coastal discharge, bathymetric steering, and wind forcing. Poster presentation, Ocean Sciences Meeting, New Orleans, Louisiana, February.

Reister, I., S. L. Danielson, T. D. Hennon, H. Statscewich, and K. Ballantine. 2025. Controls of the northern Gulf of Alaska spring bloom over coastal and mid shelf waters. Poster presentation, Alaska Marine Science Symposium, January, Anchorage, Alaska.

Schoen, S. K., M. Arimitsu, N. Bargmann, C. Marsteller, M. Smith, and J. Piatt, 2024. Assessment of paralytic shellfish toxin (saxitoxin) in seabird die-offs and marine food webs across Alaska. Oral presentation, Pacific Seabird Group Annual Meeting, Seattle, Washington, February.

Schuette, P, and B. Weitzman. 2024. Sea otter efforts across the Southeast Alaska stock. Oral presentation, Southeast Alaska Tribal Conservation District Regional Gathering, Ketchikan, Alaska, August.

Smoot, C. A. 2024. Patterns of zooplankton species and trait diversity in the Gulf of Alaska from the surface to the abyssopelagic. Poster presentation, Zooplankton Production Symposium, Hobart, Tasmania, Australia, March.

Statscewich, H., S. L. Danielson, J. K. Horne, T. B. Kelly, M. Yamane, E. Farley, D. G. Kimmel, and C. W. Mordy. 2025. Extending autonomous underwater glider-based ecosystem monitoring across multiple trophic levels. Oral presentation, Alaska Marine Science Symposium, January, Anchorage, Alaska.

Traiger, S. B., R. Campbell, H. Coletti, D. Esler, K. Holderied, C. McKinstry, D. Monson, M. Renner, B. Robinson, R. Suryan, and B. Weitzman. 2024. Barnacle larvae variability and relationships to intertidal abundance in Kachemak Bay. Oral presentation, Kachemak Bay Science Conference, Homer, Alaska, March.

Traiger, S. B. 2024. Ecological impacts of the sea star wasting epidemic. Oral presentation, U. S. Geological Survey Wildlife Disease Community of Practice, Virtual, May.

Traiger, S. B., J. Bodkin, H. Coletti, K. Iken, K. Kloecker, B. Konar, D. Monson, B. Weitzman. 2025. Effects of site-specific characteristics on northern Gulf of Alaska clam assemblages. Alaska Marine Science Symposium, Anchorage, Alaska, January.

Vayder, Z., K. Iken, and H. Coletti. 2025. Temperate effects on Pacific blue mussels (*Mytilus trossulus*). Poster presentation, Alaska Marine Science Symposium, Anchorage, Alaska, January.

Waltzek, T., B. Torrevillas, A. Hassan, and P. K. Hershberger. 2024. Phylogenomic characterization of erythrocytic necrosis virus (ENV) from Pacific herring (*Clupea pallasii*). Virtual presentation, Western Fish Disease Workshop, Boise, Idaho, July.

Warren, X. 2024. Universal Implementation of Productivity Models in the Gulf of Alaska. Poster presentation, Ocean Sciences Meeting, New Orleans, Louisiana, February.

Webster, N. 2024. The Inception of Two Long-Term Passive Acoustic Monitoring Programs in the Gulf of Alaska. Poster presentation, Ocean Sciences Meeting, New Orleans, Louisiana, February.

Williams, K. 2024. Comparing primary production and vertical export of the picophytoplankton Synechococcus in the Northern Gulf of Alaska. Poster presentation, Ocean Sciences Meeting, New Orleans, Louisiana, February.

Wright, S., J. Moran, F. Sharpe, S. Teerlink, J. Neilson, C. Gabriele, K. McKeehan, D. Winters, E. Lyman, D. Gann, S. Neilson, and M. Dutro. 2024. Releasing the Big Fish: Disentangling Whales from Fishing Gear in Alaska in 2023. Poster presentation, 25th Biennial Society for Marine Mammalogy Conference on the Biology of Marine Mammals, Perth, Australia November.

Van Pelt, A. 2024. Colloidal trace metals in the Northern Gulf of Alaska: The contrasting size partitioning of iron, nickel, and copper. Poster presentation, Ocean Sciences Meeting, New Orleans, Louisiana, February.

Public presentations:

Arimitsu, M. 2025. USGS science on seabirds and forage fish response to marine heatwaves. Community Education Night for teachers, students, and community members, hosted by the Alaska Marine Science Symposium, Anchorage, Alaska. January.

Arimitsu, M., and R. Juzeler. 2024. High Sign of the Sea. Public lecture, Juneau STEAM Coalition's STEAM Café, Juneau, Alaska. March.

Cunningham, R., H. Coletti, A. Schaefer, M. Rehberg, M. Piche, B. Weitzman, B. Mahoney, H. M. Garcia-Ladd, J. Keating, and J. Shaff. 2024. Chugach Imaq: Past, Present & Future Marine Mammal Research & Monitoring in the Chugach Region. Oral mini-presentations by the Chugach Imaq Research Collaborative for the Prince William Sound Science Center Tuesday Night Talk Series, Cordova, Alaska, September.

Hershberger, P. K. 2024. Update for the Puget Sound Partnership Forage Fish Workgroup: Roles of diseases and climate change affecting herring populations. Seattle, Washington, May.

Rand, P., R. Campbell, K. Gorman, and R. Heintz. 2024. Salmon-herring interactions project. Virtual presentation to the EVOSTC Public Advisory Committee, October.

Rand, P. 2024. Overview of EVOSTC GWA salmon-herring interactions project, Presentation at the Alaska Maritime National Wildlife Refuge Visitor Center, Homer, Alaska, November.

Russin, M. 2024. Ecological interactions between Pacific salmon and Pacific herring in Prince William Sound, Alaska: Field and lab insights. UAF, Fisheries and Marine Sciences Undergraduate Internship Symposium, Fairbanks, Alaska, December.

Traiger, S. B. 2024. Curiosity Unleashed STEAM, Thunder Mountain High School, Juneau. Sea otter foraging observation activity for K-5 families, February.

Traiger, S. B. 2024. Recent changes in the Gulf of Alaska nearshore ecosystem revealed by long-term monitoring. Virtual presentation to Prince William Sound Science Center and Center for Alaskan Coastal Studies, February.

Traiger, S. B. 2024. Ocean Science Festival, Cordova High School, Cordova. Sea otter foraging observation activity for 167 students, October.

Traiger, S. B. 2024. Kachemak Currents radio program episode "Barnacles" https://www.kbbi.org/show/kachemak-currents, November.

Traiger, S. B. 2024. Six Minute Science radio program episode 19 "Barnacles" https://ktna.org/six-minute-science/, December.

Kaler, R. 2024. Alaska's Ocean Sentinels: Seabirds as Ecosystem Indicators. Chugach School District's Science Week, Whittier, Alaska. Opening lecture with interactive stations on marine bird research. Two sessions with over 30 high school students and five high school teachers from across southcentral Alaska.

Liebich, K., and G. Eroh. 2024. Alaska's capelin/seabird story. U. S. Fish and Wildlife Service Fish of the Week podcast featuring expert interviews with Mayumi Arimitsu and Robb Kaler (U. S. Fish and Wildlife Service Migratory Bird Management), March 11. https://podcasts.apple.com/us/podcast/alaskas-capelin-seabird-story/id1546630514?i=1000648718220.

Moran, J. 2024. Large whale response in Alaska. Natural History Symposium, Prince William Sound Stewardship Foundation. Whittier, Alaska, May.

Moran, J. 2024. The decline of Humpback whales in Prince William Sound, Alaska following the 2014-2016 Pacific marine heatwave. Natural History Symposium, Prince William Sound Stewardship Foundation. Whittier, Alaska, May. https://www.princewilliamsound.org/2024nhs.

Moran, J., and E. Lyman, 2024. Large whale response in Alaska. On board the M/V Valdez Spirit. Presentation to students in Stafford, Virginia from Prince William Sound, Alaska, July.

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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:

- Robb Kaler and Dan Cushing with the PWS marine bird survey project summarized PWS marine bird population trends from 1989 to 2022 and developed a poster and handouts to share the information.
- John Moran and Lauren Wild with the humpback whale project contributed humpback whale blubber samples to UAF for stress and reproductive hormone assays and provided data to the NOAA Unusual Mortality Event working group.
- Jenni Morella with the herring surveys project distributed herring aerial survey maps to the herring list serve within 24 hours of each survey; compiled and made public GIS shapefiles for 2008-2024 aerial herring biomass observations, 1973-2024 aerial herring spawn observations, 1997-2024 aerial herring survey routes, 2008-2024 aerial survey marine bird, marine mammal, and sea lion observations; and compiled and made public 1973-2024 PWS age, sex, and size data.
- 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 http://igmets.net/ 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. In addition, monthly abundances for selected plankton can be generated for user-specified regions sampled by the CPR using this extraction tool: https://www.dassh.ac.uk/lifeforms/ https://doi.mba.ac.uk/data/3086

- Seth Danielson and his team with the GAK1 project have generated a new "best combined" monthly CTD and mooring dataset that aggregates all available data into a single monthly gridded dataset in association with the GAK1 and GWA-LTRM salinity synthesis manuscripts. This new data product should make utilization of the GAK-1 dataset even easier for public and scientific applications. It will be published in association with the new (in prep) GAK1 55-year reanalysis.
- Kristen Gorman, Pete Rand, and Alex Borsky with the herring/salmon interactions project developed a comprehensive Access database to manage and archive all the various data streams from the project. This database will continue to be updated as new data become available.
- Paul Hershberger and his herring disease project team are 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 project are at the top of the queue for inclusion. We anticipate that the database and the associated herring disease surveillance data will be public-facing in late 2026.

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Aguilar-Islas, A., and M. Kaufmann. 2024. Dissolved inorganic nutrient data from stations sampled on NGA-LTER seasonal cruises, 2018-2022. Research Workspace. 10.24431/rw1k586.

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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, 2018-2022. Research Workspace. https://doi.org/10.24431/rw1k459.

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Hopcroft, R. R. 2024. Gelatinous zooplankton abundance and wet weight biomass observations from research cruises for the Northern Gulf of Alaska (NGA) LTER site, 2018 - 2022. Research Workspace. 10.24431/rw1k58z.

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Additional Products not listed above:

John Moran provided GWA-LTRM whale sightings to the "Updated determination regarding the request for ship strike risk reduction protocols in Prince William Sound, Alaska".

Updates to the UAF GAK-1 project are provided publicly at a project website homepage: http://research.cfos.uaf.edu/gak1/.

The GAK-1 project team has two manuscripts in preparation for peer reviewed journals:

- Salinity structure, drivers, and time variability in the Northern Gulf of Alaska
- Wind and climate-mediated variability in a 50-year coastal hydrographic time series

ADF&G has developed an interactive map for PWS aerial herring surveys: https://experience.arcgis.com/experience/53d54699cbf54e72aa1a4daf405076b7.

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 connections to 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 and 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 improving relationships 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 share PIs and have lead organizations in common (i.e., PWSSC, UAF). Individual project PIs are developing working relationships including sharing ship time, equipment, logistics, and field crews with the Mar ReCon program. The Science Lead and other team members attended the Mar ReCon PI meeting in January 2025. 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 October 2024 PI meeting held in Cordova. GWA-LTRM team members participated in the CORaL Network Ocean Sciences Festival in Cordova in October 2024. 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 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 Science Lead and several project team members gave presentations at the Chugach Regional Resources Commission (CRRC) annual subsistence memorial gathering in March 2024 and intend to continue this relationship throughout the current funding cycle. 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:

September 2024 EVOSTC Science Panel Comment:

This program provides vital administration of the GWA and HRM components. NOAA and PWSSC are funded to provide leadership and oversight of the comprehensive GWA LTRM program. NOAA personnel provide program management, oversight of science synthesis and

modeling, and oversee reporting from components and projects. PWSSC provides administration of the NOAA grant to non-Trustee agencies and organizations, program coordination, meeting logistics, and coordination of outreach and community involvement activities.

The SP has no concerns about the performance of this program over the past two years. We note that the program is highly successful and has supported a wide range of rigorous scientific and related projects, with a superb record of productivity, especially when considering all projects under the overall LTRM A/B umbrella. We were particularly pleased with outreach, publications and synthesis efforts (e.g., journal special issue, ongoing development of an ecosystem model).

Program management and administration are not trivial tasks. We feel that the two annual reports do not give justice to the fundamental activities of administration within LTRM A/B involving coordination, accounting, contract preparation, etc. The relatively light emphasis on these activities may be a result of the requested report format that is more suited to research projects than administrative functions.

For future annual reports, the SP has two requests. First, the PIs should consider reporting their progress under the five primary program objectives (p. 1 of the original proposal): (1) Sustain and build upon existing time series in the EVOS-affected regions of the 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; and (5) Ensure data are properly archived so that they can be accessed beyond the life of this program. Second, it would also be helpful if the report included a table showing the approved budget versus expenditures to date, as well as any requested funding carryover.

The Science Panel does not have any concerns about the GWA-LTRM program or the program management and administration.

PI Response:

Thank you for your comments. Per the Science Panel's first request, the work summary has been reorganized to demonstrate activity under each of the program's five primary objectives and program management. We appreciate the recognition that program management and administration are not trivial tasks. Many of the program management and administration activities are now reported as part of program objectives, which may further de-emphasize this work as part of the overall program.

Per the Science Panel's second request, the budget section now includes a table that lists the proposed FY22-24 spending, actual cumulative spending for the period, the proposed five-year total (for comparison), and carry-over funds for each project. This table is in addition to the screenshots of the budget workbook that show cumulative spending for each project and the budget categories, and funding carry-overs.

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 – FY24 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-FY24 cumulative spending, actual FY22-FY24cumulative 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-FY24 spending	Actual FY22-FY24 spending	Proposed total 5-year spending	Carry-over
PM NOAA/ 2422LTRM	295,819	286,489	312,085	9,330
PM PWSSC/ 2422LTRM	1,595,852	979,069	2,759,682	616,783
CPR/ 24120114-D	241,497	206,451	412,737	35,046
PWS Oceanography/ 24120114-G	704,750	522,095	1,204,437	182,655

Project title/ number	Proposed FY22-FY24 spending	Actual FY22-FY24 spending	Proposed total 5-year spending	Carry-over
GAK-1/ 24120114-I	406,263	207,230	787,129	199,033
Seward Line/ 24120114-L	666,217	438,603	1,111,494	227,614
Ocean Acidification/ 24220202	382,210	258,092	611,107	124,118
Forage Fish/ 24120114-C	915,846	885,285	1,549,494	30,561
Marine Birds/ 24120114-M	550,358	550,358	948,135	0
Killer Whales/ 24120114-N	311,245	310,164	311,245	1,081
Humpback Whales/ 24120114-O	557,699	460,127	931,779	97,572
Herring Modeling/ 24120111-C	404,671	260,589	702,327	144,082
Herring Disease/ 24120111-E	993,995	698,863	1,652,357	295,132
Herring Surveys/ 24170111-F	559,708	385,523	906,209	174,185
Herring/Salmon Int./ 24220111-I	967,357	586,628	1,593,773	380,729

Exxon Valdez Oil Spill Trustee Council

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

Annual Program Reporting Form

Project title/ number	Proposed FY22-FY24 spending	Actual FY22-FY24 spending	Proposed total 5-year spending	Carry-over
Nearshore/ 24120114-H	1,929,968	1,280,687	3,038,947	649,281
Lingering Oil/ 24200114-P	34,600	0	113,800	34,600
Totals	**11,670,698**	**8,468,897**	**19,099,382**	**3,201,801**

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	$286,489
Hoffman, PWSSC	Program Management B	$487,250	$546,818	$561,784	$576,528	$587,302	$2,759,682	$979,069
Coordination, Synthesis, Outreach, & Administration Total		**$650,231**	**$662,079**	**$579,361**	**$576,528**	**$603,567**	**$3,071,767**	**$1,265,558**
Environmental Drivers								
Ostle, MBA, & Batten, PICES	CPR in the GOA	$78,502	$80,492	$82,503	$84,564	$86,676	$412,737	$206,451
Campbell, PWSSC	PWS Oceanographic	$229,140	$234,870	$240,740	$246,758	$252,929	$1,204,437	$522,095
Danielson, UAF	GAK-1 Mooring	$125,080	$141,301	$139,882	$187,741	$193,126	$787,129	$207,230
Hopcroft & Danielson, UAF	Seward Line	$216,613	$222,026	$227,577	$233,269	$212,008	$1,111,494	$438,603
Hauri, UAF	Ocean Acidification	$144,042	$127,311	$110,856	$113,123	$115,774	$611,107	$258,092
Environmental Drivers Total		**$793,376**	**$806,001**	**$801,559**	**$865,456**	**$860,513**	**$4,126,905**	**$1,632,471**
Pelagic Monitoring								
Arimitsu & Piatt, USGS	Forage Fish Monitoring	$319,226	$293,863	$302,757	$312,010	$321,639	$1,549,494	$885,285
Kuletz & Kaler, USFWS	PWS/LTER Marine Bird Surveys	$88,075	$376,519	$85,764	$304,165	$93,612	$948,135	$550,358
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	$460,127
Pelagic Monitoring Total		**$790,796**	**$972,570**	**$571,781**	**$803,640**	**$601,866**	**$3,740,653**	**$2,205,934**
Herring Research & Monitoring								
Branch, UW	Herring Modeling	$130,016	$130,573	$144,082	$146,528	$151,128	$702,327	$260,589
Hershberger & Paez, USGS	Herring Disease	$315,826	$389,456	$288,712	$296,288	$362,074	$1,652,357	$698,863
Morella, ADF&G	Spawning Surveys & ASL	$143,686	$208,590	$207,432	$183,375	$163,125	$906,209	$385,523
Rand, Campbell, PWSSC, Gorman, UAF, Heintz, SSSC	Salmon-Herring Interactions	$231,033	$364,711	$371,613	$318,527	$307,888	$1,593,773	$586,628
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**	**$2,084,248**
Nearshore Monitoring								
Coletti, NPS, Esler, USGS, Konar & Iken, UAF	Nearshore Monitoring	$613,497	$642,629	$673,842	$551,847	$557,133	$3,038,947	$1,280,687
Nearshore Monitoring Total		**$613,497**	**$642,629**	**$673,842**	**$551,847**	**$557,133**	**$3,038,947**	**$1,280,687**
Lingering Oil								
Esler, USGS, & Lindeberg, NOAA	Lingering Oil	$0	$0	$34,600	$79,200	$0	$113,800	$0
Lingering Oil Total		**$0**	**$0**	**$34,600**	**$79,200**	**$0**	**$113,800**	**$0**
	Program Total Cost	**$3,821,107**	**$4,176,610**	**$3,672,982**	**$3,821,388**	**$3,607,295**	**$19,099,382**	**$8,468,897**
FY 22-26 Total all Program projects including 9% GA		**$4,165,006**	**$4,552,505**	**$4,003,550**	**$4,165,313**	**$3,931,952**	**$20,818,326**	**$9,231,098**

The budget below shows FY22 – FY24 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	$2,090,858	$2,133,244	$2,105,592	$10,434,337	$4,295,623
Travel	$129,780	$157,534	$136,254	$139,456	$129,551	$692,574	$347,069
Contractual	$1,022,084	$1,020,129	$836,211	$991,786	$840,534	$4,710,744	$2,252,969
Commodities	$233,564	$256,439	$219,992	$206,760	$186,946	$1,103,700	$620,840
Equipment	$263,027	$344,953	$178,837	$131,432	$129,772	$1,048,021	$513,032
Indirect Costs (rate will vary by project)	$228,812	$236,751	$210,830	$218,711	$214,902	$987,784	$439,365
SUBTOTAL	$3,821,107	$4,176,610	$3,672,982	$3,821,388	$3,607,295	$19,099,382	$8,468,897
General Administration (9% of subtotal)	$343,900	$375,895	$330,568	$343,925	$324,657	$1,718,944	N/A
PROGRAM TOTAL	**$4,165,006**	**$4,552,505**	**$4,003,550**	**$4,165,313**	**$3,931,952**	**$20,818,326**	
Other Resources (In-Kind Funds)	**$1,921,954**	**$1,988,772**	**$1,947,543**	**$1,977,340**	**$1,958,099**	**$9,793,708**	

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: 2222LTRM ProgramTitle: Gulf Watch Alaska-LTRM	SUMMARY TABLE

The spreadsheet below shows spending that individual projects would like to carry over from FY22 and FY23 to FY24. The primary reason for the underspending in 2022 and 2023 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 FY24.

Project Number	Project Title	Lead PI(s)	FY24 Carry Over to FY25 (based on FY22-24 cumulative spending)
Program Management			
2322LTRM-A	GWA-LTRM Program (NOAA)	Lindeberg & Suryan	$9,330
2322LTRM-B	GWA-LTRM Program (PWSSC)	Hoffman	$616,783
Environmental Drivers			
23120114-D	CPR	Ostle & Batten	$35,046
23120114-G	PWS Oceanographic	Campbell	$182,655
23120114-I	GAK-1	Danielson	$199,033
23120114-L	Seward Line	Hopcroft & Danielson	$227,614
23220202	Ocean Acidification	Hauri	$124,118
Pelagic			
23120114-C	Forage Fish	Arimitsu	$30,561
23120114-M	PWS Marine Bird Surveys	Kaler	$0
23120114-N	Killer Whales	Durban & Matkin	$1,081
23120114-O	Humpback Whales	Moran & Wild	$97,572
Herring Research & Monitoring			
23220111-C	Herring Modeling	Branch	$144,082
23220111-E	Herring Disease	Hershberger & Paez	$295,132
23170111-F	Herring Surveys	Morella	$174,185
23120111-I	Herring/Salmon Interactions	Rand et al.	$380,729
~~23220203~~	~~Pollock/Herring Interactions~~	~~Rhea-Fournier et al.~~	~~$0~~
Nearshore			
23120114-H	Nearshore	Coletti et al.	$649,281
Lingering Oil			
23120114-P	Lingering Oil	Esler & Lindeberg	$34,600
Total Carry Over			**$3,201,801**

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	$26,194
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	$286,489
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: 2422LTRM-A** **Project Title: Program Management A** **PI(s): Lindeberg & 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.

***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	$634,015
Travel	$12,400	$12,400	$12,690	$13,390	$13,390	$64,270	$21,672
Contractual	$121,800	$154,550	$158,120	$160,728	$163,365	$758,563	$313,064
Commodities	$10,000	$10,000	$10,000	$10,000	$10,000	$50,000	$10,318
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	$979,069
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: 2422LTRM-B** **Project Title: Program Management B** **Primary Investigator: Hoffman (PWSSC)**	**NON-TRUSTEE AGENCY SUMMARY PAGE**