

Progress Report

Implementation & Development of the Alaska Regional Coastal Ocean Observing System
(AOOS) FY 2021-2025

Award number: NA21NOS0120094

Period of Activity: July 1, 2022 – December 31, 2023

Principal Investigator: Sheyna Wisdom

PROJECT MILESTONES

An updated Project Milestone Table is provided as Attachment 1.

PROGRESS & ACCOMPLISHMENTS

Section 1 (Core Funding)

High Frequency Radars (HFRs)

Amount	Funding Area	Task
		Sustained operational funding and service delivery.
\$156,000.00	Core	H3012 UAF (Danielson) Arctic HFR
\$115,000.00	Core	H3013 UAF (Danielson) Bering HFR
\$114,286.00	Core	H3060 UAF (Danielson) Cook Inlet HFR
Status: Tasks on track for Arctic and Cook Inlet HFR; Bering Strait - Wales on track; Shishmaref delayed		

Names of RA's existing and planned HFR stations	Status	Date of most recent antenna calibration	Date planned for next antenna calibration	Recapitalization needs
SIMP (Simpson)	Delayed. Not operational in 2022 due to weather and sea state during July-August site visit, and then vessel maintenance issues in mid-September, which prevented remote site access; a boat is needed for site access. Reactivation in July/August 2023, dependent on sea ice conditions.	4/2021	8/2023	HFR system (2013) coming to end of service life, replacement (\$150k)

Names of RA's existing and planned HFR stations	Status	Date of most recent antenna calibration	Date planned for next antenna calibration	Recapitalization needs
PBRW (Point Barrow)	On track. The HFR site at Nuvuk (Point Barrow) needed maintenance in August 2022, when a new transmit cable was run from the remote power module to the transmit antenna, but other than that, it has been operational 5/22 through present. Station has been regularly telemetering data to CORDC.	8/2022	8/2023	HFR system (2003) end of service life (\$150k) - part of the costs to replace the CODAR Seasonde was Included in the IIJA Y2 fund request at \$116,563, but prices have increased since the IIJA proposal was submitted, and the price in the request may no longer reflect the realized cost. Also needed are 4 Wind Turbines for remote power module (\$20K); Replacement batteries end of service life (\$35K); CODAR spare parts/components (\$25K)
WAIN (Wainwright)	On track. Operational year-round. Station regularly telemetering data to CORDC.	8/2022	8/2023	HFR system (2009) end of service life, replacement (\$150K); 4 Wind Turbines for remote power module (\$20k)
SHSH (Shishmaref)	Delayed. Not operational in 2022 due to permitting delays and subsequent lack of available personnel. Reactivation in June/July 2023.	9/2019	7/2023	Transmit antenna - prone to breakage (\$15K); CODAR spare parts/components (\$25K)
WALE (Wales)	On track. This site was relocated and remained operational from 09/1/2022 through 12/11/2022. A malfunction in the HFR electronic chassis has taken this HFR offline. This will have to be resolved during a spring 2023 site visit.	8/2022	7/2023	Transmit antenna (CODAR Tx Antenna) - prone to breakage (\$15); Receiver antenna (CODAR Rx Antenna) (\$20k). Both were included in the IIJA Y1 fund request at the following amounts: Tx Antenna \$12,128; Rx Antenna \$18,743; CODAR Rx Antenna Cable Set (2) \$3640; CODAR Tx Antenna Cable Set (2) \$2338). Prices have since gone up and the funds requested in the IIJA proposal may no longer reflect the realized cost

Names of RA's existing and planned HFR stations	Status	Date of most recent antenna calibration	Date planned for next antenna calibration	Recapitalization needs
Cook Inlet	Delayed. Installation plans for 2 HFRs in Cook Inlet are now planned for summer 2023. Final site selection is still underway, and associated land use agreements and permits will be required. Potential site visits with Hilcorp (private land owner) were conducted in the fall of 2022.	NA	2022	NA

Names of RA's HFR IT Systems	Status	Recapitalization needs
UAF	Chukchi Sea (Arctic) HFR Data http://research.cfos.uaf.edu/hfradar/ Bering Strait HFR Data https://research.cfos.uaf.edu/hfradar/bstrait/ AOOS Data Portal https://portal.aos.org/#module-metadata/de91c282-01e2-11e2-ad19-00219bfe5678	New Central Site Computer for UAF (\$3K)– Computer in Fairbanks that gathers data from all field sites and processes the surface currents that are sent to the IOOS data server and, subsequently, Axiom. Also in need of a CODAR license upgrade. <i>Both of these requests were included in IIJA Y1 funding request at the following amounts: CODAR Base Station Computer \$2660; CODAR License Upgrade REL8 to REL22 \$4000. Prices have increased since and these requests were submitted and may no longer reflect the realized costs.</i>

Gliders & Other Uncrewed Systems (UXS)

● **Ecosystem Approach to Fisheries Management (EAFM) Glider**

Summary of Activities

All tasks are on track. Three EAFM glider surveys were completed in 2022. The first full-scale joint-effort EAFM/Office of Marine and Aviation Operations (OMAO) glider deployment occurred during the International Year of the Salmon (IYS) Gulf of Alaska Survey in the winter of 2022. The glider completed a round-trip survey along the Seward Line between February 11- April 11, 2022 (60 days). The Echodroid EAFM/OMAO glider was deployed for its second 2022 Gulf of Alaska survey on June 4, just offshore of Yakutat, AK and was recovered on July 14 offshore of Seward, AK near Seward Line station GAK14 (41 days). The University of Alaska Fairbanks (UAF) Glider Team also partnered with the Alaska Department of Fish & Game (ADF&G) in 2022 to test the feasibility of utilizing a glider to actively track acoustically tagged Tanner crabs. This pilot project occurred May 25 – June 13, 2022, during which ADF&G and UAF conducted field operations including Tanner crab pot fishing, tagging, and release (N = 35 adult males), fixed acoustic mooring deployment (N = 5), and glider deployment, flight piloting, and recovery. Glider acoustic survey transects recorded Vemco V9-2x-H model tag detections, geolocation, and oceanographic data in Marmot Bay, north of Kodiak Island, AK (20 days).

Accomplishments/successes

The UAF Glider Team highlighted the AOOS glider program to NOAA Administrator Dr. Rick Spinrad when he visited UAF in August 2022, and gave him a tour of the UAF oceanography workshop and glider lab.

Hydrographic data and the [Ecometrics dashboard](#) data from the joint-effort EAFM/OMAO IYS glider were for the first time displayed in real time on the AOOS data portal, and now this capability is available for all Alaska UAF glider deployments (including all other EAFM and Chukchi glider deployments).

The May 25-June 13 glider survey work was a partnership with the ADF&G to address crab declines and fisheries issues in the Bering Sea. The pilot project demonstrated that gliders provide a robust platform to assess interannual crab movement when combined with population surveys of distribution and abundance. Lessons learned will be utilized for planning future glider surveys in the Bering Sea.

An in-house glider operators training program has been initiated in lieu of glider pilot training at Teledyne Webb Research. The UAF Glider Team is in coordination with the Underwater Glider User Group (UG2) and the Marine Technology Society to further implement a standardized glider curriculum and certification procedure.

Problems/delays

None

● **Chukchi Glider**

Summary of Activities

All tasks and milestones are Completed for UAF, Oregon State University (OSU), and Woods Hole Oceanographic Institution (WHOI).

The Chukchi glider was deployed in the southern Chukchi Sea from the R/V *Norseman II* by Dr. Bob Pickart on July 30, 2022 at 67° 26.408' 167° 29.260'. The glider was recovered on September 7, 2022 by the R/V *Wolstad* by Dr. Kyla Drushka (34 days). Though the glider was recovered earlier than planned due to a glider operational issue, all science and passive acoustics functioned flawlessly during the deployment. Hydrographic data from the glider were displayed in real time on the AOOS data portal [Ecometrics dashboard](#). Real-time data and platform diagnostics were presented on the WHOI Website: Robots4Whales for the July - September 2022 deployment.

Accomplishments/successes

On the evening of September 1st, during the middle of a dive, the glider apparently reset itself while underwater. When it surfaced, it gave an aborted mission error and appeared as if it had no memory of its prior mission settings. Efforts were made to take control of the systems and load new settings, but the glider would go through another reboot and again act as if it had reset all settings. Efforts working with Teledyne (the manufacturer) were unsuccessful. Dr. Kyla Drushka and Dr. Jim Thomson were in the general vicinity and were willing to attempt a recovery. The glider had stopped calling in approximately 6 hrs prior to the arrival of the R/V *Woldstad* at its last known position. Dr. Mark Baumgartner (who had been piloting the glider all summer) took the 12 prior hours of drift data and predicted the glider's approximate location. The crew onboard searched along the line to the predicted location and miraculously found it 0.25 nautical miles (nm) from the waypoint Mark provided. Upon recovery, it was found that one of the communications pins had completely dissolved due to corrosion. The issue was likely related to a ground fault. The glider is being inspected by Teledyne to determine the cause of this problem. The glider rescue was featured in the AOOS eNews.

The UAF Glider Team presented the AOOS glider program to NOAA Administrator Dr. Rick Spinrad when he visited UAF in August 2022 and gave him a tour of the oceanography workshop and glider lab.

Problems/delays

The glider team had to ship the glider back to Teledyne Webb in November 2022 for repairs, which was unexpected and outside the scope of work. It has not yet returned to UAF.

- **International Year of the Salmon (IYS)**

Summary of Activities

All tasks are on track for UAF, University of Washington (UW), and Axiom Data Science (Axiom).

Accomplishments/successes

The first full-scale joint-effort EAFM/OMAO glider deployment occurred during the IYS Gulf of Alaska Survey in the winter of 2022. The glider completed a round-trip survey along the Seward Line between February 11- April 11, 2022 (60 days) as part of the 2022 IYS Survey. The Echodroid EAFM/OMAO glider was deployed for its second 2022 Gulf of Alaska survey on June 4, just offshore of Yakutat, AK and was recovered on July 14 offshore of Seward, AK near Seward Line station GAK14 (41 days).

Axiom developed an [Ecometrics dashboard](#) prototype and implemented the real time reporting dashboard during the February - April 2022 IYS glider deployment. Data streams included glider trajectory, ocean parameter time series, and comparison of current conditions to World Ocean Atlas climatology across the profiles, and real time data and ecometrics were provided on the project website and the AOOS Data Portal. Hydrographic data and the Ecometrics dashboard data from the glider can be viewed on the AOOS data portal at: [Ecometrics Dashboard](#). Several revisions have been completed since and an ongoing discussion on further improvements is underway for the 2023 field season. This real time dashboard capability is now being utilized for all AOOS and UAF glider activities in the region and is available to others operating gliders in Alaska waters.

Axiom also provided data management support to the UAF Glider Team for standardization of glider data to the Integrated Ocean Observing System (IOOS) Data Assembly Center (DAC) requirements and for real-time streaming through the AOOS Ocean Data Explorer. Axiom has gained access to the Teledyne Webb Research SFMC dockserver and configured metadata for the eco and echometric parameters in a JSON file format, which was submitted and served via the IOOS Glider DAC.

The project PIs are involved with the formation of the Acoustic Brain User Group (ABUG) that has fostered collaboration with the University of South Florida Ocean Technology Group, another user of the glider based Simrad echosounder and a contributing member of the Gulf of Mexico Ocean Observing System (GCOOS) Regional Association (RA). An abstract was submitted to the 2022 Alaska Marine Science Symposium (AMSS) entitled “Adding echosounders and an acoustic brain to characterize water column biomass distributions.”

Problems/delays

None

Other Core Observation Activities

- **Ecosystem Moorings**

Summary of Activities

AOOS funds the support of four ecosystem moorings in Alaska (Chukchi Sea Ecosystem Observatory [CEO], Gulf of Alaska Ecosystem Observatory [GEO], and M2 and M8 in the Bering Sea. All GEO moorings were recovered, however the water sampler frame at the top of the GEO2 mooring had corroded and we lost a year of data from a few sensors. An insurance claim has been approved and the lost sensors are being replaced, although the loss of data and samples are irreplaceable. We recovered all three deployed CEO moorings (From 2020 and 2021 deployments) and we deployed two new taut wire moorings and one tripod. We found that the acoustic zooplankton fish profiler (AZFP) instrument from the CEO suffered a breach of pressure through an end-cap connector; this instrument is being shipped back to ASL for repairs. Orders have been placed for new instrumentation, batteries and other consumables, and sensors shipped for calibration and service. Download of passive acoustic data is pending access to interface cable. Expected late January 2023. Data returns from the CEO deployment were generally excellent (up to 2 full years of data from most sensors deployed in 2020), with the exception of the SUNA instrument, which did not record any data due to a programming error.

All tasks on track.

Accomplishments/successes

We deployed a bottom-landing tripod at CEO from United States Coast Guard (USCGC) *Healy* during the first leg of the National Science Foundation (NSF)'s Synoptic Arctic Survey cruise. The tripod configuration allows us to move our acoustic sensors much closer to the seafloor and has an experimental time lapse camera that is collecting photographs of the seafloor and animals near the seafloor.

We have received notice that the third phase of the Arctic Marine Biodiversity Observation Network (AMBON) project is funded and that the Office of Naval Research (ONR) is willing to pay up to 8 days of ship time on R/V *Sikuliaq* over 2024-2027. This major support will allow us to reliably plan for the CEO turnaround for the next few years – a key strength for maintaining the CEO program.

The North Pacific Research Board (NPRB) has approved an additional five years of funding for the CEO project, with a 10% increase in the base funding level. We greatly appreciate the continued support from the NPRB.

Problems/delays

The water sampler frame at the top of the GEO2 mooring had corroded and we lost a year of data from a few sensors. An insurance claim has been approved and the lost sensors are being replaced, although the loss of data and samples are irreplaceable.

● **Wave Buoys**

Summary of Activities

Most tasks are on track with one delay. AOOS currently operates one wave buoy in lower Cook Inlet and one seasonal wave buoy off the Port of Nome. The Cook Inlet buoy operated throughout 2022 with no issues. The seasonal Nome wave buoy was deployed July 31 and operated through October 12, 2022, following a two-year absence (the 2020 deployment was cut short due to a buoy flooding issue, and the buoy was not deployed in 2021). We expect to make buoy supply purchases in the winter and spring of 2023 with Coastal Data Information Program (CDIP) coordination based on operational needs for the two existing Alaska CDIP buoys in Nome and Cook Inlet (e.g., mooring hardware, acoustic releases, antenna replacements). The Bristol Bay CDIP buoy deployment is delayed and a contract for CDIP buoy support has not been successful.

Accomplishments/successes

The Nome CDIP buoy was successfully deployed July 31, 2023 and remained operational throughout its seasonal deployment until it was recovered on October 12, 2023. Most notable was that it operated without interruption during the fall Merbok Tropical Storm event that impacted the Bering Sea and Bering Strait regions with strong winds, waves, and coastal inundation in mid-September 2023. The powerful storm waves that impacted western Alaska September 16 - 20, 2023 were recorded at the CDIP 241 Nome station, where waves recorded a maximum H_s (significant wave height) of 5.63 meters (m), with a maximum individual wave of 9.69 m. The water level recorded at the Nome National Water Level Observation Network (NWLON) station exceeded 3 m mean lower low water (MLLW) during this event, its highest recorded water level since 1974. CDIP posted a bulletin that provided a summary of the complete detailed wave data available at <https://cdip.ucsd.edu/themes/cdip?&d2=p12>. Though a challenging asset to maintain, the CDIP 241 Nome station continues to be a successful collaborative effort between AOOS, the Port of Nome, and CDIP operating under United States Army Corps of Engineers (USACE) sponsorship. The buoy provided valuable real time data to local communities, mariners, and the National Weather Service (NWS) throughout the 2023 unprecedented storm event, and has spurred renewed interest in acquiring more real time wave observational assets for this region.

Problems/delays

Contracts for CDIP buoy support have been drafted, but we have not identified a contractor(s) who is interested in taking on the intermittent tasks required to complete the limited CDIP buoy operations in Alaska. For now, we are continuing to contract directly with vessel support partners for immediate needs to rescue stray buoys and to complete turnaround operations as done in the past. AOOS currently operates two

CDIP buoys in Alaska. The NREL owned Kodiak buoy is no longer deployed and there are no plans to redeploy at this location. We had plans to deploy a wave buoy in Bristol Bay in summer 2022, but this deployment is delayed due to a lack of identified vessel and logistical support for the Bristol Bay deployment and recovery operations in 2022. CDIP and the USACE is still very interested in deploying in Bristol Bay and willing to help with costs. We continue to assess and are looking at a possible deployment in 2023, but are reconsidering this deployment location due to lack of logistical support in this remote region. We may also consider using lower cost wave buoys that are also less logistically difficult to deploy and recover for future deployments (Sofar Spotter Wave Buoys). AOOS is currently funded on an external project testing community stewarded wave buoy operations using Sofar technologies.

- **Passive Acoustic Monitoring**

- Summary of Activities

- The fall cruise on the NOAA Ship *Oscar Dyson* was canceled due to engine failure, but R/V *Sikulialq* was able to salvage most Distributed Biological Observatory (DBO) sites. The raw data was extracted from recorders and converted into standardized audio files, and temperature data is available. The level-one data analysis (daily occurrence) and noise metric analysis is partially complete for the mid frequency band (bowhead, gray, right, humpback, and fin whales, walrus, vessels, airguns). One more DBO mooring retrieved last year was completed (DBO4 2019-20); the second mooring will be completed this spring. The fin whale autodetector will be run this spring as well. The daily occurrence data for the two moorings analyzed with Year 1 funding will be submitted March 2023; the two analyzed with this Year 2 funding will be submitted March 2024. A few recorders that came back from the *Oscar Dyson* are still clean and calibrated, the majority of the rest returned to Seattle in December and should be finished by the end of February 2023. Noise metrics delayed since they require the high frequency band species to be analyzed first.

- Accomplishments/successes

- The data we have been collecting, processing, and analyzing at DBO sites 2 and 3 have been integral to a paper lead by Dr. Trevor Joyce at the NOAA Southwest Fisheries Science Center (SWFSC): ‘*The role of sea ice in the distribution, habitat use, and phenology of eastern North Pacific gray whales*’. The paper has just come back from review with minor revisions, so we anticipate its publication before the end of this funding cycle. Our data, along with aerial survey results, support the hypothesis that sea ice can affect the reproductive success of gray whales by blocking access to foraging hotspot areas. Our data also led to the development of an alternative hypothesis, whereby the timing of the ice retreat also influences the availability of energetically rich prey. Further analyses of data past September 2019 at these two DBO sites can provide additional data during this continuation of the gray whale Unusual Mortality Event (UME).

- Problems/delays

- The fall cruise on the NOAA Ship *Oscar Dyson* was canceled due to engine failure, but R/V *Sikulialq* was able to salvage most DBO sites.

- **Ship-based Surveys**

- Summary of Activities

- AOOS funds several ship-based surveys in Alaska including the Seward Line, Kenai Fjords Ocean Tracking Network (OTN), and Lower Cook Inlet.

- Seward Line:** All tasks are on track. Sampling along the Seward Line ship transect was completed September 10-14 (GAK1-15). All stations along the Seward Line were sampled, including minor “physics-only” stations. Western Prince William Sound stations, Icy Bay, and Montague Strait stations were also completed.

- Kenai Fjords OTN:** Acoustic receiver has been received and the plan was deployment in 2022. However, illness prevented the PI from accomplishing this. The deployment and testing of the receiver will take place in 2023.

Lower Cook Inlet Observing: All tasks are on track.

Accomplishments/successes

Mean temperatures along the Seward Line in the upper 100 m during September 2023 were 0.23°C above the 25-year Seward Line fall average. There was elevated chlorophyll at several stations, suggesting a fall bloom was underway at the time of sampling. The zooplankton community was typical of this time of year.

Problems/delays

Kenai Fjords OTN - deployment of the acoustic receiver due to PI illness that prevented deployment before winter. Deployment will be done in 2023 as soon as conditions allow.

- **Shore-based Surveys**

Summary of Activities

AOOS funds the support of shore-based projects across Alaska.

Coastal Hazards/Alaska Water Level Watch (AWLW): All tasks are on track. Multiple AWLW Steering Committee members participated and presented at the 2022 Alaska Coastal and Ocean Mapping Summit on November 16-17, 2022 (link provides access to summit presentations and the final report). The semi-annual AWLW Steering Committee meeting was held on December 5, 2023 (in person and virtual) lead by Jacquelyn Overbeck (now the NOAA Alaska Regional Geospatial Coordinator). During this meeting, the AWLW Guidance Plan for new members (3) was reviewed, and we discussed AWLW Data Portal topics (updates, new data types, next steps for portal tool development, tidal datums) and discussed use of the AWLW data and AWLW Data Portal during the Merbok Storm event. Alaska Department of Natural Resources Department of Geological and Geophysical Surveys (ADNR-DGGS) maintained the operational capacity of their nine AOOS supported alternative water level stations in Alaska, including two new stations in Kipnuk and Kivalina. They replaced water level sensors at existing sites in Tununak and Homer and relocated a live stream “coastal-change” video camera in Napakiak.

Multiple community Hydroball bathymetric surveys were also completed during the summer of 2022 in western Alaska at Kwigillingok, Kipnuk, Chefornak, Stebbins, and Saint Michael. Hydroball bathymetry data from these surveys are currently under review by the new ADNR-DGGS project Lead Autumn Poisson. ADNR-DGGS will publish the raw bathymetry data collected with the Hydroball this past summer publicly on the ADNR-DGGS website. 2021 and 2022 Hydroball data are also being evaluated by NOAA and processed through the workflow Hadley Owen (the Alaska Region Navigation Manager) put together for submission to National Center for Environmental Information (NCEI). ADNR-DGGS will provide NOAA with the 2022 data for further processing and NCEI submittal as was done for 2021 data. Field support liaison Harper Umfress at NOAA and Keith Horen (ADNR) are the points of contact for data processing assistance for these efforts. Finally, the DGGS participated in a multi-agency effort to collect storm data after the Bering Region Merbok Storm event in September 2022, and though these activities were not funded by AOOS, they will benefit the AOOS data repositories on this event.

AIS Weather Stations with Marine Exchange of Alaska (MXAK): All tasks are on track. A time-lapse web-camera was installed at Homer Spit in August 2022. This new component to the AIS Weather Stations project will co-locate time-lapse cameras at AIS locations in ports and harbors. When accessing the imagery, the data-user will be able to run time-lapse image loops for various time periods, to see how conditions might be changing. AOOS will be working on getting these optical MDA (maritime domain awareness) camera imagery incorporated into the AOOS Data View links for maritime conditions in ports and harbors (on the AOOS Webpage) in 2023. Also, all installed AIS weather sensors are now the new Gill Windsonic M/Metpak Pro, which is an upgraded version of the Maximet sensor. That replacement upgrade across all stations is now completed. These sensors were found to have better specifications, including increased accuracy and lower power consumption and lower EMI (Electromagnetic Interference – noise) during the sensor evaluation performed in July 2018.

Prince William Sound (PWS) Weather & Fish Monitoring: Service of Snotel stations were completed in fall 2022. Swapping out of the Cordova conductivity sensor was accomplished in September 2022. All

milestones for maintenance of the fish acoustic arrays in PWS are on track to be completed in early 2023.

Valdez NWLON Conductivity, Temperature, and Depth instrument (CTD): All tasks are on track. The CTD sensor was installed in November of 2022 and has been continuously operational. Significant support was provided by the NOAA Seattle Instrument (Tide Gauge) Lab to install the sensor at their Valdez NWLON site. The CTD sensor was shipped to Seattle and the Lab configured it to work within their system. The Lab staff made a site visit to Valdez to work on their equipment and installed a power supply they built for the sensor in their equipment building. Data are being shared through the AOOS Ocean Data Explorer Data Portal, at NOAA's Tides & Currents Ports page for Valdez, and NOAA's Tides & Currents Valdez, AK station page.

Accomplishments/successes

During this reporting period, western Alaska experienced a strong storm event related to Extra-Tropical Cyclone Merbok, which impacted significant areas of the Alaska coastline. NWLON operates 3 stations in the Bering region, and the AWLW has contributed an additional 10 non-NWLON water level observing stations to the region. Keeping all these non-NWLON water level stations operational simultaneously year-round is challenging. Six ADNR-DGGS/AOOS water level stations and four AOOS supported water level sites in western Alaska were fully operational during the open water ice free months, and performed without any issues during the 2022 Merbok Bering Storm (September 16, 2023) event, providing valuable real time water level information during the storm. In addition, 11 AIS weather stations operating in the Bering region were also fully operational and contributed to the NWS forecast data inputs through the National Data Buoy Center (NDBC).

Problems/delays

Ex-Typhoon Merbok pinpointed the value of the AWLW auxiliary water level observations in western Alaska, but also highlighted some of the challenges we face in delivery of that water level data to our users since these data are not included as part of the NWLON data delivery site NOAA Center for Operational Oceanographic Products and Services (CO-OPS) operates. This was a point of discussion at the December 2022 Steering Committee meeting and steps are being drafted to resolve some of these issues going forward. Jacquelyn Overbeck, the AWLW Lead, has transitioned from the AOOS Coastal Hazards Project Lead having left the State of Alaska (ADNR-DGGS) for a new position with the NOAA Office for Coastal Management. Since that transition, she has confirmed she can continue to lead the AWLW in the new role. Beginning in 2023, ADNR-DGGS will no longer facilitate the AWLW, including the AWLW steering committee and general meeting activities, but will remain a participant in these activities. Facilitation has been moved to the NOAA Office for Coastal Management by the Alaska Regional Geospatial Coordinator (Overbeck) and will be assumed as part of her Federal role. Autumn Poisson is currently acting Lead for the ADNR Coastal Hazards project with AOOS.

Following this report, Annual Arctic AIS updates provided for inclusion on the AIS Prioritizing Arctic Charting (PAC) and AOOS data portals will no longer be a project and is complete. MXAK is unable to provide data in 2022 due to privacy and data-use issues, and can no longer provide the data for this effort. Instead, funds for this activity are being used to create Annual Alaska Maritime Activity Reports using AIS data received by MXAK's terrestrial vessel tracking network. This report will instead provide annual graphical reports of maritime activity in Alaska for posting on the AOOS website and will aid assessment of where AOOS services can be of value to the maritime community. This report will be submitted annually by the end of the reporting period for each fiscal year (June) and replaces the AIS data project going forward.

- **Data**

Summary of Activities

The Sea Ice Atlas project: project is completed for this reporting period; National Snow and Ice Data Center (NSIDC) sea ice concentration data were updated in May 2022; the database is now complete through December 2021, and based on NSIDC's past release schedules, we anticipate that the remainder of the 2022 data will be available in February or March of 2023.

The Indigenous Sentinel Network (ISN): The Aleut Community of St. Paul Island (ACSPI) are currently modifying the statement of work with Axiom to be responsive to the feedback received from the Indigenous Sentinels Advisory Assembly (ISAA). We have been in communication with several members of the Axiom team (A. Canino, C. Turner, J. Sonnier) via email and have met once virtually to plan our upcoming meetings and timeline. We have suggested the following: a series of conversations between Axiom and the ISN team to explore some of the following: relationships between AOOS and /or Tribal portals; how AOOS/Axiom deals with data sovereignty currently and future efforts; Axiom data sharing agreements (what's in place, what's possible, where would you like to go); how to deal with data requests and interactions with tribes; federal guidelines for data sharing (is it all open data on AOOS portals now, can we support development of that); the data management section on AOOS website; Axiom's data use policy/procedures.

Accomplishments/successes

The Historical Sea Atlas was highlighted online by NOAA's National Ocean Service at <https://oceanservice.noaa.gov/news/mar14/alaska-sea-ice.html>

Problems/delays

None.

● **Harmful Algal Bloom (HAB) and Ocean Acidification (OA) Programs**

Summary of Activities

Continued coordination of the Alaska Harmful Algal Bloom (AHAB) network: monthly meetings with 30+ participants to share updates and HAB-related news among network members, creating connections between network members for development of new projects and proposals, helping network members identify and apply for funding to do HAB monitoring and research.

- Developing the Alaska HAB database in the AOOS ODE, starting with a map of sampling locations.
- Integration with the Phytoplankton Monitoring Network database.
- Testing out of new approaches and technologies, such as the HABscope, and DNA based detection of toxic algal blooms.
- The AOOS AHAB coordinator (Thomas Farrugia) was chosen to be a member of the National HAB Observing Network Community of Practice Steering Committee, which discusses the national-level approach to HAB monitoring and research.
- With the help of Alaska Conservation Foundation (ACF), onboarded partner communities into the HAB sampling pilot project using the ACF payment system.
- HAB sampling was performed in four communities, payments were provided for their work, and the data was entered into the Phytoplankton Monitoring Network database, which will eventually be connected to the Alaska HAB portal on the AOOS ODE.
- Axiom has been working with AOOS staff to stand up a dedicated Research Workspace campaign to ensure that data produced and consolidated through the AHAB network efforts are organized and available. Axiom and AOOS continue to work together to submit data sets to the NOAA NCEI repository.
- Axiom has been working on developing and maintaining a prototype sea surface temperature (SST) product in the AOOS data portal to determine the risk of *Alexandrium* blooms based on the sea surface temperature. Axiom, AOOS, and partners at NOAA have been in communication to develop a system to routinely harvest daily Naval Coastal Ocean Model (NCOM) SST images in the form of netCDF files.
- The Alaska Ocean Acidification Network (OAN) continued facilitation of the executive committee, planning and hosting engagement events, bringing together stakeholders and scientists on specific projects, and maintaining and expanding outreach materials.
- Seward Burke-o-Lator: The continuous seawater flow from Resurrection Bay was not operated during the award period due to supply chain issues and parts. The Burke-o-Lator was used to continue to run

discrete samples collected by communities. Water samples were collected in triplicate from sites at Utqiagvik, Kotzebue, and Nome and are awaiting shipment to the Alutic Marine Pride Institute (APMI) for Dissolved Inorganic Carbon (DIC) analysis. AOOS funding also helps support a larger ocean acidification program at APMI that includes discrete sampling and monitoring of eight sites in southcentral Alaska through APMI's newly formed Chugach Regional Ocean Monitoring (CROM) Program, marine organism exposure studies at our facility, and research and development for a portable monitoring device called the "PCO 2 Go" in collaboration with the Ocean Foundation and Dr. Burke Hales of OSU.

- Sitka Burke-o-Lator: The Burke-o-Lator is operational and has been collecting continuous data from the Sitka station. The Sitka BoL intake was replaced and upgraded to decrease biofouling. There have been some mechanical setbacks with gas standards and leaks and discrete samples from communities have not been analyzed in this period. New staff at Sitka have been trained and STA will host a water quality workshop and more training in spring of 2023. Project is on track.
- Kodiak Burke-o-Lator: Kodiak Burke-o-Lator continues to stream temperature, salinity, pCO₂ and tCO₂ data. Funding to support a Burke-o-Lator tech to analyze community samples has run out so the Burke-o-Lator is running in continuous mode only and can continue through June 2023. Staff has trained a new contractor to oversee the instrument. Project is on track.
- OA Time Series: Samples from the Northern Gulf of Alaska Long Term Ecological Research (NGA-LTER) cruise have been analyzed and have been shared with project members. The GAKOA surface mooring will be turned around in spring of 2023; preliminary data are being analyzed. The M2 surface mooring was successfully recovered in September 2022. The scheduled Fall Bering Sea cruise was unfortunately canceled due to engine problems. Therefore, the CTD survey did not happen, and there are no discrete samples from the recovery period. All final autonomous data have been archived.
- OA ferry: No work was completed on this project as the ferry was not operating and the subject matter expert was no longer with the lab. A recent announcement shows the ferry will be continuing service in February 2023.

Accomplishments/successes

- The Alaska OA Network eNews has been increasing in readership and hit a 49% open rate (~1300 subscribers). eNews includes updates on monitoring activities, recent results, interviews with researchers and stakeholders, Q&A, new resources and a "good news" corner.
- Successful training of new Burke-o-Lator technicians underway in Kodiak and Seward.
- Successful mooring turnrounds for both GAKO and M2 moorings

Problems/delays

The continuous seawater flow from the Burke-o-Lator in Seward was not operated during the award period. The deep saltwater system at APMI was inoperable due to difficulty getting parts to rebuild pumps and a compromised intake. A temporary system, utilizing a near surface intake, was not suitable for the long-term monitoring program. The original intake line is expected to be reinstated as soon as possible. The CTD survey did not happen, and there are no discrete samples from the recovery period.

• **Regional Ocean Data Sharing Initiative (RODSI)**

Summary of Activities

- Under the RODSI program, AOOS and Axiom created three regional "Mariner's Dashboards" for Prince William Sound, Cook Inlet, and Kodiak. During this reporting period, enhancements were made to add NOAA marine forecasts and tide predictions as additional data fields in each of the dashboards. User feedback so far has been positive, and we continue to upgrade user features and add new weather assets in Spring 2023.
- In collaboration with UAF/International Arctic Research Center (IARC), we also released the most recent version of the Bering Science outreach publication in early June 2022.
- A follow-up webinar was held on August 9, 2022 in conjunction with the Alaska Center for Climate

Assessment and Policy (ACCAP) and can be accessed here: <https://uaf-accap.org/event/bering-science-spring-2022/>. Heather McFarland and Rick Thoman participated in several planning meetings for the 2023 Bering Science. Meetings focused on identifying a future path and structure for the report and incorporating new AOOS personnel into the project.

- Through RODSI, AOOS provided sea ice and surface current forecasts to the Sea Ice for Walrus Outlook program (SIWO). This program is a resource for Alaska Native subsistence hunters, coastal communities, and others interested in sea ice and walrus. The SIWO provides weekly reports during the spring sea ice season with information on weather and sea ice conditions relevant to walrus in the northern Bering Sea and southern Chukchi Sea regions of Alaska. We plan to continue providing sea ice and surface current forecasts to the SIWO project in spring 2023. AOOS will also attend pre-season SIWO meeting(s) to hear from observers and walrus hunters whether there are additional data/information that we can provide to the program.
- Work on a subaward for a data rescue project on trawl data from the Chukchi Sea is on track and nearing completion.
- Work is also on track, and nearly complete, on a subaward to ingest and visualize monthly Arctic Seascapes data on the Ocean Data Explorer.
- Work continues on the Bering Strait Transboundary Incident Response Tool (BSTIRT), partially funded by World Wildlife Fund (WWF) and the National Park Service (NPS) with additional leveraging from RODSI.

Accomplishments/successes

Work on the Mariner’s Dashboards included enhancements to add NOAA marine forecasts and tide predictions as additional data fields in each of the dashboards.

Problems/delays

None.

Section 2 (Non-Core Funding)

Funding amount	Funding Area /Recipient	Task
Provided \$15,000	Axiom	<p><i>HFR - Products & Data Management - Operationalize HFR Range Series file archiving through Research Workspace (in accordance with direction of IOOS Surface Currents Program Manager)</i></p> <p>Status: All tasks on track or complete. Accomplishments: Axiom is actively developing a data archiving script to process incoming HFR data to the data center; completed the inventory for HFR data archive (http://ioos-hfradar.axds.co/pages/inventory/); provided access to Research Workspace for HFR files; and ongoing moving historical HFR data to “cold” storage. Issues: No issues.</p>

Funding amount	Funding Area /Recipient	Task
Provided \$300,000	HABs	<p><i>To further HABs understanding and prediction via a pilot project to "Continue the support of a full-time AHAB coordinator ..."</i></p> <p>Status: All tasks on track.</p> <p>Accomplishments: Grew the AHAB network, continued monthly update meetings, coordinated sampling and efforts, research continued the successful pilot community sampling program for HABs, performed outreach and engagement activities, began process of updating AHAB data portal. Preparations were made for two workshops in winter and spring 2023, as well as an outreach video about HABs in Alaska.</p> <p>Issues: No travel yet due to continued concerns about covid. Potential travel in spring 2023</p>
Provided \$20,128	UAF	<p><i>HFR system wide support - support for retuning/testing/additional work by AOOS's HFR Operators to Comply with FCC Regulations.</i></p> <p>Status: On Track.</p> <p>Accomplishments: HFR systems are being recovered during winter from Wainwright and Utqiagvik (Barrow) in January 2023.</p> <p>Issues: No issues.</p>
Provided \$35,000	AOOS	<p><i>FY22 one time. These funds will be used to assist with core needs of the Regional Association.</i></p> <p>Status: AOOS hired a Director of Engagement in July 2022 and a Director of Outreach in December 2022. This \$35,000 was included in the Personnel Admin budget for AOOS.</p> <p>Accomplishments: This addition of staff will allow to AOOS to improve our outreach with stakeholders.</p> <p>Issues: None.</p>
Provided \$80,000	Axiom	<p><i>Maintain and enhance Data Access Service Software – ERDDAP</i></p> <p>Status: All tasks on track.</p> <p>Accomplishments: IOOS has spent the last two years investigating ERDDAP as the new recommended data access service, Axiom created a RoadMap that outlines the approach; ongoing bi-monthly meetings to update the v1.2 IOOS Metadata Profile; NDBC data ingestion across IOOS RAs; monthly status log emails to DMAC managers at IOOS RAs; creation of a Gold Standard examples.</p> <p>Issues: No issues.</p>

Funding amount	Funding Area /Recipient	Task
Provided \$50,000	Axiom	<p><i>Environmental Sensor Map and Global Data Integration</i></p> <p>Status: All tasks on track. Accomplishment: FY21 portal release schedule shared, bi-monthly meetings with IOOS program office; IOOS sensor map bug tracking and fixes; migration of stations to newer v2 Axiom servers; continued ingestion of real-time stations (48000+ stations) Issues: No issues.</p>
Provided \$3,000	Axiom	<p><i>Trello Subscription</i></p> <p>Status: On track. Accomplishment: Operation of Trello Board for IOOS Program Office collaboration. Issues: No issues.</p>
Provided \$10,000	Axiom	<p><i>NOAA Alaska Regional Collaboration Team to support the Cook Inlet Operational Forecast System model validation and application development</i></p> <p>*These funds were combined with \$50,000 below to support Cook Inlet model. Status: Complete. Accomplishments: Receipt and ingestion of 27 TB of data from BOEM for 10-year hindcast model; files standardized to netCDF; codebase developed to extract processed files for model visualization; developed a prototype to run trajectory scenarios for visualization and downloading. Issues: No issues.</p>
Provided \$74,348	UAF	<p><i>The funds will support a University of Alaska Fairbanks Masters student working on our Alaska ECOHAB project (PIs: Kathi Lefebvre & Don Anderson)</i></p> <p>Status: On track. Accomplishments: Master’s student Chelsea Kovalcsik has successfully completed her first semester of graduate school with a GPA of 3.70; she collected samples from 60 subsistence-harvested northern fur seals from St. Paul Island; she tested 38 fecal samples and 13 liver samples for saxotoxins and domoic acid in January 2023 at the NOAA Northwest Fisheries Science Center; she plans to test additional samples at the WARRN-West Lab in 2023. Issues: No issues.</p>

Funding amount	Funding Area /Recipient	Task
Provided \$187,691	AOOS	<p><i>"Office of Marine and Aviation Operations (OMAO) support for glider operations/UxS Project"</i></p> <p>Status: All tasks and milestones are on track for UAF, UW and Axiom Data Science.</p> <p>Accomplishments: UAF, UW: The Echodroid EAFM/OMAO glider was deployed near Seward, AK on Feb 11, 2022 and recovered in the same location on April 4, 2022 having covered 1,271 km across the Seward Hydrographic Line (60 days). All scientific sensors performed flawlessly. A second EAFM/OMAO deployment was completed on June 4, 2022 near Yakutat, AK and the glider was recovered offshore of Seward, AK on July 14, 2022 (41 days).</p> <p>Axiom Data Science: The beta version of the Ecometrics Dashboard was implemented during the February-April 2022 IYS glider deployment. Data streams for glider trajectory, current conditions, ocean parameter time series, and comparison of current conditions to World Ocean Atlas climatology across the profiles were reported through the dashboard in real time to the project website and the AOOS Data Portal.</p> <p>Issues: No issues.</p>
Provided \$244,444	Regional Ocean Partnership	<p><i>Regional Ocean Data Sharing Initiative</i></p> <p>Status: On track</p> <p>Accomplishments: Chukchi data rescue and AMBON Monthly Arctic Seascapes are nearly complete, hosted webinar on Bering Science 2022 in conjunction with the Alaska Center for Climate Assessment and Policy, work has begun for planning the next Bering Science Report, upgrades continue for the Mariner's Dashboards.</p> <p>Issues: None</p>
Provided \$19,975	AOOS	<p><i>Skipper Science Project. Developing Long-Term Pathways to Incorporate Stakeholder Local Ecological Knowledge into the Gulf of Alaska Science Advisory Process</i></p> <p>Status: On track</p> <p>Accomplishments: designed and implemented a 2.5 hour virtual Skipper Science Workshop with 18 fishermen and 22 scientists/managers. Enabled a pilot project with AFSC to collect cod stomach contents. Collected 44 data entries from fishermen across a broad range of topics.</p> <p>Issues: The contract with Salmon State could not be established because their fiscal sponsor New Venture Fund (NVF) is unable to accept and manage federal funding sources per their own internal guidelines. These funds will be reprioritized to be stipends for compensating fishermen for their participation in sample collection.</p>

Funding amount	Funding Area /Recipient	Task
Provided \$75,000	UND	<p><i>Operational Coupling of NWM with ADCIRC in Global ESTOFS (PI Johannes Westerlink, University of Notre Dame)</i></p> <p>Status: All tasks on track.</p> <p>Accomplishments: The Global STOFS upgrades are being planned/proposed to be included in the next operational upgrade of Global STOFS. External Upland Boundary river forcing and Internal Floodplain coupled forcing is being implemented into the Global STOFS v3.0 mesh. All NWM river network intersections with ADCIRC resolved rivers across the upland ADCIRC domain boundary have been made suitable to accept specified discharges from the NWM. Smaller than 120 m NWM channels that penetrate into the finite element mesh and/or originate within the coastal floodplain inside of our finite element mesh have NWM channel intersection points identified within the ADCIRC resolved channel network and have been set up to receive NWM specified flows as source points. Rainfall directly over water within the ADCIRC mesh is handled as a distributed input and is obtained from meteorological rainfall rate fields. These modifications and coupling points are being ported to the Global STOFS v3.0 mesh.</p> <p>NWM external and internal coupling have been implemented in ADCIRC v55 and this task is complete. Coding has been ported into ADCIRC v55 to force internal source terms located inside ADCIRC resolved rivers to receive NWM flows from unresolved channel inflows originating from outside or inside the domain. Two rainfall rate terms over areas that are wet have been added into ADCIRC v55. Modified ADCIRC v55 will be uploaded onto GitHub and this branch will be merged into the release version.</p> <p>Tropical storm validation cases with the Global STOFS to NWM coupling includes six hindcast historical hurricanes forced with tides, meteorology (CFSv2+OWI reanalysis), wind waves from SWAN, and NWM riverine flows for the updated U.S. East and Gulf of Mexico Coast mesh. Broadly we see significant improvements, especially in upland river sections.</p> <p>Issue: No issues.</p>
Provided \$50,000	Axiom	<p><i>Funds to support Cook Inlet model hindcast and information product efforts.</i></p> <p>*These funds were combined with \$10,000 above to support Cook Inlet model.</p> <p>Status: Complete.</p> <p>Accomplishments: Receipt and ingestion of 27 TB of data from BOEM for 10-year hindcast model; files standardized to netCDF; codebase developed to extract processed files for model visualization; developed a prototype to run trajectory scenarios for visualization and downloading.</p> <p>Issues: No issues.</p>

Funding amount	Funding Area /Recipient	Task
\$85,000	Ocean Acidification	<p><i>OAP allotment of FY22 project resources in support of the NOAA Ocean Acidification Observing Network (NOA-ON) GAKAO (PI Monacci, University of Alaska at Fairbanks)</i></p> <p>Status: on track Accomplishments: The GAKOA surface mooring is set to be turned around in spring 2023. Seawater samples collected at the moored sensor sites at GAKOA and GAK1 are collected during monthly sampling missions aboard the R/V <i>Nanuq</i>. Issues: No issues</p>
\$85,000	Ocean Acidification	<p><i>OAP allotment of FY22 project resources in support of the NOAA Ocean Acidification Observing Network (NOA-ON) M2 (PI Monacci, University of Alaska at Fairbanks)</i></p> <p>Status: On track Accomplishments: The M2 surface mooring was successfully recovered in September 2022 during an EcoFOCI charter cruise. Issue: The scheduled fall Bering Sea cruise was canceled due to engine problems. Therefore, the CTD survey did not happen and there are no discrete samples from the recovery period. Issues: No issues.</p>
\$42,590	Ocean Acidification	<p><i>OAP allotment of FY22 project resources in support of the Alaska Ocean Acidification Network (PI Dugan, AOOS)</i></p> <p>Status: On track Accomplishments: Facilitated meetings, produced new outreach materials, developed strategic plan, continued strengthening partnerships with industry. Issues: In-person samplers meeting postponed till spring due to scheduling conflicts with samplers and researchers in February.</p>
\$29,925	AOOS	<p><i>Funds to support coordinating and administration support by the Alaska Conservation Foundation for fishermen and community members contributing to climate and Ocean Acidification work/workshops.</i></p> <p>Status: On track Accomplishments: ACF prepared to compensate attendees for this meeting planned for March of 2023. Issues: Assistance was not needed to support the first OA workshop as the PIs worked directly with the Kodiak Area Native Association to organize focus groups.</p>

PROJECT CHALLENGES/MODIFICATIONS

The AOOS staff has been very busy this reporting period! There were several competing major tasks this period, notably the BIL proposal and the data recertification process, in addition to the Year 2 non-core disbursement. The non-core disbursement is particularly challenging because the number of drawlines and

different organizations to whom the funds are being passed. In general, we have not had new organizations, but that does take extra time for ASLC to administer the subawards. We have discussed modifying our fiscal sponsorship calculation of fees to be more simple and consistent, as well as adding AOOS administrative labor to these pass-throughs.

PUBLICATIONS

Crance, J.L., Berchok, C.L., Kimber, B.M., Harlacher, J.M., Braen, E.K. and Ferguson, M.C., 2022. Year-round distribution of bearded seals, *Erignathus barbatus*, throughout the Alaskan Chukchi and northern Bering Sea. *Deep Sea Research Part II: Topical Studies in Oceanography*, 206, p.105215. Open access at <https://doi.org/10.1016/j.dsr2.2022.105215>.

Cypher, A.D., H. Statscewich, R. Campbell, S. Danielson, J. Eiler, M.A. Bishop. In press. Detection efficiency of an autonomous underwater glider carrying an integrated acoustic receiver for acoustically tagged Pacific herring. *ICES Journal of Marine Science*.

Danielson, S., Grebmeier, J., Iken, K., Berchok, C., Britt, L., Dunton, K., Eisner, L., Farley, E., Fujiwara, A., Hauser, D. and Itoh, M., 2022. Monitoring Alaskan Arctic Shelf Ecosystems Through Collaborative Observation Networks. *Oceanography*.

Danielson, S.L., Hennon, T.D., Monson, D.H., Suryan, R.M., Campbell, R.W., Baird, S.J., Holderied, K., Weingartner, T.J., 2022. Temperature variations in the northern Gulf of Alaska across synoptic to century-long time scales. *Deep Sea Res. II.* 203, 105155.

Danielson, S.D, T. D. Hennon, D. H. Monson, R. M. Suryan, R. W. Campbell, S. J. Baird, K. Holderied, T. J. Weingartner. 2022. Temperature variations in the northern Gulf of Alaska across synoptic to century-long time scales. *Deep Sea Research Part II: Topical Studies in Oceanography*, Volume 203. <https://doi.org/10.1016/j.dsr2.2022.105155>

Ducklow, H.W., Cimino, M., Dunton, K.O., Hopcroft, R.R., Ji, R., Miller, A., Sosik, H.M., 2022. Marine coastal pelagic ecosystem responses to climate variability and change. *Bioscience* 72, 827-850.

Farley, E., Danielson, S., Horne, J., McCammon, M., “Demonstrating operational readiness of AUV-based ecosystem monitoring through a field program supporting the International Year of the Salmon”, UxS Operations Center Project briefing, NOAA, July 2022.

González, S., Horne, J.K., Danielson, S.L., Lieber, L. and López, G., 2022. Representative range of acoustic point source measurements in the Chukchi Sea. *Elementa: Science of the Anthropocene*, 10(1)

Hales, Burke (2022). High-resolution record of surface seawater carbon dioxide (CO₂) content, water temperature, sea surface salinity and other parameters collected in Sitka Harbor, Alaska, USA from 2017-06-01 to 2021-04-27 (NCEI Accession 0247208). [indicate subset used]. NOAA National Centers for Environmental Information. Dataset. <https://doi.org/10.25921/9vvnv-0g64>. Accessed [date].

Horne, J. Danielson, S., Statscewich, H., Cermak, R., Farley, E., Stone, B., Wilcox, K., “Characterizing pelagic Salmon, their potential prey field, and environmental conditions in near-real-time from an underwater glider”, Underwater Glider User Group Conference, September 2022, Seattle, WA.

María Teresa Contreras Vargas, Damrongsak Wirasaet, Guoming Ling, Coleman Blakely, Joannes J Westerink, Kendra M Dresback, Christine Szpilka, Edward Payson Myers, Saeed Moghimi, Gregory N Seroka, Yuji Funakoshi, Lei Shi, Eirik Valseth, Clint Dawson, Christopher Massey, Margaret B Owensby, “Understanding the Coupled Effect of Upland Hydrology and Ocean Hydrodynamics During Extreme Events Along the East and Gulf of Mexico Coasts of the US,” Fall Meeting AGU, Chicago IL, December 12, 2022.

McKinstry, C.A.E, R.W. Campbell, and K. Holderied. 2022. Influence of the 2014–2016 marine heatwave on seasonal zooplankton community structure and abundance in the lower Cook Inlet, Alaska. *Deep Sea Research Part II: Topical Studies in Oceanography*, Volume 195. <https://doi.org/10.1016/j.dsr2.2021.105012>.

Sandy, S.J., 2022. Acoustic Detection and Characterization of Sea Ice and Surface Waves in the Northeast

Chukchi Sea (MS Thesis, University of Alaska Fairbanks)

Stafford KM, Statscewich H, Baumgartner MF, Danielson SL. 2022. Eavesdropping on the northward range expansion of subarctic marine mammals into the Arctic with underwater gliders. Presentation at the International Conference on Underwater Acoustics 2022, 20-23 June 2022, Southampton UK.

Statscewich H, Stafford K, Baumgartner M, Danielson S. Marine mammal distribution and habitat in the eastern Chukchi Sea during 2015-2020 observed from a Slocum ocean glider. Alaska Marine Science Symposium Anchorage AK 2022.

Walsh, J. E., H. Eicken., M. Johnson and K. Redilla, 2022: Sea ice breakup and freeze-up indicators for users of the Arctic coastal environment. The Cryosphere (submitted).

Weems, J., Nault, A., Gaeuman, W., Statscewich, H., Danielson, S., "Acoustic Tracking of southern Tanner Crab (*Chionoecetes bairdi*) near Kodiak, Alaska using an autonomous underwater glider", Alaska Marine Science Symposium poster, January 2023.

Whitehead, Chris; Evans, Wiley; Lanphier, Kari; Peterson, Willoughby; Kennedy, Esther;

EDUCATION, MEDIA, ENGAGEMENT, and OUTREACH

AOOS has been busy with outreach and education in this reporting period. In April 2022, AOOS announced a position for an outreach position. This position description was written to be open to a full or part-time position so that we could "cast a net" for the right person(s). We had 21 applicants, 11 of whom were asked for an interview. We interviewed four of those 11. Based on the interviews, we selected two full-time positions. Megan Onders was hired as the Director of Engagement in Jul 2022 and Alice Bailey was hired as the Director of Outreach in Dec 2022. Megan resigned in Jan 2023, so we will be evaluating if we need a second person at this time.

We have also signed a Memorandum of Understanding (MOU) with the Alaska Native Science & Engineering Program (ANSEP). We are facilitating the hiring of interns for our PIs through the ANSEP Summer Bridge program (<https://www.ansep.net/component/summer-bridge/>) under the Bipartisan Infrastructure Law (BIL).

Below is a list of events in which we participated:

- AHAB monthly meetings
- Alaska Marine Policy Form bi-monthly meetings
- North Pacific Fisheries Management Council Public meeting – Jul 2022
- Alaska Eskimo Whaling Commission – Jul & Dec 2022; Feb 2023
- Interdisciplinary Research for Arctic Coastal Environments (InterFACE) workshop – Aug 2022
- Ted Stevens Center for Arctic Security Studies Multidisciplinary Roundtable – Sep 2022
- PICES TCODE Workshop – Sep 2022
- 5th NHABON Webinar: Remote Sensing, Observing and Forecast Using Drones, Hyperspectral Sensors and Satellites – Sep 2022
- Ocean Knowledge Radio Show on KNOM (every two weeks) – Oct-Nov 2022
- Kasitsna Bay and Lower Cook Inlet Marine Ecosystem Workgroup – Oct 2022
- Young Hunters Walrus Workshop – Oct 2022
- Indigenous Peoples Council of Marine Mammals (IPCoMM) Board meeting – Oct 2022
- Alaska Federal of Natives Annual Symposium – Nov 2022
- Arctic Research Consortium of the United States (ARCUS) annual meeting – Nov 2022
- IOOS Fall meeting – Nov 2022
- Gulf Watch of Alaska Workshop – Nov 2022
- Alaska Coastal Mapping Summit – Nov 2022
- Norton Sound Economic Development Corporation – Dec 2022
- Marine Mammal Response Working Group – Dec 2022

- City of Teller City Council Meeting – Dec 2022
- Alaska Marine Science Symposium - Jan 2023
- Cook Inlet Beluga Whale Task Force - Jan 2023

PRODUCT DELIVERY

- Three regional “Mariner’s Dashboards” for Prince William Sound, Cook Inlet, and Kodiak were released in Spring 2022 to provide mariners a user-friendly interface to find weather observations relevant to making boating decisions. User feedback so far has been positive, and we continue to upgrade user features and add new weather assets for Spring 2023.
- Through RODSI, AOOS plans to continue to provide sea ice and surface current forecasts to the Sea Ice for Walrus Outlook program (SIWO) in Spring 2023.
- The BSTIRT is underway. While the prototype is not live yet, work continues on the user interface and will be available for the next reporting period.

CERTIFICATION UPDATES

Employee updates:

- Megan Onders was hired as the Director of Engagement July 2022. Megan resigned on Jan 27, 2023. We will evaluate if her position will be re-advertised.
- Alice Bailey was hired as the Director Outreach December 2022.
- With the addition of these personnel, Holly Kent is transitioning to a single title of Director of Administration and will continue to take on more tasks related to grant administration.
- Jill Prewitt reduced hours to 15-20 hours per week for the months of December 2022 and January 2023. We are evaluating her return for February 2022.

Revised bylaws:

- At the September 29, 2022 Fall Board meeting, the following changes were made and approved to the AOOS Operating Procedures:
 - Addition a Board Reimbursement of Expenses Policy
 - Addition of a Diversity, Equity, Inclusion, and Accessibility Policy
 - Updated the IOOS Authorization Legislation Coordinated Ocean Observations and Research Act of 2020
 - Removal of the Data Management and Communications Advisory Panel Terms of Reference

Certification website updates:

- AOOS updated documents for recertification in 2022. The recertification application for AOOS was approved in December 2022. We are waiting on the signed Memorandum of Agreement (MOA) from IOOS/NOAA. Once this has been finalized, the AOOS website will be updated with the final documents. NOAA Certification page found here and showing the prior 2017 AOOS Certification documents:
<https://aoos.org/about/resources/>

BUDGET SUMMARY

- Overall, our budget is tracking very well. We will likely need to make some changes to the distribution of the AWLW funds between ADNR-DGGS and JOA Surveys, as ADNR-DGGS does not have the capacity for management of these tasks.
- As noted above, our biggest challenge is keeping up with the number of cooperative agreements and associated management. With the expected NOAA Hurricane Supplemental, Inflation Reduction Act, and now BIL, the complexity of our AOOS operations will only get more complicated. AOOS has asked that ASLC look at current staffing to ensure they have can meet the needs of AOOS and the other organizations for whom they provide fiscal sponsorship.
- We will be adding administrative labor for AOOS staff for many of the pass-throughs coming through our NOAA Cooperative Agreement, as the 5% fee processed by the ASLC covers only some of the ASLC work on this and none of AOOS.

EQUIPMENT

Equipment purchases charged to the award are detailed in the table below.

Equipment	Serial Number	Use Description	Cost
Hull section	N/A	Extended length hull for increased buoyancy and large batteries	\$6,889.00
Sound Trap	6996	Monitoring underwater sound	\$5,100
Hydrobios Sed Trap Electronics	N/A	Sediment trap computer and power pack to refurbish an existing sediment trap.	\$12,825
Sea-Bird CTD Sensor	37-23136	Salinity Sensor	\$7,742.50

Travel during this period included:

- Sheyna Wisdom, Megan Onders, Jill Prewitt, Alice Bailey, Seth Danielson (UAF), and Beth Spangler (ANSEP) traveled to Utqiagvik, AK for the NSF Backyard Buoys Co-Production Workshop in August 2022.
- Sheyna Wisdom traveled to Fairbanks in August 2022 to meet with Dr. Rick Spinrad at the UAF campus.
- Jill Prewitt traveled to Busan, South Korea for the PICES TCODE Workshop in September 2022.
- Megan Onders traveled to Washington, DC for the Bristol Bay Salmon Week Reception in September 2022.
- Megan Onders traveled to Nome, AK for the Young Hunters Walrus Summit in October 2022.
- Sheyna Wisdom, Holly Kent, and Molly McCammon traveled to San Juan, PR for the IOOS Fall meeting.

BUDGET SUMMARY				
Cost Categories	Funding Provided	Funds Spent	Unspent funds remaining	Remaining %
Personnel	1,183,552	544,653	638,899	54%
Fringe	324,818	103,537	221,281	68%
Travel	65,166	26,965	38,201	59%
Equipment	64,497	35,903	28,594	44%
Supplies	63,781	54,159	9,622	15%
Contractual	1,618,549	1,077,653	540,896	33%
Other	4,767,200	1,869,453	2,897,747	61%
Total Direct Charges	8,087,563	3,712,323	4,375,240	54%

SUCCESS STORIES

Success Story Brief Description	Contact
The Historical Sea Atlas was highlighted online by NOAA's National Ocean Service at https://oceanservice.noaa.gov/news/mar14/alaska-sea-ice.html	John Walsh/ UAF-IARC
We deployed a bottom-landing tripod at CEO from USCGC Healy during the first leg of the NSF's Synoptic Arctic Survey cruise. The tripod configuration allows us to move our acoustic sensors much closer to the seafloor and has an experimental time lapse camera that is collecting photographs of the seafloor and animals near the seafloor.	Seth Danielson/ UAF

Success Story Brief Description	Contact
<p>We have received notice that the third phase of the AMBON project is funded and that the Office of Naval Research (ONR) is willing to pay up to 8 days of ship time on R/V Sikuliaq over 2024-2027. This major support will allow us to reliably plan for the CEO turnaround for the next few years – a key strength for maintaining the CEO program.</p>	<p>Seth Danielson/ UAF</p>
<p>The North Pacific Research Board has approved an additional five years of funding for the CEO project, with a 10% increase in the base funding level. We greatly appreciate the continued support from the NPRB.</p>	<p>Seth Danielson/ UAF</p>
<p>The data we have been collecting, processing, and analyzing at DBO sites 2 and 3 have been integral to a paper lead by Dr. Trevor Joyce at the NOAA SW Fisheries Science center: ‘The role of sea ice in the distribution, habitat use, and phenology of eastern North Pacific gray whales’; we anticipate its publication before the end of this funding cycle. Our data, along with aerial survey results, support the hypothesis that sea ice can affect the reproductive success of gray whales by blocking access to foraging hotspot areas. Our data also led to the development of an alternative hypothesis, whereby the timing of the ice retreat also influences the availability of energetically rich prey.</p>	<p>Catherine Berchok/ NOAA MML</p>
<p>Ms. Kovalcsik’s thesis work on St. Paul Island had tremendous community support – with community members actively participating in sample collection, engaging with Ms. Kovalcsik and her project and colleagues, and eagerly looking forward to the results. Ms. Kovalcsik’s thesis work was fortunately able to include youth interns and Island Sentinels of all ages. This bolstered the strength of the project and allowed for a greater number of samples harvested as well as strengthened the relationship with the Aleut Community of St. Paul Island.</p>	<p>Lauren Divine/ ACSPI</p>