



NOAA 'Omics Strategy Report, FY25 Q1

provided to the NOAA Science Council by the NOAA 'Omics Working Group

Projects

- **Genomics Reveals the Traverse of Japanese Sardine into the Eastern Pacific.** A [manuscript in Molecular Ecology](#) describes the first detection of Japanese Sardine (*Sardinops melanosticta*) in the California Current ecosystem, providing new insights into fisheries distributions. [A feature story](#) explains how scientists at the Southwest Fisheries Science Center (SWFSC) and the Alaska Fisheries Science Center (AFSC) leveraged sustained monitoring programs to yield this surprising discovery and highlights the utility of low coverage whole genome sequence (lcWGS) to biogeography and fisheries management (**Figure 1**).
- **New Research Identifies Well-Known Killer Whales as Two Separate Species.** A [paper](#) by scientists at SWFSC and Northwest Fisheries Science Center (NWFSC) describes how genetic, physical, and behavioral data were used to distinguish two killer whale ecotypes - residents and Bigg's - as separate species that occupy different niches in the same marine ecosystem. A [web story](#) on the work highlighted how "increasing processing power of computers has made it possible to examine killer whale DNA in ever finer detail."
- **Estimating Biomass With eDNA.** Researchers from NOAA Fisheries published "[Validation of Environmental DNA for Estimating Proportional and Absolute Biomass](#)", a study that used tank trials to develop genetic tools for estimating biomass of gadids (cod), a major fishery species (**Figure 2**). [A feature story](#) explains how this work is foundational for improving the utility of eDNA "for providing meaningful data to estimate abundance and better reflect underlying community composition in real-world environments."



Figure 1. Fisheries geneticist and co-author Gary Longo working in the laboratory. Image Credit: NOAA



Figure 2. Arctic Cod in tank. Image Credit: NOAA Fisheries

People

- **New Hires Increase Lab Processing Capabilities.** Three undergraduate research assistants joined the Pacific Marine Environmental Laboratory (PMEL) Ocean Molecular Ecology lab to help with eDNA metabarcoding. These University of Washington research assistants (**Figure 3**) bring diverse experiences and are helping process a backlog of samples, including those from West Coast Ocean Acidification net tows and samples collected under sea ice by uncrewed eDNA samplers.



Figure 3. NOAA 'Omics welcomes Mugdha Chiplunkar, Kenna Dailey, & Karina Lai. Image Credit: NOAA PMEL

- **New Support for Marine Mammal Genotyping.** With support by the [Protected Resources Toolbox Initiative](#), National Research Council postdoctoral fellow Dr. Keith Hernandez joined SWFSC to develop multi-species genotyping-in-thousands sequencing (GT-seq) panels for cetaceans and pinnipeds. Developing tools to generate genetic data more quickly and efficiently supports the NOAA Fisheries mission for marine mammal species management.

Partnerships

- **Autonomous 'Omics Sampling Employed for Plankton Monitoring.** Environmental DNA (eDNA) samples were autonomously collected at the Northwest Enhanced Moored Observatory (NEMO). Project collaborators include the NWFSC, University of Washington Applied Physics Laboratory, NOAA National Centers for Coastal Ocean Science (NCCOS), Monterey Bay Aquarium Research Institute (MBARI), McLane Research Laboratories, Quileute Tribe, Northwest Association of Networked Ocean Observing Systems, and the Olympic Coast National Marine Sanctuary. Samples collected via a [2nd Generation Environmental Sample Processor \(ESP\)](#) (**Figure 4**) will primarily be used to detect phytoplankton community changes for development of ecosystem indicators of lower trophic levels to



Figure 4. ESP at surface waiting to be lifted onto the deck. A total of 76 eDNA samples were autonomously collected in 2024. Image Credit: John Micket, UW-APL

evaluate food web quality and associated effects on early marine survival of salmon. Additionally, the ESP provides near real time analyses for the marine toxin domoic acid, and the associated eDNA data coupled with environmental data will provide ecological context for better understanding of domoic acid production and toxic bloom development for informing proactive management decisions aimed at protecting public health and coastal communities.

Infrastructure

- **Enhanced Laboratory Infrastructure Strengthens 'Omics Sample Processing and Analysis Capacity.**
 - The NWFSC acquired an epMotion 5075t to facilitate next generation sequencing library preparation, as well as a Kingfisher liquid handling robot to facilitate eDNA extractions. These technology systems will streamline laboratory practices, increase efficiency, and allow for greater sample processing.
 - The PMEL Ocean Molecular Ecology lab gained an QuantStudio 5 Real-Time PCR system which will facilitate design and development of targeted eDNA assays for sunflower stars, Dungeness Crab, and pteropods, tracking the abundance of Harmful Algal Bloom toxin producing genes, and quantitative metabarcoding. In addition, PMEL obtained a freezer monitoring system to ensure long term preservation of archived samples.
 - The Southeast Fisheries Science Center (SEFSC) Marine Mammal and Turtle Division acquired an QuantStudio 3 Real-Time Polymerase Chain Reaction (PCR) system and an Absolute Q Digital PCR (dPCR) system through support from the Inflation Reduction Act (IRA) of 2023. These enhancements will allow for analysis for the detection and quantification of rare DNA targets in eDNA samples.
 - The Atlantic Oceanographic & Meteorological Laboratory (AOML) Ocean Chemistry and Ecosystems Division attained an Absolute Q Digital PCR system and a QuantStudio 3 Real-Time PCR system to support targeted 'omics assays. Collectively, these systems will enhance the laboratory's ability to robustly quantify and detect DNA from marine organisms in both environmental samples and corals, leading to improvements in water quality monitoring, coral disease research, and development of molecular tools for fisheries and biodiversity monitoring.