FY26Q2 NOAA Omics Report

provided to the NOAA Science Council
by the NOAA Omics Working Group
April 7, 2026

Administrative and Agency Priorities

- **eDNA Recognized to Advance Fisheries Surveys & Assessments.** Under Secretary of Commerce for Oceans and Atmosphere and NOAA Administrator, Dr. Neil Jacobs' [internal] release of 42 strategic priorities for NOAA included leveraging eDNA (environmental DNA) to modernize surveys and stock assessments in conjunction with Uncrewed Systems (UxS). The announcement garnered high-level support to enhance efforts for collecting, processing, and streamlining eDNA methodologies across NOAA.

- **GO-SHIP Levels-Up eDNA.** eDNA was recently raised to a Level 2 priority for the United States Global Ocean Ship-based Hydrographic Investigations Program (Go-SHIP) program. This raises eDNA to a core hydrographic measurement that is highly desirable and must adhere to stringent data policy and timeline for submission of data, elevating eDNA alongside discrete pCO2, iron and trace metals, and surface under way systems. This change illustrates the growing importance and implementation of eDNA into routine oceanographic sampling methodologies, providing support for researchers and programs to leverage eDNA to gather extraordinarily resolute genetic data of ocean biodiversity.

Projects

- **eDNA Analysis Applied to Join NOAA Killer Whale Survey.** NOAA Fisheries scientists partnered with the Olympic Coast National Marine Sanctuary (OCNMS) to collect eDNA during a recent survey of Southern Resident killer whales (SRKW) near Swiftsure Bank in the Strait of Juan de Fuca (**Figure 1.**). In recent years, the SRKWs have been observed to spend increasing time in the area for the rich feeding diversity in the spring and summer months. The ongoing eDNA analysis will be used to characterize food-web dynamics and explore the use of eDNA sampling to better understand competition for resources between SRKWs and other conspecific populations ,within the commercially important environment, providing double the data in the same amount of time, to inform data-driven management of this protected species.

Figure 1. Two NOAA vessels survey Southern Resident killer whales. *Image courtesy of Hilma/NOAA Fisheries under permit 27052.*

- **Population Genetics Provide Insights To Micronesian Region.** Collaborators from the NOAA Fisheries Pacific Islands Fisheries Science Center (PIFSC) and the University of Central Florida leveraged population genetics to determine the Mariana Islands function as a key gateway and genetic sink. The research team used genome-wide Single Nucleotide Polymorphisms (SNPs) to demonstrate limited gene flow of peacock grouper (*Cephalopholis argus*) among regions in Micronesia (**Figure 2**.). These findings advance understanding of connectivity and stock structure for an ecologically and fisheries-relevant reef predator and provide actionable insight for spatial management across the U.S. Pacific Islands.

Figure 2. A peacock grouper (Cephalopholis argus) found on a Hawaiin coral reef. *Image courtesy of Kevin Lino/NOAA.*

- **NOAA Research Pushes the Boundaries of eDNA.** Atlantic Oceanographic and Meteorological Laboratory scientists have drastically expanded the geographic boundaries where eDNA technology has applied. Through the GOMECC-4 expedition, the study presents the first basin-scale survey of microbial life in the Gulf of America, representing the largest eDNA survey ever performed in the region. Plankton communities, which include phytoplankton and bacteria, are the invisible engines of the ocean's food web and carbon cycle. These efforts, using DNA metabarcoding, establish a baseline for how they respond to the Gulf's complex environmental gradients and identify dozens of species as biological indicators of ocean acidification. Despite the Gulf's ecological and economic importance, we have lacked a comprehensive map of its microbial residents until now; by integrating biological 'omics data with physical and chemical measurements, this study provides the predictive power needed to forecast community shifts, in addition to developing a monitoring baseline for detecting ecosystem stress that can impact coastal communities.

Partnerships

- **NOAA Fisheries Science Center Leverage Innovation Research.** NOAA Fisheries Southeast Fisheries Science Center (SEFSC) completed a Small Business Innovation Research (SBIR) III project with the engineering company, Nucleic Sensing Systems (NS2). The project enhanced the engineering capabilities of NS2's automated environmental DNA (eDNA) analyzer and field testing was conducted at a bottlenose dolphin habitat at the Mississippi Aquarium and deployed in Barataria Bay (Grand Isle, Louisiana) to test its ability to detect bottlenose dolphin eDNA in the field. The analyzer successfully detected bottlenose dolphin eDNA and results were received remotely. The team is further developing their partnership to address technology enhancements and limitations.

- **West Coast Partnership Develops Novel Assay.** NOAA Research Pacific Marine Environmental Laboratory (PMEL) has recently developed and validated an eDNA qPCR (quantitative PCR) assay for Sunflower stars (Pycnopodia helianthoides), an iconic apex kelp forest predator that experienced dramatic population declines in the past decade due to sea star wasting disease. PMEL has had great success partnering across the West Coast with the Sunflower Star Laboratory, UC Merced, and the Hakai Institute, to both develop and validate the assay. With a working assay in hand, they've partnered with NOAA Fisheries Northwest Fisheries Science Center (NWFSC) to validate the assay against NOAA kelp forest dive surveys in OCNMS; Stanford University to explore fate and transport of eDNA in coastal systems leveraging transplantation experiments; and NOAA Channel Islands National Marine Sanctuary (CINMS), CalAcademy of Sciences, University of California Los Angeles, and CalPoly San Luis Obispo to identify the remaining populations in California where the species was first observed for the first time in a decade just this past summer 2025 (identifying Pycnos at 6 new sites). This work is being supported by California Ocean Protection Council, Associations of Zoos and Aquariums, and NOAA Omics.

Infrastructure

- **NOAA Developing Advanced Technologies for Data Enterprise.** NOAA Fisheries is modernizing the data generation pipeline for informing fisheries stocks and assessments (**Figure 3.**). Omics is a key component of this effort. In conjunction with uncrewed systems, passive acoustics, active acoustics, optics, and remote sensing, omics will be leveraged to acquire unprecedented high-quality high-throughput information to enhance line-office and agency-wide efforts to ensure healthy and sustainable fisheries for the United States.

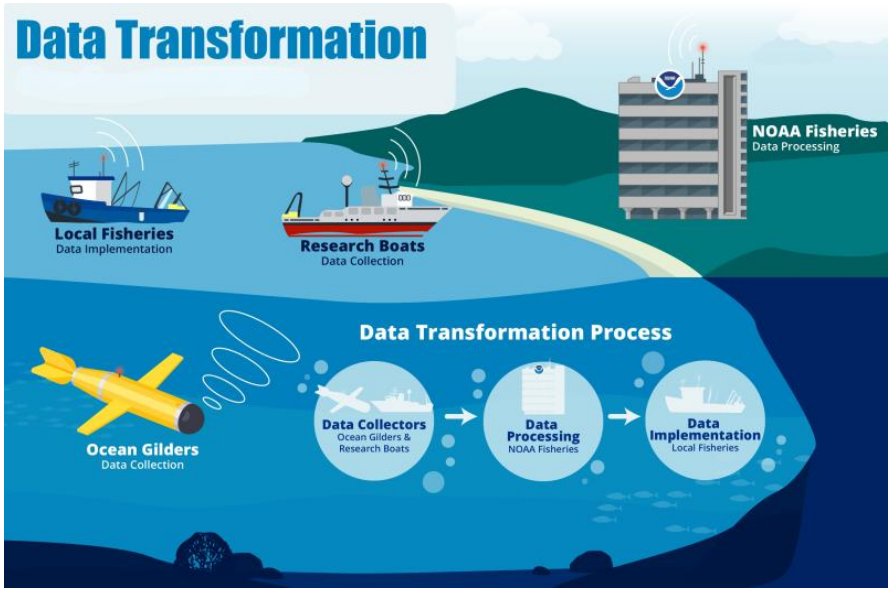

Figure 3. An illustration highlighting aspects of data transformation at NOAA Fisheries. *Image courtesy of NOAA Fisheries.*

Recent Publications

- Genetic Data Reveal Nonlocal Juvenile Recruitment and Variable Seasonal Movement of a Highly Mobile Marine Fish Across Alaska

- Aroclor 1254 impairs visual and neurosensory signaling pathways independent of the aryl hydrocarbon receptor in larval zebrafish

- Evaluating Prey Availability for the Rice's Whale (Balaenoptera ricei) Based on Environmental DNA
- Mitochondrial structure despite nuclear panmixia: sex-specific dispersal dictates population structure in sperm whales
- Molecular indicators of warming and other climate stressors in larval Pacific cod
- Nitrogen Fixation Associated with Microcystis Colonies Promotes Harmful Cyanobacterial Blooms across North American Lakes
- Phytoplankton community composition in the oligotrophic Argo Basin of the eastern Indian Ocean
- Exploring the transition from heterotrophy to high light stress using a proteomic and phosphoproteomic approach reveals altered chlorophyll biosynthesis, carbon partitioning, and astaxanthin biosynthesis and trafficking in a Haematococcus pluvialis (Chlorophyceae) mutant
- Composition of fish egg assemblages varies with depth on the West Florida Shelf
- Major Histocompatibility Complex Immunogenetic Diversity Differs Substantially Across Sea Turtle Species and Genomic Regions
- Mosaic tri-lineage secondary contact shapes diverse genomic outcomes in darters
- Genome Skimming Illuminates Hidden Species Diversity and Symbiodiniaceae Associations in East Pacific Pocillopora Corals
- Development of High-Throughput Genomic Resources to Inform White-Tailed Deer Population and Disease Management
- Testing the waters: A comparison of DNA extraction methods for the metabarcoding of microbial communities
- NMR-Based toxicometabolomics of Yellowtail Snapper (Ocyurus chrysurus) embryos, as a relevant ecological receptor, exposed to perfluorooctane sultanate (PFOS)
- Prolactin signaling in the highly osmotolerant Mozambique tilapia, Oreochromis mossambicus
- Genomic Resources for Imperiled Caribbean Reef- Forming Corals (Hexacorallia: Scleractinia): Complete Mitochondrial Genomes of Dichocoenia stokesii, Diploria labyrinthiformis, Oculina patagonica, and Stephanocoenia intersepta
- Geographic and seasonal comparison of LSU rDNA copy numbers in Alexandrium catenella life cycle stages
- Recent evolution of large offspring size and post-fertilization nutrient provisioning in swordtails
- The genome assemblies of the Tui chub, Siphateles bicolor, and Arroyo chub, Gila orcuttii