The Northern Gulf of Alaska Long-term Ecological Research Program: coming to an ocean near you in 2018

www.lternet.edu

Russell Hopcroft1, Suzanne Strom2, Ana Aguilar-Islas3, Seth Danielson3, Jerome Fiechter3
1University of Alaska Fairbanks, 2Western Washington University, 3University of California Santa Cruz

1970–1997:
UAF oceanography professor Tom Royer led dozens of Seward Line physics day-trips and research expeditions.

1997–2004:
GAK1 mooring begins. Sampling expanded to include chemistry and biology with 6-7 cruises per year as part of the U.S. Global Ocean Ecosystem Dynamics (GLOBEC) program, jointly funded by NSF and NOAA.

2005–2017:
May and September cruises have been funded by a consortium of the North Pacific Research Board, the Alaska Ocean Observing System, and the Exxon Valdez Oil Spill Trustee Council through the Gulf Watch Alaska program.

2018–forever:
NSF’s Long Term Ecological Research program joins the Seward Line Consortium to support May, July, and September cruises annually in 6-yr cycles.

LER Network Mission:
Provide scientists, policy makers, and society with knowledge and predictive understanding necessary to conserve, protect, and manage the nation’s ecosystems, their biodiversity, and the services they provide.

Network Goals:
• Understanding
• Synthesis
• Information
• Education
• Legacies
• Outreach

Many decades of North Pacific observations allow us to interpret LTER biological and chemical measurements in the context of rapid and slow environmental changes.

Conceptual models describe our understanding of ecosystem drivers, structure, and functioning. These models are valuable tools for contrasting biomes and for developing and testing research hypotheses.

Phytoplankton

High-resolution coupled atmosphere, hydrology, ice, and ocean circulation models bridge the terrestrial–marine interface and support investigations at biologically important time and space scales. Biogeochmical modeling embedded within the circulation model will allow testing and improvement of our mechanistic understanding of ecosystem dynamics.

Process study experiments determine how light, nutrients, iron, and grazing interact to regulate primary production.

Microzooplankton and mesozooplankton respond to both bottom-up and top-down drivers (i.e. both food and predators) so they link primary producers and upper trophic level consumers.

Particles
Nutrients

Optical instruments measure the size and concentration of marine particles. These include suspended sediments, detritus, and zooplankton fecal pellets, and are an important source of carbon, nutrients, and energy in the NGA.

Seasonal surveys collect hydrographic, nutrient, and biological data to measure variability.

Uninterrupted datasets extend the record to our understanding of subseasonal variability.

Between the research cruises will contribute to our understanding of subseasonal variability.

Monitoring plans include a multidisciplinary mooring that will record the year-round time history of the northern Gulf of Alaska beginning in 2019.

NGA LTER Hypotheses
Center on the interplay between the hydrologic cycle and the ecosystem’s structure and properties. Topics of interest include:

• Temperature/salinity structure
• Spring bloom production
• Hot spots of high summer primary and secondary production
• Trophic match/mismatch between producers and consumers
• Structure and composition of biological communities

Core Research Areas:
• Primary Production
• Population Studies
• Movement of Organic Matter
• Movement of Inorganic Nutrients
• Disturbance Patterns

Structure and composition of biological communities

Temperature/salinity structure

High-resolution coupled atmosphere, hydrology, ice, and ocean circulation models bridge the terrestrial–marine interface and support investigations at biologically important time and space scales. Biogeochmical modeling embedded within the circulation model will allow testing and improvement of our mechanistic understanding of ecosystem dynamics.

Process study experiments determine how light, nutrients, iron, and grazing interact to regulate primary production.

Microzooplankton and mesozooplankton respond to both bottom-up and top-down drivers (i.e. both food and predators) so they link primary producers and upper trophic level consumers.

Particles
Nutrients

Optical instruments measure the size and concentration of marine particles. These include suspended sediments, detritus, and zooplankton fecal pellets, and are an important source of carbon, nutrients, and energy in the NGA.

Seasonal surveys collect hydrographic, nutrient, and biological data to measure variability.

Uninterrupted datasets extend the record to our understanding of subseasonal variability.

Between the research cruises will contribute to our understanding of subseasonal variability.

Monitoring plans include a multidisciplinary mooring that will record the year-round time history of the northern Gulf of Alaska beginning in 2019.

NGA LTER Hypotheses
Center on the interplay between the hydrologic cycle and the ecosystem’s structure and properties. Topics of interest include:

• Temperature/salinity structure
• Spring bloom production
• Hot spots of high summer primary and secondary production
• Trophic match/mismatch between producers and consumers
• Structure and composition of biological communities

Core Research Areas:
• Primary Production
• Population Studies
• Movement of Organic Matter
• Movement of Inorganic Nutrients
• Disturbance Patterns

Structure and composition of biological communities

Temperature/salinity structure

High-resolution coupled atmosphere, hydrology, ice, and ocean circulation models bridge the terrestrial–marine interface and support investigations at biologically important time and space scales. Biogeochmical modeling embedded within the circulation model will allow testing and improvement of our mechanistic understanding of ecosystem dynamics.

Process study experiments determine how light, nutrients, iron, and grazing interact to regulate primary production.

Microzooplankton and mesozooplankton respond to both bottom-up and top-down drivers (i.e. both food and predators) so they link primary producers and upper trophic level consumers.

Particles
Nutrients

Optical instruments measure the size and concentration of marine particles. These include suspended sediments, detritus, and zooplankton fecal pellets, and are an important source of carbon, nutrients, and energy in the NGA.

Seasonal surveys collect hydrographic, nutrient, and biological data to measure variability.

Uninterrupted datasets extend the record to our understanding of subseasonal variability.

Between the research cruises will contribute to our understanding of subseasonal variability.

Monitoring plans include a multidisciplinary mooring that will record the year-round time history of the northern Gulf of Alaska beginning in 2019.

NGA LTER Hypotheses
Center on the interplay between the hydrologic cycle and the ecosystem’s structure and properties. Topics of interest include:

• Temperature/salinity structure
• Spring bloom production
• Hot spots of high summer primary and secondary production
• Trophic match/mismatch between producers and consumers
• Structure and composition of biological communities

Core Research Areas:
• Primary Production
• Population Studies
• Movement of Organic Matter
• Movement of Inorganic Nutrients
• Disturbance Patterns

Structure and composition of biological communities

Temperature/salinity structure

High-resolution coupled atmosphere, hydrology, ice, and ocean circulation models bridge the terrestrial–marine interface and support investigations at biologically important time and space scales. Biogeochmical modeling embedded within the circulation model will allow testing and improvement of our mechanistic understanding of ecosystem dynamics.

Process study experiments determine how light, nutrients, iron, and grazing interact to regulate primary production.

Microzooplankton and mesozooplankton respond to both bottom-up and top-down drivers (i.e. both food and predators) so they link primary producers and upper trophic level consumers.

Particles
Nutrients

Optical instruments measure the size and concentration of marine particles. These include suspended sediments, detritus, and zooplankton fecal pellets, and are an important source of carbon, nutrients, and energy in the NGA.

Seasonal surveys collect hydrographic, nutrient, and biological data to measure variability.

Uninterrupted datasets extend the record to our understanding of subseasonal variability.

Between the research cruises will contribute to our understanding of subseasonal variability.

Monitoring plans include a multidisciplinary mooring that will record the year-round time history of the northern Gulf of Alaska beginning in 2019.