

Data Management Plan

This primarily field-based project will generate a variety of oceanographic datasets. Data to be produced during this project are summarized below. In compliance with the NSF OCE Data and Sample Policy, these data will be submitted within 2 years of collection to the Biological and Chemical Oceanography Data Management Office (BCO-DMO) at WHOI and/or to the National Center for Biotechnology Information (DNA sequence data). Protocols for data storage, sharing and accessibility for each dataset are described below. All data will be made public after publication or at the end of the grant period.

Metadata from the proposed research cruise will be reported in the post-cruise report. Such metadata would include time and day of year, latitude and longitude, units of measure, accuracy and precision of measurements, methods of measurement and sampling, and data processing protocols. Cruise-level metadata will include name of vessel, start and end dates for the cruises, cruise plans, cruise reports, data inventory lists, and event logs. We will follow the community-accepted metadata standards that have been developed and implemented via BCO-DMO. Metadata will be generated in two ways – automatic logging of the ship's global positioning data, and manual entries into an event log. Data will be recorded to the event log during the cruise at the time of each discrete activity (e.g., CTD casts, collection of discrete water sample, plankton net tows, discrete optical profile, or deployment and recovery of sediment trap array).

Types of data and samples:

1. Underway Oceanographic Data

- a. Standard underway data collected aboard ship will be made available as soon as possible after each cruise by depositing it in the Rolling Deck Repository, with eventual archival in the National Oceanographic Data Center database.
- b. **O₂/Ar MIMS Data:** High temporal resolution samples for O₂/Ar ratios will be measured onboard using membrane inlet mass spectrometry. These measurements will be used to compute rates of gross primary production, community respiration, and net community production in the mixed layer. These data will be submitted to BCO-DMO within 2 years of collection with all relevant metadata.
- c. **Flow Cytometric and Optics data:** All underway optical data including imaging flow cytometry will be time-synchronized with the ship's GPS and thermosalinograph. At sea all data will be visualized in real time to evaluate data quality and instrument stability; data will be stored on a customized raspberry-PI based data logger and backed up onto a separate hard drive. Post-cruise, all continuous optical data will be merged to 1-min averages and submitted to BCO-DMO; Imaging flow cytometry data are sampled at ~20 min intervals; a composite cruise file of all imaged particles and their individual morphometrics and optical properties will be generated and submitted to BCO-DMO.

2. **CTD Sensor and Discrete Sample Data:** Shipboard vertical measurements of temperature, salinity, O₂, and fluorescence will be collected using a Sea Bird SBE-9/11Plus CTD package equipped with dual temperature, salinity and O₂ sensors and fluorometers. CTD data are acquired at 24 samples per second with digital data stored on a laptop computer. Data are backed up onto shipboard servers and provided by the shipboard technical support to PIs at the end of cruise. The CTD rosette will be lowered and raised at ~60 m min⁻¹, with water samples collected on the up cast. The CTD rosette houses 24 twelve liter polyvinyl chloride sampling bottles and discrete seawater samples will be collected from these bottles, including: frozen seawater (125-500 ml; nutrient determinations), filtered plankton concentrates.

3. **Sinking Particulates CN/P Data:** Particle interceptor traps will be used to collect sinking particles. We will utilize a free-drifting trap array, with traps deployed for 5-6 days. On recovery, particles will be concentrated onto pre-combusted filters for subsequent analyses of particulate C, N, and P. These measurements will be used to compute downward fluxes of

these elements associated with sinking particles. The quality controlled data will be submitted to BCO-DMO within 2 years of collection.

4. Zooplankton-mediated Active Flux Measurements:

- a. **1m² MOCNESS Environmental Data:** *In situ* data on temperature, conductivity, pressure, and fluorescence, with depth (0 - 1000m); Metadata file of all tows and samples collected. These data will be submitted to BCO-DMO within 2 years of collection.
- b. **Zooplankton Stoichiometry Data:** Carbon, nitrogen, phosphorous (CN/P) measurements from size-fractionated zooplankton samples collected by MOCNESS, as well as CN/P measurements on target species with particularly significant roles in zooplankton-mediated bioelemental fluxes.
- c. **Zooplankton Metabarcoding Data:** Community metabarcoding samples, data consisting of paired-end Illumina sequences for size-fractionated MOCNESS samples. Material from 6 tows, 9 depths, 0-1000m.
- d. **Zooplankton Respiration Data:** Respiration rates from sealed chamber experiments will be obtained from two 2-day incubations (10 bottles each experiment).

Data Dissemination & Policies for Data Sharing and Public Access

All of the data generated in this study will be made publicly available upon publication in a peer-reviewed journal, or within two years of the completion of the project. To increase accessibility to project data and the dissemination of our research findings—particularly among scientists from developing countries—we will make every effort to publish our results as open-access articles or within open-access journals. Project PIs will work with early career project participants to facilitate submission of data as described below. All data from this project are considered within the public domain for all not-for-profit uses and there will be no permission restrictions placed on use of the data.

Oceanographic and Environmental Data: All oceanographic data will be made publicly available within 2 years of collection through the NSF supported BCO-DMO site and there will be no restrictions on its use. Shipboard underway data will be made available within one year via the Rolling Deck to Repository. End-users of these data are likely to include physical, biological, and chemical oceanographers interested in vertical coupling in biogeochemistry and ecology between the upper ocean and mesopelagic waters. There are no ethical and privacy issues with these data. There are no human research subjects in our study. The dataset from this project will not be copyrighted.

1. **Flow Cytometric and Optics data:** Optically derived particulate carbon, absorption- and fluorescence based chlorophyll-a estimates, optically-derived net and gross primary production, imaging flow cytometry of nano- and micro-plankton and detritus.
2. **O₂/Ar MIMS Data:** rates of gross primary production, community respiration, and net community production.
3. **Sinking Particulates CN/P Data:** Sinking particle flux data, together with associated metadata, will be submitted to BCO-DMO within 2 years of sample collection.
4. **Zooplankton Stoichiometry and Respiration Data:** CN/P and respiration rate measurements from both bulk zooplankton and experimental animals will be submitted to BCO-DMO, with all relevant metadata. An archival copy through WHOI/MBL (doi referenced) will be created.
5. **Zooplankton Sequence Data:** The processed fastq sequences for station ALOHA zooplankton will be submitted to the National Center for Biotechnology Information (NCBI) Short Read Archive (SRA). Zooplankton BIOM files for the operational and functional taxonomic units will be submitted to BCO-DMO with creation of an archival copy through WHOI/MBL (doi referenced), together with metadata regarding sample and data collection and processing.