Collaborative Research: Defying Dissolution: Unraveling the Enigma of North Pacific Deep-Sea Scleractinian Reefs in Undersaturated Water

Data Management Plan

Data Policy Compliance: The project investigators will comply with the data management and dissemination policies described in the *NSF Award and Administration Guide* (AAG, Chapter VI.D.4) and the *NSF Division of Ocean Sciences Sample and Data Policy*. PIs will partner with Biological and Chemical Oceanography Data Management Office (BCO-DMO) to manage all data produced.

Pre-Cruise Planning: Pre-cruise planning will be done via email and phone calls. Detailed plans for station locations, ROV dive plans, CTD deployment, water sampling strategy, and water sample allocation will be written up as a science implementation plan for the cruise. The actual sampling events will be recorded on paper logs (scanned into PDF documents) and into a digital event log.

Description of Data Types: The project will produce several observational and experimental datasets as well as specimen collections as a result of two research cruises in the Hawaiian archipelago.

Observational Datasets:

1. Metadata: The metadata associated with the surveys and the samples collected (latitude, longitude, depth, etc.) will be submitted to Biological and Chemical Oceanography Data Management Office (BCO-DMO). Metadata will be prepared in accordance with BCO-DMO conventions (i.e. using the BCO-DMO metadata forms) and will include detailed descriptions of collection and analysis procedures. At the time of collection, each specimen will be labeled with a unique identifier that will be associated with all analytical efforts and included in a database of metadata. Both the unique specimen identifier and subsequent unique analysis numbers will be included in the database of metadata and will be associated with data deposited in data repositories and reported in journal articles. These data will also be submitted to the Ocean Biogeographic Information System (OBIS) as soon as possible after each of the cruises. Once samples are identified, we will also provide species identifications, with collection locations, to each database.

2. **CTD and Niskin bottle data:** CTD data collected and processed using a SeaBird SBE CTD package and SeaBird's SeaSave software; data will include standard environmental measurements (pressure, temperature, salinity, fluorescence). File types: Raw and processed files. Repository: BCO-DMO.

3. Cruise underway data: Routine underway data collected along the ship's track (including meteorological data, sea surface temperature, salinity, fluorescence, ADCP). Will be collected by the shipboard instrumentation. File types: .csv ASCII files. Repository: BCO-DMO and R2R.

4. Multibeam Data: multibeam raw data (*.all) will be filtered, processed (Qimera sonar data processing application), archived, and exported into GIS-importable formats (georeferenced *.tiff;*.ascii raster) at sea by the science team on a daily basis. Backscatter data derived from *.all files will be processed on GMT and saved in the same form as bathymetry. Other derived products include Fledermaus models and scenes, GMT style netCDF grids, ArcGIS layers, and geotiffs. While it is common practice for the onboard marine technicians to have a backup scheme for the raw data for which they are responsible, the science team will create additional real-time backups of raw data and derived products as the data is being acquired and processed. All raw data and sub products will be submitted to the BCO-DMO and the National Geophysical Data Center.

5. Video Data: Woods Hole Oceanographic Institution maintains a visual data archive for all National Deep Submergence Facility vehicles and makes these data available to the public after a proprietary hold period determined by the PIs. We will also work with the Lamont Doherty Earth Observatory Marine Geosciences Data System to host specialized data coming from the ROV. Our labs will also create and maintain a second backup copy of all ROV photographic and video files before we begin analyses.

6. Deep-sea Coral Lander Data:

Lander data will include instruments to measure pH, CO_2, temperature, oxygen, chlorophyll and current speed and direction every 1-2 hours. This will be collected and processed with Aanderaa Data Studio 3D

software. File types: .csv ASCII files. Repository: BCO-DMO

Experimental and Analytical Datasets:

Biogeochemical, Aging, and Water Chemistry Data: Geochemical data will be analyzed by several different laboratories where each follows standard protocols of storing results electronically and assigning unique numerical identifier to each analysis. Both the unique specimen identifier and the unique analysis number will be associated with all data deposited in data repositories and reported in journal articles. All geochemical data collected during this project will be archived in the appropriate databases such as at the National Oceanographic Data Center (NODC), NOAA World Data Center for Paleoclimatology (National Climatic Data Center) via the BCO-DMO, the Carbon Dioxide Information Analysis Center (CDIAC), and Ocean Acidification International Coordination Centre (OA-ICC) that archives data to the open access publisher Pangaea.

Samples: Sampling will occur during both cruises and will consist of deep-sea coral specimens. A database of collected specimens in the form of tables (Excel and text format files) will include information on Family, Genus, Species (when available), date of collection, latitude and longitude of collection, specific label information, analytical labels, depth, and other environmental information such as temperature and substrate will be part of the project metadata. Where appropriate the SESAR will be used to assign an International GeoSample Number (IGSN). All specimens will be photographed prior to analysis and the pictures stored in the same manner as the database. Both the sample data and photographs will also be made available to OBIS and BCO-DMO. Voucher specimens will be provided to the Smithsonian Natural History Museum for identification and archiving. Providing specimens to the Smithsonian allows access to the broader scientific community for phylogenetic and morphological studies focused on specific taxa. Samples collected whole for aging and geochemical analyses will be dried and archived in the laboratory of Dr. Roark in the Geography Department at Texas A&M University. Currently more than 200 deep-sea coral specimens are curated and archived in the laboratory.

Modeling Datasets: Georeferenced presence-absence data sets will be created and saved as *.csv files. All environmental variables (bathymetry-geomorphology and derived products, water chemistry, physical oceanography parameters, and satellite data) will be primarily processed in their native formats and software (D-Magic, FMGT, Matlab, ODV) then transformed into ArcGIS layers and ESRI *.ascii raster. Visual product derived from Habitat Suitability Models (maps) will be saved as ArcGIS layers and *.ascii raster. Other sub-products as statistics indexes, response curves, and graphs will be archived as *.csv files.

Data Storage and Access

During the Project: The investigators will store project data (including spreadsheets, ASCII files, images, and event logs) on laboratory computers and on Google Drive. Personal computers in all laboratories are backed up daily using Apple Time Machine to an onsite external hard drive. In addition data are backed up offsite by FSUCML and TAMU College of Geosciences Central IT organizations.

Mechanisms and Policies for Access, Sharing, Re-Use, and Re-Distribution: Data produced by this project may be of interest to chemical and biological oceanographers, and climate scientists interested in the role of biogeochemistry in the global climate system. We will adhere to and promote the standards, policies, and provisions for data and metadata submission, access, re-use, distribution, and ownership as prescribed by the BCO-DMO Terms of Use (http://www.bco-dmo.org/terms-use)

Roles and Responsibilities: Each PI will be responsible for sharing his/her subset of data among the project participants in a timely fashion. Dr. Roark will coordinate the overall data management and sharing process and will submit the project data, and metadata to the Biological and Chemical Oceanography Data Management Office (BCO-DMO) who will be responsible for forwarding these data and metadata to the appropriate national archive.

Research Publication and Dissemination: Dissemination and sharing of research results with other researchers will be accomplished through presentation at scientific conferences and through publication of peer reviewed manuscripts. All student theses and dissertations arising from the proposed project will be submitted to the FSU and TAMU libraries, and will be available to the public.