DATA MANGEMENT PLAN

Data management will be coordinated by the co-Principal Investigators and carried out by all project participants. The plan encompasses three areas: use policies, standards, and data and sample preservation and archival. The PIs will leverage existing systems wherever possible. All data will be communicated in a timely fashion following the NSF policy.

I.   Products of Research

Three main data types will be generated in the proposed activities: chemical oceanographic data and biological data on the physiology and mineralogy of tropical crustose coralline algae (CCA) and digital images of CCA and associated fungal disease in the Pacific (including high resolution mosaics of the reef benthos, of the surface of CCA settlement plates, and of CCA tissue in histological analysis). The empirical data will be a combination of quantitative experimental measures, qualitative raw in situ data for monitoring purposes, and processed seawater chemical metrics, all geo-referenced. In particular the co-PIs will measure the growth and physiological responses of a number of coralline algal species to natural variation and experimental manipulation in seawater pCO_2 and temperature including: relative abundance of early successional benthic reef taxa on settlement plates and *in situ* (% cover of benthic functional groups and species for CCA), incidence of CFD (no. novel CFUs per uninfected host population), CFD prevalence (no. infected hosts per CCA population), net calcification of assemblages and of individual thalli standardized to final surface area (g $CaCO_3$ cm^{-2} yr^{-1}), net productivity of assemblages and individual thalli (g AFDW cm^{-2} yr^{-1} and μmol O_2 hr^{-1} at saturating irradiance), and photosynthetic efficiency (P_{max}, α_I, β_I), C:N:P thallus stoichiometry, pigment content (μg g^{-1}), vertical accretion rate (mm $CaCO_3$ yr^{-1}), recruitment rate (no. individual thalli m^{-2} yr^{-1}), and lateral expansion (cm^2 yr^{-1}) of individuals. Mineralogical data of CCA skeletons will be collected using two techniques (pXRD and LA-ICP-MS) and reported as wt% $MgCO_3$ in calcite, $MgCO_3$ mol%, and Mg/Ca_C. A variety of chemical parameters will also be measured using autonomous sensors including temperature (T), salinity (S), pH_{SW} and/or pCO_2 (μatm) at each reef study site; PI Price is responsible for these data. Discrete water samples for nutrients (NO_3, NO_2, NH_4, PO_4, SiO_4), total alkalinity (A_T μmol kg^{-1} SW), and total dissolved inorganic carbon (C_T μmol kg^{-1} SW) will be collected following standard operating procedures as described by Dickson et al. (2007). Quality control will be assessed using certified reference materials to calibrate sensors and lab instrumentation as per Dickson et al. (2007). These data will be processed, along with T, S, and depth, to calculate the remaining carbonate chemistry parameters using CO2SYS: ρ (kg m^{-3}), CO_2 (μmol kg^{-1} SW), HCO_3^- (μmol kg^{-1} SW), CO_3^{2-} (μmol kg^{-1} SW), Ω-Calcite, Ω-Aragonite, & Ω-Mg Calcite (mole fraction TBD from CCA mineralogy). PI Price has a track record of collecting similar data as evidenced by her publication record. The data collected will be retained by the co-PIs indefinitely.

II.   Data and Sample Storage and Preservation

All biological and chemical data sets and metadata describing species, field site conditions and geo-referenced measurement locations will be uploaded to networked servers maintained at Bigelow Laboratory. These servers are backed up weekly, and can be made available to collaborators needing access to the data. Similarly, Bangor University has a personalized in-house procedure for data backup and data archiving. Data will be transferred and archived at the Biological and Chemical Oceanography Data Management Office (BCO-DMO; http://www.bco-dmo.org/) following processing. No data transformations

will be necessary to prepare data for preservation or data sharing and data will be structured in EML (see below) with associated 'read me' files to make readily usable.

III.   Data Formats and Metadata

Our data will be submitted as a clean matrix and will be stored in a comma separated files (.csv) with an associated metadata file. The biological and ecological data will be structured in Ecological Metadata Language (EML). We will also include a "readme file" that will explain variables, structure of the files, etc. for each of the independent data sets. All chemical time series data will be stored in ascii or MatLab formats with associated metadata and readme files. Data will be formatted to follow the standard operating procedures for ocean acidification research and data sharing as described by Riebesell et al. (2010).

IV.   Data Dissemination & Policies for Data Sharing and Public Access

Data will remain with the PI for 2 years after the completion of the project to allow adequate time for publication. Foreseeable users of the data are managers associated with the US Fish and Wildlife Service as the waters and coral reefs surrounding Palmyra were recently designated (2009) as part of the new Pacific Island Remote Area (PRIA) National Marine Monument. Additionally, the NOAA Coral Reef Ecosystem Division and Coral Reef Conservation Programs and the American Samoa Department of Marine & Wildlife anticipate using the data for monitoring purposes.

Roles and Responsibilities

All personnel funded through this project will be responsible for maintaining and updating individual data sets and for writing detailed metadata and read me files that outline all components of how, when and where a particular data set was collected. A fraction of the salaries requested will be used for data management activities, in particular data entry, QA/QC, calibration, metadata management, and conversion to standard formats.

Citations

Dickson, A.G., Sabine, C.L. and Christian, J.R. (Eds.) 2007. Guide to best practices for ocean CO_2 measurements. PICES Special Publication 3, 191 pp.

Riebesell U., Fabry V. J., Hansson L. & Gattuso J.-P. (Eds.), 2010. Guide to best practices for ocean acidification research and data reporting, 260 p. Luxembourg: Publications Office of the European Union.