Data Management Plan

Data Policy Compliance

We are committed to making our environmental data freely available in as timely a fashion as possible, **and in line with BIO-OCE's requirements will make all data publically accessible within two years of their collection in the database maintained by the Biological and Chemical Oceanography Data Management Office (BCO-DMO)**. The Helmuth lab maintains a website that provides open access to weather station and sonde data (https://hobolink.com/p/02a28f0a8f6d88b3cb508399b253f0b8). It also maintains a website that provides access to the lab's network of intertidal sensors via a graphical interface (http://www.northeastern.edu/helmuthlab/database/). The latter are mirrored on the BCO-DMO web site (http://www.bco-dmo.org/dataset/555780/data).

Descriptions of Data Types

Data and code generated as part of this project will fall into 7 categories:
1. Empirical field data, biological (species mapping);
2. Empirical field data, physical (scans, weather data, temperatures);
3. Physiological data
4. Field photographs (ground, aerial and infrared);
5. Modeling code (Individual-based metacommunity model, Dynamic Energy Budget, Heat budget);
6. Simulation results;
7. Heat budget forecasts;

Data and Metadata Formats and Standards

Empirical field data, biological: The project will collect spatially-explicit biological data using quadrats and transects to describe patterns of species distributions and organismal mortality following extreme weather events.

Empirical field data, physical: These data comprise measured mapping data from the terrestrial laser scanner and calculated topographic data from drone photography; and weather data. The weather data are already archived on a publically-accessible web site.

Physiological data: Data from physiological experiments will be archived as raw data (from heart beat sensors and oxygen probes) as well as summary data in CSV format.

Field photographs: Data from quadrats and aerial photography will be archived in RAW format.

Modeling code: all dynamical and statistical models will be developed using the C, MATLAB and R languages. All code will be written using each language's formatting guidelines (*e.g.*, http://adv-r.had.co.nz/Style.html) for R and https://sites.google.com/site/matlabstyleguidelines/ for MATLAB).

Simulation results: Output from heat budget models from the Finite Element Analysis and metacommunity models will be archived in native format (FEA software and/or CSV format).

Heat budget forecasts: Forecasts based on weather data and data from remote sensing platforms will be archived in CSV format with time and location stamps.

Data Storage and Access During the Project

Data will be stored locally on desktop computers and regularly backed-up to Gouhier's computer cluster (RAID10: mirroring and stripping) at Northeastern University's Marine Science Center and cloud-based services. The cloud service will be accessible by both the US and Israeli teams to facilitate data sharing.

Mechanisms and Policies for Access, Sharing, Re-Use, Re-Distribution, and Archiving

All data types as well as metadata associated with this proposed research, including information on sites, experiments, and data collected (*e.g.,* date, time, location, experimental treatments and maintenance, and environmental variables measured) will be archived and made accessible to researchers within two years of collection. Any embargoed data will be made available to project participants only via a password protection system on a cloud service until the embargo is lifted. This venue offers the advantage of quicker turn-around when posting new data (i.e., fewer administration layers involved in processing), but at the expense of long-term (beyond the termination of the project) stability. We will therefore mirror all databases on the BCO-DMO website within 2 years. The redundancy of the two systems maximizes both speed of availability and stability. Finally, we will mirror all databases onto Northeastern University's recently launched Digital Repository Service (DRS, http://library.northeastern.edu/services/drs-digital-repository-service). All modeling code (R, C, MATLAB) associated with this project will be made available via BCO-DMO and GitHub (https://github.com/tgouhier).

Roles and Responsibilities

Co-PI Gouhier will assume responsibility for data management in collaboration with PI Helmuth. Both PIs will ensure that any personnel working on the project will be aware of data standards (*e.g.*, all time and date stamps in GMT, etc.) and will record notes in a common log.