**Data management, analysis and dissemination**

Currently, data from all sites are publicly available on http://www.northeastern.edu/helmuthlab/database/ and are collated by year into text files. Data are coded by substratum angle, tidal height and wave exposure. An immediate priority is the construction of a searchable database where data can be retrieved within a user-defined range of parameters (e.g. all data for north-facing sloping shores in northern California for the period of June 2001-May 2006). In order to facilitate this transition from a spreadsheet-based method of archival data storage to a true database, all data from the last 6 years have been coded into common formats that should be easily adapted to any of several available programs. Data have also been thoroughly error checked, and any instances of errors or uncertainties, data have been flagged. We are therefore in a position to immediately begin adding new data directly into a database, as soon as we have the personnel to do so.

The development and testing of the new database will be performed on several powerful workstations in Tang's lab, but the final database will be hosted on a 128-core shared-memory computer Tang and his colleagues recently acquired through funds from NSF. Although the primary usage of this computer is computation, it comes with a stand-alone storage unit with 16 500GB SATA drives that can be used for storing logger files generated through this project. We will carefully design the structure and queries of our database so that the computing request is small and does not disturb the computations running on this server. We will also develop a scheduling scheme so that data pre-processing tasks (which may require large amount of computing resources) will be performed when the server is not that busy. All data will be made accessible to the public through our new web site via a clickable map (see prototype developed as a collaboration between our labs at climate.biol.sc.edu/EyesOnTheOcean.htm).

As part of this project (and other ongoing projects in our labs) we will attempt to "personalize" the effects of climate change on nonhuman animals. We will accomplish these goals via a web interface that provides factual, peer-reviewed, age-appropriate information about climate change and its effects on organisms that students can use for research and presents a series of fun games (developed by Tang's students) that help students to "connect" with nonhuman animals in ways that also personalize data collected by as part of this project.

A graduate student from Tang lab will be responsible for the development of this web site, and for interfacing the dataset with lesson plans developed by a student/teacher team (see broader Impacts below). It is our intention to use public access versions of database software (such as MySQL) rather than commercial software, so that the database/metadata can be more easily integrated into a searchable web-based format.

The Center for Science Education at USC interacts with middle and high school teachers throughout South Carolina. We will contact these teachers to make them aware of the materials produced as part of our web interface. We will also build upon existing connections with local K-12 classrooms to encourage students to use the materials produced as part of our web site.

**Data formats**

One of the primary goals of this project is to provide physiologically relevant data across a wide range of spatial and temporal scales. In this regard the 8-10 year data set presented here is truly unique, and can provide physiologists and ecologists with considerable information regarding the potential impacts of climate and climate change on intertidal mussels.

Since we collect a large data amount of data (about 150 entries per day per logger) and

changing over time, we need to design a software tool to provide additional pre-processing so that efficient queries can be achieved. For example, when the logger file of a specific date comes in, the tool should extract the highest, lowest and average temperatures and log them into the database. When a user queries the highest temperature of a month, such information can be returned quickly without reading through all logger data. We will consult with potential user groups to compile a list of common queries and design the pre-processing tool to ensure fast and accurate queries. Throughout the project, we will follow strict software engineering and database design procedures so that progress is steady and the database is optimized.