



## CICEET

### Enhancing tools for HABS detection

The impact of Harmful Algal Blooms (HABs) on public health and regional economies is intensifying as their frequency and duration continue to grow in coastal states around the nation. CICEET is committed to helping coastal resource managers cope with HABs by improving the effectiveness and accessibility of HABs detection technologies. The following CICEET projects seek to bridge the gap between HABs research and the application of pragmatic technology.



#### Fiber Optic Microarray to Detect Harmful Algal Bloom Species: Dr. Donald Anderson, Woods Hole Oceanographic Institution

Rapid detection has become increasingly important as HABs become more common. However, current detection methods can be time consuming and costly. This project's investigators have developed an innovative, multi-species method that uses fiber optic technology to quickly and accurately detect multiple HAB species in one sample. CICEET's investment will help to refine this technology for lab and field use. Investigators will work with coastal resource managers to ensure that the tool meets user needs.

#### High-throughput Quantitative Detection of Microbial Contaminants: Dr. Mara Diaz, University of Miami Rosenstiel School of Marine and Atmospheric Science

Coastal decision makers need robust tools to detect the warning signs that precede HABs and the conditions that signal the coast is clear. These researchers are building on a previous CICEET project that developed a rapid detection array for harmful algae species. Using two innovative technologies in tandem, researchers seek to enhance the array's ability to rapidly detect and quantify multiple target species and provide an early warning system for HABs.

#### Development of Microfluidic Technologies for the Detection and Quantification of Toxins from Harmful Algal Blooms: Dr. Todd Lane, Sandia National Laboratories

Several HABs detection methods have proven sensitive and accurate, but they're also cumbersome, use sensitive equipment, require perishable additives, or are unable to quantify toxins, which limits their usefulness in routine monitoring of shellfish beds. This project will lay the groundwork for the development of a reliable, cost-effective prototype to analyze multiple HAB toxins simultaneously in phytoplankton and shellfish in the field, thereby providing an early warning system to help managers protect communities from exposure to toxins.

#### Improved Characterization of Microalgal Abundance and Taxonomic Status through Laser-Induced Fluorescence (LIF): Dr. Hugh MacIntyre, Dauphin Island Sea Lab

To protect their communities from HABs, coastal managers must monitor algal populations that change quickly over space and time. In vogue are fluorescence-based optical monitors that 'see' chlorophyll a, which is present in some algal species. However, these tools are less effective in turbid coastal waters, cannot distinguish between algal species, and fail to identify alternative pigments. These researchers are building on a previous CICEET project to develop a field stage prototype of a laser fluorometer that differentiates between different groups of microalgae based on the fluorescence signal of their pigments.

#### Automated Imaging and Classification System for Harmful Algal Bloom Detection: Dr. Robert Olson, Woods Hole Oceanographic Institution

Early detection of intense HABs requires continuous monitoring, yet staff and funding restrictions hamper many community-based monitoring programs. This project aims to develop an automated, HABs monitoring system that captures images of organisms in water samples, and then uses software to identify and characterize the algae in the image. Continuous processing of samples and images will allow researchers to see increases in populations of harmful algae before they reach bloom stage. Eventually, researchers hope to implement a real-time, remotely operable, classification system that can be used in the field.

#### Multichannel Handheld Sensor for Microbial Contaminants: Dr. John Paul, University of South Florida College of Marine Science

Current red tide monitoring methods are labor-, skill-, and equipment-intensive, and sometimes inaccurate. This project team has already developed a faster, more sensitive method of detecting Florida's red tide microbe. Working with Florida's Bureau of Aquaculture Environmental Services, they will adapt this costly, sophisticated technology into a field-ready, fast acting, handheld sensor for use by non-technical personnel.