Florida ECOHAB

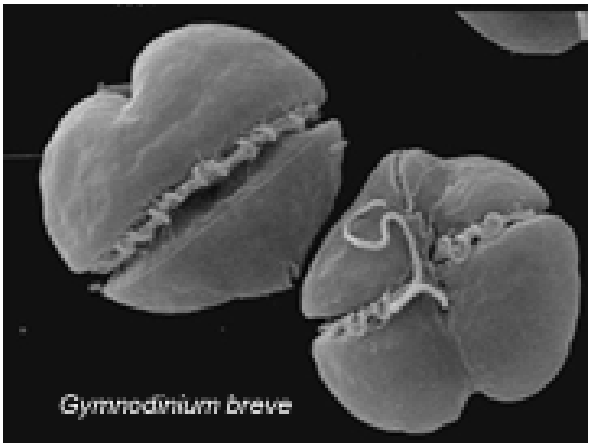
Primary Investigator: Gary Fahnenstiel - NOAA GLERL

Project Rationale

Blooms of Karenia brevis are a common occurrence in southwest Florida, and cause significant economic and aesthetic effects. A large interdisciplinary, multi-investigator program was started by NOAA/EPA to examine the causes and consequences of these blooms. We were invited to participate in this program in order to delineate the causes of Karenia brevis blooms. Our goal is to measure species-specific rates of photosynthesis and growth of field populations of Karenia brevis. Additionally, we are proposing to measure the optical efficiency of single Karenia brevis cells in the field so that species-specific quantum and growth yields can be calculated. This program is part of a larger program called ECOHAB: Florida that includes this study, physical oceanography, circulation patterns and shelf scale modeling for predicting the occurrence and transport of Karenia brevis red tides. The physical part of the program is funded out of NOAA and EPA and is operated by the University of South Florida, Department of Marine Science. The coordinated programs provide data to do large and small scale modeling of blooms.

Background

Harmful algal blooms (HAB) of the toxic dinoflagellate, Karenia brevis, have caused massive fish kills in the Gulf of Mexico since the 1500s, with most occurrences on the west coast of Florida. In 1996, the list of states that have experienced natural resource, public health and economic impacts related to this organism expanded, with the addition of Alabama, Mississippi, and Louisiana, to include all the Gulf-coast states and North Carolina. Estimates of economic impacts to Florida and North Carolina from two moderate intensity blooms ranged from 15 to 25 million dollars respectively. The harmful impacts caused by Karenia brevis occur only when cell concentrations increase significantly above low background concentrations that are present year-round in the Eastern Gulf of Mexico. Once a bloom has developed offshore in typically oligotrophic waters, cell concentrations at the 105 level can be maintained for months. During 21 of the past 22 years, red tide blooms have been observed within the region between Tampa Bay and Charlotte Harbor. The key to understanding any HAB lies in knowing how one algal species has adapted and come to dominate in its particular realm of physical, biological and chemical conditions. Our ability to predict initiation, maintenance, and dispersal of blooms on the Florida shelf has been severely limited by the lack of a quantitative description, or model, of their population dynamics and the physical, biological and chemical regime in which they are embedded. The modeling components of this project will incorporate the quantitative description of blooms and their surrounding environment provided by the field and laboratory portions of this project. The Florida ECOHAB program would try to address these needs.



2004 Plans

Field work has been completed, and focus is on analysis and publication. One paper has been completed, and it is likely that one more paper will be prepared. To date we have seen little variation in growth rates of Karenia brevis despite large changes in environmental factors, suggesting that in situ growth is not the dominant mechanism contributing to red tide blooms.

Accomplishments

In 2003 we completed the counting of our first year of ECOHAB autoradiographs. We have one additional year to count before we can begin analysis. So far, the growth rates have all ranged between 0.06-0.11 per day, which are lower than expected for bloom species.

Several research cruises were conducted in the 2002 October-December sampling period off the southwest coast of Florida. During these cruises over 50 growth experiments were conducted. Additionally, measurements for single cell optical efficiency were made on over 30 discrete samples. To date, all the growth rates have been dipped and developed for track autoradiography. The single cell optical efficiency measurements have also been made, and are being analyzed.

We conducted field work in the fall and winter of 2001 on the ecology of Karenia brevis blooms off the Florida coast. Specifically, researchers at the LMFS determined growth rates, photosynthetic rates and light absorption characteristics of populations of Karenia brevis during different stages of a bloom.

Products

Publications

Lohrenz, S. E., G. L. Fahnenstiel, G. J. Kirkpatrick, C. L. Carroll, and K. A. Kelly. 1999. Microphotometric assessment of spectral absorption and its potential application for characterization of harmful algal blooms. *J. Phycol*. 35:1438-1446.