The Centers for Disease Control and Prevention (CDC) has funded a multi-faceted approach to harmful algal blooms (HABs) in South Carolina. Task Group members are assessing the extent of HABs in freshwater and brackish ponds and estuarine environments, expanding monitoring and response efforts, and identifying potential mitigation measures. Human health surveillance and outreach efforts are also being further developed to ensure the safety of South Carolina citizens. CDC is supporting similar cooperative agreements in the states of Maryland, Virginia, North Carolina, and Florida.

In South Carolina, there are three types of potentially harmful algae that have been found to be widespread: *Pfiesteria* spp. and two lesser-known algae, raphidophytes and cyanobacteria. Raphidophytes, the most common HABs in brackish ponds, have been associated with fish kills, but more work is needed to determine potential negative human health effects. Cyanobacteria, typically found in fresh water but also present in lower-salinity estuaries, often grow on aquatic plants such as hydrilla. Scientists are looking at a possible relationship between an undescribed species and the occurrence of avian vacuolar myelinopathy (AVM), a neurologic disease found in bald eagles, coots, mallards, and other bird species.

Health professionals with S.C. Department of Health and Environmental Control and the Medical University of South Carolina are expanding their surveillance system to identify people with a high risk of exposure to potentially harmful algae. Medical and nurse consultants, on call 24 hours a day, screen callers to determine if their symptoms are consistent with HAB exposure. If toxin exposure is suspected, the person is referred to a doctor for medical evaluation and follow-up. The agencies also notify other people—those who live or play in areas where the HAB was documented—about the potential risk of coming into contact with certain types of harmful algae.

Coastal brackish ponds are monitored closely because they are favorable for the growth of many types of phytoplankton, including those that produce toxins. The grant also enables Task Group scientists to continue their monitoring and rapid-response efforts. If a sample contains harmful algae, then scientists analyze the sample to characterize the toxin and learn more about the physio-ecology of the species. In addition, a Real-Time Remote Monitoring (RTRM) system has been placed in a pond on Kiawah Island, S.C. A rapid response protocol will be established based on chlorophyll and nutrient readings that exceed a particular threshold.

Outreach programs will be enhanced and improved. The Southeast Phytoplankton Monitoring Network (SEPMN) is expanding into North Carolina and Georgia. The Task Group newsletter has been redesigned, and the Web site will be enhanced with links to publications, scanning electron microscope images, and a glossary of terms. A series of workshops has been initiated to increase awareness of the HAB issue among natural resource managers, engineers, planners, and recreational users of waterways, and general information brochures are being developed.
Member Focus

Steve Morton is a research oceanographer with NOAA’s Marine Biotoxins Program and project lead for the Southeast Phytoplankton Monitoring Network. Steve has a Ph.D. in plant biology from Southern Illinois University, and his research interests include the physio-ecology, taxonomy, and culture of toxin-producing algae.

Q: What’s a typical day for you?
A: I don’t think I have a typical day…we’re working on so many things, from microscopy to culturing algae. It really depends on when new samples come in. Right now, we’re doing projects for several organizations including the University of Hawaii, Moscow State University, the Smithsonian Institution, Florida Fish and Wildlife Research Institute, and the S.C. Algal Ecology Laboratory.

Q: What’s been the most interesting HAB-related project you’ve worked on?
A: Samples from the Black Sea because the last time it was researched was in 1950, and it has almost every type of toxin-producing algae—Alexandrium spp., a new species of Pseudo-nitzschia, Dinophysis spp.

Q: Aside from harmful algae, what else do you work on?
A: Right now I’m isolating cultures of Phaeocystis, a brown algae related to kelp, for a researcher at the University of Charleston—we may be describing a new species.

Q: What major projects are you currently working on?
A: The Southeast Phytoplankton Monitoring Network, toxin testing of samples from the S.C. Algal Ecology Lab, the physiological ecology of Gambierdiscus toxicus, a known producer of ciguatoxin…we’re looking at ways to increase or decrease toxin production by manipulating temperature and salinity. And we just finished looking at a type of algae that produces okadaic acid, the toxin associated with Diarrhetic Shellfish Poisoning.

Q: What cultures are you growing in the lab?
A: Every known toxic species that are culturable—K. brevis, Gambierdiscus toxicus, Prorocentrum minimum…we’re isolating a new toxin, perhaps a neurotoxin, for a type of Alexandrium.

Q: What toxins have you researched?
A: Ciguatoxin, brevetoxin, domoic acid, and okadaic acid.

Q: How did you develop an interest in this field?
A: Through a science fair project in junior high school…I looked at the composition of chalk. And I’ve always been interested in microscopy—I got my first microscope in the fifth grade. I think a lot of people in my generation were influenced by Jacques Cousteau. In terms of harmful algae specifically, I did some work as an undergrad in the Florida Keys on organisms that produce ciguatoxin.

Q: What advice would you give to a youngster who may be interested in this line of work?
A: Learn as many techniques as you can…culture techniques, microscopy, molecular, extraction…be broad, do a lot of things—take chemistry.
In Brief

In August 2004, two people contracted Ciguatera Fish Poisoning (CFP) after eating barracuda that was caught 50 miles offshore of Charleston, S.C. One person had only mild discomfort, but the other person had more serious neurological effects. The left-over cooked barracuda was sent to researchers for toxin analysis. The sample contained ciguatoxin, a neurotoxin produced by the dinoflagellate Gambierdiscus toxicus. This is the first reported case of CFP in South Carolina; other cases have previously been reported in Florida and it appears that barracuda are migrating up the Atlantic coast. While CFP is not lethal, people are cautioned to be aware of the possibility of ciguatoxin in reef fish such as barracuda, snapper, and grouper.

Members of the Task Group presented a special session at the S.C. Aquatic Plant Management Society’s annual meeting on August 27, 2004 in Springmaid Beach, S.C. Increasing the awareness of the HAB issue in South Carolina to this particular group will help expand early detection and rapid response to potentially harmful algal blooms and fish kill events, especially in inland freshwater ponds and lakes.

An in-service training workshop was conducted on September 8, 2004, titled “Harmful Algal Blooms: Coastal Ponds and BMPs,” for county extension agents and resource managers. After the workshop, attendees took a field trip to Kiawah Island, which provided an opportunity for further discussion about the use of buffers to mitigate effects of HABs.
Information and Resources

Web sites
S.C. Algal Ecology Lab:
http://links.baruch.sc.edu/scael
NOAA's Marine Biotoxins Program:
http://www.chbr.noaa.gov/
CoastalResearch/Whois.htm
NOAA Coastal Services Center’s Harmful Algal Bloom Project:
http://www.csc.noaa.gov/crs/habf
Florida Fish and Wildlife Research Institute, featuring “red tide” information:
http://www.floridamarine.org
Centers for Disease Control and Prevention, Health Studies Branch:
http://www.cdc.gov/nceh/hsb
Ecology and Oceanography of Harmful Algae Blooms (ECOHAB) Program:
http://www.redtide.whoi.edu/hab/nationplan/ECOHAB/
ECOHABhtml.html

Publications
Harmful Algae News. The Intergovernmental Oceanographic Commission (IOC) newsletter on toxic algae and algal blooms, Tim Wyatt, Editor:
http://www.ioc.unesco.org/hab/news.htm
Harmful Algae. Sandra Shumway and Theodore Smayda, Editors-in-Chief:
http://www.elsevier.com/locate/hal
International Directory of Experts in Harmful Algae, an IOC publication:
http://ioc.unesco.org/hab/data.htm

To report an algal bloom or fish kill, call SCDHEC at (888) 481-0125 or SCDNR at (800) 922-5431. You may also contact Lara Mason, SCDNR HAB and fish kill coordinator, directly at (843) 953-9077, or visit http://links.baruch.sc.edu/scael/report.htm.

Visit us on the Web at www.scseagrant.org/schab.htm

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