COMMITTEE ON SCIENCE AND TECHNOLOGY
SUBCOMMITTEE ON ENERGY AND ENVIRONMENT
U.S. HOUSE OF REPRESENTATIVES

HEARING CHARTER

Harmful Algal Blooms: Challenges on the Nation's Coastlines

Thursday, July 10, 2008
10:00 a.m. to 12:00 p.m.
2318 Rayburn House Office Building

Purpose

On Thursday, July 10, 2008 the Subcommittee on Energy and Environment of the Committee on Science and Technology will hold a hearing to examine Harmful Algal Blooms (HABs) recent trends and impacts on the coast, ocean, and Great Lakes.

The purpose of the hearing is to examine the challenges harmful algal blooms and red tide events impose on the coastlines and in marine and fresh waters. The hearing will also examine the current research on the microbial bloom ecology as well as the options for prevention, control, and mitigation. In addition, the hearing will examine the state of the science and recent trends on an international level as it relates to national and global changes. The hearing will examine the *National Plan for Algal Toxins and Harmful Algal Blooms*, and how the plan will affect our nation's ability to control the HABs problem.

Witnesses

Dr. Robert Magnien is the Director of the Center for Sponsored Coastal Ocean Research in the National Oceanic and Atmospheric Administration, NOAA. Dr. Magnien will discuss the current state of federally funded HABs research at NOAA, as well as options for prevention, control, and mitigation. He will also discuss the *National Plan for Algal Toxins and Harmful Algal Blooms*.

Dr. Donald Anderson is a Senior Scientist and Director of the Coastal Ocean Institute at Woods Hole Oceanographic Institution. Dr. Anderson will discuss the current research on the ecology of the blooms of microorganisms on both the east and west coasts. He will also discuss the issue and the state of the science on an international level, as well as comment on the *National Plan for Algal Toxins and Harmful Algal Blooms*.

Mr. Dan Ayres is a Coastal Shellfish Manager and Lead Biologist at the Washington State Department of Fish and Wildlife Region Six Office. Mr. Ayres will discuss the challenges harmful algal blooms and red tide events impose on the coastlines. He will also discuss the impacts of harmful algal blooms on beach closures, tourism, human health, and the science behind these toxins. He too will comment on the *National Plan for Algal Toxins and Harmful Algal Blooms*.

Dr. H Kenneth Hudnell is Vice President and Director of Science at SolarBee Inc. SolarBee is a solar-powered technology to improve water quality through high-flow, long-distance circulation. Dr. Hudnell will discuss the challenges and impacts of harmful algal blooms, specifically in fresh water. He will also discuss the applications of new technologies for prevention and control of biotoxins in water.

Background

What are Harmful Algal Blooms?

Algae are photosynthetic, plant-like protists. Algae are vitally important to marine and fresh water ecosystems, and most species of algae are not harmful. Blooms occur in both marine and freshwater environments when some algal species out-compete others and reproduce rapidly to produce large numbers of algae. An algal bloom can discolor the water due to the large number of algal cells. To the human eye, blooms can appear greenish, brown, and even reddish-orange depending upon the algal species, the aquatic ecosystem, and the concentration of the organisms. Blooms can kill fish and other aquatic life by decreasing sunlight available to the water and by using up all of the available oxygen in the water (hypoxia).

A harmful algal bloom (HAB) is a bloom that produces toxins which are detrimental to plants and animals. These outbreaks are commonly called red or brown tides. These produced toxins accumulate in shellfish, fish, or through the accumulation of biomass that in turn affect other organisms and alter food webs. In recent years, many of the nation's coastlines, near shore marine waters, and freshwaters have experienced an increase in the number, frequency, duration and type of HABs.

Blooms can be caused by several factors. An increase in nutrients can cause algae growth and reproduction to increase dramatically just as fertilizing a lawn makes the grass grow faster. In other instances, an environmental change allows certain algae to out-compete others for nutrients which can result in a bloom of the algae with the advantage. This environmental change can be water quality, temperature, nutrients, sunlight, or other factors.

Impacts of Harmful Algal Blooms

Harmful algal blooms are one of the most scientifically complex and economically significant coastal management issues facing the nation. In the past, only a few regions of the U.S. were affected by HABs, but now all U.S. coastal regions have reported major blooms. These phenomena have devastating environmental, economic, and human health impacts. Impacts include human illness and mortality following direct consumption or indirect exposure to toxic shellfish or toxins in the environment; economic hardship for coastal economies, many of which are highly dependent on tourism or harvest of local seafood; as well as dramatic fish, bird, and mammal mortalities. There are also devastating impacts to ecosystems, leading to environmental damage that may reduce the ability of those systems to sustain species due to habitat degradation, increased susceptibility to disease, and long-term alterations to community structure.

The Harmful Algal Bloom and Hypoxia Research and Control Act

Scientific understanding of harmful algal blooms and hypoxic events (severe oxygen depletion) has progressed significantly since the early 1990's, but major impediments still remain for prediction, control and mitigation of these complex phenomena. Practical and innovative approaches to address hypoxia and HABs in U.S. waters are essential for management of aquatic ecosystems and to fulfill a stronger investment in the health of the coasts and oceans called for by the U. S. Ocean Action Plan[1] and recent reports on ocean policy. Recognizing this need, in 2004 Congress reauthorized and expanded the Harmful Algal Bloom and Hypoxia Research and Control Act of 1998 (*Public Law 105-383*) by passing the Harmful Algal Bloom and Hypoxia Amendments Act of 2004 (*Public Law 108-456).*

The 1998 Harmful Algal Bloom and Hypoxia Research and Control Act (HABHRCA) established an Interagency Task Force to develop a national HAB assessment and authorized funding for existing and new research programs on HABs. This includes two multi-year research programs at NOAA that focus on HABS, the Ecology and Oceanography of Harmful Algal Blooms (ECOHAB) program and the Monitoring and Event Response for Harmful Algal Blooms (MERHAB) program. These programs involve federal, state, and academic partners and support interdisciplinary extramural research studies to address the issues of HABs in an ecosystem context. HABHRCA was reauthorized in 2004, requiring assessments of HABs in different coastal regions and in the Great Lakes and plans to expand research and address the impacts of HABs. The law also authorized research, education, and monitoring activities related to the prevention, reduction, and control of harmful algal blooms and hypoxia and reconstituted the Interagency Task Force on HABs and Hypoxia.

The law also directed NOAA to produce three reports and a research and technology transfer plan. These were to be provided to Congress and made publicly available within 1 to 2 years after the date of enactment (e.g. by December 2006). The *Prediction and Response Report*[2], released in September 2007, addresses both the state of research and methods for HAB prediction and response, especially at the federal level. None of the other products mandated by the legislation have been completed. The *National Scientific Research, Development, Demonstration, and Technology Transfer Plan for Reducing Impacts from Harmful Algal Blooms* (RDDTT Plan) is undergoing interagency approval. This plan will establish research priorities to develop and demonstrate prevention, control and mitigation methods to advance current prediction and response capabilities. The *Scientific Assessment of Freshwater Harmful Algal Blooms* is reported to be complete. However, it is not yet available. The law also required a scientific assessment of hypoxia to be produced within 2 years of enactment. This report is not yet completed.

[1] U.S. Commission on Ocean Policy. Bush Administration, 2004. http://ocean.ceq.gov/actionplan.pdf

[2] Prediction and Response Report, 2007
http://www.cop.noaa.gov/stressors/extremeevents/hab/habhrca/Predict_Resp_IntRpt_0107.pdf

The law also provided for the development of local and regional scientific assessments of HABs and hypoxia. These were not required to be produced by any specific date. These assessments were to be initiated at the request of state, tribal, or local governments or for affected areas identified by NOAA. No reports have been produced through this provision.

Current Federal Research Programs and Plans

The following are examples of ongoing research programs that support interdisciplinary research studies to address the issues of HABs and hypoxia:

- Ecology and Oceanography of Harmful Algal Blooms (ECOHAB) – a multi-agency partnership between the U.S. Environmental Protection Agency (EPA), National Aeronautics and Space Administration (NASA), National Science Foundation (NSF), NOAA's Center for Sponsored Coastal Ocean Research (CSCOR) and the Office of Naval Research (ONR)
- Monitoring and Event Response for Harmful Algal Blooms (MERHAB) – NOAA
- Coastal Hypoxia Research Program (CHRP) – NOAA
- Interagency Research Efforts on Gulf of Mexico Hypoxia
    - Northern Gulf of Mexico Program Ecosystems & Hypoxia Assessment (NGOMEX) – NOAA
    - Gulf of Mexico Program – EPA
    - Hypoxia in the Gulf of Mexico – USGS

For the past 12 years, the science community has been guided by the *National Plan for Marine Biotoxins and Harmful Algae* (Anderson, et al, 1993)[3]. This plan has served as the foundation for the development of national, regional, state and local programs and the advancement of scientific knowledge on HABs and their impacts. HABs have increased in their type, frequency, location, duration, and severity yet the decision-making and management systems have not changed. Thus the national plan has been updated to reflect the current state of the HAB problem, needs, priorities, and approaches. The new plan, *Harmful Algal Research and Response: A National Environmental Science Strategy 2005-2015*[4] (HARRNESS) is composed of views from the research and management community and outlines a framework for actions over a ten-year period.

The HABs issue has been approached at a multi-agency level because no single agency has the resources or mandate to address the many dimensions of the HAB problem. There is presently a range of programs and agencies that address specific aspects of HABs including: the ecology, the toxicology, monitoring, and human health impacts. The new US plan, HARRNESS, is designed to facilitate coordination by highlighting the needs and priorities of research and management of

[3] Anderson, D.,Galloway,S.B., Joseph, J.D. A National Plan for Marine Biotoxins and Harmful Algae. 1993. http://hdl.handle.net/1912/614
https://darchive.mblwhoilibrary.org/bitstream/1912/614/1/WHOI-93-02.pdf

[4] *HARRNESS, Harmful Algal Research and Response: A National Environmental Science Strategy 2005-2015.* National Plan for Algal Toxins and Harmful Algal Blooms. http://www.esa.org/HARRNESS/

communities. As outlined in the plan, the major priorities and critical needs for additional capability and understanding fall into four thematic areas:

1. Bloom ecology and dynamics
2. Toxins and their effects
3. Food webs and fisheries
4. Public heath and socioeconomic impacts

In addition to the programs listed above, there are several other national research programs that support research on HABs:

- NSF/NIEHS Oceans and Human Health Initiative
- National Sea Grant College Program
- EPA Science to Achieve Results (STAR) Program
- Centers for Disease Control (CDC) Programs to support state-based surveillance for human illness associated with HABs.