Subcommittee on Fisheries Conservation, Wildlife and Oceans
House Committee on Resources

H.R. 1856
Reauthorization of Harmful Algal Bloom and Hypoxia Research and Control Act of 1998
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Testimony of
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Chairman Gilchrest and members of the subcommittee, I speak in strong support for reauthorization of HABHRCA and of the amendments contained in H.R. 1856.

As a research scientist, a frequent scientific advisor to state and federal agencies, and the CEO of a leading coastal research institution—headquartered, I might add, in the Chairman's district—I have extensive experience in the science and management of harmful algal blooms and hypoxia in coastal waters.

While working in Louisiana during the 1980s I initiated the research program that led to the documentation and diagnosis of the largest area of recurring hypoxia in the United States, the so-called Dead Zone of the northern Gulf of Mexico (Figure 1). The research subsequently carried on by Dr. Nancy Rabalais and numerous collaborators led to an Integrated Assessment by the President's National Science and Technology Council and then in 2000 to an Action Plan endorsed by eight federal agencies, nine states and two tribes to shrink the area of serious oxygen depletion in the Gulf—which can be as large as the state of Massachusetts—to about 40% of its present dimensions by reducing nutrient pollution of the Mississippi River. Research, monitoring and assessment activities authorized under HABHRCA have been critical in advancing our understanding of Gulf hypoxia, in sorting out the interplay of natural phenomena and human activities in its growth and variability, and in determining effective and realistic targets for its amelioration.

Other coastal waters in the United States and around the industrialized world also experience serious hypoxia that developed during the latter half of the 20th century. Over 140 coastal systems experiencing hypoxia—43 in the U.S. alone—have now been identified around the world.[1] The cause of this dramatic phenomenon was an increase of loadings of nutrients, mainly forms of nitrogen and phosphorus, from waste discharges, land-use changes, atmospheric emissions from burning of fossil fuels, and, particularly,

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[1] Diaz, R.J., J. Nestlerode and M.L. Diaz. 2004. A global perspective on the effects of eutrophication and hypoxia on aquatic biota. In: *Proceedings of the 7th International Symposium on Fish Physiology, Toxicology and Water Quality*, Tallinn, Estonia, May 12-15, 2003, G.L. Rupp and M.D. White (editors). U.S. Environmental Protection Agency, Ecosystems Research Division, Athens, Georgia, USA.

agriculture[2]. Globally, the application of industrially produced fertilizers grew more than five-fold just between 1960 and 1980, the period during which hypoxia and other symptoms of nutrient over-enrichment were popping up in coastal ecosystems around the world (Figure 2).

As Chairman Gilchrest knows, one of these ecosystems is the nearby Chesapeake Bay. From the 1970s, the deeper waters of Chesapeake have experienced extensive hypoxia (oxygen levels too low for most animals) and even anoxia (completely devoid of oxygen) during the summer months. Since 1987, the Bay states, the District of Columbia and the Federal government have been working to reduce nutrient inputs to improve water quality, reduce hypoxia, and thereby restore living resources. Yet, during the early part of last summer the hypoxic zone was of record size, extending down as far south as the York River in Virginia (Figure 3). While this was due in part to unusual climatic conditions, including very high river flows, this was a compelling reminder that we yet have far to go in cleaning up the Bay.

As daunting a proposition as breathing life back into the northern Gulf or Chesapeake Bay is, we have the advantage in the United States of robust science, the wherewithal to control pollution sources, and, importantly, one nation. I serve on an advisory board for a program recently established by the European Commission to coordinate research on the Baltic Sea, where hypoxia is a major problem. This effort involves 12 funding agencies in nine nations, with their different languages, governments, economies, and traditions in freely conducted science. In contrast, the Harmful Algal Bloom and Hypoxia Research and Control Act authorizes a strategic national program through which science can develop and focus in a coherent way.

Disregarding this key U.S. advantage, the FY 2004 appropriations for harmful algal bloom and hypoxia research are, unfortunately, taking us toward a more balkanized regional approach of apportioning funding to NOAA's laboratories. The scientific community is hopeful that NOAA Assistant Administrator Spinrad and his colleagues in the other agencies can maintain a nationally strategic, "competitive, peer-reviewed, merit-based interagency research program" as called for in the spirit of Section 3 of H.R. 1856. The community is also quite disappointed that the President's FY 2005 budget shows a reduction in investments in research and assessments related to harmful algal blooms and hypoxia. The appropriation levels included in H.R. 1856 are much more appropriate given the seriousness of these problems, growing capacity of the scientific community, and opportunities for scientifically novel and practically useful advances. With the release of the report of the U.S. Commission on Ocean Policy imminent, I can tell you as a member of the Commission's Science Advisory Panel that the report will highlight eutrophication as a major cause of coastal ecosystem degradation and call for a new era of ecosystem-based management founded on sound science. In that light, the

[2] Boesch, D.F. 2002. Challenges and opportunities for science in reducing nutrient over-enrichment of coastal ecosystems. *Estuaries* 25:744-758.

programmatic consequences of the FY 2004 budget and the FY 2005 request seem to be headed in exactly the wrong direction.

Other witnesses will provide more detailed testimony on the sections of H.R. 1856 that deal with harmful algal blooms. I would like to stress the importance of the requirement for a National Scientific Research Plan into Reducing Impacts from Harmful Algal Blooms. For both HABs and hypoxia the time has come for science to move beyond phenomenology and diagnosis and into prognosis and prescription for prevention and control. Several years ago, I had the opportunity to lead a preliminary scientific assessment of options for prevention, control and mitigation of harmful algal blooms[3] and hope that our report provides a useful starting point for the national research plan for reducing impacts of HABs.

Although not all harmful algal blooms are caused by nutrient over-enrichment, many clearly are. Tremendous new insight has been gained into the relationships between nutrient enrichment and HABs. Much—if not all—of this research has been conducted under the auspices of the ECOHAB and MERHAB programs authorized by HABHRCA. The following highlight some of the new understanding that has been gained:

1. For specific HAB species, new data have been obtained supporting the relationship between nutrient loading and their outbreaks.
2. New findings have emerged indicating that the form of nutrient supplied may impact the extent to which HAB species may proliferate. Thus, in addition to total nutrient load, the form of that nutrient (for example, whether the nitrogen is primarily in an organic or inorganic form) must be understood.
3. Significant understanding has been gained with regard to the biology of specific HAB species, and how they respond to nutrients under different environmental conditions. For example, a species may have one response in cool water, and another when the water is significantly warmer. Again, knowledge of total nutrient load is not sufficient; rather, the timing of that load is also critical to understand.
4. New knowledge has been developed regarding the relative response of specific HAB species to nutrients when other competing non-HAB species are present.
5. Application of powerful new techniques and tools has led to a better understanding of the ability of HAB species to maintain themselves in dormant, or near dormant states. Thus, we now have much better knowledge of the sediment as a reservoir for organisms that are potentially available to respond to nutrient pulses or other conditions.

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[3] Boesch, D.F., D.M. Anderson, R.A. Horner, S.E. Shumway, P.A. Tester, and T. E. Whitledge. 1996. *Harmful Algal Blooms in Coastal Waters: Options for Prevention, Control and Mitigation*. National Oceanic and Atmospheric Administration, Silver Spring, Maryland.

This emerging knowledge suggests that we can develop means for prevention and mitigation. We can stop the growing trends and expansion of these events.

Finally, as a marine ecologist, I want to strongly support the provisions of H.R. 1856 that extend HABHRCA to the Great Lakes and freshwater environments in general. These environments are equally susceptible and because they are proximal to human populations and often used for drinking water supplies pose a direct threat to human health. In that regard, I also want to point out the clear linkage between HABHRCA and other legislative initiatives to authorize an oceans and human health research program. These efforts go hand in hand.

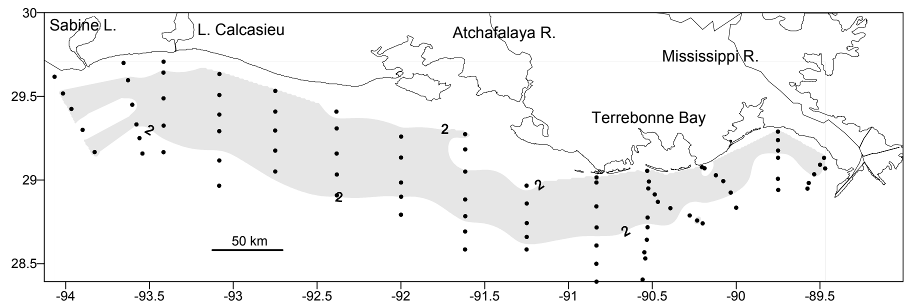

Figure 1. Extent of bottom hypoxia on the Louisiana-Texas continental shelf, summer 2001.

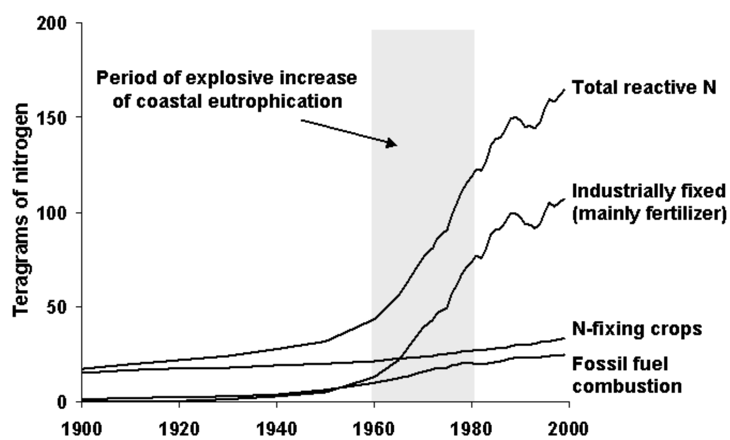

Figure 2. Coastal hypoxia grew dramatically during a period of rapid growth in reactive nitrogen resulting from human activities.

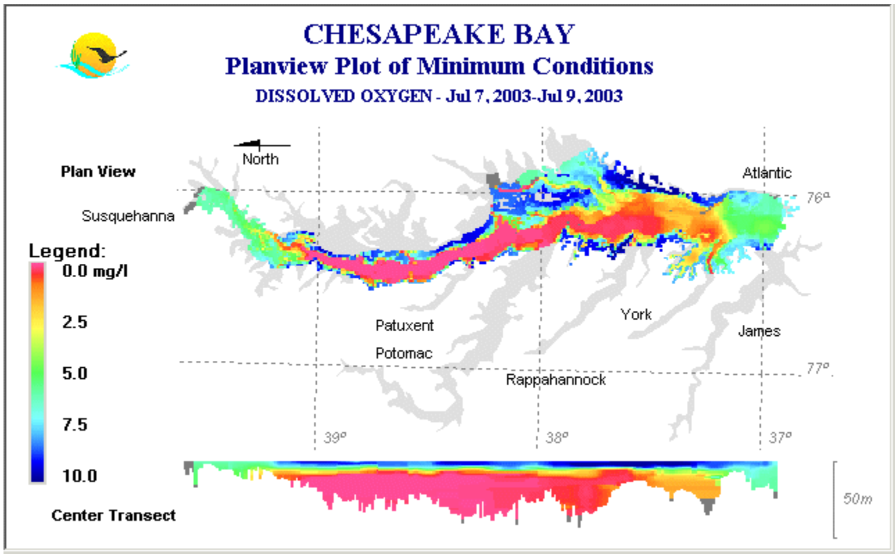

Figure 3. Extensive hypoxia in bottom waters in Chesapeake Bay, July 2003.