



Ocean Acidification

A National Strategy to Meet the Challenges of a Changing Ocean

Origin and Findings of the NRC Study

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Photo from NOAA

International Scientific Community Recognizes Ocean Acidification

***The Ocean
in a High CO₂ World***

AN INTERNATIONAL SCIENCE SYMPOSIUM.
MAY 10-12, 2004
UNESCO, PARIS, FRANCE

Second Symposium on The Ocean in a High-CO₂ World

6 - 9 October 2008 / Musée Océanographique, Monaco

under the High Patronage of His Serene Highness Prince Albert II

H.R. 5946

Magnuson-Stevens Fishery Conservation & Mgmt. Reauth. Act of 2006

- Sec. 701. Study of the acidification of the oceans and effect on fisheries.
 - The Secretary of Commerce shall request the National Research Council to conduct a study of the acidification of the oceans and how this process affects the United States.

Ocean Rescue

(New York Times, Dec. 24, 2006)

Because it was approved at about 3 o'clock in the morning in the frantic final hours of the 109th Congress, one important & positive piece of legislation has gone largely unnoticed. This was the reauthorization of the of the 30-year-old Magnuson-Stevens Act, the basic law regulating fishing practices in American waters from 3 to 200 miles offshore. ...

Ocean Rescue, NY Times (Cont'd)

... As useful as these changes are, however, the bill contains one obscure provision (Sec. 701 of Title VII) that may prove to be of even greater importance to ocean health. The handiwork of Rep. Jay Inslee, a Washington State Democrat, it is a one-sentence directive to the Secretary of Commerce to ask the National Research Council, part of the National Academy of Sciences, “to conduct a study of the acidification of the oceans and how this process affects the United States.”

Abbreviated Statement of Task

1. Review current knowledge of ocean acidification, covering past, present, and anticipated future effects on ocean ecosystems.
2. Identify critical uncertainties and key science questions regarding the progression and impacts of ocean acidification and the new information needed to facilitate research and decision making for potential mitigation and adaptation options.
3. Recommend a strategy of research, monitoring, and assessment for federal agencies, the scientific community, and other partners, including a strategy for developing a comprehensive, coordinated interagency program to address the high priority information needs.

Federal Sponsors

- National Oceanic and Atmospheric Administration (NOAA)
- National Science Foundation (NSF)
- National Aeronautics and Space Administration (NASA)
- U.S. Geological Survey (USGS)

Committee Membership

François M. M. Morel, *Chair*, Princeton University

David Archer, University of Chicago

James P. Barry, Monterey Bay Aquarium Research Institute

Garry D. Brewer, Yale University

Jorge E. Corredor, University of Puerto Rico, Mayagüez

Scott C. Doney, Woods Hole Oceanographic Institution

Victoria J. Fabry, California State University, San Marcos

Gretchen E. Hofmann, University of California, Santa Barbara

Daniel S. Holland, Gulf of Maine Research Institute

Joan A. Kleypas, National Center for Atmospheric Research

Frank J. Millero, University of Miami

Ulf Riebesell, Leibniz Institute of Marine Sciences

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S. 1581

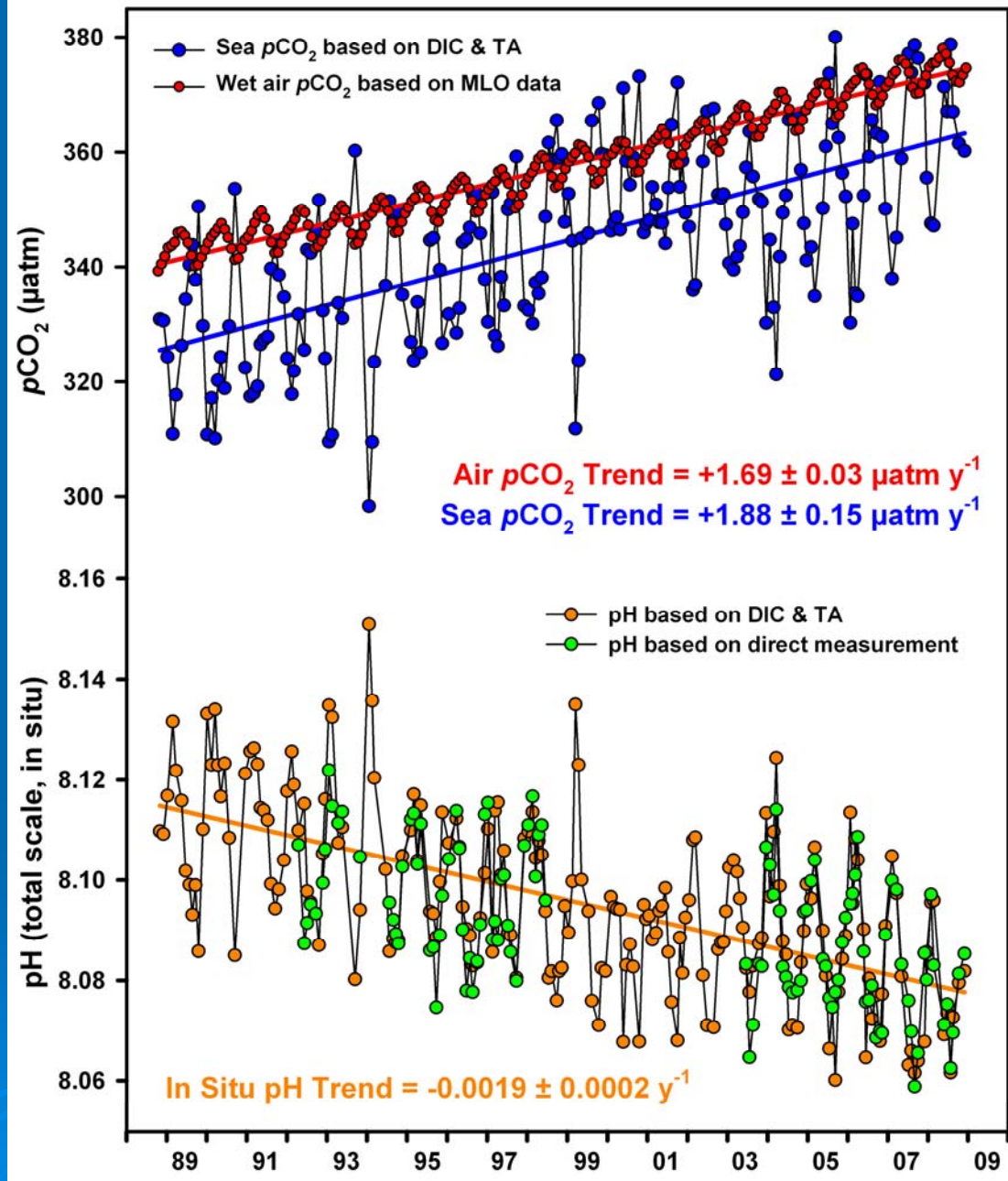
- A bill to establish an interagency committee to develop an ocean acidification research & monitoring plan & to establish an ocean acidification program within the National Oceanic and Atmospheric Administration.
- Be it enacted by the Senate & House of Representatives of the United States of America in Congress assembled,
- Section 1. Short title; Table of Contents.
- (a) Short title. – This Act may be cited as the “Federal Ocean Acidification Research & Monitoring Act of 2007” or the “FOARAM Act”.

Key Messages

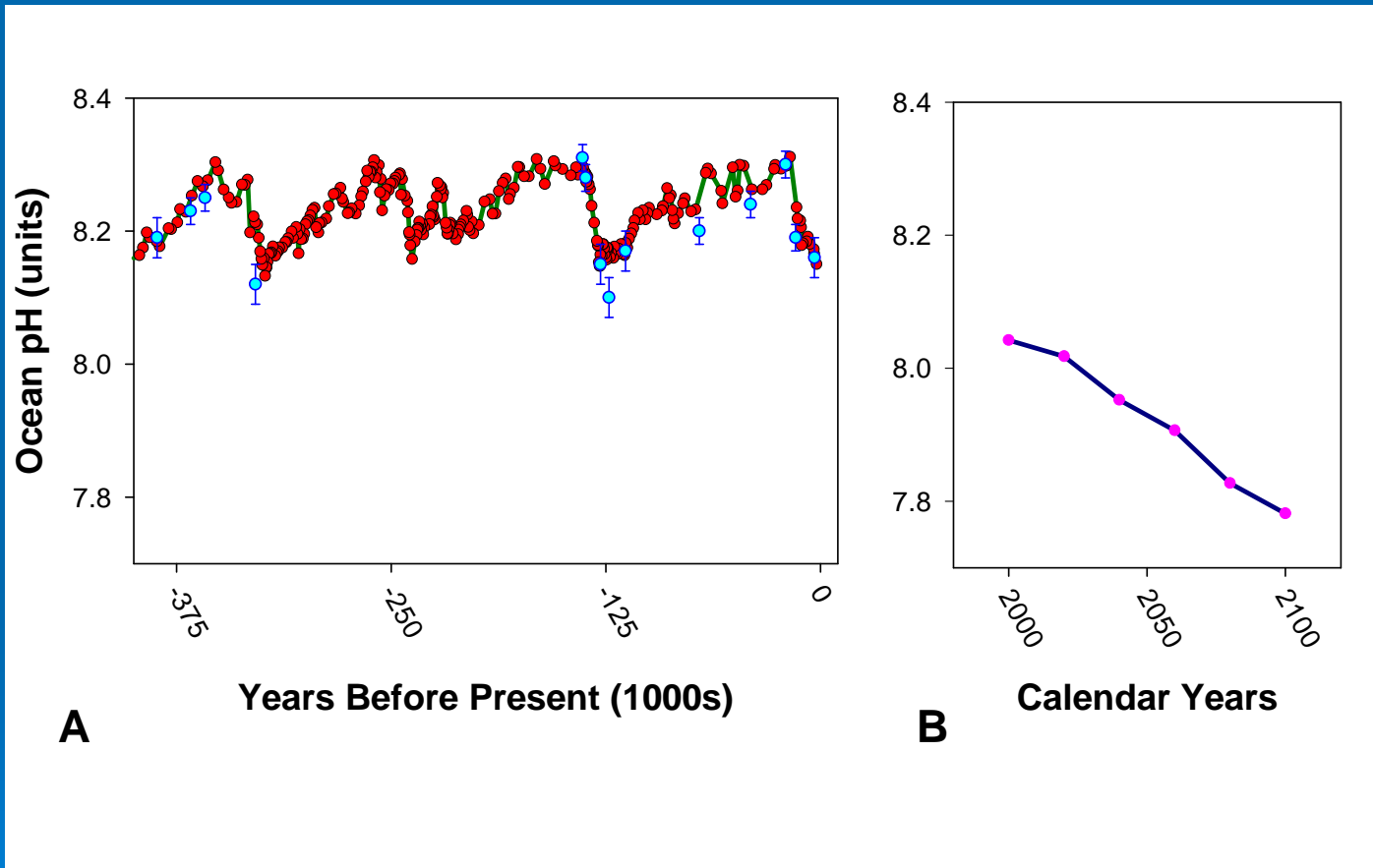
- **Ocean chemistry is changing at an unprecedented rate and magnitude due to human-made carbon dioxide emissions.**
- **Changes in seawater chemistry are expected to affect marine organisms that use carbonate to build shells or skeletons.**
- **It is currently not known how various marine organisms will acclimate or adapt to the chemical changes resulting from acidification.**



Rising Atmospheric CO₂ and Changing Ocean Chemistry



Rate of Acidification



National Program Elements

- Robust observing network,
- Research to fulfill critical information needs,
- Assessments and support to provide relevant information to decision makers,
- Data management,
- Facilities and training of ocean acidification researchers,
- Effective program planning & management.

Observational Network

A global network of chemical and biological observations is needed to monitor changes in ocean conditions attributable to acidification.

Existing observing systems do not provide adequate coverage or measurements of carbon parameters, biological constituents, or biological indicators.

Research Needs

- processes affecting acidification in coastal waters;
- physiological mechanisms of biological responses;
- potential for biological acclimation and adaptation;
- response of individuals, populations, and communities;
- ecosystem-level consequences;
- interactive effects of multiple stressors;
- implications for biogeochemical cycles; and
- **socioeconomic impacts and informing decisions.**

Socioeconomic Impacts

Fisheries, aquaculture, and tropical coral reef systems appear to be the most vulnerable sectors based on currently available data and these sectors have also attracted the most public attention and concern.



Photo from NOAA

Vision of the Future?

**Natural
carbon
dioxide
vent**



Hall-Spencer et al., 2008