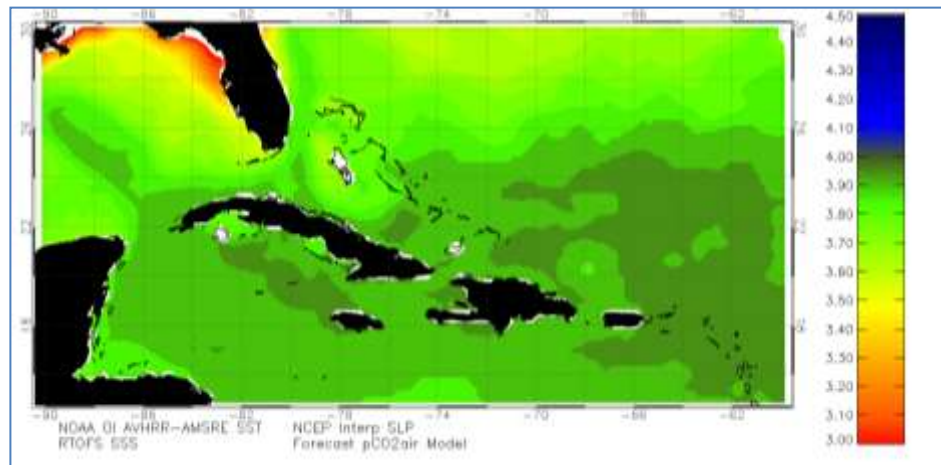


Florida Keys National Marine Sanctuary

Climate Change

Management Issue

Global climate is changing due to human activities. We anticipate increased occurrences of worldwide mass coral bleaching events if human carbon footprints remain at current levels. How these climate change impacts will affect or cascade through the different components of the marine ecosystem is not fully known or predictable.



NOAA Coral Reef Watch Aragonite saturation state composite for January 2009.
Map credit: NOAA

Description

Evidence shows that average global temperatures have been increasing over the last thirty years. Additionally, concentrations of carbon dioxide have been increasing in both the atmosphere and the oceans during the same time period. How these climate change impacts will cascade through the marine ecosystem remains questionable because some coral reefs and associated organisms (e.g., fishes, invertebrates, seagrass, algae, etc.) may have resilient characteristics. Understanding the nature of this resiliency will require expertise from multiple ecological disciplines.

Questions and Information Needs

- 1) What characteristics of a specific geographic area confer resistance or resilience to bleaching, disease, and effects of climate change?
- 2) What characteristics of each coral species confer resistance or resilience to bleaching, disease, and effects of climate change?
- 3) How far in advance can bleaching events be predicted using currently available tools?
- 4) What is the predictability of bleaching and disease events in terms of duration and geographic scope?
- 5) How do bleaching and disease conditions affect other components of the ecosystem (e.g., fish, reef invertebrates, sponge pumping rates, etc.)?
- 6) How do increased concentrations of carbon dioxide (i.e., ocean acidification) affect reef accretion, coral larvae formation, metamorphosis, growth and survival, resistance or resilience to disease, bleaching, and other stressors?
- 7) How do increased concentrations of carbon dioxide (i.e., ocean acidification) affect physiologic development in fish? Does this in turn affect their foraging or defensive behaviors?

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- 8) How do increased concentrations of carbon dioxide (i.e., ocean acidification) affect sponge spicule development? Invertebrate exoskeletal development?

Scientific Approach and Actions

- Examine existing habitat monitoring data to look for characteristics that have historically conferred resistance and cross reference those with bleaching data;
- Assess and prioritize research and monitoring activities by developing and implementing a prioritized research and monitoring plan for the Sanctuary;
- Develop a local coral bleaching response plan;
- Assemble relevant research, monitoring, and bathymetric data into appropriate databases for management consideration and guidance; and
- Monitor the socioeconomic correlation to climate change and its impact of the marine ecosystem.

Potential Key Partners and Information Sources

NOAA's Satellite and Information Service, NOAA Fisheries, NOAA's Atlantic Oceanographic and Meteorological Laboratory, Florida Fish and Wildlife Conservation Commission, Florida International University, University of South Florida, University of Miami, NOVA Southeastern University, Florida Institute of Technology, Mote Marine Laboratory, and volunteers.

Management Support Products

- Coral bleaching response plan
- Report characterizing the accuracy of bleaching event predictions
- Report describing characteristics that may relate to resistance or susceptibility to bleaching
- Distilled summaries of scientific reports regarding the extent, severity, or predictability of bleaching events
- Presentations on the effects of climate change on the marine ecosystem of south Florida at conferences, symposia, meetings and workshops
- Maps of particularly sensitive areas

Planned Use of Products and Actions

- Draft a Bleaching Response Plan using the information collected during research and monitoring activities
- Contribute to the data record on long term monitoring of coral bleaching in the Sanctuary
- Use results to develop or enhance education and outreach products
- Use relevant data to recommend management strategies that would promote ecosystem resiliency (e.g., temporary closure of sensitive areas or other temporal zoning strategy)

Program References

FKNMS Management Plan

- Science Management and Administration Action Plan (Chapter 3.1.1)
- Research and Monitoring Action Plan (Chapter 3.1.2)

ONMS Performance Measures

- Number of sites in which living marine resources, based on long-term monitoring data, are being maintained or improved

Other Documents

- FKNMS Condition Report (2011)
- FKNMS Comprehensive Science Plan (2002)
- Florida Keys National Marine Sanctuary and Protection Act of 1990

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