NOAA Deep Dive: Florida Coral Reef Bleaching Event

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National Oceanic and Atmospheric Administration
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Florida Coral Bleaching-Level Heat Stress

- Unprecedented bleaching-level heat stress impacting all of Florida’s Coral Reef
- Heat stress developed earlier than ever before by 5-6 weeks
- Sea Surface Temperatures for Florida Keys Virtual Station have been higher than previous record value for 27 of past 36 days
- Southeast Florida has never before reached Alert Level 2 conditions
- Most extreme heat stress in lower/middle Florida Keys
Year-to-Date Bleaching Alert Area

No stress  
Bleaching Watch  
Bleaching Warning  
Bleaching Alert Level 1  
Bleaching Alert Level 2

**Bleaching Alert Level 1**  
Significant bleaching likely

**Bleaching Alert Level 2**  
Severe bleaching and significant mortality likely

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Cheeca Rocks, Florida Keys. 24 July 2023. Image credit: G. Kolodziej/NOAA. Arrow on plot shows when photo was taken.

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Bocas del Toro, Caribbean Panama. 14 July 2023. Image credit: J. Sanchez. Arrow on plot shows when photo was taken.

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All unbleached areas are recent, heat-driven mortality of *Acropora cervicornis*, which is listed as threatened under the Endangered Species Act.
Year-to-Date Bleaching Alert Area

Confirmed coral bleaching

- 5 countries in Eastern Tropical Pacific
  - Mexico
  - El Salvador
  - Costa Rica
  - Panama
  - Columbia

- 7 countries/territories in Atlantic
  - Florida
  - Mexico (both sides of Yucatan)
  - Panama
  - Belize
  - Cuba
  - Puerto Rico
  - US Virgin Islands
Modeled Four-Month Coral Bleaching Outlook (Updated weekly)
Coral Reef Watch Summary

- Large-scale heat stress and coral bleaching event underway, impacting two ocean basins and multiple countries

- All sites in Caribbean and Atlantic are experiencing:
  - Sea Surface Temperatures as high, or higher than ever before in satellite record
  - Accumulation of heat stress earlier than ever before

- Entirety of Florida Keys experiencing Alert Level 2 conditions
  - Some sites already exposed to 2 times greater amount of heat stress than when mortality is expected to begin
  - Take-home: Corals in Florida are experiencing extreme levels of heat stress that have never been experienced before

- Outlook product predicts intensifying heat stress across entire Caribbean
  - Caribbean-wide bleaching event may begin in a matter of days to weeks
  - Alert Level 2 conditions predicted for majority of Caribbean coral reef sites by end of September
Cheeca Rocks, FKNMS
Cheeeca Rocks

- Resilient site with high coral cover
- Climate sentinel site for NOAA’s National Coral Reef Monitoring Program
- More than a decade of environmental and ecological data have driven science
- A Mission: Iconic Reefs restoration site
Bleaching at Cheeca Rocks

AOML Coral Program
National Coral Reef Monitoring Program

- bleaching threshold
- maximum monthly mean

Date
05/29/23 06/05/23 06/12/23 06/19/23 06/26/23 07/03/23 07/10/23 07/17/23 07/24/23 07/31/23 08/07/23 08/14/23
Bleaching at Cheeca Rocks

June 30

July 24

Images roughly 10 x 10m
Impacts on the ecosystem

All hard coral species are bleached or pale
Soft corals such as sea fans have died
Solution-driven science for restoration

Performance assessment
Different genotypes have different tolerances

Automation for restoration
Increase efficiency and decrease costs

Stress hardening
Naturally prepare corals for stress in the wild
Florida Keys National Marine Sanctuary
Variable stress, variable impacts

Duration of temperature stress

- Carysfort S
- Cheeca
- Sombrero
- Marathon
- EDR

Number of Days

Temperature °F

88 (day&night)
86
88
90
91.4
93.2

National Oceanic and Atmospheric Administration (NOAA) Coral Briefing
Rethinking restoration: operationalizing research

- ID & propagate resilient genotypes
- ID resilient sites
- Research
  - Symbiont shuffling
  - Selective breeding
  - Stress hardening/acclimation
- Novel outplant strategies
- Minimize stress
  - shading
  - predator control
  - herbivory

Reef Renewal: Shading nursery structures
Reef Renewal: Genotypic variation in bleaching resilience
Nursery Rescue: to deep water or onto land

1. Acroporid gene bank rescue

2. Acropora spawning Hub: Reef Renewal to FLAQ

3. Coral Restoration Foundation (CRF)

4. CRF Coral Bus to transport corals

Production stock: moving coral ropes from nearshore nursery (20 feet) to offshore (70 feet) refugia

Corals maintained at 82-85 °F

Tavernier nursery (shallow water) to Keys Marine Lab (KML)
For More Information

Media resources:
https://research.noaa.gov/2023/08/15/media-resources-deeper-dive-into-coral-bleaching-event/

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