EL NINO FORECASTING AND RESPONSE TO MARINE HEATWAVE EVENTs

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Friday, September 22, 2023
Session 8

Year-to-Date Bleaching Alert Area

Confirmed coral bleaching since May 2023

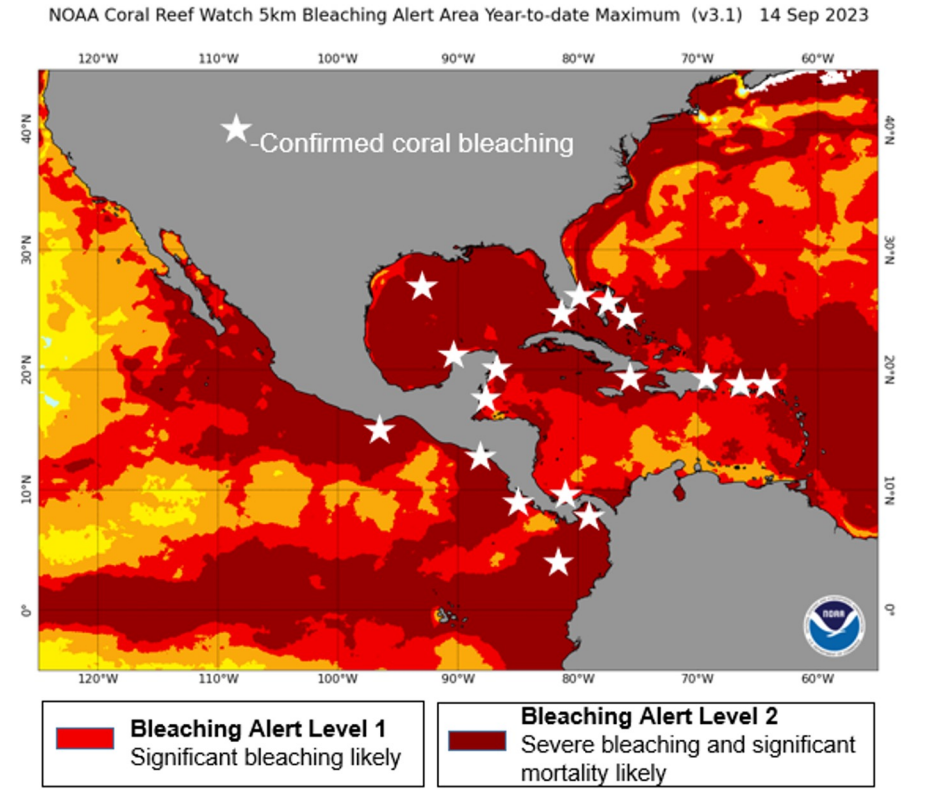
Eastern Tropical Pacific
- Mexico
- El Salvador
- Costa Rica
- Panama
- Columbia

Persian Gulf
- United Arab Emirates
- Iran

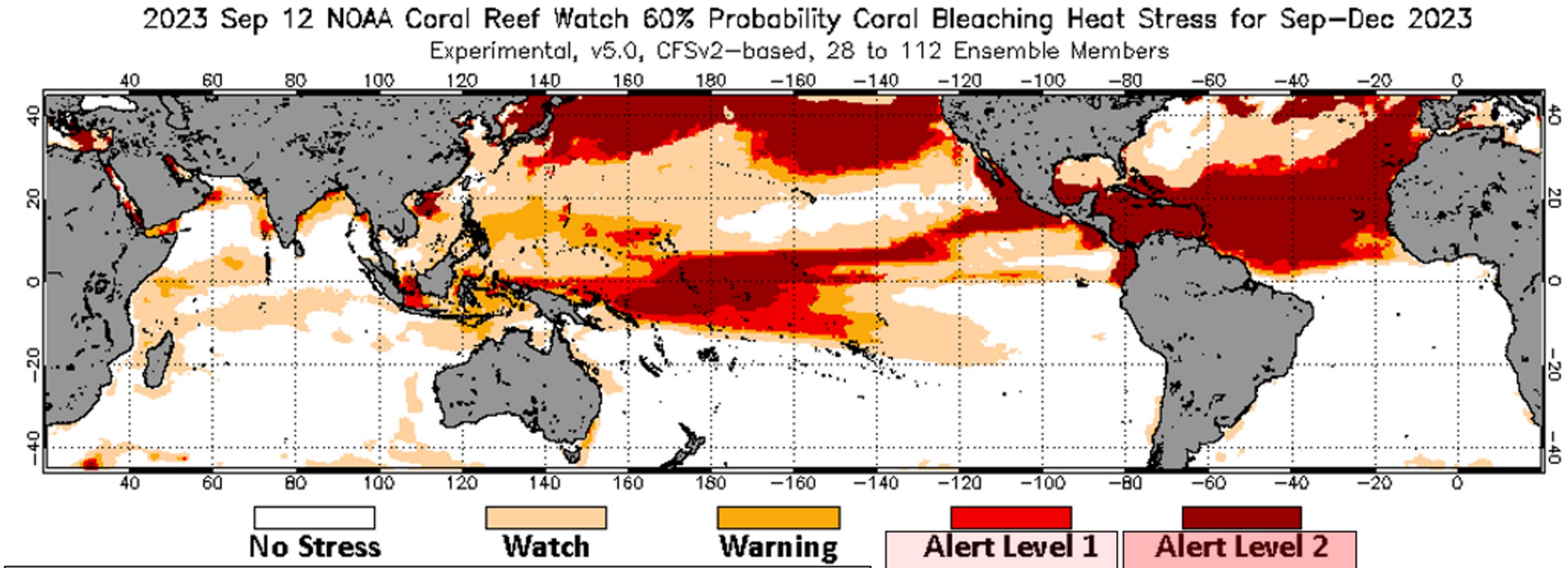
Red Sea:
- Jordan
- Egypt

Atlantic and Caribbean
- Florida
- Mexico (both sides of Yucatan)
- Panama
- Belize
- Cuba
- Puerto Rico
- US Virgin Islands
- Bahamas
- Dominican Republic

Western Pacific:
- Japan



Modeled Four-Month Coral Bleaching Outlook



Outlook product predicts intensifying heat stress across entire Caribbean

Alert Level 2 conditions predicted to persist for majority of Caribbean, as well as Eastern and Central Pacific through October - November

NOAA Coral Reef Watch Summary

- Large-scale heat stress and coral bleaching event underway, impacting four different oceans 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
- Corals in Florida exposed to levels of heat stress never experienced before
  - Multiple sites in Lower/Middle Florida Keys exposed to more than 2 times the amount of heat stress than when mortality is expected to begin

NOAA Coral Reef Watch Summary

- 100% of Virtual Stations in NW Atlantic are at an Alert Level 1 (Bleaching expected)
  - 85% are at an Alert Level 2 (Severe bleaching and mortality expected)
- Outlook product predicts intensifying heat stress across entire Caribbean, Eastern and Central Pacific
  - Alert Level 2 conditions predicted to persist for majority of Caribbean through October-November
  - Alert level 2 conditions will persist in Eastern and Central Pacific (Kiribati, Howland/Baker, N Line Islands) for at least next 8 weeks

Florida case study of 2023 bleaching response

- Stand down on outplanting (late July)
- Try to assess impacts (mid-August)
- Acroporid gene bank rescue
- Nursery evacuations to land-based facilities or transplants to deeper depths
- Consider other interventions and/or reduce localized stressors
  - e.g., shading, feeding, snail removal

What has this event taught us about response planning (so far)?

- We have great forecasting/predictive modeling, but we don't have great in-situ data during bleaching events
- We need a lot more data, and better, more sophisticated data
  - e.g., with species-specific susceptibility data, we can create a timeline of urgency for managers
- More accurate percent (%) mortality data
- Ideal endpoint is understanding how much coral is actually lost.
  - Hard to say what was lost without good "before" data (shifting baselines)
  - Consider using Structure-from-Motion/Photomosaics so you have a record that can be referred to year over year (if monitoring fixed sites)

Highlighted need for adaptive management

A MANAGER'S GUIDE TO CORAL REEF RESTORATION PLANNING AND DESIGN

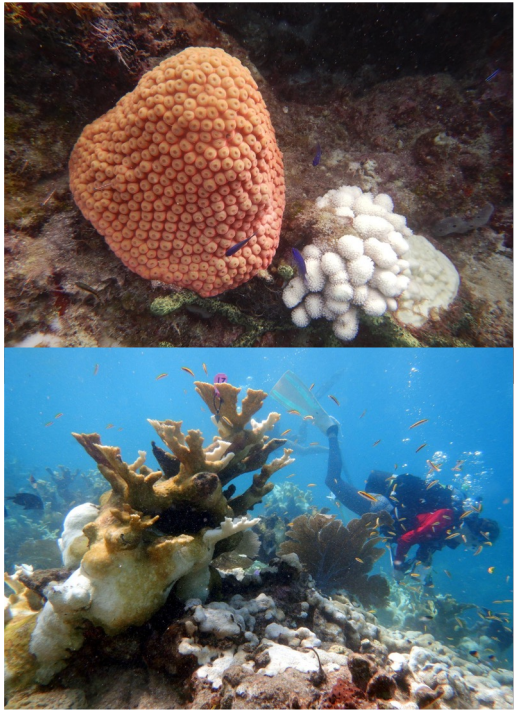
Response planning lessons learned

Management/Planning lens:

- Thinking through the whole lifecycle of a [restoration, outplanting, etc.] project

Technical scientific needs lens:

- Improving bleaching monitoring
  - Timing of data collection
  - Quantitative % mortality
  - Species-specific data



Questions?

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