



The Ecological Effects of a Marine Heatwave on Panamanian Coral Reefs

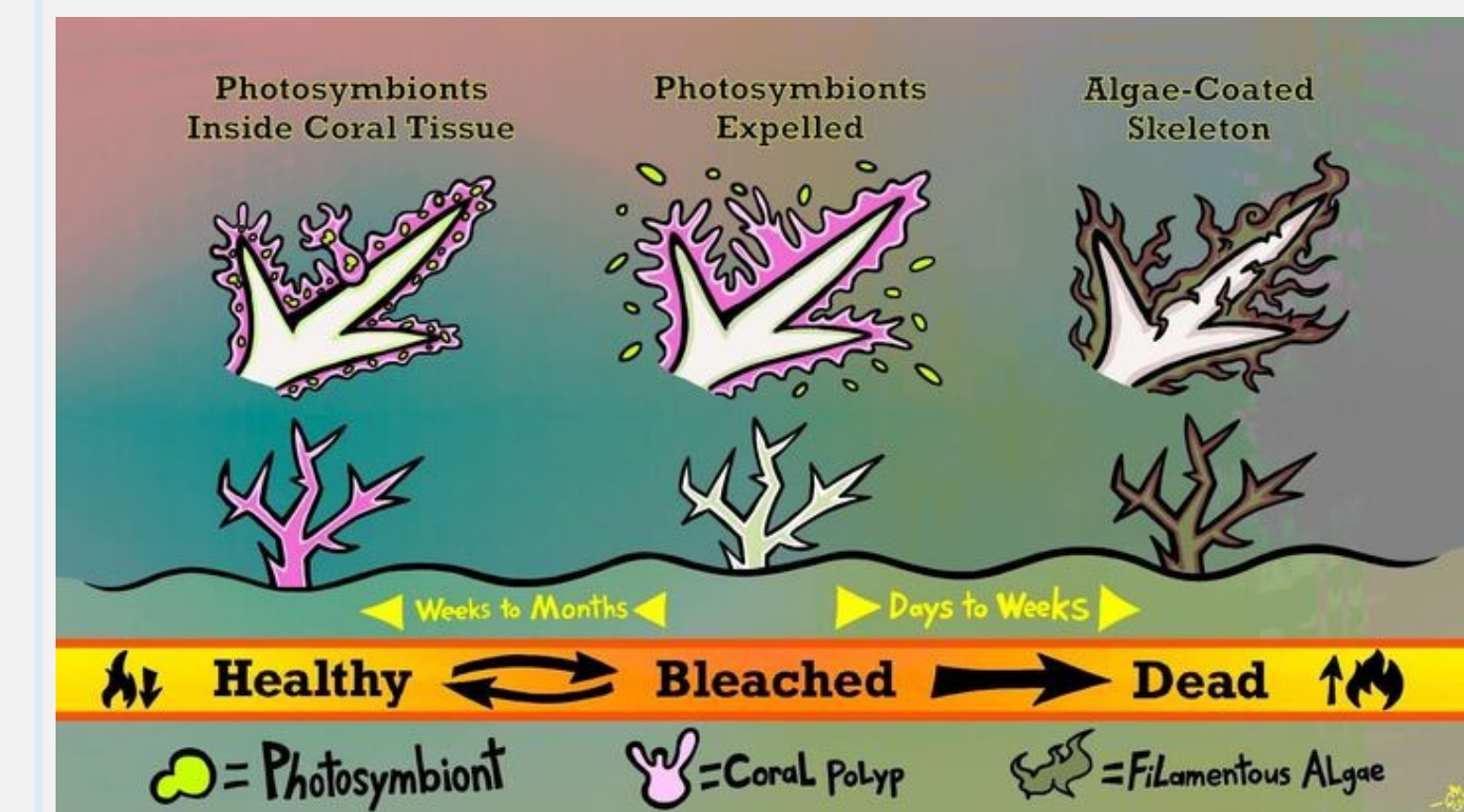
Caroline DeSouza, Felicia Aronson, Leah Harper, Brooke Sienkiewicz & Sarah Gignoux-Wolfsohn
Department of Biological Sciences, University of Massachusetts Lowell



Introduction

Heatwaves alter the state of balance in marine ecosystems, straining organism interactions. Corals are particularly vulnerable to changes in the marine environment as they are holobionts, relying on support from their microbiome; which includes photosynthetic algae as a source of autotrophic energy.

Unprecedented elevated temperatures were recorded in Caribbean Sea during the Fall of 2023. This heatwave induced a massive bleaching event in the region, causing corals to expel their algal symbionts.



Drawn by Christian Flaherty

Objectives

- To continually observe and document the health statuses of coral reefs in Panama through and following a marine heatwave
- To compare coral bleaching patterns across host species

Methodology



Smithsonian
Tropical Research Institute



Tagged corals at three reefs in Bocas del Toro, Panama

Surveyed & photographed tagged coral colonies at three time points



Analysis of coral health status over time.
Dplyr, tidyverse, ggplot2, ggsankey

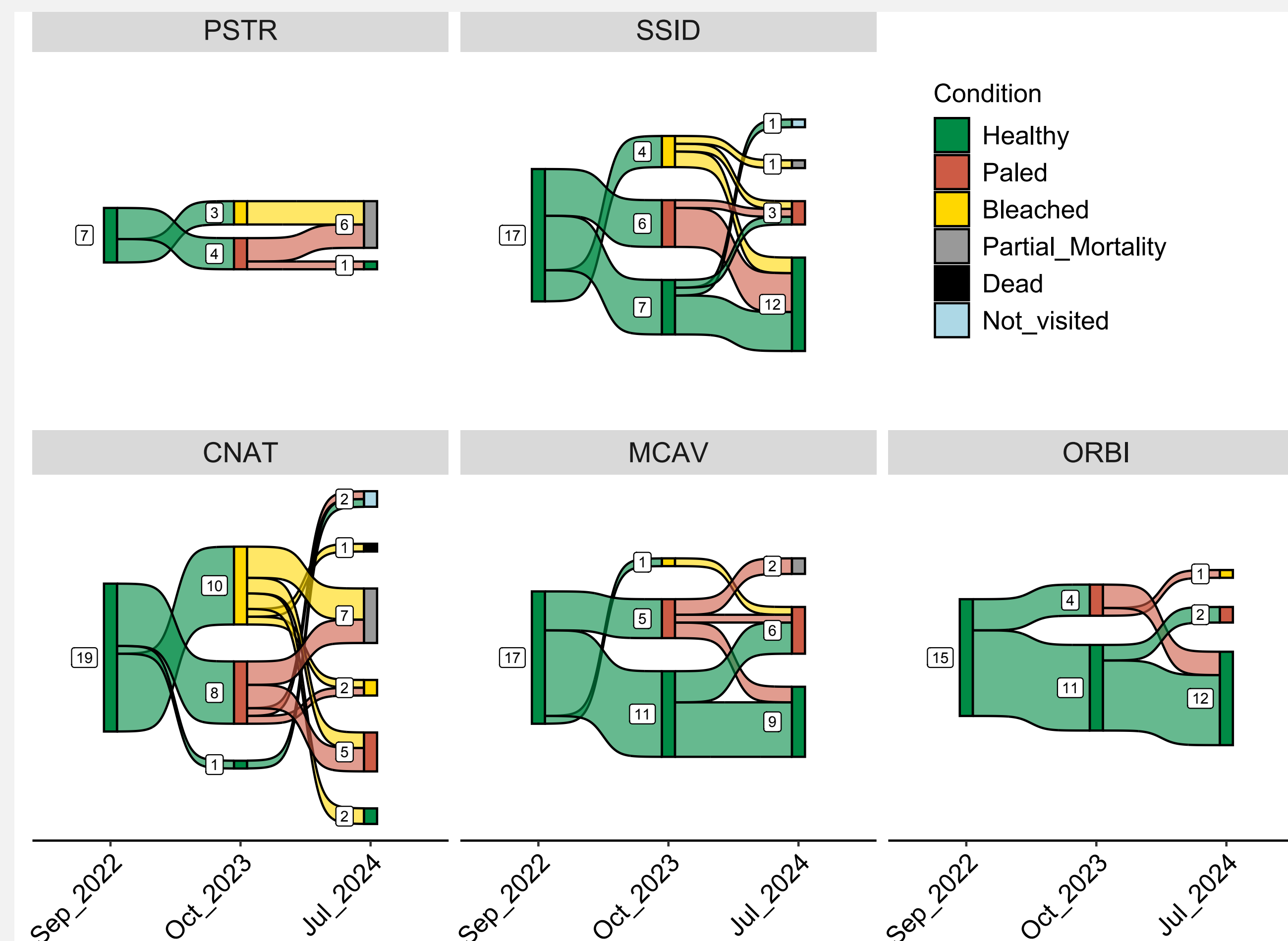
Results

During Marine Heatwave

- All PSTR colonies observed to have some bleaching
- Other species were more successful in resisting active bleaching

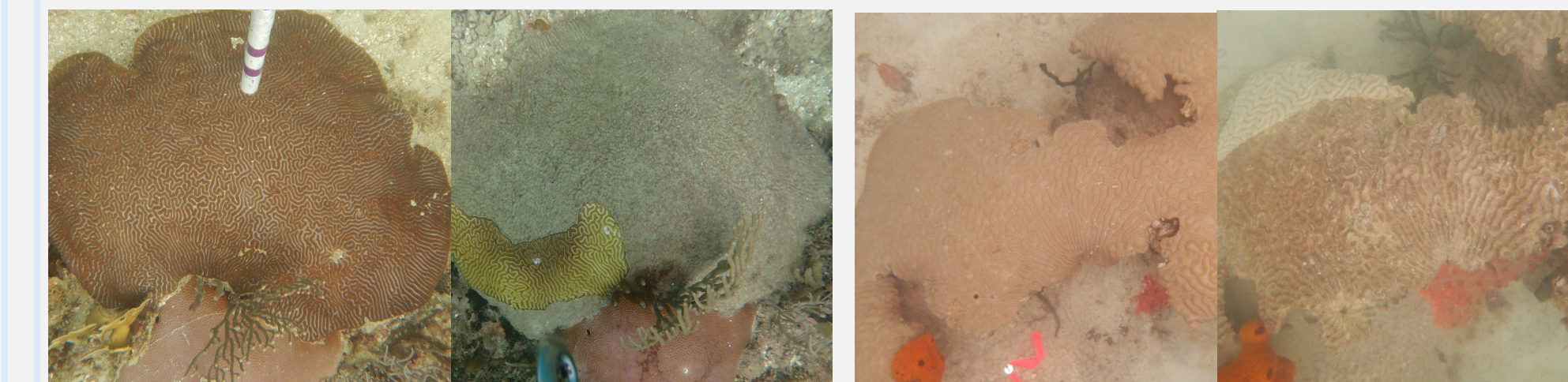
Post-Marine Heatwave

- Majority of CNAT and PSTR colonies experienced tissue death
- SSID, MCAV, & ORBI spp. were able to recover algal symbionts



Conclusion

- Several colonies are unable to recover algal symbionts, leading to eventual tissue death
- Coral polyps can temporarily sustain themselves during bleaching events by feeding on dissolved organic matter
- Colpophyllia natans (CNAT) are extremely susceptible to bleaching and subsequent tissue death, suggesting that their symbionts are less resilient to increased temperatures



Sep_2022 Jul_2024
PSTR

Sep_2022 Jul_2024
CNAT

Future Directions

- ITS2 DNA metabarcoding to quantify symbionts across coral host species
- Utilizing Belizean coral samples from 2019-2024
- Explore bleaching recovery and changes in recruited algae
- Continued observation of Panamanian corals and an in-situ experiment
- Light exposure manipulation on out planted corals

Acknowledgements

Thank you to the Smithsonian Tropical Research Institute at Bocas del Toro, Smithsonian MarineGEO, Carolina César Ávila, The Sea of Change Foundation, and Life on a Sustainable Planet