

DEVELOPING REALISTIC SCIENCE- BASED PERFORMANCE STANDARDS FOR *ACROPORA* RELOCATION EFFORTS

William F. Precht

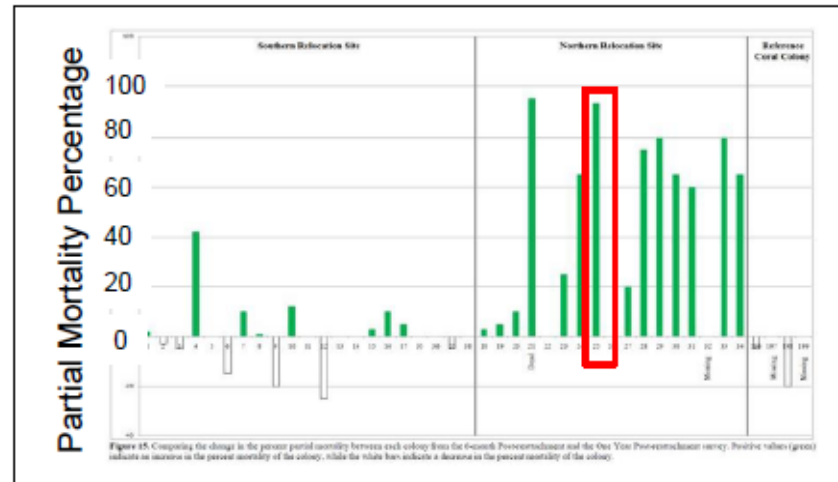
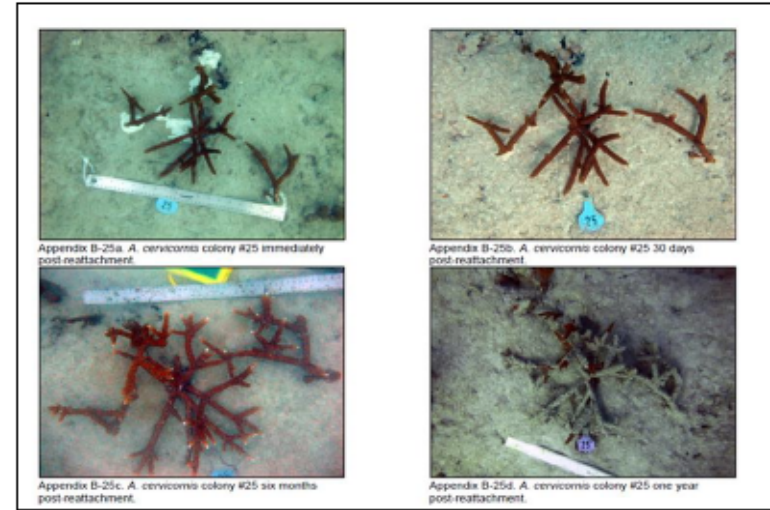


Bio-Tech Consulting

An EnviroTrac Company

Performance standards for coral relocation

- The one year post-relocation report concludes “*only one A. cervicornis colony (Colony 21) had died, and survivorship of 97.3% of the remaining tagged A. cervicornis colonies remains higher than the 83% post-relocation survival rate originally anticipated by NMFS*” (CSI 2015, page 22).
- Lesson learned: Update performance standard with NO net loss of tissue after 2 years of monitoring (per pooled species group)



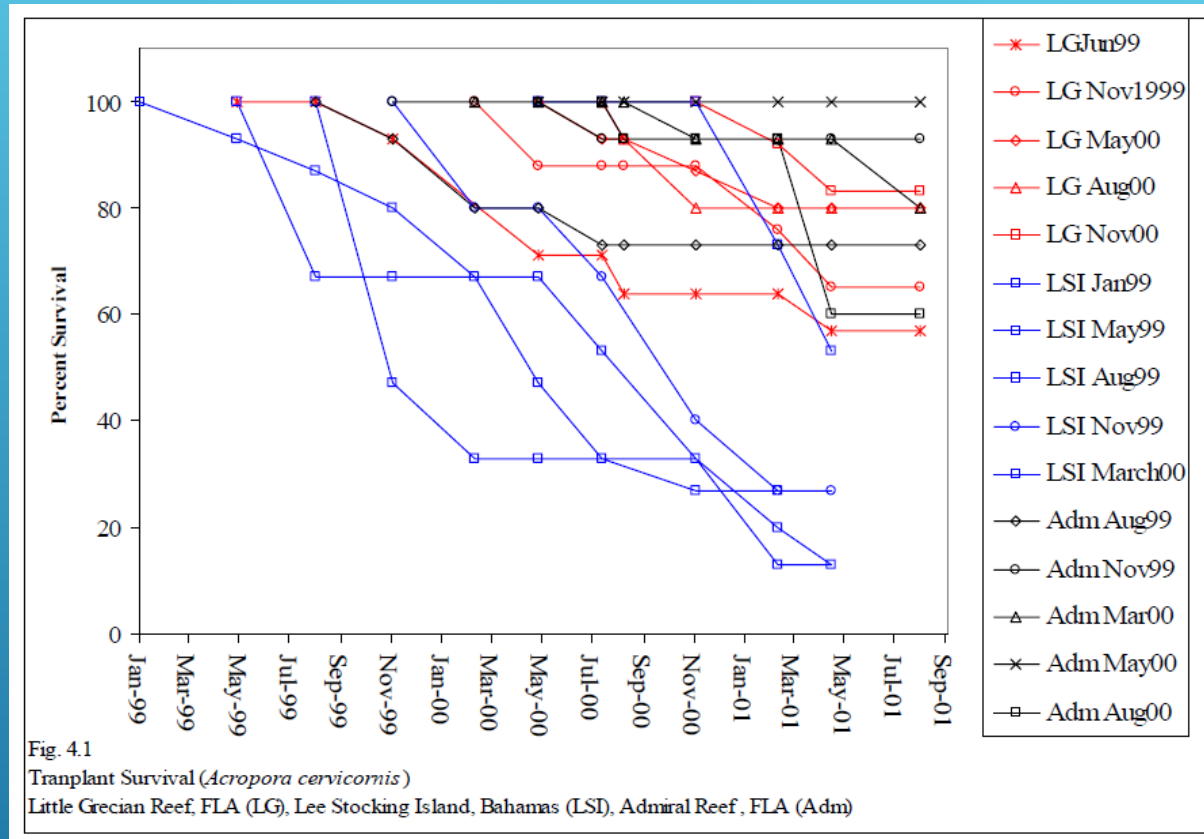
IS THIS A REALISTIC STANDARD?

HOW DOES THE POPULATION DYNAMICS
OF WILD CORALS INFORM OUR GOALS?

SCIENCE-BASED DATA SHOULD DRIVE
OUTCOME EXPECTATIONS BOTH FOR
MITIGATION AND RESTORATION PROJECTS.

A series of white lines of varying lengths and orientations, including a long diagonal line and several shorter parallel lines, are positioned on the right side of the slide.

HOW LONG DO TRANSPLANTS SURVIVE?



First glimpse was from G. Chilcoat's Master's Thesis
in 2004 from the Univ. Georgia

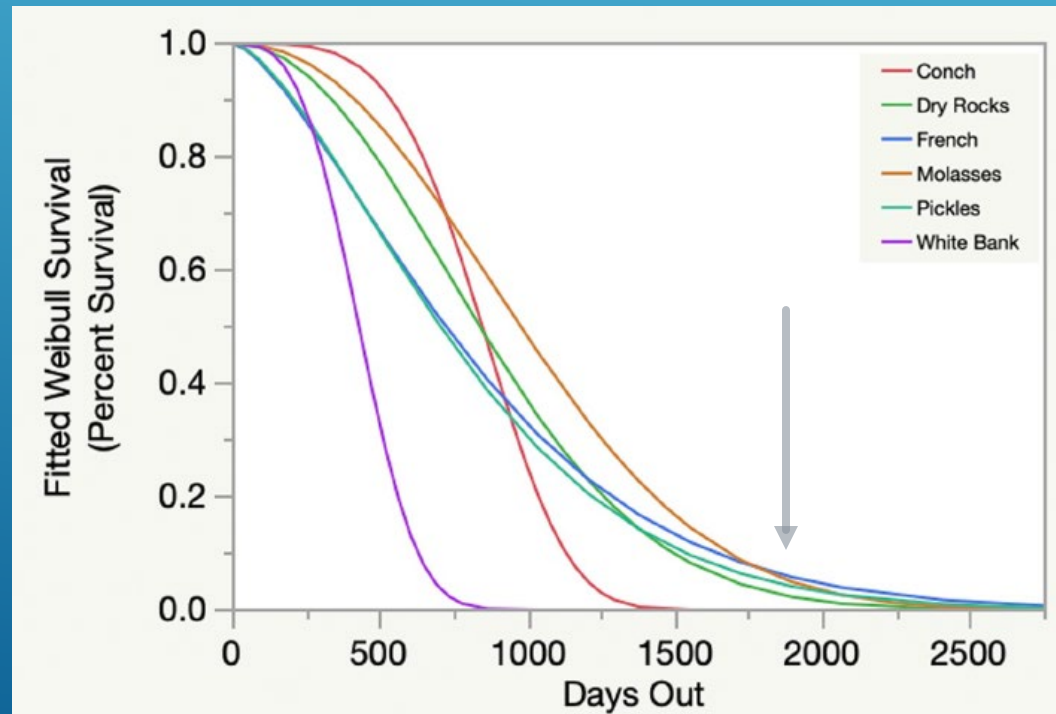
RESULTS FROM THE FIRST DECADE OF CRF

PLOS ONE

RESEARCH ARTICLE

Survivorship and growth in staghorn coral (*Acropora cervicornis*) outplanting projects in the Florida Keys National Marine Sanctuary

Matthew Ware¹, Eliza N. Garfield², Ken Nedimyer³, Jessica Levy⁴, Les Kaufman⁵, William Precht⁶, R. Scott Winters⁴, Steven L. Miller^{7*}

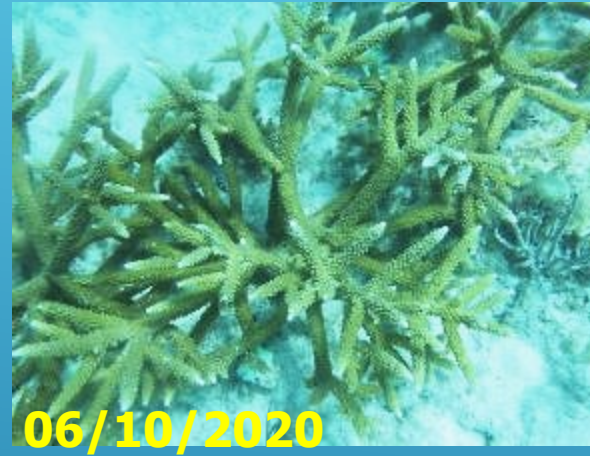


TESTING CORAL TRANSPLANT PERFORMANCE: AQUARIUS CORAL RESTORATION/RESILIENCE EXPERIMENTS



MILLER ET AL. 2010

Rainbow Reef - Outplant Survivorship After 3 Years



Photos: Emily Esplandiu - ReeFLorida Presentation 11/2024



Appendix B-25a. *A. cervicornis* colony #25 immediately post-reattachment.



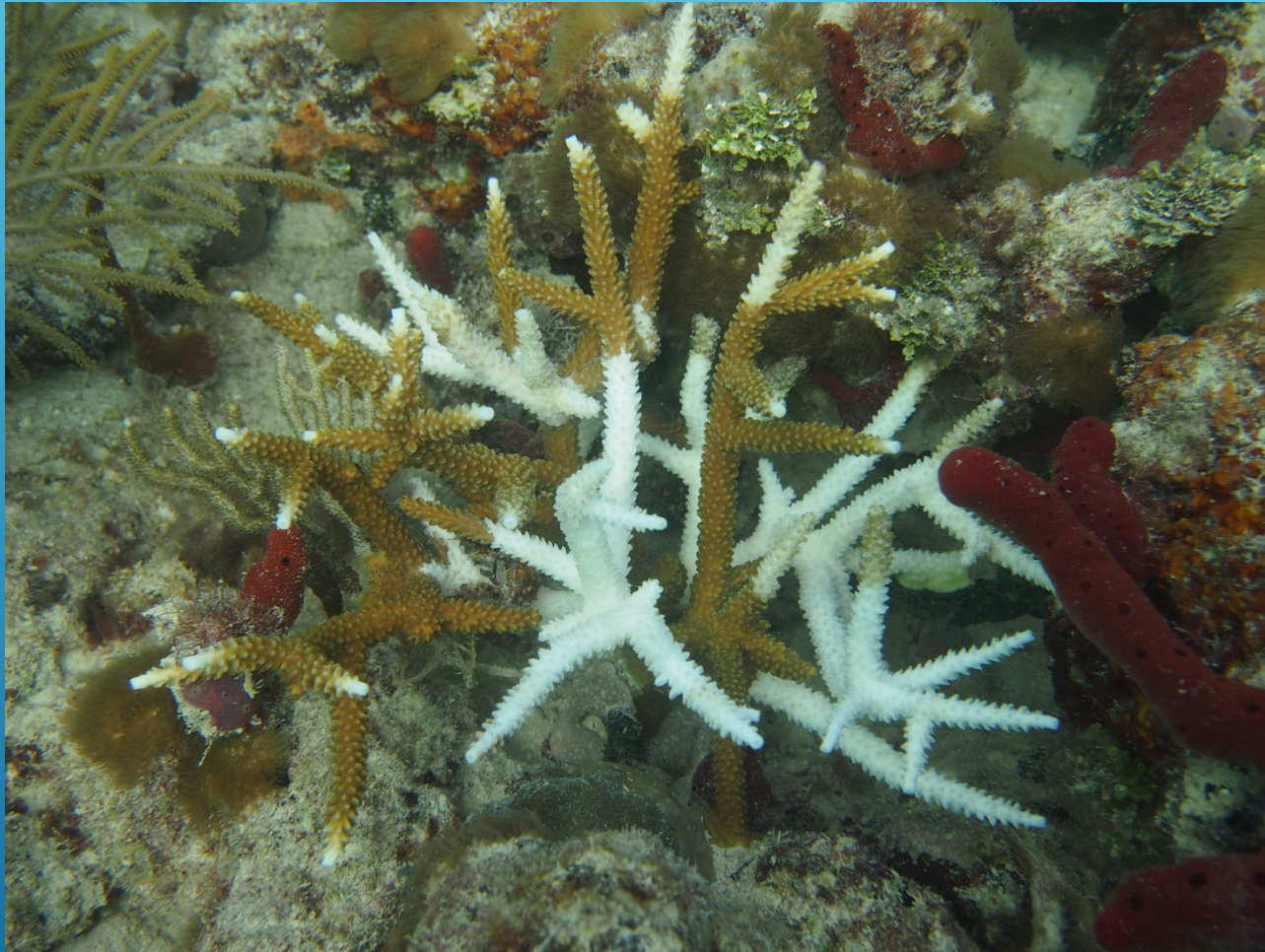
Appendix B-25b. *A. cervicornis* colony #25 30 days post-reattachment.



Appendix B-25c. *A. cervicornis* colony #25 six months post-reattachment.



Appendix B-25d. *A. cervicornis* colony #25 one year post-reattachment.



NORTH CONTROL – REEF 2
JULY 14, 2014



SAME CORAL
OCTOBER 1, 2014

Vol. 137: 217–237, 2020
<https://doi.org/10.3354/dao03441>

DISEASES OF AQUATIC ORGANISMS
Dis Aquat Org

Published online January 30

Ecology, histopathology, and microbial ecology of a white-band disease outbreak in the threatened staghorn coral *Acropora cervicornis*

Sarah A. Gignoux-Wolfsohn^{1,*}, William F. Precht², Esther C. Peters³,
Brooke E. Gintert^{2,4}, Leslie S. Kaufman⁵

Biscayne Bay coral at risk from sloppy dredge work

BY JENNY STALETOVICH - JSTALETOVICH@MIAMIHERALD.COM

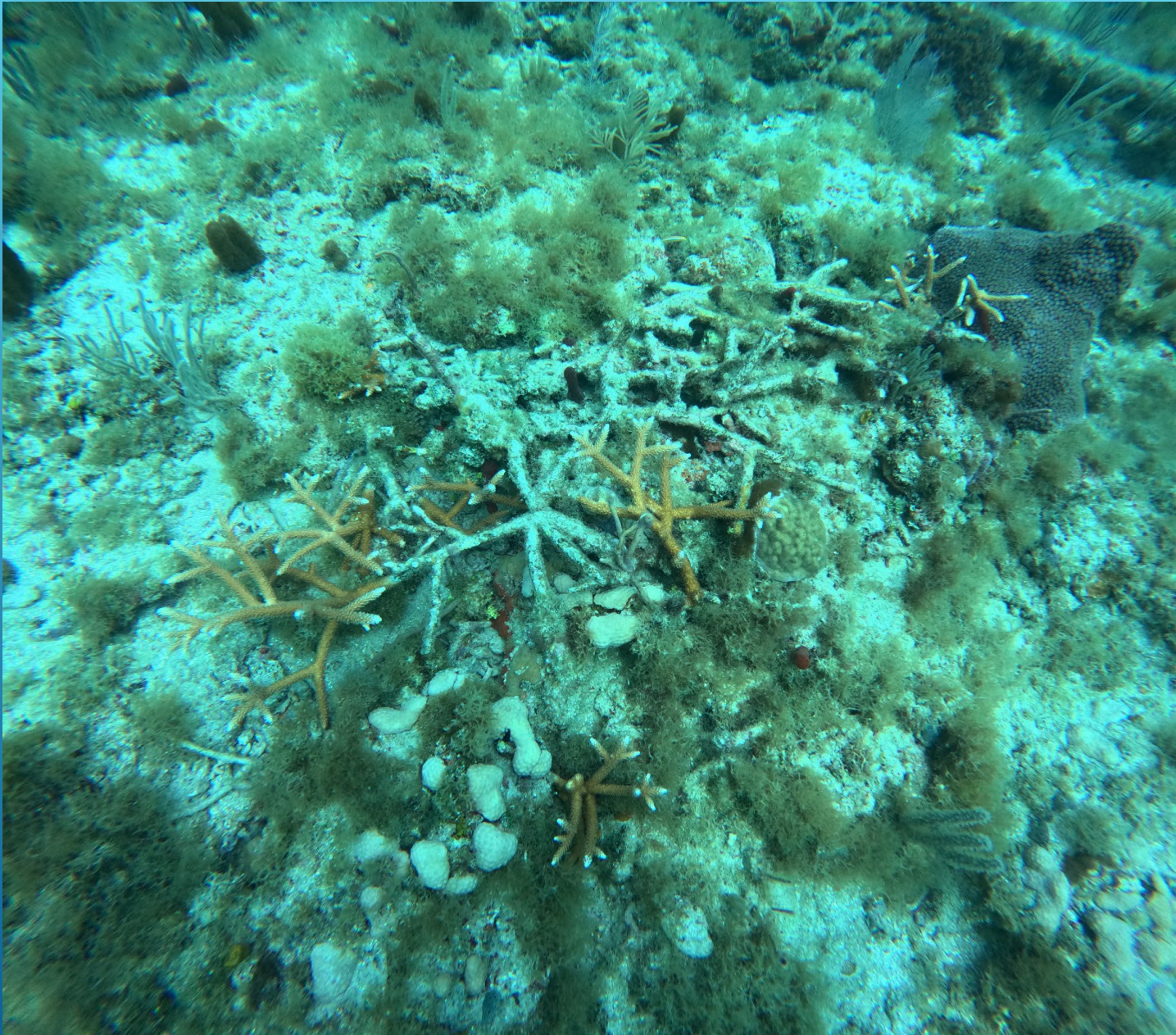
02/05/2015 4:50 PM | Updated: 02/05/2015 6:24 PM



Biscayne Bay Waterkeepers say a diver discovered this colony of staghorn coral transplanted from Government Cut to an artificial reef last year covered with sediment and dying last week. BISCAYNE BAY WATERKEEPER



LOOK
FAMILIAR?



LOOK FAMILIAR?



HOW ABOUT THIS?

PMDP MONITORING PROJECT SOUTH CONTROL – REEF 2

R2SC2 T1 C2



It is important to know what happened between Photo 1 and 8!

CORAL RESTORATION

What we think we've been accomplishing.



Photo W.F. Precht

CORAL RESTORATION

What we are actually doing.

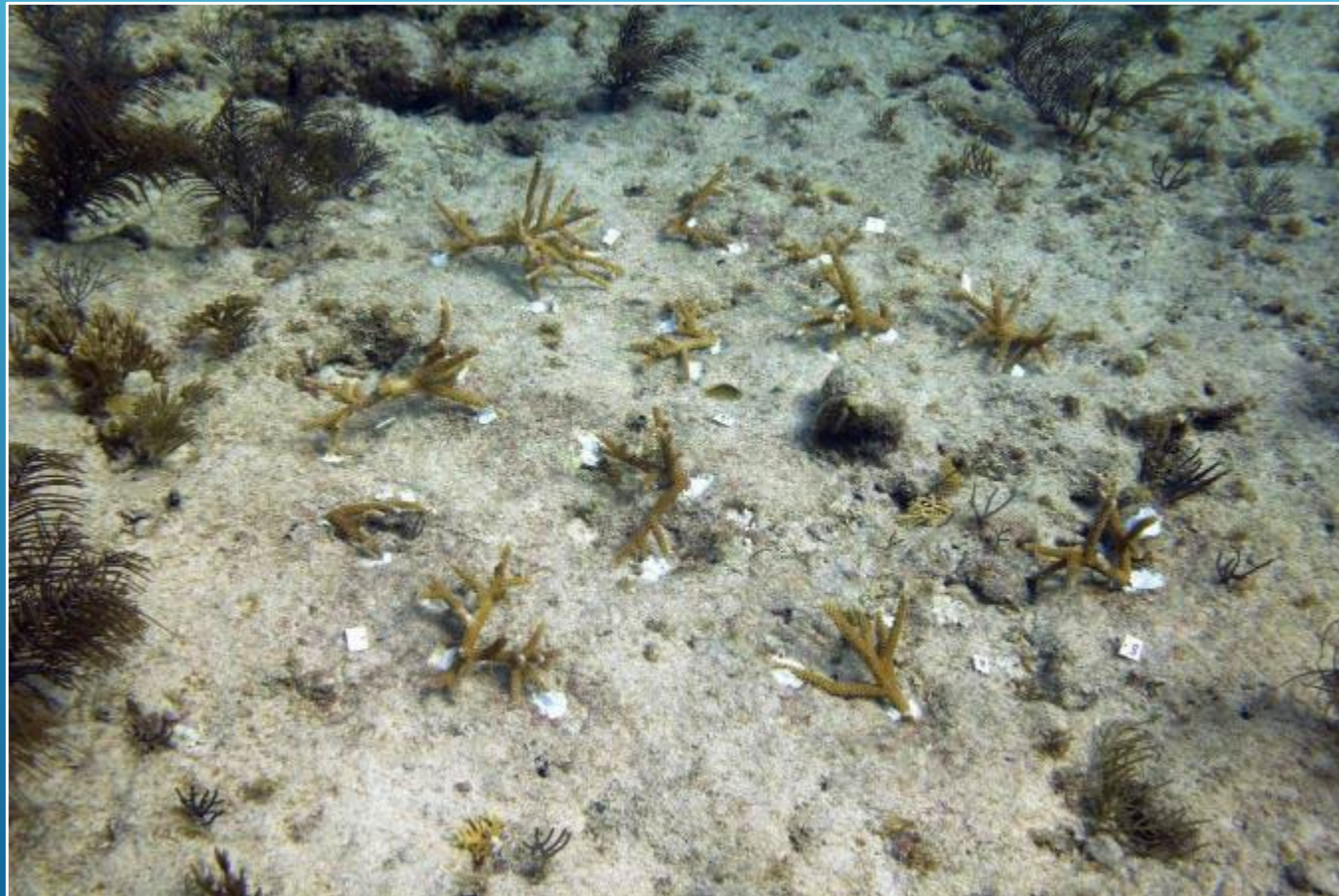
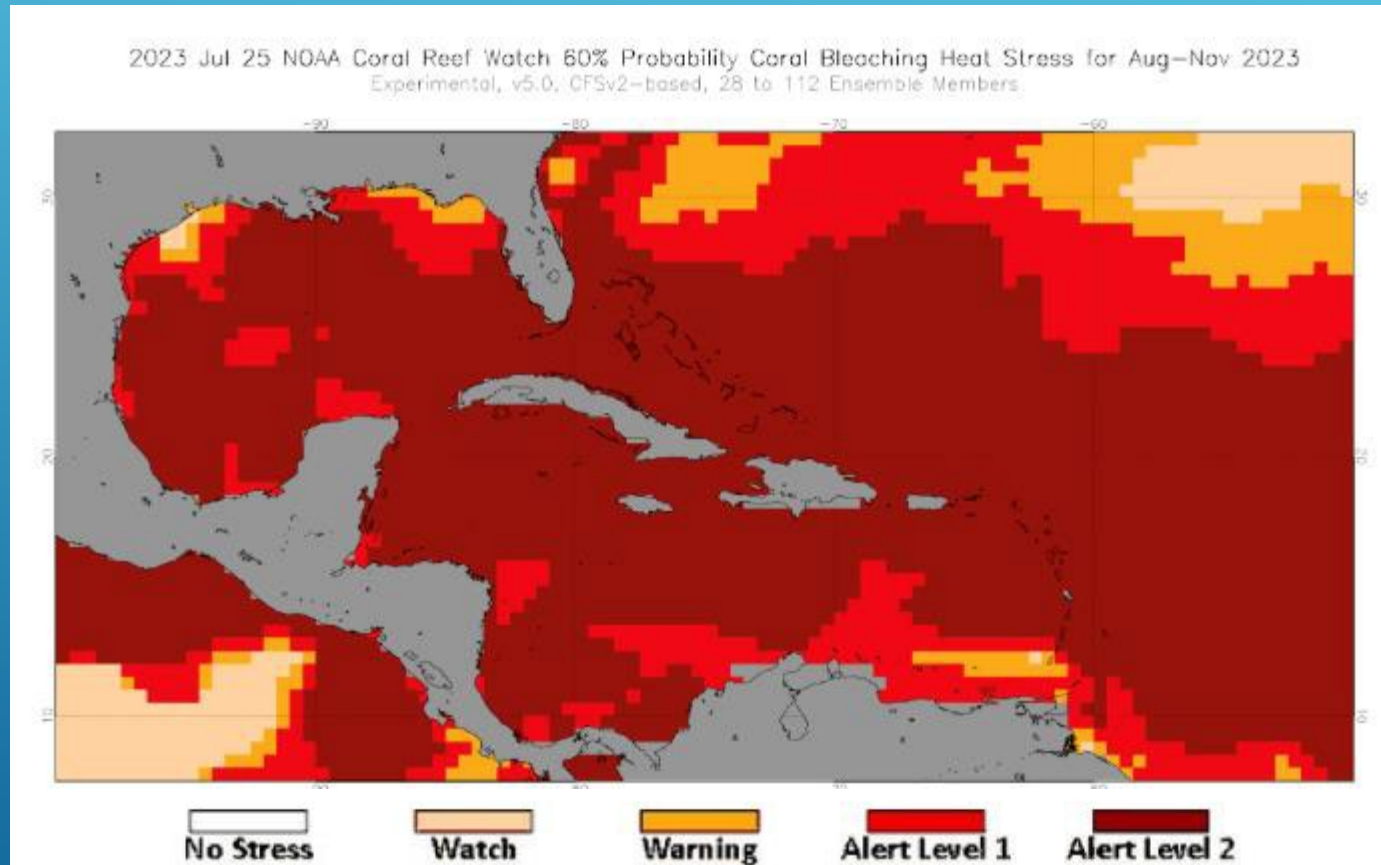


Photo W.F. Precht

SUMMER 2023

THE SUMMER FROM HELL!



CORAL BLEACHING 2023

RECORD WARM SSTS RECORD

BLEACHING STRESS

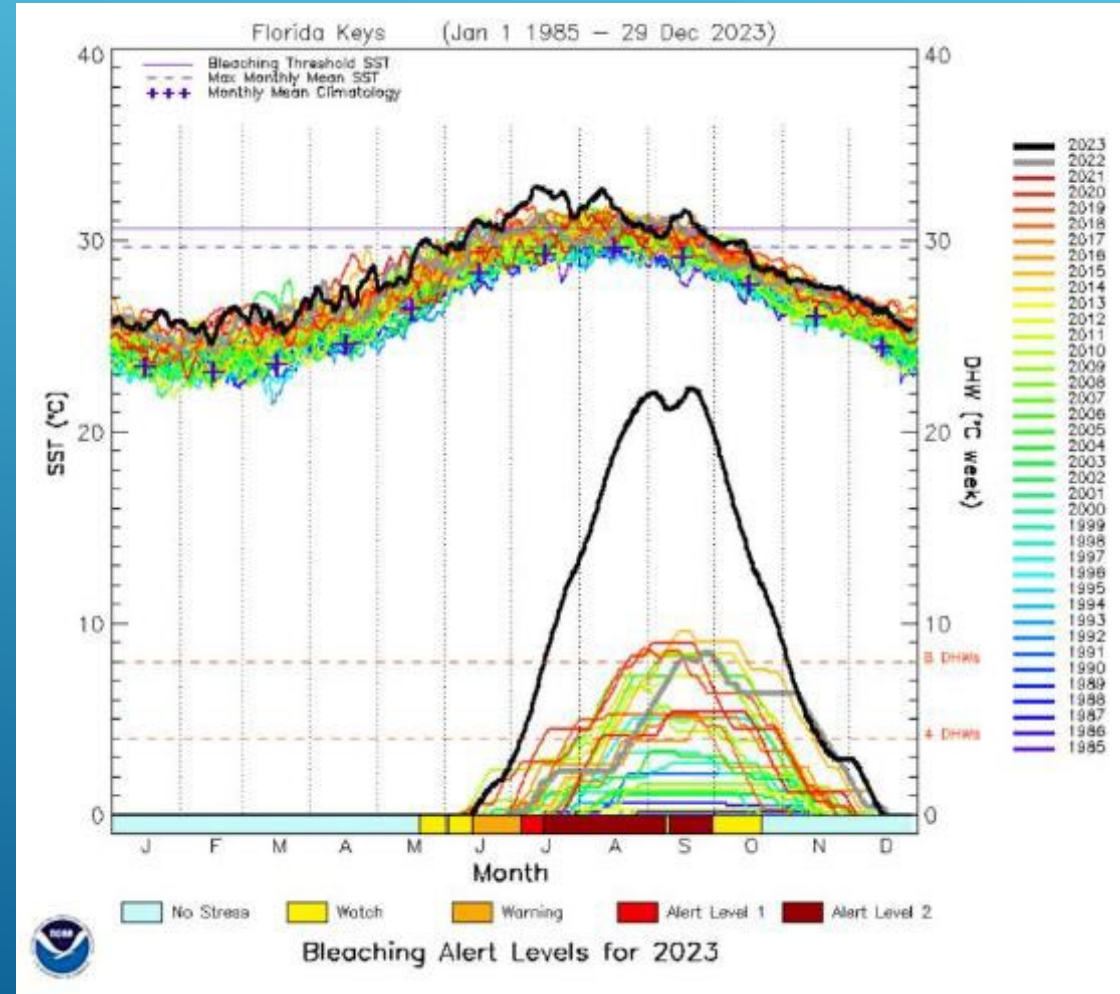




Photo of Horseshoe Reef by Dr. Kate Lesneski



REEFocus 

Jul 21 • 2 min



HISTORIC HEATWAVE TRIGGERING CORAL DIE-OFF IN FLORIDA

3



Coral Restoratio... · 8/8/23 ...

Here are images of CRF-raised elkhorn at Horseshoe Reef from 2021 and the same corals today. It's incredible to see how big they have grown in just two years and heartbreaking how fast they could be wiped out because we still won't accept the seriousness of climate change.



CORAL BLEACH



Coral Restorati... · 8/30/23 ...

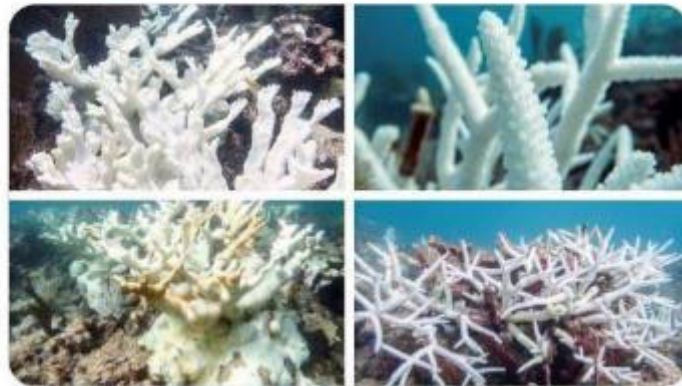
More than 90% of the corals in our KW Nursery are now completely bleached and many have died already, and at EDR roughly 100% of our stag and elk are now bleached. We are expecting some rain and cooler weather this week, which may give these corals a chance to bounce back.





Liv Williamson,... · 8/30/23 ...

Sad update from North Dry Rocks in Key Largo: On 8/28, we found all staghorn & elkhorn [#coral](#) severely bleached & dying. There are no longer any “winners” that have escaped, & I expect all will die in the next several weeks. I can’t believe they spawned just a few weeks ago 🥺



Liv Williamson, Ph.D. · 18h ...

Update from North Dry Rocks (9/21): tragically, this site has become a graveyard of elkhorn & staghorn [#coral](#). Once a true gem with >2 dozen elkhorn genets & countless staghorn (planted by [@coralcrf](#)), the vast majority have died & only a few are hanging on. So very devastating 😭





Liv Williamson,... · 8/30/23 ...

One of my favorite wild elkhorn **#corals** in Key Largo, a parent of our babies for years, has succumbed to the 2023 **#bleaching** event. While some corals died quickly from July's extreme temps, others have declined over time without relief from the heat.



The tragedy continues. 🥹



C

G 2023

CORAL BLEACHING 2023

“GUTTED” AND “HEARTBREAKING”



Coral Restorati... · 7/25/23 ...
Heartbreaking scenes from the [#FloridaKeys](#): At Cheeca Rocks, renowned for its high live stony coral coverage, 99% of corals are bleached. Even the resilient 'massives' are struggling. Rising water temperatures are to blame. It's time for [#ClimateAction](#). [#SaveTheCorals](#)



Dalton Hesley ... · 8/16/23 ...
It feels morbidly ironic that today, on the 1-year anniversary of our historic investment in [#climateaction](#), is the day we observed mass coral bleaching at our showcase coral restoration site in [@BiscayneNPS](#). Our team is gutted.

A heavy reminder that our work is far from done...



Liv Williamson,... · 9/22/23 ...
Bearing witness to tragedy 🥹 Watching the elkhorn & staghorn [#coral](#) bleach & die over the past few months has been absolutely heartbreaking. I fear what will become of these species now that both wild & restored colonies are mostly lost throughout the [#FloridaKeys](#).



Coral Outplants in 2023

The reality!



Photo W.F. Precht



Photo: Jessica Levy CRF

CORAL REEFS

Heat-driven functional extinction of Caribbean *Acropora* corals from Florida's Coral Reef

Derek P. Manzello^{1,*†}, Ross Cunning^{2,3,*†}, Richard F. Karp^{3,4,5}, Andrew C. Baker³, Erich Bartels⁶, Ryan Bonhag⁶, Alexandra Borreil⁶, Amanda Bourque⁷, Kristen T. Brown^{1,8}, Andrew W. Bruckner⁹, Bryce Corbett², Martine D'Alessandro³, Craig Dahlgren¹⁰, Jenna Dilworth¹¹, Erick Geiger^{1,8}, David S. Gilliam¹², Maya Gomez^{10,11}, Grace Hanson^{9,13}, Cailin Harrell¹⁴, Dalton Hesley³, Lindsay K. Huebner¹⁴, Carly D. Kenkel¹¹, Hanna R. Koch⁶, Joe Kuehl^{6,15}, Ilsa B. Kuffner¹⁶, Mark C. Ladd¹⁷, Sophia Lee^{3,11}, Kathryn C. Lesneski^{9,13}, Amanda Lewan⁶, Diego Lirman³, Gang Liu¹, Shayle B. Matsuda², Phanor H. Montoya-Maya¹⁸, Jennifer Moore⁹, Erinn M. Muller⁶, Ken Nedimyer¹⁵, John Everett Parkinson¹⁹, Rob Ruzicka¹⁴, Jason Spadaro⁶, Blake L. Spady^{1,8}, Jennifer Stein¹⁴, Joseph D. Unsworth³, Cory Walter⁶, Alexandra D. E. Wen³, Dana E. Williams^{4,17}, Sara D. Williams⁶, Olivia M. Williamson^{3,20}

- ▶ While the ultimate goal of restoration is to attain naturally sustaining populations through both sexual and asexual reproduction of the transplanted corals and then to have these corals potentially to colonize other areas through dispersal, this has not yet been achieved from corals outplanted from nurseries.
- ▶ There is great potential for success, but to-date no reefs have been successfully restored to the point of self-sustaining thickets that successfully reproduce through either fragmentation or sexual reproduction.

- ▶ To date, there are NO published records of long-term, successful outplanting of *Acropora* spp. into natural reef habitats or successful *Acropora*-based reef mitigation programs to offset project impacts in Florida or the greater Caribbean.
- ▶ While there has been exceptional success in growing, and propagating *Acropora* in both land-based and in-water nurseries, outplanting efforts have met with mixed results. It appears that in the FKNMS there is high initial survivability (>90%) of *Acropora* outplants, unfortunately <10% of these corals have lived longer than four years (Ken Nedimyer [CRF], personal communication). Understanding the cause of this potential bottleneck must be unraveled through hypothesis-driven experimental programs and long-term efficacy monitoring.
- ▶ Therefore, the promise of a successful mitigation effort as proposed by NOAA (no net tissue loss in two years) is not science-based and should be rejected outright.
- ▶ Understanding these same limitations in coral restoration outplant projects should help guide future restoration efforts.
- ▶ Clearly, we should not be planting trees in a forest that is still on fire. BTW – that fire is still raging!
- ▶ Putting our restoration efforts in corals and methods that have repeatedly failed is nothing short of a Sisyphean task and in my estimation is the definition of madness.