

Assessing the long-term growth and survival of boulder corals outplanted in the Florida Keys

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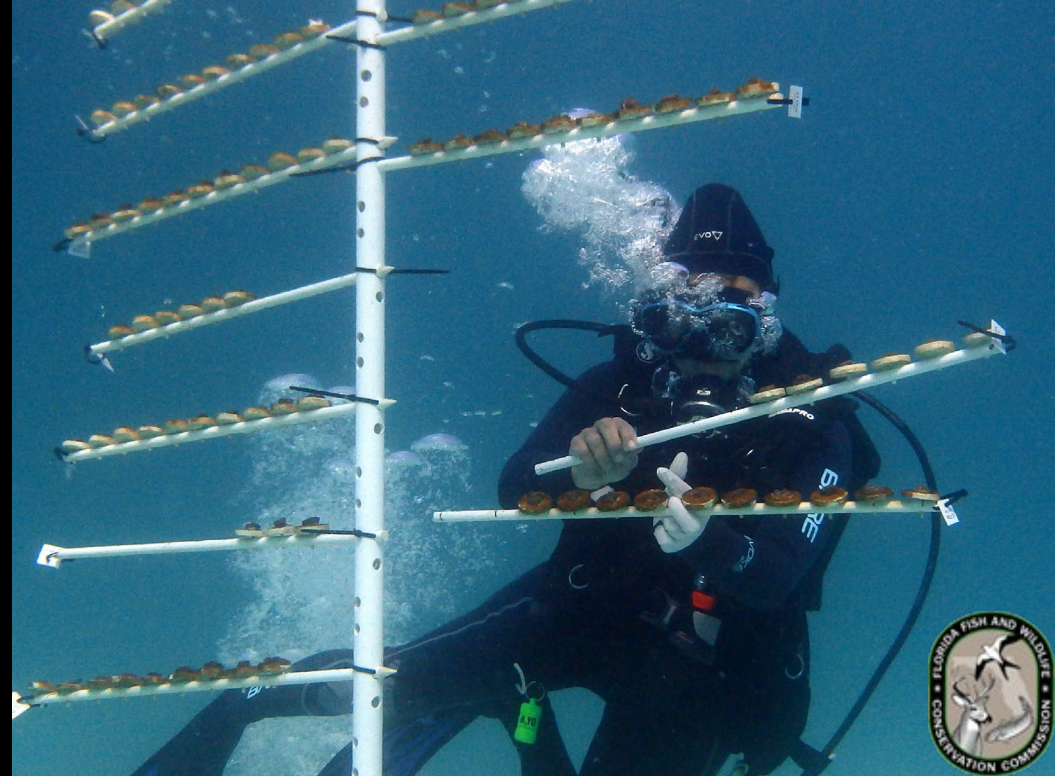


Background

- Began 2019 as a pilot study looking at susceptibility of newly outplanted corals to SCTLD
 - No disease noted
- Long-term monitoring (Fall 2019-Spring 2025)
 - Most coral outplants are only monitored for 1 year
 - Vital to determine restoration benefits for ecosystem
 - Allows monitoring of corals during disturbance events (i.e. hurricanes, temperature events)

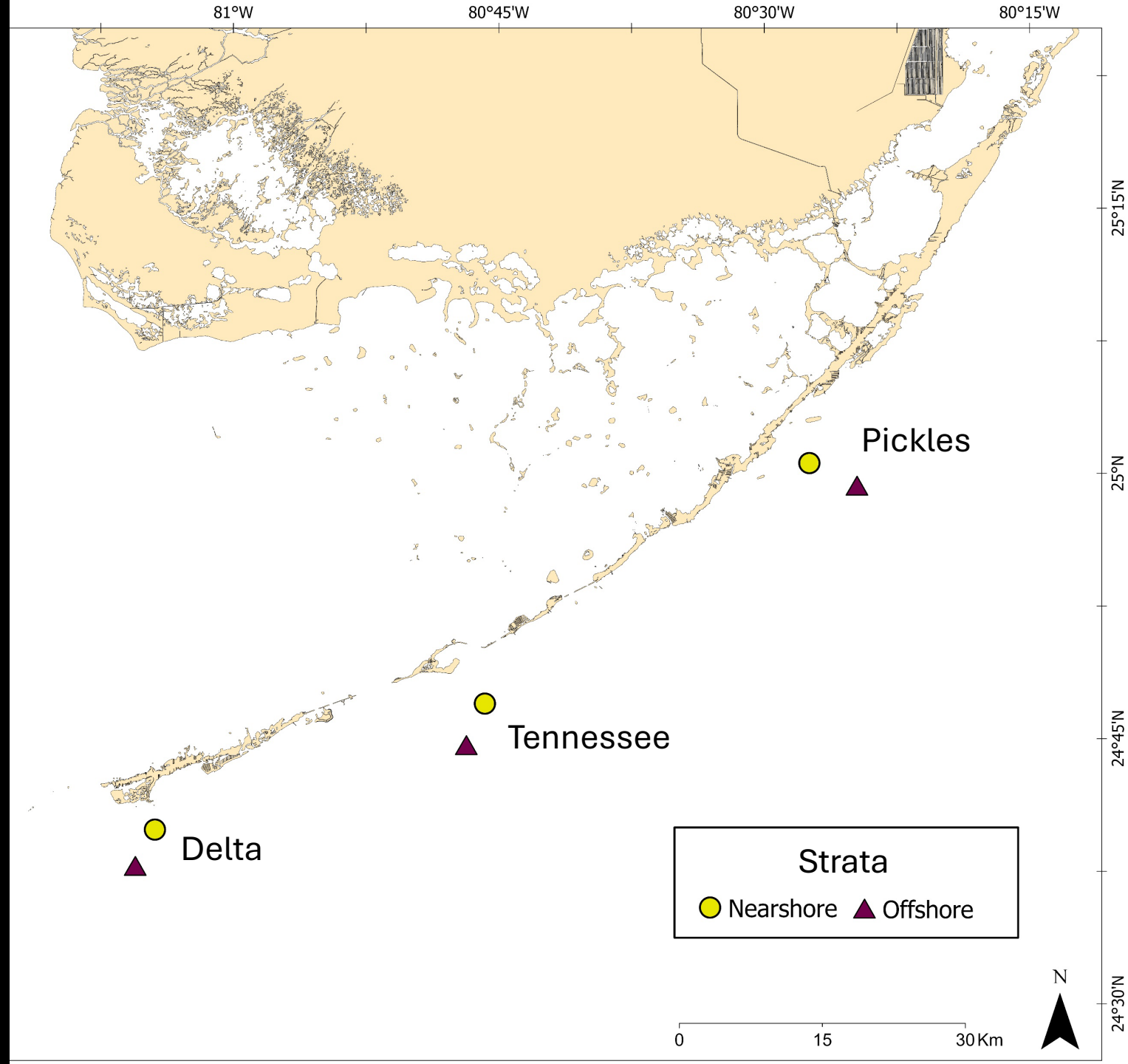
Experimental design

- 360 corals total
- 3 species
 - *Montastraea cavernosa*
 - *Orbicella faveolata*
 - *Pseudodiploria clivosa*
- 2 sources
 - In-water nursery
 - Land-based nursery



Outplant locations

- 3 regions
 - Pickles
 - Tennessee
 - Delta
- 2 strata per region
 - Nearshore ~16 ft
 - Offshore ~22 ft



Experimental design

- Each outplanted coral assessed for status (Alive/Dead/Missing), disease, predation, bleaching
- Each coral photographed with a ruler
 - Surface area calculated in ImageJ



Early finfish predation

- Initially finfish predation was intense but decreased by 12-week monitoring

Bull Mar Sci. 97(2):337–350. 2021
<https://doi.org/10.5343/bms.2020.0056>

coral reef paper

Recovery from finfish predation on newly outplanted boulder coral colonies on three reefs in the Florida Keys

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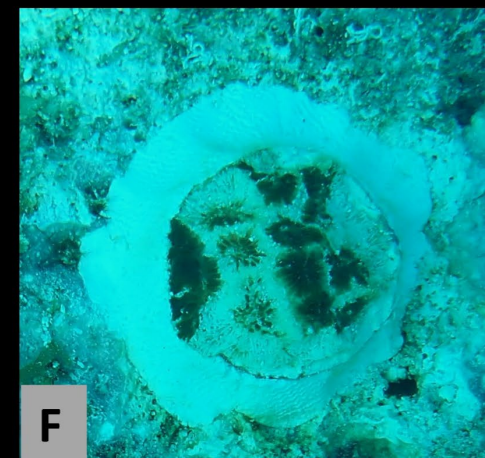
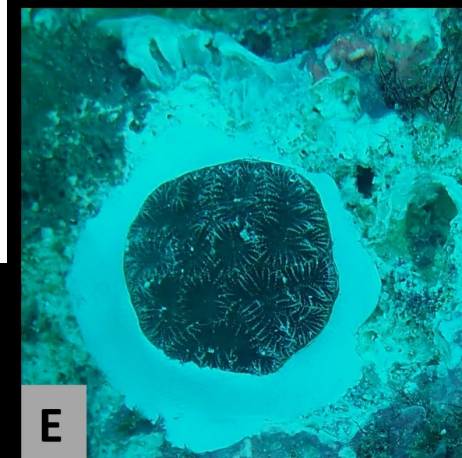
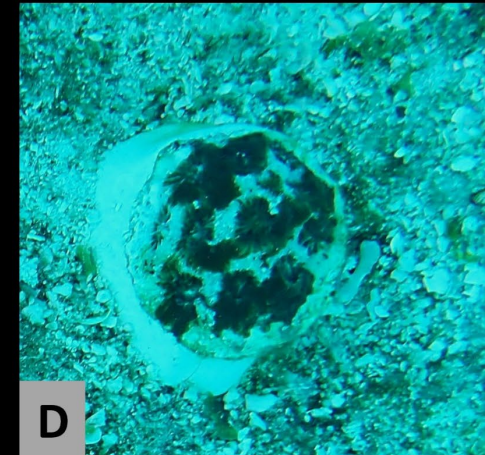
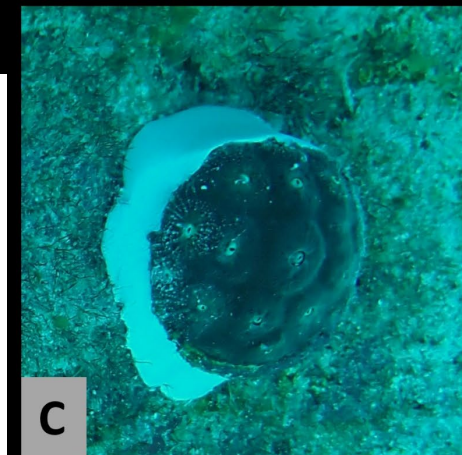
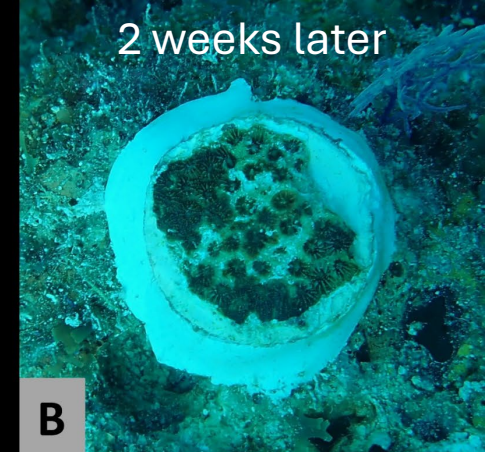
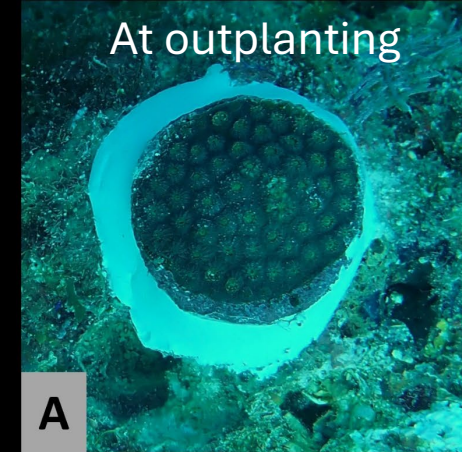
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Kerry E Maxwell ¹

William C Sharp ¹

- Early predation for this study defined as within the first 2 weeks



Track growth and survival from 2019-2025

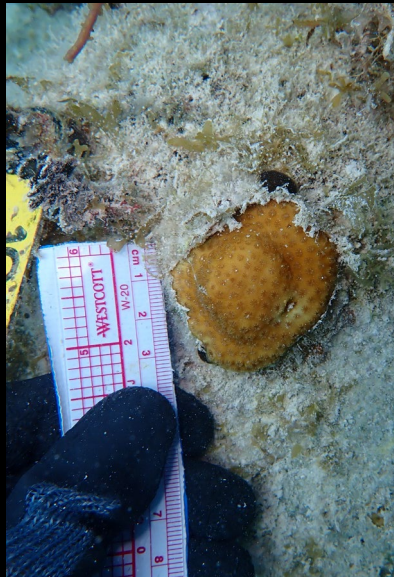
- Effect of Species, Region, Strata, Origin, and Early Finfish Predation
- Survival- Generalized linear mixed effects models
- Growth- Linear mixed effects models



Nov 2019



Aug 2020



June 2021



Aug 2022

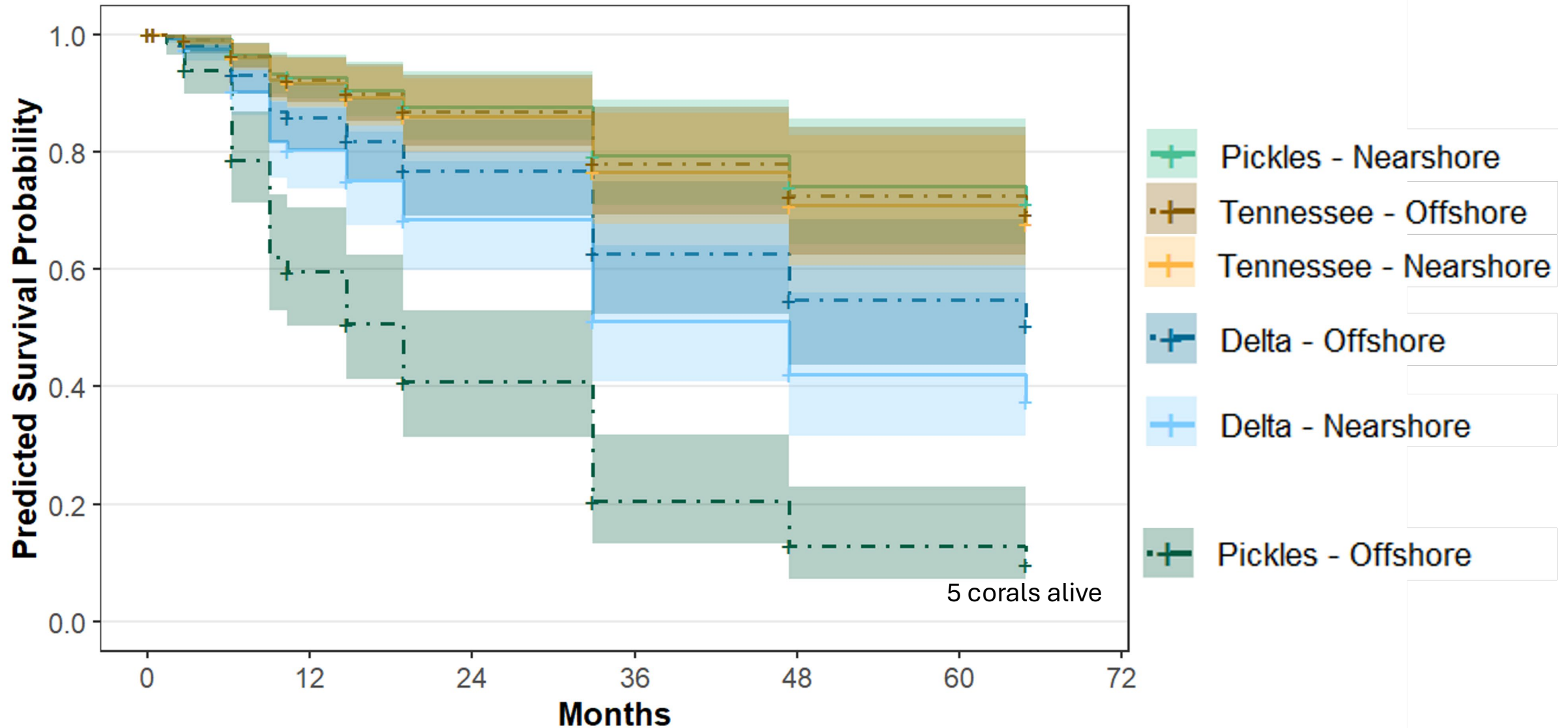


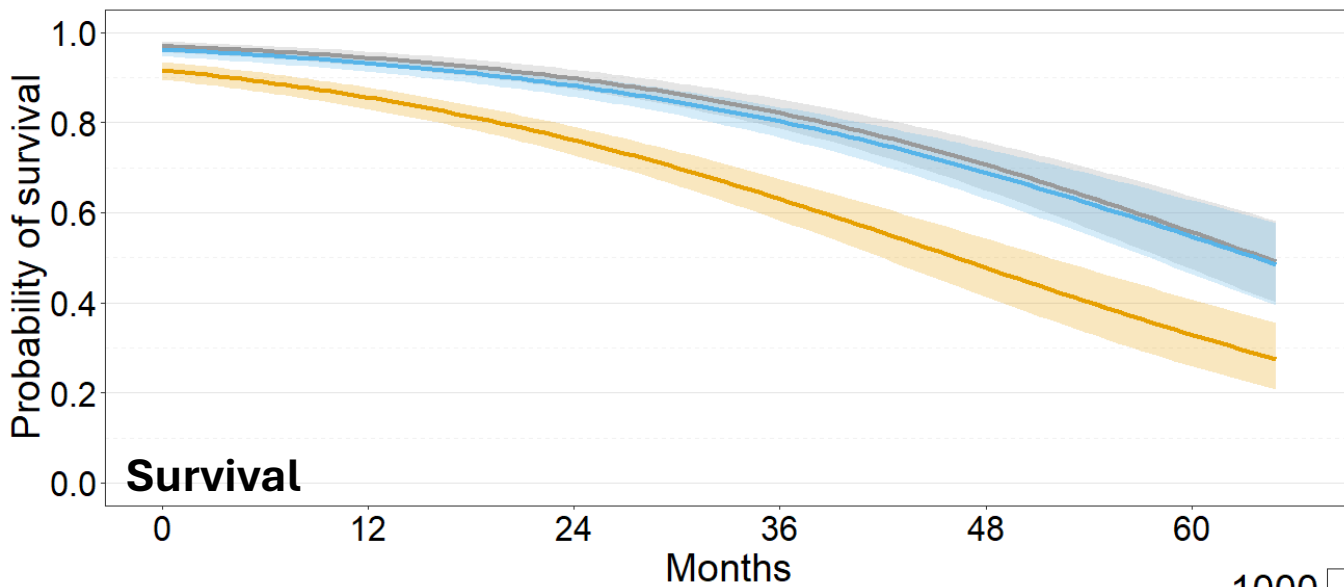
Oct 2023



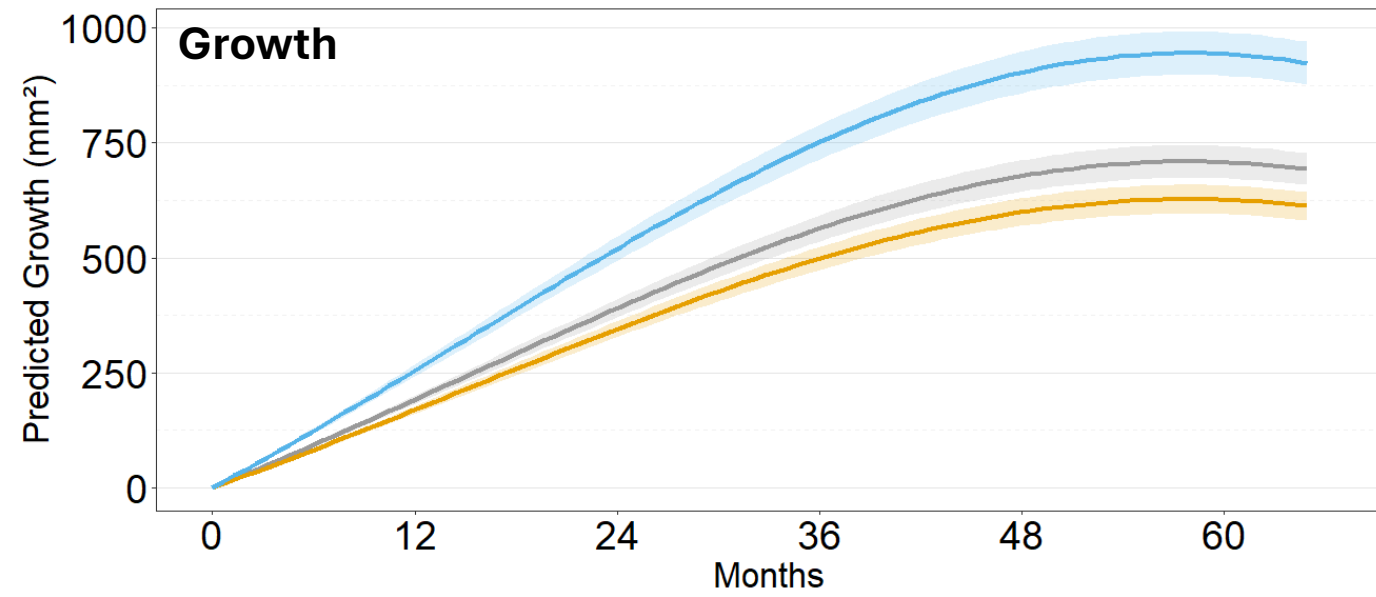
May 2025

What's the dill with Pickles Offshore?





— M. cavernosa — O. faveolata — P. clivosa



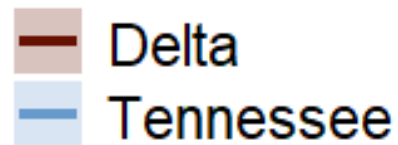
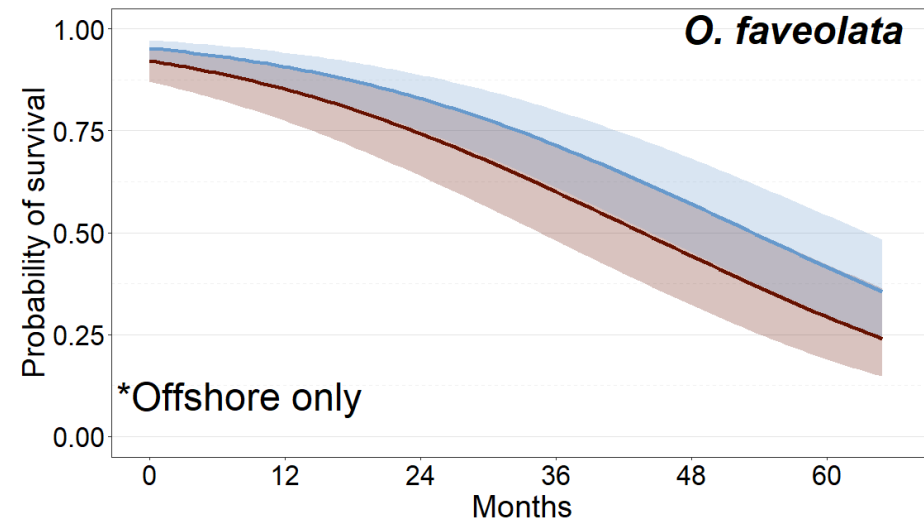
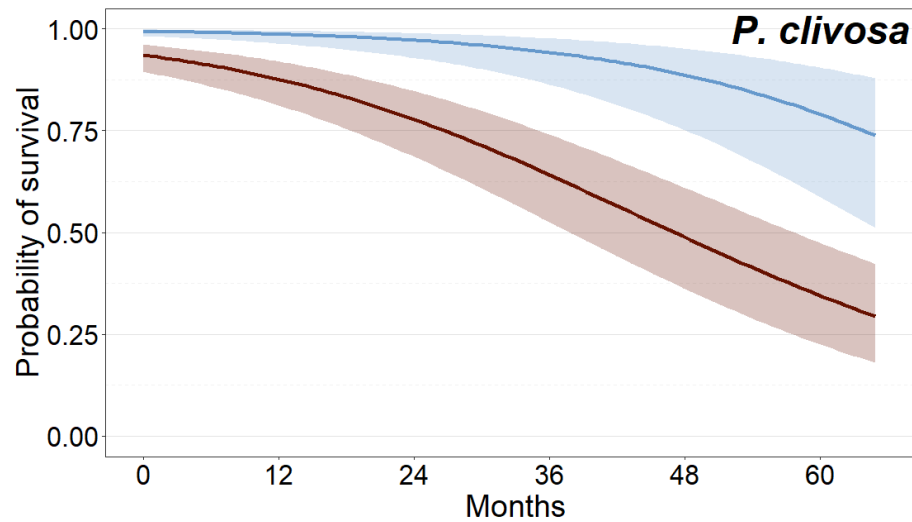
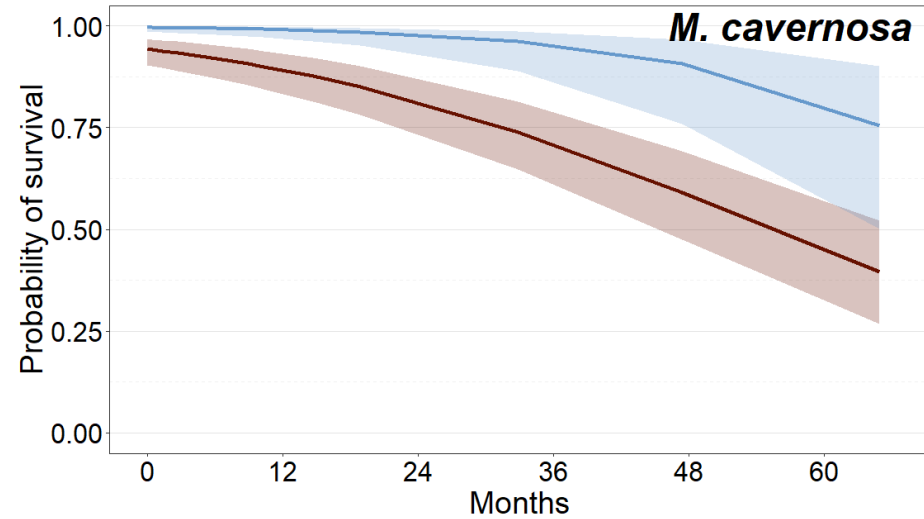


Region

Survival

Growth

- No effect

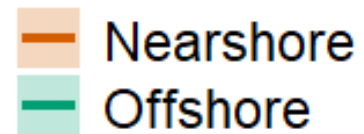
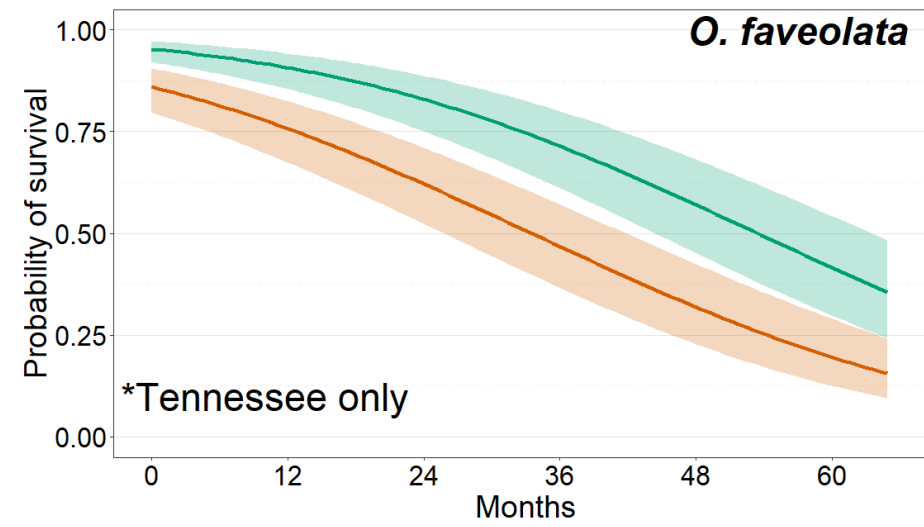
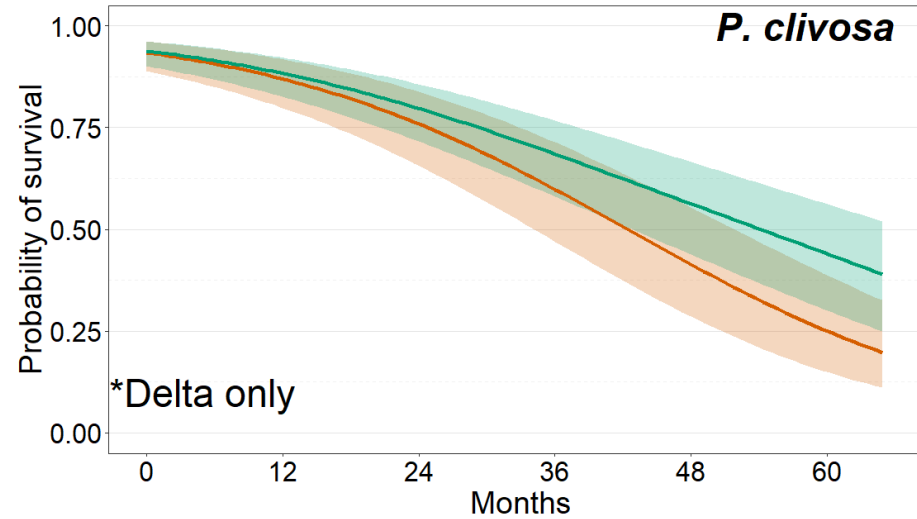
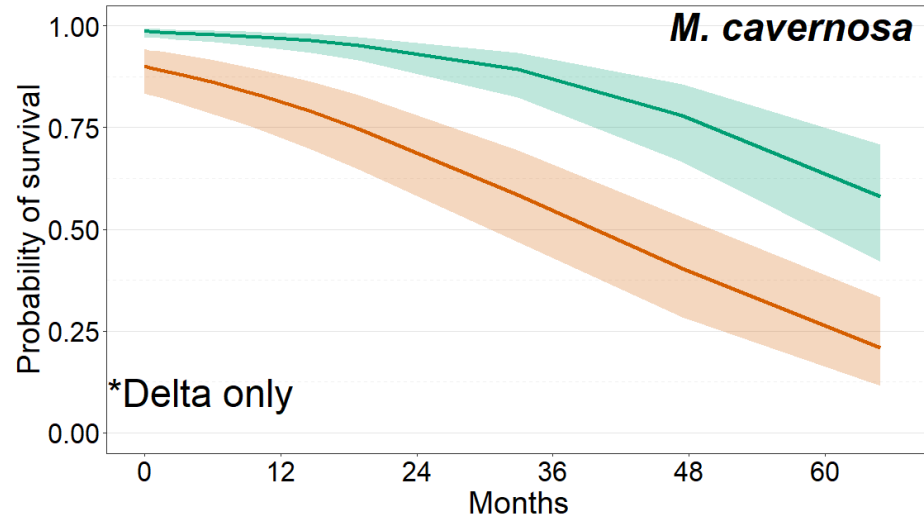


- Tennessee greater survival



Strata

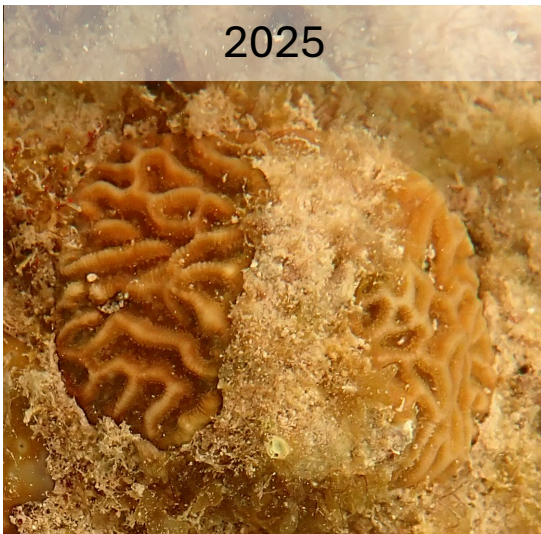
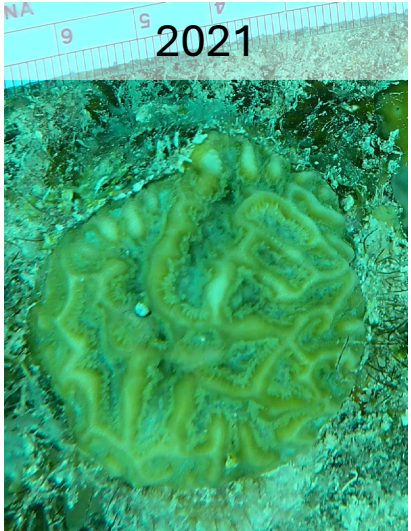
Survival



- Offshore greater survival
- Region specific strata affects



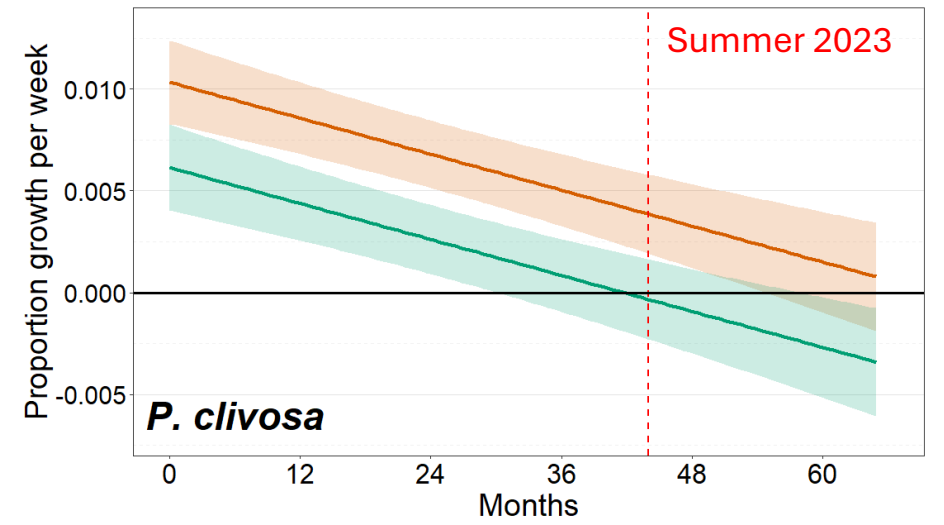
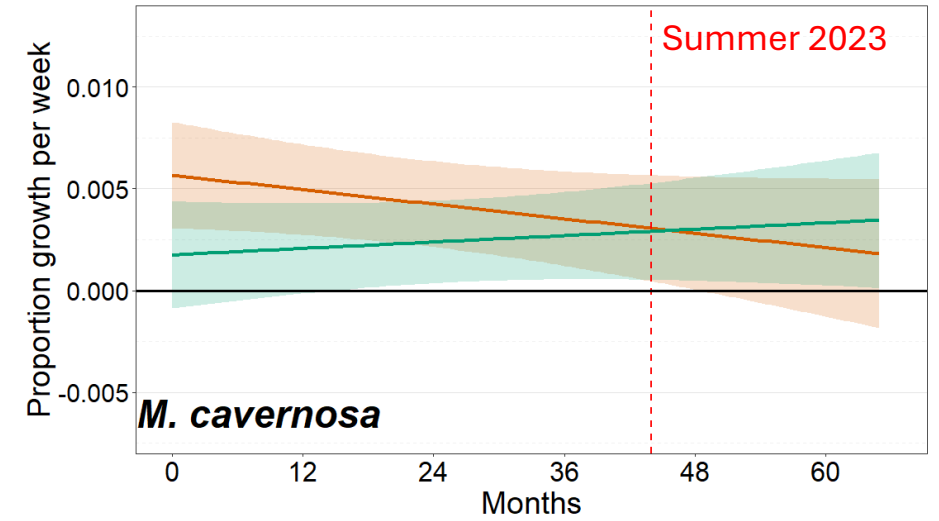
Strata



Growth

— Nearshore
— Offshore

- Nearshore had higher growth

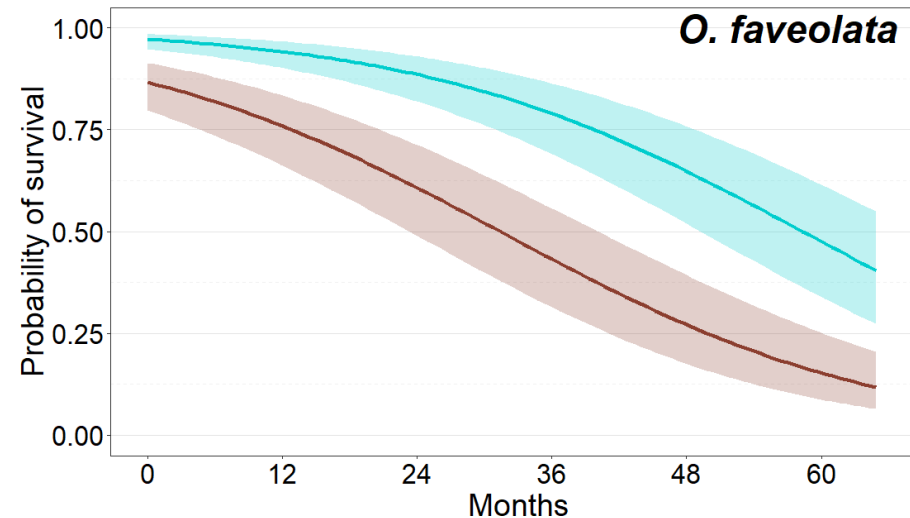
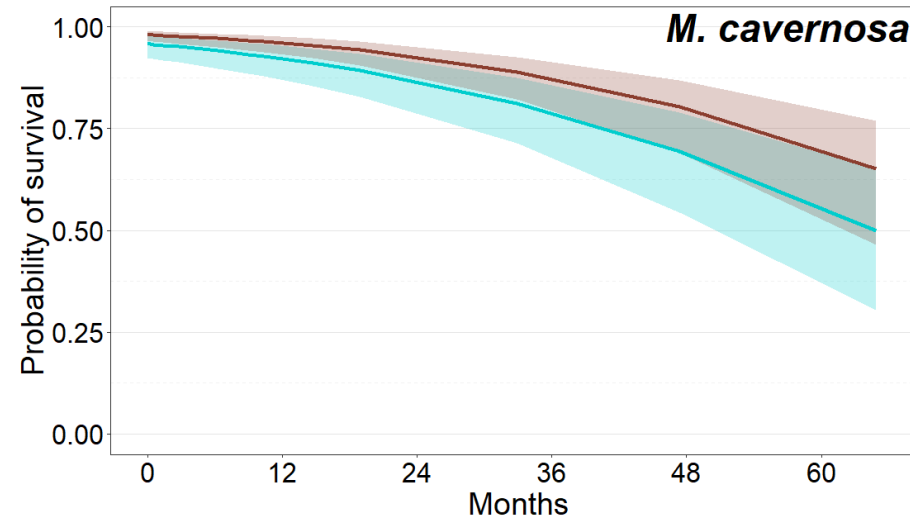




Origin

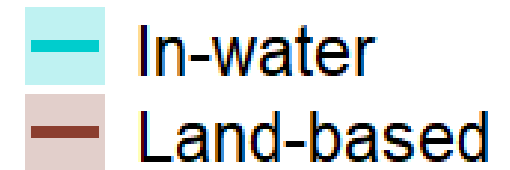
- *P. clivosa* not affected
- Varied by species

Survival



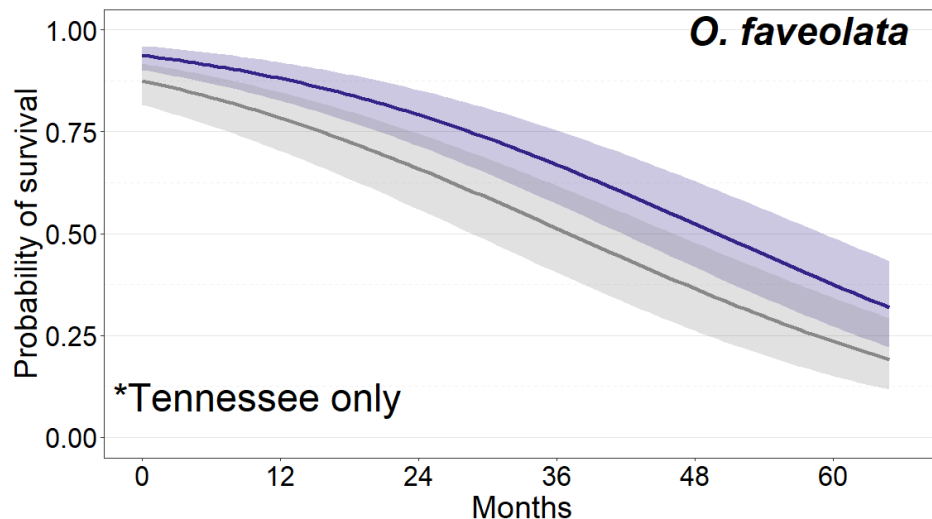
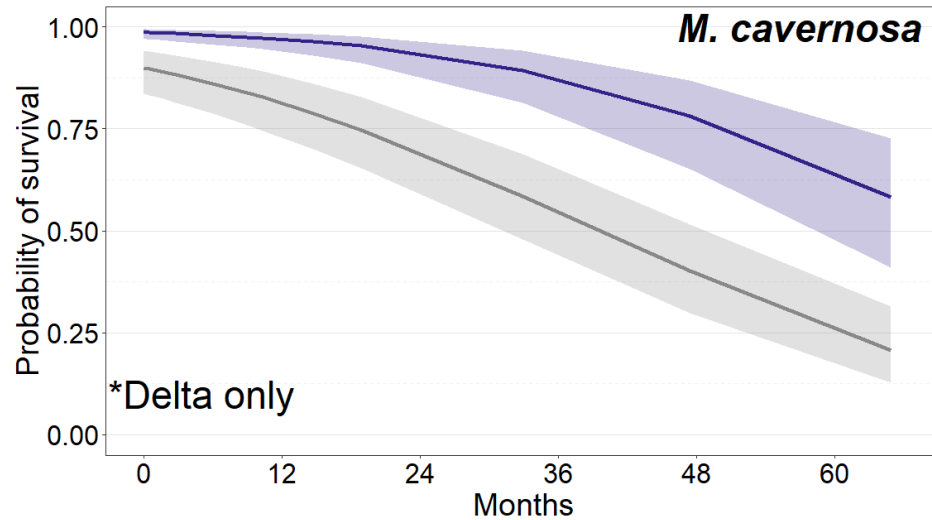
Growth

- No effect

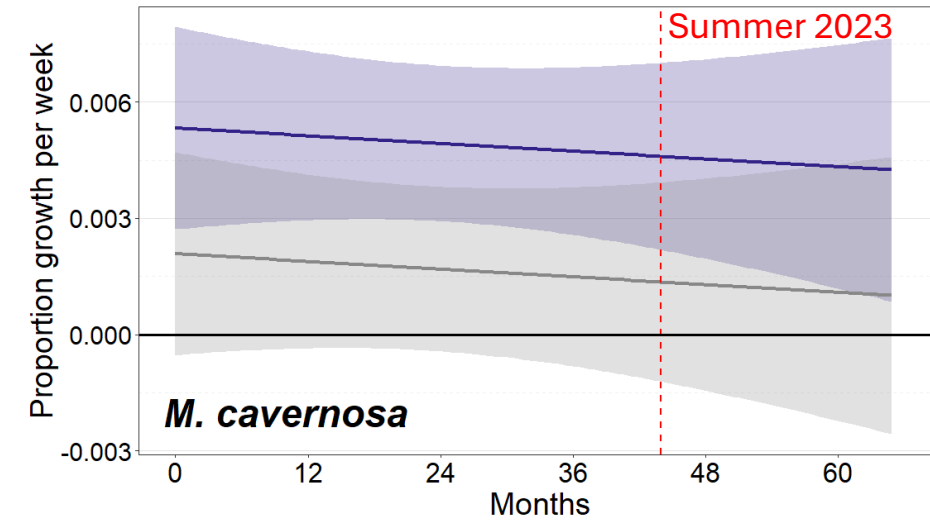


Early fish predation

Survival



Growth



- *P. clivosa* not affected
- Predation detrimental
 - Survival region specific



Takeaways

- Even with mortality, overall area of coral **increased ~2.5 times**
- Tennessee had **greater survival** for all species
- Offshore had **greater survival** but nearshore had **higher growth**
- **Early predation detrimental** to survival and growth but varied by species
- *P. clivosa* most affected by **2023 extreme temperatures**
- **Species-specific restoration plans are needed**

Acknowledgements

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- Field work: Duncan Coles, Nicole Charnock, Krissy Fisher, Eliot Hart, Dakota Merck, Chelsea McLaughlin, Kristene Parsons, Devon Pharo, Brian Reckenbeil, Kylie Smith, Sharla Sugierski, Rachel Zimmerman, Lauren Zitzman
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- Permitting: This research was permitted by the Florida Keys National Marine Sanctuary (#FKNMS-2019-136)

The background of the slide features a close-up photograph of two sea urchins. On the left, a green sea urchin is visible, characterized by its numerous small, rounded, greenish-yellow spines. On the right, a purple sea urchin is shown, with its long, thin, dark purple spines extending outwards. The two urchins are positioned side-by-side, creating a vibrant contrast of colors.

Questions?
