The Effect of Depth on the Health of Reef-building and Weedy Corals in Bonaire

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Introduction

- Coral reefs protect shorelines, maintain biodiversity, and attract tourism for the island of Bonaire in the southern Caribbean.
- In the Caribbean, coral reefs are in decline due to human impacts and climate change.
- In Fall 2023, Bonaire experienced an island-wide coral bleaching event that affected many species of coral and resulted in some mortality.
- Weedy corals, such as those in the genera *Agaricia* and *Porites*, are small, fast-growing species that reproduce quickly.
- Reef-building corals, such as those in the genera *Orbicella* and *Montastraea*, create the physical structure of coral reefs, and often grow more slowly and larger.
- The abundance of weedy corals on Caribbean coral reefs has been increasing due to human and climate change stressors.
- Our study objective: Investigating the differences in coral health between weedy and reef-building groups of corals and across depths six months after the fall 2023 bleaching event.

Hypotheses

- Depth effect: Coral colonies at deeper depths will exhibit a lower percentage of unhealthy conditions compared to colonies at shallower depths.
- Coral type effect: Weedy coral species (e.g., *Agaricia* and *Porites*) will show a lower percentage of unhealthy conditions compared to reef-building corals.
- Interaction prediction: The difference in health between weedy and reef-building corals will be most pronounced at more shallow depths.

Methodology

- We analyzed images from three depths (10, 15, 20, and 25m) and eight sites from around Bonaire, identifying 9,295 corals and assessing their health status.
- Data was collected in June 2024 six months after a major bleaching event.
- 65 photos were analyzed per transect to assess coral size and health attributes including bleaching, mortality, and disease, which all factor into overall health.
- Image processing was done using the program TagLab.
- Analyzed data from images using the coding program R to identify trends with coral species, depth, and health.

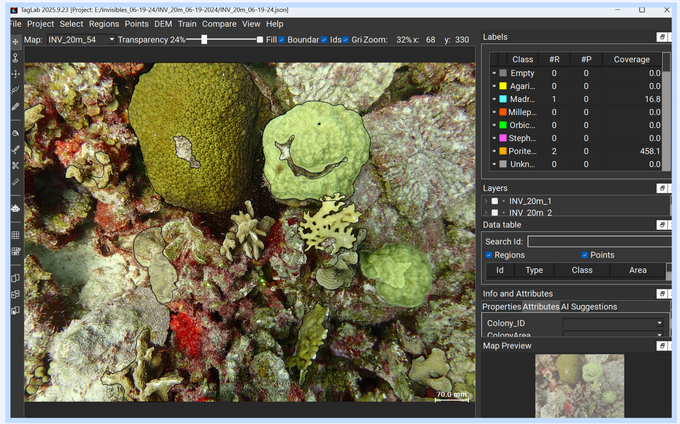

Figure 1. Image analysis in TagLab program.

Results

Table 1. Total number of coral colonies surveyed and percentage of unhealthy colonies at each depth (10m, 15 m, 20 m, and 25 m).

Depth (m)	# of Coral Colonies	% of Unhealthy Colonies
10	2800	13.6
15	2500	20.1
20	2050	19.3
25	1950	20.3

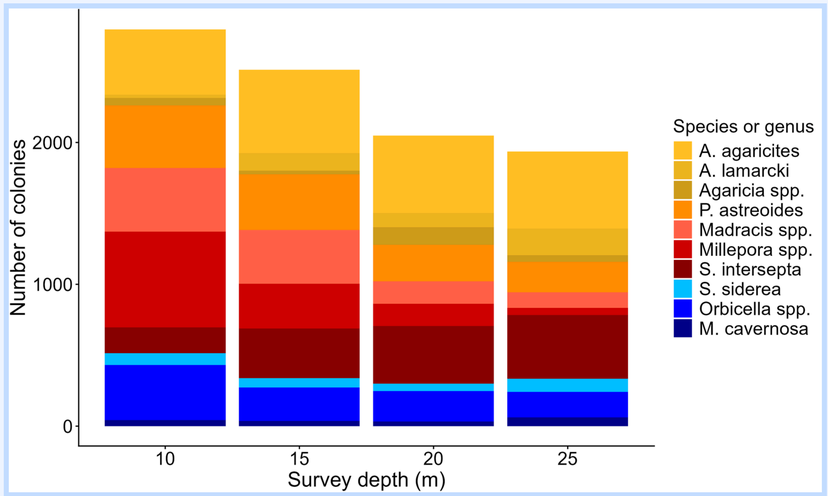

Figure 2. Number of coral colonies per genus or species at each survey depth. Data collected at 8 sites.

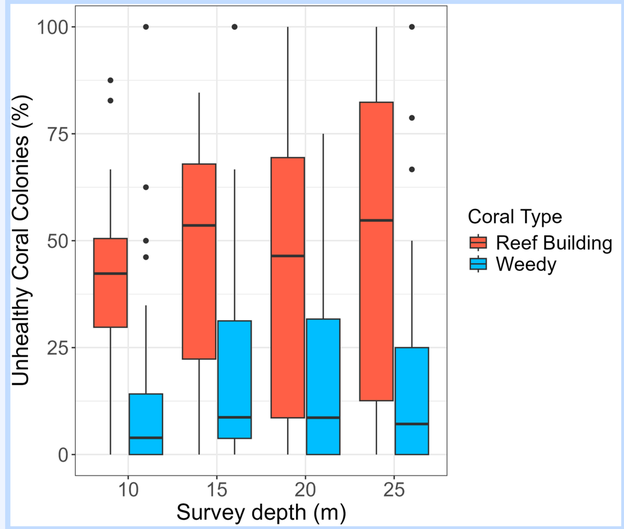

Figure 3. Percent of unhealthy coral colonies by coral type and survey depth at 8 sites.

Discussion and Future Steps

- At all depths, we found that the number of weedy coral species was much higher than reef-building species. The number of corals decreased with increasing depth.
- We found no difference in coral health by depth across survey sites.
- Trends in our data indicate that weedy corals are healthier than reef building corals at all depths. These differences in health are most pronounced at 10m depths.
- Trends in coral health in Bonaire are strongly related to specific coral genera or species.
- Determining coral health patterns after large bleaching events can provide a better understanding of species-specific responses.
- Future research should analyze health trends at more sites and depths.

Acknowledgments

We would like to thank the UROP program for making this opportunity possible. We would also like to thank our research mentor, Laurel Field, for her constant support.

References