

Stony Coral Disease on San Salvador Reefs

Kellen Gradwell, Micah Ford, Nicolette Faller, and Sophia Stang

Faculty Sponsor: Dr. Isidro Bosch

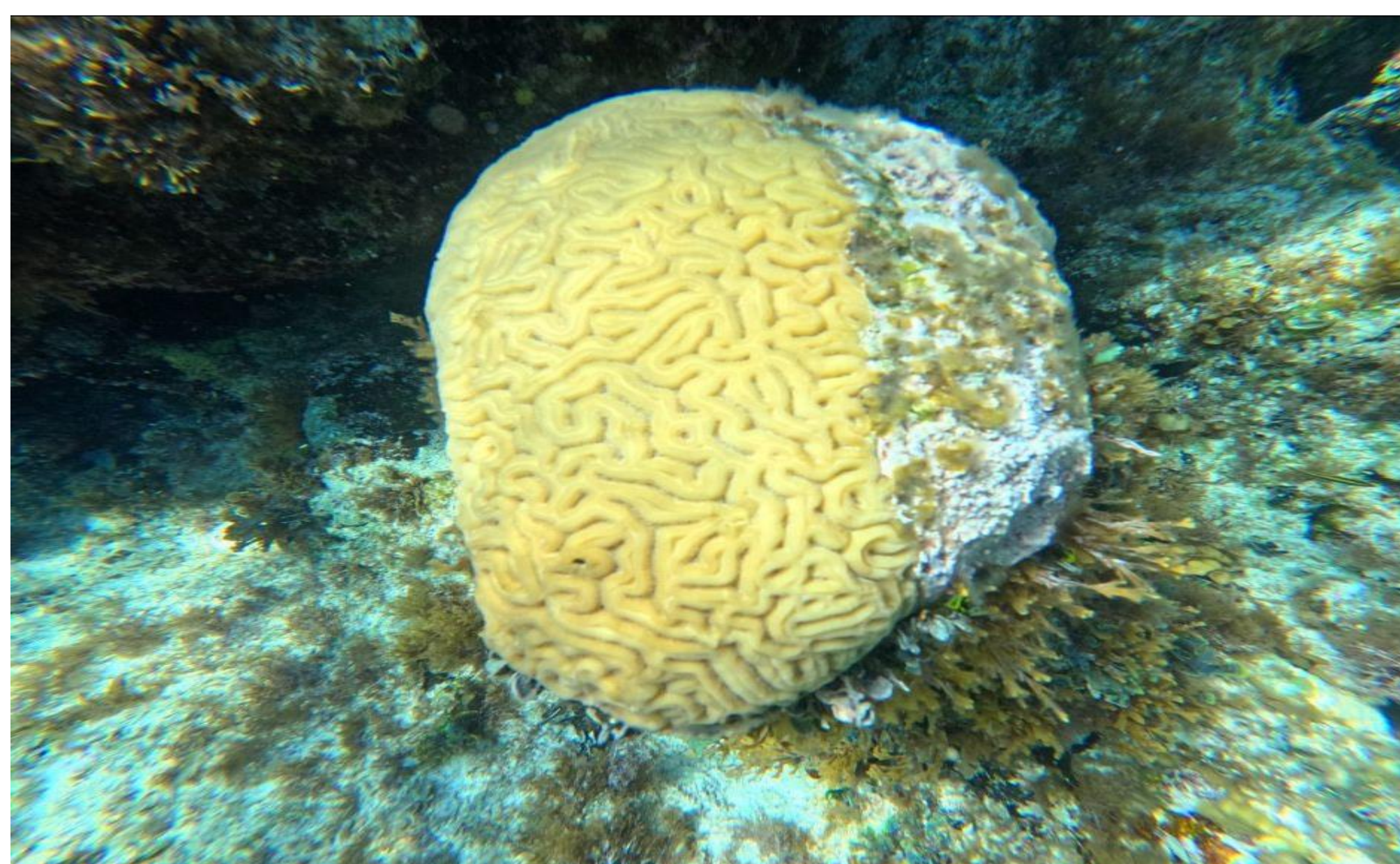
State University of New York College at Geneseo

Introduction

Coral reefs sustain incredibly diverse ecosystems that are now threatened by climate change, overfishing, and infectious diseases. Disease spread has increased greatly in recent years, especially in the Caribbean waters. **Stony Coral Tissue Loss Disease (SCTLD)** was first identified in 2014 and has spread through all the Bahamian island reefs, posing the greatest current threat of disease to corals in the Caribbean (Alvarez-Filip *et al.*, 2022). In 1998 data collected on disease rates revealed percentages of 0 to 8% at the various sites sampled at (Paulette *et al.*, 2003). Our current data shows a disease rate of 52%. Paying particular attention to SCTLD, we studied disease rates and prevalence as well as susceptibility of certain corals to specific diseases. SCTLD was highly prevalent among the corals of San Salvador and generally indiscriminate in the corals it affected. White Pox, Black Band, and White Band diseases were less prevalent but affected specific corals. Data collection and analysis is important to future management of newly established national parks designed to protect coral reefs around San Salvador Island and provides evidence for the extensive coral coverage loss in San Salvador. Certain coral resilience may point towards a solution, and a lack of it may suggest an even larger problem.

Objectives

1. Determine if Stony Coral Tissue Loss Disease is more prevalent than other diseases.
2. Determine whether all coral species are equally affected by disease or if certain coral species are less affected.



Symmetrical brain coral with SCTLD

Materials & Methods

Data collection involved placing ten meter transects along a reef and taking a video as well as photographs along the line. We also took general disease surveys of the area to get a larger picture of disease types. The imaging was then analyzed to determine coral type, disease cover, and disease type.

Results

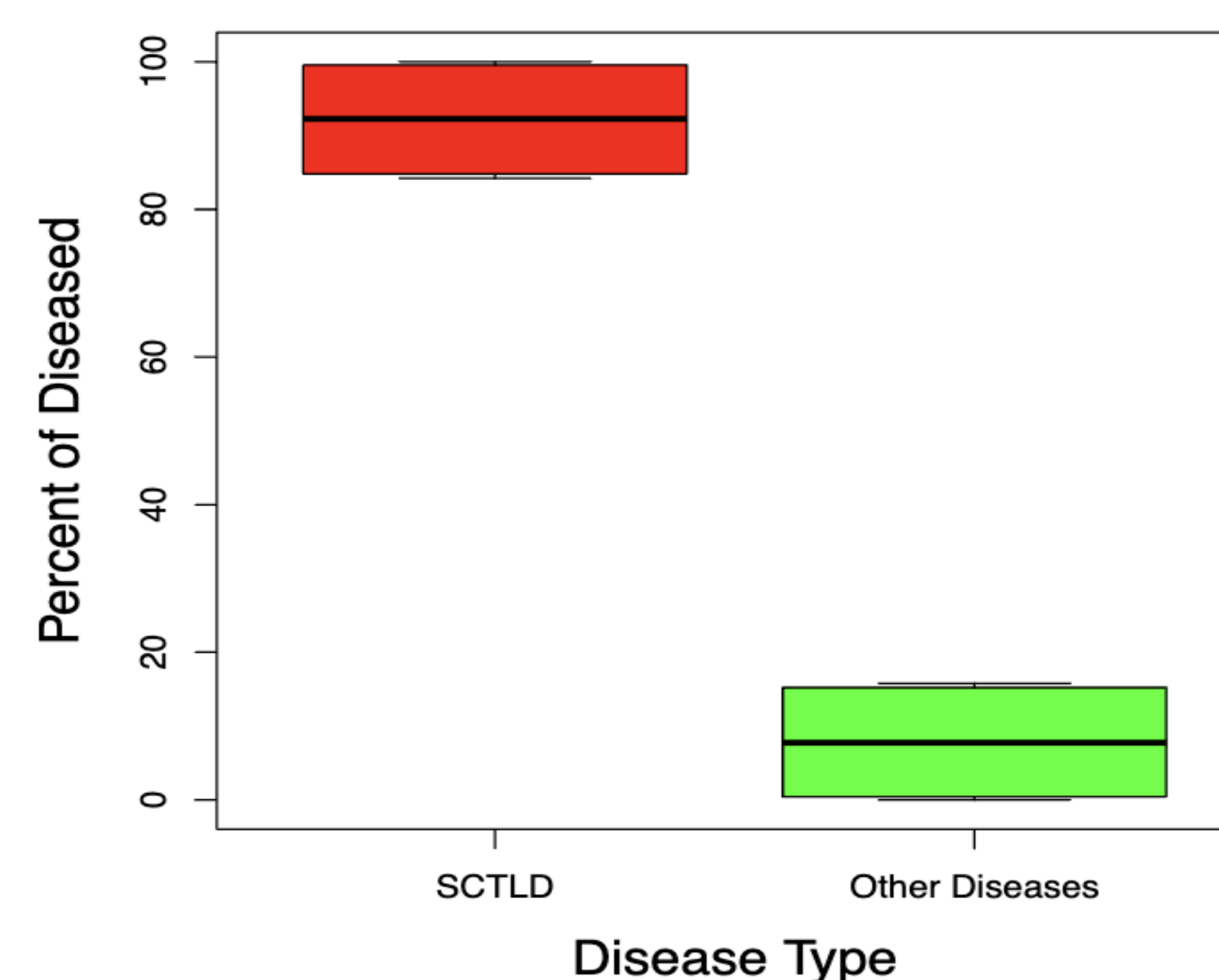


Fig1. Out of the 52% of diseased corals, a significantly higher percentage was affected with Stony Coral Tissue Loss Disease than any other disease type. On average, 92.185% of diseased corals were affected by SCTLD while other diseases affected 7.815% ($t = 13.941$, $df = 6$, $p\text{-value} < .001$). This is equivalent to 47.936% of all corals having SCTLD.

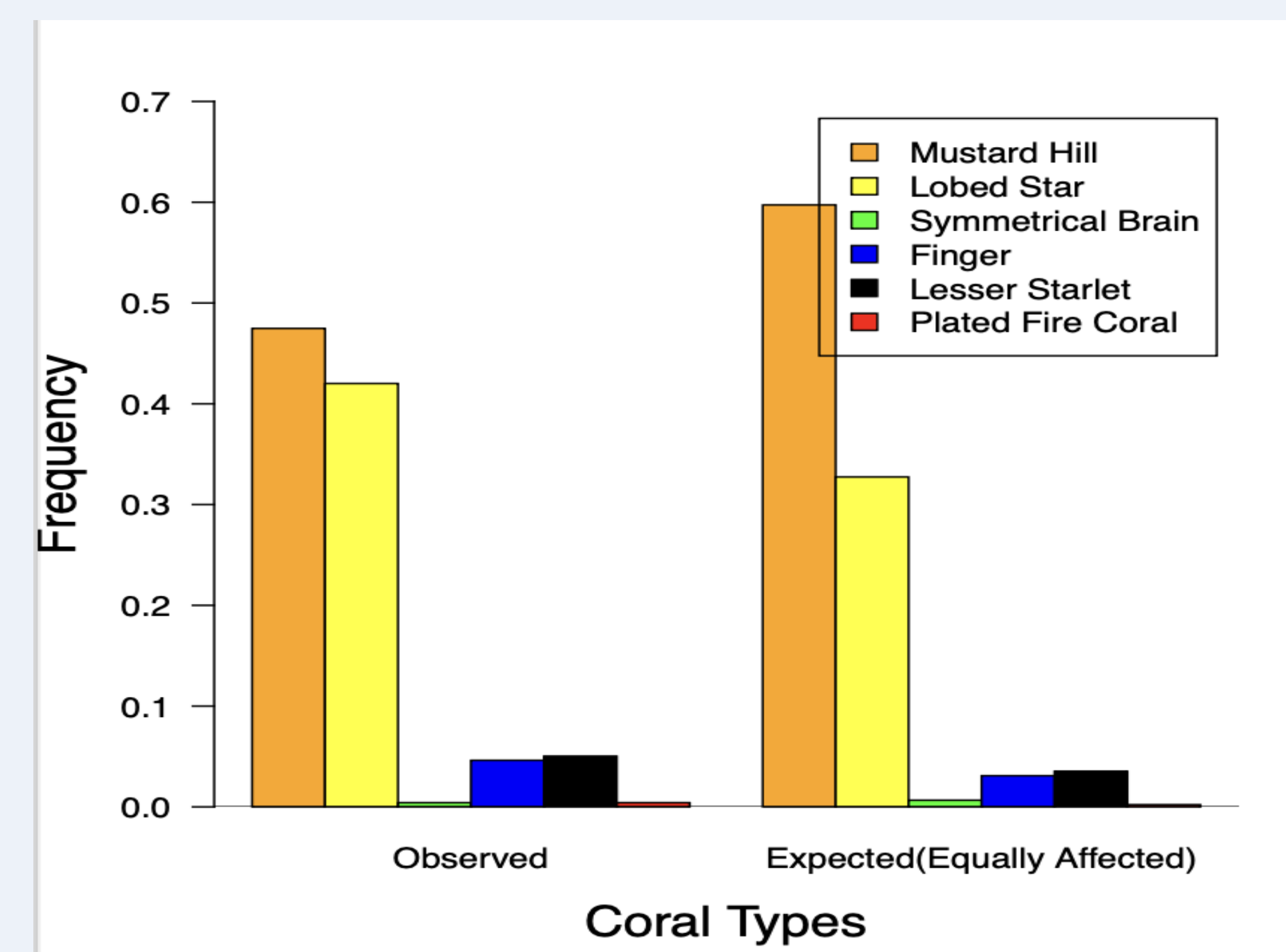


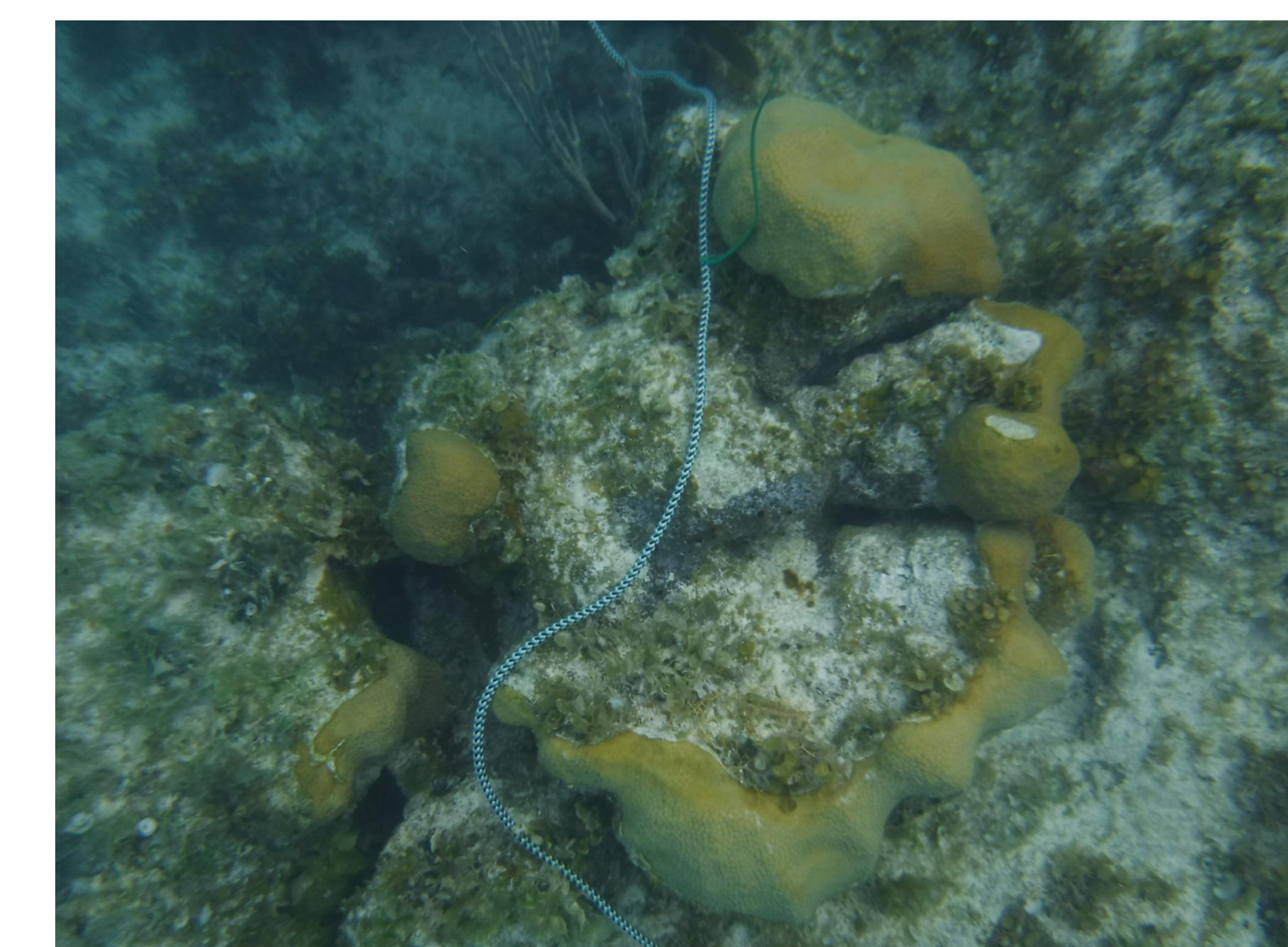
Fig2. All coral species are equally affected by disease. There is no significant difference in the expected disease rate for each species of coral and the observed rate of disease for each species ($X\text{-squared} = .067969$, $df = 5$, $p = 0.999999$).

Conclusion

Stony Coral Tissue Loss Disease is highly prevalent in San Salvador. More than 92% of the diseased corals we observed were infected by SCTLD (Fig1). Scientists must turn their attention to coral health and possible solutions to SCTLD. Over 52% of the corals we observed in San Salvador were diseased, a dramatic increase compared to past years' disease data. There was no significant difference in the coral species affected by the diseases (Fig 2), indicating no immunity towards SCTLD. Therefore, this disease has the potential to devastate entire coral ecosystems without partiality. Causes of SCTLD are still trying to be identified; however, corals are susceptible to this highly pathogenic disease, in part due to external factors such as warming temperatures and ocean acidification. These factors must be addressed to save coral reefs across the globe.



Mustard hill coral with SCTLD



Lobed star with SCTLD and transect shown

References

- Alvarez-Filip, L., González-Barrios, F.J., Pérez-Cervantes, E. *et al.* Stony coral tissue loss disease decimated Caribbean coral populations and reshaped reef functionality. *Commun Biol* 5, 440 (2022). <https://doi.org/10.1038/s42003-022-03398-6>
- Peckol, Paulette M.; Curran, H. Allen; Greenstein, Benjamin J.; Floyd, Emily Y.; and Robbart, Martha L., "Assessment of Coral Reefs off San Salvador Island, Bahamas (Stony Coral, Algae and Fish Populations)" (2003). Geosciences: Faculty Publications, Smith College, Northampton, MA.

Acknowledgements

We would like to thank Dr. Bosch and Dr. Over for their academic and personal guidance. We would like to thank Melissa Hicks for sharing her time and knowledge with us on this trip. We would also like to thank the Gerace Research Center for allowing us to use their facilities.

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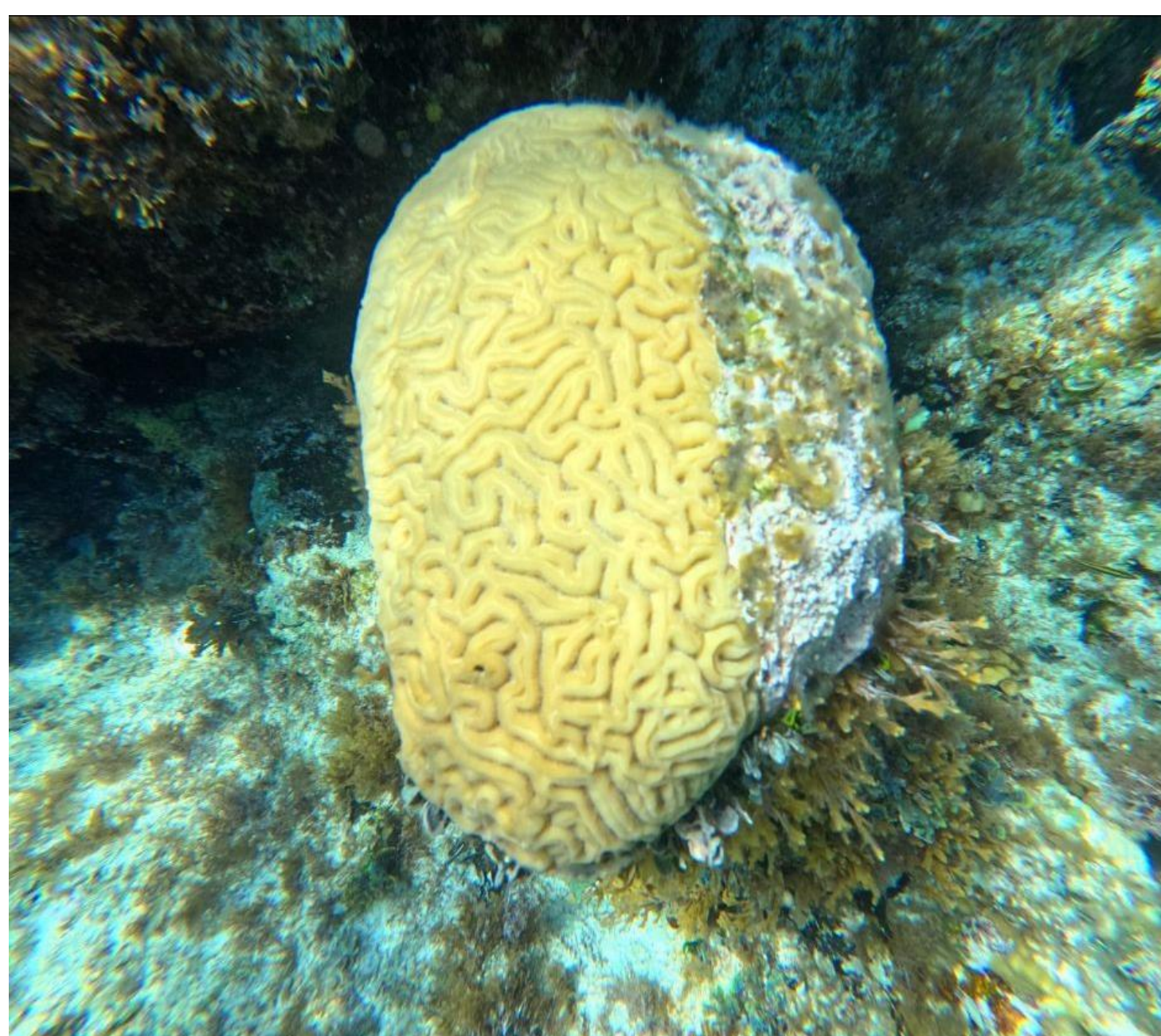
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Introduction

- Coral reefs sustain incredibly diverse ecosystems that are now being threatened by climate change, overfishing, and infectious diseases
- Disease spread has increased greatly in recent years, especially in the Caribbean waters. **Stony Coral Tissue Loss Disease (SCTLD)** was first identified in 2014 and has spread through all the Bahamian island reefs, posing the greatest current threat of disease to corals in the Caribbean (Alvarez-Filip *et al.*, 2022)
- We investigated coral disease rates in multiple shallow reef sites on San Salvador Island in the Bahamas, paying particular attention to SCTLD, to study disease rates and prevalence as well as susceptibility of certain corals to specific diseases
- Data collection and analysis is important to future management of newly established national parks designed to protect coral reefs around San Salvador Island and provides evidence for the extensive coral coverage loss in San Salvador. Certain coral resilience may point towards a solution, and a lack of it may suggest an even larger problem.

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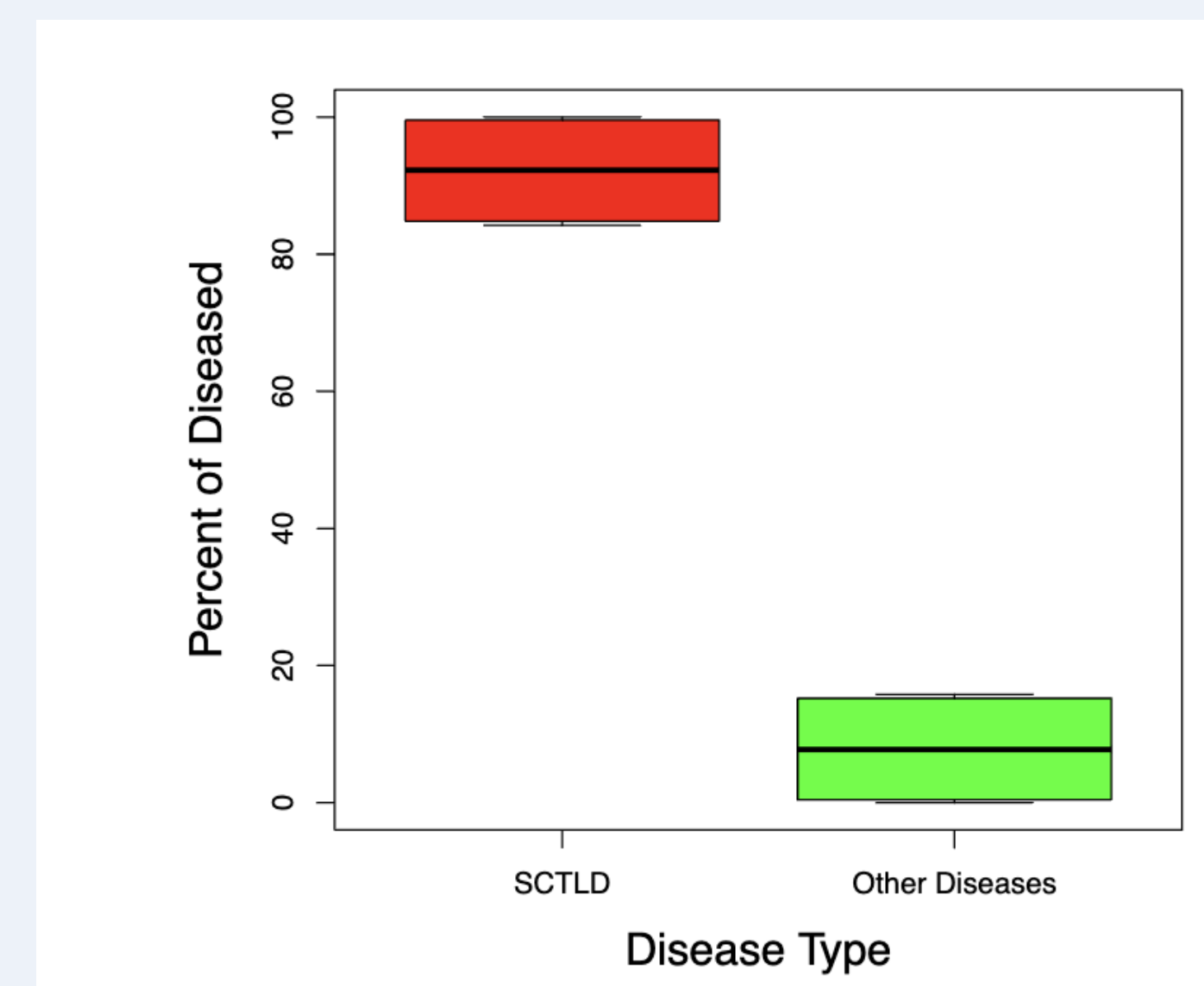


Fig1. A significantly higher percentage of diseased corals were affected with Stony Coral Tissue Loss Disease than any other disease type ($t = 13.941$, $df = 6$, $p\text{-value} < .001$). On average, 92.185% of diseased corals were affected by stony coral tissue loss disease while other diseases affected 7.815%.

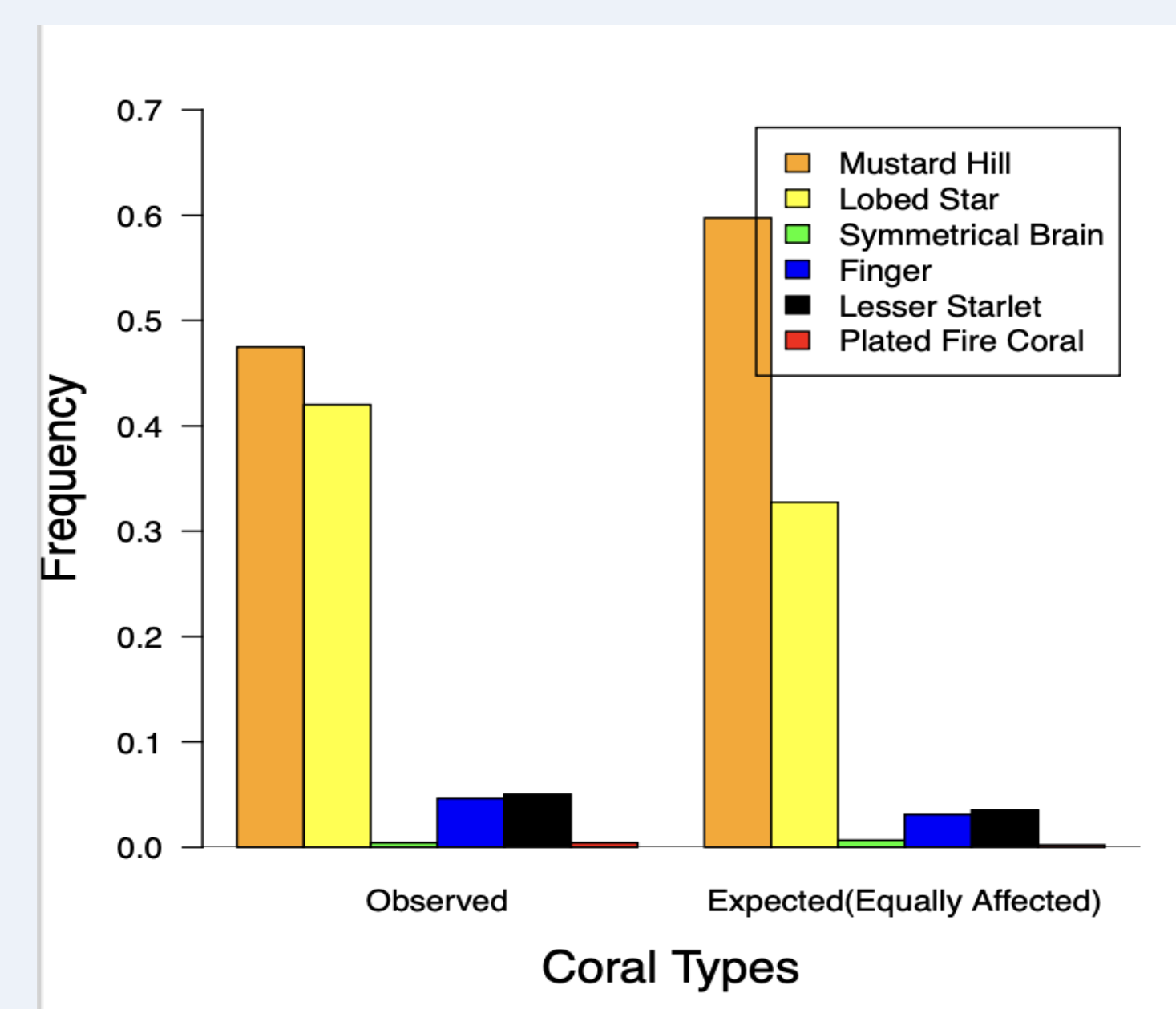


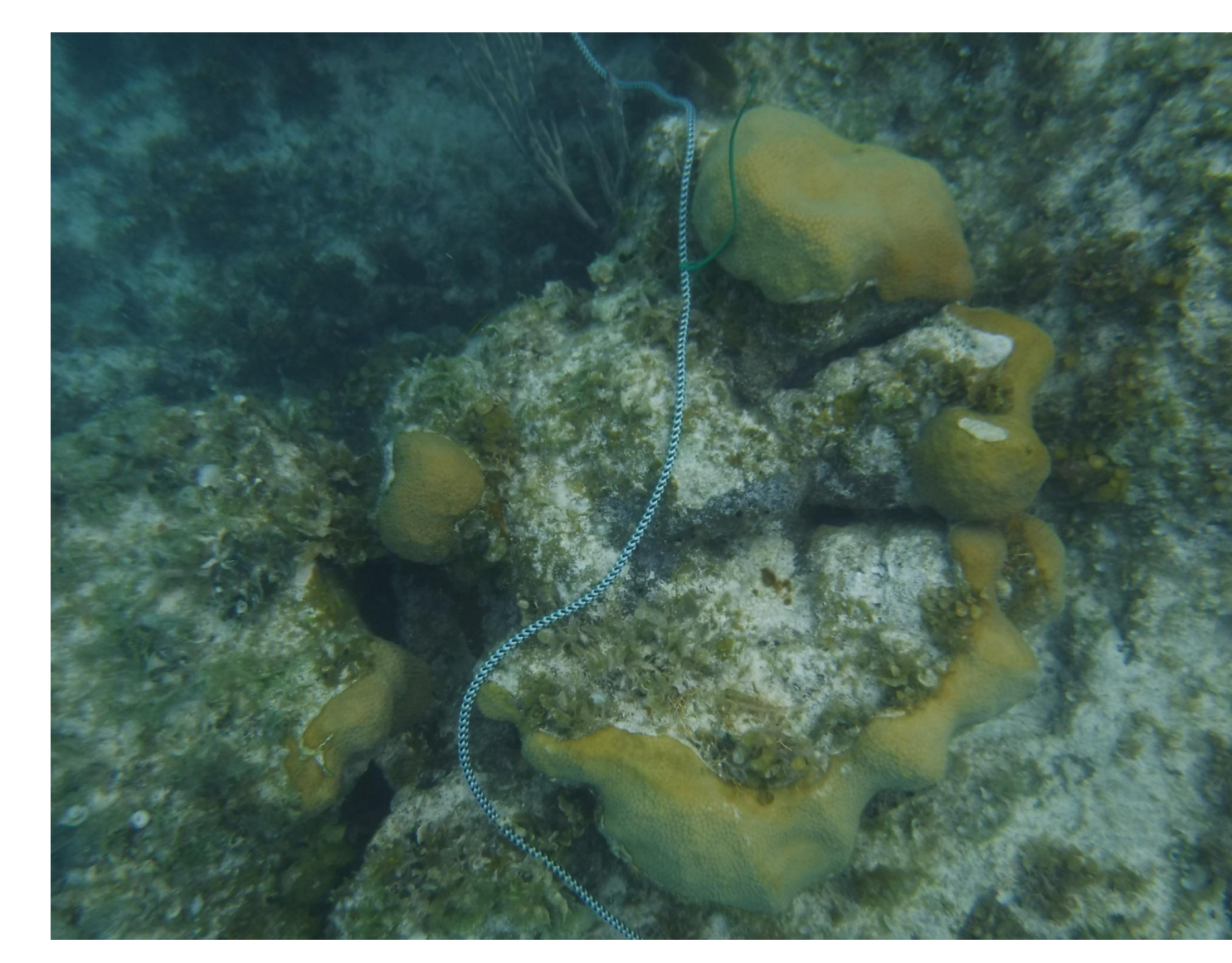
Fig2. All coral species are equally affected by disease. There is no significant difference in the expected disease rate for each species of coral and the observed rate of disease for each species. ($\chi^2 = .067969$, $df = 5$, $p = 0.999999$)

Conclusion

- More than 92% of the diseased corals we observed were infected by SCTLD (Fig1). Scientists must turn their attention to coral health and possible antidotes or solutions to SCTLD.
- Over 52% of the corals we observed in San Salvador were diseased, a dramatic increase compared to past years' disease data. In 1998 data collected on disease rates revealed percentages of 0 to 8% at the various sites sampled at (Paulette *et al.*, 2003).
- There was no significant difference in the coral species affected by the diseases (Fig 2), indicating no significant immunity possessed by any species of stony coral towards SCTLD. Therefore, this disease has the potential to devastate entire coral ecosystems without partiality.
- Causes of SCTLD are still trying to be identified; however, it is clear that corals are susceptible to this highly pathogenic disease, in part due to external factors such as warming temperatures and ocean acidification.



Mustard hill coral with SCTLD



Lobed star with SCTLD and transect shown

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