Disease Frequency in Restored vs. Wild Staghorn (*Acropora cervicornis*) Sites in Bonaire, Dutch Caribbean

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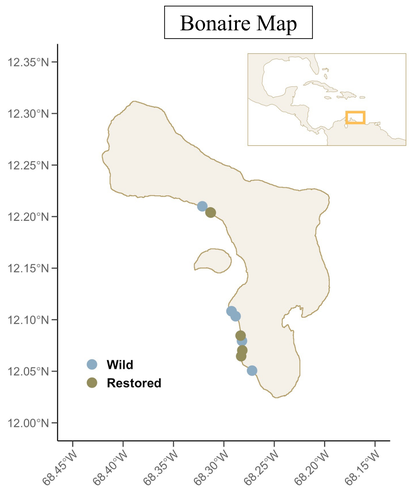
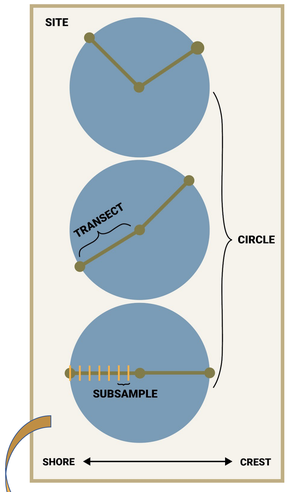
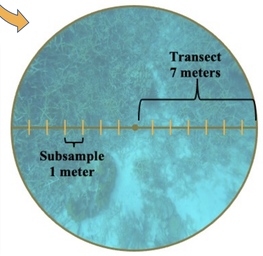
Introduction

- *A. cervicornis* is a major structure-building coral for Caribbean reefs.[1]
- *A. cervicornis* mortality has increased drastically.[1]
- **Disease** has been found to be one of the main causes of *A. cervicornis* decline.[1]
- **Reef Renewal Bonaire** is a non-profit group working towards restoring this coral.
- **Restored sites**: Sites where *A. cervicornis* fragments are outplanted.
- **Wild sites**: Naturally-occurring *A. cervicornis*.

HYPOTHESIS: There will be a higher presence of disease within natural sites compared to restored sites, and disease presence will be correlated to the percentage of dead *A. cervicornis*.







A. cervicornis was surveyed at 9 sites: 5 wild and 4 restored.

Each circle included 2 transects made up of 7 subsamples 1 meter in length. One transect ran towards the shore and the other ran towards the crest. Angle of the transect depended on *A. cervicornis* presence and density.

Methodology

Proportion of disease present was surveyed along a transect (*N*=66 transects) and then photos were taken of the corals along the transect.

Seven evenly-spaced photos were pulled from each transect to minimize overlap.

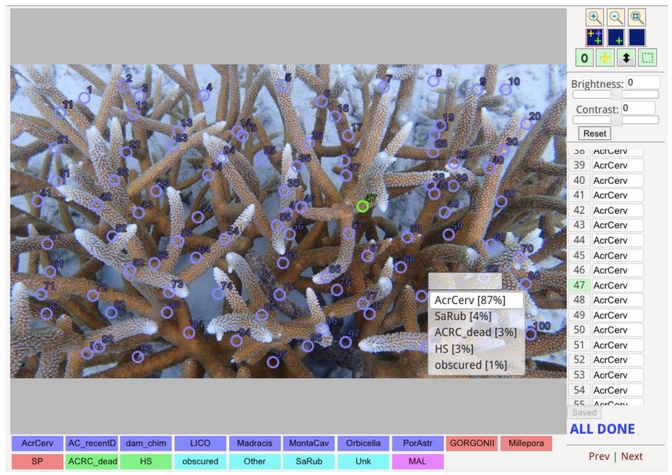
Photos were uploaded to CoralNet, an open-source program that the researchers used to train a machine-learning algorithm to identify substrate and organisms.

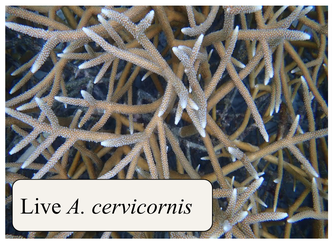
In CoralNet, 100 points were overlaid in stratified-random design on a photo and then identified by hand into different organism or substrate categories.

The CoralNet point count data was used to assess the percentage of dead *A. cervicornis* along a transect.

A two-tailed, unpaired t-test was performed to assess the difference in proportion of disease presence and % dead coral between wild and restored sites.

A Pearson's correlation coefficient (r) was calculated to assess the relationship between % dead coral and disease.



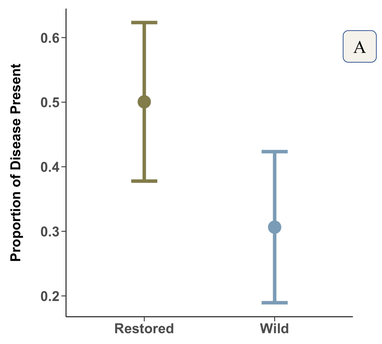

Live *A. cervicornis*

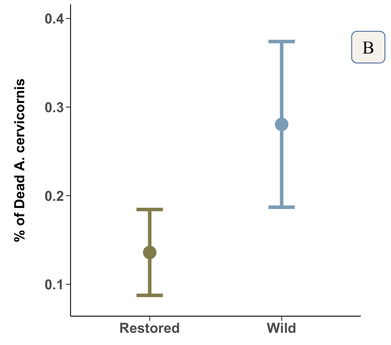

Diseased *A. cervicornis*

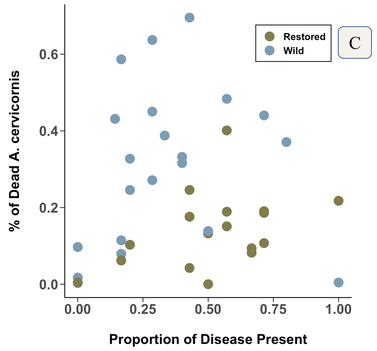

Dead *A. cervicornis*

Results

	Proportion Disease	% Dead Coral	Number of Transects
Restored	0.50 ± 0.25	0.14 ± 0.10	18
Wild	0.31 ± 0.27	0.22 ± 0.22	23







(A) Restored sites had significantly greater proportion of disease than wild sites (t_{39}= 2.367, p=0.023).

(B) Restored sites had significantly greater percentage of dead *A. cervicornis* than wild sites (t_{39}=-2.629, p=0.012).

(C) There is not a significant correlation between proportion of disease and % of dead *A. cervicornis* (r=0.130, p=0.417).

Discussion and Future Directions

- The hypothesis was not supported, because restored sites had a higher proportion of disease.
- Recently outplanted corals appear to be more susceptible to disease, which aligns with previous research.[2]
- Proportion of disease is not correlated to percentage of dead coral, which might be due to disease needing a live host in order to persist.
- Restoration practitioners should actively monitor restored sites and potentially treat them for disease.[3]

References

[1]Aronson & Precht. *Hydrobiologia* (2001). [2]Moriarty et al. *Trends Microbiol* (2020). [3]Sweet et al. *Proc R Soc Lond B Biol Sci* (2014).