Comparative growth and survival of *Acropora cervicornis* on disk versus line nurseries

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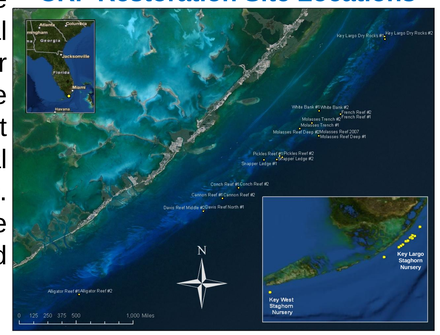
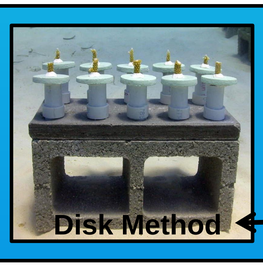
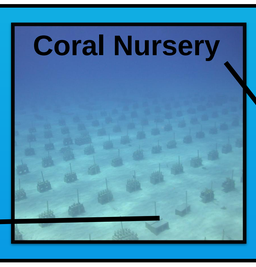
Introduction:

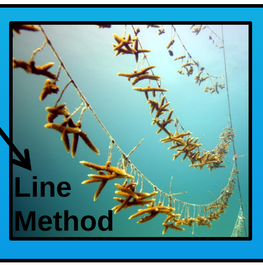
The Coral Restoration Foundation (CRF) offshore nursery was established in 2001, with three distinct genotypes have been identified and tracked over the years, and the number of clones of those original corals now number over 6,000 at the nursery and another 500 planted on reefs in the Upper Keys. CRF has been testing new and innovative ways to grow staghorn coral, *Acropora cervicornis*, more efficiently. Most corals are grown in our disk nursery, where coral fragments are epoxied to concrete disks and attached to an anchored concrete structure on the seafloor. However, we have been testing a clothesline structure vertically supported with buoys, called a line nursery, which suspends coral fragments mid-water allowing for multi-directional growth. We have designed an experiment to test seasonal growth and survival using the two nursery techniques. With these data we will determine an optimal growing season and propagation strategy to maximize survival and growth of corals.

CRF Restoration Site Locations







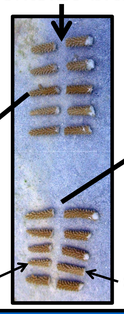


Methods:

- 20 *A. cervicornis* fragments cut 3 cm weekly, for 1 year
- 10 corals were epoxied to concrete disks
- 10 corals were hung on monofilament line nurseries
- Of each 10, 5 fragments were cut once (branch tips) and 5 were cut twice (branch middle sections)
- Survival was monitored weekly for one year after initial cutting
- Growth measured initially and then at 1 year
- All fragments were genetically identical cut from genotype, K1

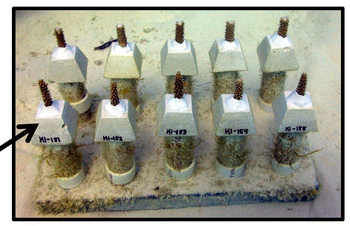
Newly cut fragments:10 branches cut in half

Fragments hung on lines



Cut once (branch tips)

Cut twice (branch middles)

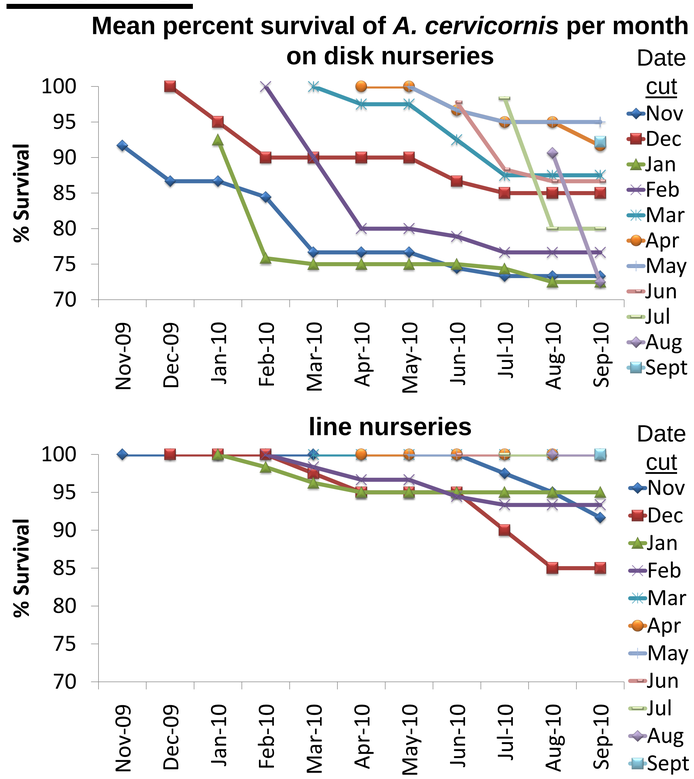


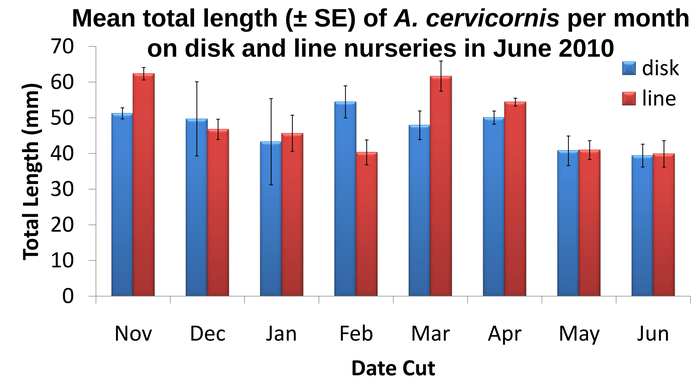
Fragments epoxied to disks

Question 1:

Is there a difference in growth or survival among line and disk nursery methods?

Results:

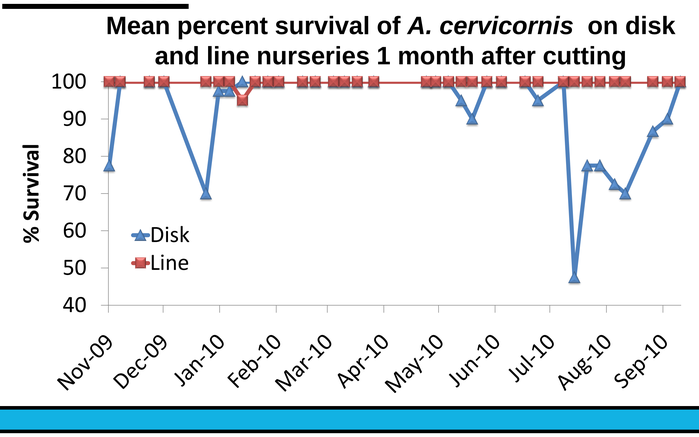




Question 2:

When is the best time of year to prune corals in order to reduce mortality?

Results:



Conclusions:

- Corals on line nurseries have significantly higher survival than those on disks (logrank test, $p < 0.001$)
- No significant difference in survival between cutting fragments once or twice, only line / disk method differed
- Corals epoxied to disks in November, and March were significantly smaller than those on lines (anova, $p < 0.01$)
- Most mortality occurred during one month of cutting
- Highest mortality during the year was in January (extreme cold, 56ºF) and August (summer heat, 90ºF)
- Despite temperatures corals on the line nursery were unaffected, and mortality was due to algal overgrowth
- No evidence of disease, bleaching, or predation was found on the line nursery, yet all were present on disks
- We hypothesize that line nurseries have:
  - higher survival because corals were lifted above cold thermoclines and predators (likely to spread disease).
  - larger corals because increased space to grow and current motion may increase feeding ability, thus faster growth.
- To maximize coral survival and growth after propagation:
  - Avoid disk method during temperature extremes
  - Use line nurseries as the primary propagation method

Acknowledgements

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