Lessons Learned Over 7 Years of Acropora Restoration and Propagation in Florida and the Caribbean

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Coral Gardening

• Minimize negative impacts on wild populations

• Maximize productivity

• Produce a sustainable source of coral

• Strong, science-based reef restoration techniques used > 60 Caribbean nursery and/or restoration projects (Young et al 2012)
Increase *Acropora* biomass

Bridge spatial gaps

Increase genetic diversity

Establish sexually reproductive populations
NOAA Restoration Center/American Recovery and Reinvestment Act- network of nurseries established in 2009

- > 65,000 nursery corals
- 241 known genotypes
- 105 outplant sites
- > 15,500 outplanted corals

UM nurseries installed 2007, 2009, 2013

- 4 nurseries
- 1,600 nursery corals
- 20 outplant sites
- 2,500 outplanted corals

Collaborations with PC Ecological Foundation (2010), CCMI (2012), and CEI (2014)
Increased partial mortality due to competition, predation, breakage, and RTL.
Low initial mortality (<10%) due to transportation/installation

Higher mortality (<20%) after 12 months due to storms/sedimentation and breakage
Nursery Growth

- Growth (cm yr)

- Nursery Growth

- p < 0.05

- SN

- 12 mo

- 24 mo

- 40

- 30

- 20

- 10

- 0
Nursery Structures

![Graph showing growth comparison between Frame and Rope structures with a p-value of less than 0.001.](image)

The graph illustrates the growth (cm/yr) in Nursery Structures, with Rope structures showing significantly higher growth compared to Frame structures (p < 0.001).
Genetic Diversity

$p < 0.05$
Outplant Survival

2013 = larger corals

2012

2013
Outplant Growth

Variation between sites, regions, and years

$\text{p} < 0.001$
Outplants vs Controls

- **Growth cm yr⁻¹**
  - Outplants
  - Controls
  - *p* < 0.001

- **% Survival**
  - Outplants
  - Controls
  - *p* < 0.001
Outplant Growth

5.3 cm

365 cm
Spawning
Conclusions

- Methods have minimal impact on donor colonies
- Coral nurseries are highly productive and successful
- Outplanted corals demonstrate significant linear extension over time
- Utilizing coral nurseries for *Acropora* restoration can significantly contribute to population recovery and coral reef structure
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Comparative productivity (cm/yr) before and after fragging event:

- Initial productivity:
  - 1 month after fragmentation event:
  - 8 months

- After fragging:
  - Significant increase in productivity

* p<0.001

Pruning Vigor!!
Growth significantly increases after branch formation

![Graph showing mean tissue length over time with different growth stages and statistical significance](image)

Herlan and Lirman, 2009
Inducing Branch Formation

Productivity (cm⁻¹)

Day 1

Day 50

$p=0.055$