



El papel de viveros en restauración después de encallamientos en Guayanilla, Puerto Rico

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May 16, 2013

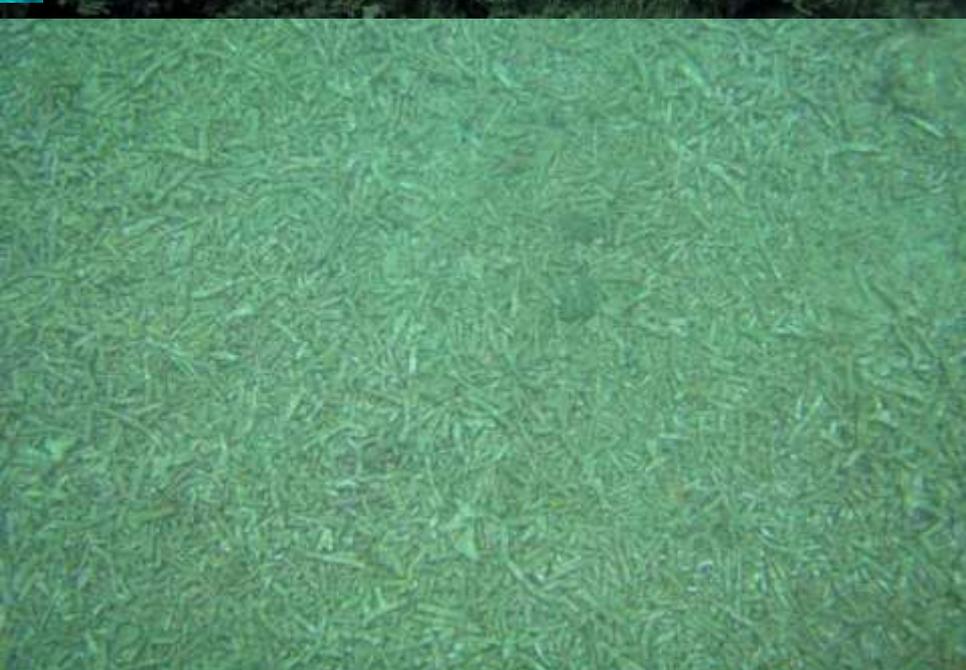
NOAA
Restoration
Center



M/V Margara

- Grounding occurred April, 2006.
- Approximately 7,500 m² of reef were damaged. Initial impact was 1,500 m² ; additional 6,000 m² damaged during removal of vessel
- 11,000 corals were reattached during Emergency Restoration
- Approximately 150,000 corals were damaged or lost during the grounding.
- Still awaiting primary restoration to address 1,600 m² of rubble fields that inhibit recovery at the site.







FUCAs

- PVC frame prevents sagging in middle as corals grow
- No Maintenance
- High Growth Rates/ Low Mortality
- Storm Resistant
- Dimensions: 1.5m x 3m



Survival and Growth

Time Period	One Year
Mean Linear Growth	52.5 ± 1.1 cm
Mean Linear Growth Rate	4.4 cm/month
Maximum Diameter	21.7 ± 0.3 cm
Change in Diameter	1.4 cm/month
Mortality	4.5%

- Currently 1,600 colonies in the nursery
- Outplant 1,200 each year
- Remaining 400 colonies used to restock the nursery





Outplanting

Size of outplants	40 cm diameter
Outplant densities	4 – 8 colonies/m ²
Survival	>90%
Size at 1.5 yrs	60 cm – 1 m

Methods

- Combination of nails, cable ties, and epoxy

-15-25 Pilot Outplants



2006 M/V Margara Grounding

NOAA
FISHERIES
SERVICE



Unrestored area 2012



Restored area 2012



Restoration in Progress





LNG-C Matthews

- Grounding occurred Dec. 2009 in Guayanilla, PR
- 3,200m² of reef were damaged
- 7,000 corals were reattached
- Restoration complete took almost 3 months.
- Some *Acropora* damage. These colonies were reattached *in situ* and some frags brought to Margara nursery to increase genotypic diversity









USCG ATONs deployed in winter 2011/12





Damage Assessment

Location	Maria Langa	Offshore Tallaboa	Total*
Size of Impact	45.6 m ²	37.5 m ²	83.1 m ²
# of Corals Lost	1,014	964	1,978

*** Rapid response by USCG after notification prevented additional damage to the reef**



132 corals reattached and 16 *A. cervicornis* transplanted during ER



M/V Kapitan Egorov

- Grounding occurred 1998 in Guayanilla, PR
- 7,000m² of reef were damaged
- No Restoration
- Recovery significantly delayed in many areas





2013 Outplanting

- 1,200 corals outplanted
- 3 “thickets” (10m x 6m) were created using 400 colonies in each
- Fish monitoring using RVC method in thickets, impact and reference area





M/V PORT STEWART

- Grounded on Oct. 28, 2009 in Yabucoa, PR
- 500 m² of reef damaged
- 1,000 corals reattached
- 15 m² of limestone used to restore lost rugosity at the site
- Restoration complete







Temporary Line Nurseries

- Acropora fragments placed on line nurseries during Emergency Restoration
- Fragments reattached after restoration completed
- Replanted colonies showed higher growth and lower partial mortality than control reference colonies.





M/V Jireh

- Grounded on June 20, 2012 in Mona
- Last piece of the vessel removed Oct 5
- Colony of *A. palmata* crushed by bow when vessel rotated during hurricanes
- Other colony by hull proactively transplanted
- *A. palmata* colonies from nursery in La Parguera will be transplanted to impact site (May 2013)





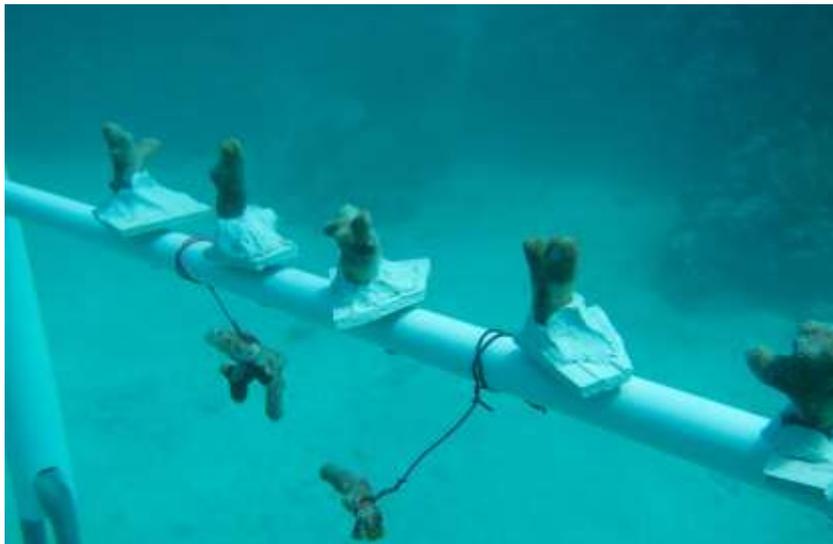
Additional Species

Challenges in the Caribbean

- Most species slow growing (0.5 cm/yr)
- Might need to develop new techniques



Dendrogyra cylindrus



Porites porites



Madracis mirabilis

Acknowledgements

Sean Griffin



Pedro Rodriguez



- NOAA
 - Protected Resources Division
 - Restoration Center
 - Coral Reef Conservation Program
- PR DNER
- Sea Ventures

Tom Moore





Preguntas?