INTEGRATING RESTORATION INTO CORAL REEF MANAGEMENT

Where we were, where we are and where we are heading...
State of the Reef System

Reef condition

Small Scale Direct Site Restoration

Overfishing/LBSP/Climate Change
Engineering Solutions: “Build it and they will come approach...”
State of the Reef System

Overfishing/LBSP/Climate Change

- 2011

Ecosystem Restoration + Threat Abatement

Threat Abatement or Ecosystem Restoration

Status Quo
Ecological Restoration

• Now we have broadened our definition of restoration beyond just restoring physical impacts
• Integrating effective ecological restoration methods
  – Threat Reduction:
    • Broward Anchorage*
    • MPA
    • Watershed Restoration
  – Species & Population Enhancement
    • Corals
    • Diadema
    • Fish
  – Restoration of Associated Habitats
    • Seagrass
    • Mangroves
Caribbean Acropora Restoration Database

NOAA ARRA Project Sites
Active Species and Population Enhancement

1) FRAGMENT COLLECTION

2) NURSERY GROW-OUT PHASE

3) RESTORATION / OUTPLANTING

4) REPRODUCTION

5) RECOVERY
Active Species and Population Enhancement

Long-Spined Urchin Restoration Project: Vision

• Holistic Reef Restoration...actively restore ecologically functional coral reefs via reintroduction of hatchery-raised *Diadema antillarum* and nursery propagated corals

• Why *D. antillarum*?
  
  Keystone herbivore whose decline has been recognized as one of the reasons for the degradation of coral reefs
Long-Spined Urchin Restoration Project: Status

Hatchery

- successful spawning on demand
- successful larval culture
- metamorphosis and juvenile grow-out remain a challenge

Laboratory Studies

- Comparing behavioral and ecological characteristics of hatchery-raised and wild juveniles
  - morphological differences
  - differences in sheltering behavior
Long-Spined Urchin Restoration Project: Plans

• Mitigate hatchery-raised morphological and behavioral differences

• Experimental releases of *D. antillarum* to determine best release size, season, density

• Are urchins shelter limited?
  • Test artificial urchin shelters as a recruitment device
Reef Flat Restoration: Invasive Algae Removal
Where to go from here with the help of the USCRTF:

- State of Coral Reefs necessitate active restoration to enable Coral Reefs to recovery in conjunction with threat abatement.

- Active Restoration:
  - Utilization of this tool for compensatory mitigation
  - Population Recovery
  - Programmatic Support for Continued Coral Restoration Projects