Applications of Green Technology for Oyster Reef Restoration

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Low-profile oyster reef margins
Plans for Enhancement

Low-Profile, Intertidal Oyster Reef Habitat

- 45% increase in area
- ~0.7 ac. existing
- 1.3 ac. Proposed
Intertidal Oyster Reef Pilot Study

What restoration materials and application techniques will work best to foster oyster settlement and sustained growth while addressing the following habitat challenges?

• Materials must be suitable for oyster settlement and growth
• Materials must be secured to the substrate and resistant to tidal, wave and storm energies
• Materials should reduce predation pressures, if possible (at least short term)
• Materials should not introduce plastic into the marine environment
Monitored effects of 6 treatments

(5 “green technology” +1 non-biodegradable)

Intertidal Oyster Reef Pilot Study
(April 2017 - October 2018)
Dr. Thomas Manning

4 treatments of Limestone & Silicate base w/ Stearic acid (LSS):
- LSS
- LSS + Nutrients
- LSS + Cultch
- LSS + Cultch + Nutrients
Biodegradable Elements for Starting Ecosystems (BESE)

Photo: Katie Konchar

Photo: Malenthe Teunis
Oyster “Mats”

- Based on original design by Dr. Linda Walters and colleagues, UCF
- Commonly used on Florida’s east coast by Brevard Zoo Oyster Mat Program

Brevard Zoo Oyster Mat Program:
http://brevardoystergardens.org/oyster-mats/
Intertidal Oyster Reef Pilot Study 2017-2018

- 12 replicate arrays
- 6 treatments
- Fixed control
Monthly monitoring:

- Oyster settlement / recruitment (excludes BESE)
- Oyster size-frequency distribution (excludes BESE)
- Predators (bird, fish, invertebrate)
- Treatment decay
- Water quality

Today’s results focus on final assessment (Oct 2018)
Results:
Oyster Recruitment (Live)

• All treatments differed significantly from control.
• LSS treatments without cultch recruited statistically fewer oysters than control.
• LSS treatments with cultch recruited statistically more oysters than control.
• Oyster mats attracted the greatest number of settled oysters (significantly more than the control).
• No effect of added nutrients among LSS treatments.
Results: Oyster Shell Height

- Average size increased through May – October growing season, but stabilized around 20 mm
- Significant effect of treatment on shell size, but by a very thin margin (<0.5 mm)
• Temperatures above mass spawning threshold (26°C) from approx. mid-May – early Oct.
• Temperatures were frequently higher than 30°C, especially in late summer (July-Sept.).
• Salinity was frequently high (29.75 ± 3.17 ppt) across the project period.
Results: Predator Abundance

- Evidence of predation observed on all treatments
- Predators observed in low abundance on all treatments; most prevalent on LSS without cultch; least prevalent on oyster mats and BESE
- Crabs: Stone (*Menippe mercenaria*); Blue (*Callinectes sapidus*); Mud (*Panopeus spp.*); & Hermit
- Oyster drills (*Urosalpinx cinereal, Thais haemastoma*)
- Crown conch (*Melongena corona*)
- American oyster catcher (*Haematopus palliates*)
Results: Treatment Degradation

- LSS with nutrients were especially quick to degrade.
- All treatments with cultch remained intact through duration of experiment.
- BESE became brittle at highest elevation sites.
Conclusions

Green technology materials

• No beneficial effect of nutrient infused concrete (LSS) material
• Materials involving cultch performed better than control plots, likely due to stationary position & predator protection
• Oyster mats were most successful, although time consuming and plastic intensive
• Oyster mats and BESE provided best 3D structure and protection from predators

Site conditions

• Despite consistent spat settlement, oysters did not grow beyond approx. 20mm
• Small oyster size likely due to slow growth & high mortality in high salinity conditions

Future studies: 1) Enclose cultch in BESE; 2) Use BESE to create oyster mats
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