Restoring Oyster Reef Habitat with By-products of a Clam Culture Industry in Cedar Key, Florida USA

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Background

Cedar Key Clam Culture Industry

- Initiated in 1990s through federally-funded job retraining programs for underemployed oyster harvesters and net fishermen
- Over 200 former fishermen placed into businesses
  - 2 to 4-acre leases
  - Annual net profit potential of $30-35K per 2-acres
- 750 acres of aquaculture leases established in Gulf of Mexico
Cedar Key Clam Culture Industry

– Today
  • Over 175 clam farms
  • >80% of state’s production
  • Sales value of $17M (2007)

Florida Sales Value*

* Aquaculture surveys conducted by Florida Agriculture Statistics Service
Supporting Infrastructure

- Seed suppliers
- Bag suppliers
- Other suppliers
- Equipment manufacturers

- Boat builders
- Wholesalers
Survey of shellfish whole-salers conducted to determine number and value of clams handled, 2007

Input-output methodology used to estimated direct, indirect and induced impacts (IMPLAN PRO™ software)

- Total output - $44.9M
- Value added - $28.7M
- Labor Income - $22.9 M
- Jobs Created - 556

Complete report available at website: http://economicimpact.ifas.ufl.edu
Cedar Key Oyster Fishery

- 30 families involved in fishery
- 6 oyster wholesalers in county
- $425,000 value (FWRI, 2006)
- 10% of state’s production
Cedar Key Oyster Fishery

- Fluctuating harvests due to drought, hurricanes, predators, and other causes
Restoration Projects

- Recovery of “derelict” clams bags for use as building blocks to construct oyster reef habitat
- Recovery of clam shells for use as cultch planting materials to replace oyster reef substrate
Cedar Key clam culture industry

Clams are grown in polyester mesh bags staked to the bottom substrate on sovereign submerged land leases in the Gulf of Mexico.
Impact of 2004 hurricane season

- **Cedar Key area**: (65%) Approx. 35% loss — wave action
- **Charlotte Harbor area**: (15%) Approx. 100% loss — freshwater and wave action
- **Indian River Area**: (20%) Approx. 100% loss — wave action

Hurricanes:
- **H. Ivan**
- **H. Charley**
- **H. Frances**
- **H. Jeanne**
- **TS Bonnie**
What is a “Derelict” Clam Bag?

- Damaged and abandoned clam farming equipment (clam bags)
- Excessive buryment of clam bags resulting in
  - Suffocation of clams and mortality
  - Shell in bags makes excellent substrate for oysters and attracts spat
What is a “Derelict” Clam Bag?

• Bags difficult to remove - excessive sedimentation and fouling organisms
• Many growers did not have necessary equipment to remove and dispose
• Estimated over 20,000 “derelict” clam bags on clam leases in Cedar Key
“Derelict” Clam Bag Removal Project

June 2007 - December 2009

• Recover clam bags from aquaculture lease areas

• Relocate and use as structural components to construct an off-shore oyster reef at Atsena Otie
Atsena Otie, an offshore key of cultural and historical significance, was also impacted by the hurricane seasons of 2004-5.

The northwest bank was severely eroded exposing brick foundation of Eberhard Faber Cedar Mill site.
“Derelict” Clam Bag Removal Project

- The Suwannee River Water Management District (land owners) with the U.S. Fish & Wildlife Service (land managers) were developing a multi-faceted program for shoreline protection
  - Installation of coir fiber logs
  - Re-vegetating shoreline
“Derelict” Clam Bag Removal Pilot Project
June 2007 - December 2009

• Oyster reef to serve as “break-water” to
  • Reduce wave energy
  • Allow for sediment accumulation
  • Assist in providing shoreline stabilization
Project Components and Partners

• **Funding:** 2006 Florida State Legislature, Clam Disaster Assistance - $30,000  
  Suwannee River Resource Conservation and Development - $10,000  
  National Oceanic & Atmospheric Administration’s Marine Debris - $60,000  
  Growers cost-share (25% of bag removal / 10% overall) - $10,375

• **Fiscal Administration:** Levy Soil and Water Conservation District

• **Project Manager:** Cedar Key Aquaculture Association

• **Permitting and Signage:** Suwannee River Water Management District

• **Technical Assistance and Resource Evaluation:**  
  • FL Department of Agriculture and Consumer Services, Division of Aquaculture  
  • FL Dept. of Environmental Protection, Big Bend Seagrasses Aquatic Preserve  
  • University of Florida / IFAS Cooperative Extension  
  • Florida Sea Grant
Project Results

34 clam farmers participated
7 “approved” bag removers
Project Results

Reclamation of 1.0 acres of state-owned submerged lands or partial reclamation of 34 aquaculture leases
4,243 derelict clam bags removed and relocated
Oyster Reef Building Blocks

Estimated 8,000 live oysters in a “derelict” clam bag and 0.15 yd$^3$ of cultch material

Approx. 34 million oysters and 640 yd$^3$ of cultch planted at Atsena Otie reef site
A 0.17-acre oyster reef (360’ x 20’ x 3’ high) constructed
Monitoring

- Reef integrity
- Oyster population dynamics
- Biological diversity

Stone Crab
*Menippe mercenaria*

Lightning Whelk
*Busycon contrarium*

Sea Whip
*Leptogorgia virgulata*
Atsena Otie Oyster Reef Habitat Site

June 2009
Clam shell is a by-product of washing/tumbling activities during processing

- Over 20 clam (shellstock) wholesalers in Cedar Key area
Clam Shell Recovery and Recycling

- In 2005, initiated pilot project using funds from an Emergency Disaster Recovery Program grant with Gulf States Marine Fisheries Commission.
Clam Shell Recovery and Recycling

4,215 cubic yards, or ~97,000 bushels, of shell collected and stored for oyster fishery enhancement efforts
Volunteer Oyster & Clam Shell Recycling

- Initiated by Cedar Key Aquaculture Association and Oystermen’s Association, 2006
- Recycling station located at Cedar Key Water Plant
- Engage residents in participating in restoration efforts
Volunteer Oyster & Clam Shell Recycling

- Recycling bins located at area festivals to educate visitors
Planting of recovered and stockpiled clam shell began in April 2009
Sites preselected by oyster association and
Clam Shell Planting

- Sampling of plants in June (top right) and August (bottom right)
- Reefs restored using this technique may be productive in 12-18 months under optimal conditions

John Gunter, environmental specialist with FDACS Division of Aquaculture
In 2010, 1200 cubic yards (~28,000 bushels) of clam shell were planted

4.8 acres were covered and enhanced at 5 sites off Levy County
Cedar Key’s Shellfisheries Industry
C.A.R.E.S.* for the Environment!

*County Alliance for Responsible Environmental Stewardship

Removal of “Derelict” Clam Bags from Leases
- Restoring ecological and commercial value to impaired state-owned lands
- Accelerating the recovery of clam farming businesses
- Providing economic benefits
- Instilling environmental practices

Creation of Oyster Reef Habitat
- Providing fisheries habitat
- Improving water quality by filtration
- Allowing for sediment accumulation
- Reducing shoreline erosion
- Protecting natural, archaeological, and cultural resources
Thank You

For further information, contact Leslie Sturmer at LNST@ufl.edu or visit the website: http://shellfish.ifas.ufl.edu