# Restoration of Intertidal Oyster Reefs Affected by Boating Activity in Mosquito Lagoon, Florida

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**Florida Oyster Reef Restoration Workshop**
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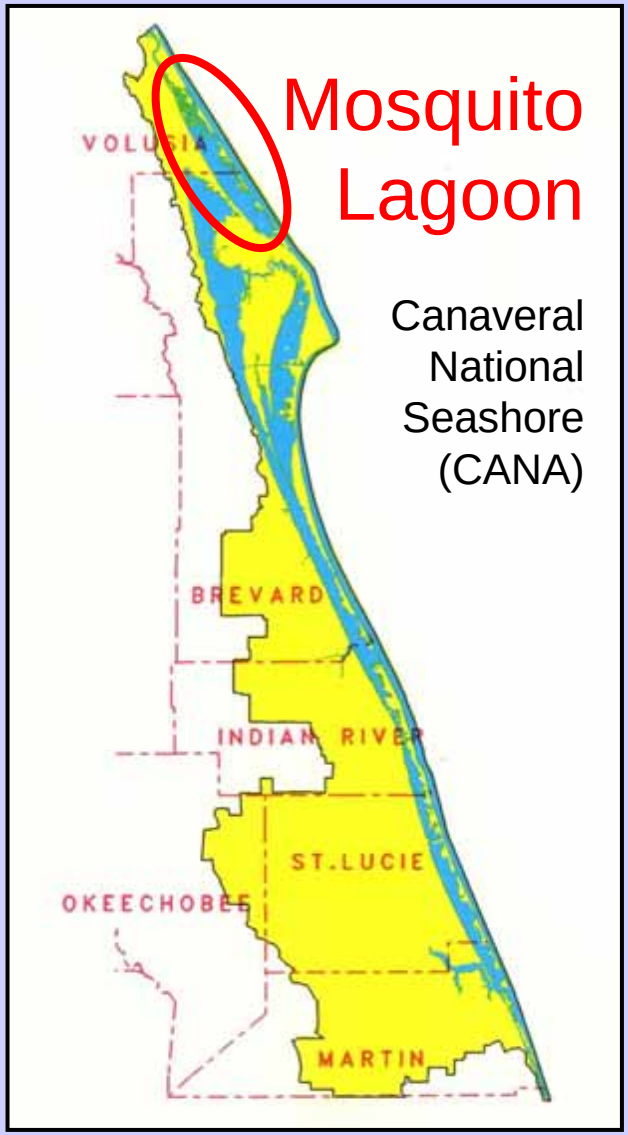
**St. Petersburg FL**

# Outline

- Associated Research
- Community Involvement
- *Mytella charruana*


Mosquito Lagoon
Canaveral National Seashore (CANA)
VOLUSIA
BREVARD
INDIAN RIVER
ST.LUCIE
OKEECHOBEE
MARTIN

# Threats to Oyster Reefs

- Overharvesting
- Disease
- Habitat degradation
- Reduced water quality
- Boat wakes

# CANA Reef Characteristics

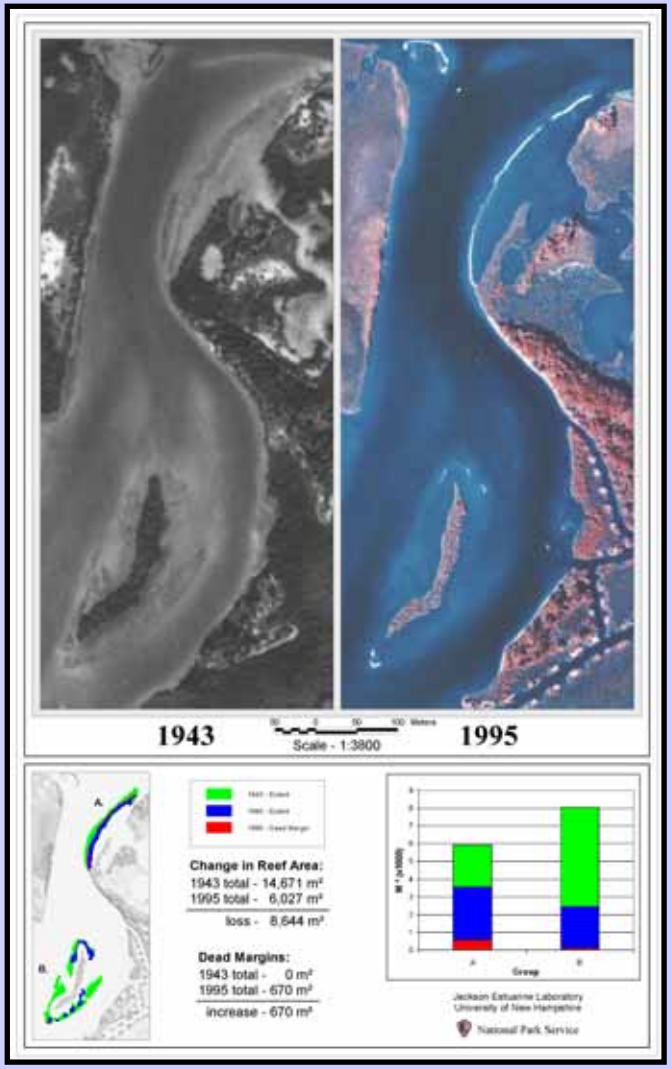
## Pristine

- live oysters
- vertical orientation
- submerged at high tide

## Impacted

- "dead margins" of disarticulated shells
- horizontal orientation
- exposed at all times

# Previous Research




## CAUSE OF DEAD MARGINS?

- 2000 - 15% reefs exhibited dead margins
- Located adjacent to navigation channels
- 1998 -2003 = 43% increase in # of registered boats
- 3% annual increase boat registrations *and* dead margins

*Grizzle et al, 2002; Wall et al, 2005*

# Previous Research

# Mat Architecture

*Dr. Linda Walters - University of Central Florida*

# Project Goals

1. Develop optimal protocol for restoration of reefs using mats
   - Level dead margins and monitor
   - “Plant” artificial seagrass in front of reefs
   - Measure biodiversity of mats

2. Implement larger-scale restoration of intertidal oyster reefs in CANA

3. Involve and educate the community

# Project Design

Combinations of seagrass and leveling on manipulated reefs

- 30 reefs
  - 6 leveled with seagrass/6 leveled without
  - 6 unleveled with seagrass/6 unleveled without
  - 6 reference reefs (no dead margins)

# Hypotheses

1. Null: All treatments have similar biodiversity and larval settlement

2. Alternative: Leveling reefs increases surface area for larval oyster recruitment

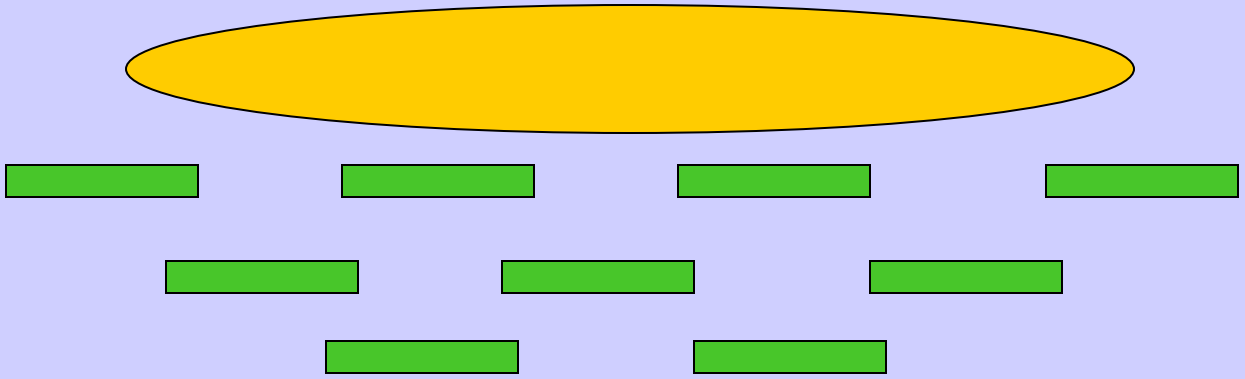
3. Alternative: Artificial seagrass will...

- Increase # recruits – Improve 3-D structure – Increase biodiversity
- decrease negative impacts from boat wakes
- minimize sediment resuspension
- prevent disarticulated shells from forming new mounds

# Methods: Profiles and Leveling

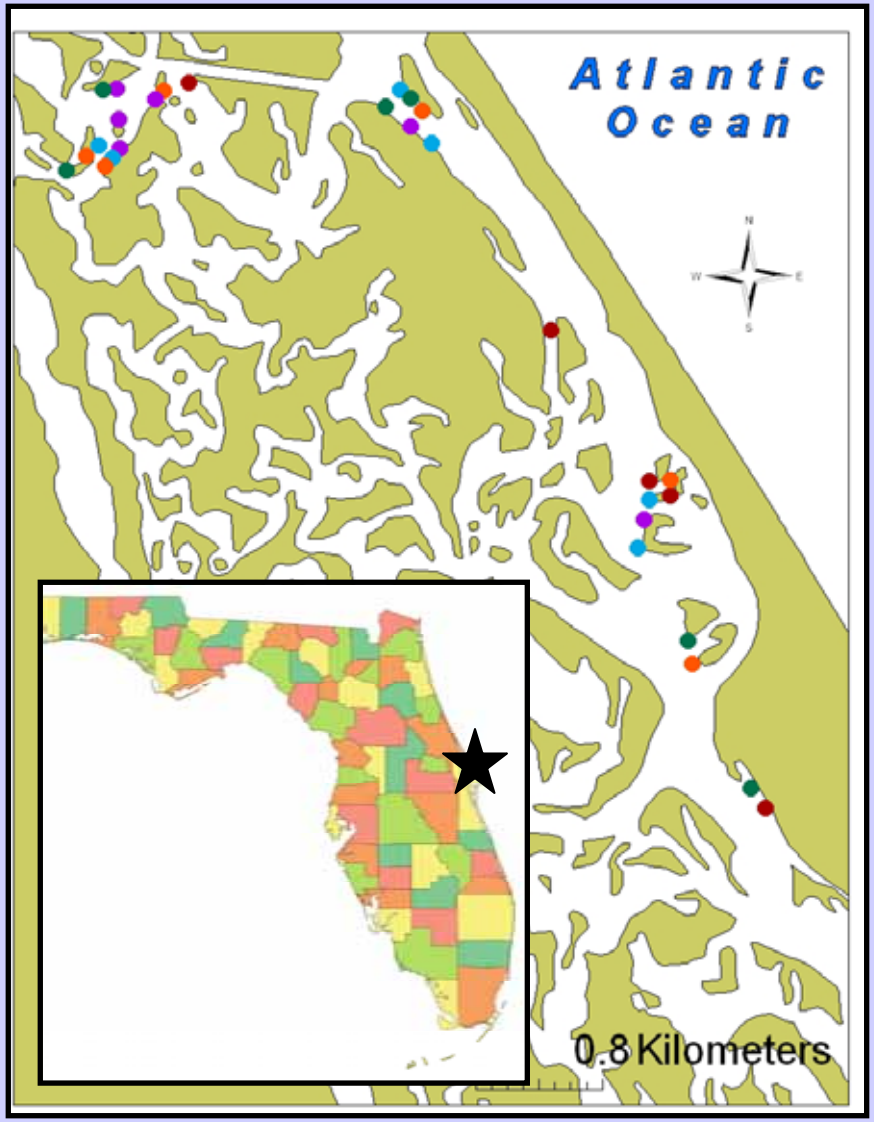
# Methods: Artificial Seagrass





# Reef Set Up

- 15 mats/site
- 5 each - fore, mid, back reef




# Study Sites within CANA

- Reference
- Seagrass and Leveled
- Seagrass and Unleveled
- No seagrass and Leveled
- No seagrass and Unleveled

# Monitoring Reefs: Profiles

- before leveling
- after leveling
- 4 months
- 8 months
- 12 months

# Monitoring Mats: Oysters

## 4, 8 & 12mo.

Spat Recruitment

Bridges Formed

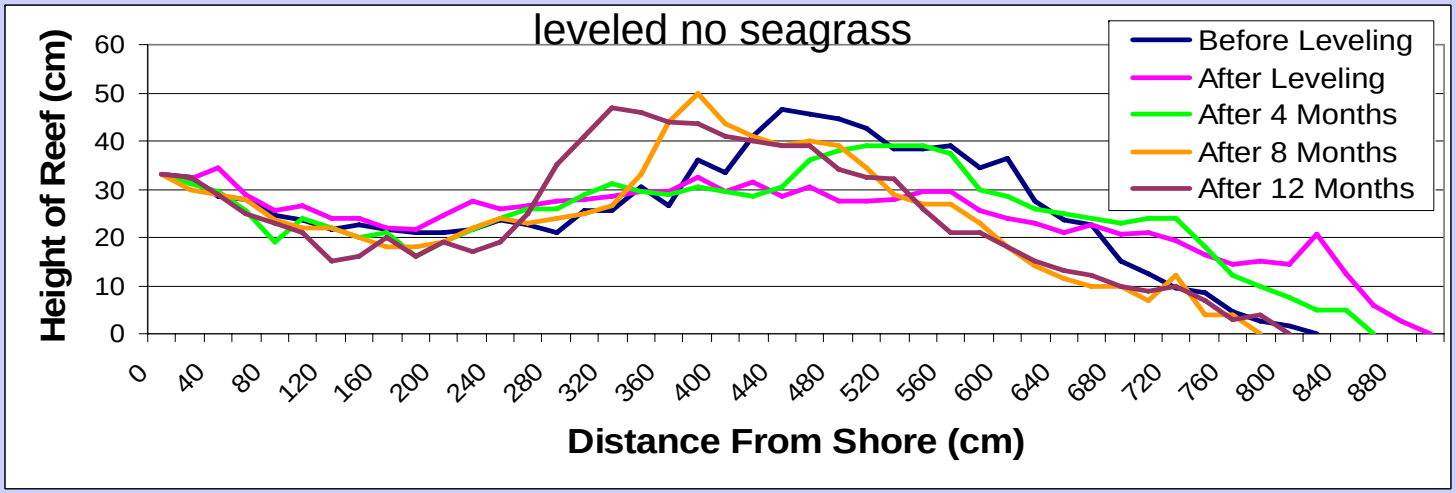
# Monitoring Mats: Biodiversity

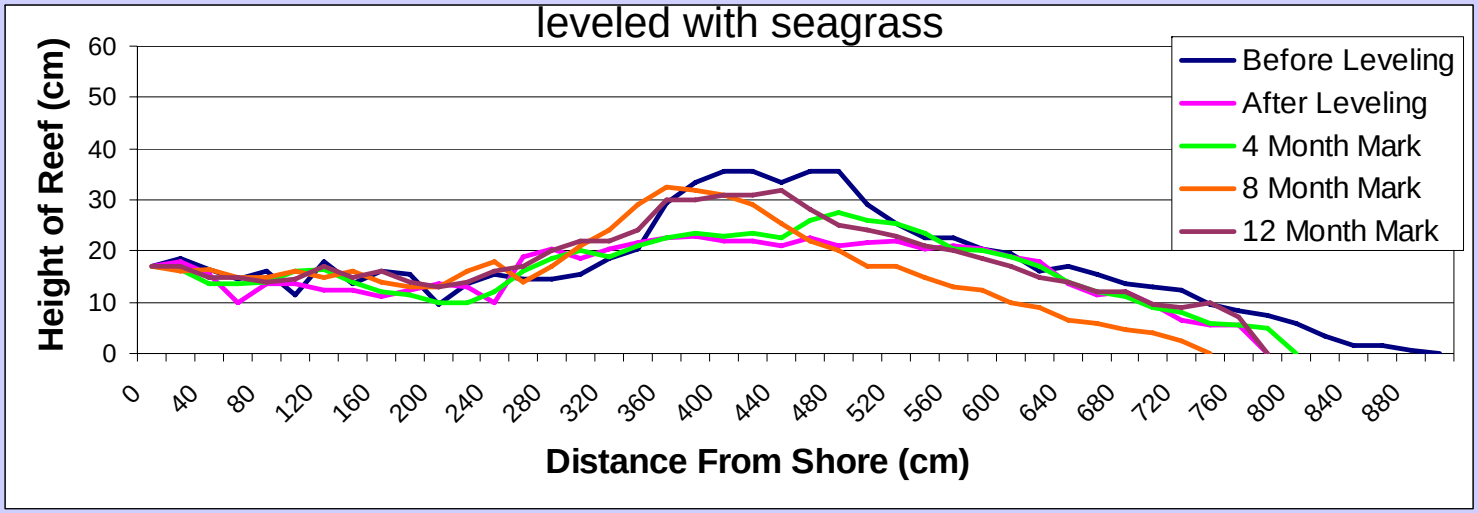


Lift Nets/Reef
- mat with shells
- mat without shells

Diversity & Abundance
- mobile, sessile, & attached algal species

# *Preliminary* Results/Observations



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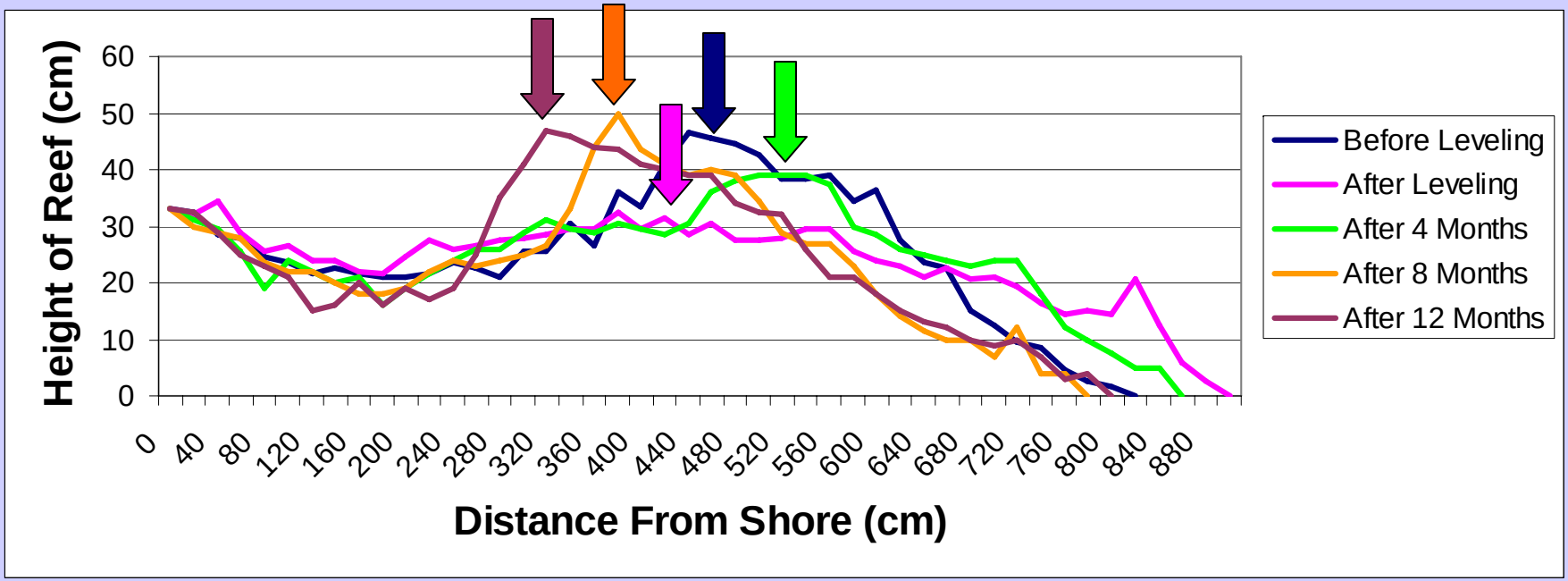


no seagrass and leveled

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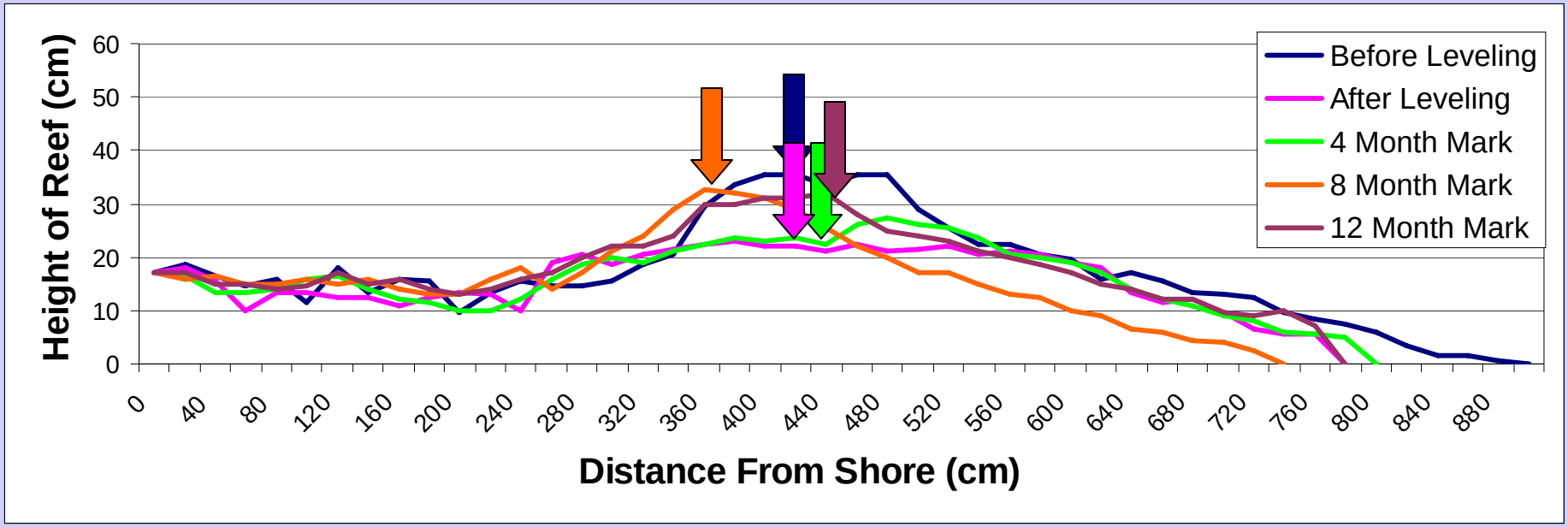


seagrass and leveled

# *Preliminary* Results/Observations

## Recruitment/growth

- highest on impacted reefs
- back and mid-reef counts lower on impacted reefs
- leveling appears to increase recruitment on mid-reef and back reef areas on impacted reefs
- artificial seagrass does not help increase recruitment

# *Preliminary* Results/Observations

## Lift Net Biodiversity

- Higher abundance and diversity of organisms in the restoration mat lift nets than the control mats (Vexar only)

- Mats @ reference and impacted reefs have similar biodiversity

- Measuring biodiversity may not be good short-term indicator of reef health/restoration success


April/May Deployment

# Lagoon looking for volunteers

# Community-Based Restoration

## Performance metrics...

October 2005 – February 2007

- 140 mat making events
- 5,100+ volunteers
- 100,000+ shells drilled
- 3,000+ mats made

# *Mytella charruana* RESEARCH

1. Monthly sampling to identify new recruitment, and systematically sample throughout the Lagoon

2. DNA Analyses to better understand the genetic diversity of *M. charruana* in the IRL and compare to the genetic diversity of populations from its native range in Central/South America

3. Fact Sheet on *Mytella charruana* to raise awareness of this new invader

4. Action Plan that describes what should be done in response to the invasion in the IRL


Researchers:
*Dr. Linda Walters & Dr. Eric Hoffman*
*University of Central Florida*

The Nature Conservancy

The Nature Conservancy / Florida Chapter

## Invasive Mussel Alert

*Mytella charruana* Found in Indian River Lagoon

**History**

*Mytella charruana*, a tropical mussel native to Mexico and South America, first appeared in large numbers in the seawater intake pipes of a Jacksonville, Florida power plant in 1986. It never became established as the population died off that winter. In August 2004, *Mytella* was discovered in the Mosquito Lagoon portion of the Indian River Lagoon. Since this discovery, *Mytella* numbers have increased, suggesting the mussels are reproducing. As of April 2006, 578 individuals have been collected in Mosquito Lagoon.

**What Is Being Done?**

The Nature Conservancy has teamed up with the University of Central Florida to determine the potential invasiveness of this species. Starting in the summer of 2006, lagoon-wide surveys will be conducted to determine *Mytella charruana*'s distribution, and genetic tests will be conducted to learn more about its make-up.

**Identification**

*Mytella charruana* attaches to submerged hard surfaces, including oyster shells, driftwood and pilings. Specimens are usually less than 2 cm in length but may exceed 4 cm. At first glance the shell is black or dark brown in color and has visible, semicircular rings. Close inspection reveals a wavy dark (brown, purple, dark green) and light (cream) pattern. The shell's interior is iridescent purple. *Mytella* can be distinguished from other common native mussels (*Guekensia demissa* and *Brachiodontes spp.*) by the lack of distinct ridges (ribs) on the exterior of the shells (see photos below).

**Why We Are Concerned**

*Mytella charruana* has the potential to greatly increase in numbers, which may mean less food and space for native organisms, including commercially important native oysters. *Mytella charruana* can infest and clog intake pipes at industrial plants and power utilities, decreasing efficiency and increasing costs for these services. This happened in Jacksonville in 1986.

**What Are Invasive, Non-Native Species?**

Invasive, non-native species are organisms that are introduced into new areas where they are not considered native and have the ability to form self-sustaining, free-living populations. These species have the ability to cause economic or environmental damage or harm to human health. They often go unnoticed until they have spread extensively, making eradication difficult and costly. The zebra mussel in the Great Lakes and the green mussel in Tampa Bay, Florida, are examples of invasive mussels that have had devastating impacts.

**How You Can Help**

Be on the look out for *Mytella charruana*. Collect all specimens that you find; record the date and precise location (including the nearest landmark, GPS coordinates if available, and substrate found on); and preserve specimens in rubbing alcohol. Please send this information to Dr. Linda Walters, Biology Department, UCF, Orlando, FL 32816, (407) 823-2148, ljwalter@pegasus.cc.ucf.edu.

Mytella charruana

Guekensia demissa

Brachiodontes spp.

*The mission of The Nature Conservancy is to preserve the plants, animals and natural communities that represent the diversity of life on Earth by protecting the lands and waters they need to survive.*

# Fact Sheet

## Atlantic Coast Distribution

- Government agencies
- Academic Institutions
- Non Profit Organizations
- TNC Global Invasive Species Initiative web site http://tncweeds.ucdavis.edu

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Thank You!