



Growing the Oyster Aquaculture Industry in the Gulf of Mexico

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2012 AQUACULTURE PRODUCTION VALUES

VALUE

\$1.2

billion
dollars

20%

of total U.S.
seafood production
& fishery products by value

MARINE & FRESHWATER
NATIONAL TOTALS



PRODUCTION

594

million
pounds

15th

in global
aquaculture
production

MARINE SPECIES HIGHLIGHTS

Oysters
\$136 million
35 million pounds

Clams
\$99 million
10 million pounds

Salmon
\$77 million
43 million pounds

Mussels
\$9 million
0.7 million pounds

Shrimp
\$6 million
0.3 million pounds

Marine
aquaculture
is growing at
8%
per year
(2007-2012)

REGIONAL MARINE HIGHLIGHTS

Pacific
48%
by value

Northeast
31%
by value

Gulf of Mexico
13%
by value

Southeast
8%
by value



NOAA FISHERIES

Shellfish Culture in USA

- Oysters, clams, mussels – a success story for US aquaculture
- But in 2008, very limited off-bottom oyster culture in Southern US from North Carolina around to Texas



In the Gul of Mexico, Two Means of Traditional Oyster Production

- 'Wild' public oyster reefs
- Private 'oyster beds'



Both Rely upon Natural Set

- 'Cultching'/shell planting is done to improve the habitat for oyster settlement to improve set
- On private beds, oyster seed may be moved to different areas



Gulf of Mexico Traditional Oyster Industry

- In 2008, the U.S. eastern oyster industry (*Crassostrea virginica*) produced **over 23 million pounds of oysters, valued at almost \$82.5 million** (NMFS).
- By volume, the Gulf of Mexico dominated the harvest, accounting for **over 89% of the harvest**
- By value, however, the Gulf of Mexico obtained **73% of the total dollar value of the US harvest** (NMFS)



This is Primarily Commodity Market

- Focused on the commodity, shucked product market
- High volume, low price



Credit: Scott Mowbray

Challenges to Tradition

- Concerns about natural set
- Variability in supply hurts industry
- Different opportunities for farmers with branded oysters



Use of Hatcheries in Region

- Two university oyster hatcheries in Gulf of Mexico
 - Auburn University
 - Louisiana State University
- Centers for research, demonstration and training



Auburn University Shellfish Lab



Two Hatchery 'Products'

- Singles for 'off-bottom' culture



- Spat on Shell for 'on-bottom' culture



Off-Bottom Culture in Gulf of Mexico – First Attempts

- Attempted in Apalachicola, Florida, other parts of the Florida Panhandle and Bon Secour Bay, Alabama
- “Biological success, financial failure” – Chris Nelson, BSF



Off-Bottom Culture in Gulf of Mexico – Reboot in 2009

◉ What did we do?

- Researched cost-effective methods of producing oysters under local conditions with commercially available gear with emphasis on practical advice
- Trained potential oyster farmers in an oyster farm 'park'
- Collaborated with regulatory agencies and industry to simplify and reduce costs of permitting
- Communicated with restaurants and media about success of new farms and quality of oysters

Off-Bottom Culture

- Typically relies on hatchery-reared seed
- Gear is used to protect oysters from predators, burial and other losses
 - Requires \$ investment
 - Requires time
- Can be established in areas where oysters on the bottom don't survive (high salinity, soupy bottom)

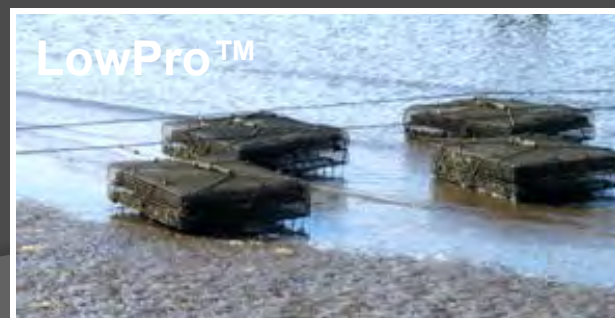
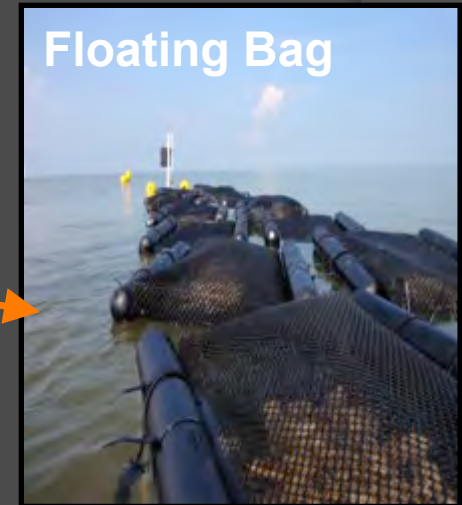
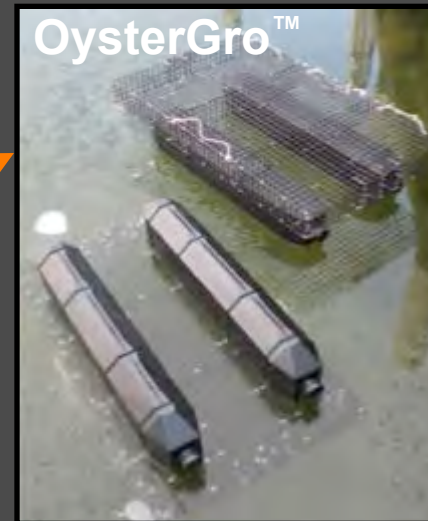


Initial Research

- ◉ In Alabama, collaboratively tested 4 types of gear, of which 3 control fouling through air drying
 - Australian long-lines
 - Floating cages
 - Floating bags
 - Bottom cages
- ◉ Needed to produce oysters that at most needed a rinse



Grow-Out Gear



Photos: Bill Walton, Courtney
Coddington, & Julie Davis

Air Drying Takes Oysters Fully Out of Water: Control Frequency and Duration of Low Tide



Fernando DeCillis

Importance of Quality



- ⦿ This was obvious as we started oyster farms in the Gulf of Mexico
- ⦿ Generic Gulf oysters have huge variability in quality
- ⦿ Arguably increasingly important to oyster farming industry



Timing: Different Market

- Live oysters served raw in the shell
- Wholesale price of \$0.30-0.70 per oyster
- Branding



<div>  <i>Raw Bar</i>  </div>		
SEAFOOD.		
SHRIMP COCKTAIL lemon, cocktail sauce		12.
RED SNAPPER CEVICHE clams, maitake, urfa, squash seed oil		17.
OYSTERS.		
HOG ISLAND SWEETWATER, TOMALES BAY, CA salmon roe & thyme; earthy sweet		2.85
SEA HOOK, HOOD CANAL #5, WA celery & hyssop		2.95
SEA COW, HAMMERSLEY INLET, WA celery salted wild mushroom		2.85
ELD INLET, SOUTH PUGET SOUND, WA chamomile & melon; mineral finish		2.95
CAPER'S BLADES, BULLYARD SOUND, SC crisp, salty & slender		3.15
NORTHERN CROSS, KEGOTANK BAY, VA salted parsnip & green onion		2.35
RAPPAHANNOCK, RAPPAHANNOCK RIVER, VA salinity; root veggies		2.25
DE SALT, TOM'S COVE, VA esapeake salt darlings		2.25
HOLLYWOOD, PATUXENT RIVER, MD tery, clean & mega mild		2.55
ST BEACH BLONDE, NINIGRET POND, RI ted meat, earth & stone		3.15
OLD GOOSE, NARRAGANSETT BAY, RI each side prosciutto		3.15
NINIGRET CUP, CHARLESTOWN, RI ne & butter, medium salinity		3.15
MOONSTONE, POINT JUDITH POND, RI y & minerals; perfect with muscadet		3.15
WHITE COWE'S PASTURE, DENNIS, MA ing onion & crab meat		3.15
WELLFLEET, WELLFLEET HARBOR, MA st bodied & very salty		3.15
WISBY BAY, RUSTICO BAY, PEI ato n' chives		2.95
LITTLE SHEM, LITTLE SHEMOGUE BAY, NB an & mineraly		2.95
L LAKE, YARMOUTH, NS per clean & accessible		3.05

Quantifying Quality

- Aspects of Quality
 - Taste
 - Smell
 - Shell Thickness
 - Shell Shape
 - Shell Size
 - Meat Condition, Plumpness
 - Shell Cleanliness
 - Food safety
 - Consistency of Product in All of the Above



www.kusshioysters.com

Oyster 'Cupping' and 'Fanning'



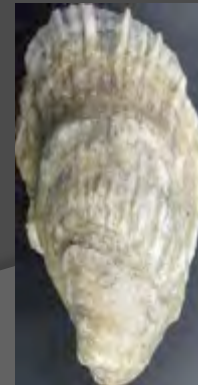
0.4 SW/SH



1.0 SL/SH



0.25 SW/SH



0.5 SL/SH



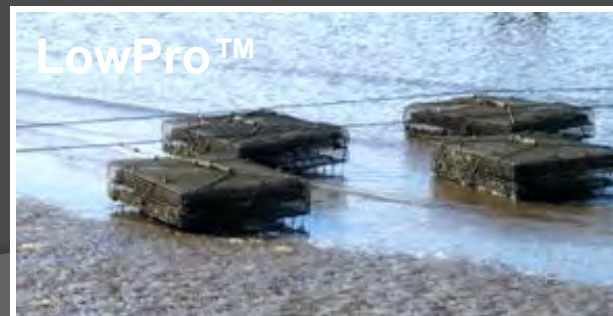
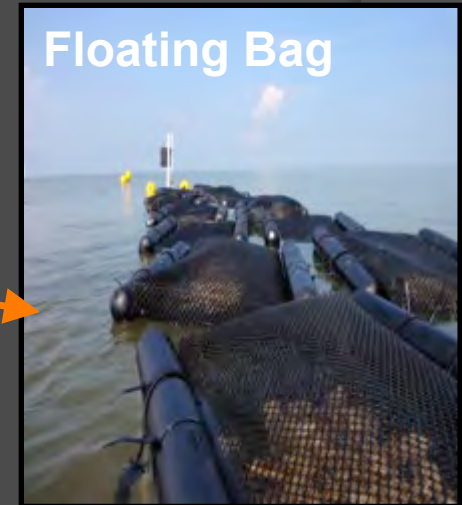
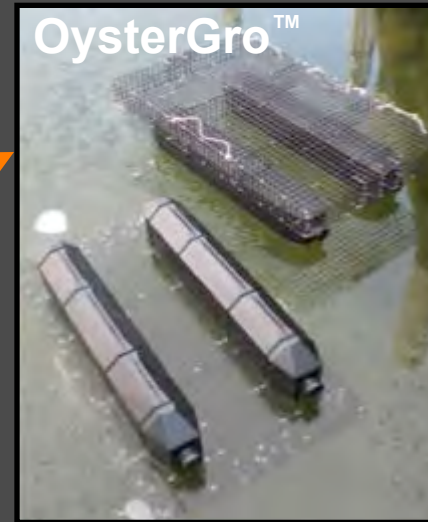
Effect of Gear

- Tested four different gear types at one site (Point aux Pins, Alabama)
- Response variables included:
 - Shell metrics, dry shell weight, dry tissue weight, condition index, survival



Photo: Bill Walton

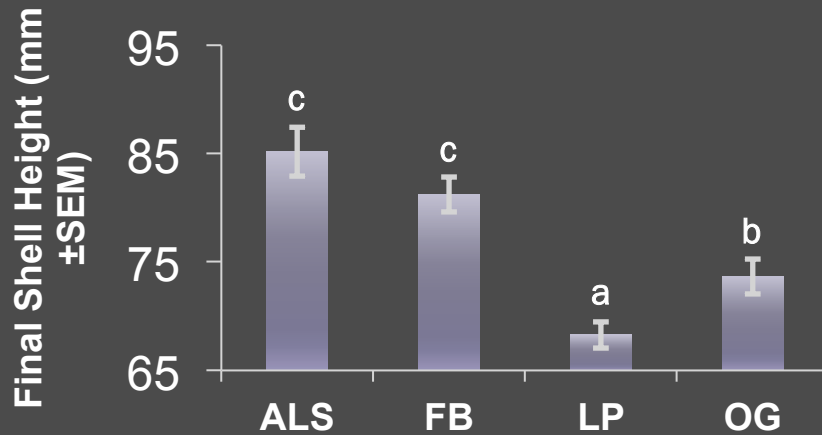
Grow-Out Gear



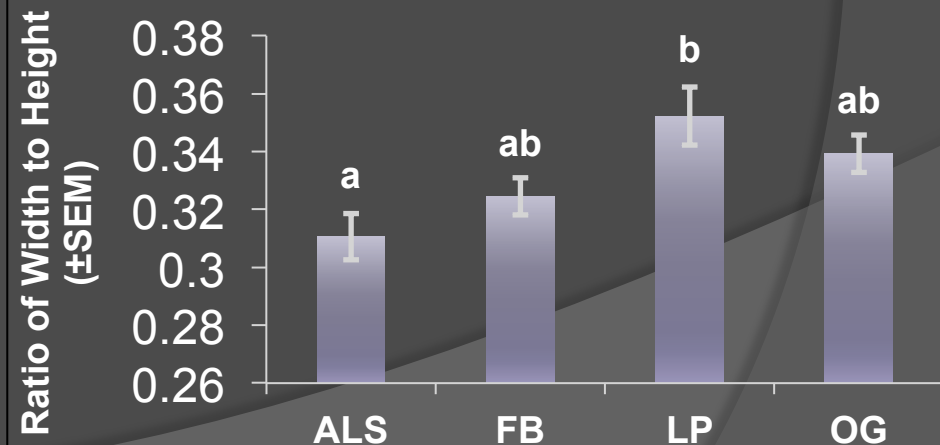
Photos: Bill Walton, Courtney
Coddington, & Julie Davis

Effects of Gear Type on Shell Height and Cup

Effect of Gear on Shell Height



Effect of Gear on Cup Shape



Bottom Line?

- ⦿ Gear affected oyster growth, survival and cup
- ⦿ Choose your gear with this in mind

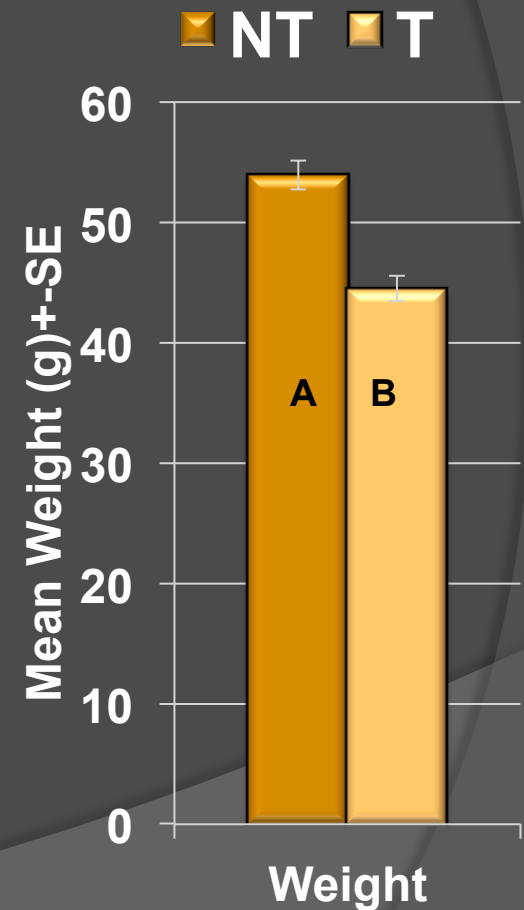
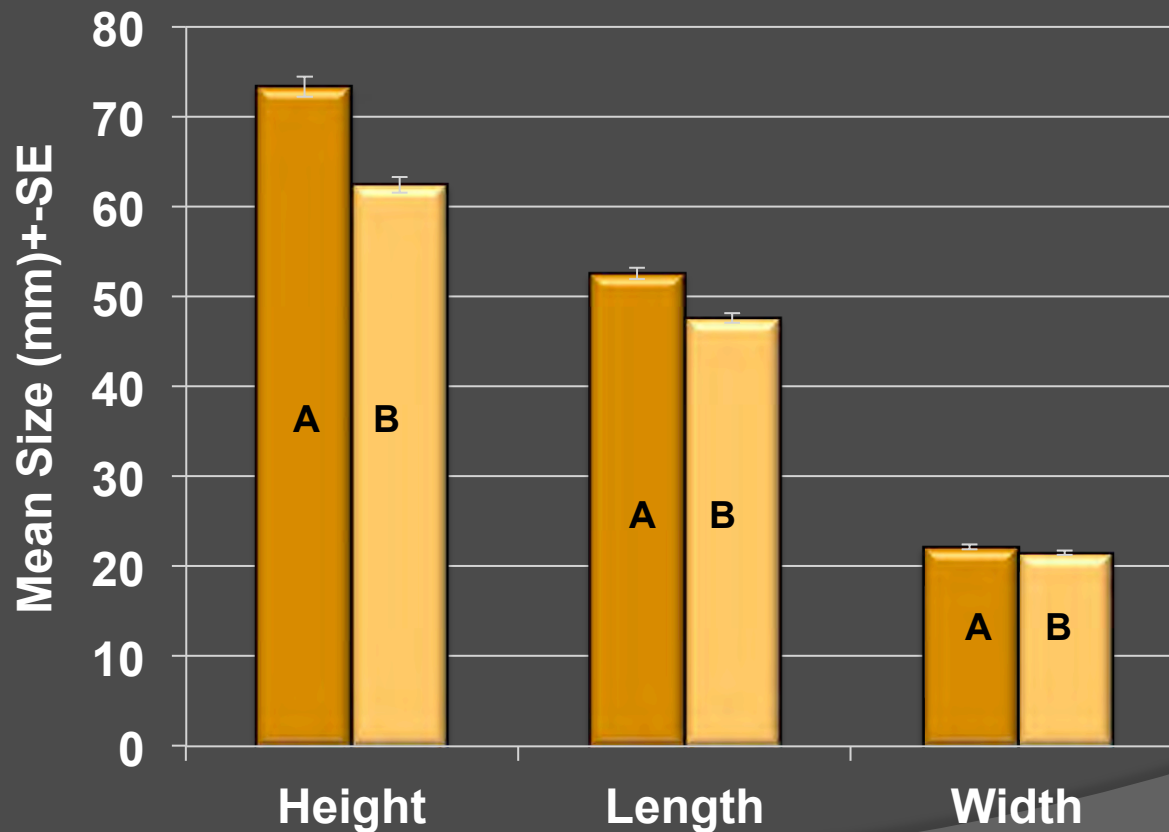
Effect of Tumbling

- Tumbling in second year didn't lead to changes in shape (Coddington-Ring, 2011)
- Follow Up Experiment: Monthly Tumbling from 3 months after spawn to 9 months
- Measured effects on survival, growth, shape and condition index



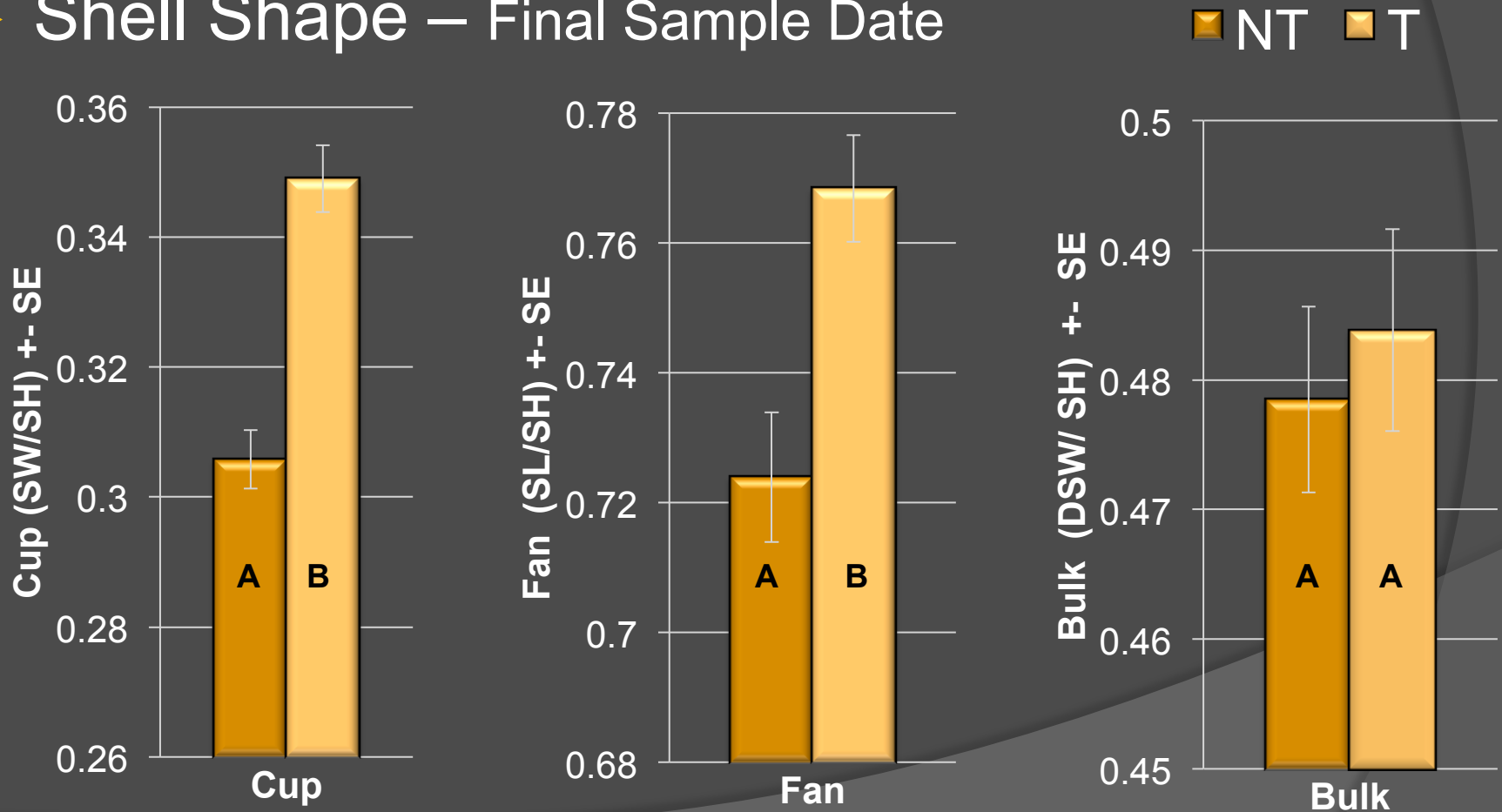
Effect on Shell Metrics

➤ Shell Metrics – Final Sample Date



Effect on Shell Shape

➤ Shell Shape – Final Sample Date



Bottom Line?

- Tumbling, especially in the first year, positively affects cup shape and fan shape – but does impose a growth penalty

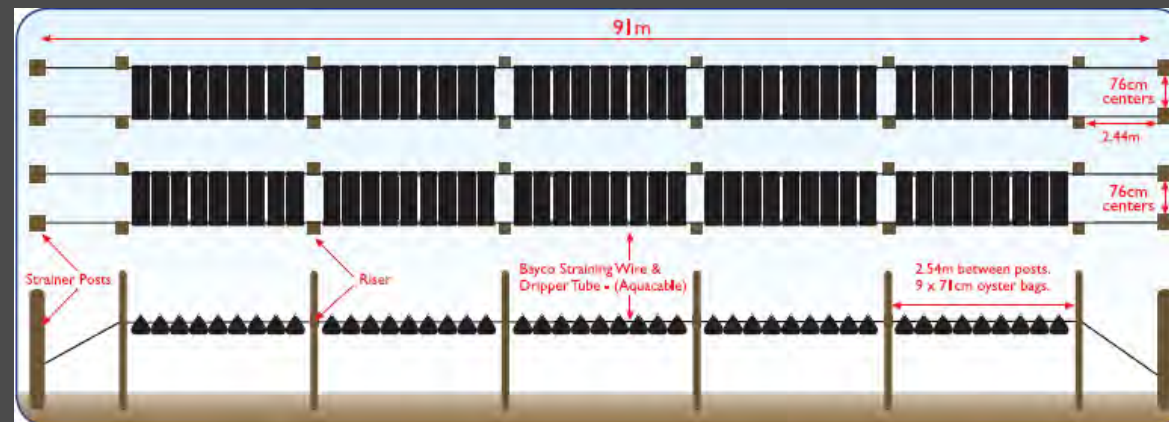
Effect of Basket Orientation and Stocking Density (Davis, 2013)



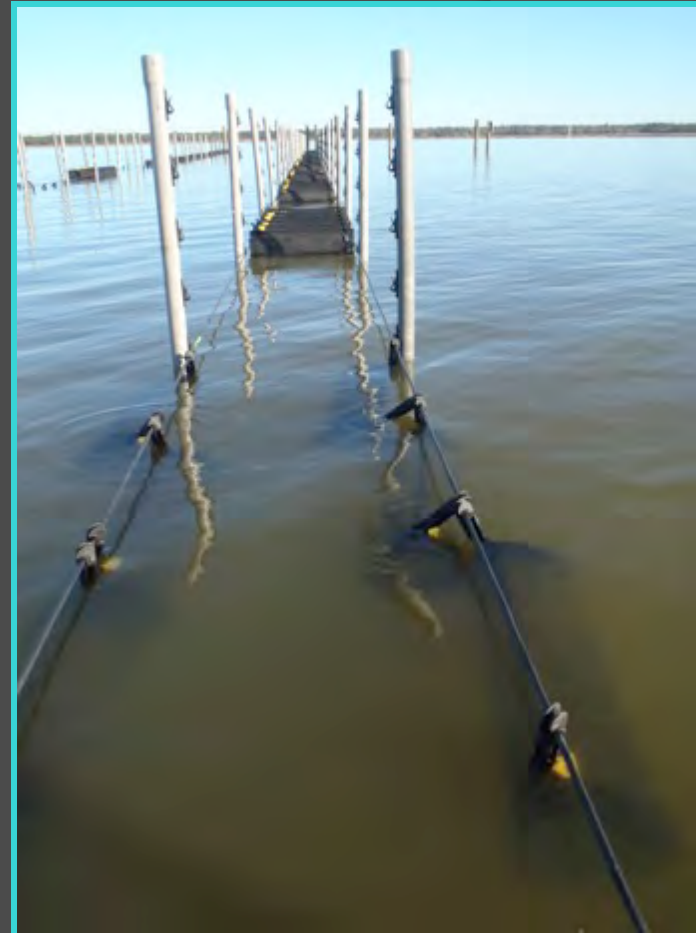
Adjustable Long-line System



In-line arrangement

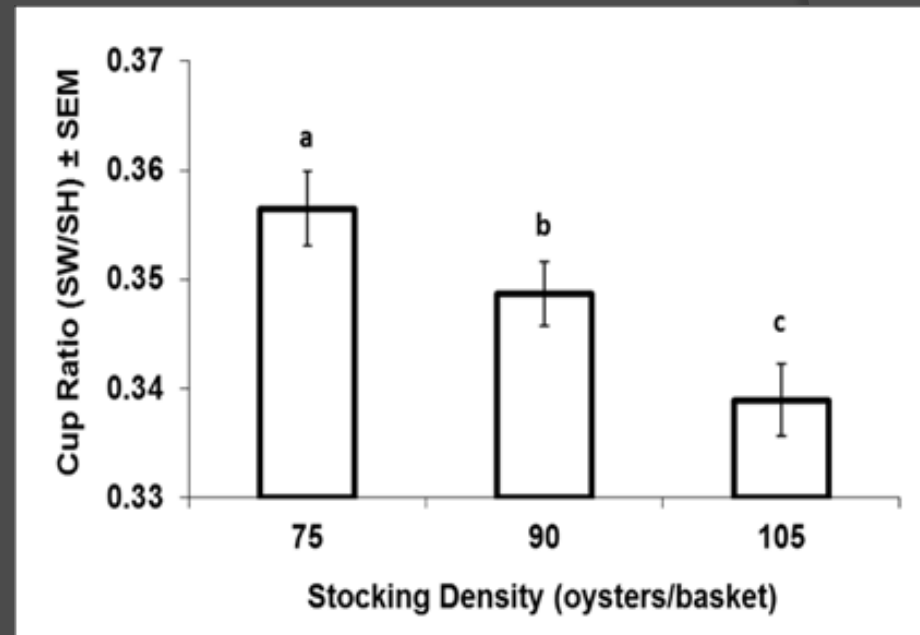
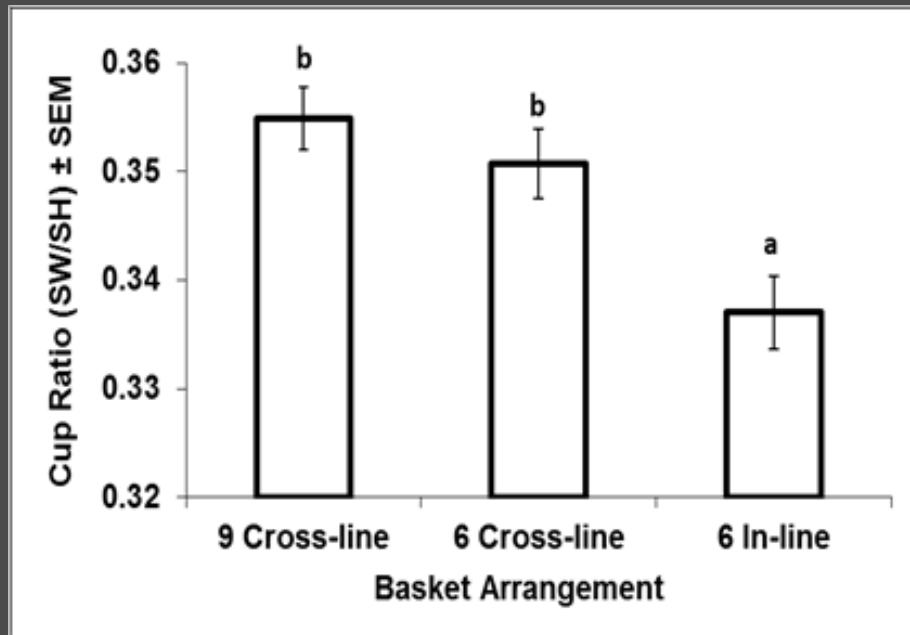


Cross-line arrangement



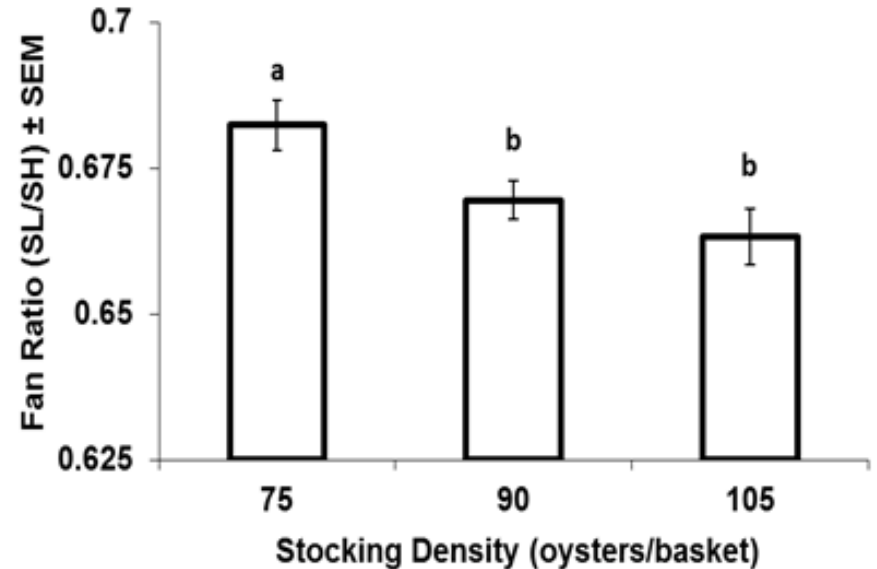
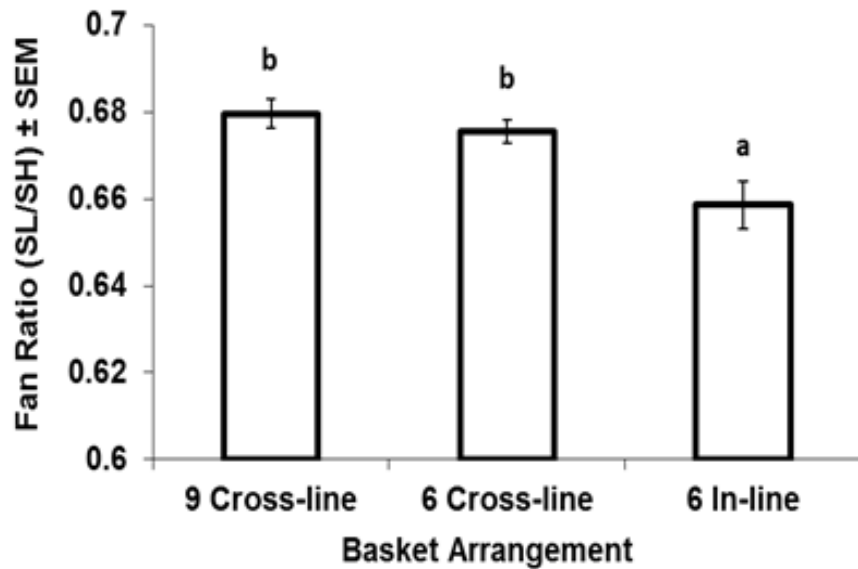
Shell Quality: Shape

CUP



Shell Quality: Shape

FAN



Bottom Line?

1. For basket orientation, in-line orientation in our system grew faster, but were less cupped and fanned
 1. No major differences between oysters in bays with 6 baskets versus 9 baskets cross-line.
2. For stocking density, oysters stocked at 75/basket were smaller BUT more cupped and fanned than oysters stocked at higher densities.

Making Informed Decisions as Growers

“Between calculated risk and reckless decision-making lies the dividing line between profit and loss.”

Charles Duhigg, Author of
iEconomy

- ◉ Farmers can make suite of decisions about culture methods that significantly impact quality as well as yield (survival and growth), including:
 - Gear type
 - Tumbling
 - Stocking density
 - Orientation of gear
 - Etc.

Current Research

- ◎ Methods to improve quality
 - Reduce mud blister infestations and other bio-fouling
 - Improve consistency of size and shape
 - Manage effects of handling to improve product safety



Future Research

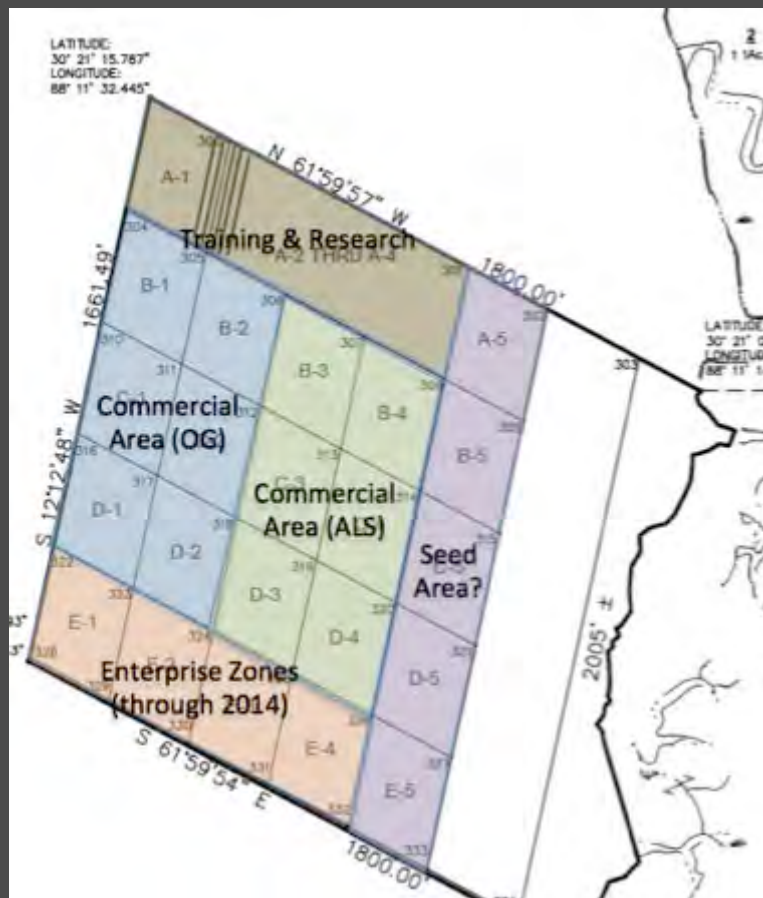
⦿ Directions

- Focus on consistency
- Focus on measuring success in terms of profit

- ⦿ Improving farm management with better technology (Oyster Farm 2.0)
- ⦿ Evaluating the importance of nursery experience on grow-out success
- ⦿ Summer mortality issues

Training Program

- Auburn University permitted a 60-acre oyster farming 'park'
 - Zone for training potential oyster farmers
 - Zone for trained oyster farmers to start their own 2-acre commercial farms



Hands-On Training



- 16 farmers trained over two years
- Provided classes and hands-on instruction
- Each farmer chose a gear type and was given 20,000 oyster seed to raise

Oyster Farming Park



Collaboration

- ⦿ Developed easier, less expensive permitting
 - Governor's Committee for Shellfish Aquaculture (based on Maryland legislation)
- ⦿ Ongoing issues, where Auburn University continues to provide input and expertise

Communication

- Educating chefs, buyers, and consumers about the new industry and the oysters
- Helping farmers develop 'brands'
- Encouraging regional cooperation (OysterSouth)



Free (Good) Press

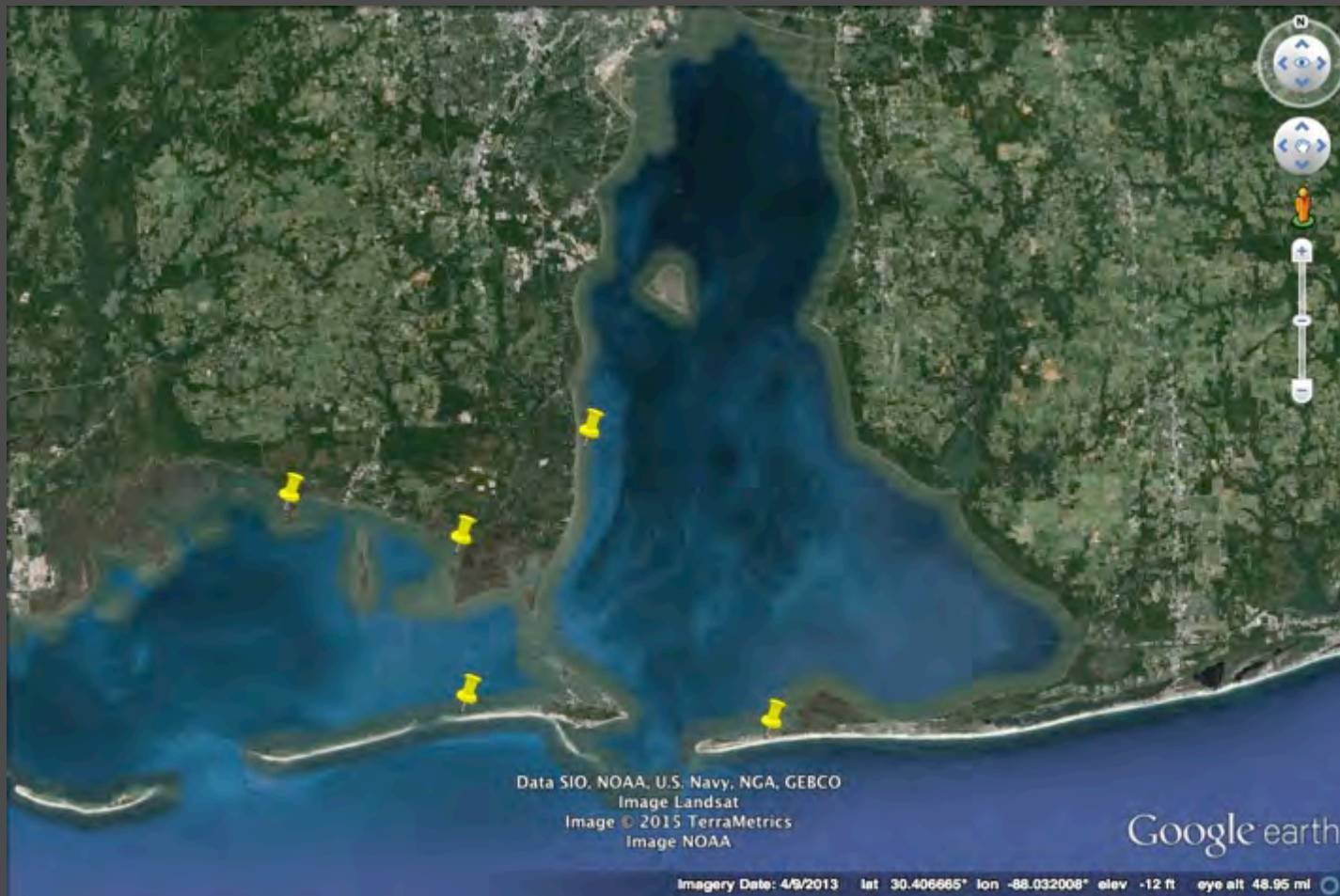


Where Has This Gotten Us?

- ◉ In 2008, no farming in Gulf of Mexico
- ◉ In Alabama, now 13 farms
- ◉ Over this last year (2015), harvest was approximately 1,000,000 oysters
- ◉ Seed orders for farms in Alabama this year currently total approximately 4 million seed



Five 'Areas' in Alabama



Where Has This Gotten Us?

- ◉ In Louisiana, now 4 oyster farms
- ◉ In Mississippi, changing regulations and creating 1-3 oyster farm 'zones'
- ◉ In Florida, at least 12 farms now raising oysters



Plenty of Challenges

- ◎ Prolonged closures (harmful algal blooms, rainfall)
- ◎ Threats to water quality
- ◎ Issues with lease for AU oyster farming park
- ◎ New hurdles in permitting
- ◎ Summer mortality
- ◎ **Seed supply**



Looking Forward (Off-bottom)

- Hopefully on the verge of a vibrant, new environmentally-friendly industry in Alabama
- Jobs, traditions and the environment



Conclusions

- ⦿ Exciting growth of off-bottom oyster farming in the region
 - Typically family farms
 - Creating jobs, allowing people to make a living on the coast
- ⦿ Potential for spat on shell in the region
- ⦿ Auburn University will continue to provide:
 - Science-based advice
 - Demonstration of new techniques
 - Training for individuals

Questions

