

# Development and demonstration of integrated Aquafort multitrophic aquaculture in the north central Gulf of Mexico

J. Valentine<sup>1</sup>, K. Lucas<sup>2</sup>, R. Blaylock<sup>2\*</sup>, S. Sempier<sup>3</sup>, M. Chambers<sup>4</sup>, and K. Riley<sup>5</sup>

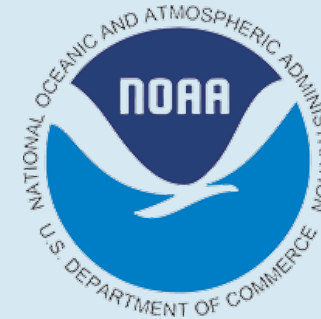
1 – Dauphin Island Sea Lab, Dauphin Island, AL

2 -Thad Cochran Marine Aquaculture Center, University of Southern Mississippi, Ocean Springs, MS

3 – Mississippi-Alabama Sea Grant Consortium, Ocean Springs, MS

4 – University of New Hampshire, Durham, NH

5 – NOAA, National Center for Coastal Ocean Science





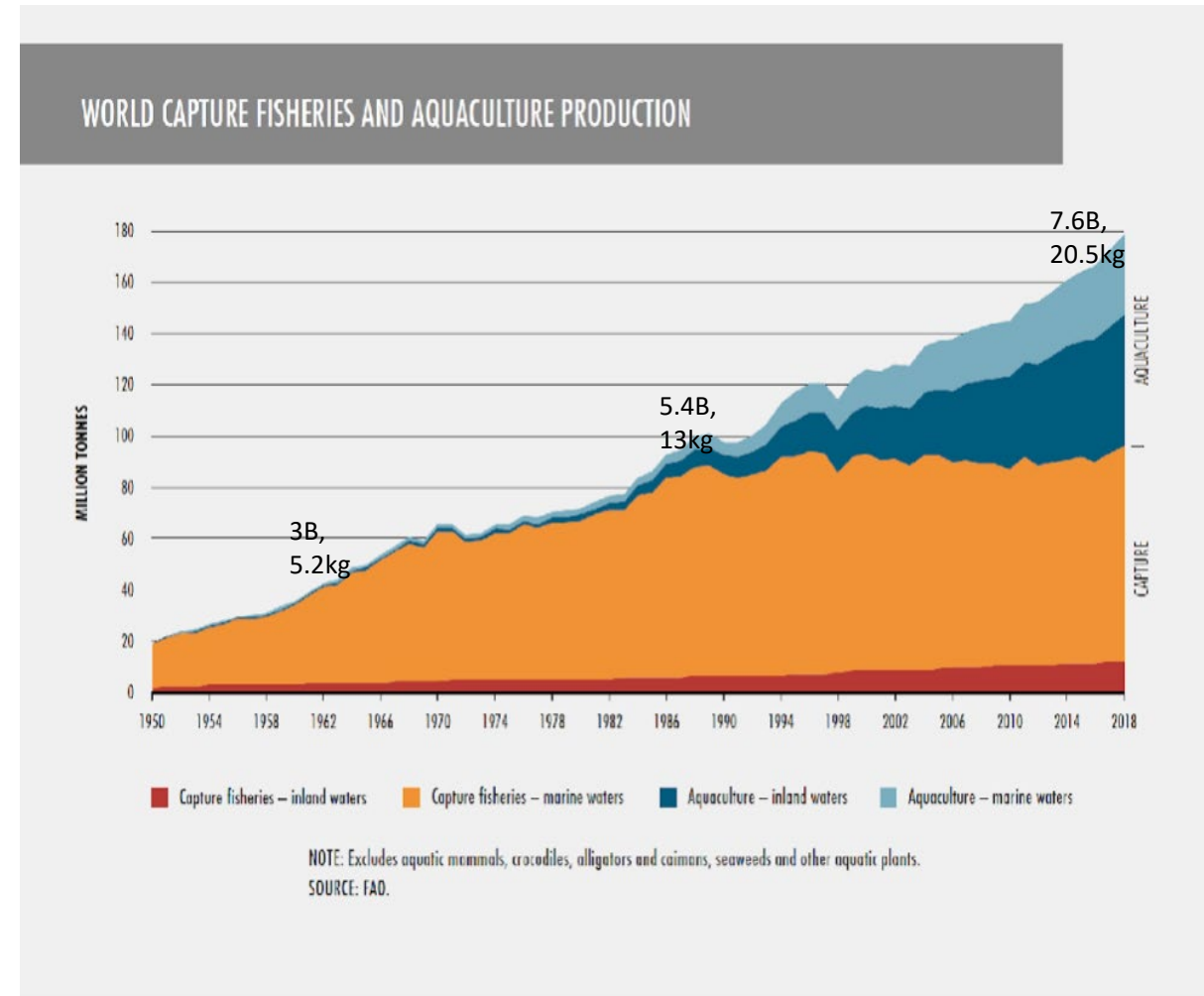
- Presentation Overview
  - Team Members
  - Process
  - Farm requirements
  - Site selection
  - Site and community preparation
  - Cage information
  - Operations overview



- Dauphin Island Sea Lab – John Valentine
- USM – Kelly Lucas, Reg Blaylock, Angelos Apeitos, Egan Rowe, Megan Gima, Anand Hiroji, Chet Rakocinski
- MS-AL Sea Grant – Steve Sempier
- University of New Hampshire/NH Sea Grant – Michael Chambers, Dave Fredriksson
- Kelson Marine – Tobias Dewhurst
- NOAA Center for Coastal Ocean Science– Ken Riley



- Need to feed growing population - Demand for seafood will grow – double protein by 2050
- Wild capture fisheries is fishing at maximum sustainable yield
- Aquaculture is the fastest growing food sector
- The U.S. meets seafood demand by importing about 90 percent of the seafood supply
- Skilled workforce
- Job development and diversification
- Working waterfronts – ancillary industries



# Gulf of Mexico: Site of Multiple Forms of Natural Disturbances



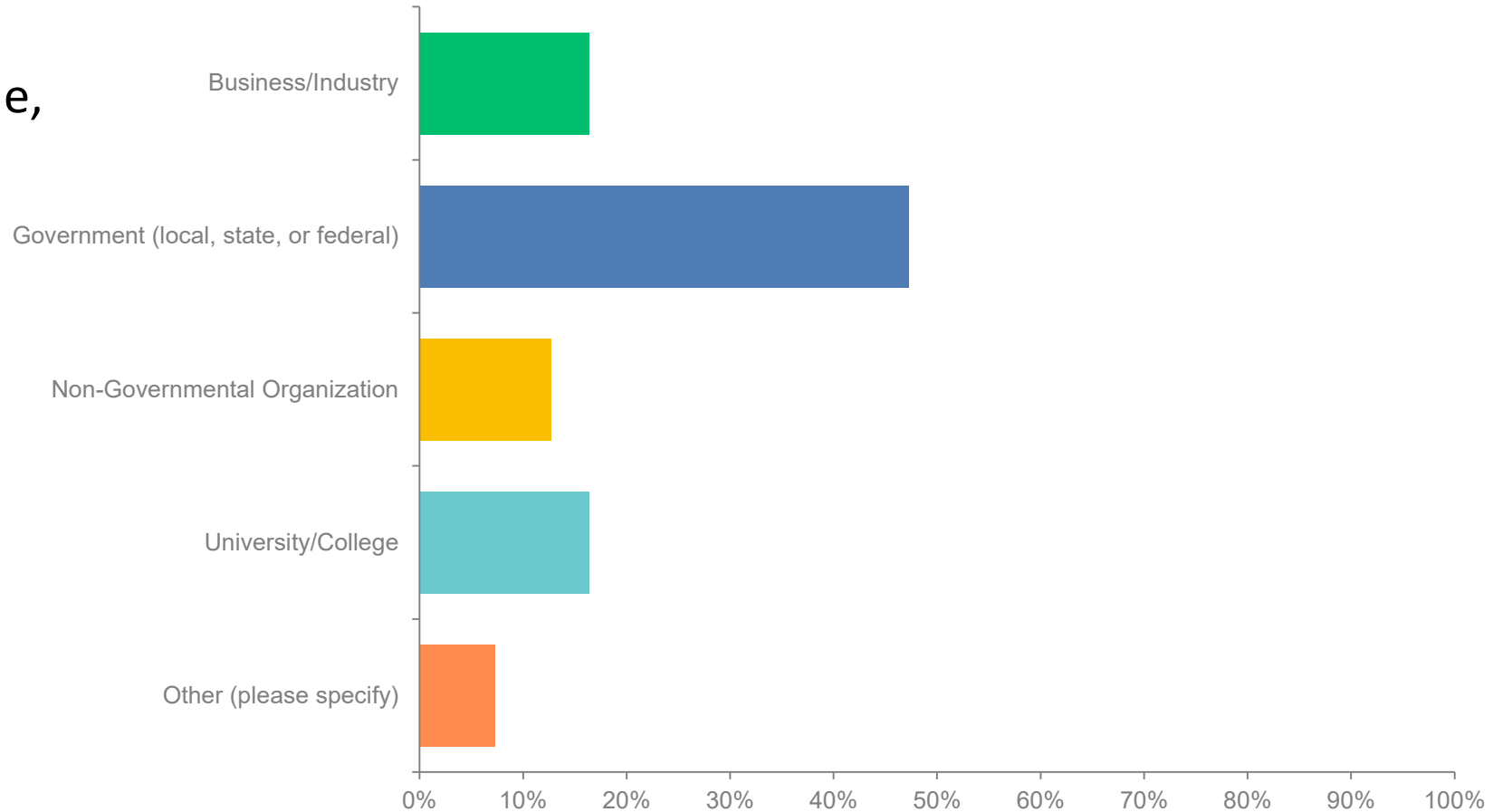
- Establish farm parameters
- Siting analysis
- 1<sup>st</sup> Public Engagement
- Pre-permit agency discussions
- Hydrographic survey of selected site and back-up location
- Structural Modeling
- Environmental Sampling
- Permit application
  - USCG, CG-2554 Authorization, Private Aids to Navigation Application
- 2<sup>nd</sup> Public Engagement
- Deploy & Stock Aquafort

# Summary and Current Status

- Siting analysis (Summer 2022)
- 1<sup>st</sup> Public Engagement (Summer 2022)
- Pre-permit agency discussions (began Summer 2022)
- Hydrographic survey of selected site and back-up location (Summer 2023)
- Structural Modeling (Fall 2023)
- Environmental Sampling (begin- Winter 2023/2024)
- Permit application (Winter 2023/2024)
  - USCG, CG-2554 Authorization, Private Aids to Navigation Application
- 2<sup>nd</sup> Public Engagement (Spring/Summer 2024)
- Deploy & Stock Aquafort (Fall 2024)

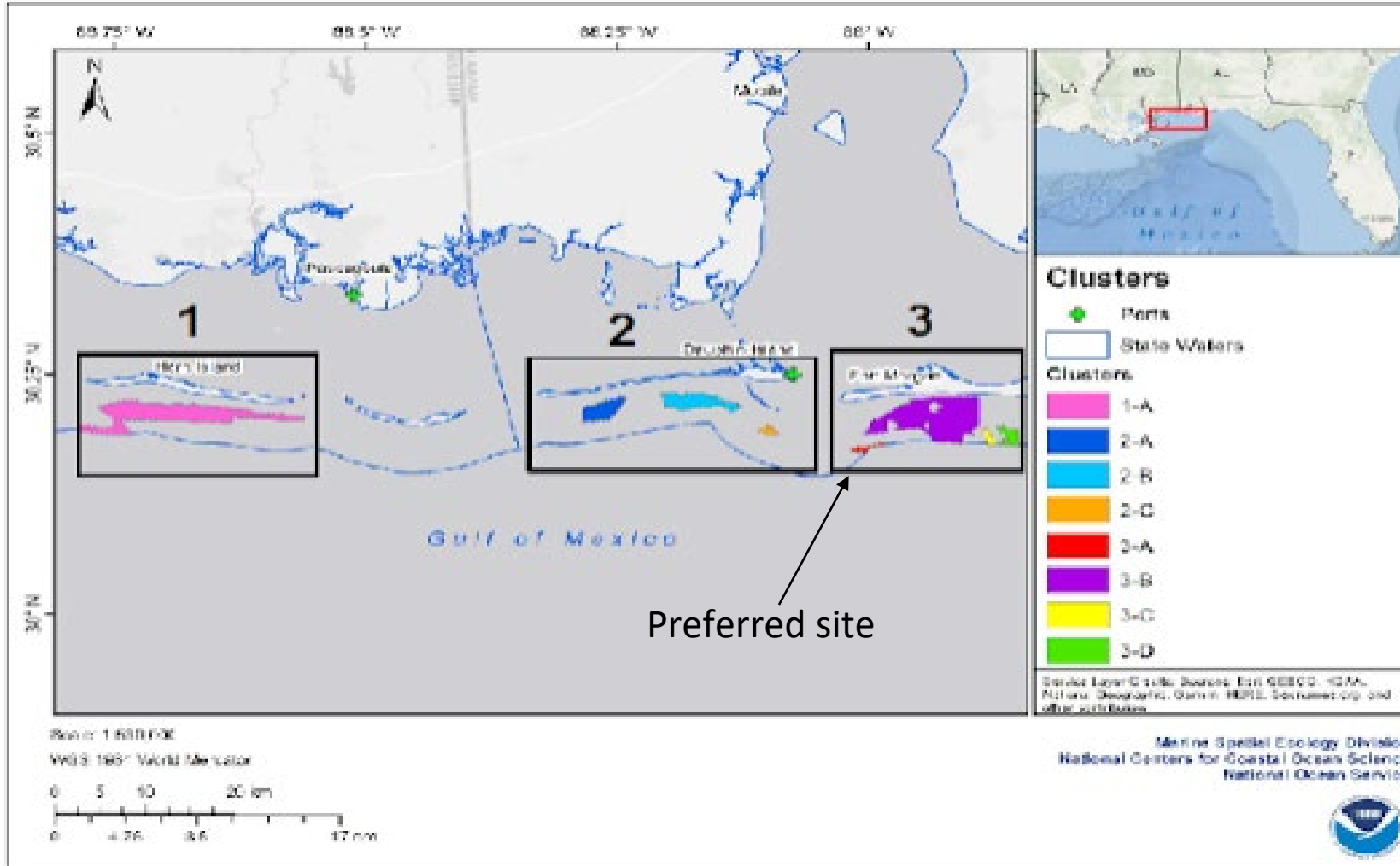
(red=completed)

- Spanish Fort, AL
- 400 invited (targeted fishers/shrimpers/oyster people, oil and gas, state/local/federal people)
- 55 people
- 60% in-person, 40% virtual
- Presentations (goals, purpose, design, species, process)
- Panel
- Posters
- Questions/input
- Compile comments



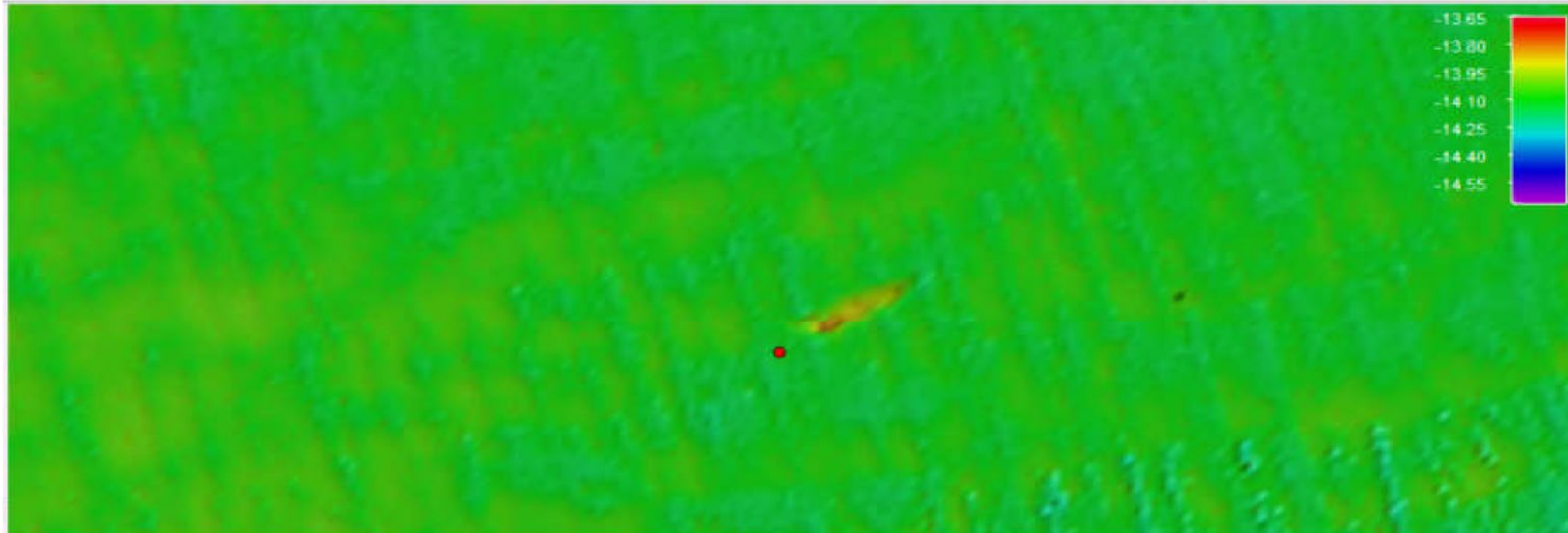


# Site Selection: Options of Interest



- Bathymetry
- Military
- Unexploded Ordnance
- Shipping Lanes
- AIS Vessel Traffic
- Shrimp Vessel Activity
- Submarine Cables
- Artificial Reefs
- Lightering Zones
- Oil & Gas Platforms
- Oil & Gas Well
- Oil & Gas Active Leases
- Oil & Gas Pipelines
- Shipwrecks and obstructions
- Deep Sea Coral

# Archaeological Assessment: Bathymetry



An object at a depth of 14.10m with a relief of 0.3m and length of 6m, and width of 1.5 m is located at approximately 404555.8 E and 3338839.5 N (NAD 83, UTM 16 N)



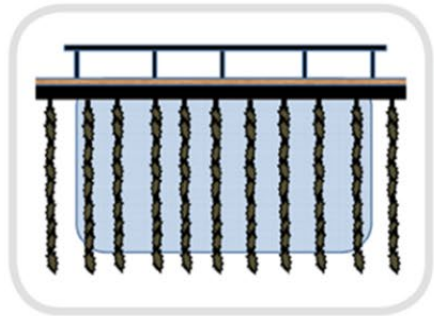


# Planned Approach for the Demonstration Project

- Integrated multi-trophic aquaculture
  - Multiple species of different trophic levels farmed together to improve efficiency, reduce waste and provide ecosystem services.
    - Ecologically your approach is to create what is hopefully an integrated food web module.
    - Mimic nature
- AquaFort
  - Demonstration of a novel seafood growing system being used in other parts of the U.S.
  - Engage the public and seafood community in producing reliable supply of local, fresh, healthy products.



# AquaFort (UNH)

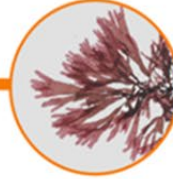


Side Profile View

Sugar Kelp



Dulse



Juvenile seaweed is attached to line and grows alongside the mussel strings around the IMTA raft.



**Blue Mussels**

Seeded strings of mussels hang vertically around the IMTA raft and fish netting.

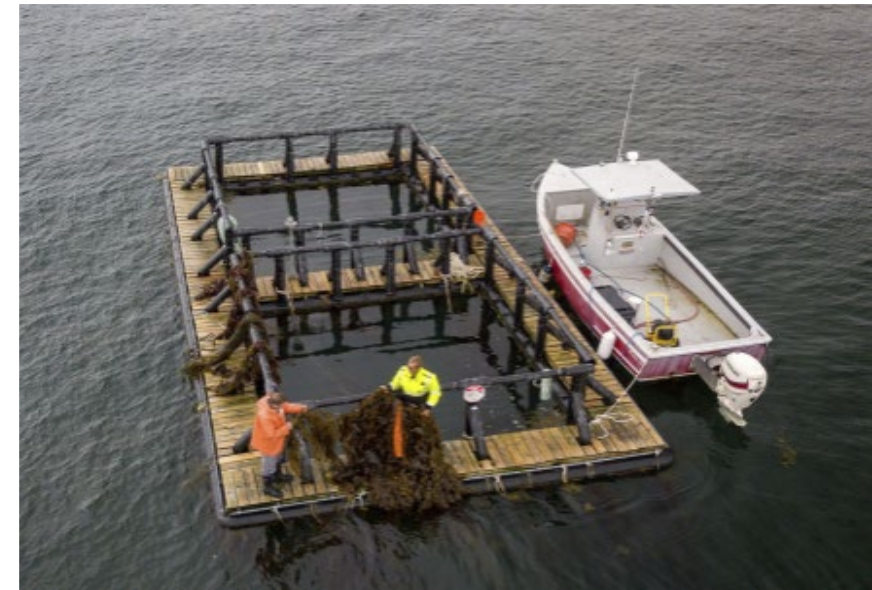


**Steelhead Trout**

from a hatchery in Ossipee, NH is raised within netting deployed inside the IMTA raft.

Mooring

- Two Bay Raft:
- HDPE structural components
- Foam billet buoyancy members
- Fiberglass decking
- 3' tall stanchions
- Two - 20'x20'x15' net pens



# Offshore Demonstration Farm Requirements

**Study areas:** State waters of Mississippi and Alabama

**Max distance from port(s):** Close proximity to Dauphin Island, AL; Mobile, AL; Pascagoula, MS; or Gulfport, MS

**Species:** Eastern oyster (*Crassostrea virginica*), Red drum (*Sciaenops ocellatus*), Spotted seatrout (*Cynoscion nebulosus*), Atlantic tripletail (*Lobotes surinamensis*), Gracilaria macroalgae (*Gracilaria tikvahiae*)

**Depth requirements:** 8-20 m within state waters

**Seawater temperature:** 6 – 30° C

**Current velocity:** >0.15 m/s

**Significant Wave Height:** Undefined

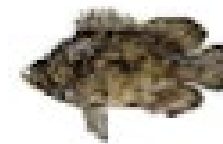
**Max farm footprint (including anchorage):** 400-1000 sq. meters

**Cage Type:** Aqua Fort (UNH design)



**Eastern Oyster**

Photo: <https://www.usfws.gov/basins/conservation/atlantic-coastal-marine-mollusks/atlantic-oyster>



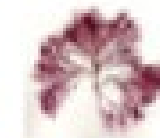
**Atlantic Tripletail**

Photo: [https://get.wiki.com/wiki/Atlantic\\_tripletail](https://get.wiki.com/wiki/Atlantic_tripletail)



**Red Drum**

Photo: <https://www.fishbase.org/species/sciaenops-ocellatus>



**Graceful Red Weed**

Photo: <https://www.hawaii.gov/dnr/office/office-of-aquaculture/programs/algaculture/algaculture-species/>



**Spotted Seatrout**

Photo: [https://get.wiki.com/wiki/Atlantic\\_tripletail](https://get.wiki.com/wiki/Atlantic_tripletail)

# Pre-Permit Agency Discussions

- ~40 people
  - AL Dept. Conservation of Natural Resources
  - USCG
  - NOAA Fisheries, NOS
  - USDA SERO
  - DOD
  - BOEM
  - EPA
  - USFWS
- Monthly meetings with NOAA



# Yet to come: Operations

- All operational and best management plans created prior to deployment
- AquaFort deployed and stocked in the fall
- Products harvested in early to mid summer of the following year.
- Cage removed for cleaning after harvest
- Environmental sampling occurs year-round
- Farm participants will be helping manage the farm
- Live video from farm, tours of farm and outreach and AL and MS aquariums
- Economic analysis

# Acknowledgements

- Gulf States Marine Fisheries Commission – Steve VanderKoooy
- USM Thad Cochran Marine Aquaculture Center – Les Graham

