

Florida Red Tide Mitigation and Technology Development Initiative

Technology Advisory Council Public Meeting Mote Aquaculture Research Park

Kevin Claridge

Vice President, Sponsored Research and Coastal Policy Programs

July 22, 2021



Meeting Agenda

- Welcome
- Meeting Facilitation
 - Florida Administrative Register Public Notice
 - Council Questions Anytime and Public Comment Period
- Council Members Role Call and Chair Remarks
- Review of Previous TAC meetings and Reporting
- Overview of Red Tide Initiative Research Process
- Requests For Proposals, Selected Projects, and Project Status
- Promising Tools and Technologies
- Looking Ahead
- Public Comments
- Partner Comments
- Closing Council Member Remarks



Technical Advisory Council

Dr. Michael P. Crosby, Chair – Mote President & CEO

Dr. James Powell – House Speaker Appt

Dr. James Sullivan – Senate President Appt

Dr. Katherine Hubbard – FWC Appt

David Whiting – DEP Appt

Governor Appointee Pending



Previous Initiative TAC Meetings

- Overview of the Red Tide Initiative and Statute (379.2273 FS)
- Role of the TAC
- Sunshine and Public Record Laws
- Meeting Minutes and Presentations
 - Red Tide Initiative Website on Mote.org
- Florida Red Tide Background
- Statutory Reporting Requirements
- FWC Contract
- Initiative Outreach
- Year 1 and Year 2 Project Presentations and Updates
- Looking Ahead and Next Steps Briefings



Initiative Required Reporting

379.2273(2)(d) Florida Statutes:

Beginning January 15, 2021, and each January 15 thereafter until its expiration, the initiative shall submit a report that contains an overview of its accomplishments to date and priorities for subsequent years to the Governor, the President of the Senate, the Speaker of the House of Representatives, the Secretary of Environmental Protection, and the Executive Director of the Fish and Wildlife Conservation Commission.

FWC-FWRI Contract Reports

Regular partnership interaction and reports with FWC



Red Tide Initiative Progress



FLORIDA RED TIDE MITIGATION AND TECHNOLOGY DEVELOPMENT INITIATIVE 379.2273(2)(d)

ACCOMPLISHMENTS AND PRIORITIES REPORT JANUARY 2021

Red tides, or red tide harmful algal blooms, are a higher-than-normal concentration of microscopic alga that occur in ocean and coastal waters. Red tides in Florida have been documented since the 1800's and their impacts likely date back earlier, based on records from Spanish explorers. In Florida, the toxin producing *Karenia brevis* is the species causing most red tides. These blooms can harmfully affect sea life, lead to massive fish kills, cause human respiratory problems, close beaches, and determinately impact shellfish, fishing, hotel, restaurant, recreational, and tourism industries.

This report is being provided to meet the requirement of 379.2273(2)(d) Florida Statutes, which states: "Beginning January 15, 2021, and each January 15 thereafter until its expiration (2025),

the initiative shall submit a report that contains an overview of its accomplishments to date and priorities for subsequent years to the Governor, the President of the Senate, the Speaker of the House of Representatives, the Secretary of Environmental Protection, and the Executive Director of the Fish and Wildlife Conservation Commission."

MITIGATING RED TIDE IMPACTS FOR FLORIDA

The Florida Red Tide Mitigation & Technology Development Initiative is a partnership between Mote Marine Laboratory (Mote) and the Florida Fish and Wildlife Conservation Commission (FWC) codified under 379.2273 Florida Statutes that establishes an independent and coordinated effort among public and private research entities

Early Progress

- ✓ 125+ Potential Mitigation Compounds Examined for Tiered Testing
- ✓ 70+ Proposals Reviewed
- ✓ 25+ Projects Underway
- ✓ 20+ Business , Academic and Agency Partners
- ✓ Mitigation Tools to Fast Track
- ✓ Research Facility Constructed
- ✓ Private/Federal Funding Leveraged
- ✓ Public Website and Technology Advisory Council Meetings
- ✓ Report to Governor, Legislature, and Agencies on Accomplishments and Priorities



Red Tide Initiative Research Process

Tier 1



Tier 2



Tier 3

Laboratory
Experiments

Mesocosms
Raceways

Canal
Nearshore
Offshore



Does it kill cells and
eliminate toxins
in the lab?



Is it effective with natural
communities?
Are there adverse impacts?
Logistical issues?
Economically feasible?



Pilot Studies
Field Demonstrations
Federal/State/Local
Regulatory Approvals



The First rule of Red Tide Mitigation:

DO NO (MORE) HARM!



Red Tide Initiative – Request For Proposals

- 379.2273(2)(c)(1) Florida Statutes: Mote may use a portion of awarded funds to facilitate additional engagement with other pertinent marine science and technology development organizations...
- Open to any/all interested parties to **bring international best and brightest ideas**
- Proposal guidelines and proposal submission:
 - Mote.org
 - **3 Request For Proposals** and 3 Webinars
 - **Coordinating efforts** to maximize research success through partnership and **avoid duplication**
 - Support not to exceed 1 year - may request longer in next RFP – **several continuing**
- Use of Mote facilities/infrastructure is **available at no charge**
- 20 proposals Year 1; 26 proposals Year 2; **19 proposals in Year 3**
- Partner Led Proposal Review Process:
 - **Diverse reviewer expertise** from NOAA, EPA, FWC, DEP, Universities, Estuary Programs, private consultants, and Mote
 - Each scientist reviewed 3-5 proposals using provided questionnaire
 - Additional Non-Conflicted Mote Scientist Review and **Encouraged Coordination**
 - » Organized and provided all reviews together for Dr. Crosby
 - » **Presenting to TAC for guidance**
- Subcontracts from Mote – 50%, 25% at Interim Report, 25% at Final Report



Year 1 and 2 Projects

(some tentatively continuing Year 3)

1. Dr. Kathryn J. Coyne, University of Delaware: *Optimizing production of a dinoflagellate-specific **algicide** for control of *Karenia brevis**
2. Dr. Sumit Chakraborty, Mote Marine Laboratory, *Development and Validation of New and Existing Technologies: Expanding PHySS's (Programmable Hyperspectral **Seawater Scanner**- PHySS(2.0)) Role in Mitigation of Harmful Impacts Caused by the Florida Red Tide*
3. Dr. Allen Place (Taylor Armstrong presenting), University of Maryland: *Pushing *Karenia* Over the Edge with Beer Derived **Flavonoids***
4. Dr. William Haskell, Mote Marine Laboratory, ***Automated in situ Advanced Sensing** Technology Development for Red Tide Mitigation and Control (PHySS-C)*
5. Dr. Vijay John, Tulane University: *A Thin Shroud with Integrated **Algaecide to Flocculate and Sink** *Karenia brevis**
6. Dr. Richard Pierce, Mote Marine Laboratory, *Testing the **Efficacy of Products for Mitigating** Harmful Effects of *Karenia brevis* Red Tide Events along the Florida Gulf Coast*
7. Dr. Don Anderson, Woods Hole Oceanographic Institute: *Fate and Effects of *Karenia brevis* Cells, Toxins, and Nutrients Following **Clay Application** for Bloom Control*
8. Dr. Vincent Lovko, Mote Marine Laboratory, *Developing **UAV-based Red Tide Detection** System*
9. Dr. Michael Parsons, Florida Gulf Coast University: *Examining the Feasibility of **Removing and Composting Fish Carcasses** to Mitigate Red Tide*
10. Sarah Caywood and Aspen Cook, Mote Marine Laboratory, *Expansion and Updates to the **Beach Condition Reporting System***
11. Dr. Dana Wetzel, Mote Marine Laboratory, ***Natural Compound Control** and Mitigation for Red Tide*

Year 1 and 2 Projects

(continued, some tentatively continuing Year 3)

1. Neil Williams, nTec solutions LLC: *A Chemical-Free Red Tide Mitigation Technology Utilizing **UV-C LEDs***
2. Dr. Vincent Lovko, Mote Marine Laboratory, *BloomZoom: A Portable **Phone-based Microscope for Quantitative Detection** of *K. brevis* Through Citizen Science*
3. Dr. Alexis Wells Carpenter, AxNano LLC: *Evaluation of Controlled Release **Oxidants** for Red Tide Treatment and Mitigation*
4. Ralph Elliott, Ecological Laboratories: ***Microbe-Lift** Mitigation 96 Hour Testing with *K brevis**
5. Dr. Cynthia Heil, Mote Marine Laboratory, *Citizen Science Detection and Quantification of Florida Red Tides via Personal and **Smartphone-enabled PCR Technology***
6. Dr. Regina Rodriguez, Carbonxt: *In-situ Mitigation of Florida Red Tide via **Activated Carbon***
7. Dr. Cynthia Heil, Mote Marine Laboratory, *Evaluation of **QUAT Efficacy** for Red Tide Mitigation*
8. Annarie Lyles, Solaris Cybernetics, LLC: *Efficacy of EVIE **Robot** against *K. brevis**
9. Dr. Dana Wetzel, Mote Marine Laboratory, *A Rapid Field Red Tide Toxin **Biosensor for Commercially Important Shellfish and Seawater***
10. Dr. Jamie Lead, University of South Carolina: *A preliminary study to assess the feasibility of a **nanotechnology** approach to the removal of *Karenia brevis* cells and brevetoxin from estuarine and marine waters*
11. Dr. George Philippidis, University of South Florida: *Bioprospecting of natural **algicidal bacteria** associated with Harmful Algal Blooms to develop a sustainable mitigation strategy for red tides*

Tentative Year 3 Projects

(will send abstracts to TAC for recommendations)

1. Dr. Jennifer McCall, University of North Carolina at Wilmington, *Enabling **accurate field-based testing for shellfish farmers** with optimized toxin extraction and stable standards*
2. Dr. William Haskell, Mote Marine Laboratory, *Development of a low-cost propelled autonomous **underwater vehicle for red tide mitigation** and early response*
3. Dr. George Philippidis, University of South Florida, *Red tide mitigation through natural **algicidal bacteria** suppression of *K. brevis* during HAB progression*
4. Dr. Julia Darcy, AxNano LLC, *Controlled Release **Oxidants** for Red Tide Treatment and Mitigation*
5. Dr. Vijay John, Tulane University, *A Thin Shroud with **Integrated Algaecide to Flocculate and Sink Karenia Brevis***
6. Dr. Kathryn Coyne, University of Delaware, *Continued development of **bacteria-derived algicidal compounds** for mitigation of *Karenia brevis**
7. Dr. James Ivey, University of South Florida, *Karenia Mitigation Platform: means and method for enhancing, vetting, and **deploying red tide mitigation** technologies within open water conditions.*
8. Dr. Donald Anderson, Woods Hole Oceanographic Institute, *Fate and Effects of *Karenia brevis* Cells, Toxins, and Nutrients Following **Clay***
9. Thoram Charanda, Prescott Clean Water Technologies, LLC, *Innovative Use of Advance **Oxidation, Nanobubble-Cavitation** for Rapid Deployment to Restore Severely Impacted Red Tide Areas Back to Natural Conditions*
10. Vinay Patel, Enviro Science Technologies, Inc, *Establishing the Efficacy of SEBS (Specific **Enzyme Bacterial System**) for *K. brevis* Cell and Brevetoxin Mitigation*



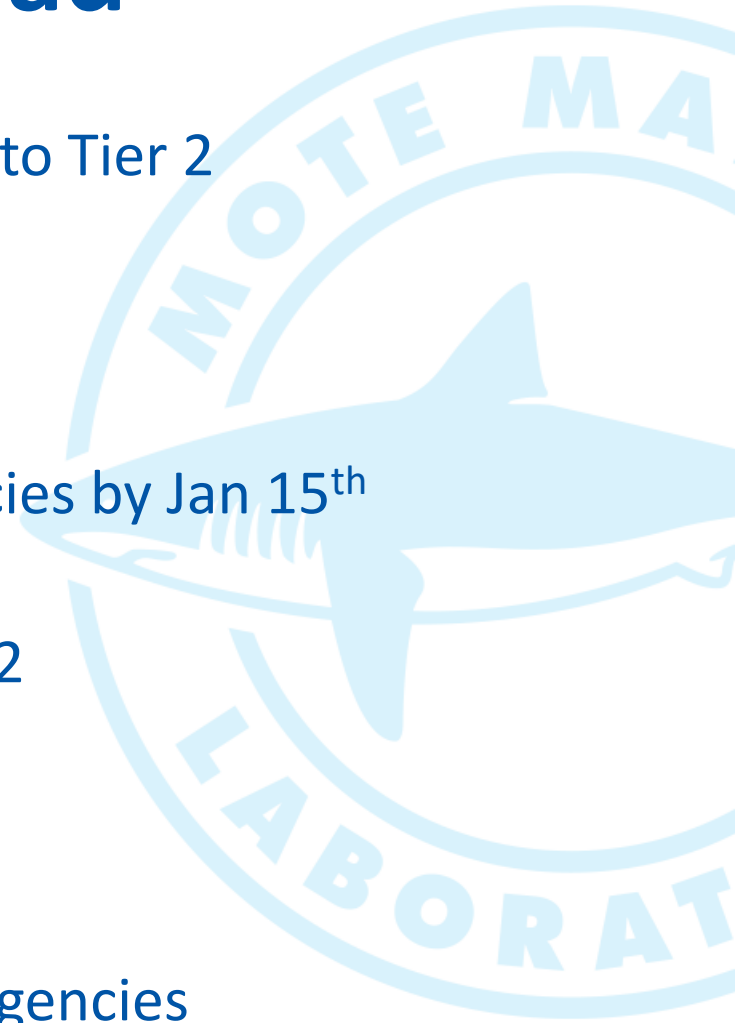
Promising Tools and Technologies (so far, continuing to Tier 2+ testing with regulatory approval and economically feasible considerations)

- Compounds
 - Several naturally occurring algae and bacteria
 - Curcumin and NonTox
 - Clay and several Clay integrations
 - Percarbonate
 - Quaternary Amine Compounds
 - Activated Carbon
- UV Light
- Ozonation
- Redevelopment/Expansion of Beach Conditions Reporting
- Seawater and Shellfish Biosensor



Looking Ahead

- Increasing number of projects moving to Tier 2
- FWC Contract Report due October 31st
- Sept 2021 Red Tide Facilities Event
- Culture Lab Technician starts Aug 4th
- Report to Governor, Legislature, Agencies by Jan 15th
- Year 4 RFP Winter 2021/22
 - Funding subcontracted in April 2022
- 2021 TAC Meetings
 - July 22 and December?
- Regulatory Steps and Field Tests
- Collaborative Outreach with PI's and Agencies



Public Comments and/or Submitting Written Comments for the Minutes

Kevin Claridge
kclaridge@mote.org



Thanks to All Our Red Tide Initiative Research Partners



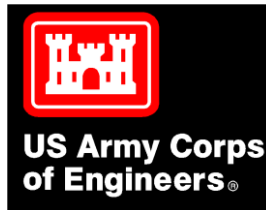
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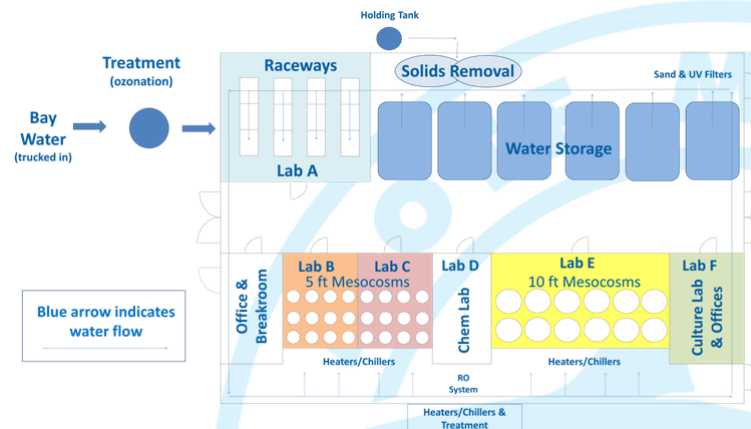
Florida Red Tide Mitigation and Technology Development Initiative

Mote Marine Laboratory Aquaculture Research Park Mesocosm and Culture Lab Tour



Mitigation and Technology Development Facility

- Mote Aquaculture Research Park
- 150K gallons treated and recirculated seawater
- Tiered safe setting research through lab-based, large-scale 5ft and 10ft mesocosms, raceways, and pilot-scale field studies
- Large volumes of *K. brevis*
- Ecosystem-based testing of mitigation compounds in a controlled setting to prepare for field implementation
- Enhanced air treatment, PPE provided, and air testing
- Do no additional health or environmental harm
- No charge for facility use, culture, and assistance as part of Initiative



Research Mesocosms



Red Tide Culture Room



Research Raceways



Partnership Signage



Thank You!

Any Questions/Comments:

Kevin Claridge

941-388-4441, ext. 275

kclaridge@mote.org

