

Gulf Coast Oyster Breeding and Hatchery Initiative Strategic Planning Workshop to Establish a Regional Oyster Breeding Program

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Matthew W. Johnson, Daniel Wieczorek, and Kenneth Riley



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Executive Summary

The Gulf Coast Oyster Breeding and Hatchery Initiative Strategic Planning Workshop was held February 20–21, 2025, at the University of Southern Mississippi's (USM) Thad Cochran Marine Aquaculture Center. Co-led by NOAA Fisheries and USM, the workshop convened over 40 stakeholders - representing federal and state agencies, academic institutions, Sea Grant, and the oyster farming industry to establish initial goals, priorities, and partnerships for a regional oyster breeding program. The goal of the workshop was to develop a shared vision for a new Gulf Oyster Breeding Center (GOBC) that will enhance the resilience, productivity, and sustainability of oyster aquaculture across the U.S. Gulf Coast.

The workshop opened with a series of strategic discussions led by the Steering Committee. Day 1 focused on the rationale for the Center, infrastructure development, business planning, and lessons learned from other regional oyster breeding programs across the nation. USM's planned \$11 million recirculating oyster aquaculture facility, expected to open in 2026, will serve as the Center's foundation potentially supporting production of up to 1.5 billion eyed larvae per year. In addition, the facility will support industry resiliency by producing improved oysters with higher fitness in Gulf environments. The GOBC will not compete with private hatcheries but will serve as a non-commercial breeding nucleus, developing and distributing genetically improved broodstock to support commercial hatchery expansion and oyster farm resilience.

Day 2 broadened participation to include growers, Sea Grant, and extension agents, emphasizing inclusive stakeholder engagement. Discussions addressed key challenges such as regulatory fragmentation (especially in Texas and Florida), the need for a Gulf-wide "oyster free-trade zone," and the importance of data sharing, genetic conservation, and tools for genetic risk assessment. Participants emphasized the need for a centralized breeding roadmap, shared performance indexes for existing oyster lines, and stronger coordination across state and federal agencies. Outreach strategies to build trust and understanding, particularly among traditional extensive on-bottom growers and the wild-harvest industry, were also discussed.

Breakout groups identified near- and long-term research priorities, including growth and survival traits, market-informed breeding goals, improved communication between researchers and industry, and expansion of the Gulf Shellfish Farmers Association as a unified voice for advocacy. An "ideal oyster" was envisioned as fast-growing, disease-resistant, tolerant to environmental variability, and highly marketable. Participants also developed a ten-year timeline for Center milestones, including broodstock availability by Year 3 and measurable industry gains by Year 10.

This workshop marks the first in a series of planning efforts to build a regionally coordinated oyster breeding program that supports the Gulf's aquaculture economy. The GOBC will leverage the region's existing infrastructure, robust industry relationships, and research expertise to deliver improved broodstock, workforce training, and a framework for long-term genetic advancement.



Group photo of the workshop participants.

Participants

Reg Blaylock*, University of Southern Mississippi
Sarah Bodenstein**, Louisiana State University
Terry Boyd, Magnolia Key Oyster Company
Charlie Culpepper, National Aquaculture Association
David Dale, Oak Island Oyster Company
Megan Gima*, University of Southern Mississippi
Rusty Grice, Mississippi-Alabama Sea Grant

Boris Guerrero, Grand Isle Sea Farms
Nathan Herring, Bright Side Oyster Company
Christopher Hollenbeck, Texas A&M – Corpus Christi
Jennifer Jenkins, Crystal Seas Oysters[§]
Matthew W. Johnson*, NOAA Southeast Fisheries Science Center
Heather King, Auburn University Shellfish Laboratory
Jack Koch**, Louisiana State University Agricultural Center
Kelly Lucas, University of Southern Mississippi
Wood Oglesby, Louisiana Sea Grant
Yniv Palit, USDA Agricultural Research Service
Jerome La Peyre, Louisiana State University
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Scott Rikard, Auburn University Shellfish Laboratory
Ken Riley*, NOAA Office of Aquaculture
Elizabeth Robinson, Louisiana Sea Grant, Grand Isle Oyster Research Lab
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Andrea Tarnecki, Auburn University Shellfish Laboratory
John Webster, New Reef Oyster Company
Dan Wiczorek*, NOAA Office of Aquaculture
Paul Zajicek, National Aquaculture Association
Lane Zirlott, Murder Point Oysters

*Steering Committee Member; **Workshop Facilitator; [§] Invited but not in attendance

Gulf Coast Oyster Breeding and Hatchery Initiative

Strategic Planning Workshop to Establish a Regional Oyster Breeding Program

February 19-20, 2025

**Thad Cochran Marine Aquaculture Center, Research Building
300 Laurel Oak Drive
Ocean Springs, MS 39564**

Expected Outcome: The NOAA Aquaculture Program and the University of Southern Mississippi will collaborate with partners and stakeholders to develop frames of reference, rationale, and actionable steps for establishing a regional oyster breeding program to be based at the Thad Cochran Marine Aquaculture Center.

Workshop Objectives:

- 1) Plan for the development of a new oyster breeding program that focuses on industry-identified traits to increase resilience in shellfish farms among Gulf States.
- 2) Identify priorities for research, technology, and extension.
- 3) Define the necessary infrastructure, technology, and operational requirements for a new regional breeding program.
- 4) Identify collaborative strategies among researchers, oyster farmers, industry stakeholders, and regulatory bodies.
- 5) Share the vision with a broader group of regional stakeholders to gather feedback.

1.0 Day 1 – Wednesday, February 19

1.1 Agenda:

- 8:30 Steering Committee Arrival
- 9:00 Rationale for Gulf Oyster Breeding Center
- 10:00 Campus and Facilities Tour
- 11:00 Business Planning and Agreements
- 11:45 Steering Committee Meeting Wrap-Up
- 12:10 Lunch – Meet and Greet
- 1:00 Workshop Facilitation + New Attendee Introductions
- 1:10 Welcome / Workshop Charge / What to Expect
- 1:15 Strategic Planning: Goal, Objectives, and Research Planning
- 2:15 Gulf Oyster Genetics and Breeding Research Consortium Overview
- 3:15 Partnerships and Engagement
- 4:00 USDA and NOAA Oyster Breeding Centers
- 5:00 Summary and Wrap-up

1.2 Summary

Attendees:

Steering Committee: Reg Blaylock (University of Southern Mississippi), Sarah Bodenstein (Facilitator), Megan Gima (University of Southern Mississippi), Matthew W. Johnson (NOAA-SEFSC), Jack Koch (Facilitator), Yniv Palit (USDA-ARS), Kenneth Riley (NOAA-OAQ), Eric Saillant (University of Southern Mississippi), and Dan Wiczorek (NOAA-OAQ).

Additional Afternoon Participants: Tom Delomas (USDA-virtual), Chris Hollenbeck (TAMU-CC), Heather King (AUSL), Dina Proestou (USDA-virtual), Caird Rexroad (USDA-virtual), Scott Rickard (AUSL), Neil Thompson (USDA-virtual), Andrea Tarnecki (AUSL), and Gary Wikfors (NOAA-virtual)

The goal of Day 1 was to gather the Gulf Oyster Breeding Center Steering Committee members and provide a current state update. This goal was met through discussions on rationale, business planning, partnerships, goals, objectives, research planning, Selection of Aquaculture Lines with improved Traits (SALT) Project overview and accomplishments, and information sharing from the three current federal oyster breeding centers in the US.

Several important points were raised when discussing the rationale for the breeding center. The main rationale for the breeding center is to increase oyster larvae production along the Gulf Coast. The new recirculating facility on the University of Southern Mississippi (USM) Thad Cochran Marine Aquaculture Center campus will significantly expand larvae production capacity from 300-400 million eyed larvae per year to 1-1.5 billion per year. This expansion addresses the current gap in setting capability at USM and provides a more consistent supply of larvae. However, the breeding center will not compete with commercial hatcheries in the Gulf region but rather act as a genetic nucleus. The center will focus on research to support selective breeding of broodstock lines to distribute to commercial hatcheries. This approach aims to facilitate industry growth, particularly in growing the number of hatcheries along the Gulf, rather than replacing private hatchery operations. The breeding program at the center will primarily develop genetic lines for off-bottom aquaculture while also producing lines for traditional on-bottom aquaculture, acknowledging the differing trait requirements for each market.

When discussing business planning, the steering committee confirmed that the center might be funded through a state-federal-NGO partnership. The initial startup funding would originate from a congressional appropriation through NOAA. Long-term sustainability may involve partnerships with USDA and insights from existing breeding centers such as the Northeast Center. A director or program manager for the breeding center will be hired and, long-term, this position should be held by a federal employee. In the short term, a program manager and lead scientist may be hired through USM, the Northern Gulf Institute, or the Cooperative Institute for Marine and Atmospheric Sciences.

Before the tour, the steering committee set goals for how the rest of the workshop would proceed and the expected outcomes. The overall goal was to engage stakeholders (i.e., industry, academics, federal, and extension) transparently, gather feedback, and align expectations, particularly regarding the timeline for broodstock availability. It was important to stress that this workshop was the first of many conversations and to ensure that others did not feel excluded. Key outcomes included: 1) planning for the development of a new oyster breeding program that focuses on industry-identified traits to increase resilience; 2) identifying priorities for research, technology, and extension; 3) defining necessary infrastructure, technology, and operational requirements; 4) identifying collaborative strategies among researchers, hatcheries, farmers, regulatory bodies, and stakeholders, and 5) sharing the vision for the center with a broader group of stakeholders.



Workshop participants on a tour of the Thad Cochran Marine Aquaculture Center campus.

After a tour of the USM campus and lunch, the workshop continued by welcoming new participants beyond the steering committee. Strategic planning followed, discussing the challenges and research priorities of the new breeding center. In addition to the new recirculating hatchery, the center will require reliable grow-out sites and industry partnerships, cryopreservation and genotyping capabilities, and data-sharing systems for tracking genetics and environmental interactions across sites and research partnerships. Varying state regulations for importing oyster seed make disseminating genetic lines from

the hatchery potentially difficult. Collaboration among state regulatory bodies is crucial to streamline genetic policies and avoid arbitrary restrictions. The concept of an "oyster free-trade zone" was proposed to facilitate industry growth. During discussions, the group concluded that a successful breeding program must focus on survival and growth, as aesthetically appealing oysters are useless if they do not thrive. The role of a quantitative genetics program, whether through a dedicated person, academic program, or commercial partner, was identified as important but still under discussion. Data infrastructure was identified as critical for tracking genetic progress and environmental influences on breeding stock. Finally, a market assessment for seed and half-shell demand was proposed to inform production requirements and investment.



Workshop participants in a group discussion about the challenges and research priorities of the new breeding center.

After a break, a review of past and ongoing research efforts in Gulf oyster genetics and breeding was conducted. Eric Saillant from the University of Southern Mississippi, Scott Rickard from the Auburn University Shellfish Lab, and Chris Hollenbeck from Texas A&M University-Corpus Christi presented. At the end of Day 1, scientists from three USDA and NOAA Breeding Centers presented the shellfish genetics and breeding programs at their respective facilities. The presenters were Tom Delomas and Dina Proestou from the USDA Agricultural Research Service in Rhode Island, Gary Wikfors from the NOAA Northeast

Fisheries Science Center in Connecticut, and Neil Thompson from the Pacific Shellfish Research Unit in Oregon.



In-person workshop participants and online speakers from USDA and NOAA Breeding Centers.

2.0 Day 2 – Thursday, February 20

2.1 Agenda

- 8:30 Review and Discussion of Gulf Oyster Breeding Center
- 11:30 Lunch – Meet and Greet
- 12:30 Welcome
- 12:45 Workshop Facilitation and Introductions
- 1:00 Workshop Charge - Goals and Rationale for Gulf Oyster Breeding Center
- 1:20 History of Oyster Breeding & Genetic Resources for the Gulf Shellfish Aquaculture Industry
- 2:30 Research Needs and Industry Priorities
- 3:45 Stakeholder Engagement and Partnership
- 4:30 Next Steps / Open Discussion / Feedback
- 5:00 Summary and Wrap Up

2.2 Summary

Attendees:

Working Group: Reg Blaylock (University of Southern Mississippi), Sarah Bodenstein (Facilitator), Megan Gima (University of Southern Mississippi), Christopher Hollenbeck (Texas A&M), Matthew W. Johnson (NOAA-SEFSC), Jack Koch (Facilitator), Yniv Palit (USDA-ARS), Kenneth Riley (NOAA-OAQ), Eric Saillant (University of Southern Mississippi), and Dan Wieczorek (NOAA-OAQ).

Participants: Terry Boyd (MS Industry), David Dale (MS Industry), Russell Grice (MS-AL Sea Grant), Nathan Herring (LA Industry), Heather King (Auburn), Jerome La Peyre (Louisiana State University), Wood Oglesby (LA Sea Grant), Scott Rikard (Auburn), Elizabeth Robinson (Louisiana State University / Sea Grant), and Andrea Tarnecki (Auburn).

Day 2 began with the steering committee reviewing the events of the previous day and discussing key takeaways and areas that were not covered. Key takeaways included the need for a plan to address regulatory challenges with sharing genetics across state borders (Texas and Florida). A unified approach coordinated across the Gulf is needed to streamline regulations, implement an “oyster free-trade zone” for sharing seed, and foster industry growth. In addition, the committee noted that the Gulf has the infrastructure for oyster breeding, but logistical coordination across institutions would be key. Furthermore, the Gulf Shellfish Farmers Association must drive efforts to streamline regulations, improve logistical coordination, help set research priorities, and build broad political support. A strong association will also strengthen the relationships among the federal government, Sea Grant, academia, and industry. Complete response data from this activity can be found in Section 5.1 below.

The steering committee also noted key points that required further discussion on Day 2. These points included the need for a Gulf-wide resource inventory—a comprehensive review of hatchery and farm training resources, business tools, genetic lines, and seed production capacity that currently exist. The committee also discussed that the breeding center could support workforce development by offering additional resources beyond broodstock, such as training workshops, commercial hatchery fact sheets, and internship programs. Finally, the role of the federal government in coordinating breeding efforts needed to be better defined.

After the conclusion of the steering committee review, new participants arrived. After lunch, the goals and rationale of the workshop were reintroduced for new participants. A review of past and ongoing research efforts in Gulf oyster breeding was conducted, similar to the session for Day 1 with Eric Saillant, Scott Rickard, and Chris Hollenbeck presenting. During this session, discussions occurred about the four distinct wild oyster populations in the Gulf, with South Texas oysters being the most genetically divergent. Higher-resolution genomic analyses reveal smaller-scale genetic differences, highlighting the need for region-specific breeding strategies. The breeding center must evaluate the oyster populations

across different Gulf locations to determine which lines perform best under different conditions and to maintain genetic diversity. However, breeding costs must be kept low (low-cost genotyping will play a big role), and long-term success will depend on industry feedback and support. Challenges could arise with industry and public support, as there has been resistance to genetically improved oysters in Louisiana, particularly among traditional on-bottom oyster farmers who view hatchery production with skepticism. Outreach, education, and strategic communication (avoiding terms like “ploidy”, “GMO” and “genetic”) are essential to gaining public and industry acceptance.



Workshop participants review and discuss the goals and rationale of the Gulf Oyster Breeding Center at the beginning of Day 2.

2.3 Break-Out Activities

After a break, a group activity to identify research needs and industry priorities was conducted. Three break-out groups were formed and asked to individually answer three questions:

1. What are two current research priorities?
2. What are two future research priorities?
3. Where disconnects exist between research and industry?

Group 1 consisted mainly of industry members and federal employees. Group 2 consisted of academic researchers, and Group 3 consisted of Sea Grant and extension agents. Once groups had individually answered each question, all groups came together for a larger discussion. Summarized responses can be found in Table 1. Complete response data from this activity can be found in Sections 5.2 and 5.3 below.

2.3.1 Activity 1 Results – Identify Research Needs and Industry Priorities

The summarized results of the first breakout group activity can be found in Table 1, below. Results for each question were organized by Group.

Table 1. Summary of breakout group responses from Activity 1: Identify Research Needs and Industry Priorities. Participants were divided into three stakeholder groups and asked to identify current and future research priorities, as well as disconnects between industry and research. The table highlights key differences and areas of alignment across groups, including a shared emphasis on genetic line development, regional adaptation, and improved communication between stakeholders.

	Group 1 (Industry & Federal)	Group 2 (Academic Researchers)	Group 3 (Sea Grant & Extension)
Current priorities	1) Increased growth & survival of 2N, 3N, and 4N oysters 2) Better appearance and “shuckability”	1) Understand Gulf-wide breeding needs (seed demand, ploidy ratio, state-based data) 2) Characterize what genetic lines are currently available	1) Inventory of current genetic lines in the Gulf 2) Performance index of inventory
Future priorities	1) increased broodstock fertility & ease of	1) Begin genomic selection based on industry needs	1) Ensure access to lines developed at the Gulf

	conditioning 2) Regional broodstock lines	2) Provide genetic lines that compliment wild broodstock	Breeding Center 2) Develop an evolving breeding plan that maximizes time and cost-effectiveness
Disconnects with industry & research	In-person workshops are beneficial but farmers have difficulty attending too many of them. Translation and application of research to industry is key (i.e., proof of concept, economic tools, no jargon).	Seamless integration from industry to academia with clear communication of needs (user-centered design). Continuity of long-term research between academic and industry partners	Manage expectations of the industry on timeline, outcomes and products

2.3.2 Activity 2 Results – the Ideal Oyster

The next set of activities were conducted to engage workshop participants in discussions about stakeholder engagement and partnership. First, participants offered suggestions for what traits an “ideal oyster” developed by the breeding center would have (Figure 1). Participants identified the importance of fast, predictable growth with a high meat yield, good meat-to-shell ratio, and a deep cup. They also highlighted the need for increased survival through strong disease resistance and tolerance to salinity and temperature fluctuations. In addition, good gamete quality and quantity, with broodstock ripe year-round, was a key consideration. Finally, they agreed on the value of a visually



Figure 1. Word cloud generated from participant responses to the “ideal oyster” activity. The size of each word reflects the frequency with which it was mentioned, illustrating key themes and common priorities across the group. This visualization provides a snapshot of shared values, highlighting attributes participants consider most important in future oyster breeding efforts.

appealing oyster that was easy to shuck, had great flavor, and was available year-round.

2.3.3 Key Collaborations Needed

After the traits of the ideal oyster were identified, a discussion was held about the key collaborations needed to successfully breed and distribute the broodstock for this hypothetical oyster. The Gulf Shellfish Farmers Association was identified as the key organization to unify the voice of the Gulf oyster industry, and advocate for priorities by collaborating with policymakers. Industry, academia, and policymakers must work together to develop and communicate research priorities using white papers, executive summaries, and advocacy efforts. These collaborations should expand beyond farmers to include restaurants and consumers to align breeding goals with market demand. Finally, to sustain these efforts, long-term industry engagement and funding are essential for maintaining a strong association.

2.3.4 Activity 3 Results – Timeline

In the final workshop session, participants were asked to identify activities they believed the breeding center should be performing at different points in time: Year 0, Year 1, Year 3, Year 5, and Year 10 (Figure 2).



Figure 2. Results of a stakeholder-driven planning activity outlining a ten-year roadmap for the Gulf oyster breeding program. The timeline identifies key milestones and strategic actions across Years 0, 1, 3, 5, and 10, based on input from industry, researchers, and extension professionals. Activities include initial stakeholder engagement, breeding line development, infrastructure expansion, industry adoption, and long-term goals for economic sustainability and genetic refinement. This framework is intended to guide coordinated efforts and investment in the development of a regionally tailored oyster breeding program in the Gulf of America.

3.0 Workshop Outcomes

3.1 Short-term Research and Development Needs

- Assess ideal oyster traits for aquaculture production and restoration
- Assess the market for seed and half shell needs (regionally and nationally)
- Assess the scope for Gulf oyster farming
 - Capacity estimate of farms and oyster seed demand on the Gulf Coast
 - How many seeds could you realistically plant if all factors were optimal?
 - Acreage estimates are available but no idea how many of those acres are in production or have gear built out
 - Research need for market intel, scenario planning, what is the need for hatcheries and infrastructure
- Develop a Gulf oyster community network (industry, academia, regulators) to enable and support reliable partnerships, identify and express needs, and provide reliable grow out and test sites, stock holding sites, genetic resources protection technologies (e.g., cryopreservation), genetic and genomic technologies, advocacy platform to regulators
- Build an open-data infrastructure to enable data sharing and track of pedigrees, genetics, water quality-organisms interactions, epigenetics, etc. (multi institutional and inclusive of industry)
- Develop a common set of genetic tools to drive dataset compatibility
- Develop capabilities to assess genetic risk (National Genetic Risk program) and perform genetic risk assessment
- Foster Sea Grant-Academia-Industry-Association relationships (List-serv, Co-host a workshop at USM to get people together)
- Develop a list of other resources that the breeding center can offer (**extension**)
 - Commercial hatchery fact sheets, training workshops; extension program
 - Gulf-wide inventory of what is currently available → resources, training programs, business planning tools, people to talk to, etc.
- Develop a mechanism to collect information from industry partners
 - E.g., What each hatchery has available, what they were able to sell, what they are overwintering, why do farmers buy from specific hatcheries
- Develop an oyster catalog: catalog of companies, varieties with information about broodstock raising conditions to provide seed suited to particular environments to farmers
- Protect Gulf oyster genetic resources (e.g., cryopreservation)
- Develop mechanisms to include restaurants and consumers in ideal oyster discussions

3.2 Long-term Research and Development Needs

- Annual technology exchange between breeding centers
- Determine state-based and region-based genetic requirement needs
- Establish a unified, oyster free-trade zone in the Gulf (Oyster Highway)
- Develop mechanism to provide updated scientific and industry-relevant information to inform state and region-based genetic requirements
- Provide easy-to-understand genetic requirements for farmers, academics, and regulators (include reasoning for basis of requirements)
- Enable new oyster line development (ploidy, environmental tolerance, disease resistance)
- Develop the technology, protocols, and genomic resources to make it cheaper and more affordable to breed oysters. Creating lines is good but also create the pathways to breed

3.3 Other Priorities

- Develop a list of priorities for Gulf oyster research
- Develop clear goals for the Gulf Oyster Breeding Center
- Support further development of the Gulf Oyster Farmer Breeds Association
- Enable and support a transitional mechanism for a self-sufficient industry (e.g., seed)
- Assess opportunities to leverage Gulf-wide facilities and resources to support industry and academic needs for aquaculture production (main focus) and restoration
- Build a talent database to identify the groups and the talent that exist in the Gulf and where there are gaps

4.0 Acknowledgements

We extend our sincere gratitude to all individuals and organizations that contributed to the success of the *Gulf Coast Oyster Breeding and Hatchery Initiative: Strategic Planning Workshop to Establish a Regional Oyster Breeding Program*, held February 19–20, 2025.

This workshop was co-led by NOAA Fisheries and the University of Southern Mississippi's Thad Cochran Marine Aquaculture Research Center. We especially thank USM for generously providing the venue, coordinating on-site logistics, and facilitating campus tours that helped shape productive conversations and strategic planning.

We gratefully acknowledge the NOAA Fisheries Office of Aquaculture for funding this workshop, and for their continued leadership in advancing sustainable marine aquaculture. We also recognize the valuable support and participation of the USDA Agricultural Research Service, whose expertise was essential in aligning workshop outcomes with both regional and national breeding priorities.

Special thanks go to the workshop Steering Committee members, facilitators, and invited presenters whose leadership and contributions guided discussions and outcomes.

Finally, we thank all workshop participants, including representatives from the oyster farming industry, state and federal agencies, academic institutions, and Sea Grant programs. Your time, insights, and commitment to advancing a coordinated Gulf oyster breeding program were invaluable and laid the foundation for the development of the Gulf Oyster Breeding Center.

Back cover: We integrated generative artificial intelligence throughout the workshop to spark discussion, support facilitation, and generate outputs such as word clouds and graphics.

