

SUSTAINABLE FISHERIES AND AQUACULTURE

IMPACTS

S.C. Sea Grant Consortium Provides Technical Assistance to Oyster Mariculture Industry, Enabling Sustained Growth

Graham Gaines, S.C. Sea Grant Consortium

Recap: S.C. Sea Grant Consortium technology transfer efforts have resulted in the propagation of South Carolina-based seed stock to supply the rapidly emerging oyster-farming industry in South Carolina and throughout the South Atlantic region. The total economic benefit attributed to the S.C. Sea Grant Consortium is \$535,203.

Relevance: In April 2014, South Carolina introduced a moratorium on importing oyster seed. Growers had to seek new seed sources and develop capacity to produce seed within S.C. to continue industry growth. A grower expressed interest in expanding nursery production and building a hatchery to meet the needs of all S.C. growers. The Program aimed to build an industry that is resilient to environmental and regulatory changes by providing a reliable, in-state oyster seed source.

Response: The S.C. Sea Grant Consortium (Consortium) provided continued technical expertise on hatchery and nursery system design and standard operating procedures to allow the facility to optimize production. Beginning in 2014, the Consortium, in Partnership with industry, launched a broodstock Program with the goal of producing triploid oyster seed using only South Carolina broodstock. Approximately 50% of the seed used by growers in South Carolina in 2020 came from the hatchery built on Consortium technical assistance.

Results: According to SCDNR, dockside value of oyster mariculture production in 2020 was \$728,295. While hatchery technical assistance was completed in 2018, the industry would not have grown without Consortium support. Dockside oyster mariculture value attributed to the Consortium is \$182,074. Using conservative prices for restaurant- and seafood-market retail and assuming sales were split across restaurants and seafood markets, a value added economic benefit of \$353,129 is estimated for a total economic benefit of \$535,203.

Partners: Lady's Island Oysters

S.C. Sea Grant Consortium Gains Sustainability Commitments from McClellanville Working Watermen

Graham Gaines, S.C. Sea Grant Consortium

Recap: The McClellanville Watermen's Association (MWA) have committed to a sustainable and ethical approach toward commercial fishing.

Relevance: Fishermen in McClellanville, and elsewhere in the state, possess vast knowledge of fisheries habitat and ecosystems. They are aware their actions have direct, short-term, and long-term impacts on these ecosystems. Seafood consumers are increasingly requesting the need for sustainability and transparency to be incorporated into fisheries practices. Additionally, marine resource agencies apply pressure and laws for the industry to abide by. This

creates a need for fishermen within common fisheries and geographies to collectively agree on ways to improve upon their sustainable practices.

Response: Consortium specialists worked with the Town of McClellanville and the MWA to determine how the McClellanville fishing community can best express their commitment toward sustainability. While the fishers themselves have always been intentionally mindful of their ecological impact, it was determined that a collective set of guidelines will be an appropriate supplement to the direction that the MWA is taking - to ensure the industry and fisheries are sustained for future generations. Consortium specialists researched and spoke with similar Programs across the country that have made similar commitments, and through meetings and drafts, eventually decided on a way forward.

Results: In December 2020, the watermen signed off on the "McClellanville Watermen Association's Collective Commitments to Sustainability and Ethical Fishing Practice." The document highlights, among other things, the watermen's commitment to: stewardship of coastal waters and fishing grounds, legal and ethical practices in seafood harvesting and sales, and ethical and non-discriminatory labor practices. Resulting from these commitments, new opportunities related to capturing traditional ecological knowledge and citizen science projects are expected.

Partners: McClellanville Community Foundation; McClellanville Watermen's Association

S.C. Sea Grant Consortium Builds Capacity for the South Carolina Seafood Alliance

Graham Gaines, S.C. Sea Grant Consortium

Recap: The South Carolina Seafood Alliance has better positioned itself as an influential professional association for the commercial fishing industry in the Southeast, poised to promote sustainable seafood options and improve the industry's existing infrastructure and operations.

Relevance: The South Carolina commercial fishing industry has decreased dramatically in recent years, which reduces the state's capacity to provide locally-sourced seafood. The drivers behind this decline are complex, but fishermen and academics often allude to an increasingly complex regulatory environment, low-cost seafood imports and non-local seafood sources, a lack of generational skills and assets transfer, and a devaluing of the profession. Without an organized effort, coastal economies and coastal heritage are negatively impacted, and food security is threatened.

Response: The Consortium's Living Marine Resource specialist assessed the needs of the commercial fishing industry to understand its status and priorities. It was determined that a lack of organization was preventing grants and public funds earmarked for food security and sustainable fisheries from finding its way to the South Carolina fishing industry. The Consortium worked with the South Carolina Seafood Alliance's previous director to determine how to better position the organization to receive funds and better advocate on behalf of the industry. The Partnership also explored how to take advantage of parallel efforts at the federal level.

Results: The South Carolina Seafood Alliance has been registered as a 501(c)(3), and is now registered with federal Programs and websites to receive funding directly. A new executive director with a background in sustainable seafood has been hired, and the Board of Directors is tackling new challenges. Longtime Partnerships between the Consortium, the Alliance, the South Carolina Shellfish Growers Association, and the S.C. Department of Agriculture have been strengthened, while new Partnerships are being formed. A new website and outreach plan have been

developed. Paperwork has been digitized and a new approach to finances was organized. Finally, a new strategic plan has been developed.

Partners: South Carolina Seafood Alliance; South Carolina Department of Agriculture

S.C. Sea Grant Consortium Assists with Securing Sustainable Seafood Grants to Non-Profit Fisheries Organizations

Graham Gaines, S.C. Sea Grant Consortium

Recap: The Consortium played an integral role in the award of three grants to two local non-profit organizations - McClellanville Community Foundation (\$12,000) and the South Carolina Seafood Alliance (\$37,500)-which will collectively support the resilience of the commercial fisheries industry in South Carolina.

Relevance: Obtaining funds to support fisheries industry-wide organizational efforts is challenging, as all efforts and resources are channeled toward keeping their independent operations afloat. Many businesses and organizations lack expertise in grant writing or relevant connections to nationwide networks that support grassroots efforts. By stepping in to connect the industry to private and public Partners that offer funding assistance, commercial fisheries objectives related to sustainability and resilience can be supported. This was of particular importance during the COVID pandemic, which crippled the seafood industry's ability to support anything beyond essential functions.

Response: The Consortium offered grant-writing assistance to multiple fisheries organizations in 2020. Two organizations were receptive to the Partnership and collaborated on various grant opportunities. The Consortium helped the McClellanville Community Foundation (MCF) apply for funding from Catch Together, a non-profit organization that supports financing for sustainable fisheries. The Consortium also helped obtain funding on behalf of the South Carolina Seafood Alliance, from Catch Together as well as from the USDA's Local Food Promotion Program.

Results: MCF was awarded \$12,000 from Catch Together's COVID Relief grant opportunity. The funds supported education, outreach, and fundraising activities of McClellanville's working watermen, who hope these efforts will aid industry recovery from the loss of revenue incurred during COVID-19 due to restaurant closures. The watermen now have a consumer-facing image to leverage their branding. The Seafood Alliance used their \$12,000 award from MCF to support staff salary because seafood industries could not afford the Alliance's membership dues since restaurants were closed. The Alliance's \$25,500 award from USDA's Local Food Promotion Program is being used to assess the infrastructure and operational needs of S.C.'s seafood industry, so key priorities can be addressed through Partnerships and funding opportunities.

Partners: South Carolina Department of Agriculture; US Department of Agriculture (USDA); South Carolina Seafood Alliance; McClellanville Community Foundation; Catch Together

S.C. Sea Grant Consortium Gets Increased Payout Rates for S.C.-Grown Oysters from U.S. Department of Agriculture Disaster Assistance Program

Graham Gaines and Matt Gorstein, S.C. Sea Grant Consortium

Recap: S.C. Sea Grant Consortium (Consortium) extension specialists engage with U.S. Department of Agriculture

(USDA) Farm Service Agency (FSA) office in Columbia, S.C. to update risk reduction products.

Relevance: Currently in South Carolina, the only federal crop insurance coverage available to the state's oyster growers is through a non-specialized USDA Program called the Non-Insured Crop Disaster Assistance Program (NAP). This is not always an optimal choice for the state's growers for reasons including high premiums and low payout rates not commensurate with typical wholesale prices received by growers.

Response: Consortium extension specialists engaged with the USDA Farm Service Agency office in S.C. to discuss oyster aquaculture risk reduction products, including Non-Insured Crop Disaster Assistance Program coverage. It was discussed how payout rates in S.C. (\$0.50 for 3" oysters; \$0.33 for 2-3" oysters) were not necessarily reflective of the marketplace for S.C.-grown oysters. The Consortium obtained data from the S.C. Department of Natural Resources documenting oyster mariculture production and wholesale revenue to show that, in 2019, the average wholesale price received by S.C. growers was \$0.84 per oyster. This finding was shared with the FSA office.

Results: The USDA FSA raised its NAP payout rates to \$0.88 for 3" oysters grown in SC and \$0.79 for 2-3" oysters grown in S.C.

Partners: US Department of Agriculture (USDA)

ACCOMPLISHMENTS

S.C. Sea Grant Consortium Scientists Continue to Explore Social Carrying Capacity of Expanding Oyster Mariculture Along the Coast

Bill Norman, Lauren Duffy, Jeffrey Hallo, Laura Jodice; Clemson University

Recap: Overall, a preponderance of support exists for oyster farming in South Carolina, particularly when it is well-managed and does not interfere with boating.

Relevance: As a result of the promotion of local seafood and growing familiarity with shellfish products such as oysters and clams, the demand and willingness to pay a higher price for farmed shellfish has increased, especially in coastal tourism destinations on the South Carolina coast. Recent research suggests S.C. residents and tourists are broadly supportive of existing mariculture, but there is little understanding of support for expansion of oyster mariculture, which will include highly visible infrastructure.

Response: S.C. Sea Grant researchers based at Clemson University are examining social carrying capacity among residents and waterway users who will be most directly impacted by expansion. They worked with an advisory group comprised of shellfish managers, commercial growers, local officials, business owners, and recreational users to develop a survey designed to reach stakeholder groups in Charleston and Beaufort counties in coastal South Carolina. Eighty interviews were conducted, including social value data (e.g., aesthetic, recreational, ecological, land-use, cultural) to be digitized onto S.C. Department of Health and Environmental Control mariculture permit maps.

Results: Overall, a preponderance of support exists for oyster farming, particularly when it is well-managed and does not interfere with boating. Oysters and oyster farming are often supported as culturally appropriate and as a mechanism for economic growth, local food production, and community vitality. The general public seems relatively under-informed, and in cases misinformed, about oyster farming; most concerns expressed about it are often related to this lack of knowledge. The research team developed a draft survey instrument based on input and

feedback from the project advisory committee, a review of issues from both supportive and oppositional advocacy groups, a review of both scientific and professional literature, previous project outcomes. Static, Moving and Virtual Reality (VR) visual stimulations were developed for use with the survey, which will be completed in the next year.

Partners: Charleston Oyster Company; Lady's Island Oyster Farm; South Carolina Department of Natural Resources (SC DNR); South Carolina Department of Health and Environmental Control (SC DHEC); The Nature Conservancy (TNC); Charleston Fish Finder; Harry Hampton Memorial Wildlife Fund; Great Underwriting Solutions; Hilton Head Sportfishing Club ; ACE Basin National Estuarine Research Reserve (US DOC, NOAA, NOS, NERRS); South Carolina Coastal Conservation League ; Reel Chance Charters; East Coast Shellfish Growers Association

S.C. Sea Grant Researchers are Utilizing Local Charleston, South Carolina Craft Brewery By-Products to Fill Nutritional Gaps in Sustainable Fish Feeds for Juvenile Red Drum

Aaron Watson, Fabio Casu, Mike Denson; S.C. Department of Natural Resources

Recap: Consortium researchers are investigating the feasibility of developing a viable by-product from brewery spent grain material for use in high quality fish feeds. This would represent a sustainable use, potential additional revenue stream for breweries, and would assist the domestic aquaculture industry's growth by providing locally sourced, cost effective ingredients to either replace fishmeal or meet specific nutritional requirements.

Relevance: As domestic and world populations continue to increase, so does the demand for healthy, sustainable fish protein. Aquaculture has expanded exponentially to fill the growing divide between supply and demand; however, a great deal of aquaculture production still relies on feed ingredients for protein and lipid sources from wild stocks in the form of fishmeal and fish oil, while the costs of feed can represent more than 50% of the total cost of producing market size fish. Spent grains from craft breweries represent a currently underutilized potential source of nutrition for fish feeds.

Response: S.C. Sea Grant researchers are examining the potential use of spent grains from craft breweries in the Charleston, South Carolina area as viable ingredients in fish feeds for juvenile red drum. They have partnered with three local craft breweries, collected monthly samples from each brewery, and begun evaluating the material itself for composition and determining digestibility and tolerance in juvenile red drum.

Results: The initial analyses demonstrate a high level of consistency both over time within a single brewery and over time between breweries regarding all analyzed components. This is a very encouraging result as it means that by-product from breweries can not only be combined without significantly changing the composition, but it also means the material can easily be incorporated into down-stream uses such as animal feeds relatively easily. Another result that has been encouraging for the continued exploration of brewery by-product as an ingredient is the ease of collecting, drying, and processing the material. No significant or expensive equipment has been required in any steps of developing a fine powdered material ideal for analyses and inclusion in feeds.

Partners: Holy City Brewing; Low Tide Brewing; Tradesman Brewing Company

S.C. Sea Grant Consortium Researchers Look for Pathways to Produce Omega-3 Fats for Use in Aquaculture Facilities

Mark Blenner, Clemson University

Recap: Low nitrogen environments are more suitable for enzyme activity to produce omega 3 fats for use in aquaculture outfits.

Relevance: As developing countries around the world continue to raise their standard of living, and as the world population continues to rise, there is an increasing demand on the global food supply. However, overfishing of natural waters endangers the ocean and river ecosystems, threatening the security of this important food source. For the aquaculture industry to continue to grow and meet the global demands for nutritious fish, a new and sustainable source of omega-3 fatty acids will have to be developed.

Response: Researchers examined utilizing agricultural products, such as rendered animal fats and plant oils as sustainable feedstocks for the production of food, chemicals, and materials. To achieve this, researchers proposed engineering a biocatalyst that is able to efficiently convert liquid and solid fats into higher value products, such as omega-3 fats, for aquaculture production.

Results: Enzyme efficiency was tested and shown to be more prevalent in low nitrogen environments, leading to higher production of omega- 3 fats.

Partners: U.S. Department of Agriculture (USDA); Delaware Sea Grant

S.C. Sea Grant Consortium Researchers Developing Spotted Seatrout Model Designed for Enhanced Resource Management

Tanya Darden, S.C. Department of Natural Resources

Recap: South Carolina Sea Grant Consortium researchers began designing a spotted seatrout model that more accurately reflects its life history to guide resource managers with decision-making in stock enhancement.

Relevance: Spotted seatrout are especially vulnerable to winter kills, which occur at least once each decade and appear to be the major factor associated with changes in population abundance. Little information is available to guide the role of stock enhancement in facilitating recovery of spotted seatrout populations following these events. Stocking offspring from a small number of broodstock may reduce genetic diversity and effective population size, both of which are important for the long-term adaptability of a population.

Response: Researchers are developing a demographic and genetic model they hope will provide resource managers in South Carolina with a stock enhancement tool to guide spotted seatrout conservation and restoration following winter cold events.

Results: Consortium researchers have collected genetic data from 650 spotted seatrout samples, calculated spawn and hatchery effective population size, and begun to modify an existing genetic model for spotted seatrout life history.

S.C. Sea Grant Consortium Researchers Developing Tripletail Fish Culture Techniques for Co-Production in Shellfish Ponds

Jason Broach, S.C. Department of Natural Resources

Recap: S.C. Sea Grant Consortium researchers are establishing tripletail fish culture techniques in an effort to demonstrate feasibility of co-producing them in shellfish ponds as a way to diversify production.

Relevance: Tripletail are a highly valuable marine finfish for seafood markets, but require extensive research to develop methods for successful aquaculture of the species. With a fast-growing juvenile phase, limiting wild-caught supply, and retail value up to \$23 per pound, commercial aquaculture of tripletail could certainly be a lucrative opportunity for aquaculture producers in South Carolina to diversify their production models, particularly in conjunction with shellfish production ponds.

Response: Successful demonstration of the feasibility to house and spawn mature broodfish and co-produce marketable tripletail along with shellfish in extensive settings may positively influence producers to incorporate tripletail into their business plans. Researchers set out to define culture techniques for spawning tripletail and extensive larval and juvenile culture in seawater ponds with oyster crops and disseminate effective spawning methods to South Carolina aquaculture producers.

Results: In an effort to establish at least one natural spawning population of tripletail in a recirculating aquaculture system (RAS) and record spawning frequency and quality over time, tripletail have been collected by fisherman and staff at the South Carolina Department of Natural Resources (SCDNR).

S.C. Sea Grant Consortium Researchers Developing Non-Lethal Tool to Aid in Cobia Population Stock Assessments and Restoration

Tanya Darden, S.C. Department of Natural Resources

Recap: South Carolina Sea Grant Consortium researchers began building a nonlethal tool to sequence cobia genomes in an effort to begin restoration efforts for inshore spawning populations.

Relevance: Cobia is a species of concern in SC due to heavy fishing pressure on the inshore spawning population segment over the last two decades, and the state of South Carolina has implemented management actions, including harvest reduction and stock enhancement within inshore waters.

Response: Researchers proposed using next generation sequencing technologies, which are more efficient in screening entire genomes, in an effort to develop a new tool for sex identification of cobia. The development of a non-lethal, minimally invasive tool for sex identification will substantially aid in assessing the restoration of the inshore population segment by providing easy access to wild population data, as well as increasing hatchery production efficiency.

Results: Researchers began sequencing cobia samples for DNA sex identification of the individuals. Sampling will continue in an effort to develop a non-lethal tool that can be used in stock enhancements and assessments, and sustainable aquaculture.

S.C. Sea Grant Consortium Scientists Develop Novel Fish Aging Techniques

Joe Quattro, University of South Carolina; Michelle Passerotti, University of South Carolina; Joe Ballenger, S.C. Department of Natural Resources

Recap: S.C. Sea Grant Consortium research led to development of novel methodologies for predicting both annual and daily ages from otoliths of red snapper, and predicting age to 17 years in sand tiger sharks. Additionally, a novel equipment modification for use in scanning very small otoliths for use with near infrared spectroscopy (NIRS) was developed.

Relevance: The ability to quickly detect changes in age and growth trajectories of fish is a key to successfully managing them. Current methods are time-consuming, expensive, and make real-time management more challenging. In addition, climate change presents new and dynamic challenges to the management of migratory fish species, potentially altering life cycles and habitat ranges. Developing novel aging methods in fish species is important to every stakeholder and end-user of fisheries resources, as it will improve the regulatory process and enhance management.

Response: S.C. Sea Grant Consortium researchers at the University of South Carolina and the S.C. Department of Natural Resources are estimating fish ages using near infrared spectroscopy (NIRS) and on red snapper otoliths, a bony structure of the inner ear, and sand tiger shark vertebrae. Over 1200 otoliths from Gulf of Mexico and Atlantic red snapper populations were scanned using NIRS, and comparisons to traditionally-aged otoliths confirm this methodology to be both faster and highly accurate for annual and daily aging. This methodology has also successfully been used for predicting age to 17 years in sand tiger sharks.

Results: Consortium researchers expect time and cost savings associated with the NIRS method to be substantial, as NIRS data collection and age prediction for otoliths in NIRS models could be accomplished by a single person in much less time compared to traditional methods.

NOAA Fisheries is actively vetting this methodology for integration into age production methodologies nationwide. Regional management council recommendations have been made recently in assessment workshops to pursue use of NIRS for improving the scope and timing of production ageing for managed species.

Partners: Bruker Corporation; Florida Fish and Wildlife Conservation Commission (FL FWC); Alaska Fisheries Science Center (US DOC, NOAA, NMFS); Southeast Fisheries Science Center (US DOC, NOAA, NMFS, SEFSC)

Consortium Creates South Atlantic Red Snapper Research Program

Susan Lovelace, Graham Gaines, Susannah Sheldon, and Ryan Bradley, S.C. Sea Grant Consortium

Recap: After engaging a steering committee and running a competition, the Consortium was awarded nearly \$1.5 Million dollars for the development of a great Red Snapper Count in the South Atlantic.

Relevance: The allowable catch limit of red snapper from South Atlantic federal waters has varied substantially, in some years being zero. The allocations for harvest are set using a formula based on historic and recent average landings. Uncertainty in the stock assessment inhibits the ability to set an allowable catch limit that can be effectively monitored. While latest assessments suggest that catch limits should be lowered, a majority of fishermen expressed frustration.

Response: With the intent of improving uncertainty estimates in generating an absolute abundance estimates, the

South Carolina Sea Grant Consortium (Consortium) worked with regional Sea Grant Programs to synthesize regional research needs into prioritized research objectives for the RFP and ran the competition. Letters of Intent were evaluated for projects that best met the objectives and were feasible within the budget and timeline of the Program.

Results: The Consortium engaged a steering committee comprised people from Sea Grant, NMF, state agencies, and industry. After considering priority research needs, the priority questions were developed. The SC ensured that the RFP was widely distributed and reviewed the Letters of Intent. The goal is to fund one or more projects to count the number of red snapper in the South Atlantic to provide a better understanding of the stock and improved the science upon which catch limits are based.

Partners: University of North Carolina, Wilmington (UNCW); Georgia Sea Grant; University of Georgia (UGA); Florida Sea Grant/UF; Georgia Department of Natural Resources (GA DNR); North Carolina Department of Environment and Natural Resources (NC DENR); S.C. Department of Natural Resources; Florida Fish and Wildlife Conservation Commission; South Atlantic Fishery Management Council (SAFMC); Abundant Seafood; Texas A&M University (TAMU); Mississippi-Alabama Sea Grant Consortium; Hulls Seafood

S.C. Sea Grant Consortium Contributes to Clemson-Led Project on Socioeconomic Research for Mariculture Industry

Matt Gorstein and Graham Gaines, S.C. Sea Grant Consortium

Recap: S.C. Sea Grant Consortium extension specialists provide expertise in successfully implementing shellfish mariculture socioeconomic research project to investigate both consumer and producer.

Relevance: The South Carolina shellfish aquaculture industry, specifically oysters, continues to grow. As this industry is still relatively young, characterizing consumer preferences for S.C. aquaculture products is important for identifying emerging opportunities and/or challenges. Moreover, characterizing the industry from a producer perspective is also vital for tracking industry progress and being proactive in addressing potential barriers to sustainable industry growth.

Response: Researchers from Clemson University received funding from the U.S. Department of Agriculture to assess consumer perceptions of South Carolina aquaculture products, produce a South Carolina shellfish aquaculture industry situation and outlook report, and estimate the total economic contribution of the industry. Consortium extension specialists provided expertise and assistance related to survey design and development of outreach products.

Results: According to consumers, the most important product attributes they consider when purchasing aquaculture products are taste, quality/freshness, and cost. Sixty-five percent of survey respondents indicated that they would be willing to pay a price premium for aquaculture products produced in South Carolina (34% premium for clams, 43% for oysters, and 29% for shrimp), and 76% of respondents living in South Carolina coastal counties indicated that they support off-bottom oyster production.

Partners: Clemson University

S.C. Sea Grant Consortium Provides COVID-19 Support for the Seafood Industry

Graham Gaines, S.C. Sea Grant Consortium

Recap: Throughout 2020, the Consortium assisted seafood producers to navigate the challenges posed by COVID-19, by promoting local seafood outlets during a time that access to fresh seafood was difficult and unsafe. The Consortium also directed seafood producers to relief resources and developed plans to build the resiliency of the seafood supply chain to future disruptions.

Relevance: Early impacts of COVID-19 was particularly challenging for the seafood industry, as South Carolina seafood producers lean heavily on restaurants as outlets for their products. 58% of shrimp and 62% of oysters are estimated to be consumed at restaurants, and one study in the Lowcountry estimated 90.7% of “on the half-shell” single oysters were consumed in S.C. restaurants. Keeping the industry’s doors open and preventing job loss therefore became a priority.

Response: Specialists supported the industry by communicating with seafood producers in S.C. to see who was able to stay open and continue to safely sell products, and maintained communications so the information was updated and shared by a trusted source. Specialists then participated in networking groups, webinars, and briefings to understand federal Programs available to food producers. Finally, specialists engaged in one- on-one conversations with producers to assess impact and determine a corrective action for building resiliency, which resulted in funding for 2021 and beyond.

Results: The Consortium published a regularly-updated webpage dedicated to local seafood markets that were open during the pandemic, and included safety information, hours of operation, and contacts. Over 30 establishments, sorted by county, benefited from this exposure. Direct support was provided to seven producers to navigate federal Programs under the CARES Act, while information was shared with 64 fishermen and 13 aquaculturists. A subcommittee was developed to identify beneficial projects to increase resilience of the mariculture industry. A proposal was developed and \$67,500 was awarded to address supply chain vulnerabilities, aquaculture literacy, and development of direct marketing strategies.

Partners: South Carolina Seafood Alliance; South Carolina Shellfish Growers Association

S.C. Sea Grant Consortium Develops Rapid Response RFP

Graham Gaines and April Turner, S.C. Sea Grant Consortium

Recap: The Consortium developed and was awarded a \$99,500 Direct Marketing Support project for the shellfish aquaculture and nature- based tourism industry, aimed at providing both immediate and long-term solutions to the impacts of COVID-19, all of which will begin in 2021. The “Rapid Response” activities address a vulnerable supply chain using a three-tiered approach: understanding consumer preferences, identifying regulatory obstacles, and direct support of online marketing efforts by S.C. seafood producers.

Relevance: COVID-19 caused many challenges for seafood businesses in South Carolina. Farmed shellfish is reliant on restaurants as an outlet for their product, with more than 65% of growers’ inventory going directly to restaurants. Soft-shell crab producers, the other major mariculture industry in S.C., suffered an 80% loss in 2020 sales. The pandemic has highlighted a major vulnerability in the local seafood supply chain, and presented an opportunity to learn how to improve that supply chain. To keep businesses open, prevent job losses, and boost the supply of sustainable seafood, determining best practices for alternative sales were needed.

Response: The Consortium worked with industry members to develop “Rapid Response” opportunities that would address the problems identified above. These solutions included: (a) understanding the potential for direct marketing of S.C. seafood products through a Study Group Partnership with the Clemson Marketing MBA Program; (b) developing a regulatory guide for retail or direct-to-consumer sales for seafood producers; (c) an aquaculture literacy campaign to promote the science behind year-round oyster sales; and (d) social media training courses for aquaculture producers. Included in this Rapid Response package were funds to support nature-based tourism.

Results: A total of \$99,500 was awarded to the Consortium for a Direct Marketing Support project for the shellfish aquaculture and nature-based tourism industries, aimed at providing both immediate and long-term solutions to the impacts of COVID-19.

S.C. Sea Grant Consortium Develops Red Snapper RFP

Susan Lovelace, Graham Gaines, Susannah Sheldon, and Ryan Bradley, S.C. Sea Grant Consortium

Recap: National Sea Grant Office and National Marine Fisheries Service awarded the Consortium \$75,000 to administer a \$1.5M research competition investigating abundance of the South Atlantic stocks of Red Snapper (*Lutjanus campechanus*). The Consortium identified and worked with a steering committee of marine fisheries experts to determine the contents and scope of a Request for Proposals to better understand the stock status of this economically and ecologically important species.

Relevance: Red snapper is a popular target of sportfishers and the commercial fishing industry throughout the South Atlantic. Historical overharvesting resulted in a depleted population in the South Atlantic, but under current management measures the population is recovering. Some controversy surrounds the current stock assessment for South Atlantic red snapper, particularly with regard to accuracy of population estimates. Given this, the Consortium was tasked with overseeing and implementing a research competition to support a sub-award to generate an absolute abundance estimate for the entire South Atlantic red snapper stock.

Response: The Consortium established a steering committee of 18 marine fisheries professionals, including fisheries scientists, policy makers, fishermen, and extension agents to prepare the RFP, which was based on congressional language, scientific data, and stakeholder input. Communications teams helped in the distribution of the RFP.

Results: The committee fielded and reviewed Letters of Intent, and internal staff at the Consortium communicated with potential submitters on the submission details and guidelines. The funds were awarded in 2021, and the project is currently underway.

Partners: Florida Sea Grant; Georgia Sea Grant; National Sea Grant College Program (US DOC, NOAA, OAR, NSGCP); North Carolina Sea Grant; Abundant Seafood; South Atlantic Fishery Management Council (SAFMC); National Marine Fisheries Service (US DOC, NOAA, NMFS); Georgia Department of Natural Resources (GA DNR); North Carolina Department of Environment and Natural Resources (NC DENR); South Carolina Department of Natural Resources (SC DNR); Hulls Seafood

S.C. Sea Grant Consortium Contributes to Greater Amberjack Research Needs

Graham Gaines and Susan Lovelace, S.C. Sea Grant Consortium

Recap: The Consortium contributed to the 2020-2023 Gulf of Mexico and South Atlantic Greater Amberjack Research Program Visioning project - an effort to plan, implement and document a multi-regional, multi-year Greater Amberjack (*Seriola dumerili*) research Program through a cooperative agreement with the National Sea Grant Office (NSGO) and the National Marine Fisheries Service (NMFS). Greater Amberjack is an important recreational and commercial species in the Gulf of Mexico and South Atlantic regions.

Relevance: The goal of the Greater Amberjack Research Program was to develop additional data sources, assessment approaches, and knowledge to improve agency- and agency-independent estimates of the abundance of Greater Amberjack throughout the species' range. To adequately pursue a research Program of this scale, a visioning phase was implemented to solicit stakeholder data input and understand the key research needs.

Response: Consortium staff helped develop a survey instrument, reviewed existing research and policies, and interviewed Greater Amberjack fishermen, including both sport and commercial fishermen. A total of six interviews were held which ascertained attitudes and motivations towards amberjack fishing, a characterization of industry perceptions towards the stock, and management of the fishery.

Results: Consortium staff also served on the steering committee for the research project, which took the lessons learned from the visioning phase to inform the development of the RFP.

Partners: Florida Sea Grant; Georgia Sea Grant; Louisiana Sea Grant; Mississippi-Alabama Sea Grant Consortium; North Carolina Sea Grant

S.C. Sea Grant Consortium Develops Oyster Production Surveys for "Industry Status and Outlook" Report

Graham Gaines and Matt Gorstein, S.C. Sea Grant Consortium

Recap: In Partnership with Clemson University economists, the Consortium collected data to be used for a state-wide Shellfish Industry Economic Impact report. The report will detail the extent of shellfish mariculture production in South Carolina, and the impact the industry has on the state economy and employment.

Relevance: Shellfish mariculture is relatively new in South Carolina, and a comprehensive assessment of its extent and impact has yet to be conducted. By understanding the financial components and economic impact of shellfish mariculture, an accurate and transparent method potentially can be used for legislative and management purposes. The financial sector can then make more informed decisions on lending risk and investment opportunities.

Response: Consortium staff conducted in-person field visits and collected data on the seven existing floating gear oyster farms in the state. Results: Data collected included: total investments; employment; operational costs; revenue; production; marketing information; and challenges and opportunities for the industry. The collection of this data will be processed using advanced statistical and analytical software, which will be used for the report to be finalized in 2021.

Partners: Clemson University; South Carolina Shellfish Growers Association

S.C. Sea Grant Consortium Outlines Concept for Aquaculture Research and Training Study and Return on Investment Analysis

Matt Gorstein and Graham Gaines, S.C. Sea Grant Consortium

Recap: Concept is outlined to conduct shellfish aquaculture research and training Program feasibility study and return on investment (ROI) analysis.

Relevance: The growth of the shellfish aquaculture industry in the last few years has led to an increased interest in developing research and development to optimize sustainable shellfish production and survival rates and workforce training Programs to adequately train industry entrants in gear handling, shellfish science, and business planning.

Response: The Consortium identified an interested partner to conduct the ROI analysis. This assessment will utilize input-output modeling techniques to estimate the potential return on investment of constructing and operating a shellfish aquaculture research and training Program in South Carolina as measured through an economic impact analysis. Next steps include stakeholder meetings, data collection, implementation of the ROI analysis, and full feasibility study.

Results: Interested stakeholders from Consortium member institutions, technical colleges, and regulatory agencies were identified and invited to participate in a working group to define the scope and steer the assumptions of the ROI analysis.

Partners: University of South Carolina