

NURTURING THE SUCCESSFUL GROWTH AND MATURATION OF A DOMESTIC SEAWEED AQUACULTURE INDUSTRY: IDENTIFYING AND REMOVING BARRIERS AND PROMOTING OPPORTUNITIES

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Seaweed aquaculture is an emerging industry in the United States. Several states are actively cultivating seaweed at the commercial or research/investigative scale, however, several significant barriers exist which prevent the expansion of this new industry to meet its potential. Although efforts to address these barriers are currently underway in individual states, progress is slow due to limited resources and no mechanism facilitating an exchange of information. A comprehensive and collaborative effort was necessary to move this emerging industry forward. With the support of federal funds in 2019, the National Seaweed Hub, a partnership of 10 Sea Grant programs and their diverse stakeholders, was established with the goal to support the successful growth and maturation of a domestic seaweed aquaculture industry through sharing of evidence-based, non-advocate information.

In early 2020, a National Needs Assessment, targeting multiple stakeholder groups involved with the seaweed industry, was implemented to determine challenges, needs and market outlets for domestically cultivated seaweeds. Results from the needs assessment and the status of the emerging industry were shared during the first National Seaweed Symposium in March 2020. Diverse stakeholder-driven work groups were formed based on four common challenges identified through the needs assessment: Market Opportunities, Post-harvest and Processing Infrastructure, Regulations, and Production Systems. Facilitated by Sea Grant Extension and National Sea Grant Law Center staff, work group participants will develop achievable work plans or strategies addressing barriers they determine to be priorities preventing the expansion of domestic seaweed aquaculture. To ensure transparency of work group progress and work plan developments, progress reports in the form of meeting summaries, as well as all final outputs, will be posted to the Seaweed Hub's website (www.seaweedhub.org).

GOFISH HAWAI'I: DEVELOPMENT AND DEMONSTRATION OF A COLLABORATIVE SEA-LAND GRANT AQUAPONIC FARMER TRAINING PROGRAM

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The University of Hawai'i College of Tropical Agriculture and Human Resources (CTAHR) program GoFarm Hawai'i has grown to become one of the largest and most successful beginning farmer development programs in the country. However, current and former members have expressed interest in integrating aquaculture technology into their terrestrial growing operations. To meet this demand, GoFarm Hawai'i leadership and extension specialists from both University of Hawai'i Land and Sea Grants developed a workshop series called GoFish Hawai'i. This series was developed as an introduction to aquaponic farming, and to offer training opportunities to learn how to integrate small scale coupled and decoupled aquaponic systems into existing fruit and vegetable farms. Five 3-hour workshops were delivered monthly from November 2020-March 2021 using a hybrid in-person and virtual delivery approach. Thirty-five participants registered and participated in the workshop series with topics including; panel discussions with industry leaders, basic system design, fish management and water quality, planting and nutrient management, and discussions of market opportunities and return on investment. A postworkshop survey of participants indicated that they substantially increased their knowledge of aquaponic production, and all respondents evaluated the workshop as Satisfactory to Excellent. Respondents also indicated a desire for a stronger hands-on component and expansion of aquaponic training opportunities. As a result, a practicum component and site visits are being added to the curriculum.

RECIRCULATING AQUACULTURE SALMON NETWORK (RAS-N): BUILDING CAPACITY OF ATLANTIC SALMON PRODUCTION IN THE U.S. THROUGH STRONG INDUSTRY ENGAGEMENT

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NOAA Sea Grant has funded a national collaborative project consisting of research institutions, industry, and government agencies across the US. Efforts of the Recirculating Aquaculture Salmon Network (RAS-N) are supported by research, education, extension, and industry partners from the Mid-Atlantic, Great Lakes and Northeast regions of the U.S. Together, the overarching goal of RAS-N is to build capacity for Atlantic salmon RAS in the U.S by addressing the barriers and needs of industry for successful growth, stability, and economic feasibility. In the first year, a holistic hub was established with formal founding partners from across each region. A main objective of the RAS-N hub is to gather stakeholder input which includes guidance, concerns, ideas and other input regarding industry needs, thoughts on extension, outreach approaches, workforce development, optimal use of available federal/state funding, and other topics. The first RAS-N workshop was hosted by the University of Wisconsin-Stevens Point Northern Aquaculture Demonstration Facility, which provided initial stakeholder input on industry barriers and needs. Over the past year, work groups were formed to focus on priority areas and a white paper was developed to outline current and future research concerning technical and biological barriers as well as non-technical needs (economics, workforce development, etc.). These barriers and needs were the focus of the most recent workshop hosted by the University of Maryland Institute of Marine and Environmental Technology. This presentation will highlight RAS-N workshops, its efforts to build and expand capacity-building, and future activities, including development of a road map.

A NEED FOR NEW ACADEMIC PROGRAMS IN OCEAN ENGINEERING WITH A FOCUS ON AQUACULTURE.

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A strong need exists to establish a vibrant aquaculture industry in the United States to counteract the substantial seafood trade deficit and to have sustainable products. To close the seafood trade deficit, it is essential for aquaculture development to occur on land, in coastal waters and in the offshore environment. Sustainable products need to include macroalgae, shellfish and finfish species. For the industry to be established, a technological approach will be necessary to have optimized systems for performance and economic viability. This will require individuals to have a technical background in engineering but also have experience in environmental and aquaculture sciences.

In this presentation, an academic model will be introduced for the education of individuals with a Mechanical, Civil or Environmental engineering background to become Ocean engineers and apply their knowledge to advance aquaculture.

The core of the academic program would include

- Ocean waves and tides,
- Coastal engineering and processes,
- Design of ocean aquaculture structures,
- Oceanographic instrumentation and aquaculture system monitoring with
- Boat handling and seamanship.

The core engineering background will then be enhanced to include environmental and aquaculture sciences such as

- Marine pollution and control,

- Recirculating aquaculture systems and aquaponics,
- Geographic information systems,
- Aquaculture husbandry techniques and
- Marine mammal science and policy.

Another component of the program could include short courses in

- Emerging aquaculture entrepreneurship and
- Engineering economics with aquaculture applications.

The thrust of this academic program would have an emphasis on “hands-on” experiences to help build an industry in the U.S. It would include Sea Grant Extension throughout the country. The program could also be extended internationally to complement efforts like those organized by the United Nations, USAID and numerous nongovernmental organizations and have a humanitarian focus.

ILLUSTRATING MICHIGAN'S 2020 STATUS OF AQUACULTURE IN RESPONSE TO COVID-19

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Michigan's aquaculture industry was negatively impacted in 2020 due to COVID-19. Uncertainty and State of Michigan orders which included restrictions for restaurants and other food service establishments disrupted food supply chains as well as limited opportunities for local tourism activities. However, the full impact of COVID-19 to Michigan aquaculturists was unknown, as there was little known of the status of the overall industry in the state. To help address these challenges, Michigan Sea Grant applied for and received a \$100,000 COVID-19 rapid response grant from the National Sea Grant office which aimed to help assess the aquaculture, commercial fishing, and charter fishing industries in Michigan in response to 2020 COVID impacts. This talk will share the summarized findings of interviews from aquaculture producers in Michigan and how these baseline findings have been distributed to inform decision makers for COVID-19 financial relief and future regulation efforts.

In 2020, Michigan had 52 aquaculture operations which provided 111 jobs. These businesses produce 23 different types of fish for various purposes with the most common reasons being stocking and food consumption. Of the 52 farms, 11 are public and 41 are privately owned. The public sector includes 6 state hatcheries, 3 federal, and 2 Universities which produce fish purely for stocking purposes only. The private sector produces anywhere from 830,000 to 910,000 lbs of fish in which the most common fish produced is the rainbow trout. Private businesses experienced anywhere from 25-33% loss in sales, in which some farms could not financially stay open. Food fish were the most impacted as there were new consumer patterns which these farmers had to pivot their marketing strategies. This was due to disruptions in the food supply chains such as processor and restaurant closures due to state lockdowns and regulation changes. However, some benefits came from the pandemic. For example, once Michigan reopened, there was a large demand for fish so sales for aquaculture producers were booming. Those who did shift from wholesale to retail markets made more money for less fish, and those who had the financial capacity finally had the time to fix up their facility. The public sector also really benefited from the virtual opportunities which helped to connect the various facilities that are located across the state.

This information was reported to Michigan's DNR to develop a spending plan for CARES Act funding allocation for the state of Michigan. This information was also shared with state advisory groups to help educate and illustrate the differences in needs between public and private

sectors in Michigan. An infographic illustrating this information will be shared as a resource for public aquaculture literacy. Additionally, information as to how this differs from the 2018 US Aquaculture census for Michigan will also be discussed.

AQUATIC ANIMAL DRUG APPROVAL PARTNERSHIP (AADAP) PROGRAM: INTRODUCTION TO INADS

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Fish may get sick when raised at a hatchery or need different drugs for sedating, spawning, or marking. The number of available approved aquaculture medications is limited, thus leaving the medicine cabinet lacking for many treatment options. One way to legally use unapproved medications is to work with the U.S. Fish & Wildlife Service’s (USFWS) Aquatic Animal Drug Approval Partnership (AADAP) Program to participate under the National INAD Program (NIP). The NIP has over 15 different Investigational New Animal Drug (INAD)s that are available for fishery managers to use as long as they follow the established study protocols and report the study data.

The NIP was created over 20 years ago, and each year more than 200 facilities/offices located throughout the United States have participated and benefited from the program. The field data collected from INAD studies has created a wealth of useful information. This data has contributed to demonstrating efficacy and safety of individual INADs to the Food and Drug Administration (FDA), as well as to assist pharmaceutical drug sponsors in assembling complete data packages for FDA submission. In addition, the NIP has functioned to help maintain the health and fitness of fish stocks from across the country, and assisted fisheries managers in meeting restoration, recovery, and recreational program objectives.

This presentation will provide a brief overview of the AADAP Program and an in-depth explanation of the INAD Program including what an INAD is, how one can participate in the INAD Program, and how the data is used.

For more information on the NIP and the AADAP program, please visit the AADAP website (<https://www.fws.gov/fisheries/aadap/home.htm>).

BEST PRACTICES FOR VIRTUAL AQUACULTURE EVENTS - LESSONS LEARNED FROM GREAT LAKES AQUACULTURE DAY

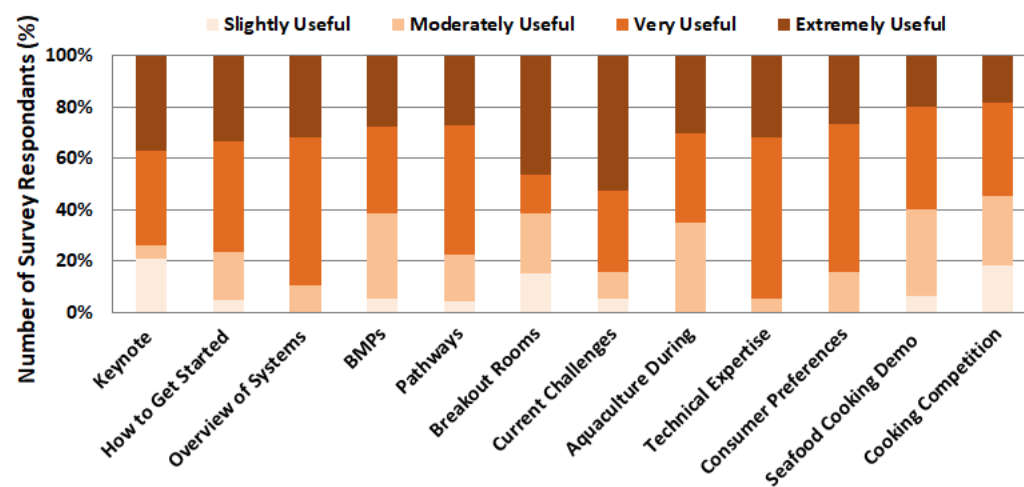
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In 2019, the Great Lakes Aquaculture Collaborative was formed through funding provided by the National Oceanic and Atmospheric Administration's (NOAA) National Sea Grant Program. This collaborative aquaculture hub is made up of Great Lakes area Sea Grant program representatives, aquaculture researchers from the Great Lakes region, and is guided by industry advisory boards. Feedback from advisory boards in early 2020 helped to shape the first annual event. This event focused on three major themes (targeting different audiences) to organize the October 10, 2020 Great Lakes Aquaculture Day (GLAD): 1) how to get started in aquaculture (new industry professionals), 2) aquaculture technical expertise (current professionals), and 3) consumer education opportunities (general public). Due to the COVID-19 pandemic, the group hosted a one-day virtual event. GLAD consisted of a keynote speaker, seven expert presentations, three panel discussions, an aquaculture demonstration video, lunch breakout room discussions, culinary cooking demonstrations, and a live cooking competition. GLAD had national and international reach with over 260 attendees from 23 US states and 7 countries.

The success and engagement of this event was due in part to the utilization of best practices for event planning and virtual presentations. Some of those practices included elaborate planning documents, role assignments, script creations, and multiple practice sessions prior to the event. The event also utilized unique engagement tools such as a breakout room, a live cooking competition, and polling. A diverse set of presentation topics also delivered useful and engaging content on aquaculture. Materials were also made available online to have further reach after the event. After the event, an online survey was sent to participants which revealed that the event was successful in helping potential and current producers become more successful. Survey results summarized in figure 1 showcase what attendees thought of each of the day's sessions.

Figure 1. Survey results indicating the usefulness of each session during the 2020 GLAD (response rate = 38%).



CARBON DIOXIDE IN GROUNDWATER: DEVELOPING A WARNING SYSTEM FOR AQUACULTURE PRODUCERS – EXPERIENCE DURING A PANDEMIC

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Estimated groundwater usage in the United States reached 84,700 million gallons per day during 2015, of which approximately 0.8% (669 million gallons per day) were used for aquaculture in the southern region. It is estimated that aquaculture in Arkansas used about 152 million gallons per day mostly from the Mississippi River Valley alluvial aquifer. Groundwater quality is very variable depending on the geological formation where water is trapped, and typically is depleted of dissolved oxygen, has low pH due to high presence of carbon dioxide, and in occasions has high presence of iron and manganese compounds. These issues have been addressed by fish farmers by designing aquaculture facilities that include aeration towers (Figure 1) as a way of stripping and removing carbon dioxide, as well as sedimentation tanks and filtration units (Figure 2) to get rid of iron in the water.

Although aquaculture producers in Arkansas have been dealing with water chemistry changes for a long time, from May through August 2019 several baitfish and sportfish farms in Lonoke county experienced losses due to sudden increases in the carbon dioxide concentration in water used for their hatcheries, holding tanks, and packing units before shipping. This led to an estimated direct loss of over \$200,000. These water quality changes motivated the Aquaculture Extension Program at the University of Arkansas at Pine Bluff (UAPB) to start a pilot project to prevent and eventually warn fish farmers of the deleterious effects of these water quality changes.

The pilot project was intended to monitor carbon dioxide (CO₂) using a practical approach and to standardize the methodology across all the farms involved in the project. A thermometer, and two Hach kits for determining alkalinity, pH, hardness, and iron were provided to eleven aquaculture producers. Training to technicians was performed at the beginning of the program and included water samples, use of kits, and record keeping. Participant aquaculture facilities were in the following counties: Lonoke (6), Jefferson (1), Prairie (1), Monroe (2) and Benton (1). Results from the pilot project and data collected at the different farms will be presented.

Figure 1 - Aeration tower Figure



2 – Filtration units



THE GREAT LAKES AQUACULTURE COLLABORATIVE'S (GLAC) ROLE IN SUPPORTING SUSTAINABLE AQUACULTURE IN THE GREAT LAKES REGION

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The Great Lakes comprise one of the world's largest freshwater ecosystems and are well positioned to support a robust freshwater aquaculture industry. Despite the large size of the resource, aquaculture production in the region is small and not keeping pace with increases in consumer demand for fish and seafood. The Great Lakes Aquaculture Collaborative (GLAC), one of the Sea Grant supported Aquaculture Hubs, was formed to address potential barriers and develop opportunities for sustainable, land-based aquaculture in the region. GLAC is composed of Sea Grant extension educators and university researchers from Minnesota, Wisconsin, Illinois, Indiana, Ohio, Michigan, Pennsylvania, and New York. The project's primary goal is to provide relevant, science-based initiatives that support an environmentally responsible, competitive, and sustainable aquaculture industry in the region. The GLAC has formed eight state and one regional advisory groups composed of aquaculture producers, distributors, and researchers. The ideas that have come out of these advisory groups are already helping to drive future GLAC activities. For example, we have held three informational webinars and one region-wide virtual event on topics chosen by our advisory groups. All GLAC webinars, events, materials, and updates are accessible from the GLAC website (<https://greatlakesseagrant.com/aquaculture/>). GLAC research projects that are ongoing include understanding consumers' willingness to pay for aquaculture products, identifying what producers perceive as barriers to expanding and diversifying their businesses, and identifying policy and regulatory hurdles for aquaculture producers in the region. Through direct interaction with our advisory groups and among Sea Grant programs, a number of other collaborations have grown out of the GLAC. Examples of

new projects include a website (the Great Lakes Fresh Fish Finder) with the goal of connecting fish producers directly to consumers and a proposal to educate the public (youth to adults) about aquaculture. Our strong emphasis on building collaborations among GLAC partners and regional producers will ensure that the collaborative will continue to exist and impact the region beyond the life of the grant.

THE USFWS AADAP PROGRAM – SUPPORTING FISH DRUG APPROVALS THROUGH PIVOTAL EFFICACY AND TARGET ANIMAL SAFETY STUDIES

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The U.S. Fish and Wildlife Service’s (USFWS) Aquatic Animal Drug Approval Partnership (AADAP) Program is the only program in the United States that is exclusively dedicated to acquiring U.S. Food and Drug Administration (FDA) approval of new medications for use in fish culture and fisheries management. To gain FDA approval of a drug, sufficient data must be generated and accepted by the FDA’s Center for Veterinary Medicine (CVM) to demonstrate the drug is safe for humans, the target animals, and the environment; can be manufactured consistently, and is effective for its proposed use(s). To help fulfill this mission, the AADAP Research Program collaborates with federal, state, tribal, academic, and private sector partners to conduct pivotal research studies to support New Animal Drug Approvals (NADAs). This presentation will focus on the activities of the AADAP Research Program, illustrating how it conducts the necessary pivotal efficacy and target animal safety studies required by the FDA-CVM as part of the aquatic drug approval process, and informing the audience of the current national needs for freshwater and saltwater pivotal studies and how they can become involved.

THE AQUACULTURE INFORMATION EXCHANGE (AIE): A WEB-BASED KNOWLEDGE-SHARING AND PROJECT FACILITATION PLATFORM FOR AQUACULTURE.

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NOAA and USDA are in the process of developing a knowledge-sharing and project facilitation platform called the Aquaculture Information Exchange (AIE). Development of the AIE is in response to interagency discussions on ways to facilitate collaboration among scientists and extension at different federal agencies, academia, NGOs and industry. In addition, agencies want to create a process to foster integration of bottom up and top down ideas, and enable diverse expertise to focus on important science needs. Simultaneously, this effort addresses a longstanding aquaculture community need to facilitate knowledge sharing and enhance collaboration.

To accomplish these goals, the AIE will be organized around two different groupings of aquaculture “experts” - Communities and Work Groups. The AIE will be a flexible online platform to enable easy communication among and within aquaculture communities and enable easy facilitation of project focused deliverables produced by work groups. Communities involving individuals with all levels of expertise from both the public and private sector with interests in U.S. aquaculture and related topics.

The overall mission for this effort is to create a continually evolving online community where members feel empowered to ask, answer, and learn from one another. The AIE’s web-based communications platform will provide a space for open topic-based discussions about the latest research and developments in aquaculture that can help to keep the industry informed. . Benefits of the AIE will include expanded access to diverse aquaculture expertise, facilitation of collaboration on possible projects and funding opportunities, and enhanced bottom-up input and support for aquaculture topics. As a caveat, because the AIE is being jointly developed by NOAA and USDA, it is hoped that this platform will foster participation by many individuals from diverse backgrounds involved in aquaculture. This includes researchers, members of industry, as well as both the Land Grant and Sea Grant aquaculture extension communities. The general structure of the AIE will be developed utilizing best practices and approaches from successful models used by other science communities.

This presentation will provide a look into how the AIE is being developed as well as its structure and components and how individuals can become involved. In addition, examples of how the AIE can benefit the Land Grant and Sea Grant extension networks by bridging gaps will be discussed.

NOAA’S COMMUNITY OF PRACTICE FOR AQUACULTURE LITERACY (CoPAL): WHAT’S NEXT AND HOW TO BE INVOLVED

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Evidence shows that support for aquaculture is associated with “its perceived benefits outweighing perceived risks, trust in scientists and the process of science, and perceived credibility of the sources providing public audiences with information” (Rickard 2020). In the United States, lack of widespread support and unawareness of aquaculture as a sustainable industry demonstrates a need to develop cross-sectoral strategies to enhance public understanding and engagement with the sector. Successful strategies for outreach and education can influence how communities discuss, support, and make decisions about aquaculture products, regulations, and careers. Creative approaches for public engagement from environmental education sectors promote innovation, exploration, and community-relevant learning as a context for improving aquaculture literacy.

In this presentation, we will provide an overview of lessons learned and common goals that were identified through cross-sectoral conversations about aquaculture literacy between NOAA and its aquarium and industry partners. The insights from which are directing upcoming activities for NOAA’s Community of Practice for Aquaculture Literacy (CoPAL). We will share the approach and rationale behind how NOAA’s Office of Education, Office of Aquaculture, and National Sea Grant Office came together to co-develop CoPAL. We will also discuss how environmental educators and informal learning institutions (e.g., aquariums) provide the necessary platforms through which to build trusting relationships with, and distribute credible aquaculture information to, the general public. Additionally, we will give an update on our eeBLUE Aquaculture Literacy mini-grant program, which is managed by the North American Association for Environmental Education and driven by partnerships across NOAA, informal learning institutions, and the aquaculture industry. No one sector can tackle aquaculture literacy alone, so join us to understand how Sea Grant Extension can continue to provide crucial input and guidance as we build strategies to enhance the public’s understanding of aquaculture.

INDUSTRY RESEARCH, ENGAGEMENT AND EDUCATION NEEDS

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Sea Grant invests around \$20 million in federal funds annually to support aquaculture, research, education and engagement. To better respond to industry needs in these functional areas, Sea Grant is developing a research, education and engagement plan. The plan is being developed using information collected from multiple sources including an internal needs assessment of the Sea Grant Network and an external needs assessment of the industry, non-governmental organizations and federal agencies, and the use of existing planning documents which identify research, education and engagement needs. The three sources of information will be used to develop the final plan. Once complete, the plan will be shared with the National Sea Grant College Program to use in their deliberations when developing their competitive funding initiatives. The National Aquaculture Association has been a critical partner during the process of developing the plan. The presentation will present a high-level summary of the results of the final plan.

OFFSHORE OPTICS

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Aquaculture is a growing industry in Florida, and there is particular interest in offshore marine aquaculture. Offshore aquaculture production has the potential to help meet the protein requirements for a burgeoning population, provide seafood security and help support working waterfront communities. However, the complexity of offshore production is not fully understood by the public. In fact, there are small, but vocal, anti-aquaculture activist groups that often use false information to undermine public confidence and resists even low-impact or environmentally responsible operations. Identified concerns include that the expansion of marine aquaculture will adversely impact fishing, harm coastal communities, and degrade the oceans for other recreational users. To gain the public trust and support, some call it social license, we must show that rather than degrading opportunities and experiences for America's traditional ocean users, open ocean aquaculture can create and improve them.

In 2017, NOAA Sea Grant awarded funding to Kampachi Farms, currently Ocean Era, for the Vellella Epsilon (VE) Project. This demonstration project provides a solution to the constraints and misperceptions that currently surround U.S. domestic offshore aquaculture development by documenting the potential for demonstration projects to bring about significant changes in community receptivity to offshore aquaculture. In an initial effort to provide outreach and engagement related to this project, Florida Sea Grant organized the Pioneering Offshore Aquaculture Workshop, June 27, 2019, at Mote Marine Lab in Sarasota, FL. This workshop offered discussion of current and future offshore Aquaculture projects in the Gulf. It included presentations on important topics related to what we have experienced and understand about offshore aquaculture followed by a facilitated discussion on what knowledge gaps and concerns exist and how they can be addressed to further the development of this industry in the Gulf.

A specific concern expressed at the meeting was a lack of research-based information available. To this end funding was acquired to sponsor an intern to work with Ocean Era and Florida Sea Grant to develop a strategic communications plan for offshore aquaculture. Addressing concerns collected at the workshop and identified by stakeholders will form the basis of the plan. Additionally, funding has been applied for the development of an exhibit at Mote Marine Aquarium where we can enhance aquaculture literacy by providing information about sustainable offshore aquaculture to aquarium visitors in Sarasota, where the VE project will be deployed. The exhibit would be designed to increase viewers understanding of the complexities of offshore aquaculture and provide them with the knowledge and skills to make informed decisions about a new industry in their community. Improving aquaculture literacy of the complexities of sustainable offshore aquaculture could allow the community to better understand

proposed aquaculture operations and provide them access to critical information to more effectively assess the contributions of aquaculture to the economy.

BUSINESS AND ECONOMIC PLANNING FOR SEAWEED AQUACULTURE SYSTEMS IN THE UNITED STATES

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This presentation will provide an overview of a new project funded under the NOAA Sea Grant funding opportunity titled, “Addressing Economics and Market Needs of the U.S. Aquaculture Industry.” Kelp, *Saccharina spp.* are the most common seaweed species cultivated in the United States. Kelp farming, as well as the farming of various other seaweeds, is a significant and growing industry in the US as seaweeds, especially kelp, can be used for food, medicinal products, additives and bioremediation. With any new industry, barriers to its development and expansion always emerge. One of the greatest barriers is the lack of economic/financial information on the cultivation of domestic kelp. There is a need to better understand the realistic economic and financial parameters associated with kelp aquaculture in order for farmers, investors and lenders to make more informed decisions regarding investment in this type of venture.

The goal of this project is to support the development of a vibrant, profitable, and sustainable seaweed aquaculture industry in the United States. Project objectives include: (1) Develop business planning and management tools for kelp aquaculture systems, which improve the economic and financial viability of this industry; (2) Increase access to capital among existing and prospective seaweed farmers via an emphasis on improved industry knowledge for investors/financers/potential market entrants; (3) Conduct a comprehensive economic assessment of the ecosystem services provided by seaweed aquaculture; and (4) Develop outreach and education activities through SG extension for industry, regulators and financial institutions to support the development of a seaweed aquaculture industry. Anticipated outcomes include more access to capital, more informed business decisions by farmers, investors and lenders; increased employment; greater success of business; and environmental improvements.

SUPPORT OF THE AQUACULTURE INDUSTRY BY SEA GRANT IN RESPONSE TO THE COVID-19 PANDEMIC

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Seafood is integral to coastal and Great Lakes livelihoods and economies. When the COVID-19 pandemic struck, small seafood businesses were endangered, many restaurants closed, and the market for aquaculture products was severely compromised. Recognizing the need for innovative solutions, NOAA Sea Grant began rapid response investments in July 2020 - specifically resulting in the allocation of \$2.48 million to support the U.S. aquaculture industry. A number of projects across the US and its territories were supported beginning shortly after the pandemic occurred. Most projects are still ongoing and continue to address vital issues and topics relevant to supporting the industry including opportunities for shellfish restoration; development of innovative marketing and distribution strategies for aquacultured products; enhancing education and outreach efforts focused on seafood consumption, tourism, and consumer awareness and education; and legal issues associated with the pandemic. This presentation will provide an overview of projects supported by NOAA Sea Grant in 2020 in response to the pandemic. The presentation will also discuss future opportunities to help ensure continued industry resilience.

ENGAGEMENT OF THE SEA GRANT NETWORK THROUGH REGIONAL CHATS

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Beginning in April 2020 the National Sea Grant Office and the Sea Grant Aquaculture Liaison coordinated regional chats held virtually with the Sea Grant Network focusing on aquaculture and seafood resources. The chats were initiated as a means of exchanging information regarding grant opportunities and relief programs in response to the COVID-19 pandemic. Currently scheduled every two weeks, these one-hour chats involve four separate regions and associated Sea Grant programs: the Great Lakes (Illinois/Indiana, Lake Champlain, Michigan, Minnesota, New York, Ohio, Pennsylvania, Wisconsin); the Northeast/mid-Atlantic (Connecticut, Delaware, Maine, Maryland, MIT, New Hampshire, New Jersey, New York, Rhode Island, WHOI, Virginia); the Southeast/Gulf of Mexico (Florida, Georgia, Mississippi/Alabama, North Carolina, Puerto Rico/USVI, South Carolina, Texas); and the West Coast/Alaska/Pacific (Alaska, California, Guam, Hawaii, Oregon, Washington).

Over time chats have evolved to include additional topics of discussion aside from COVID-19. Although chats focus on updates from programs, updates are also provided by the Regional Aquaculture Coordinators, the National Sea Grant Law Center, the Sea Grant Aquaculture Liaison, and the National Sea Grant Office, time on the agenda is regularly devoted to presentations and discussion topics. For example, to date chats have included presentations delivered by NOAA and USDA programs, national aquaculture industry organizations, and student researchers and discussion topics have included needs and strategies with respect to stakeholder engagement, aquaculture literacy, and aquaculture advocacy.

These chats may be considered as a good example of establishing a community of practice which has resulted in regular and efficient communication with the ultimate goal of better addressing and responding to stakeholder needs. This presentation will provide an overview of regional chats, how they have evolved, as well as their improvement.

PIVOTING THE AQUACULTURE OUTREACH AND EDUCATION PROGRAM TO KEEP AUDIENCE ENGAGEMENT DURING THE PANDEMIC

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The University of Wisconsin-Stevens Point Northern Aquaculture Demonstration Facility (UWSP NADF) is a state-of-the-art, dynamic facility which is one of a kind in the Midwest due to the research, demonstration and education abilities. The facility's mission is to promote education and advance the discovery, dissemination, and application of knowledge for sustainable aquaculture in a northern climate. With a professionally trained staff of dedicated aquaculturists and biologists, the facility maintains a high level of expertise for conducting a myriad of projects with various cool and coldwater fish species at various life stages while leading the nation in developing a skilled and experienced workforce for the growing industry. A strong focus of the facility is to promote aquaculture education by partnering with local K-12 schools, educators, and other educational organizations. The program focuses on hands-on, interactive learning such as in-depth tours of the facility for all ages, local classroom visits, interactive booths at local events, and presentations at various public gatherings.

As with many programs, due to the pandemic, the facility's outreach and education program had to pivot from participatory to entirely virtual. To keep engagement with various audiences, the facility had to re-direct efforts into a greater online presence as well as strengthen collaborations with partners, such as Wisconsin Sea Grant, to help share projects and outcomes with a broader audience.

Top initiatives to strengthen education and outreach during the pandemic included: development and distribution of educational and technical videos, offering virtual presentation tours of the facility for all audiences, and increasing collaboration with partners such as Wisconsin Sea Grant to increase facility publications and articles as well as increased distribution of project deliverables with a broader audience. With the incorporation of these initiatives, the facility was able to maintain its outreach and education program and further reach audiences that the traditional outreach program did not reach. Examples of this includes students and educators that did not have the funding or means to visit the facility in the past, as well as an extensive audience reach and technology-transfer by showcasing research and information through video production. Many of these new initiatives will stay with the outreach program into the future due to the success, of not only reaching new audiences but also as a means of providing inclusive outreach using digital information and technology transfer.