**NRAC Priorities**

**2014**

**PROBLEM STATEMENTS**

**TRA-14-1**

**Goal: To reduce human illness caused by exposure to pathogenic *Vibrios*, thereby allowing for continued growth in the shellfish aquaculture industry in the Northeast U.S.**

**Statement of the Problem:** *Vibrio* bacteria are naturally occurring marine organisms that proliferate in warm waters. Molluscan shellfish can concentrate bacteria as they feed and thus consuming raw shellfish exposes humans to potentially pathogenic species such as *Vibrio vulnificus* and *Vibrio parahaemolyticus*. Shellfisheries resource managers need a tool to detect the presence of specifically pathogenic *Vibrios* so that they can adequately manage and ensure the safe harvest and marketing of shellfish product. Researchers have developed a simple and rapid fluorogenic procedures for the identification and enumeration of Vibrionaceae. However, while this procedure is useful in determining total Vibrionaceae levels, the predictive value has not yet been quantified. In addition, an important issue that has not been addressed by this method regarding Vibrionaceae abundance and distribution is the correlation between total Vibrionaceae and pathogenic species. To evaluate potential outbreaks, it will be essential to either identify pathogenic strains directly, or use total Vibrionaceae as an indicator of pathogenic species. This is analogous to current monitoring for total coliforms or fecal coliforms as indicators for the presence of enteric pathogens, e.g. *Salmonella* or *E. coli*. Resolution of this issue requires a critical comparison of the levels of total Vibrionaceae in seawater and shellfish, with levels of pathogenic strains of Vibrionaceae in the same seawater and shellfish samples. If there is a correlation between total Vibrionaceae and pathogenic Vibrio levels, then total Vibrionaceae may be used as an indicator of pathogenic species.

Unfortunately, detection and quantification of pathogenic species is not straightforward. Microbiological methods of detection are time consuming and are not statistically valid. Recently, molecular methods have been described using quantitative real-time PCR (qRT-PCR) for sensitive and accurate detection and enumeration of pathogenic *Vibrio* spp. in water samples and shellfish tissue. Although these methods are less time consuming than microbiological methods, they require a greater level of training and expertise, and are costly.

Potential projects may include, but are not limited to:

* Investigate and validate the use of total Vibrionaceae as an indicator of pathogenic *Vibrio* spp.
* Development and/or demonstration of improved and cost-effective methods for the rapid detection of pathogenic strains of *Vibrio* bacteria.

**TRA-14-2**

**Goal: Improved and cost-effective management of shellfish growout operations**

**Statement of the Problem:** The field growout portion of shellfish culture can be extremely labor intensive. Since shellfish growers do not typically use any herbicides or pesticides to reduce bio-fouling or repel predators, a thorough maintenance of gear in the marine environment requires the significant expenditure of time and money. Common processes for removing bio-fouling from hard clam predator control screens, oyster cages or mussel longlines have typically been a manual operation, possibly improved with a power washer. Others have employed a variety of dips with fresh water, very high salinity dips, hot water, and various other methods to keep fouling down and allow for good water flow to the cultured shellfish. This topic repeatedly comes up on the East Coast Shellfish Growers Association listserve as an area of great interest.

Successful growers have addressed biofouling but typically use the most expedient method whether or not it is totally satisfactory, mainly because of the aforementioned time and costs. There is certainly room to investigate alternative methods through research to take the cost and time impact out of the producers’ hands and have a good scientific process address it. Collaboration is essential with industry.

Predation by numerous species has a large impact on overall crop survival. Cow-nosed rays, various crab species and starfish pose problems for growers. The ray issue has grown significantly over the past 15 years, and if crops are left uncovered, can be devastating. Since these species will simply not go away, new innovative techniques are needed to reduce their populations near cultured shellfish.

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Examples of specific issues – Lowering input cost in management and operation through:

* + - Reduction in biofouling problems.
		- Control of shellfish predators such as cow-nosed rays and invertebrates including crabs and starfish.

**TRA-14-3**

**Goal: Improving aquaculture production by lowering input costs**

**Statement of the problem:** High input costs (e.g. energy, capital equipment, space) related to the production of aquatic organisms continues to hinder growth of the aquaculture industry in the Northeast region. For example, high energy costs related to the pumping, heating and cooling of water reduce competitiveness of the industry. Handling activities such as grading and counting aquatic crop species tends to be inefficient as practiced in the Northeast and need improved engineering to reduce labor and improve consistency of the end product. NRAC seeks proposals that will research and demonstrate innovative production technologies resulting in reduced input costs.

Examples of specific issues – Lowering input cost in management and operation through:

* + - Alternative energy sources
		- More efficient, labor reducing systems engineering
		- More effective spatial use – i.e., three-dimensional culture with plants, shellfish, finfish

**TRA-14-4**

**Goal: Increasing profitability and/or marketability through product diversification**

**Statement of the problem:** Many existing aquaculture operations can improve profits through diversification of new products, thereby spreading out the capital costs. Unused waste-stream products have potential to provide input for propagating a new species in existing operations. Proposals from existing or new producers should be outcome oriented. Additional species may be added to a producer’s product line by utilizing the waste stream from existing operations for improved sustainability.

The Chesapeake region is threatened by many unwanted or invasive species. Research proposals focusing on the cultivation of native plants or animals that can be used for bioremediation, mitigation, or ecological restoration will qualify for this problem statement.

Examples of specific issues – increasing crop diversification by examining:

* + - New species potential
		- Cultivating and propagating native plants for the ornamental aquatic plant industry that have bioremediation or ecological services potential

**TRA-14-5**

**Goal: Improving shellfish and finfish health maintenance and disease control**

**Statement of the problem:** Animal health is a constant concern for aquatic animal production facilities and an issue that is commonly listed as a primary research need in aquaculture producer surveys. Shellfish and finfish diseases are continuously evolving and spreading, resulting in a high level of risk that requires careful management of cultured animals. In addition to disease, pests and environmental threats to animal health such as harmful algal blooms impact the grower’s bottom line. Better information is required in the areas of disease etiology, prevention, and/or treatment to provide producers with the best management tools available for minimizing the impact of disease. Proposals are solicited that address further development of our knowledge-base of pathogenic and non-pathogenic health strategies that lead to improved health management and improved production on the farm.

Specific issues for minimizing crop loss through effective control and/or prophylaxis might target:

* + Non-chemical control of parasitic copepods in salt and freshwater
	+ Husbandry-management strategies for coping with Harmful Algal Blooms (HABs); especially newer species in the Northeast such as *Cochlodinium polykrikoides*

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**TRA-14-6**

**Goal: Improving site selection and reducing user conflicts in marine aquaculture systems**

**Statement of the problem:** Siting aquaculture operations in the marine environment, whether in estuaries or offshore, can lead to both real or perceived conflicts with other stakeholders. As mapping (and potentially regulation) of ocean uses, including marine protected areas, develops as a component of marine spatial planning (MSP), a thorough analysis of relevant siting factors related to shellfish, finfish and macroalgal aquaculture is warranted. Geographic Information Systems (GIS) can be used to visually display and provide quantitative analysis of factors that influence siting of aquaculture operations. Development of appropriate siting factors (data layers including metadata) of value to the aquaculture industry will assist the marine spatial planning effort and ensure that the needs of aquaculture operators are fully considered.

Specific issues – Examining user conflict issues with regard to land-water and its interface by:

* Conducting an analysis of coastal spatial conflicts between user groups with recommended policy considerations
* Develop a rationale for the “layers” that need to be considered in a GIS format MSP exercise

**2015**

**TRA-15-1**

**Goal: To reduce human illness caused by exposure to pathogenic *Vibrios*, thereby allowing for continued growth in the shellfish aquaculture industry in the Northeast U.S.**

**Statement of the Problem:** *Vibrio* bacteria are naturally occurring marine organisms that proliferate in warm waters. Molluscan shellfish can concentrate bacteria as they feed and thus consuming raw shellfish exposes humans to potentially pathogenic species such as *Vibrio vulnificus* and *Vibrio parahaemolyticus*. Shellfisheries resource managers need a tool to detect the presence of specifically pathogenic *Vibrios* so that they can adequately manage and ensure the safe harvest and marketing of shellfish product. Researchers have developed a simple and rapid fluorogenic procedures for the identification and enumeration of Vibrionaceae. However, while this procedure is useful in determining total Vibrionaceae levels, the predictive value has not yet been quantified. In addition, an important issue that has not been addressed by this method regarding Vibrionaceae abundance and distribution is the correlation between total Vibrionaceae and pathogenic species. To evaluate potential outbreaks, it will be essential to either identify pathogenic strains directly, or use total Vibrionaceae as an indicator of pathogenic species. This is analogous to current monitoring for total coliforms or fecal coliforms as indicators for the presence of enteric pathogens, e.g. *Salmonella* or *E. coli*. Resolution of this issue requires a critical comparison of the levels of total Vibrionaceae in seawater and shellfish, with levels of pathogenic strains of Vibrionaceae in the same seawater and shellfish samples. If there is a correlation between total Vibrionaceae and pathogenic Vibrio levels, then total Vibrionaceae may be used as an indicator of pathogenic species.

Unfortunately, detection and quantification of pathogenic species is not straightforward. Microbiological methods of detection are time consuming and are not statistically valid. Recently, molecular methods have been described using quantitative real-time PCR (qRT-PCR) for sensitive and accurate detection and enumeration of pathogenic *Vibrio* spp. in water samples and shellfish tissue. Although these methods are less time consuming than microbiological methods, they require a greater level of training and expertise, and are costly.

Potential projects may include, but are not limited to:

* Investigate and validate the use of total Vibrionaceae as an indicator of pathogenic *Vibrio* spp.
* Development and/or demonstration of improved and cost-effective methods for the rapid detection of pathogenic strains of *Vibrio* bacteria.

**TRA-15-2**

**Goal: Improved and cost-effective management of shellfish growout operations**

**Statement of the Problem:** The field growout portion of shellfish culture can be extremely labor intensive. Since shellfish growers do not typically use any herbicides or pesticides to reduce bio-fouling or repel predators, a thorough maintenance of gear in the marine environment requires the significant expenditure of time and money. Common processes for removing bio-fouling from hard clam predator control screens, oyster cages or mussel longlines have typically been a manual operation, possibly improved with a power washer. Others have employed a variety of dips with fresh water, very high salinity dips, hot water, and various other methods to keep fouling down and allow for good water flow to the cultured shellfish. This topic repeatedly comes up on the East Coast Shellfish Growers Association listserve as an area of great interest.

Successful growers have addressed biofouling but typically use the most expedient method whether or not it is totally satisfactory, mainly because of the aforementioned time and costs. There is certainly room to investigate alternative methods through research to take the cost and time impact out of the producers’ hands and have a good scientific process address it. Collaboration is essential with industry.

Predation by numerous species has a large impact on overall crop survival. Cow-nosed rays, various crab species and starfish pose problems for growers. The ray issue has grown significantly over the past 15 years, and if crops are left uncovered, can be devastating. Since these species will simply not go away, new innovative techniques are needed to reduce their populations near cultured shellfish.

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Examples of specific issues – Lowering input cost in management and operation through:

* + - Reduction in biofouling problems.
		- Control of shellfish predators such as cow-nosed rays and invertebrates including crabs and starfish.

**TRA-15-3**

**Goal: Improving aquaculture production by lowering input costs**

**Statement of the problem:** High input costs (e.g. energy, capital equipment, space) related to the production of aquatic organisms continues to hinder growth of the aquaculture industry in the Northeast region. For example, high energy costs related to the pumping, heating and cooling of water reduce competitiveness of the industry. Handling activities such as grading and counting aquatic crop species tends to be inefficient as practiced in the Northeast and need improved engineering to reduce labor and improve consistency of the end product. NRAC seeks proposals that will research and demonstrate innovative production technologies resulting in reduced input costs.

Examples of specific issues – Lowering input cost in management and operation through:

* + - Alternative energy sources
		- More efficient, labor reducing systems engineering
		- More effective spatial use – i.e., three-dimensional culture with plants, shellfish, finfish

**TRA-15-4**

**Goal: Increasing profitability and/or marketability through product diversification**

**Statement of the problem:** Many existing aquaculture operations can improve profits through diversification of new products, thereby spreading out the capital costs. Unused waste-stream products have potential to provide input for propagating a new species in existing operations. Proposals from existing or new producers should be outcome oriented. Additional species may be added to a producer’s product line by utilizing the waste stream from existing operations for improved sustainability.

The Chesapeake region is threatened by many unwanted or invasive species. Research proposals focusing on the cultivation of native plants or animals that can be used for bioremediation, mitigation, or ecological restoration will qualify for this problem statement.

Examples of specific issues – increasing crop diversification by examining:

* + - New species potential
		- Cultivating and propagating native plants for the ornamental aquatic plant industry that have bioremediation or ecological services potential

**TRA-15-5**

**Goal: Improving shellfish and finfish health maintenance and disease control**

**Statement of the problem:** Animal health is a constant concern for aquatic animal production facilities and an issue that is commonly listed as a primary research need in aquaculture producer surveys. Shellfish and finfish diseases are continuously evolving and spreading, resulting in a high level of risk that requires careful management of cultured animals. In addition to disease, pests and environmental threats to animal health such as harmful algal blooms impact the grower’s bottom line. Better information is required in the areas of disease etiology, prevention, and/or treatment to provide producers with the best management tools available for minimizing the impact of disease. Proposals are solicited that address further development of our knowledge-base of pathogenic and non-pathogenic health strategies that lead to improved health management and improved production on the farm.

Specific issues for minimizing crop loss through effective control and/or prophylaxis might target:

* + Non-chemical control of parasitic copepods in salt and freshwater
	+ Husbandry-management strategies for coping with Harmful Algal Blooms (HABs); especially newer species in the Northeast such as *Cochlodinium polykrikoides*

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**TRA-15-6**

**Goal: Improving site selection and reducing user conflicts in marine aquaculture systems**

**Statement of the problem:** Siting aquaculture operations in the marine environment, whether in estuaries or offshore, can lead to both real or perceived conflicts with other stakeholders. As mapping (and potentially regulation) of ocean uses, including marine protected areas, develops as a component of marine spatial planning (MSP), a thorough analysis of relevant siting factors related to shellfish, finfish and macroalgal aquaculture is warranted. Geographic Information Systems (GIS) can be used to visually display and provide quantitative analysis of factors that influence siting of aquaculture operations. Development of appropriate siting factors (data layers including metadata) of value to the aquaculture industry will assist the marine spatial planning effort and ensure that the needs of aquaculture operators are fully considered.

Specific issues – Examining user conflict issues with regard to land-water and its interface by:

* Conducting an analysis of coastal spatial conflicts between user groups with recommended policy considerations
* Develop a rationale for the “layers” that need to be considered in a GIS format MSP exercise

**2016**

**TRA-16-1**

**Goal: Increasing profitability and/or marketability through product diversification**

**Statement of the Problem:** Existing aquaculture businesses can improve profits by diversifying into new products, thereby spreading out their capital costs and increasing products for marketing. For instance, currently unused waste-stream products have potential to be modified into commercial products for application to alternative markets or used in a different application. Also innovative approaches to system integration with other technologies such as aquaponics, IMTAS, and green-roof industries or using aquaculture as a means for providing ecological services could show promise. Regardless, proposals should be outcome oriented. Additional species or products may be added to a producer’s line from existing operations for improved sustainability. Markets can be identified for new or existing products, including waste-stream utilization, through research that will determine the ecological, socio-economic, and ethnic factors associated with the outcome of the project.

Examples of specific issues for improving profitability may include:

* + - New species potential, especially in urban settings
		- Developing value-added products from aquaculture and waste materials
		- Commercially cultivating and propagating native plants and/or animals with bioremediation, ecological services, or ecological restoration potential
		- Research on how to penetrate and/or expand into markets more efficiently using targeted socio-economic and ethnic factors. Determine expectancy of success by investigating aspects of “grow-local, buy-local” demand for producers and marketers to service currently non or underserved populations with aquaculture products. Examine the value of “USA Produced” products.

**TRA-16-2**

**Goal: Improving aquaculture production through cost-effective management, improved efficiency, and reduction of input costs**

**Statement of the Problem:** NRAC seeks proposals that will research and demonstrate innovative production technologies resulting in reduced input costs such as:

* High input costs (e.g., labor, energy, capital equipment, feeds, space) related to the production of aquatic organisms continues to hinder growth of the aquaculture industry in the Northeast region. For example, high energy costs related to the pumping, heating, and cooling of water reduce competitiveness of the industry. Handling activities such as grading and counting aquatic crop species tends to be inefficient as practiced in the Northeast and needs improved engineering to reduce labor and increase consistency of the end product. Improved methods for reducing labor associated with biofouling and predator control are needed for producers.
* Breeding programs to improve performance of aquaculture species are needed to reduce time to market, improve disease resistance, yield, and various domesticated traits.
* Improved feeds that will provide for reduced rearing costs, lowered fish meal protein inputs, increased survivability, and improved health.
* Research leading to the elimination of gaps in knowledge related to closing the life cycle of targeted species.
* The regulatory burden associated with aquaculture is a recognized obstacle. Research leading to science based knowledge to inform policies that reduce the cost of compliance for aquaculture production while preserving the opportunity for federal, state, and local oversight will be entertained.
	+ - Climate change specifically ocean acidification (OA) is a growing concern for the aquaculture industry. Research leading to implementable production strategies, such as timing of production, larval development, shell formation, spat set timing, siting, and/or broodstock genetics that may be more tolerant to OA, will be considered. Ideas must be cost-effective with localized applications.

**Collaboration with industry is essential.**

Examples may include:

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* + - Reduction in biofouling problems
		- Control of predators
		- Energy-efficient systems and alternative energy sources
		- Engineering of more efficient, labor-reducing systems
		- More effective spatial use – i.e., multitrophic aquaculture
		- Development towards domesticated broodstocks
		- Use of novel or sustainable protein/oil sources
		- Nutritional requirements research

**TRA-16-3**

**Goal: Improving shellfish and finfish health maintenance, disease control, and biosecurity**

**Statement of the problem:** Animal health is a constant concern for aquatic animal production facilities and an issue that is commonly listed as a primary research need in aquaculture producer surveys. Shellfish and finfish diseases are evolving and spreading continuously, resulting in a high level of risk that requires careful management of cultured animals. In addition to disease, pests and environmental threats to animal health, such as harmful algal blooms, impact the grower’s bottom line. Better information is required in the areas of disease etiology, prevention, and/or treatment to provide producers with the best management tools available for minimizing the impacts of disease. Proposals are solicited that address further development of our knowledge-base of pathogenic and non-pathogenic health strategies that lead to improved health management and improved production **on the farm**.

Potential projects may include, but are not limited to:

* Development of cost-effective assays for detection of aquatic animal pathogens, diseases, and toxic agents in finfish and shellfish tissues and environmental samples
* Communicating full knowledge of viral and bacterial infections and their replication
* Developing and/or demonstrating improved and cost-effective methods for the rapid detection of pathogenic strains of *Vibrio* bacteria
* Minimizing crop loss through effective control and/or prophylaxis targeting non-chemical control of parasitic copepods in salt and freshwater
* Husbandry-management strategies for coping with Harmful Algal Blooms (HABs), especially newer species in the Northeast such as *Cochlodinium polykrikoides*
* Identifying, preventing, and managing finfish diseases relevant to the Northeast and elsewhere
* Improving detection methods for identifying and quantifying Norovirus in shellfish

**2017**

**TRA-17-1**

**Goal: Research and demonstrate opportunities for increased profitability**

**Statement of the Problem:** There are a number of limitations in the development and growth of aquaculture in the northeast. NRAC seeks proposals that will increase profitable production by demonstrating:

* Lowering input costs (e.g., labor, energy, capital equipment, feeds, space) related to the production of aquatic organisms. For example, high energy costs, related to the pumping, heating, and cooling of water, reduce competitiveness of the industry. Handling activities such as grading and counting aquatic crop species tends to be inefficient as practiced in the Northeast and needs improved engineering to reduce labor costs and increase consistency of the end product.
* Developing value-added products from aquaculture and aquaculture waste materials.
* Creating the potential for bioremediation, ecological services, and/or ecological restoration.
* Improving methods for reducing labor associated with biofouling and predator control, especially for predators that are invasive, novel, non-endemic, or emergent.
* Refining breeding programs to improve performance of aquaculture species to reduce time to market, improve disease resistance, yield, and various domesticated traits.
* Improving feeds that will result in reduced rearing costs, lowered fish meal protein inputs, increased survivability, and improved health.
* Research leading to the elimination of gaps in knowledge related to closing the life cycle of targeted species.
* Developing the knowledge-base of pathogenic and non-pathogenic health strategies that lead to improved health management and improved production **on the farm**.
* Marketing research on how to penetrate and/or expand into markets more efficiently using targeted social, economic and ethnic factors. Determine expectancy of success by investing aspects of “grow-local, buy-local” demand for producers and marketers to service currently non- or underserved populations with aquaculture products. Examine the value of “USA Produced” products and the depth of those available markets.

**Collaboration with industry and/or extension is essential.**

Examples may include:

* Novel marketing or value-added strategies
* Control of predators
* Energy-efficient systems and alternative energy sources
* Engineering of more efficient, labor-reducing systems
* More effective spatial use – i.e., multitrophic aquaculture
* Development towards domesticated broodstocks
* Reduction in biofouling problems
* Use of novel or sustainable protein/oil sources
* Nutritional requirements research

**TRA-17-2**

**Goal: Identify and describe existing access, economic, and regulatory barriers in the northeast.**

**Statement of the Problem**: The entry of new players and the expansion of current aquaculture businesses in the northeast is limited by a lack of understanding of the myriad of regulatory processes and requirements which often vary on a state-by-state basis. Farmers, both current and incoming, must have access to information resources that assist in the establishment, operation and marketing of aquaculture businesses. Therefore, the NRAC TIAC sees a need for an assessment and compilation of relevant information on aquaculture and aquaculture business development. This inventory should be compiled in a way that is readily accessible to the aquaculture industry. What are the best strategies for archiving and providing access to the compiled inventory? Information in the inventory should be organized by state and include:

* What species are grown in each state?
* What permits are needed and how do you get them?
* What are the relevant regulations?
	+ Poaching and theft
	+ BMP for regulators
* What application processes are required to enter the aquaculture business? Which agencies are involved?
* Business plans and economic analyses
* Are resources available to help with business plan development? Where are those resources and how can they be accessed?
* Who are the relevant contacts?
* State aquaculture coordinator
* Business planner
* Resource manager
* What are the critical access questions?
* Requirements for active use
* Are there non-utilized leases and what is their fate?
* Create a “road map” for users

**2018**

 **TRA-18-1**

**Goal: Research and demonstrate opportunities for increased profitability**

**Statement of the Problem:** A number of limitations affect the development and growth of aquaculture in the northeast. NRAC seeks proposals to increase profitable production by:

* Lowering input costs (e.g., labor, energy, capital equipment, feeds, and space) related to the production of aquatic organisms. For example, high-energy costs for pumping, heating, and cooling water, reduce the competitiveness of the industry. Handling activities such as grading and counting aquatic crop species tends to be inefficient as practiced in the Northeast and needs engineering to reduce labor costs and increase consistency of the end product.
* Developing value-added products from aquaculture and aquaculture waste materials.
* Creating potential for bioremediation, ecological services, and/or ecological restoration using aquaculture products and/or methods.
* Improving methods for reducing labor associated with biofouling and predator control, especially for predators that are invasive, novel, non-endemic, or emergent.
* Demonstrate the effectiveness of breeding for improving production efficiency and/or product quality in the commercial sector.
* Improving feeds that result in reduced rearing costs, lowered fish-meal protein inputs, increased survivability, and improved health.
* Research leading to the elimination of knowledge gaps related to closing the life cycle of targeted species.
* Developing the knowledge-base of pathogenic and non-pathogenic health strategies that lead to improved health management and improved production **on the farm**.
* Market research on how to penetrate and/or expand into markets more efficiently using targeted social, economic, and ethnic factors. Determine expectancy of success by investing aspects of “grow-local, buy-local” demand for producers and marketers to service currently non- or underserved populations with aquaculture products. Examine the value of “USA Produced” products and the depth of available markets.
* Modifying farming and production strategies in response to environmental change.

**Collaboration with industry and/or extension is essential. These individuals must be identified and their participation/support in the project specified with budget as appropriate.**

* Examples may include:
* Novel marketing or value-added strategies
* Control of predators
* Energy-efficient systems and alternative energy sources
* Engineering of more efficient, labor-reducing systems
* More effective spatial production techniques, *i.e.*, multitrophic aquaculture including aquaponics, especially in urban areas
* Development of domesticated broodstock
* Reduction in biofouling effects
* Use of novel or sustainable protein/oil sources
* Nutritional requirements research

**TRA-18-2**

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**Goal: Co-production between industry and NRAC extension network leads to targeted outputs, technology transfer, and workshops that disseminate existing technology underutilized on northeast farms yielding outcomes that result in overall growth of the industry in the Northeast.**

**Statement of the Problem**: NRAC has generated novel and important solutions for aquaculture in the northeast. NRAC seeks proposals that will increase the on-farm utilization and implementation of successful science-based solutions generated by its previously funded projects. These can include, but are not limited to:

* Workshops that target training industry groups about beneficial, but underutilized technology, that was generated through NRAC research
* On-farm training/demonstration programs that help drive technological solutions
* Multi- and social-media content that effectively and professionally describes NRAC products

**Explicit collaboration with previous researchers and current industry members is essential for the success of these projects.**

**2019**

 **TRA-19-1**

**Goal: Research and demonstrate opportunities for increased profitability.**

**Statement of the Problem:** Aquaculture in the Northeast region includes a vast array of species, systems and industries. NRAC funds projects focused on all aspects of aquaculture relevant to inland and coastal states in the region. Nonetheless, a number of limitations continue to affect the development and growth of aquaculture in the Northeast. NRAC seeks proposals to increase profitable production by:

* Lowering input costs (e.g., labor, energy, capital equipment, feeds, and space) related to the production of aquatic organisms.
* Developing value-added products from aquaculture and aquaculture waste materials.
* Market research on how to penetrate and/or expand into markets more efficiently using targeted social, economic, cultural and ethnic factors.
* Creating potential for bioremediation, ecological services, and/or ecological restoration using aquaculture products and/or methods.
* Demonstrating the effectiveness of breeding and/or strain selection for improving production efficiency and/or product quality in the commercial sector.
* Improving feeds that result in reduced rearing costs, lowered fish-meal protein inputs, increased survivability, and improved health.
* Research leading to the elimination of knowledge gaps related to closing the life cycle of species with aquaculture value.
* Developing the knowledge-base of infectious and non-infectious diseases to improve health management and improved production **on the farm**.
* Proactive approaches and novel research for industry and managers to mitigate impacts such as harvest closures arising from new or emerging pathogens (HABs, vibrio, etc).
* Modifying farming and production strategies in response to environmental change.
* Improving methods for reducing labor associated with biofouling and predator control, especially for predators that are invasive, novel, non-endemic, or emergent.

**Collaboration with industry and/or extension/outreach is required. These individuals must be identified and their participation explicitly detailed in the proposal. A budget must be included for all co-investigators and the extension point/outreach person.**

* Examples may include:
* Novel marketing or value-added strategies
* Energy-efficient systems and alternative energy sources
* Engineering of more efficient and/or labor-reducing systems
* Multitrophic aquaculture including aquaponics, especially in urban areas
* Development of domesticated broodstock
* Reduction in biofouling or predator losses
* Use of novel or sustainable protein/oil sources
* Nutritional requirements research
* Increase consistency of end products.
* Valuation of “USA Produced” products and exploration of new markets.

**2020**

**TRA 20-1**

**Goal:** Create innovative strategies addressing social barriers to development and expansion of the aquaculture industry in the Northeast region.

**Statement of the problem**: Social issues such as negative public perception, regulatory burden, user conflicts, and constraints in markets and distribution networks limit the sustainable expansion of the aquaculture industry. NRAC seeks to fund the development, implementation, and adoption of innovative approaches to foster the expansion of the industry in the region. This research could focus on:

* Effective communication and dissemination of science-based facts about aquaculture.
* Addressing social barriers to the expansion of the industry, such as issues with public perception and user conflicts.
* New approaches for streamlining the permit approval process and decreasing the regulatory burden while preserving accurate and fair stakeholder input and biological and social sustainability.
* Social strategies for addressing the negative perceptions of aquaculture: such as processes for organic and sustainability certification or considerations based on targeting social, economic, cultural, and ethnic factors.

**NRAC funds multistate, outcome-based research, and deliverables should be clearly specified.**

**Collaboration with industry and/or extension is required. These individuals must be identified and their participation explicitly detailed in the proposal.**

 **TRA-20-2**

**Goal: Research and demonstrate opportunities for increased profitability.**

**Statement of the Problem:** Aquaculture in the Northeast region includes a vast array of species, systems and industries. NRAC funds projects focused on all aspects of aquaculture relevant to inland and coastal states in the region. Nonetheless, a number of limitations continue to affect the development and growth of aquaculture in the Northeast. NRAC **seeks proposals to increase profitable production** by:

* Lowering input costs (e.g., labor, energy, capital equipment, feeds, and space) related to the production of aquatic organisms.
* Developing value-added products from aquaculture and aquaculture waste materials.
* Creating potential for bioremediation, ecological services, and/or ecological restoration using aquaculture products and/or methods.

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* Demonstrating the effectiveness of breeding and/or strain selection for improving production efficiency and/or product quality on the farm.
* Improving feeds that result in reduced rearing costs, lowered fish-meal protein inputs, increased survivability, and improved health.
* Elimination of knowledge gaps related to closing the life cycle of species with aquaculture value.
* Developing the knowledge-base of infectious and non-infectious diseases to improve health management and improved production **on the farm**.
* Novel research from the natural and social sciences and proactive approaches to mitigate impacts such as harvest closures arising from new or emerging pathogens (HABs, vibrio, etc.).
* Modifying farming and production strategies in response to environmental change.
* Improving methods for reducing labor associated with biofouling and predator control, especially for predators that are invasive, non-endemic, or emergent.

**NRAC funds multistate, outcome-based research, and deliverables should be clearly specified.**

**Collaboration with industry and/or extension is required. These individuals must be identified and their participation explicitly detailed in the proposal.**

**2021**

**TRA 21-1**

**Goal:** Create innovative strategies addressing social barriers to development and sustainable expansion of the aquaculture industry in the Northeast region.

**Statement of the problem**: Social, political, and economic issues, including public perceptions, user conflicts, regulatory and legal issues, and constraints in markets and distribution networks, limit sustainable expansion of the aquaculture industry. NRAC seeks to fund development, implementation, and adoption of innovative approaches that foster regional industry growth and success. Proposals could focus on:

* Addressing social barriers that inhibit sustainable expansion of the aquaculture industry, such as issues with public perception or user conflicts.
* Identifying and assessing the benefits, and/or potential unintended consequences, of industry expansion relative to social carrying capacity.
* Developing approaches that simplify the permit approval process, decrease the regulatory burden, and promote regulatory harmonization among states within the region, while preserving accurate and fair stakeholder input and biological and social sustainability.
* Communicating and disseminating effective science-based information about aquaculture.
* Identifying or implementing social strategies that improve public perceptions of aquaculture, for example: certification processes and standards for organic, ethical, or sustainable production, or strategies addressing social, economic, or ethnic considerations.
* Evaluating and quantifying ecological, economic, social, and cultural benefits of aquaculture and how these may inform regulations, blue carbon credits, or other novel opportunities.

**NRAC funds multistate, outcome-based research, and deliverables should be clearly specified.**

**Collaboration with industry and/or extension is required. These individuals must be identified and their participation explicitly detailed in the proposal.**

**TRA-21-2**

**Goal:** Research and demonstrate opportunities for increased profitability.

**Statement of the Problem:** Aquaculture in the Northeast region includes a diversity of species, systems, and industries. NRAC funds projects focused on all aspects of aquaculture relevant to inland and coastal states in the region, but with an emphasis on factors that continue to constrain the development, growth and profitability of aquaculture in the Northeast. NRAC seeks proposals that increase profitable production by:

* Lowering input costs (e.g., labor, energy, capital equipment, feeds, and space) related to the production of aquatic organisms.
* Developing value-added products from aquaculture and aquaculture waste materials.
* Creating potential for bioremediation, ecological services, and/or ecological restoration using aquaculture products and/or methods.
* Demonstrating the effectiveness of breeding and/or strain selection for improving production efficiency and/or product quality on the farm.
* Improving feeds to lower rearing costs, reduce fish-meal protein inputs, improve health, promote growth, and increase survival.
* Eliminating knowledge gaps related to closing the life cycle of species with aquaculture value.
* Expanding upon the knowledgebase of infectious and non-infectious disease to improve health management and production on the farm.
* Modifying farming and production strategies in response to environmental change and industry expansion.
* Reducing labor inputs associated with biofouling and predator control, particularly for invasive, non-endemic, or emergent biofouling organisms or predators.
* Developing organic certification standards and assessment of the path towards implementation in the region.

**NRAC funds multistate, outcome-based research, and deliverables should be clearly specified.**

**Collaboration with industry and/or extension is required. These individuals must be identified and their participation explicitly detailed in the proposal.**

**2022**

**TRA-22-1**

**Goal:** Develop and/or improve aquaculture marketing and sales strategies that facilitate growth of the aquaculture industry that address issues of oversupply and market disruption.

**Statement of the Problem:** The widespread disruption of aquaculture product distribution caused by the COVID pandemic poses unique opportunities for our industry to identify and exploit marketing strategies aimed at correcting for market disruptions, assisting with growth of traditional markets, and penetration of aquaculture products into non-traditional markets. NRAC seeks proposals that address:

* Unique strategies for expanded distribution of aquaculture products including e-commerce, direct retail, CSAs, and regional cooperatives.
* Strategies for industry resilience in the face of market saturation and/or large-scale market or distribution disruptions (pandemic, storms).
* Developing organic certification standards and assessment of the path towards implementation in the region.
* Developing value-added products from aquaculture and aquaculture-waste materials; post-harvest processing, etc.
* Blue carbon/nitrogen credits and the development of one or more regional ecosystem services markets.
* Review of the aquaculture industry's vulnerabilities exposed by the pandemic and identification of strategies for how those can be mitigated moving forward.
* Mechanisms to support more effective crop-insurance programs that are directly relevant to aquaculture

**NRAC funds multistate, outcome-based research. Project deliverables should be clearly specified. Collaboration with industry and/or Extension is required. These individuals must be identified, and their participation explicitly detailed in the proposal. Communicating and disseminating effective, science-based information about aquaculture in central to the NRAC mission. Dissemination plans should be clearly outlined in every proposal.**

**TRA-22-2**

**Goal:** Research and demonstrate opportunities for increased profitability.

**Statement of the Problem:** Aquaculture in the Northeast region includes a diversity of species, systems, and industries. NRAC funds projects focused on all aspects of aquaculture relevant to inland and coastal states in the region, but with an emphasis on factors that continue to constrain the development, growth and profitability of aquaculture in the Northeast. NRAC seeks proposals that increase profitable production by:

* Lowering input costs (e.g., labor, energy, capital equipment, feeds, and space) related to the production of aquatic organisms.
* Creating potential for bioremediation, ecological services, and/or ecological restoration using aquaculture products and/or methods.
* Demonstrating the effectiveness of breeding and/or strain selection for improving production efficiency and/or product quality on the farm.
* Improving feeds to lower rearing costs, reduce fish-meal protein inputs, improve health, promote growth, and increase survival.
* Eliminating knowledge gaps related to closing the life cycle of species with existing or potential aquaculture value.
* Expanding upon the knowledgebase of infectious and non-infectious diseases to improve health management and production on the farm.
* Modifying farming and production strategies in response to environmental change, large-scale disruptions, and industry expansion.
* Reducing labor inputs associated with biofouling and predator control, particularly for invasive, non-endemic, or emergent biofouling organisms or predators.
* Addressing issues related to food safety, record keeping, and traceability deriving from the Food Safety Modernization Act (FSMA).

**NRAC funds multistate, outcome-based research. Project deliverables should be clearly specified. Collaboration with industry and/or Extension is required. These individuals must be identified, and their participation explicitly detailed in the proposal. Communicating and disseminating effective, science-based information about aquaculture is central to the NRAC mission. Dissemination plans should be clearly outlined in every proposal.**

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**TRA-22-3**

**Goal:** Create innovative strategies addressing social barriers to development and sustainable expansion of the aquaculture industry in the Northeast region.

**Statement of the problem:** Social, political, and economic issues, including public perceptions, user conflicts, regulatory and legal issues, limit sustainable expansion of the aquaculture industry. NRAC seeks to fund development, implementation, and adoption of innovative approaches that foster regional industry growth and success. Proposals could focus on:

* Addressing social barriers that inhibit sustainable expansion of the aquaculture industry, such as issues with public perception or user conflicts, including but not limited to demonstration of aquaculture technologies that improves public and management understanding of on-farm production.
* Best Management Practices for siting of new farms.
* Understanding social carrying capacity of the industry.
* Understanding successful litigation strategies in permitting aquaculture, including reviewing case law at the federal and state level (e.g., Right-to-Farm laws, pre-permitting regulatory consultations).
* Developing approaches that simplify the permit approval and renewal process, decrease the regulatory burden, and promote regulatory harmonization across states within the region, while preserving accurate and fair stakeholder input and biological and social sustainability.
* Evaluating and quantifying ecological, economic, social, and cultural benefits of aquaculture and how these may inform regulations, blue carbon credits, or other novel opportunities.

**NRAC funds multistate, outcome-based research. Project deliverables should be clearly specified. Collaboration with industry and/or Extension is required. These individuals must be identified, and their participation explicitly detailed in the proposal. Communicating and disseminating effective, science-based information about aquaculture is central to the NRAC mission. Dissemination plans should be clearly outlined in every proposal.**