The following multi-year National Sea Grant aquaculture research projects were selected in 2014 (first year of 2-year projects)

Sea Grant College Program	Investigator	Investigator Affiliation	Project Title	FY14 Federal Share	FY14 Matching Funds
California Sea Grant	Olin	University of California – San Diego	Sustainable marine aquaculture in the Southern California Bight: a case study on environmental and regulatory confidence	$192,599	$89,463
Delaware Sea Grant	Jardine	University of Delaware	Economics of Ecosystem Services from Oyster Aquaculture	$164,341	$81,102
Illinois-Indiana Sea Grant	Trushenski	Southern Illinois University	Developing a Food and Drug Administration-approved Therapeutic Drug for Treating Diseases of Cultured Marine Fishes	$147,382	$81,138
Lousiana Sea Grant	Supan	Louisiana State University	On-board rapid cooling of cultured oysters to address regulatory needs	$109,077	$58,300
Woods Hole Sea Grant	Smolowitz	Roger Williams University	Research to Inform Regulatory Decisions on the Management of *Vibrio parahaemolyticus* in Massachusetts Shellfish Growing Areas	$144,892	$72,449
Mississippi-Alabama Sea Grant	Kim	Mississippi State University	Validation of Field-Applicable Detection Kits for Total and Pathogenic Vibrio parahaemolyticus in Oysters	$67,969	$34,108
Mississippi-Alabama Sea Grant	Blaylock	University of Southern Mississippi	Increasing the Reliability, Nutritional Value, and Economic Viability of Large-Scale Copepod Production for Marine Fish Larviculture	$242,827	$123,896
New Jersey Sea Grant	Bushek	Rutgers University	Minimizing Risks of Vibrio Bacteria in Farm-Raised Oysters in Intertidal Environments	$197,498	$98,751
New York Sea Grant	Rivara	Cornell University Cooperative Extension	Development of small, local shellfish hatcheries and improving the production capacity for established hatcheries culturing the Eastern oyster, *Crassostrea virginica*	$98,827	$58,506
Oregon Sea Grant	Waldbusser	Oregon State University	Improving Juvenile Oyster Survival through Adaptation and Screening of Ocean Acidification Impacts	$190,975	$91,410
Rhode Island Sea Grant	Uchida	University of Rhode Island	Risk of Food-Borne Diseases in Farmed Oysters: Economic Analysis of Consumer Response and Producers' Strategy	$176,375	$88,209
Virginia Sea Grant	Carnegie	Virginia Institute of Marine Science	Streamlining Biosecurity Management in the Context of Regional Molluscan Shellfish Transfers	$266,989	$134,091
Washington Sea Grant	Young	University of Washington	Development and Commercial Transfer of Technologies to Improve the Hatching Success and Production of Juvenile Black Cod (Sablefish), *Anoplopoma fimbria.*	$237,528	$163,195
Washington Sea Grant	Hauser	University of Washington	A new native species for shellfish aquaculture and precautionary guidelines to protect wild populations: local adaptation, population structure and broodstock development in rock scallops (*Crassadoma*	$236,216	$160,535
Wisconsin Sea Grant	Hartleb	University of Wisconsin-Stevens Point	Production and Economic Evaluations of New Technologies for Raising Yellow Perch Fingerlings	$110,094	$68,983

***Amount shown is FY 2014 federal funding only. Projects are typically 2-year.**

Additional state Sea Grant aquaculture projects can be found via our public search at seagrant.noaa.gov

The following multi-year National Sea Grant aquaculture extension and technology transfer projects were selected in 2014 (second year of 2-year projects)

Sea Grant College Program	Institutional Affiliation	Sea Grant Director	Project Title	FY 14 Federal Share*	FY 14 Matching Funds*
Alaska Sea Grant	University of Alaska Fairbanks	Paula Cullenberg	Continued Growth of the Alaska Shellfish Farming Industry through Education, Workforce Development, and Extension Services	$196,664	$94,498
USC Sea Grant	University of Southern California	Linda E. Duguay	Technology Transfer of Self Cleaning Larval Rearing Tanks to the United States to Improve Microbial Control and Larval Survival	$299,954	$153,124
Connecticut Sea Grant	University of Connecticut	Sylvain De Guise	Identifying and Addressing Process-related Challenges to the Expansion of Sea Vegetable Aquaculture in Connecticut	$97,515	$55,495
Connecticut Sea Grant	University of Connecticut	Sylvain De Guise	Development of a Northeast Aquaculture Research Farm Network (NARF-Net)	$184,406	$94,485
Delaware Sea Grant	University of Delaware	Nancy Targett	Aquaculture and Fisheries Technologies for Food and Health Educators, Seafood Professionals and Communicators	$38,393	$22,274
Florida Sea Grant	University of Florida	Karl Havens	Revitalizing the Hard Clam Aquaculture Industry in the Southeastern U.S. through Transferring Technology on Sunray Venus Clam, Macrocallista	$209,241	$105,987
Maryland Sea Grant	University of Maryland, Center for	Fredrika Moser	Evaluation of Innovative Practices for Sustainable Aquaculture Development in Chesapeake Bay	$151,876	$78,976
Texas Sea Grant	Texas A&M University	Pamela Plotkin	Seed-to-Harvest Operations Manual and Training Program for Indoor BioFloc-Dominated (BFD) Production of L. vannamei, the Pacific White	$210,000	$134,179
Washington Sea Grant	University of Washington	Penelope Dalton	Meeting demands for safe, sustainable shellfish aquaculture in Washington state	$189,554	$100,599
Wisconsin Sea Grant	University of Wisconsin System	Jim Hurley	Workforce Education and Training for Environmentally and Economically Sustainable Great Lakes Aquaculture	$201,751	$122,505

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National Sea Grant aquaculture research projects awarded in 2014

Sustainable Marine Aquaculture in the Southern California Bight: a Case Study on Environmental and Regulatory Confidence
University of California – San Diego

This proposal will tackle regulatory hurdles, develop a forum and coastal manager working group for education and training, build siting maps, improve public perception, and address environmental concerns for offshore aquaculture development in the Southern California Bight (SCB). The offshore waters of the southwest U.S. have extraordinary potential for development of marine aquaculture. This project was developed to create a working group of coastal managers and scientists with a high-level of scientific and technical expertise on marine aquaculture development. We will host the 1st and 2nd Southern California Aquaculture Forum at the Aquarium of the Pacific in Long Beach to gather experts to exchange knowledge, assess regional datasets, and foster the technical, strategic and political debate on offshore marine aquaculture development. We will develop operational maps, dynamic spatial models, and environmental data for simulating and visualizing commercial-scale aquaculture operations in the SCB. Multiple modeling platforms will be used to assess the environmental response to establishment of offshore fish farm operations. Simulations and routines will be developed to estimate water column and benthic impacts for a pilot-scale and commercial-scale operation.

Economics of Ecosystem Services from Oyster Aquaculture
University of Delaware

Oyster aquaculture has the potential to provide valuable ecosystem services including nutrient removal. Nutrient removal occurs through bioaccumulation of nutrients such as nitrogen in oyster biomass and by promoting microbial denitrification in the sediments. However, a key challenge to growing the aquaculture industry is that the market price of oysters does not account for the ecosystem services that oysters provide. This project will examine various ways to compensate oyster growers for the ecosystem services that they provide. The specific goals of this project are to: 1) Conduct economic experiments in the mid-Atlantic region to identify those oyster attributes and oyster associated labels that result in higher demand for local and regionally-produced oysters for different consumer types; 2) Measure nitrogen removal rates (bioaccumulation and denitrification) in the Delaware Inland Bays; 3) Estimate the potential cost savings from using oyster aquaculture to meet water quality goals in the Delaware Inland Bays.

Developing a Food and Drug Administration-approved Therapeutic Drug for Treating Diseases of Cultured Marine Fishes
Southern Illinois University

All animal drugs used in U.S. agriculture must be reviewed for safety and approved by the Food and Drug Administration (FDA). There are currently no FDA-approved drugs available to treat bacterial infections in marine fish, and an 'empty medicine chest' is considered a major limiting factor in development of marine aquaculture in the U.S. AQUAFLOR® (50% florfenicol) is an antibiotic feed premix that has been approved as an aquaculture drug in more than 20 countries, including the U.S. where it is FDA-approved to treat a variety of bacterial infections in freshwater fish. To expand this approval to include marine fish, FDA must be provided with evidence proving the drug is safe to marine

species. This project will generate information needed by the FDA to make this determination. If FDA is provided with sufficient information to support claims for AQUAFLOR in marine fish, it would become the first antibiotic approved to control mortality in marine fish in the U.S.

On-board rapid cooling of cultured oysters to address regulatory needs
Louisiana State University

Time/temperature requirements during the warm water months are a leading topic at the Interstate Shellfish Sanitation Conference (ISSC). This research will test thermo-dynamic strategies of on-board cooling of oysters for possible use in all molluscan shellfish producing states, especially some 20 states required to operate under a vibrio management plan. This project will involve public and private partnerships in testing and prototype production and dissemination to other shellfish producing regions. A commercial prototype on-board treatment unit for shellstock cooling and storage using ice will be tested for reducing internal vs external oyster temperatures when dipped in static vs circulating ice-slurries maintained at ≤4.5C during summer months; test levels of V. vulnificus and V. parahaemolyticus of treated and control shellfish; test differences in 7 and 14 day post-harvest oyster mortality (gaping) of ice-dipped vs. undipped oysters while held in cold storage; produce thermo-dynamic based time/temperature recommendations for shellfish handling for federal and state molluscan shellfish control authorities; and, demonstrate results at regional aquaculture conferences and trade shows and programming of the Sea Grant Marine Extension Program.

Research to Inform Regulatory Decisions on the Management of *Vibrio parahaemolyticus* in Massachusetts Shellfish Growing Areas
Roger Williams University

This work will provide data for identification of human health risk due to consumption of eastern oysters that have accumulated *Vibrio parahaemolyticus* (Vp) and *V. vulnificus* (Vv) by increasing the understanding of risk in the context of oyster cultivation and harvesting practices. Using our recently developed multiplex quantitative PCR, abundance of Vp and VV will be determined. Specifically, we will determine total abundance of Vp and Vv as well as potentially pathogenic Vv and Vp in oyster samples from subtidal and intertidal locations at various times under various treatment/handling scenarios in Wellfleet and Duxbury, MA. Additionally, environmental data and abundance of Vp and Vv will be determined for water and sediment samples. We will develop a statistical framework that 1) relates the incidence of Vv and Vp at harvest with the incidence of Vibriosis among consumers and 2) can be used to support the design of monitoring protocols and better grow out and handling strategies that will minimize the risk of high Vp and Vv in oysters after harvest.

Increasing the Reliability, Nutritional Value, and Economic Viability of Large-Scale Copepod Production for Marine Fish Larviculture
University of Southern Mississippi

Because of their small size and high nutritional value, copepods outperform traditional live foods for the hatchery production of many species that are candidates for marine aquaculture. However, the use of copepods for commercial aquaculture has been limited by the inconsistency and unreliability of the supply, the lack of technologies for large-scale production of nauplii without extensive manpower and microalgae culture facilities, and the inability to store and ship the products. The University of Southern Mississippi and Reed Mariculture, Inc. are partnering to relieve a major constraint on the development of domestic marine aquaculture by increasing the cost-effectiveness of commercial-scale culture of *Acartia tonsa* and *Parvocalanus crassirostris.* For these two species, the project seeks to 1) evaluate the effects of abiotic and dietary factors on the nutritional profile and population dynamics, 2) develop commercial algae concentrate diets, 3) determine the optimal conditions for large-scale intensive production, and 4) demonstrate the use of copepods produced in the manner developed by this project for the rearing of marine finfish species relevant to the Gulf of Mexico region.

Validation of Field-Applicable Detection Kits for Total and Pathogenic *Vibrio parahaemolyticus* in Oysters
Mississippi State University

The primary goals of this project are (1) to validate the current agar-based kits for the detection of total and pathogenic V. *parahaemolyticus* in oysters against reference methods; (2) to develop pectin based alternatives for the current agar-based test kits to allow production without heating, and (3) to transfer technology to laboratories involved in regulatory testing for state shellfish control authorities and the oyster industry. The agar and pectin formulated Vp assay kits with two biomarkers will be validated at the level required by the FDA and ISSC so they will be available options for state regulatory laboratories. Additionally, successful completion of this project could lead to the Vp test kits as a commercial product (patent protected) available to the US and international markets. Availability of a rapid and inexpensive testing method for total and pathogenic V. *parahaemolyticus* (either commercially available or publically available formulation) will allow the oyster farmers to contract or conduct testing to evaluate the level of risk associated with their harvest practices.

Minimizing Risks of Vibrio Bacteria in Farm-Raised Oysters in Intertidal Environments
Rutgers University

Nationally, oyster farming is a 300+ million dollar industry supporting thousands of small farms and sustainable green jobs in rural areas. Farm-raised oyster production is increasing rapidly in the Northeast and mid-Atlantic region. Illnesses associated with vibrio bacteria following shellfish consumption have also been increasing, presenting a serious concern to shellfish farmers, food safety regulators, and consumers. The ability to predict where, when and under what conditions vibrio presents a health risk is limited by a poor understanding of its basic ecology, especially as it relates to pathogenic strains. Additionally, the relationship of these strains with farm practices, which vary widely, remains poorly explored, particularly along the Atlantic Coast. Without such critical information, well-intended regulatory policy can be inadequate or unnecessarily excessive. With public health and jobs at risk it is essential to get it right. This project will perform a course of applied research designed to inform

oyster aquaculture regulations and advance harvest practices to minimize levels of vibrios in cultured oysters, thereby reducing the risk of vibriosis.

Development of Small, Local Shellfish Hatcheries and Increasing Hatchery Production Methods for Existing Hatcheries Culturing the Eastern Oyster, *Crassostrea virginica*
Cornell University Cooperative Extension

Oyster farming in the Mid-Atlantic and Northeast are growing at a rapid rate due to demand and new state and county leasing programs that allow for increased access to underwater land. The establishment of new hatcheries as well as increasing the capacity for existing hatcheries is necessary if the supply of oyster seed will keep up with demand. This project aims to use novel techniques to do both. As live algal cultures can be the bottleneck in new hatchery startups we will use off-the-shelf live algae replacements to allow two small “pocket” hatcheries to start with limited budgets and expertise. The other goal is to enable established hatcheries to increase throughput by making more efficient use of tank space. We plan to convert larval tanks in one commercial and one municipal hatchery from the industry-standard static to continuous flow. This should allow an order of magnitude increase in larval stocking density, resulting in more oyster seed from a hatchery with a minimum of investment. Results will be shared through a variety of means including regional seminars and electronic media.

Improving Juvenile Oyster Survival through Adaptation and Screening of Ocean Acidification Impacts
Oregon State University

Ocean acidification nearly devastated the Pacific Northwest oyster industry from extensive hatchery production failures over multiple years, with estimated losses ~$100 million. Similar to the sensitive stages of early bivalve larvae in hatcheries, during the metamorphosis from swimming to sessile stages, bivalves are particularly sensitive to environmental stress. In order to assist oyster growers in managing their newly set oysters, we will adapt existing fluorescent staining techniques to field ready microscopes that will allow them to assess fitness and shell building capacity. Working with four industry partners in Yaquina Bay, OR, Netarts Bay, OR, and Willapa Bay, WA we will implement methods in the field, gather feedback from growers for design and simplifying procedures, and calibrate the methods. A visual scale that allows growers to determine fitness of oysters in this highly sensitive state will allow them to make informed adaptation-based decisions during the culture process. Providing rapid-assessment tools to the oyster industry will build increased resilience and adaptive capacity in light of ocean acidification and other global change issues.

Risk of Food-Borne Diseases in Farmed Oysters: Economic Analysis of Consumer Response and Producers’ Strategy
University of Rhode Island

The goal of this project is to enhance the resilience of the oyster aquaculture industry against the risk of food-borne disease outbreaks. With a focus on the demand side of farmed oysters, this project will examine consumers' behavior in response to food-borne disease outbreaks, and investigate potential response strategies for aquaculturists. We are interested in estimating the two impacts. First is the so-called negative information spillover effect, where, for example, the demand of RI oysters is dampened

by the news of disease outbreak in neighboring states. Everyone in the industry seems to know that this exists, but what is unknown is the magnitude of the impact. Second is the effectiveness of positive information (i.e. information aimed to reassure consumers about the product safety) on counteracting the negative spillover effect. Whatever the severeness of the negative spillover effect, the industry needs an effective countermeasure to mitigate the negative spillover effect; our research aims to provide critical information and guidance for such effort. While the project's geographical focus is in southern New England, our findings and results are expected to be applicable in other regions.

Streamlining Biosecurity Management in the Context of Regional Molluscan Shellfish Transfers
Virginia Institute of Marine Science

Managing molluscan diseases in the context of interstate shellfish transfers is critical to the health and sustainability of aquaculture industries on the US East Coast. The present management paradigm, mandating health analyses for every batch of germplasm, larvae, seed or broodstock proposed to be transferred across state lines and zero-tolerance policies for major pathogens, is strained by a growing industry and ill-suited for a region in which the pathogens are wide-ranging and often ubiquitous, to the detriment of both reasonable commerce and biosecurity. The primary goal of this project will be to produce clear new guidelines for managers to use in routinely responding to one key regulatory question: Should this shellfish seed import be permitted? We will convene an Eastern United States Interstate Molluscan Shellfish Transport Workshop with nearly forty participants from the scientific, regulatory, and commercial communities coast-wide to generate syntheses with regard to the current regulatory landscape, pathogen and disease distributions, and diagnostic assays for them; to gather feedback about the present regulatory framework and desired changes; and to find consensus concerning pathogen tolerances in animals proposed for transport and in the appropriate application of molecular tools.

A New Native Species for Shellfish Aquaculture and Precautionary Guidelines to Protect Wild Populations: Local Adaptation, Population Structure and Broodstock Development in Rock Scallops (*Crassadoma gigantea*)
University of Washington

The conservation of genetic resources is an issue of increasing importance, especially in an era of rapid climate change and growing need for aquaculture production to supplement stagnant fisheries. Many management bodies have tight regulations on species transfers to conserve genetic population diversity, even if evidence for locally adapted populations is limited. This project is a public private partnership to estimate the extent of local adaptation to CO2 in rock scallops on the US west coast, a native species with high market potential in all four US Pacific coast states. Ocean acidification caused by elevated CO2 levels is already causing water quality problems in many hatcheries in Puget Sound and thus represents a major problem for profitable shellfish aquaculture. We will compare performance of larvae from different populations under ambient and elevated CO2, and test for local adaptation by reciprocal transplant experiments. Our study will inform current regulatory restrictions on scallop transfer within and between states, and will develop genetic resources useful for aquaculture development of this valuable native species.

Development and Commercial Transfer of Technologies to Improve the Hatching Success and Production of Juvenile Black Cod (Sablefish), *Anoplopoma fimbria*
University of Washington

Sablefish (black cod) are a deepwater species native to the west coast of the U.S. with very high market value. Aquaculture of this species is new and a key issue is the inconsistent supply of affordable fry that stems from critical bottlenecks in larval production. Our research utilizes a partnership involving industry, tribal entities, academia and the federal government to specifically address "hatchery bottlenecks between the egg and fingerling stages". Specific objectives include the transfer of current research results on sablefish larval rearing to the commercial-scale production of sablefish fingerlings to decrease commercial production time from larvae to fingerlings and to shorten the time to harvest. In this objective, we will incorporate techniques to a) rear larvae at higher temperatures; b) omit/contract live feeding phases; and c) produce all female stocks. A second objective will be to conduct new research to a) develop methods to increase fertilization success and to increase the production of viable embryos and larvae; and b) develop and test immersion vaccination protocols to shorten the juvenile to grow-out phase.

Production and Economic Evaluations of New Technologies for Raising Yellow Perch Fingerlings
University of Wisconsin-Stevens Point

One of the biggest constraints limiting expansion of the domestic yellow perch aquaculture industry is the high cost of feed-trained fingerlings. Since 2012, breakthroughs at the UW-Stevens Point Northern Aquaculture Demonstration Facility (UWSP-NADF), including significant refinements to tank designs (turbid water, water surface spray and tank colors), feeds, and feeding strategies, have greatly improved the survival and growth of yellow perch fry reared in tanks. This project will compare the performance parameters and production costs of yellow perch fingerlings raised using novel in-tank methods developed at the UWSP-NADF with those of the traditional pond-tank method widely used throughout the commercial yellow perch aquaculture industry. At the conclusion of the project, UW-Extension personnel will prepare production and economic reports comparing the two different fingerling production methods.

National Sea Grant aquaculture research projects awarded in 2014

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Validation of Field-Applicable Detection Kits for Total and Pathogenic *Vibrio parahaemolyticus* in Oysters
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The primary goals of this project are (1) to validate the current agar-based kits for the detection of total and pathogenic V. *parahaemolyticus* in oysters against reference methods; (2) to develop pectin based alternatives for the current agar-based test kits to allow production without heating, and (3) to transfer technology to laboratories involved in regulatory testing for state shellfish control authorities and the oyster industry. The agar and pectin formulated Vp assay kits with two biomarkers will be validated at the level required by the FDA and ISSC so they will be available options for state regulatory laboratories. Additionally, successful completion of this project could lead to the Vp test kits as a commercial product (patent protected) available to the US and international markets. Availability of a rapid and inexpensive testing method for total and pathogenic V. *parahaemolyticus* (either commercially available or publically available formulation) will allow the oyster farmers to contract or conduct testing to evaluate the level of risk associated with their harvest practices.

Minimizing Risks of Vibrio Bacteria in Farm-Raised Oysters in Intertidal Environments
Rutgers University

Nationally, oyster farming is a 300+ million dollar industry supporting thousands of small farms and sustainable green jobs in rural areas. Farm-raised oyster production is increasing rapidly in the Northeast and mid-Atlantic region. Illnesses associated with vibrio bacteria following shellfish consumption have also been increasing, presenting a serious concern to shellfish farmers, food safety regulators, and consumers. The ability to predict where, when and under what conditions vibrio presents a health risk is limited by a poor understanding of its basic ecology, especially as it relates to pathogenic strains. Additionally, the relationship of these strains with farm practices, which vary widely, remains poorly explored, particularly along the Atlantic Coast. Without such critical information, well-intended regulatory policy can be inadequate or unnecessarily excessive. With public health and jobs at risk it is essential to get it right. This project will perform a course of applied research designed to inform

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Development of Small, Local Shellfish Hatcheries and Increasing Hatchery Production Methods for Existing Hatcheries Culturing the Eastern Oyster, *Crassostrea virginica*
Cornell University Cooperative Extension

Oyster farming in the Mid-Atlantic and Northeast are growing at a rapid rate due to demand and new state and county leasing programs that allow for increased access to underwater land. The establishment of new hatcheries as well as increasing the capacity for existing hatcheries is necessary if the supply of oyster seed will keep up with demand. This project aims to use novel techniques to do both. As live algal cultures can be the bottleneck in new hatchery startups we will use off-the-shelf live algae replacements to allow two small “pocket” hatcheries to start with limited budgets and expertise. The other goal is to enable established hatcheries to increase throughput by making more efficient use of tank space. We plan to convert larval tanks in one commercial and one municipal hatchery from the industry-standard static to continuous flow. This should allow an order of magnitude increase in larval stocking density, resulting in more oyster seed from a hatchery with a minimum of investment. Results will be shared through a variety of means including regional seminars and electronic media.

Improving Juvenile Oyster Survival through Adaptation and Screening of Ocean Acidification Impacts
Oregon State University

Ocean acidification nearly devastated the Pacific Northwest oyster industry from extensive hatchery production failures over multiple years, with estimated losses ~$100 million. Similar to the sensitive stages of early bivalve larvae in hatcheries, during the metamorphosis from swimming to sessile stages, bivalves are particularly sensitive to environmental stress. In order to assist oyster growers in managing their newly set oysters, we will adapt existing fluorescent staining techniques to field ready microscopes that will allow them to assess fitness and shell building capacity. Working with four industry partners in Yaquina Bay, OR, Netarts Bay, OR, and Willapa Bay, WA we will implement methods in the field, gather feedback from growers for design and simplifying procedures, and calibrate the methods. A visual scale that allows growers to determine fitness of oysters in this highly sensitive state will allow them to make informed adaptation-based decisions during the culture process. Providing rapid-assessment tools to the oyster industry will build increased resilience and adaptive capacity in light of ocean acidification and other global change issues.

Risk of Food-Borne Diseases in Farmed Oysters: Economic Analysis of Consumer Response and Producers’ Strategy
University of Rhode Island

The goal of this project is to enhance the resilience of the oyster aquaculture industry against the risk of food-borne disease outbreaks. With a focus on the demand side of farmed oysters, this project will examine consumers' behavior in response to food-borne disease outbreaks, and investigate potential response strategies for aquaculturists. We are interested in estimating the two impacts. First is the so-called negative information spillover effect, where, for example, the demand of RI oysters is dampened

by the news of disease outbreak in neighboring states. Everyone in the industry seems to know that this exists, but what is unknown is the magnitude of the impact. Second is the effectiveness of positive information (i.e. information aimed to reassure consumers about the product safety) on counteracting the negative spillover effect. Whatever the severeness of the negative spillover effect, the industry needs an effective countermeasure to mitigate the negative spillover effect; our research aims to provide critical information and guidance for such effort. While the project's geographical focus is in southern New England, our findings and results are expected to be applicable in other regions.

Streamlining Biosecurity Management in the Context of Regional Molluscan Shellfish Transfers
Virginia Institute of Marine Science

Managing molluscan diseases in the context of interstate shellfish transfers is critical to the health and sustainability of aquaculture industries on the US East Coast. The present management paradigm, mandating health analyses for every batch of germplasm, larvae, seed or broodstock proposed to be transferred across state lines and zero-tolerance policies for major pathogens, is strained by a growing industry and ill-suited for a region in which the pathogens are wide-ranging and often ubiquitous, to the detriment of both reasonable commerce and biosecurity. The primary goal of this project will be to produce clear new guidelines for managers to use in routinely responding to one key regulatory question: Should this shellfish seed import be permitted? We will convene an Eastern United States Interstate Molluscan Shellfish Transport Workshop with nearly forty participants from the scientific, regulatory, and commercial communities coast-wide to generate syntheses with regard to the current regulatory landscape, pathogen and disease distributions, and diagnostic assays for them; to gather feedback about the present regulatory framework and desired changes; and to find consensus concerning pathogen tolerances in animals proposed for transport and in the appropriate application of molecular tools.

A New Native Species for Shellfish Aquaculture and Precautionary Guidelines to Protect Wild Populations: Local Adaptation, Population Structure and Broodstock Development in Rock Scallops (*Crassadoma gigantea*)
University of Washington

The conservation of genetic resources is an issue of increasing importance, especially in an era of rapid climate change and growing need for aquaculture production to supplement stagnant fisheries. Many management bodies have tight regulations on species transfers to conserve genetic population diversity, even if evidence for locally adapted populations is limited. This project is a public private partnership to estimate the extent of local adaptation to CO2 in rock scallops on the US west coast, a native species with high market potential in all four US Pacific coast states. Ocean acidification caused by elevated CO2 levels is already causing water quality problems in many hatcheries in Puget Sound and thus represents a major problem for profitable shellfish aquaculture. We will compare performance of larvae from different populations under ambient and elevated CO2, and test for local adaptation by reciprocal transplant experiments. Our study will inform current regulatory restrictions on scallop transfer within and between states, and will develop genetic resources useful for aquaculture development of this valuable native species.

Development and Commercial Transfer of Technologies to Improve the Hatching Success and Production of Juvenile Black Cod (Sablefish), *Anoplopoma fimbria*
University of Washington

Sablefish (black cod) are a deepwater species native to the west coast of the U.S. with very high market value. Aquaculture of this species is new and a key issue is the inconsistent supply of affordable fry that stems from critical bottlenecks in larval production. Our research utilizes a partnership involving industry, tribal entities, academia and the federal government to specifically address "hatchery bottlenecks between the egg and fingerling stages". Specific objectives include the transfer of current research results on sablefish larval rearing to the commercial-scale production of sablefish fingerlings to decrease commercial production time from larvae to fingerlings and to shorten the time to harvest. In this objective, we will incorporate techniques to a) rear larvae at higher temperatures; b) omit/contract live feeding phases; and c) produce all female stocks. A second objective will be to conduct new research to a) develop methods to increase fertilization success and to increase the production of viable embryos and larvae; and b) develop and test immersion vaccination protocols to shorten the juvenile to grow-out phase.

Production and Economic Evaluations of New Technologies for Raising Yellow Perch Fingerlings
University of Wisconsin-Stevens Point

One of the biggest constraints limiting expansion of the domestic yellow perch aquaculture industry is the high cost of feed-trained fingerlings. Since 2012, breakthroughs at the UW-Stevens Point Northern Aquaculture Demonstration Facility (UWSP-NADF), including significant refinements to tank designs (turbid water, water surface spray and tank colors), feeds, and feeding strategies, have greatly improved the survival and growth of yellow perch fry reared in tanks. This project will compare the performance parameters and production costs of yellow perch fingerlings raised using novel in-tank methods developed at the UWSP-NADF with those of the traditional pond-tank method widely used throughout the commercial yellow perch aquaculture industry. At the conclusion of the project, UW-Extension personnel will prepare production and economic reports comparing the two different fingerling production methods.
